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Contents

Acronyms and Abbreviations ..... **vi**

Glossary ..... **x**

Executive Summary ..... **xvii**

1 Introduction **1-i**

2 Risk Assessment Approach **2-i**

3 Engineering Description **3-i**

4 Constituents of Potential Concern **4-i**

5 Estimation of Emissions **5-i**

6 Environmental Modeling **6-i**

7 Screening Human Health Risk Assessment **7-i**

8 Screening-Level Ecological Risk Assessment **8-i**

9 Relationship of Risk Assessment to WTP **9-i**

10 Uncertainty Assessment **10-i**

11 References **11-i**

Appendices

Appendix A Constituents of Potential Concern ..... **A-i**

Appendix B Modeling Parameters and Human Health Risk Assessment ..... **B-i**

Appendix C Ecological Risk Assessment ..... **C-i**

Attachments

Attachment 1 ***Integrated Emissions Baseline Report for the Hanford Tank Waste Treatment and Immobilization Plant*** **(24590-WTP-RPT-PO-03-008, Rev 0)** **A1-i**

Attachment 2 ***Estimated Organic Emissions from Process Cells*** **(24590-WTP-HAC-50-00001, Rev C)** **A2-i**

Acronyms and Abbreviations

ADD	average daily dose
AE	absorption efficiency
AEGL	acute exposure guideline levels
AHQ	acute hazard quotient
AIEC	acute inhalation exposure criteria
AR	arylhydrocarbon receptor
AREC	acute radionuclide exposure criteria
AREL	acute reference exposure levels
ATSDR	Agency for Toxic Substances and Disease Registry
AUF	area use factor
BAF	bioaccumulation factor
BCF	bioconcentration factor
BEF	bioaccumulation equivalency factor
BLM	US Bureau of Land Management
CalEPA	California Environmental Protection Agency
CDE	committed dose equivalent
CFR	*Code of Federal Regulations*
CLUP	*Comprehensive Land-Use Plan*
COPC	chemical of potential concern
CSM	conceptual site model
CTUIR	Confederated Tribes of the Umatilla Indian Reservation
DCF	dose conversion factor
DEM	digital elevation model
DNA	deoxyribonucleic acid
DOE	US Department of Energy
DQO	data quality objective
DST	double-shell tank
ECF	elevation correction factor
Ecology	Washington State Department of Ecology
EPA	US Environmental Protection Agency
EPC	exposure point concentration

ERA	ecological risk assessment
ERPG	Emergency Response Planning Guidelines
ESU	evolutionarily significant unit
ETF	Effluent Treatment Facility
FCM	food chain multiplier
FEALE	Fitzner-Eberhardt Arid Lands Ecology Reserve
FGR	Federal Guidance Report
FR	*Federal Register*
FRA	final risk assessment
FWS	US Fish and Wildlife Service
GAF	gastrointestinal absorption factor
HEAST	Health Effects Assessment Summary Table
HEME	high-efficiency mist eliminator
HEPA	high-efficiency particulate air
HHRA	human health risk assessment
HHRAP	Human Health Risk Assessment Protocol
HI	hazard index
HLW	high-level waste
HQ	hazard quotient
IAEA	International Atomic Energy Agency
IHLW	immobilized high-level waste
ILAW	immobilized low-activity waste
ILCR	incremental lifetime cancer risk
IRIS	Integrated Risk Information System
ISCST3	Industrial Source Complex Short Term Model, Version 3
ISMS	integrated safety management system
IX	ion exchange
LADD	lifetime average daily dose
LAW	low-activity waste
LERF	Liquid Effluent Retention Facility
LOAEL	lowest observed adverse effect level
MM5	Mesoscale Model 5
MSL	mean sea level

MTCA	*Model Toxics Control Act*
MW	molecular weight
NAAQS	National Ambient Air Quality Standard
NAWQC	National Ambient Water Quality Criteria
NCEA	National Center for Environmental Assessment
NOAEL	no observed adverse effect level
ORP	Office of River Protection
OSHA	Occupational Safety and Health Administration
OSWER	Office of Solid Waste and Emergency Response
PAH	polycyclic aromatic hydrocarbons
PCB	polychlorinated biphenyl
PCDD	polychlorinated dibenzo-p-dioxin
PCDF	polychlorinated dibenzofuran
pCi	picocurie
PEF	particulate emission factor
PIC	product of incomplete combustion
PJM	pulse jet mixer
PRA	pre-demonstration test risk assessment
PSD	prevention of significant deterioration
QF	quality factor
RAWP	risk assessment work plan
RF	risk factor
RCF	root concentration factor
RfC	reference concentration
RfD	reference dose
RFD	reverse flow diverter
RME	reasonable maximum exposure
ROD	Record of Decision
ROPC	radionuclide of potential concern
RPF	relative potency factor
SBS	submerged bed scrubber
SF	slope factor
SFr	soil or sediment ingestion fraction

SLERA	screening-level ecological risk assessment
SLERAP	Screening-Level Ecological Risk Assessment Protocol
SLRA	screening-level risk assessment
SP	sediment-to-plant
SVOC	semivolatile organic compound
T&E	threatened and endangered
TAP	toxic air pollutant
TCDD	tetrachlorodibenzo-p-dioxin
TCDF	tetrachlorodibenzofuran
TEEL	temporary emergency exposure limits
TEF	toxicity equivalency factor
TEQ	toxic equivalency
TIC	tentatively identified compound
TRU	transuranic
TRV	toxicity reference value
TSS	total suspended solids
TUF	temporal use factor
UHC	underlying hazardous constituent
UR	unit risk
USGS	US Geological Survey
USLE	Universal Soil Loss Equation
UTS	Universal Treatment Standards
VOC	volatile organic compound
WAC	waste acceptance criteria
WESP	wet electrostatic precipitator
WHO	World Health Organization
WP	water-to-plant
WTP	Hanford Tank Waste Treatment and Immobilization Plant

Glossary

abiotic – non-living; used to describe air, soil, sediment, and water to which receptors may be exposed.

anadromous – describing fish that spend most of their adult lives in salt water and migrate to freshwater rivers and lakes to reproduce.

Ba – biotransfer factor for an animal product, expressed as the ratio of the chemical concentration in fresh weight tissue to the daily intake of the chemical by the animal.

Ba_{beef} – biotransfer factor for beef, expressed as the ratio of the chemical concentration in fresh weight tissue to the daily intake of the chemical by beef cattle.

$Ba_{chicken}$ – biotransfer factor for chickens, expressed as the ratio of the chemical concentration in fresh weight tissue to the chemical intake from the feed by chickens.

Ba_{egg} – biotransfer factor for eggs, expressed as the ratio of the chemical concentration in fresh weight tissue to the chemical intake from the feed by chickens.

Ba_{milk} – biotransfer factor for milk, expressed as the ratio of the chemical concentration in fresh weight tissue to the daily intake of the chemical by milk cows.

Ba_{pork} – biotransfer factor for pork, expressed as the ratio of the chemical concentration in fresh weight tissue to the daily intake of the chemical by swine.

BAF-S – terrestrial invertebrate bioaccumulation factor, used to calculate the transfer of a chemical from soil to a terrestrial invertebrate.

BAF-T_p – mammal or bird bioaccumulation factor, used to calculate the transfer of a chemical from a plant to a mammal or bird; the factor is specific to each receptor because it includes the daily intake of plants by the receptor.

BAF-T_s – mammal or bird bioaccumulation factor, used to calculate the transfer of a chemical from soil or sediment to a mammal or bird; the factor is specific to each receptor because it includes the daily intake of soil or sediment by the receptor.

BAF-T_w – mammal or bird bioaccumulation factor, used to calculate the transfer of a chemical from ingested water to a mammal or bird; the factor is specific to each receptor because it includes the daily intake of water by the receptor.

BASF – benthic invertebrate bioaccumulation factor, used to calculate the transfer of a chemical from sediment to a benthic invertebrate.

BCF_{fish} – fish bioconcentration factor, used to calculate the transfer of a chemical from surface water to a fish.

BCF_{inv} – aquatic invertebrate bioconcentration factor, used to calculate the transfer of a chemical from surface water to an aquatic invertebrate.

BEF – the ratio of bioaccumulation of a polychlorinated dibenzodioxin or dibenzofuran COPC to the bioaccumulation of 2,3,7,8-tetrachlorodibenzo-p-dioxin.

Benthic – having to do with sediment at the bottom of a stream, pond, river, or lake.

Bioaccumulation factor (BAF) – uptake factor for direct and indirect transfer of chemicals from abiotic medium and food to an organism, expressed as the ratio of the concentration of a chemical in an organism and the concentration of the chemical in an abiotic medium that is a direct source of the chemical for the organism and which the organism's food is also exposed.

Bioconcentration factor (BCF) – uptake factor for direct transfer of chemicals from abiotic medium only to an organism, expressed as the ratio of the concentration of a chemical in an organism and the concentration of the chemical in an abiotic medium that is a direct source of the chemical for the organism.

Biomagnification factor (BMF) – the ratio of the concentration of a chemical in a consumer and the concentration of the chemical in its food.

Br – soil-to-plant uptake factor; uptake is through roots or root hairs.

Br_{ag} – soil-to-plant uptake factor for aboveground plants, accounting for the uptake from soil and the subsequent transport of chemicals through the roots to the aboveground parts of a plant.

$Br_{rootveg}$ – soil-to-plant uptake factor for chemicals in root vegetables, accounting for the uptake from soil to the belowground root vegetable or produce.

BW – total body weight of a receptor.

C_a – concentration of a COPC or ROPC in the tissue of an animal receptor resulting from ingestion of contaminated soil, sediment, water, and food.

C_{air} – concentration of a COPC or ROPC in air resulting from WTP airborne emissions.

CALPUFF – an air dispersion model. This model handles winds more realistically than the ISCST3 model.

Carnivore – an animal that eats other animals.

C_{forage} – modeled concentration in forage.

C_{grain} – modeled concentration in grain.

C_p – concentration of a COPC or ROPC in plants resulting from uptake of WTP airborne emissions directly and from soil.

C_{pw} – concentration of a COPC or ROPC in soil pore water resulting from deposition of WTP airborne emissions.

Conservation of mass – The conservation of mass is a fundamental concept of physics. Within a defined system, the amount of mass remains constant (that is, mass cannot be created from nothing). For this discussion, the defined system is the release of chemical emissions from the WTP, subsequent deposition to soil, and uptake into biological organisms.

Conservative – used in the RAWP to refer to conditions that implicitly or explicitly overestimate exposure. In some cases the word "conservative" is used to refer to procedures that result in higher risks than would have been calculated by explicitly using methods in the guidance.

COPC – chemical of potential concern.

CR_{forage} – consumption rate of forage by a receptor (quantity consumed per day).

CR_{grain} – consumption rate of grain by a receptor (quantity consumed per day).

CR_{silage} – consumption rate of silage by a receptor (quantity consumed per day).

CR_{soil} – consumption rate of soil by a receptor (quantity consumed per day).

Cs – modeled concentration in soil or sediment.

C_{silage} – modeled concentration in silage.

C_{soil} – modeled concentration in soil.

DCF – dose conversion factor, a multiplier used to convert the concentration of an ROPC in air, soil, or water to the external radiation dose absorbed by a receptor.

Default – a predetermined numerical value that is used in place of a missing value.

Dose – the amount of a chemical taken in by an organism.

Driver – a COPC or ROPC that contributes 10 % or more of the threshold incremental lifetime cancer risk for human risk, or 10 % or more of the threshold hazard index for human or ecological risk.

Exposure duration – time period over which a receptor is exposed.

Feed – For the animals included in this discussion (cattle, wild game, swine, poultry, and wildfowl), feed may include forage, grain, or silage.

f_{oc} – fraction of the dry mass of soil consisting of organic carbon, for example, particle-bound, dissolved, or emulsified organic chemicals and decaying plant and animal material.

Food chain – a sequence of discrete feeding relationships between different species populations or groups of similar organisms.

Food chain multiplier (FCM) – the ratio of the concentration of a substance in the tissue of an animal (consumer or predator) and the concentration in the abiotic medium at the base of the food chain (i.e., soil, water, sediment). Per the EPA guidance, this is the preferred technique for ecological evaluation of terrestrial food chains even though it was originally developed in aquatic food chains. The ratio of tissue concentrations in predator and prey is given by $FCM_{predator}/FCM_{prey}$

Hanford offsite maximum – location of maximum predicted ground-level concentrations of both airborne and deposited emissions outside the Hanford Site boundary. This location will have the highest modeled exposures on land that DOE does not control.

Herbivore – an animal that eats primarily plant material.

Human Health Risk Assessment Protocol (HHRAP) - the human health risk assessment guidance document (EPA 1998a in section 11).

ILCR – incremental lifetime cancer risk.

Insectivore – an animal that eats primarily insects and other invertebrates.

ISCST3 – Industrial Source Complex Short-Term Model; an earlier air dispersion model used by the WTP, now replaced by CALPUFF.

Joule-heated – heated by passing an electric current directly through the material.

Kd_s – soil-water partitioning coefficient. Per EPA 1999a (see section 11) Kd_s "describes the partitioning of a compound between soil pore-water and soil particles, and strongly influences the release and movement of a compound into the subsurface soils and underlying aquifer". It is used here to model the movement of chemicals from soil into plant roots.

K_{oc} – soil organic carbon-water partitioning coefficient (concentration of chemical in soil, expressed as soil carbon, relative to its solubility in water).

K_{ow} – octanol/water partitioning coefficient (ratio of the solute concentration in the water-saturated octanol phase to the solute concentration in the octanol-saturated water phase).

LOAEL – the lowest dose of a toxic chemical that caused an observable adverse effect in a toxicity test on the endpoint being measured; if the range of doses tested did not include a dose low enough to cause a NOAEL, it is not possible to determine how close the LOAEL is to a no adverse effect level dose.

Mass density – the weight of material in a unit area given a specified soil depth.

Mass-limited uptake factor – an uptake factor that results in 100 % of an available chemical being transferred into a biological receptor but no more.

mGy – milliGray, a unit of absorbed radiation equal to 0.001 Joule/kg.

NOAEL – the highest dose of a toxic chemical that did not cause any observable adverse effect in a toxicity test on the endpoint being measured; if the range of doses tested did not include a dose high

enough to cause a LOAEL, it is not possible to determine how close the NOAEL is to an adverse effect level.

Omnivore – an animal that eats both plants and animals.

Onsite ground maximum – location of maximum predicted ground-level concentrations of both airborne and deposited emissions on the Hanford Site. This location will have the highest modeled exposures for current workers on the Hanford Site, for potential future residents on the Hanford Site, and for ecological receptors.

Planktivorous – describing fish that eat plankton.

Plausible – describing exposure scenarios for receptors that currently exist, or may reasonably be expected to exist in the future, at a given location (for example, a future resident at the Hanford offsite maximum location). Exposure parameters for plausible scenarios are conservative.

Product of incomplete combustion (PIC) – a chemical produced when combustion of an organic COPC does not completely convert the COPC to carbon dioxide and oxides of nitrogen, sulfur, and/or any other element that makes up the chemical structure of the COPC.

QF – a factor that describes the relative biological activity (i.e., quality) of alpha radiation compared to gamma radiation.

rad – a unit of absorbed radiation equal to 0.01 Joule/kg.

RCF – root concentration factor, used to calculate the belowground transfer of a chemical from the soil to a root vegetable.

$RDExt_{air}$ – external radiation dose (rad/d) from airborne ROPCs surrounding the receptor.

$RDExt_{sed}$ –external radiation dose (rad/d) from ROPCs in sediment; receptor either is immersed in sediment or is on or near the surface of the sediment.

$RDExt_{soil}$ – external radiation dose (rad/d) from ROPCs in soil to a receptor that either is immersed in soil or is on or near the surface of the soil.

$RDExt_{water,imm}$ – external radiation dose (rad/d) from ROPCs in water to a receptor that is immersed in water.

$RDExt_{water,prox}$ – external radiation dose (rad/d) from ROPCs in water to a receptor that is above but near the surface of the water.

RDInt – internal radiation dose (rad/d) to an organism that has incorporated ROPCs.

Regression – a mathematical method that determines how closely an equation fits a series of data points. Regression can be used to derive a generalized equation from a number of observed values, for example, the equations to calculate bioaccumulation factors from log K_{ow} values.

Sensitive species EC20 – a benchmark calculated from chronic toxicity test data that is intended to allow no more than a 20 % reduction in weight or number of offspring in 95 % of species.

Slope factor – plausible upper-bound estimate (for chemicals) and central estimate (for radionuclides) of the probability of a cancer response per unit intake over a lifetime.

SFr – soil fraction is the ratio of the soil ingestion rate to the sum of the plant and animal ingestion rates.

SLERAP – screening-level ecological risk assessment protocol; the ecological risk assessment guidance document (EPA 1999a in section 11).

Soil pore water – water in the interstitial spaces between the mineral and organic particles of soil.

SP – sediment-dwelling plant bioconcentration factor, used to calculate the transfer of a chemical from sediment to a sediment-dwelling plant.

SPv – plant bioconcentration factor, used to calculate the transfer of a chemical from soil to a soil-dwelling plant.

Steady state – the condition where the value of a variable does not change through time.

Surrogate – a chemical with known bioaccumulation or toxicity factors which are used in lieu of those factors for a COPC for which the factors are not known. The surrogate is sufficiently chemically similar to the COPC that the COPC is expected to have similar bioaccumulation or toxicity factors to those of the surrogate.

Target analyte – an analyte that is expected to occur in WTP airborne emissions and can readily be identified and quantified by chemical analytical methods that will be used at the WTP.

T&E species – plant and animal species that have been designated by law as threatened or endangered.

TEF – the ratio of toxicity of a polychlorinated dibenzodioxin and dibenzofuran COPC to the toxicity of 2,3,7,8-tetrachlorodibenzo-p-dioxin.

Tentatively identified compound – a compound that is detected in environmental samples that is not a target analyte. TICs are identified generally as a result of using mass spectrometry techniques. When a TIC is identified, it can be definitively identified by analyzing an authentic standard of the putative unknown.

Tilled soil – soil evenly mixed down to a depth of 20 cm.

Untilled soil – soil evenly mixed down to a depth of 1 cm.

Uptake factor – the ratio of a chemical concentration in one environmental medium to its concentration in another.

Wetland – an area whose soil is saturated with water; saturation causes low oxygen concentrations in the soil and results in the growth of plants specialized to live with low oxygen levels.

Worst-case – describing exposure scenarios for receptors that are not reasonably expected to exist now or in the future at the specified location (for example, a future resident at the onsite ground maximum location). Exposure parameters for worst-case scenarios are conservative.

WP – aquatic plant concentration factor, used to calculate the transfer of a chemical from surface water to an aquatic plant.

Executive Summary

The purpose of this work plan is to provide the concepts, methods, and data to be used in an environmental risk assessment. The intent of this environmental risk assessment is to ensure that the airborne emissions from the Hanford Tank Waste Treatment and Immobilization Plant (WTP) will be safe to anyone who lives near or works on or near the Hanford Site, to Native Americans who use resources on or near the Hanford Site, and to plants and animals on or near the Hanford Site. It is important that people and the environment are not harmed because potential exposures are overlooked or underestimated, but it is also important to maximize the ability of the facility to dispose of the tank wastes and to protect against the potential leakage from these tanks into the nearby Hanford Site soil, groundwater, and ultimately the Columbia River. A balance of these goals will result from the interactive process of reviewing and improving this work plan and subsequent documents that will contain the actual environmental risk assessments. Indeed, each stage of this work will benefit from interactions with regulatory agencies, Native American tribes, and the public to assure public health and to protect the environment. These interactions are expected to be in the form of questions and comments about methods and data, and other inputs.

Hanford tank wastes consist of approximately 54 million US gallons of highly radioactive and mixed dangerous wastes that are managed by the US Department of Energy. The wastes consist of solids (sludge), liquids (supernatant) and salt cake (dried salts that will dissolve in water to form supernatant). The term low-activity waste (LAW) generally refers to the supernatant portion, while high-level waste (HLW) usually refers to the solids; both of these waste categories are subsets of HLW. These wastes are stored in underground holding tanks and will be pumped to the WTP. At the WTP, wastes will be pretreated and immobilized using a technology called *vitrification*. Vitrification is a thermal process that converts the waste materials into durable glass. The vitrified wastes and secondary wastes resulting from the WTP processes will then be transferred to permitted treatment, storage, or disposal units. The WTP is scheduled to be in operation for up to 40 years. During the pretreatment and vitrification of the various types of wastes, some airborne emissions will be created. There are various engineered devices that will control the nature and amounts of these emissions, but there will still be material in the form of vapors and small particles that will be released via three tall stacks and several vents into the environment around the WTP.

Once the vapors and particulates leave the facility stacks, they will be carried by air currents and deposited on the surface of soil and vegetation around the WTP and on the surface of the Columbia River. An air-dispersion model named CALPUFF will be used to calculate how the emitted chemicals and radionuclides will be dispersed. Some of the material will enter terrestrial and aquatic food chains, and people and animals can ingest the food that contains small amounts of material from the emissions. The work plan contains details about these processes; pathways and exposures are defined in very explicit ways so that a complete and quantitative risk assessment can be conducted. The work plan presents a thorough explanation of these exposures via various pathways to a variety of receptors, from as many as 470 different chemicals and radionuclides.

The environmental risk assessment will define and evaluate risks, or the potential for harm, to human and ecological receptors within various distances from the WTP. For example, the air-dispersion model will model exposure depositions and concentrations within a 50 kilometer radius around the WTP. The area within a 50 kilometer radius is predominantly located within Benton County in Washington State, and includes parts of Franklin, Grant, Yakima, and Kittitas counties. The Tri-Cities, comprised of the cities of

Richland, Kennewick, and Pasco, are adjacent to the southern edge of the Hanford Site. The Tri-Cities area contains a population of approximately 192,000, the majority of whom reside between 30 kilometers and 50 kilometers from the WTP Site. There are no permanent residents on the Hanford Site, but there are workers. Native American tribes have treaty rights to resources on Hanford Site, and the environmental risk assessment will evaluate potential risks from food gathering and social activities. A variety of ecological receptors inhabit the Hanford Site. They include terrestrial and aquatic plants (the basis of the food chains); terrestrial, aquatic, and sediment-dwelling animals; mammals and birds that eat the terrestrial and aquatic plants and animals; and aquatic biota in the Columbia River. Thus, Hanford Site-specific human and ecological receptors will be evaluated in the risk assessments, and there will be two types of risk assessments: one focusing on humans (the human health risk assessment) and the other focusing on plants and animals in the environment (the ecological risk assessment).

The human health risk assessment includes four fundamental steps: (1) data evaluation, (2) exposure assessment, (3) toxicity assessment, and (4) risk characterization. These steps, as well as the collection of considerable amounts of data and associated estimation methods, are specified by the Washington State Department of Ecology and the US Environmental Protection Agency. The data evaluation step focuses on the selection of the chemicals and radionuclides of potential concern and the quantification of emissions; both of these are described fully in the work plan. Exposure assessment, the second step, deals with estimating the type, extent, and magnitude of potential exposures. The types of human receptors that will be used to calculate quantitative estimates of risk are also established at this step. These receptors are the following: worker, resident (both adult and child), resident subsistence farmer (both adult and child), resident subsistence fisher (both adult and child), Native American subsistence resident (both adult and child), nursing infant, and a person who has an acute or short-term exposure. The geographical locations where the people live and work and the exposure pathways are explained in the work plan. The third step is a toxicity assessment, which involves evaluating the potential of the various chemicals and radionuclides to cause adverse health effects in exposed individuals. The toxicity assessment will consider the potential cancer and noncancer effects associated with contaminant exposures. Risk characterization, the fourth step, involves evaluating the exposure and the toxicity information together to estimate the potential for various humans under various conditions to experience adverse effects (cancer and noncancer) as a result of being exposed to the media contaminated by emissions from the WTP. Risks are presented as potential incremental lifetime cancer risk, or noncancer hazard quotients and hazard indices. The information will be presented for each chemical and radionuclide, each pathway, each set of exposures, and each receptor. In turn, these risk values will be compared to risk thresholds. Thus, various comparisons will be possible in order to understand and make decisions about the protection of human health.

The ecological risk assessment includes the same fundamental steps as the human health risk assessment, although the first step is called problem formulation instead of data evaluation. As described above for the human health risk assessment, these four steps follow a logical order, with additional methodical substeps. Just as is the case for human health risk methods and data, the methods and the data for the ecological risk assessment have been specified by regulatory agencies such as the Washington State Department of Ecology and the US Environmental Protection Agency. As in the case of human health, where Hanford Site-specific human receptors are being evaluated, Hanford Site-specific vegetation and animals are also being evaluated. These receptors are organized into two types according to the habitat type in which they live: the land or terrestrial habitats around the WTP site, and the aquatic habitats of the Columbia River. For the terrestrial habitats, the following receptors will be used to quantify potential risk: plants, soil invertebrates, herbivorous mammals and birds, omnivorous mammals and birds, and carnivorous mammals and birds. For the Columbia River, the following aquatic receptors will be used: plants, sediment-dwelling invertebrates, fish (including salmon) and other aquatic organisms, herbivorous

waterfowl, shorebirds, and fish-eating mammals and birds. There is abundant information about the feeding habits of these organisms and there is also considerable toxicity data. A quantitative characterization will be provided for as many as 470 chemicals and radionuclides, assessing many pathways in a variety of geographical places, and many exposures to a variety of ecological receptors. The ecological risk assessment calculates exposure and effects ratios. These ratios, called hazard quotients and hazard indices, are in turn compared to thresholds. There will be sufficient information to make decisions about the protection of the environment.

Various types and degrees of uncertainty are introduced into the human health and ecological risk assessments at every step of the process. This uncertainty occurs because risk assessment is a complex process, requiring integration of source information, estimates of fate and transport in variable environments, exposure assessment, and effects assessment. Uncertainty is inherent even when the most accurate, up-to-date, and appropriate models are used. Throughout the risk assessments, an effort is made to overestimate, rather than underestimate, the exposures and risks in order to compensate for these uncertainties. The work plan explains how an uncertainty assessment will be used to place the risk estimates in proper perspective to allow fully informed risk management decisions.

In summary, chemical and radionuclide contaminants present in underground tanks at the Hanford Site need to be retrieved and treated before they leak into the nearby soil and groundwater, and possibly into the Columbia River. The WTP processes to pretreat and vitrify the contents of underground tanks will help to solve this potential problem. Emissions are expected from these waste treatment processes, and this work plan shows the models and scientific data that will be used to characterize how separate chemicals and radionuclides may move through the air, soil, surface water, sediment, and food chains around the WTP in the Hanford Site environment. These airborne releases could potentially expose a variety of human and ecological receptors to chemicals and radionuclides.

This work plan will benefit from inputs from regulatory agencies, Native American tribes, and the public. After inputs are incorporated, the work plan methods and data will be implemented. Computations will follow, and risk predictions will be compared to appropriate thresholds. These findings will be put into proper perspective using an uncertainty assessment to allow fully informed risk management decisions. These decisions will focus on protecting human health, plants, and animals while operating the WTP successfully.

Contents

1 Introduction 1-1

1 Introduction

This risk assessment work plan (RAWP) presents the risk assessment protocol for evaluating potential risks to human health and ecological resources from the Hanford Tank Waste Treatment and Immobilization Plant (WTP) at the Hanford Site. The Hanford Site is located in southeastern Washington State, is owned by the US government, and managed by the US Department of Energy (DOE), US Bureau of Land Management (BLM), US Fish and Wildlife Service (FWS), and Washington State Department of Fish and Wildlife. The WTP will include two waste vitrification facilities and a pretreatment facility, and will be built in the 200 East Area of the Hanford Site.

This work plan establishes the methods for conducting the screening-level risk assessment (SLRA) to estimate potential risks to human health and ecological resources associated with airborne releases resulting from processing Hanford tank waste into a stable, glassified form. Airborne releases are the only viable pathway for receptor exposure; therefore, the US Environmental Protection Agency (EPA) guidance for airborne releases is being used (see section 2). Other releases, such as releases to water and non-dangerous solid waste disposal, are permitted through appropriate regulatory programs. Throughout the risk assessment process, the intent is to ensure that the WTP is safe for people living or working on or near the Hanford Site as well as safe for plants and animals.

The risk assessment, in conjunction with the other portions of the WTP Dangerous Waste Permit (WA7890008967), will serve to:

- Establish operating conditions for the facilities
- Identify feed constituents that need to be controlled to stay below acceptable risk thresholds
- Identify what monitoring of WTP components is required to verify permit compliance

The limits and monitoring requirements established as a result of the risk assessment process are not the only inputs required for control and operation of the WTP. Other inputs will include:

- Equipment control limits and monitoring established as a result of experience with operations from similar DOE vitrification facilities including: the West Valley Demonstration Project in West Valley, New York, and the Defense Waste Processing Facility at the Savannah River Site in Aiken, South Carolina
- Control limits and monitoring recommendations of equipment vendors
- Control limits and monitoring required by other permits, approvals, and authorizations (for example, air permits)

This RAWP contains a brief statement of the risk assessment approach (section 2) and an engineering description of the WTP (section 3). Sections 4 through 8 present the key components of the human health and ecological SLRA protocol as noted below:

- Identification of constituents of potential concern - section 4
- Quantification of airborne emissions - section 5
- Modeling of the airborne emissions and other environmental pathways - section 6

- Screening human health risk assessment - section 7
- Screening ecological risk assessment - section 8

Section 9 presents the relationship of the risk assessment to the WTP, including the process to establish risk-based emissions limits, if needed. Section 10 describes how uncertainty will be handled in the SLRA. References are provided in section 11 and are followed by three appendices and two attachments providing details of the constituents of potential concern (Appendix A), chemical-specific physical/chemical and toxicity data for human health and ecological resources, respectively (appendices B and C), details of the emissions estimate (Attachment 1), and details of the WTP process cell emissions (Attachment 2). The public, Native American tribes, and regulatory agencies are being invited to comment on this work plan and on subsequent documents in order to obtain their input to the decision-making process.

Contents

2 Risk Assessment Approach 2-1

2.1 Scope of the Screening-Level Risk Assessment 2-1

2.2 Screening-Level Risk Assessment Process 2-1

Figures

Figure 2-1 Overview of Screening-Level Risk Assessment Process for WTP Air Emissions 2-5

Figure 2-2 Overview of Fate and Transport of Airborne Emissions During the PRA and FRA for the WTP 2-6

2 Risk Assessment Approach

This section describes the overall screening-level risk assessment (SLRA) scope and approach (shown in Figure 2-1) that will be used to establish operating conditions for cold commissioning (nonradioactive waste testing) as well as processing of mixed wastes at the Hanford Tank Waste Treatment Plant and Immobilization Plant (WTP).

The primary regulatory guidance followed for this risk assessment is found in the *Human Health Risk Assessment Protocol for Hazardous Waste Combustion Facilities* (EPA 1998a) and the *Screening-Level Ecological Risk Assessment Protocol for Hazardous Waste Combustion Facilities* (EPA 1999a).

2.1 Scope of the Screening-Level Risk Assessment

The SLRA will evaluate exposure and risks to potential human and ecological receptors within a 50 km radius of the WTP. See section 7 for an additional discussion of the human receptors, and section 8 provides additional details of the ecological receptors.

The area within the 50 km radius is located predominantly within Benton County in Washington State, with smaller portions located in Franklin, Grant, Yakima, and Kittitas counties. The Tri-Cities; that is, the combined cities of Richland, Kennewick, and Pasco, are adjacent to the southern edge of the Hanford Site. The Tri-Cities area contains a population of approximately 192,000 (US Census 2000), the majority of whom reside between 30 km and 50 km from the WTP site. The population outside the Tri-Cities but within 50 km of the WTP site is sparse. There are no permanent residences on the Hanford Site. Native American tribes have treaty rights to resources on the Hanford Site, and the SLRA includes potential risks from food gathering and social activities (for more information see section 7.1).

A variety of ecological receptors inhabit the Hanford Site. They include terrestrial and aquatic plants; terrestrial, aquatic, and sediment-dwelling invertebrates; mammals and birds that eat terrestrial plants and animals; fish and other aquatic biota; and mammals and birds that eat fish and other aquatic biota. These ecological receptors are discussed in more detail in section 8.1.

The SLRA, specifically the pre-demonstration test risk assessment (PRA) and the final risk assessment (FRA), will address the potential operating life of the WTP. The current WTP Dangerous Waste Permit (WA 7890008967) covers projected operations of the WTP. The SLRA assumes that the facility will operate at maximum capacity for its entire design life (40 years from the start of the facility operations). Risks from the waste in the Hanford double-shell tank system, as well as cumulative risk from the Hanford Site, are outside the scope of the SLRA.

2.2 Screening-Level Risk Assessment Process

The major components of the SLRA process for airborne emissions are the following (Figure 2-1):

- Work plan for the SLRA - This work plan is submitted to comply with conditions of the WTP Dangerous Waste Permit (WA7890008967). The work plan establishes the methods for the future implementation of the SLRA. The PRA and FRA are subparts of the SLRA, as described in this work plan.

- Pre-demonstration test risk assessment - The PRA will be performed before performance demonstration testing of the WTP. The PRA will estimate human health and ecological risk based on engineering estimates of emissions from WTP units.
- Final risk assessment - The FRA will be conducted following collection of data from performance demonstration testing of WTP units. The FRA is conducted using an approach very similar to the PRA. However, estimated emission rates will be supplemented with the results of the environmental performance demonstration tests, resulting in a more reliable estimate of process emissions and, therefore, a better estimate of risks associated with the WTP processes.

Participants in the SLRA process are:

- US Department of Energy (DOE)
- Washington State Department of Ecology (Ecology)
- US Environmental Protection Agency (EPA) Region 10
- Yakama Indian Nation
- Confederated Tribes of the Umatilla Indian Reservation
- Nez Perce Tribe
- The general public
- Bechtel National, Inc. (WTP co-operator).

All participants are welcome to make contributions to the development this work plan and other documents.

The SLRA must serve several purposes, including: (1) identifying any potential risks to human health or ecological resources that may result from emissions from the WTP; (2) providing the information necessary to determine what, if any, additional permit conditions are necessary for the operation of the WTP to be protective of human health and ecological resources; and (3) providing risk information to Ecology, EPA, DOE, Native American tribes, and the public. For these reasons, the overall approach for the SLRA is to identify potential risks associated with both plausible and worst-case scenarios as defined in the following.

- The plausible exposure scenarios represent more realistic assumptions regarding the location of potential human and ecological receptors. The exposure scenarios reflect anticipated WTP operations and the continuation of current uses of the surrounding land and habitats, and make reasonable assumptions about future land uses while still using upper-bound estimates of exposure pathways and activity patterns.
- The worst-case exposure scenarios represent worst-case assumptions regarding the location of human and ecological receptors, exposure pathways, and activity patterns (for example, subsistence fishing). The receptor locations used in the worst-case scenario are considered hypothetical since assumed activities (for example, resident, subsistence farmer) do not currently occur in the worst-case Hanford Site locations nor are they expected to occur during the WTP's operational lifetime.

The exposure scenarios are intended to provide a better understanding of the range of potential risks to a variety of human and ecological receptors representing conservative exposures at locations typical of the Hanford Site area under a variety of land use conditions at current and future times.

Both the plausible and worst-case exposure scenarios will incorporate conservative assumptions regarding human and ecological exposures. This approach is consistent with the *Environmental Protection Agency Risk Characterization Policy* (EPA 1995a), which directs the "use of several descriptors, rather than a single description, to enable the EPA to present a fuller picture of risk that corresponds to the range of different exposure conditions encountered by various individuals and populations".

The general technical process for the SLRA is provided in Figure 2-2. This process starts with the estimation of air concentration of various chemicals and radionuclides, moves to an estimation of airborne deposition, and from there to predictions of movement in soil, surface water, and food. Next, exposure to humans, plants, and animals will be estimated in order to complete the risk characterization.

Requirements and assumptions for the FRA will be influenced by the results of the PRA as well as data collected during environmental performance demonstration tests. The FRA will include estimated emissions based on engineering calculations (pretreatment system emissions and vapor-phase organic emissions from WTP process cells) and environmental performance demonstration tests for the low-activity waste (LAW) and high-level waste (HLW) vitrification systems. Based on the results of the environmental performance demonstration tests, the FRA may involve running new models, modeling additional chemicals, or changing model parameters. Information that will require updating in the FRA, as specified in the WTP Dangerous Waste Permit (WA7890008967), will include:

- Toxicity data current at the time of the submittal
- Compounds newly identified, or updated emissions data from current waste characterization and emission testing
- Air modeling updated to include stack gas parameters based on most current emissions testing and current WTP unit design
- Physical/transport properties of constituents current at the time of the submittal
- Process description based on current WTP unit design
- Emissions data and all supporting calculations based on current WTP unit design
- Update of receptor locations based on land use or land use zoning changes, if any

The performance demonstration testing of melter units presents unique challenges that differ from incineration-type combustion units, which are used as a starting point for developing test plans. Differences include the systems used to control melter emissions versus those used for flame combustion units, as well as differences in the quantities and concentrations of COPCs fed to melter units versus other flame-type combustion units. In order for the performance demonstration test to be predictive of the ability of the melter offgas systems to control emissions and demonstrate that human health and environmental protection standards established by the SLRA are met, it will be necessary to take these differences into account.

The SLRA process is iterative. It includes review of the PRA findings and revision of risk assessment assumptions and WTP engineering design and operation for the FRA. Results of the FRA will be used to calculate risk-based emissions limits to protect human health and the environment. Input from Ecology, EPA, Native American tribes, and the public will be included at each step of the process. The graphic description of the process provided in Figure 2-1 identifies points for this input.

The PRA modeling results will be used to formulate FRA approaches. Thus, the PRA is an important first step and the primary emphasis of this work plan.

Figure 2-1 Overview of Screening-Level Risk Assessment Process for WTP Air Emissions

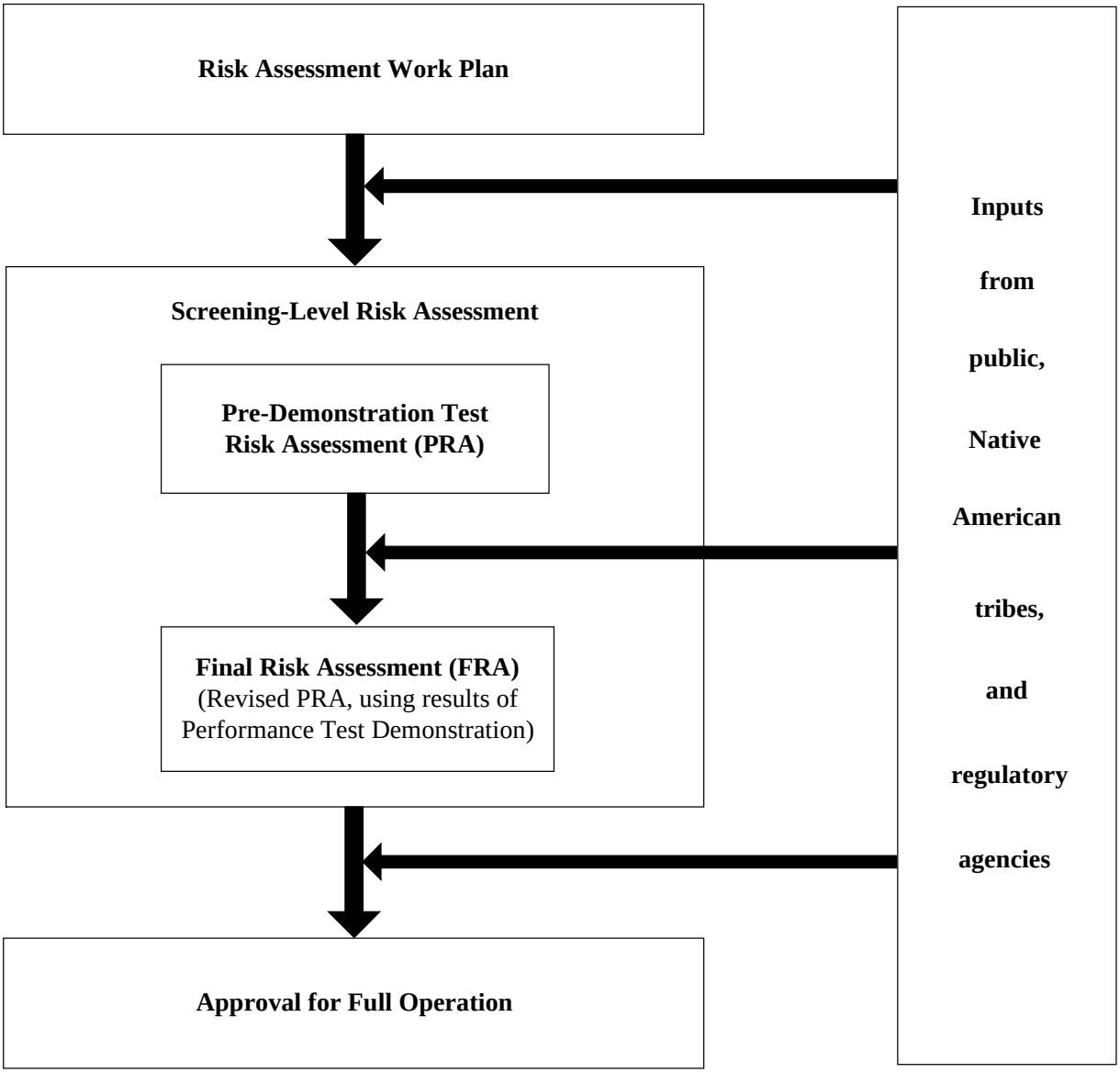
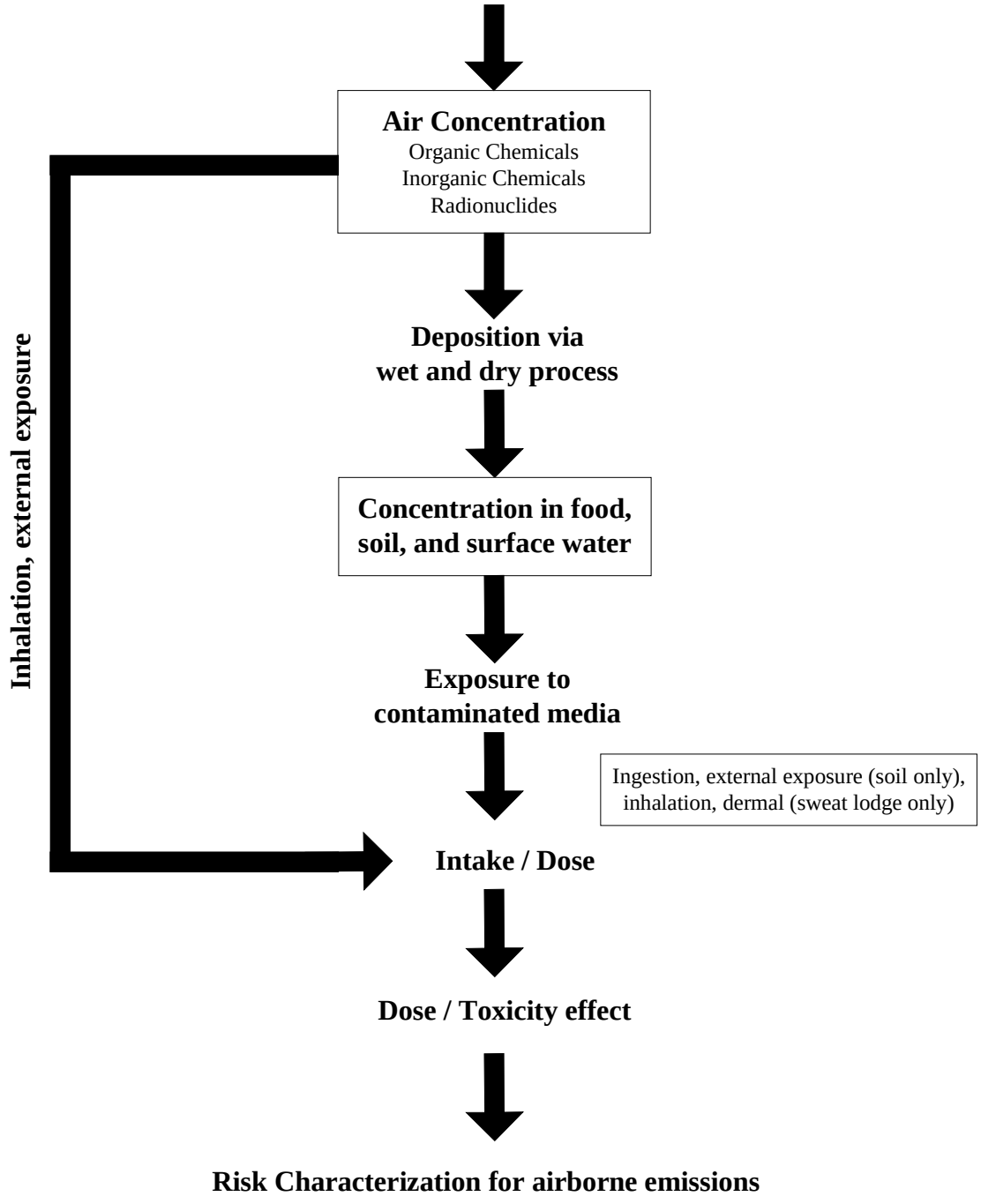


Figure 2-2 Overview of Fate and Transport of Airborne Emissions During the PRA and FRA for the WTP



Contents

3 Engineering Description 3-1

3.1 WTP Overview 3-1

3.2 Pretreatment Overview 3-2

3.3 LAW Vitrification 3-3

3.4 HLW Vitrification 3-3

3.5 Stacks and Flues 3-4

3.6 Facility Control Philosophy 3-4

Figures

Figure 3-1 Location of the WTP on the Hanford Site 3-6

Figure 3-2 WTP Layout 3-7

Figure 3-3 Simplified Process Diagram 3-8

Figure 3-4 WTP Stacks and Flues 3-9

3 Engineering Description

Hanford tank waste consists of approximately 54 million US gallons of highly radioactive and mixed hazardous wastes stored in underground storage tanks at the US Department of Energy's (DOE's) Hanford Site. The Hanford Tank Waste Treatment and Immobilization Plant (WTP) is being constructed to treat mixed wastes from underground storage tanks. After the tank waste is received from the Hanford double-shell tank system, it will be pretreated and then immobilized using a process called *vitrification*. Vitrification is a thermal process that converts the waste materials into a durable glass. The vitrified wastes and secondary wastes resulting from the WTP processes will be transferred to permitted treatment, storage or disposal units for disposition. Offgas generated by the pretreatment and vitrification processes will be treated in independent offgas treatment systems. This section provides an overview of the mixed waste treatment processes that will be used in the WTP.

3.1 WTP Overview

The WTP is located at the eastern end of the 200 East Area of the Hanford Site, near the former Grout Treatment Facility, 241-AP Tank Farm Complex, and Plutonium Uranium Extraction Plant. Figure 3-1 shows the location of the WTP on the Hanford Site.

Waste from the Hanford double-shell tank system will be transferred to the WTP pretreatment facility. The tank waste consists of solids (sludge), liquids (supernatant), and salt cake (dried salts that will dissolve in water to form supernatant).

The term low-activity waste (LAW) feed generally refers to the supernatant portion of Hanford's double-shell tank waste, although it can include high-level waste (HLW) solids. Hanford tank waste is from a variety of nuclear process facility sources. It historically has been managed as HLW. LAW feed is composed of three waste feed envelopes, which are described below.

- **Envelope A**. Concentrations of certain radionuclides (such as cesium) in this feed envelope are high enough to warrant their removal so that the immobilized low-activity waste (ILAW) glass will meet applicable requirements.
- **Envelope B**. This feed envelope contains higher concentrations of cesium than Envelope A. This envelope also allows for concentrations of chlorine, chromium, fluorine, phosphates, and sulfates that are higher than those found in Envelope A, which may limit the rate of waste incorporation into glass.
- **Envelope C**. This feed envelope contains high enough concentrations of cesium and organically complexed strontium and transuranics (TRUs) to require removal to meet ILAW glass specifications.

The HLW or solids fraction of the waste contains the long half-life radioactive constituents as well as other undissolved solids. The HLW feed is composed of a single envelope, which is described below.

- **Envelope D**. HLW feed will be in the form of a slurry containing approximately 10 grams to 200 grams of unwashed solids per liter. Most of the Envelope D radionuclides are in unwashed solid form. The liquid fraction of the slurry will be composed of residues from Envelope A, B, or C waste; the solid fraction will be Envelope D waste.

Figure 3-2 shows a layout of the WTP. Three main process buildings (pretreatment facility, HLW vitrification facility, and LAW vitrification facility) will contain most of the dangerous waste management operations and include major areas for pretreating and vitrifying (immobilizing) tank waste. The pretreatment facility will receive and pretreat the waste prior to vitrification. Two separate vitrification facilities will be used to immobilize the pretreated waste. The LAW vitrification facility will immobilize the majority of the supernatant and dissolved salt cake from the Hanford tank waste. The HLW vitrification facility will immobilize the HLW fraction of the Hanford tank waste. Other smaller support buildings will provide for storage or transfer of materials used in the treatment process and for storage of wastes.

Figure 3-3 provides a simplified diagram of the WTP processes. Mixed wastes from the double-shell tank system (shown in the lower left corner of the diagram) will be received and processed through the WTP's various pretreatment operations (including feed evaporation, ultrafiltration, and ion exchange). The resultant pretreated wastes will, in turn, be fed to the LAW or HLW vitrification systems. The treatment of offgas from the pretreatment and vitrification processes will result in point source emissions to the environment from each of the three processing facility stacks. Figure 3-3 uses shading to distinguish offgas treatment steps from other process operations.

3.2 Pretreatment Overview

LAW Envelopes A, B, and C will be transferred to the WTP pretreatment facility as solutions that contain some undissolved solids (Envelope D-type waste or LAW-precipitated salts). HLW Envelope D feed will be transferred as slurry to the WTP pretreatment facility.

Wastes having sodium molarity less than 5 will be received into the pretreatment facility and concentrated in the waste feed evaporator. Wastes having a sodium molarity greater than or equal to 5 will bypass the waste feed evaporator. Once the sodium molarity is acceptable for further processing (either as received or after evaporation), the waste will go through the following processes:

- LAW envelopes A or B feeds will be blended with HLW feeds (Envelope D) in an ultrafilter preparation tank. The ratio of LAW to HLW undissolved solids will be established to support the respective glass production rates. The blended HLW and LAW feed streams will undergo a filtration process that separates LAW liquid stream (permeate) from the slurry. The LAW permeate will then be processed through the ion exchange (IX) process discussed below. The concentrated solids slurry will be caustic leached (if warranted), washed, and blended with cesium concentrate from the IX and strontium (Sr)/TRU solids from ^{90}Sr/TRU precipitation (see below), before being transferred to the HLW vitrification facility.
- Envelope C feeds will contain organic complexants that cause the Sr and some TRU waste to remain in solution. This waste will undergo a ^{90}Sr/TRU precipitation process before filtration. The filtration step will then separate the ^{90}Sr/TRU solids, manganese oxide solids (a by-product from the precipitation process), and entrained solids from permeate (LAW stream). The ^{90}Sr/TRU precipitate will be washed and stored for blending with HLW feed before HLW vitrification. The ^{90}Sr/TRU precipitate (Envelope C solids) will not be caustic leached. Envelope C permeates are processed through the IX processes.
- After filtration, the permeate will undergo IX to remove ^{137}Cs. The ^{137}Cs eluate will be concentrated by evaporation; the concentrated eluate will then be blended with pretreated HLW solids before transfer to the HLW vitrification facility. The last step in the pretreatment process is to concentrate the treated LAW liquid by evaporation before transferring the waste to the LAW vitrification facility.

The pretreatment building will also contain a process and vessel ventilation system, an offgas treatment system, and a stack. Liquid effluents will be either recycled back into the facility or sent to the Hanford Site Liquid Effluent Retention Facility (LERF) or 200 Area Effluent Treatment Facility (ETF).

3.3 LAW Vitrification

Treated Envelope A, B, and C supernatants from the pretreatment facility will be transferred to the LAW vitrification facility for processing. The LAW vitrification process will consist of two melter systems operated in parallel. Each melter system has a set of feed preparation vessels, a large-capacity joule-heated ceramic melter, and an offgas treatment system. The facility will also have a secondary offgas system shared by the two melter systems. The following description applies to each of the two LAW melter systems.

Pretreated LAW waste feeds will be received into one of two LAW concentrate receipt vessels inside the LAW vitrification building. Batches of concentrated LAW feed will be transferred from these vessels to feed preparation vessels, where glass formers and sucrose will be added and blended to form a uniform batch of feed to the LAW melters. The slurry feed will be transferred to the melter feed vessels, where it is fed continuously to the LAW melters.

Each LAW melter is designed to nominally produce 15 metric tons per day of ILAW glass and operate at a temperature between 950 centigrade (°C) and 1150 °C. The feed will enter the melter from the top and form a cold cap above the melt pool. Volatile components in the feed will be evaporated or decomposed, then drawn off through the melter offgas system. Nonvolatile components will react to form oxides or other compounds dissolved in the glass matrix. Bubblers will agitate the mixture to increase the glass production rate. An airlift system will pour the glass from the melter into stainless steel containers.

Each LAW melter system will have its own primary offgas equipment, including a film cooler, submerged bed scrubber (SBS), and wet electrostatic precipitator (WESP). Particulates and condensables, including entrained or volatilized radionuclides in the melter offgas stream, will be captured in the SBS and WESP. Condensables from the SBS and the WESP will be collected in the liquid effluent system and recycled to the treated LAW evaporator in the pretreatment facility. The primary offgas systems will join after the WESP and will be routed to the secondary offgas system. At this point, the LAW vessel vent header will join the offgas. The secondary offgas system will provide final filtration, remove mercury, destroy organics, reduce oxides of nitrogen (NO_x), and removes halides. This will be done by using high-efficiency particulate air (HEPA) filters, a treated activated carbon bed, a thermal catalytic oxidizer, a selective catalytic reducer, and a caustic scrubber.

3.4 HLW Vitrification

The HLW vitrification facility will receive the pretreated HLW feed from the pretreatment facility. Treated Envelope D slurry and the LAW intermediate waste products (separated ^{90}Sr/TRU and ^{137}Cs) will make up the feed to the HLW vitrification facility. The HLW vitrification process will consist of two joule-heated ceramic melters fed by independent feed and blending vessel trains, a dedicated offgas treatment system for each melter, and a common secondary effluent collection system. HLW feed concentrate will be transferred from the pretreatment building to the HLW concentrate receipt vessels in the HLW vitrification building. Batches of HLW feed concentrate will then be transferred to one of the two melter feed preparation vessels. The feed concentrate will be blended with glass-forming chemicals

and sucrose, then mixed to ensure a uniform mixture. The melter feed slurry will be transferred to the melter feed vessel, where it can be fed to a dedicated HLW melter.

Each of the two HLW melters are designed to operate at a temperature between 950 °C and 1150 °C at a nominal rate of 1.5 metric tons per day of IHLW glass. Melter feed slurry will be introduced at the top of the melter and form a cold cap on the surface of the melt pool. Water and volatile components will evaporate or decompose and then be drawn off through the offgas system. Nonvolatile components will react to form oxides, which will become part of the molten glass.

Each HLW melter will have a dedicated primary and secondary offgas system where the offgas from the melter will pass through a film cooler, SBS, WESP, high-efficiency mist eliminators (HEMEs), and HEPA filters to remove particulates and radionuclides. The offgas will then pass through a secondary offgas system consisting of treated activated carbon, silver mordenite, thermal catalytic oxidation, and selective catalytic reduction. This secondary system will remove mercury and halides, destroy organics, and reduce NO_x.

An airlift system inside the melter will pour molten HLW glass into stainless steel canisters. The filled canister will then be inspected, the glass sampled as necessary, and the canister sealed. The canisters from the two melters will be decontaminated by a nitric acid/cerium (HNO_3/Ce^{+4}) chemical milling process that dissolves a thin layer of the canister outer wall material. Canister decontamination waste effluents will be recycled to the pretreatment building.

3.5 Stacks and Flues

The pretreatment, LAW, and HLW vitrification facilities will each have separate stacks where the treated emissions derived from process operations and other sources will be released to the environment. The stacks will house a bundle of individual emission units (flues) that are associated with their respective sources. Thus, each of the three facilities will have one stack only. For additional information about flues relative to stacks, see Attachment 1.

In addition to the process offgas system, building ventilation systems will be incorporated into each of the processing plants. Treated building ventilation systems will also be vented to the atmosphere through dedicated flues. Figure 3-4 shows simplified graphic representations of the expected emission sources and the associated flues.

The offgases associated with pretreatment processes will be exhausted through the pretreatment stack via flues PT-S3 and PT-S4. The emissions associated with potential leaks to processing cells will be discharged through flue PT-S2 within the pretreatment stack. The treated offgases associated with LAW vitrification processes will be discharged through the LAW vitrification stack via flue LV-S3. The emissions associated with leaks to the LAW vitrification process cells will be discharged through flue LV-S2. The treated offgases associated with HLW vitrification processes will be discharged through flues HV-S3 and HV-S4 within the HLW vitrification stack. The emissions associated with potential leaks to process cells will be discharged through the HLW vitrification stack via the HV-S2 flue.

3.6 Facility Control Philosophy

This section presents an overall control philosophy for the WTP. The goal of the facility control philosophy is to satisfy the following criteria:

- Preservation of worker and public safety
- Protection of the environment
- Preservation of equipment integrity
- Assurance of product quality
- Minimization of plant lifetime costs

The design, construction, and commissioning of the WTP is being conducted in a manner that is protective of employees, the public, and the environment. The process systems, piping, vessels, and equipment have been specifically designed to provide primary confinement of hazardous, radioactive, and chemical materials. The facility structures, along with their respective ventilation systems, will provide secondary confinement of airborne and liquid releases. The ventilation system will support confinement of airborne contamination within the building by directing the flow of air from areas of less contamination potential to areas of greater contamination potential. The ventilation system will also filter the building exhaust air.

Diagnostics will be used to optimize throughput and reduce downtime. A plant information computer with data entry and reporting capabilities will be provided to process information needed for facilitating plant optimization. Provisions will be made for overview and scheduling information.

The confinement and shielding requirements, combined with the need to provide hazard isolation and accessible areas for plant operation, have led to the building configuration of multiple cells and caves connected by transfer tunnels and shielded doors. This configuration provides a series of barriers enclosing the various zones, which are classified according to the contamination potentials.

Throughout the design phase, design reviews are conducted by multidiscipline teams to ensure safety and provide for feedback and improvement. The process systems, facility structure, and facility design ensure that operations of the WTP will be safe and protective of human health and the environment.

Figure 3-1 Location of the WTP on the Hanford Site

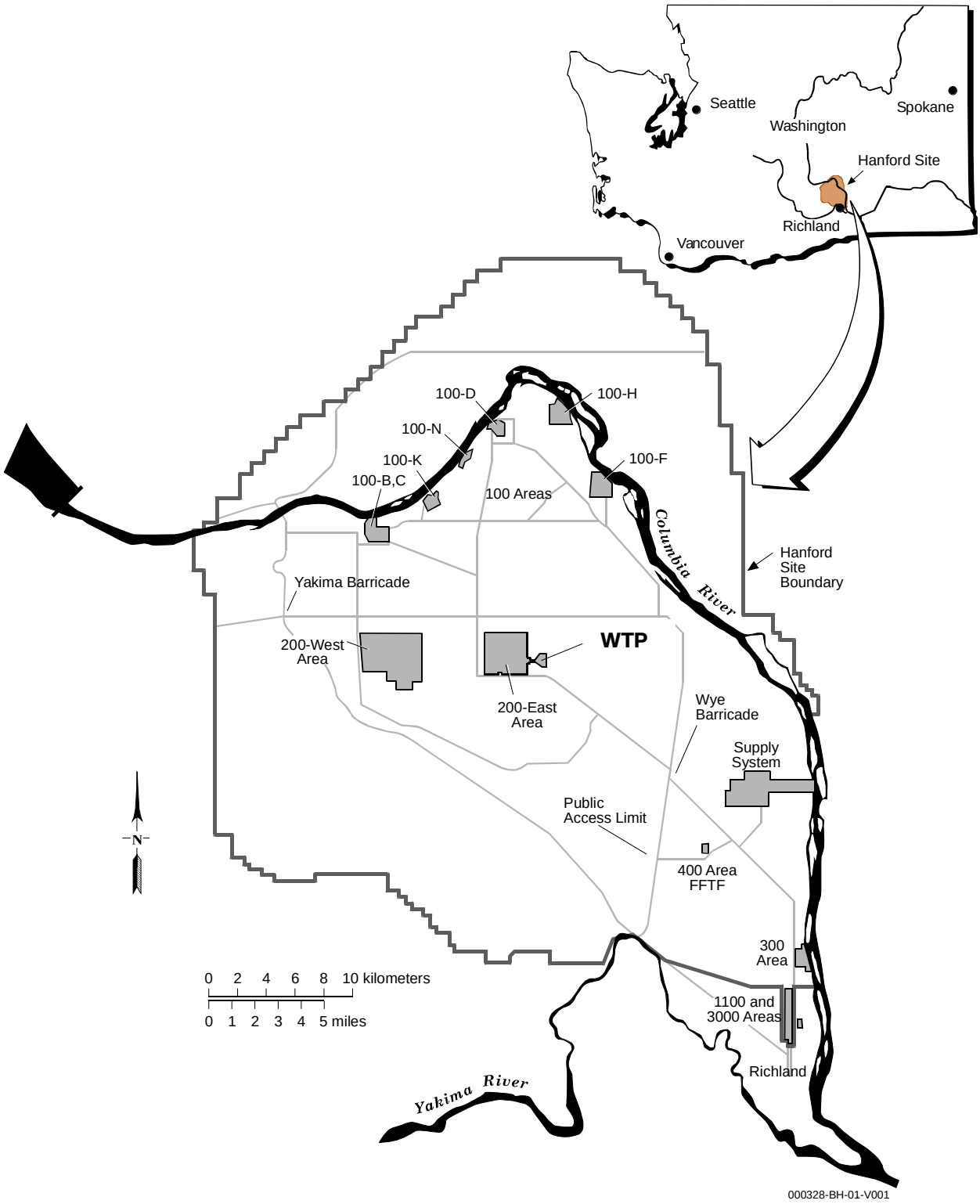


Figure 3-2 WTP Layout

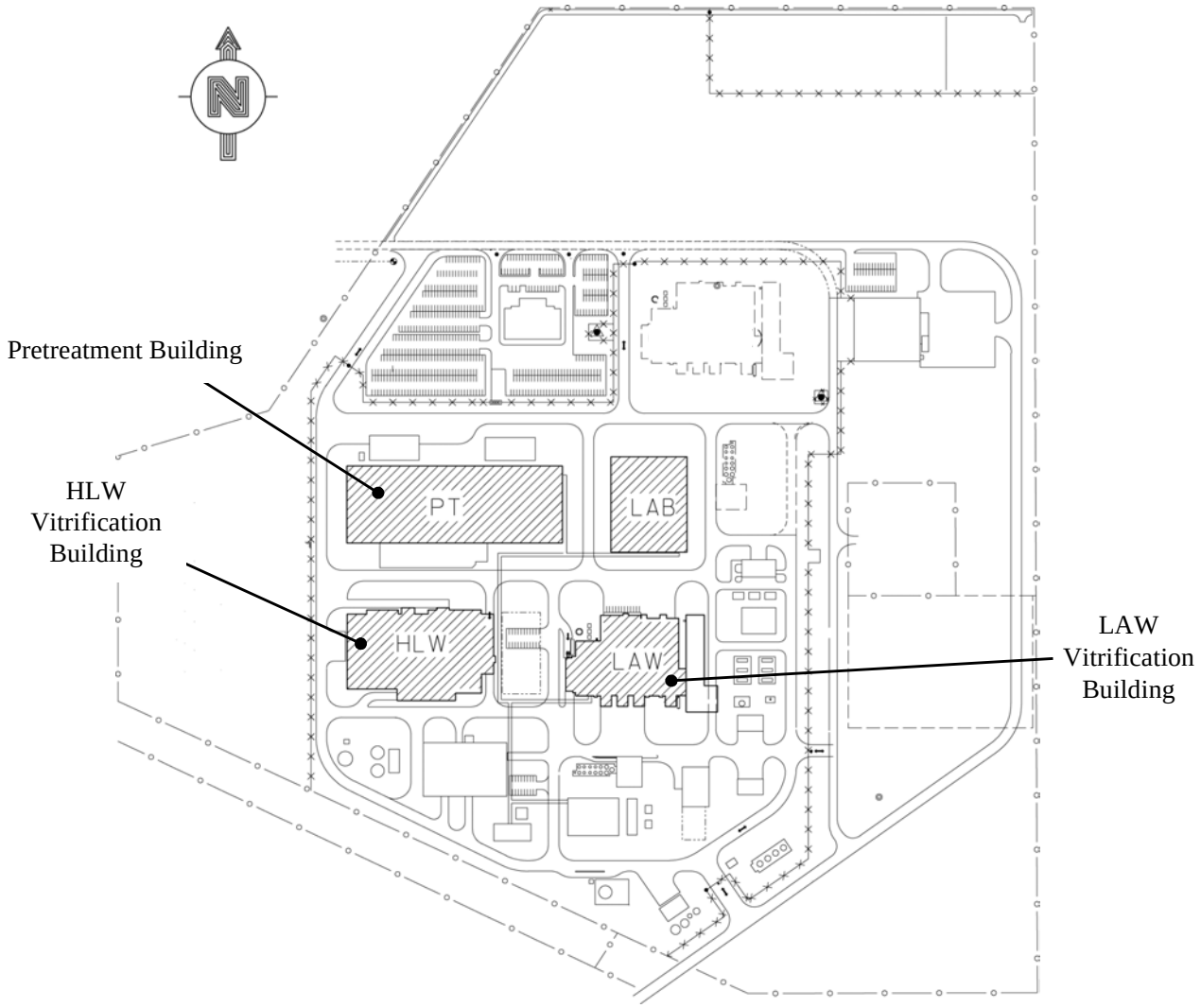


Figure 3-3 Simplified Process Diagram

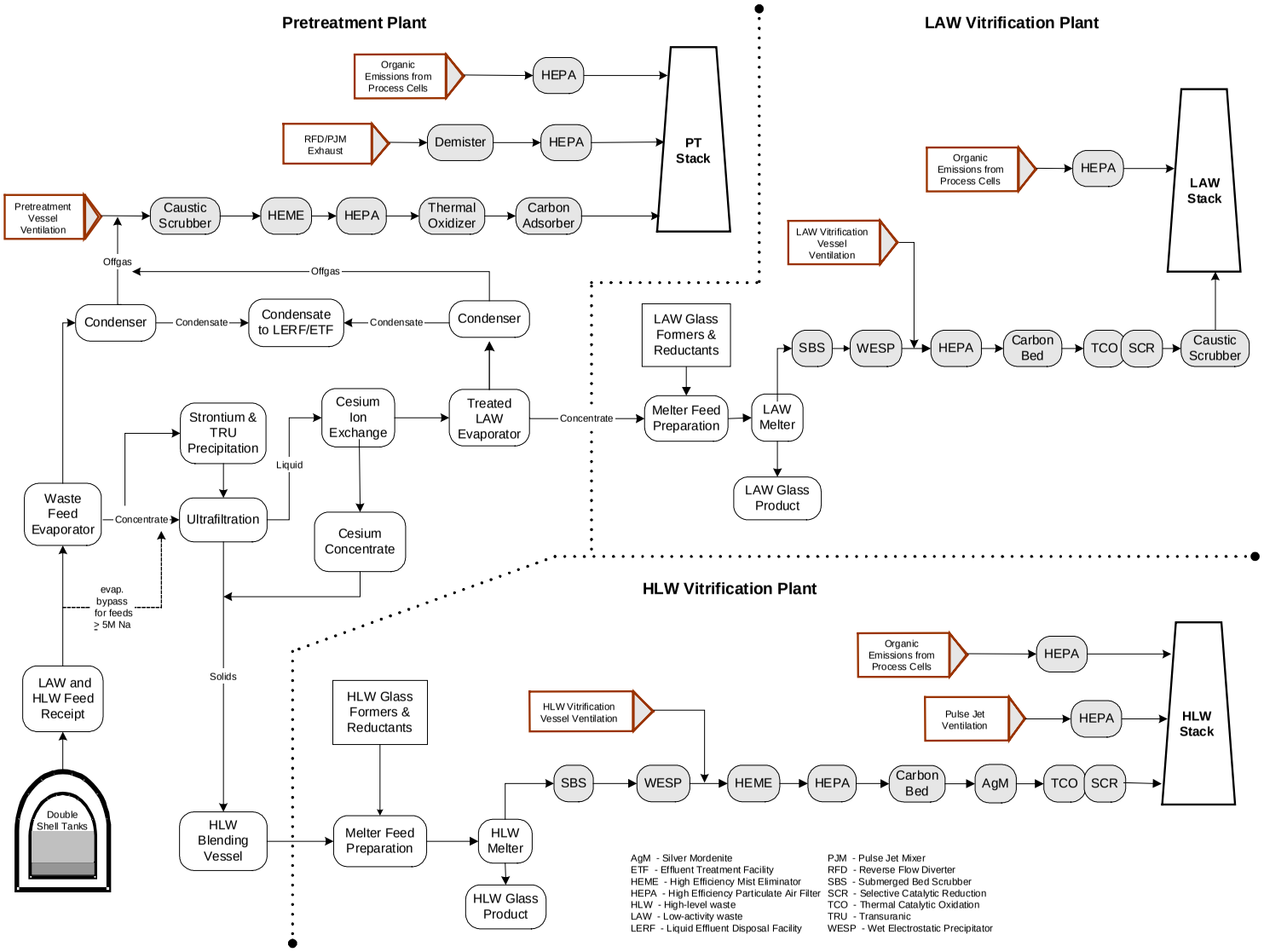
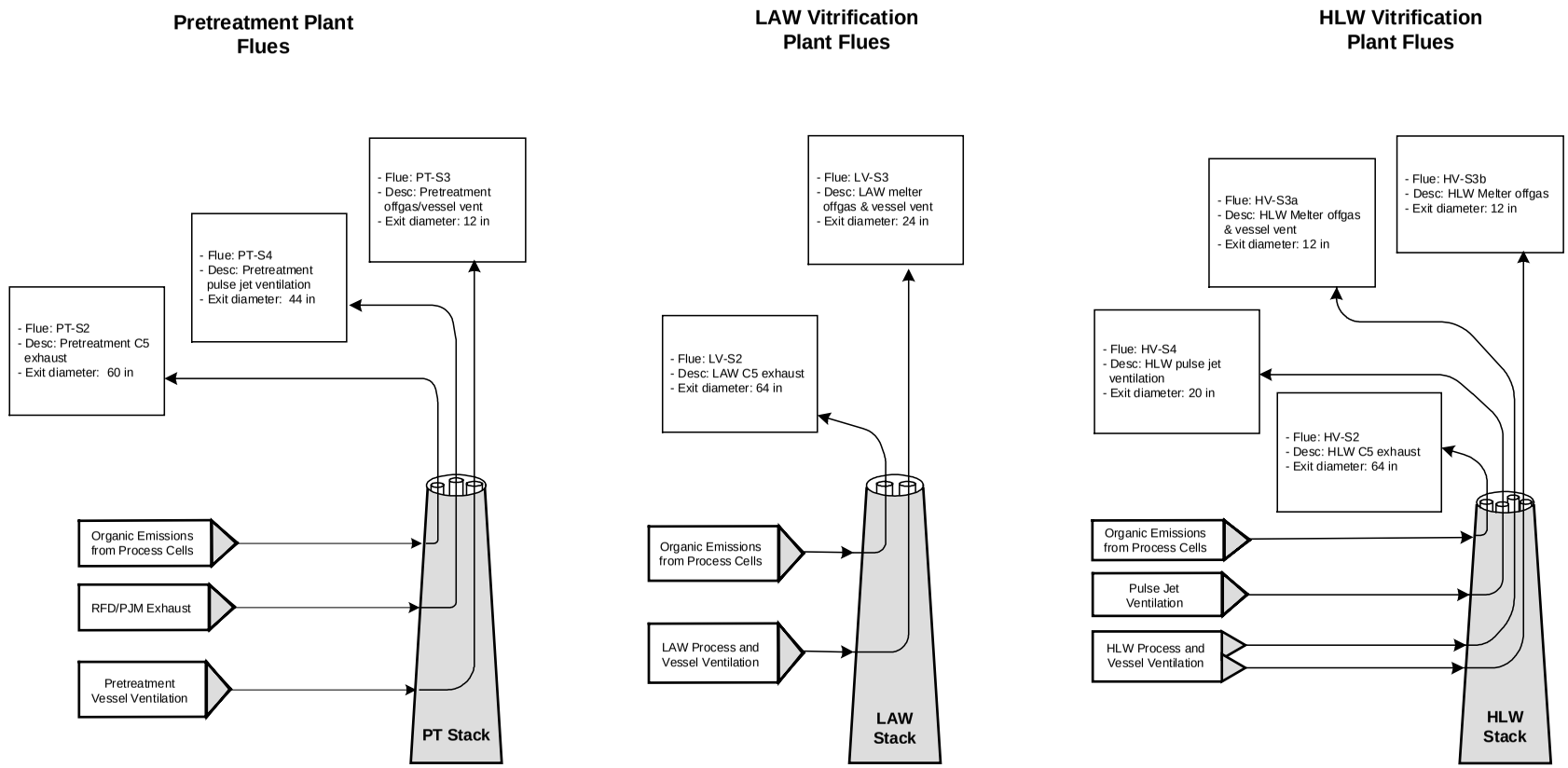


Figure 3-4 WTP Stacks and Flues



Contents

4 Constituents of Potential Concern 4-1

4.1 Chemicals of Potential Concern 4-1
4.1.1 Chemicals from the Regulatory DQO 4-2
4.1.2 Environmental Protection Agency Products of Incomplete Combustion 4-3
4.1.3 Site-Specific Products of Incomplete Combustion 4-4
4.1.4 Chemicals Screened in the Regulatory DQO Process and Added Back to the COPC List 4-4
4.1.5 Criteria Pollutants 4-4

4.2 Radionuclides of Potential Concern 4-4

4.3 Identification of COPCs and ROPCs for the Quantitative Preliminary Risk Assessment 4-5
4.3.1 Identification of Organic COPCs for Inclusion in the Quantitative PRA 4-5
4.3.2 Identification of Inorganic COPCs for Inclusion in the Quantitative PRA 4-6
4.3.3 Identification of ROPCs for Inclusion in the Quantitative PRA 4-7

4.4 Uncertainty in COPC and ROPC List 4-7
4.4.1 Uncertainty in Identification of COPCs and ROPCs for PRA 4-7
4.4.2 Uncertainty in COPCs Not Included in the Quantitative Assessment 4-8

4.5 Summary of Identification of COPCs and ROPCs 4-8

Tables

Table 4-1 Organic Chemicals of Potential Concern (COPCs) for Pre-Demonstration Test Risk Assessment (PRA) 4-10

Table 4-2 Inorganic Chemicals of Potential Concern (COPCs) for Preliminary Risk Assessment 4-18

Table 4-3 Radionuclides of Potential Concern (ROPCs) for Preliminary Risk Assessment 4-19

Figures

Figure 4-1 Selection of Constituents of Potential Concern 4-20

4 Constituents of Potential Concern

The *Human Health Risk Assessment Protocol for Hazardous Waste Combustion Facilities* (EPA 1998a) recommends that the selection of constituents of potential concern focus on compounds that (1) are likely to be emitted due to the presence of the compound or its precursors in the waste feed, (2) are potential products of incomplete combustion (PICs), (3) are potentially toxic to humans, and/or (4) have a definite propensity for bioaccumulating or bioconcentrating in human and ecological food chains. The process for identifying constituents of potential concern as described in EPA 1998a includes six steps:

1. Start with a list of all compounds analyzed for in the environmental performance demonstration (or supporting research and technology development testing) and note which compounds were detected in the test.
2. Evaluate the type of waste to be processed to determine whether any of the compounds that were not detected should be retained as constituents of potential concern because they are potentially present in the waste.
3. Exclude compounds that are not detected, are not components of the waste, and do not have toxicological data.
4. Exclude compounds that are not detected, are not components of the waste, and do not have a high potential to be PICs.
5. Evaluate the 30 largest tentatively identified compounds (TICs) to determine whether any of these compounds have toxicities similar to the detected compounds. If they do not, consider surrogate toxicity data.
6. Evaluate compounds that may be of concern due to other site-specific factors. Include as constituents of potential concern any compounds that are a concern due to site-specific factors and may be emitted by the melter unit.

The process described above requires the use of data collected during the environmental performance demonstration. This data will be developed and used to evaluate risk during the final risk assessment (FRA) process. Because the pre-demonstration test risk assessment (PRA) will be performed before the environmental performance demonstration results are available, it is necessary to develop a list of constituents of potential concern based on design information and assumptions rather than emissions measurements.

The following sections describe the strategy for identifying PRA chemicals of potential concern (COPCs, section 4.1) and radionuclides of potential concern (ROPCs, section 4.2). Figure 4-1 summarizes the COPC and ROPC selection process. The term *COPC* is used to represent chemicals associated with the tank waste and melting process, while the term *ROPC* refers to radioactive constituents of potential concern.

4.1 Chemicals of Potential Concern

The process of identifying COPCs for the PRA used the following four steps to identify chemicals that are likely to be emitted due to the presence of the compound, or its precursors, in the waste feed or as potential products of incomplete combustion.

1. Start with the list of all chemicals identified as potentially present in the waste. This list was taken from the *Regulatory Data Quality Objectives Supporting Tank Waste Remediation System Privatization Project* (Wiemers and others 1998), also referred to in this document as the "regulatory DQO". These chemicals are discussed in section 4.1.1 and listed in Appendix A, tables A-1 and A-2, of this work plan.
2. Add chemicals that may be created as PICs (sections 4.1.2 and 4.1.3 and Appendix A, tables A-3 and A-4.)
3. Add chemicals excluded from the regulatory DQO list because of low toxicity but that may be present in the waste (section 4.1.4 and Appendix A, Table A-5).
4. Add criteria pollutants (section 4.1.5).

The derivation of the list of COPCs is discussed below and summarized in Figure 4-1 and in Appendix A, tables A-1 through A-5.

4.1.1 Chemicals from the Regulatory DQO

The preliminary list of COPCs was compiled using input from the regulatory DQO (Wiemers and others 1998). Analytes included in the regulatory DQO were selected from a large group of regulated constituents using technically defensible decision logic. The decision logic was followed to select compounds that could plausibly be in the waste feed and of concern relative to the permitting activities and risk assessment. The regulatory DQO is based on (1) analytical data from samples of solid and liquid waste and vapors from the headspace of the tanks, and (2) evaluation of the types of wastes that were stored in the tanks and the chemical constituents that may have made up these wastes even if they have never been detected in analytical samples. The results of this decision logic and their use in developing the COPC list for the WTP are provided here. The reader is urged to refer to the regulatory DQO document (Wiemers and others 1998) for complete details of the decision logic and data used in the regulatory DQO. Ecology and EPA have concurred with the result of this process and its use as a starting point for the WTP COPC list.

A consolidated list of 850 chemical compounds (Wiemers and others 1998) was used as the input for the regulatory DQO process. This list of compounds included:

- Toxic air pollutant (TAP) lists Class A (WAC 173-460-150, toxic air pollutants; known, probable, and potential human carcinogens; and acceptable source impact levels) and Class B (WAC 173-460-160, toxic air pollutants, and acceptable source impact levels)
- Underlying hazardous constituents (UHC) list (40 CFR 268.48)
- Universal treatment standards list (40 CFR 268.48)
- *Double-Shell Tank (DST) System Dangerous Waste Permit Application* (DOE-RL 1991) constituents, except for waste code F039. To date, no landfill leachate has been added to the tanks. Therefore, these compounds were not included in the regulatory DQO database used to select the COPCs.

The list of 850 compounds was screened to arrive at a final list of 125 organic and 49 inorganic compounds. Tables A-1 and A-2 in Appendix A of this work plan identify these organic and inorganic COPCs. A brief discussion of the methods and criteria used in the regulatory DQO to narrow the initial input list is included below. Additional details regarding this process are provided in Wiemers and others (1998).

The compounds were reduced from 850 to 174 in the regulatory DQO based on the following:

- Detectability in the single-shell/double-shell waste
- Stability in the DST environment
- Toxicity and carcinogenicity
- Availability of SW-846 (EPA 1986) analytical methods
- Association with the operations at the Hanford Site

The resulting list of 125 organic compounds includes polychlorinated biphenyls (PCBs). This class of compounds includes 209 separate congeners. Fourteen of these congeners (the coplanar PCBs) are considered to be "dioxin-like" and are evaluated individually. These 14 coplanar PCBs were added to the regulatory DQO list of 125, resulting in a total of 139 organic compounds shown in Appendix A, Table A-1.

The inorganics were established by the following:

- Listing the inorganic compounds and metals in the input of the starting lists
- Consolidating the list of metals and ions
- Comparing the resulting list to the Hanford Site waste inventories
- Considering the applicability of SW-846 (EPA 1986) analytical methods
- Assessing alternative sources of information

Toxicity criteria were not used to screen inorganic chemicals because the starting list of inorganics was so much shorter than the list of organic chemicals, and there was not as large an unknown component to the inorganics (that is, fewer compounds that were not detected). The resulting list of 49 inorganic compounds is provided in Appendix A, Table A-2.

4.1.2 Environmental Protection Agency Products of Incomplete Combustion

The organic and inorganic chemicals retained by the regulatory DQO process were compared to the US Environmental Protection Agency (EPA) list of recommended and potential PICs contained in Table A.1 of the *Human Health Risk Assessment Protocol for Hazardous Waste Combustion Facilities* (EPA 1998a). All 148 PICs from Table A.1 of EPA 1998a not already included as part of the regulatory DQO were added as COPCs. These additional 148 COPCs are listed in Table A-3 in Appendix A of this work plan. The 148 organic compounds listed in Table A-3 include the chemicals recommended for identification and the chemicals for potential identification that were originally identified in tables 1 and 2 of the *Draft Exposure Assessment Guidance for Resource Conservation and Recovery Act Hazardous Waste Combustion Facilities* (EPA 1994a) and the compounds identified in combustion unit emissions and stack emissions originally identified in the *Review Draft Addendum to the Methodology for Assessing Health Risks Associated with Indirect Exposure to Combustor Emissions* (EPA 1993d) as cited by EPA (1998a). These 148 chemicals include PICs from a variety of combustion units but not specifically from vitrification units. These PICs were included to ensure a conservative approach.

4.1.3 Site-Specific Products of Incomplete Combustion

A bench-scale test of the melter technology was conducted at the Catholic University of America Vitreous State Laboratory in December 1998 (Matlock and Pegg 1999). A surrogate waste feed was used for this test that likely does not represent the constituents in the actual tanks. This surrogate waste was designed to represent the most difficult-to-destroy chemicals potentially present in the tank waste and, thus, to provide a conservative estimate of potential PICs. This test identified 16 additional potential PICs. These chemicals are listed in Table A-4 of Appendix A.

4.1.4 Chemicals Screened in the Regulatory DQO Process and Added Back to the COPC List

EPA Region 10 (CCN 064332) did not agree with the removal of chemicals from the COPC list based on toxicity. Therefore, all chemicals not included in the regulatory DQO due to low toxicity, regardless of other factors (for example, number of detects), are included in the list of preliminary COPCs.

The regulatory DQO process eliminated 46 chemicals detected in the liquid or vapor phase of the tank waste and 65 chemicals that could possibly be in the tanks but which were never detected. These 111 regulated organic chemicals eliminated from the regulatory DQO were compared to the PICs previously added to the list of preliminary COPCs (sections 4.1.2 and 4.1.3 of this work plan). Based on this comparison, an additional 26 regulated organic chemicals with positive detects and 41 regulated organic chemicals with no detects, eliminated by the regulatory DQO process, were added to the list of preliminary COPCs. These 67 additional chemicals are listed in Appendix A, Table A-5, of this work plan under the headings “detected chemicals eliminated from DQO” and “nondetected chemicals eliminated from DQO.”

Many of the organic COPCs that have been retained for risk assessment have not been detected in tank waste or do not have an established method for analytical detection in tank waste. As part of the ongoing updates to the risk assessment performed in accordance with the WTP Dangerous Waste Permit, the list of COPCs for risk assessment will be considered in conjunction with outcomes from the regulatory DQO implementation to determine whether changes are warranted.

4.1.5 Criteria Pollutants

National ambient air quality standards (NAAQSs) have been established for six criteria pollutants: sulfur dioxide, particulate matter, carbon monoxide, ozone, nitrogen dioxide, and lead. These criteria pollutants will be addressed in the prevention of significant deterioration (PSD) permit application for this facility. In addition, five of these criteria pollutants were added to the list of preliminary COPCs. The sixth, lead, was previously included in the COPCs identified by the regulatory DQO process.

4.2 Radionuclides of Potential Concern

The list of 46 preliminary ROPCs was established based upon *Standard Inventories of Chemicals and Radionuclides in Hanford Site Tank Wastes* (Kupfer and others 1997). Information used to establish the global inventories originated from key historical records, various chemical flowsheets used in reprocessing of irradiated Hanford Site reactor fuels, and calculations of radionuclide isotope generation and decay. This list includes 16 radionuclides identified as contributing greater than 99.99 % of the radioactivity in the tank waste (Kupfer and others 1997) plus an additional 30 radionuclides included due to their toxicity. The ROPCs are listed in Table A-6 in Appendix A.

4.3 Identification of COPCs and ROPCs for the Quantitative Preliminary Risk Assessment

The COPCs and ROPCs identified in tables A-1 through A-6 in Appendix A include an extensive list of chemicals and radionuclides (1) potentially present in the waste to be processed and (2) potentially produced as PICs during the processing of waste. The process of identification of COPCs and ROPCs for the quantitative PRA used the following conditions to identify chemicals that are potentially toxic to humans or ecological resources, and/or have a definite propensity for bioaccumulating or bioconcentrating in human and ecological food chains.

Final COPCs and ROPCs carried through the quantitative risk assessment will be all COPCs and ROPCs for which:

- Appropriate physical/chemical parameters are available to quantitatively estimate potential emissions or fate and transport behavior of the constituent through the environment
- Appropriate human health or ecological toxicity data is available to quantitatively evaluate potential effects of the constituent

Tables A-7 through A-11 in Appendix A provide a summary of which COPCs and ROPCs can be carried through the quantitative human health risk assessment (HHRA) for each human receptor group and exposure pathway. Tables A-12 through A-14 provide a summary of which COPCs and ROPCs can be carried through the quantitative ecological risk assessment (ERA) for each ecological receptor. Receptors and pathways are described in sections 7 (human health) and 8 (ecological) of this work plan. Sources of chemical specific toxicity and physical/chemical data, including the use of a few Ecology- and EPA-approved surrogate values where chemical-specific values are not available, are described in section 7.2, section 8.3, and Appendices B-1 and C.

Constituents not included in the quantitative risk assessment will be discussed qualitatively as part of the uncertainty assessment.

4.3.1 Identification of Organic COPCs for Inclusion in the Quantitative PRA

The 370 preliminary organic COPCs identified per the method described in section 4.1 and Figure 4-1 of this work plan are listed in Table 4-1 and have been grouped into the following classes based on chemical structure and molecular weight (MW):

Volatile Organic Compounds (VOCs)	Semivolatile Organic Compounds (SVOCs)
Aromatic halogenated hydrocarbons	Dioxin and furan compounds
Aromatic nonhalogenated hydrocarbons	PCBs
Nonaromatic nonhalogenated hydrocarbons	Phthalates
Nonaromatic halogenated hydrocarbons	Light polynuclear aromatic hydrocarbons (PAHs) (MW < 200 g/mole)
	Heavy PAHs (MW > 200 g/mole)
	Light substituted benzene compounds (MW < 200

Volatile Organic Compounds (VOCs)	Semivolatile Organic Compounds (SVOCs)
	g/mole)
	Other light SVOCs (MW < 200 g/mole)
	Other heavy SVOCs (MW > 200 g/mole)
	Herbicides and organochlorinated pesticides

EPA (1994a) has identified several of these categories (dioxins/furans, PAHs, PCBs, phthalates, other chlorinated organics and nitroaromatics) as having the highest potential to cause increased risk to human health. Thus, the WTP list includes the classes of organic chemicals considered to be most important to EPA (1994a).

The number of organic COPCs that can be carried through the quantitative risk evaluation is summarized below:

- Toxicity and physical/chemical data appropriate for evaluation of chronic human exposures is available for 284 of the 370 organic COPCs.
- Toxicity data appropriate for the evaluation of potential effects resulting from acute (that is, one-hour) exposure to COPCs is available for 313 of the 370 organic COPCs.
- Toxicity data appropriate for evaluation of chronic ecological exposures is available for 162 of the 370 organic COPCs.

In all, 343 of the 370 organic COPCs listed in Table 4-1 can be quantified in some way for at least some of the receptors included in the risk assessment. Tables A-7 through A-14 in Appendix A provide a detailed breakdown of the human and ecological receptors and human exposure pathways for which risks can be quantified for each of these COPCs.

4.3.2 Identification of Inorganic COPCs for Inclusion in the Quantitative PRA

The 54 preliminary inorganic COPCs identified per the method described in section 4.1 and Figure 4-1 are listed in Table 4-2 and have been grouped into three classes: metals, nonmetals and anions, and criteria pollutants. As noted about the organic chemicals, these classes were not used in selecting COPCs; rather, the evaluation includes all the classes considered important to EPA.

The number of inorganic COPCs that can be carried through the quantitative risk evaluation is summarized below:

- Toxicity and physical/chemical data appropriate for evaluation of chronic human exposures is available for 24 of the 54 inorganic COPCs.
- Toxicity data appropriate for the evaluation of potential effects resulting from acute (that is, one-hour) exposure to COPCs is available for 48 of the 54 inorganic COPCs.
- Toxicity data appropriate for evaluation of chronic ecological exposures is available for 31 of the 54 inorganic COPCs.

In all, 50 of the 54 inorganic COPCs listed in Table 4-2 can be quantified in some way for at least some of the receptors included in the risk assessment. Tables A-7 through A-14 provide a detailed breakdown

of the human and ecological receptors and human exposure pathways for which risks can be quantified for each of these COPCs.

This list of inorganic COPCs includes the stable form of the 12 chemicals listed below, also evaluated as ROPCs:

antimony	iodine	tin
barium	nickel	uranium
cadmium	selenium	yttrium
cobalt	strontium	zirconium

The chemical toxicity (that is, not associated with radioactivity) of these constituents will be evaluated in the PRA.

4.3.3 Identification of ROPCs for Inclusion in the Quantitative PRA

The 46 preliminary ROPCs identified per the method described in section 4.1 and Figure 4-1 are listed in Table 4-3. Toxicity and physical/chemical data appropriate for evaluation of chronic human health, acute human health, and chronic ecological exposures to ROPCs is available for all 46 of the preliminary ROPCs. Tables A-7 through A-14 in Appendix A provide a detailed breakdown of the receptors and exposure pathways for which risks can be quantified for each of these ROPCs.

4.4 Uncertainty in COPC and ROPC List

The identification of COPCs and ROPCs for the PRA is uncertain because these constituents are identified before operation of the WTP and must, therefore, rely on assumptions regarding what may be in the waste feed and what may be produced as PICs. Test data that will be collected for the FRA during the environmental performance demonstration will reduce but not eliminate this uncertainty because this test data will include uncertainty due to TICs, detection limits, and variations in actual waste feed.

In both the PRA and FRA, uncertainty is introduced into the risk assessment by COPCs that cannot be carried through the quantitative assessment due to lack of toxicity data (all ROPCs have adequate toxicity data to be carried through the quantitative assessment).

Sources of uncertainty in the identification of COPCs and ROPCs for the PRA are described briefly below. An overview of how these uncertainties will be evaluated, along with uncertainties in all other steps of the risk assessment, is provided in section 10 of this work plan.

4.4.1 Uncertainty in Identification of COPCs and ROPCs for PRA

Sources of uncertainty in the identification of COPCs and ROPCs include

- Uncertainty in the waste feed from the DSTs
- Uncertainty in PICs produced by the WTP

While a considerable amount of analytical data is available for the contents of the DSTs, the contents of all tanks have not been fully characterized. To compensate for deficits in the analytical data, the

regulatory DQO that was used as the basis for the COPC list incorporated constituents that could be present in the tanks, based on Hanford activities, even if these constituents have not been detected in analytical samples.

Limited PIC data is available from bench-scale tests performed on surrogate waste at the Catholic University of America Vitreous State Laboratory in December 1998 (Matlock and Pegg 1999). This surrogate waste was designed to represent the most difficult-to-destroy chemicals potentially present in the tank waste and, thus, to provide a conservative estimate of potential PICs. To maintain a conservative bias in the PRA, PICs identified by EPA (1998a) as present in stack emissions from existing hazardous waste incinerators were included in the COPC list along with WTP-specific PICs identified in the bench-scale testing. ROPCs are not produced as PICs.

4.4.2 Uncertainty in COPCs Not Included in the Quantitative Assessment

Some COPCs identified as potentially present in the waste or as PICs cannot be carried through the quantitative risk assessment because appropriate toxicity data is not available to characterize their potential effects on human or ecological receptors. Four hundred and seventy COPCs and ROPCs were identified for evaluation in the PRA: 370 organic COPCs, 54 inorganic COPCs, and 46 ROPCs. Toxicity information is available to conduct a quantitative chronic HHRA on over 300 of these constituents and an ecological assessment on over 200 constituents.

Constituents without toxicity information will not be included in the quantitative human health or ecological risk assessments. If these constituents are similar in their toxicity and persistence to the constituents with toxicity data, the total risk or hazard would be underestimated by a factor of approximately 1.4 (that is, 424 COPCs/308 COPCs with toxicity data). Similarly, for ecological receptors, if the toxicity and persistence of the constituents without toxicity data are similar to the toxicity and persistence of the constituents with toxicity data, the total hazard would underestimated by a factor of 2.2 (that is, 424 COPCs/193 COPCs with toxicity data). It is more likely that the nonquantified constituents will have lower toxicity, persistence, or both, and this can be addressed through an evaluation of the types of chemicals with and without toxicity data. For example, inorganic COPCs without toxicity data include essentially nontoxic chemicals such as calcium, iron, potassium, sodium, chloride, and hydroxide, while a few organic COPCs without toxicity data (such as two coplanar PCBs) are potentially toxic.

4.5 Summary of Identification of COPCs and ROPCs

The list of 470 COPCs and ROPCs selected for the PRA includes many more compounds than are expected in actual facility emissions. The list is long because assumptions were used to compensate for the uncertainty regarding the exact make-up of the waste and the lack of environmental performance demonstration data. (That is, it was assumed that all chemicals potentially present in the waste will be emitted along with all chemicals identified as PICs from any type of combustion unit.) The list of preliminary COPCs and ROPCs includes numerous chemicals (especially organic chemicals) that have never been detected in the tank waste.

Figure 4-1 summarizes the process used to identify 470 preliminary COPCs and ROPCs for the PRA. The inorganic and organic COPCs and ROPCs are summarized in tables 4-1 (organics), 4-2 (inorganics), and 4-3 (radionuclides).

Tables 4-1 through 4-3 summarize the current availability of data to quantitatively evaluate the preliminary COPCs and ROPCs. These tables also provide a list of the COPCs and ROPCs that will be quantitatively evaluated in the PRA. Some type of quantitative risk/hazard analysis can be conducted for 435 of the 470 preliminary constituents of potential concern. Preliminary COPCs and ROPCs not included in the PRA will be addressed qualitatively in the uncertainty assessment.

Tables A-7 through A-11 in Appendix A identify the human receptor groups and exposure pathways for which risks/hazards can be quantified for each COPC and ROPC based on the availability of physical/chemical parameters for fate and transport modeling and toxicity data for evaluating effects on human health receptors. The human receptors identified in these tables are as follows:

- Hanford site industrial worker (Appendix A, Table A-7)
- Residential receptors (Appendix A , Table A-8)
- Native American subsistence receptors (Appendix A ,Table A-9)
- Nursing infant (Appendix A ,Table A-10)
- Acute receptor (Appendix A ,Table A-11)

Tables A-12 through A-14 in Appendix A identify the ecological receptors for which hazards can be quantified for each COPC and ROPC based on the availability of toxicity data for evaluating effects on ecological receptors. The ecological receptors identified in these tables are as follows:

- Terrestrial plants and invertebrates (Appendix A ,Table A-12)
- Terrestrial mammals and birds (Appendix A ,Table A-13)
- Aquatic biota, salmonids, and benthic invertebrates (Appendix A ,Table A-14)

The COPC and ROPC lists will be reevaluated for the final risk assessment (FRA) following the environmental performance demonstration. This reevaluation will take into account any new information gathered during the PRA and performance demonstration test and will include input and approval by Ecology and EPA.

Table 4-1 Organic Chemicals of Potential Concern (COPCs) for Pre-Demonstration Test Risk Assessment (PRA)

	Constituent	CAS Registry Number	Toxicity Values[a]	Regulatory DQO[b]	EPA Addition to DQO[c]	PIC?[d]
DQO Chemicals: These 216 chemicals have toxicity data and were on the original regulatory DQO list or EPA additions. These COPCs can be quantitatively evaluated.	**Aromatic Halogenated Hydrocarbons**					
	2,3,4,6-Tetrachlorophenol	58-90-2	n, e		X	
	4-Chloro-3-methylphenol	59-50-7	a, e		X	
	Aromatic Nonhalogenated Hydrocarbons					
	2-Nitrotoluene	88-72-2	n, a		X	
	4-Nitrobiphenyl	92-93-3	a		X	
	Benzene	71-43-2	c, n, a, e	X		PIC
	Ethyl benzene	100-41-4	c, n, a, e	X		PIC
	m-Xylene	108-38-3	n, a, e	X		PIC
	o-Xylene	95-47-6	n, a	X		PIC
	p-Xylene	106-42-3	n, a	X		PIC
	Styrene	100-42-5	n, a, e	X		PIC
	Toluene	108-88-3	n, a, e	X		PIC
	Non-aromatic Nonhalogenated Hydrocarbons					
	1,2-Epoxybutane	106-88-7	n, a		X	
	1,3-Butadiene	106-99-0	c, a	X		PIC
	1,4-Dioxane	123-91-1	c, a, e	X		PIC
	1-Methylpropyl alcohol	78-92-2	n, a	X		
	1-Nitropropane	108-03-2	n, a		X	
	2,2,4-Trimethylpentane	540-84-1	n, a		X	PIC
	2-Butanone	78-93-3	n, a, e	X		PIC
	2-Butenaldehyde (2-Butenal)	4170-30-3	n, a, e	X		PIC
	2-Heptanone	110-43-0	n, a	X		
	2-Hexanone	591-78-6	n, a, e	X		
	2-Methyl-2-propanol	75-65-0	n, a	X		
	2-Methyl-2-propenenitrile	126-98-7	n, a, e	X		PIC
	2-Methylaziridine	75-55-8	n, a		X	
	2-Methylpropyl alcohol	78-83-1	n, a, e		X	
	2-Pentanone	107-87-9	n, a	X		
	2-Propanone (Acetone)	67-64-1	n, a, e	X		PIC
	2-Propene-1-ol	107-18-6	n, a, e		X	
	2-Propyl alcohol	67-63-0	n, a, e	X		
	3-Heptanone	106-35-4	n, a	X		
	3-Methyl-1-butanol	123-51-3	n, a		X	
	3-Methyl-2-butanone	563-80-4	n, a	X		
	3-Pentanone	96-22-0	n	X		
	4-Heptanone	123-19-3	n, a	X		
	4-Methyl-2-pentanone	108-10-1	n, a, e	X		PIC
	4-Methyl-3-penten-2-one	141-79-7	n, a		X	
	5-Methyl-2-hexanone	110-12-3	n, a	X		
	Acetaldehyde	75-07-0	c, n, a		X	PIC
	Acetamide	60-35-5	n, a		X	
	Acetic acid	64-19-7	n, a	X		
	Acetic acid ethyl ester	141-78-6	n, a, e	X		
	Acetic acid n-butyl ester	123-86-4	n, a	X		
	Acetonitrile	75-05-8	n, a	X		PIC
	Acrolein	107-02-8	n, a, e	X		PIC
	Acrylonitrile	107-13-1	c, n, a, e	X		PIC
	Bis(isopropyl)ether	108-20-3	n		X	
	Butane	106-97-8	n, a	X		
	Carbon disulfide	75-15-0	n, a, e	X		PIC
	Cyclohexane	110-82-7	n, a	X		
	Cyclohexanone	108-94-1	n, a	X		
	Cyclohexene	110-83-8	n, a	X		
	Cyclopentane	287-92-3	n, a	X		
	Ethyl alcohol	64-17-5	n, a	X		
	Ethyl ether	60-29-7	n, a, e		X	
	Formaldehyde	50-00-0	c, n, a, e		X	PIC
	Formamide	75-12-7	n, a		X	
	Formic acid	64-18-6	n, a	X		PIC
	Formic acid, methyl ester	107-31-3	n, a		X	
	Methyl acetate	79-20-9	n		X	

Table 4-1 Organic Chemicals of Potential Concern (COPCs) for Pre-Demonstration Test Risk Assessment (PRA)

	Constituent	CAS Registry Number	Toxicity Values[a]	Regulatory DQO[b]	EPA Addition to DQO[c]	PIC?[d]
DQO Chemicals (continued): These 216 chemicals have toxicity data and were on the original regulatory DQO list or EPA additions. These COPCs can be quantitatively evaluated.	Methyl alcohol	67-56-1	n, a, e	X		
	Methyl isocyanate	624-83-9	n, a	X		PIC
	Methyl tert-butyl ether	1634-04-4	n, a		X	PIC
	Methylacetylene	74-99-7	n, a		X	
	Methylcyclohexane	108-87-2	n, a	X		PIC
	N,N-Dimethylacetamide	127-19-5	n, a		X	
	n-Butyl alcohol	71-36-3	n, a, e	X		
	n-Heptane	142-82-5	n, a, e	X		
	n-Hexane	110-54-3	n, a, e	X		PIC
	Nitromethane	75-52-5	n, a		X	
	n-Nonane	111-84-2	n, a	X		
	n-Octane	111-65-9	n, a	X		
	n-Pentane	109-66-0	n, a	X		
	n-Propionaldehyde	123-38-6	n, a	X		PIC
	n-Propyl alcohol	71-23-8	n, a	X		
	n-Valeraldehyde	110-62-3	n		X	
	Oxirane	75-21-8	c, a	X		PIC
	Propionic acid	79-09-4	n, a		X	
	Propionitrile	107-12-0	n, a	X		
	p-tert-Butyltoluene	98-51-1	n		X	
	Triethylamine	121-44-8	n, a	X		
	Trimethylamine	75-50-3	n, a		X	
	Vinyl acetate	108-05-4	n, a, e		X	PIC
	Non-aromatic Halogenated Hydrocarbons					
	1,1,1,2-Tetrachloroethane	630-20-6	c, n, a, e		X	PIC
	1,1,1-Trichloroethane	71-55-6	n, a, e	X		PIC
	1,1,2,2-Tetrachloroethane	79-34-5	c, a, e	X		PIC
	1,1,2,2-Tetrachloroethene	127-18-4	c, n, a, e	X		PIC
	1,1,2-Trichloroethane	79-00-5	c, n, a, e	X		PIC
	1,1,2-Trichloroethylene	79-01-6	c, n, a, e	X		PIC
	1,1-Dichloroethane	75-34-3	n, a, e	X		PIC
	1,1-Dichloroethene	75-35-4	c, n, a, e	X		PIC
	1,2,2-Trichloro-1,1,2-trifluoroethane	76-13-1	n, a	X		PIC
	1,2-Dichloro-1,1,2,2-tetrafluoroethane	76-14-2	a	X		
	1,2-Dichloroethane	107-06-2	c, n, a, e	X		PIC
	1,2-Dichloroethylene	540-59-0	n, a, e		X	
	1,2-Dichloropropane	78-87-5	c, n, a, e	X		PIC
	1-Chloroethene	75-01-4	c, n, a, e	X		PIC
	2,2-Dichloropropionic acid	75-99-0	n		X	
	3-Chloropropene (Allyl chloride)	107-05-1	n, a	X		
	Bromochloromethane	74-97-5	a		X	PIC
	Bromodichloromethane	75-27-4	c, n, a, e		X	PIC
	Bromomethane	74-83-9	n, a, e	X		PIC
	Carbon tetrachloride	56-23-5	c, n, a, e	X		PIC
	Chlorodifluoromethane	75-45-6	n, a	X		PIC
	Chloroethane	75-00-3	n, a	X		PIC
	Chloroform	67-66-3	c, n, a, e	X		PIC
	Chloromethane	74-87-3	c, n, a	X		PIC
	Chloropentafluoroethane	76-15-3	a		X	
	cis-1,3-Dichloropropene	10061-01-5	a	X		
	Dichlorodifluoromethane	75-71-8	n, a, e	X		PIC
	Dichlorofluoromethane	75-43-4	a	X		
	Dichloromethane	75-09-2	c, n, a, e	X		PIC
	Hexafluoroacetone	684-16-2	a	X		
	trans-1,2-Dichloroethylene	156-60-5	n, a, e		X	PIC
	trans-1,3-Dichloropropene	10061-02-6	a	X		
	Trichloroacetic acid	76-03-9	a		X	
	Trichlorofluoromethane	75-69-4	n, a, e	X		PIC
	Trifluorobromomethane	75-63-8	a		X	

Table 4-1 Organic Chemicals of Potential Concern (COPCs) for Pre-Demonstration Test Risk Assessment (PRA)

	Constituent	CAS Registry Number	Toxicity Values[a]	Regulatory DQO[b]	EPA Addition to DQO[c]	PIC?[d]
DQO Chemicals (continued): These 216 chemicals have toxicity data and were on the original regulatory DQO list or EPA additions. These COPCs can be quantitatively evaluated.	**Dioxin and Furan Compounds (PCDDs/PCDFs)**					
	Dibenzofuran	132-64-9	n, a, e		X	PIC
	Polychlorinated Biphenyls (PCBs)					
	Polychlorinated biphenyls (PCBs)	1336-36-3	c, n, a, e	X		PIC
	Phthalates					
	Bis(2-ethylhexyl) phthalate (DEHP)	117-81-7	c, n, a, e		X	PIC
	Butylbenzyl phthalate	85-68-7	n, a, e		X	PIC
	Dibutyl phthalate	84-74-2	n, a, e		X	PIC
	Diethyl phthalate	84-66-2	n, a, e		X	PIC
	n-Dioctyl phthalate	117-84-0	n, a, e		X	PIC
	Light Polycyclic Aromatic Hydrocarbons (molecular weight <200 g/mole)					
	2-Chloronaphthalene	91-58-7	n, a, e		X	PIC
	Acenaphthene	83-32-9	n, a, e		X	
	Acenaphthylene	208-96-8	a, e		X	
	Anthracene	120-12-7	n, a, e		X	PIC
	Fluorene	86-73-7	n, a, e		X	PIC
	Indene	95-13-6	a		X	
	Naphthalene	91-20-3	n, a, e		X	PIC
	Phenanthrene	85-01-8	a, e		X	bench
	Pyrene	129-00-0	n, a, e		X	PIC
	Heavy Polycyclic Aromatic Hydrocarbons (molecular weight >200 g/mole)					
	3-Methylcholanthrene	56-49-5	a		X	
	Benzo[a]anthracene	56-55-3	c, a, e		X	PIC
	Benzo[a]pyrene	50-32-8	c, a, e	X		PIC
	Benzo[b]fluoranthene	205-99-2	c, a, e		X	PIC
	Benzo[g,h,i]perylene	191-24-2	a, e		X	PIC
	Benzo[k]fluoranthene	207-08-9	c, a, e		X	PIC
	Chrysene	218-01-9	c, a, e		X	PIC
	Dibenz[a,h]anthracene	53-70-3	c, a, e	X		PIC
	Dibenzo[a,e]pyrene	192-65-4	a		X	
	Fluoranthene	206-44-0	n, a, e		X	PIC
	Hexachloronaphthalene	1335-87-1	a	X		
	Indeno[1,2,3-cd]pyrene	193-39-5	c, a, e		X	PIC
	Octachloronaphthalene	2234-13-1	a	X		
	Light Substituted Benzene Compounds (molecular weight <200 g/mole)					
	1,2,4-Trichlorobenzene	120-82-1	n, a, e	X		PIC
	1,2-Dichlorobenzene	95-50-1	n, a, e	X		PIC
	1,3-Dichlorobenzene	541-73-1	a, e	X		PIC
	1,4-Dichlorobenzene	106-46-7	c, n, a, e	X		PIC
	1,4-Dinitrobenzene	100-25-4	n, a	X		PIC
	2,4,5-Trichlorophenol	95-95-4	n, a, e		X	PIC
	2,4,6-Trichlorophenol	88-06-2	c, a, e		X	PIC
	2,4-Dichlorophenol	120-83-2	n, a, e		X	PIC
	2-Chlorophenol	95-57-8	n, a		X	PIC
	2-Chlorotoluene	95-49-8	n, a, e		X	bench
	2-Nitrophenol	88-75-5	e, a		X	PIC
	alpha-Methylstyrene	98-83-9	n		X	
	Chlorobenzene	108-90-7	n, a, e	X		PIC
	Cumene	98-82-8	n, a, e		X	PIC
	m-Cresol	108-39-4	n, a, e		X	PIC
	Nitrobenzene	98-95-3	n, a, e	X		PIC
	o-Cresol	95-48-7	n, a, e		X	PIC
	Phenol	108-95-2	n, a, e	X		PIC
	p-Nitrochlorobenzene	100-00-5	a	X		
	Other Light Semivolatile Compounds (molecular weight <200 g/mole)					
	1,1'-Biphenyl	92-52-4	n, a, e	X		PIC
	1,1-Dimethylhydrazine	57-14-7	c, a	X		
	2-Propenoic acid	79-10-7	n, a, e	X		
	Acetophenone	98-86-2	n, a, e	X		PIC
	Cyclohexanol	108-93-0	a		X	
	Dimethylaniline	121-69-7	n, a, e		X	
	di-n-Propylnitrosamine	621-64-7	c, a		X	PIC

Table 4-1 Organic Chemicals of Potential Concern (COPCs) for Pre-Demonstration Test Risk Assessment (PRA)

	Constituent	CAS Registry Number	Toxicity Values[a]	Regulatory DQO[b]	EPA Addition to DQO[c]	PIC?[d]
DQO Chemicals (continued): These 216 chemicals have toxicity data and were on the original Regulatory DQO list or EPA additions. These COPCs can be quantitatively evaluated.	Ethylene dibromide	106-93-4	c, n, a	X		PIC
	Ethylene glycol monobutyl ether	111-76-2	n, a, e		X	PIC
	Methylhydrazine	60-34-4	c, a	X		
	N,N-Diphenylamine	122-39-4	n, a, e	X		PIC
	Nitric acid, propyl ester	627-13-4	a	X		
	N-Nitrosomorpholine	59-89-2	a		X	
	N-Nitroso-N,N-dimethylamine	62-75-9	c, a	X		PIC
	Oxalic acid	144-62-7	a	X		
	p-Phthalic acid	100-21-0	n		X	
	Pyridine	110-86-1	n, a, e	X		PIC
	Quinoline	91-22-5	c, a		X	PIC
	Tetrahydrofuran	109-99-9	a	X		PIC
	Other Heavy Semivolatile Compounds (molecular weight >200 g/mole)					
	2,6-Bis(tert-butyl)-4-methylphenol	128-37-0	none	X		
	2-sec-Butyl-4,6-dinitrophenol	88-85-7	n, a, e	X		
	4-Bromophenylphenyl ether	101-55-3	a, e		X	
	Bis(3-tert-butyl-4-hydroxy-6-methyl-phenyl)sulfide	96-69-5	a		X	
	Dibutylphosphate	107-66-4	a		X	
	Hexachlorobenzene	118-74-1	c, n, a, e	X		PIC
	Hexachlorobutadiene	87-68-3	c, n, a, e	X		PIC
	Hexachloroethane	67-72-1	c, n, a, e		X	PIC
	Mirex	2385-85-5	c, n, a, e		X	
	Pentachloronitrobenzene	82-68-8	c, n, a, e	X		PIC
	Pentachlorophenol	87-86-5	c, n, a, e	X		PIC
	Picric acid	88-89-1	a	X		
	Terphenyls	26140-60-3	a		X	
	Tributyl phosphate	126-73-8	a	X		
	Trifluralin	1582-09-8	c, n, a, e		X	
	Herbicides and Organochlorinated Pesticides					
	2,4,5-T	93-76-5	n, a, e		X	
	2,4-D and esters	94-75-7	n, a		X	PIC
	4,4'-DDD	72-54-8	c, a, e		X	
	4,4'-DDE	72-55-9	c, a, e		X	PIC
	4,4'-DDT	50-29-3	c, n, a, e		X	
	Aldrin	309-00-2	c, n, a, e	X		
	alpha-BHC	319-84-6	c, a, e	X		PIC
	beta-BHC	319-85-7	c, a, e	X		PIC
	delta-BHC	319-86-8	e		X	
	Dieldrin	60-57-1	c, n, a, e	X		
	Endrin	72-20-8	n, a, e	X		
	gamma-BHC (Lindane)	58-89-9	c, n, a, e	X		PIC
	Heptachlor	76-44-8	c, n, a, e	X		PIC
	Isodrin	465-73-6	a	X		
	Methoxychlor	72-43-5	n, a, e		X	PIC
	Silvex (2,4,5-TP)	93-72-1	n, a, e		X	
	Toxaphene	8001-35-2	c, a, e	X		

Table 4-1 Organic Chemicals of Potential Concern (COPCs) for Pre-Demonstration Test Risk Assessment (PRA)

	Constituent	CAS Registry Number	Toxicity Values[a]	Regulatory DQO[b]	EPA Addition to DQO[c]	PIC?[d]
PICs from bench-test: These 14 chemicals are included because they were detected in bench-scale testing. These COPCs can be quantitatively evaluated.	**Aromatic Nonhalogenated Hydrocarbons**					
	Benzyl alcohol	100-51-6	n, a, e			fate
	Non-aromatic Nonhalogenated Hydrocarbons					
	Methyl methacrylate	80-62-6	n, a, e			bench
	p-Cymene	99-87-6	n			bench
	Non-aromatic Halogenated Hydrocarbons					
	Iodomethane	74-88-4	a			bench
	cis-1,2-Dichloroethene	156-59-2	n, a			bench
	Light Polycyclic Aromatic Hydrocarbons (molecular weight <200 g/mole)					
	2-Methyl naphthalene	91-57-6	n, a, e			bench
	Light Substituted Benzene Compounds (molecular weight <200 g/mole)					
	1,2,3-Trichlorobenzene	87-61-6	a, e			bench
	n-Propyl benzene	103-65-1	a			bench
	n-Butyl benzene	104-51-8	a			bench
	4-Chlorotoluene	106-43-4	a			bench
	Bromobenzene	108-86-1	a			bench
	sec-Butyl benzene	135-98-8	a			bench
	tert-Butyl benzene	98-06-6	a			bench
	1,2,4-Trimethyl benzene	95-63-6	n, a			bench

Table 4-1 Organic Chemicals of Potential Concern (COPCs) for Pre-Demonstration Test Risk Assessment (PRA)

	Constituent	CAS Registry Number	Toxicity Values[a]	Regulatory DQO[b]	EPA Addition to DQO[c]	PIC?[d]
Other Potential PICs and Coplanar PCBs: These 113 chemicals are included as COPCs because they are coplanar PCBs and/or PICs. These COPCs can be quantitatively evaluated.	**Aromatic Nonhalogenated Hydrocarbons**					
	Benzaldehyde	100-52-7	n, a, e			PIC
	Non-aromatic Nonhalogenated Hydrocarbons					
	Propargyl alcohol	107-19-7	n, a, e			PIC
	Glycidylaldehyde	765-34-4	n, a, e			PIC
	Propylene glycol monomethyl ether	107-98-2	n, a			PIC
	2-Methoxyethanol	109-86-4	n, a			PIC
	2-Ethoxyethanol	110-80-5	n, a			PIC
	Cyanogen	460-19-5	n, a			PIC
	Phosgene	75-44-5	n, a			PIC
	Ethyl methacrylate	97-63-2	n, a			PIC
	Non-aromatic Halogenated Hydrocarbons					
	Bromoform	75-25-2	c, n, a, e			PIC
	1,3-Dichloropropene	542-75-6	c, n, a, e			PIC
	Chlorodibromomethane	124-48-1	c, n, a, e			PIC
	1,2,3-Trichloropropane	96-18-4	c, n, a, e			PIC
	1,4-Dichloro-2-butene	764-41-0	c, a			PIC
	1,2-Dibromo-3-chloropropane	96-12-8	c, n, a			PIC
	Cyanogen bromide	506-68-3	n, a, e			PIC
	Cyanogen chloride	506-77-4	n, a, e			PIC
	Pentachloroethane	76-01-7	a, e			PIC
	Bromoethene	593-60-2	n, a			PIC
	Methylene bromide	74-95-3	n, a			PIC
	2-Chloropropane	75-29-6	n, a			PIC
	Dioxin and Furan Compounds (PCDDs/PCDFs)					
	Octachlorodibenzofuran	39001-02-0	c, a			PIC
	Octachlorodibenzo(p)dioxin	3268-87-9	c, a			PIC
	1,2,3,7,8-Pentachlorodibenzofuran	57117-41-6	c, a, e			PIC
	1,2,3,4,6,7,8-Heptachlorodibenzofuran	67562-39-4	c, a			PIC
	1,2,3,4,7,8,9-Heptachlorodibenzofuran	55673-89-7	c, a			PIC
	1,2,3,4,6,7,8-Heptachlorodibenzo(p)dioxin	35822-46-9	c, a			PIC
	1,2,3,7,8,9-Hexachlorodibenzofuran	72918-21-9	c, a			PIC
	2,3,7,8-Tetrachlorodibenzofuran	51207-31-9	c, a, e			PIC
	1,2,3,6,7,8-Hexachlorodibenzofuran	57117-44-9	c, a, e			PIC
	2,3,4,6,7,8-Hexachlorodibenzofuran	60851-34-5	c, a			PIC
	1,2,3,4,7,8-Hexachlorodibenzofuran	70648-26-9	c, a			PIC
	1,2,3,7,8,9-Hexachlorodibenzo(p)dioxin	19408-74-3	c, a			PIC
	1,2,3,6,7,8-Hexachlorodibenzo(p)dioxin	57653-85-7	c, a			PIC
	1,2,3,4,7,8-Hexachlorodibenzo(p)dioxin	39227-28-6	c, a			PIC
	2,3,4,7,8-Pentachlorodibenzofuran	57117-31-4	c, a, e			PIC
	2,3,7,8-Tetrachlorodibenzo(p)dioxin	1746-01-6	c, a, e			PIC
	1,2,3,7,8-Pentachlorodibenzo(p)dioxin	40321-76-4	c, a			PIC
	Polychlorinated Biphenyls (PCBs)					
	2,3',4,4',5,5'-Hexachlorobiphenyl	52663-72-6	c			PCB
	2,3,3',4,4'-Pentachlorobiphenyl	32598-14-4	c			PCB
	2',3,4,4',5-Pentachlorobiphenyl	65510-44-3	c			PCB
	3,3',4,4'-Tetrachlorobiphenyl	32598-13-3	c			PCB
	3,4,4',5-Tetrachlorobiphenyl	70362-50-4	c			PCB
	2,3,3',4,4',5,5'-Heptachlorobiphenyl	39635-31-9	c			PCB
	2,3,4,4',5-Pentachlorobiphenyl	74472-37-0	c			PCB
	2,3,3',4,4',5-Hexachlorobiphenyl	38380-08-4	c			PCB
	2,3,3',4,4',5'-Hexachlorobiphenyl	69782-90-7	c			PCB
	2,3',4,4',5-Pentachlorobiphenyl	31508-00-6	c			PCB
	3,3',4,4',5-Pentachlorobiphenyl	57465-28-8	c			PCB
	3,3',4,4',5,5'-Hexachlorobiphenyl	32774-16-6	c			PCB
	Phthalates					
	Dimethyl phthalate	131-11-3	a, e			PIC
	Light Substituted Benzene Compounds (molecular weight <200 g/mole)					
	Aniline	62-53-3	c, n, a			PIC
	Benzyl chloride	100-44-7	c, a			PIC
	o-Toluidine	95-53-4	c, a			PIC
	Benzotrichloride	98-07-7	c, a			PIC

Table 4-1 Organic Chemicals of Potential Concern (COPCs) for Pre-Demonstration Test Risk Assessment (PRA)

	Constituent	CAS Registry Number	Toxicity Values[a]	Regulatory DQO[b]	EPA Addition to DQO[c]	PIC?[d]
Other Potential PICs and Coplanar PCBs (continued): These 113 chemicals are included as COPCs because they are coplanar PCBs and/or PICs. These COPCs can be quantitatively evaluated.	p-Toluidine	106-49-0	c, a			PIC
	2,4-Dinitrotoluene	121-14-2	c, n, a, e			PIC
	2,6-Dinitrotoluene	606-20-2	c, n, a, e			PIC
	4-Nitrophenol	100-02-7	a, e			PIC
	2,4-Dimethylphenol	105-67-9	n, a, e			PIC
	2,4-Dinitrophenol	51-28-5	n, a, e			PIC
	p-Chloroaniline	106-47-8	n, a, e			PIC
	1,3-Dinitrobenzene	99-65-0	n, a, e			PIC
	4,6-Dinitro-o-cresol	534-52-1	a			PIC
	p-Cresol	106-44-5	n, a			PIC
	1,3,5-Trimethyl benzene	108-67-8	n, a			PIC
	o-Dinitrobenzene	528-29-0	n, a			PIC
	Toluene-2,6-diamine	823-40-5	n, a			PIC
	o-Nitroaniline	88-74-4	n, a			PIC
	Other Light Semivolatile Compounds (molecular weight <200 g/mole)					
	Epichlorohydrin	106-89-8	c, n, a			PIC
	Dichloroisopropyl ether	108-60-1	c, a			PIC
	Ethylene thiourea	96-45-7	c, n, a, e			PIC
	1,2-Diphenylhydrazine	122-66-7	c, a, e			PIC
	N-Nitrosodi-n-butylamine	924-16-3	c			PIC
	Bis(2-chloroethyl) ether	111-44-4	c, a			PIC
	1,2-Dimethylhydrazine	540-73-8	c, a			PIC
	Dichloromethyl ether	542-88-1	c, a			PIC
	Phthalic anhydride	85-44-9	n, a, e			PIC
	Maleic hydrazide	123-33-1	n, a, e			PIC
	Benzoic acid	65-85-0	n, a, e			PIC
	Ethylene glycol	107-21-1	n, a, e			PIC
	Furfural	98-01-1	n, a, e			PIC
	4,4'-Methylenedianiline	101-77-9	a			PIC
	Quinone	106-51-4	a			PIC
	Bis(2-chloroethoxy)methane	111-91-1	a			PIC
	1,3-Propane sultone	1120-71-4	a			PIC
	Ethyl carbamate (Urethane)	51-79-6	a			PIC
	2,4-Toluene diisocyanate	584-84-9	a			PIC
	Ethyl methanesulfonate	62-50-0	a			PIC
	Dimethyl sulfate	77-78-1	a			PIC
	o-Anisidine	90-04-0	a			PIC
	Safrole	94-59-7	a			PIC
	Malononitrile	109-77-3	n, a			PIC
	Ethylene glycol monoethyl ether acetate	111-15-9	n, a			PIC
	Methyl styrene (mixed isomers)	25013-15-4	n			PIC
	2-Chloroacetophenone	532-27-4	n			PIC
	Other Heavy Semivolatile Compounds (molecular weight >200 g/mole)					
	Captan	133-06-2	c, n, a			PIC
	3,3'-Dimethoxybenzidine	119-90-4	c, a			PIC
	Chlorobenzilate	510-15-6	c, n, a			PIC
	3,3'-Dichlorobenzidine	91-94-1	c, a			PIC
	Azobenzene	103-33-3	c			PIC
	Strychnine	57-24-9	n, a, e			PIC
	Hexachlorocyclopentadiene	77-47-4	n, a, e			PIC
	Pentachlorobenzene	608-93-5	n, a, e			PIC
	1,3,5-Trinitrobenzene	99-35-4	n, a, e			PIC
	Hexachlorophene	70-30-4	n, a, e			PIC
	Pronamide	23950-58-5	n, e			PIC
	1,2,4,5-Tetrachlorobenzene	95-94-3	n, a, e			PIC
	2-Cyclohexyl-4,6-dinitrophenol	131-89-5	n, e			PIC
	Dimethyl aminoazobenzene	60-11-7	a			PIC
	Hexamethylene-1,5-diisocyanate	822-06-0	n, a			PIC
	Herbicides and Organochlorinated Pesticides					
	Chlordane	57-74-9	c, n, a, e			PIC
	Endothall	145-73-3	n, e			PIC

Table 4-1 Organic Chemicals of Potential Concern (COPCs) for Pre-Demonstration Test Risk Assessment (PRA)

	Constituent	CAS Registry Number	Toxicity Values[a]	Regulatory DQO[b]	EPA Addition to DQO[c]	PIC?[d]
DQO Chemicals: These 20 chemicals do not have toxicity values but were on the original regulatory DQO list or EPA additions. These COPCs cannot be evaluated quantitatively.	**Non-aromatic Halogenated Hydrocarbons**					
	Trichlorofluoroethane	27154-33-2	none		X	
	Difluorodibromomethane	75-61-6	none		X	
	1,1,1,2-Tetrachloro-2,2-difluoroethane	76-11-9	none		X	
	1,1,2,2-Tetrachloro-1,2-difluoroethane	76-12-0	none		X	
	Light Polycyclic Aromatic Hydrocarbons (molecular weight <200 g/mole)					
	5-Nitroacenaphthene	602-87-9	none		X	
	Light Substituted Benzene Compounds (molecular weight <200 g/mole)					
	Trimethyl benzene	25551-13-7	none		X	
	Other Light Semivolatile Compounds (molecular weight <200 g/mole)					
	Diphenyl ether	101-84-8	none		X	
	Heavy Polycyclic Aromatic Hydrocarbons (molecular weight >200 g/mole)					
	5-Methylchrysene	3697-24-3	none		X	
	Benzo[a,i]pyrene	191-30-0	none		X	
	Benzo[j]fluoranthene	205-82-3	none		X	PIC
	Dibenz[a,h]acridine	226-36-8	none		X	
	Dibenz[a,j]acridine	224-42-0	none		X	
	Dibenzo[a,h]pyrene	189-64-0	none		X	
	Dibenzo[a,i]pyrene	189-55-9	none		X	
	Pentachloronaphthalene	1321-64-8	none	X		
	Tetrachloronaphthalene	1335-88-2	none	X		
	Trichloronaphthalene	1321-65-9	none		X	
	Other Heavy Semivolatile Compounds (molecular weight >200 g/mole)					
	Nitrofen	1836-75-5	none		X	
	Ammonium perfluorooctanoate	3825-26-1	none	X		
	Triphenylamine	603-34-9	none		X	
Potential PICs and Coplanar PCBs: These 7 chemicals do not have toxicity data and are not in the Regulatory DQO, but are COPCs because they are potential PICs or PCBs. These COPCs cannot be evaluated quantitatively.	**Polychlorinated Biphenyls (PCBs)**					
	2,2',3,4,4',5,5'-Heptachlorobiphenyl	35065-29-3	none			PCB
	2,2',3,3',4,4',5-Heptachlorobiphenyl	35065-30-6	none			PCB
	Other Light Semivolatile Compounds (molecular weight <200 g/mole)					
	Chlorocyclopentadiene	41851-50-7	none			PIC
	Dichloropentadiene	61626-71-9	none			PIC
	Heavy Polycyclic Aromatic Hydrocarbons (molecular weight >200 g/mole)					
	Benzo[e]pyrene	192-97-2	none			PIC
	Dibenzo[a,e]fluoranthene	5385-75-1	none			PIC
	Dibenzo[a,h]fluoranthene	No CAS #	none			PIC

[a]Toxixity Values - denotes toxicity information where:
c - carcinogenic values available
n - non-carcinogenic toxicity values available
e - ecological toxicity values available
a - acute toxicity values available

[b]Regulatory DQO - "X" indicates this compound was one of the priority-regulated organic constituents listed in Table 4.4 of the regulatory DQO.

[c]EPA Addition to DQO - "X" indicates this compound was added by EPA despite being eliminated in the Reg DQO due to low toxicity.

[d]PIC - indicates the constituent is identified as a product of incomplete combustion in EPA's Human Health Risk Assessment Protocol for Hazardous Waste Combustion Facilities, Table A-1, Information on Compounds of Potential Interest, Volume 2, Peer Review Draft. There is no need to consider feed characterization for chemicals that are only evaluated as PICs.

CAS = Chemical Abstracts Service.
DQO = Data quality objective.
WTP = Hanford Tank Waste Treatment and Immobilization Plant.

Table 4-2 Inorganic Chemicals of Potential Concern (COPCs) for Preliminary Risk Assessment

Constituent	CAS Registry Number	Toxicity Values[a]	Regulatory DQO[b]
Metals			
Aluminum	7429-90-5	a, e	X
Antimony	7440-36-0	n, a, e	X
Arsenic	7440-38-2	c, n, a, e	X
Barium	7440-39-3	n, a, e	X
Beryllium	7440-41-7	c, n, a, e	X
Bismuth	7440-69-9	a	X
Boron	7440-42-8	n, a, e	X
Bromide	24959-67-9	e	X
Cadmium	7440-43-9	c, n, a, e	X
Calcium	7440-70-2	a	X
Chromium	18540-29-9	c, n, a, e	X
Cobalt	7440-48-4	a, e	X
Copper	7440-50-8	a, e	X
Iron	7439-89-6	a, e	X
Lead	7439-92-1	a, e	X
Lithium	7439-93-2	a, e	X
Magnesium	7439-95-4	a	X
Manganese	7439-96-5	n, a, e	X
Mercury	7439-97-6	n, a, e	X
Molybdenum	7439-98-7	n, a, e	X
Nickel	7440-02-0	c, n, a, e	X
Potassium	7440-09-7	a	X
Rhodium	7440-16-6	a	X
Selenium	7782-49-2	n, a, e	X
Silicon	7440-21-3	a	X
Silver	7440-22-4	n, a, e	X
Sodium	7440-23-5	a	X
Strontium	7440-24-6	n, a, e	X
Thallium	7440-28-0	n, a, e	X
Tin	7440-31-5	n, a, e	X
Tungsten	7440-33-7	a	X
Uranium	7440-61-1	n, a, e	X
Vanadium	7440-62-2	n, a, e	X
Yttrium	7440-65-5	a	X
Zinc	7440-66-6	n, a, e	X
Zirconium	7440-67-7	a, e	X
Non-metals and Anions			
Ammonia/Ammonium	7664-41-7	n, a, e	X
Cyanide	57-12-5	n, a, e	X
Fluoride	16984-48-8	n, a, e	X
Iodine	7553-56-2	a, e	X
Nitrate	14797-55-8	n, a	X
Nitrite	14797-65-0	n	X
Phosphorus	7723-14-0	a	X
Sulfate	14808-79-8	a	X
Total sulfur	63705-05-5	a	X
Criteria Pollutants			
Carbon monoxide	630-08-0	a	
Nitrogen dioxide	10102-44-0	a	
Ozone	10028-15-6	a	
Particulate matter	No CAS #	a	
Sulfur dioxide	7446-09-5	a	
Metals			
Tantalum	7440-25-7	none	X
Chloride	16887-00-6	none	X
Hydroxide	14280-30-9	none	X
Phosphate	14265-44-2	none	X

DQO Chemicals:
These 45 chemicals have toxicity data and were on the original regulatory DQO list. These COPCs can be quantitatively evaluated.

Criteria Pollutants:
These 5 chemicals were included as COPCs because they are criteria pollutants. These COPCs can be quantitatively evaluated. There is no need for feed characterization for these chemicals.

DQO Chemicals:
These 4 chemicals do not have toxicity data but were on the regulatory DQO list. These COPCs cannot be evaluated quantitatively.

[a]Toxicity Values - denotes toxicity information where:
c - carcinogenic values available
n - non-carcinogenic toxicity values available
e - ecological toxicity values available
a - acute toxicity values available

[b]Regulatory DQO - "X" indicates this compound was one of the priority regulated inorganic constituents listed in the regulatory DQO.

CAS = Chemical Abstracts Service.
DQO = Data quality objective.
WTP = Hanford Tank Waste Treatment and Immobilization Plant.

Table 4-3 Radionuclides of Potential Concern (ROPCs) for Preliminary Risk Assessment

Constituent	CAS Registry Number	Toxicity Values[a]
Americium-241	1596-10-2	c, a, e
Antimony-125	14234-35-6	c, a, e, i
Barium-137	13981-97-0	c, a, e, i
Cadmium-113	14336-66-4	c, a, e, i
Cesium-134	13967-70-9	c, a, e
Cesium-137	10045-97-3	c, a, e
Europium-154	15585-10-1	c, a, e
Europium-155	14391-16-3	c, a, e
Niobium-93	7440-03-1[b]	c, a, e
Plutonium-239	15117-48-3	c, a, e
Plutonium-241	14119-32-5	c, a, e
Samarium-151	15715-94-3	c, a, e
Strontium-90	10098-97-2	c, a, e, i
Technetium-99	14133-79-7	c, a, e
Tritium	10028-17-8	c, a, e
Yttrium-90	10098-91-6	c, a, e, i
Actinium-227	14952-40-0	c, a, e
Americium-243	14993-75-0	c, a, e
Carbon-14	14762-75-5	c, a, e
Cobalt-60	10198-40-0	c, a, e, i
Curium-242	15510-73-3	c, a, e
Curium-243	15757-87-6	c, a, e
Curium-244	13981-15-2	c, a, e
Europium-152	14683-23-9	c, a, e
Iodine-129	15046-84-1	c, a, e, i
Neptunium-237	13994-20-2	c, a, e
Nickel-59	14336-70-0	c, a, e, i
Nickel-63	13981-37-8	c, a, e, i
Plutonium-238	13981-16-3	c, a, e
Plutonium-240	14119-33-6	c, a, e
Plutonium-242	13982-10-0	c, a, e
Protactinium-231	14331-85-2	c, a, e
Radium-226	13982-63-3	c, a, e
Radium-228	15262-20-1	c, a, e
Ruthenium-106	13967-48-1	c, a, e
Selenium-79	15758-45-9	c, a, e, i
Thorium-229	15594-54-4	c, a, e
Thorium-232	7440-29-1	c, a, e
Tin-126	15832-50-5	c, a, e, i
Uranium-232	14158-29-3	c, a, e, i
Uranium-233	13968-55-3	c, a, e, i
Uranium-234	13966-29-5	c, a, e, i
Uranium-235	15117-96-1	c, a, e, i
Uranium-236	13982-70-2	c, a, e, i
Uranium-238	7440-61-1	c, a, e, i
Zirconium-93	15751-77-6	c, a, e, i

Primary Radioactivity:
These 16 radionuclides have toxicity data and contribute greater than 99.99 % of the radioactivity in the tank waste. These ROPCs can be quantitatively evaluated.

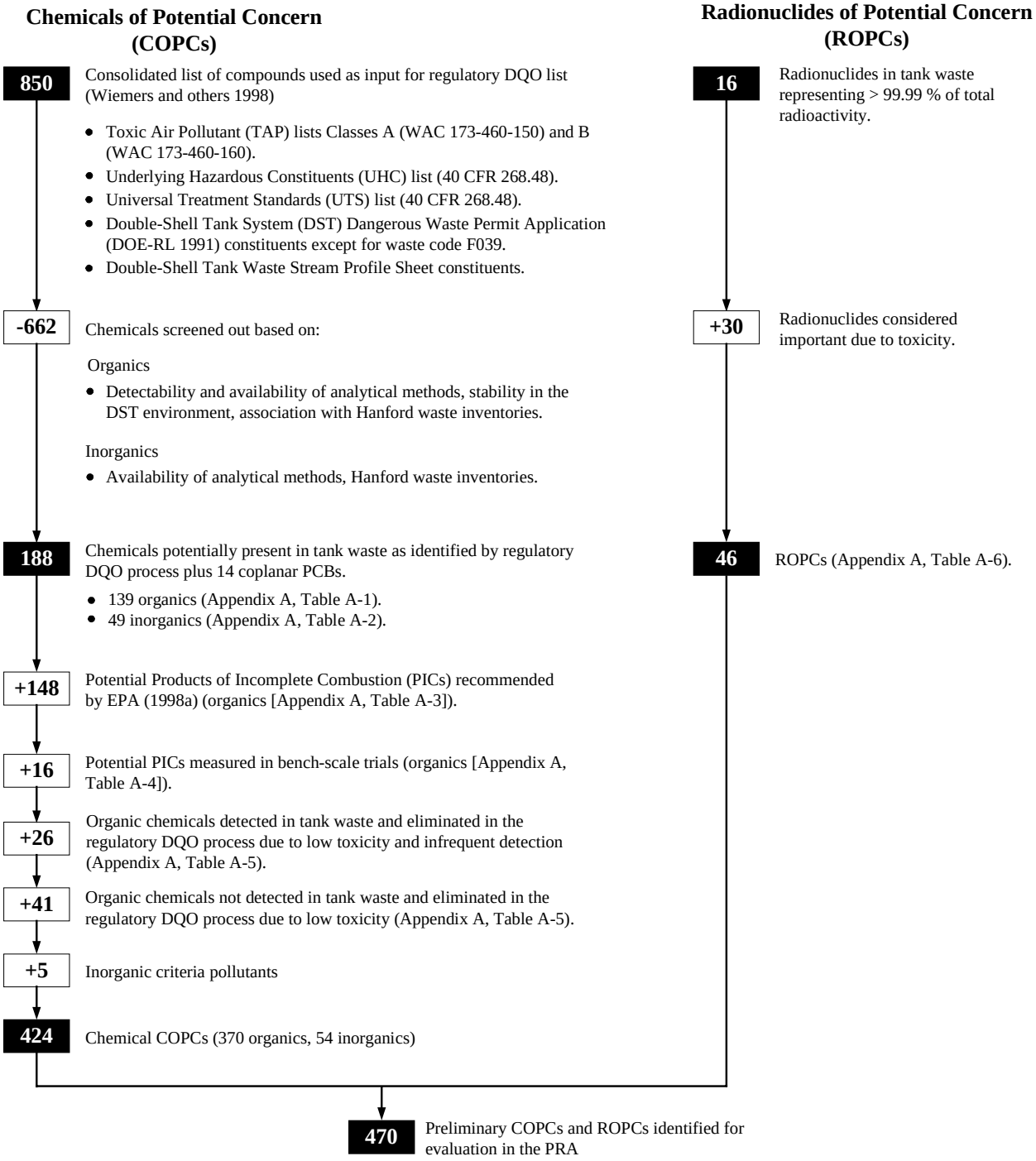
Additional Radionuclides:
These 30 radionuclides were included as ROPCs because of their toxicity. These ROPCs can be quantitatively evaluated.

[a]Toxicity values - denotes toxicity information where:
c - carcinogenic values available
e - ecological toxicity values available
a - acute toxicity values available
i - the stable form of this radionuclide is evaluated as an inorganic COPC for health effects not associated with radioactivity.

[b] CAS Registry Number for niobium metal.

CAS = Chemical Abstracts Service.
COPC = Chemical of potential concern.
WTP = Hanford Tank Waste Treatment and Immobilization Plant.

Figure 4-1 Selection of Constituents of Potential Concern



Contents

5 Estimation of Emissions 5-1

5.1 Emissions Sources 5-1

5.2 Process Emissions 5-2

5.3 Process Upset Emissions 5-2

5.4 Fugitive Emissions 5-4

5.5 Uncertainty in WTP Emissions Estimate 5-5

5 Estimation of Emissions

The Hanford Tank Waste Treatment and Immobilization Plant (WTP) is being designed to pretreat and vitrify radioactive mixed waste. A bounding estimate of stack emissions from the WTP has been developed to allow for numerical quantification of the human and ecological risks associated with airborne emissions. The emissions estimate individually considers 470 organic, inorganic, and radionuclide constituents of potential concern that could result from processing Hanford tank waste through the WTP. This section provides an overview of the assumptions and methodology used to arrive at the WTP stack emission estimates.

5.1 Emissions Sources

The screening-level risk assessment (SLRA) considers potential emissions from the following sources.

Process Emissions. Process emissions are defined as chemicals and radionuclides released from the WTP plant stacks as a result of normal (also known as routine) operations. Emissions associated with waste processing are discussed in section 5.2.

Process Upset Emissions. Process upset emissions are defined as chemicals and radionuclides released from the WTP stacks as a result of nonroutine operations (such as a process malfunction). Process upset emission rates are assumed to be higher than normal process emission rates because the upset condition is assumed to result in decreased offgas treatment efficiency or increased formation of products of incomplete combustion (PICs). However, process upset emissions are for a shorter duration. For the pre-demonstration test risk assessment (PRA), the conservative assumption that all upset conditions result in increased emission rates for short durations will be used. Process upset conditions are further described in section 5.3.

Non-Steady State Operations Emissions. The WTP may have idle time and will have maintenance time. Changeout of HEPA filter-media and replacement of catalysts are examples of maintenance activities. These non-steady state operations are assumed to be bounded by the upset factor multipliers (See section 5.3).

Fugitive Emissions. Fugitive emissions are defined as emissions of chemicals and radionuclides from non-stack sources. The WTP processing buildings that will manage the Hanford tank waste will be operated under negative pressure, and the air from the process buildings will be released to the atmosphere through one of the stacks or flues described in section 3.5. Since the WTP will not have emissions that do not pass through a stack or flue, by definition, the fugitive emissions from the facility will be zero. However, the WTP emissions will consist of vapor phase organics that are assumed to be derived from leaking valves and other ancillary equipment located in WTP process cells. These vapor-phase organic emissions are analogous to fugitive emissions, in that they will be unabated by the offgas treatment systems (that is, high-efficiency particulate air [HEPA] filtration systems) that control emissions from process cells. Fugitive emissions and unabated organic emissions from process cells are further described in section 5.4.

The SLRA will not consider emissions associated with accidental releases or with the retrieval and transfer of wastes from the Hanford double-shell tank (DST) system. Accident scenarios, such as the rupture of a tank or vessel line, are addressed in the hazards analysis and other nuclear and process safety

documents. Emissions associated with the transfers from the Hanford DST system are expected to be sufficiently bounded by the WTP process emissions estimates, as described in section 5.5.

5.2 Process Emissions

The methods, assumptions, and resulting process emission rates are documented in the *Integrated Emissions Baseline Report for the Hanford Tank Waste Treatment and Immobilization Plant* (24590-WTP-RPT-PO-03-008). This report is included as Attachment 1 to this work plan and is summarized below.

The process emissions estimate was developed using the WTP project's baseline steady-state flowsheet model. The steady-state flowsheet tracks modeled constituents across the pretreatment, low-activity waste (LAW) vitrification, and high-level waste (HLW) vitrification facilities, and provides a steady-state representation of process stream compositions at unit operation locations. The steady-state conditions provide an overall material and energy balance with time-averaged flow rates. The steady-state flowsheet allows for the use of simple equipment decontamination factors or more complex thermodynamic calculations to evaluate the modeled constituents of concern. Decontamination factors are defined as the ratio of the constituent concentration going into a unit operation to the concentration of the constituent coming out of the unit operation. Evaporator partitioning and organic vessel vent emissions were predicted from known liquid-phase concentrations using vapor-liquid equilibrium expressions. Henry's Law constants were compiled for the organic vapor-liquid equilibrium calculations.

The steady-state flowsheet tracks the main constituents expected to have the greatest impact on the material and heat balance of the plant. The constituents tracked in the steady-state flowsheet account for 117 of the constituents of potential concern. Specifically, 51 of the 250 feed organics, 35 of the 49 inorganics, 28 of the 46 radionuclides, and 3 of the 5 criteria pollutants are part of the baseline steady-state flowsheet. The emission rates for constituents of potential concern not analyzed directly in the steady-state flowsheet (with the exception of PICs) were estimated using the modeling output from a constituent that was in the steady-state flowsheet. The correlations of modeled and unmodeled constituents were based on constituents having similar physical properties with an adjustment made for differing feed concentrations, if applicable.

The emission rates of PICs were estimated based on research and technology testing data from small-scale melter runs spiked with hazardous organic constituents at the Vitreous State Laboratory of the Catholic University of America. The PIC emission rates are based on an assumption that, after offgas treatment, PICs will be present in the stack at concentrations equal to the analytical detection limit concentrations from the small-scale melter tests.

Additional details on process emissions estimation, including the basis for feed composition, treatment efficiencies, the correlation of modeled and unmodeled constituents, and PIC emission rates are described in the *Integrated Emissions Baseline Report for the Hanford Tank Waste Treatment and Immobilization Plant* (24590-WTP-RPT-PO-03-008).

5.3 Process Upset Emissions

Process upset conditions include periods of startup, shutdown, process malfunction (that is, the unit is operating outside the permitted operating conditions), or equipment failure. Periods when process equipment is being maintained or in an idle condition are also included. Process upset conditions are generally assumed to result in greater than normal stack emissions during the short period of the upset.

However, the US Environmental Protection Agency (EPA) has indicated that upsets are not generally expected to significantly increase stack emissions over the lifetime of a facility (EPA 1998a).

The potential for increased emissions during upset events will be addressed through the application of upset factors. These upset factors, as described below, will be applied (that is, adjustments will be made) to the estimated emissions that are environmentally modeled. These upset factors are based on the amount of time the facility is expected to operate in an upset condition and the estimated magnitude of stack emissions during upset relative to routine operating conditions. The preferred method for estimating this upset factor is through the use of data from existing facilities that have operating conditions similar to the proposed WTP. The frequency and duration of upset events may be estimated based on EPA 1998a:

- Data from continuous emissions monitoring systems that measure operating parameters such as stack carbon monoxide or oxygen
- Data on combustion chamber, air pollution control system (APCS), or stack gas temperature
- Ratio of automatic waste feed cut-off frequency and duration to operating time
- Variations in the APCS operating conditions

The potential magnitude of emissions during upset events may be estimated based on stack test data collected during upset conditions.

EPA default upset factors represent worst-case conditions and will be used for the PRA unless sufficient process information is available to estimate site-specific upset factors. EPA default upset factors are based on the data described above from operating hazardous waste combustion facilities. The default upset factors are expected to over-predict upset emissions from the WTP for several reasons, including:

- Carbon monoxide is frequently used as an indicator of upset conditions, and automatic waste feed cut-offs are often triggered by increased stack gas concentrations of carbon monoxide. However, routine operations, such as adjusting waste feed or air intake rates, will cause brief spikes in carbon monoxide concentration.
- Test data used for these defaults is based on hazardous waste combustion facilities designed for the destruction of liquid or solid organic waste, or both. The technology and waste feed of the WTP melters are different and less subject to upset than these facilities.

EPA 1998a default upset factors are 2.8 for organic chemicals and 1.45 for metals calculated as shown below.

Organics. A default facility is assumed to operate under upset conditions 20 % of the time and stack emissions are assumed to be 10 times greater than normal during this time.

Upset Factor = (0.80) (1) + (0.20) (10) = 2.8

Metals. A default facility is assumed to operate under upset conditions 5 % of the time with stack emissions 10 times greater than normal during this time.

Upset Factor = (0.95) (1) + (0.05) (10) = 1.45

EPA has not determined a default upset factor for radionuclides. For the PRA, radionuclides are assumed to behave similarly to metals with an upset factor of 1.45. The same upset factors will be used for both the plausible and worst-case scenarios in the PRA and the final risk assessment (FRA).

These default upset factors (2.8 for organics and 1.45 for inorganics and radionuclides) will be used for all vapor-phase emissions. An upset factor of 1 will be used for all particle and particle-bound emissions as described below.

The entire pretreatment and vitrification processes will be contained within buildings designed such that the only exits for air and emissions will be through one or more HEPA filters. When the process is operating normally, all air and emissions will pass through numerous air pollution control devices. However, even if the process experiences an upset condition or shuts down and all of the active pollution control devices operate poorly or fail completely, the only way for air and emissions to pass out of the facility will be through the HEPA filters. Therefore, an upset factor of 1 will be applied to the particulate and particulate-bound emissions estimates for organics, inorganics, and radionuclides because the HEPA filter removal efficiency used in the emissions estimate already includes an assumption of decreased removal efficiency due to upset conditions such as moisture in the filters.

5.4 Fugitive Emissions

Fugitive emissions are defined as “emissions, which could not reasonably pass through a stack, chimney, vent, or other functionally equivalent opening” (WAC 173-400-030). The WTP process buildings that manage the Hanford tank waste will be operated under negative pressure, and the air from the process buildings will be released to the atmosphere through a stack or flue. Transfer lines between buildings that will contain Hanford tank waste will be double-wall pipe. The WTP will, therefore, not emit fugitive emissions.

Building ventilation and process offgases will be treated by abatement systems that employ best available control technology for criteria pollutants, radionuclides, and toxic air pollutants prior to release to the environment through a stack or flue. Organic compounds could be released into the process cells from ancillary equipment. These emissions will be treated by HEPA filters that will abate particulate or particle-bound organic compounds. Organic compounds existing in the vapor phase will not be captured by the HEPA filters. These organic emissions from process cells have been quantified for purposes of risk assessment.

Organic emissions from process cells will be quantified by establishing the total organic emissions associated with ancillary equipment in process cells. This total includes particle, particle-bound, and vapor-phase contributions that are associated with ancillary equipment, such as valves, pump seals, compressor seals, and connectors. The methodology and emissions factors used to estimate releases from ancillary equipment are consistent with the EPA guidance document *Protocol for Equipment Leak Emission Estimates* (EPA 1995b). After establishing the total hazardous organic emissions, the fraction of emissions considered to be particle or particle-bound in the offgas will be removed. The particle and particle-bound organic constituents will be captured by HEPA filtration systems in the process cell ventilation system where the concentration is reduced by a factor of 200,000 (24590-WTP-RPT-PO-03-008). The remaining vapor-phase organic fraction will be carried forward to the corresponding facility flue where the emission rates are considered in conjunction with other process emissions for risk assessment.

A detailed discussion of the methods, calculations, and results associated with organic emissions from process cells is described in *Estimated Organic Emissions from Process Cells* (24590-WTP-HAC-50-00001). This calculation is included as Attachment 2 to this work plan.

5.5 Uncertainty in WTP Emissions Estimate

Although there are uncertainties associated with the parameters used to arrive at estimated process emissions, these uncertainties have been recognized and managed through conservative assumptions applied throughout the emissions estimation process. For example, there is analytical uncertainty associated with the organic, inorganic, and radionuclide characterization data that describes the waste feed streams to the WTP. To accommodate characterization uncertainties, the inorganic and radionuclide source terms are based upon the highest known concentration for constituents in tanks that the WTP expects to process during the initial 10 years of mixed waste operations. Similar conservatism has been applied with respect to the organic feed vector. For organic compounds, the emission estimate assumes that incoming organic concentrations are 280 times higher than the detected concentrations (or detection limits) of organic constituents analyzed in high-organic-bearing tanks at Hanford (24590-WTP-RPT-PO-03-008). The methodologies applied to assigning feed concentrations should ensure that the actual concentrations of organic, inorganic, and radionuclide constituents encountered during operations will be conservatively bounded by the emissions estimate assumptions.

The conservatism applied to the feed vector is also applied to the assignment of equipment decontamination factors. In cases where a particular treatment process has a range of achievable treatment efficiencies, the lower end of the range (which translates to the higher offgas emission rate) has been applied in the emissions estimate. The ranges of treatment efficiencies for individual treatment processes are derived from a variety of sources, including research and technology data, engineering studies, vendor literature, and regulatory guidance. For example, in establishing filtration removal efficiencies, the dual-HEPA filtration systems used in the WTP offgas treatment systems have an assumed decontamination factor of 200,000 for particle and particle-bound constituents in the offgas (24590-WTP-RPT-PO-03-008). This decontamination factor is consistent with the assumptions used across other Hanford permitting applications and is considered conservative, even for particle sizes of 0.3 μm, which are most likely to pass through HEPA filtration.

The WTP emissions estimate does not estimate the emissions that could result from retrieval of waste feed from the Hanford DST. Although these emissions are not included, the risks associated with retrieval of DST feeds will be sufficiently bounded for the following reasons:

- The WTP feed vector assumes receipt of the entire DST inventory and has been developed to conservatively overestimate the constituent concentrations present in the tank contents. As described above, the organic feed vector scaled up expected feed concentrations by a factor of 280 to account for uncertainties in characterization information.
- DST retrieval operations would be infrequent and, therefore, the assumed continuous 24 hours per day, 7 days per week, operation of WTP at 100 % efficiency would dominate any long-term risk calculations. Any acute risks associated with the DST retrieval are not expected to coincide with either the timing or location of acute risks estimated for the WTP due to temporal and spatial differences.
- Entrainment losses of particle-bound constituents from the DST tank system would be comparable to the control in the WTP facility (that is, both offgas discharge streams are controlled by HEPA filtration systems that provide a high removal efficiency for particulates).

- Losses of all constituents are being assessed and controlled under regional air-permitting control authorities.

If it is determined through air-permitting that significant airborne release risk pathways exist for the DST retrieval, the risk assessment will revisit the new information and assess an appropriate path forward.

Contents

6 Environmental Modeling 6-1

6.1 Air Dispersion Modeling 6-1
6.1.1 Model Selection 6-1
6.1.2 Detailed Discussion of CALPUFF Modeling 6-3
6.1.3 Other Modeling Parameters 6-6
6.1.4 Model Output 6-7

6.2 Soil Accumulation Modeling 6-8

6.3 Surface Water Accumulation Modeling 6-11

6.4 Sediment Accumulation Modeling 6-15

6.5 Terrestrial Plant Accumulation Modeling 6-16
6.5.1 Aboveground Plants/Direct Deposition 6-17
6.5.2 Aboveground Plants/Air-to-Plant Transfer 6-19
6.5.3 Root Uptake 6-23

6.6 Other Media 6-28

6.7 Uncertainty in Fate and Transport Modeling 6-28
6.7.1 Uncertainty in Air Dispersion Modeling 6-29
6.7.2 Uncertainty in Soil Accumulation Modeling 6-29
6.7.3 Uncertainty in Surface Water Accumulation Modeling 6-29
6.7.4 Uncertainty in Sediment Accumulation Modeling 6-30
6.7.5 Uncertainty in Plant Accumulation Modeling 6-30

6.8 Summary of Environmental Modeling 6-31

Tables

Table 6-1 Site-Specific Parameters Used in Modeling Soil Concentrations 6-32

Table 6-2 Site-Specific Parameters Used in Modeling Surface Water and Sediment 6-33

Table 6-3 Site-Specific Modeling Parameters for Estimating Exposure Point Concentrations in Plants 6-35

Table 6-4 Mass-Limited Soil-to-Plant Uptake Factors 6-36

Figures

Figure 6-1 Exposure Grids in Each Concentric Zone 6-37

6 Environmental Modeling

Environmental modeling refers to several types of models used to simulate the route of chemicals and radionuclides from the stack toward human and ecological receptors. This section describes the environmental modeling approach for the Hanford Tank Waste Treatment and Immobilization Plant (WTP). Air dispersion modeling is discussed first (section 6.1), followed by soil accumulation modeling (section 6.2), surface water accumulation modeling (section 6.3), sediment accumulation modeling (section 6.4), and terrestrial plant accumulation modeling (section 6.5). Modeling for other media (such as specific animals and fish) is briefly discussed in section 6.6 (more detailed information is provided in sections 7 and 8, because these media are modeled slightly differently for human health and ecological risk). Uncertainties related to environmental modeling are discussed in section 6.7. A summary of environmental modeling is presented in section 6.8.

6.1 Air Dispersion Modeling

Air dispersion modeling will be used to estimate the ambient air quality and deposition rates resulting from emissions of chemicals and radionuclides during operations of the WTP. This section provides details of the approach that will be used in this task.

6.1.1 Model Selection

The Industrial Source Complex Short Term Model, Version 3 (ISCST3) (EPA 1995e, EPA 2002a) was initially proposed to evaluate the air quality in the vicinity of the WTP. This model, preferred by the US Environmental Protection Agency (EPA) (*Guideline on Air Quality Models*, 40 CFR Part 51, Appendix W), is generally considered a conservative model for applications such as the screening level risk assessment (SLRA). The model uses emissions source data and hourly meteorological data to estimate ambient air concentrations and deposition rates of gases and particles at locations (receptors) of interest in the vicinity of the facility (EPA 2002a). ISCST3 is an Eulerian “plume” model that sends emissions out in a straight line from the emission source, in the direction of the wind, at the time of release. The plume continues spreading out and traveling away from the emission source, becoming more and more dilute with distance. The use of this model was evaluated for application to the WTP.

After this initial evaluation, it was determined that the CALPUFF model, a Lagrangian “puff” model, would be more appropriate in this application. EPA has just adopted CALPUFF as a guideline model (*Federal Register*, 15 April 2003), giving it equivalent status to the ISCST3 model. In addition, there are several advantages to using the CALPUFF modeling system (version 5.6) for this application, which would result in a more realistic and representative characterization of the air quality.

- Gaussian puff dispersion formulation: Plumes are treated as a series of Gaussian puffs that move and disperse according to local conditions that vary in time and space.
- Meteorology: Wind and other meteorological variables are allowed to vary in a three-dimensional space.
- Wet- and dry-deposition mechanisms: Deposition processes are included for both particles and gaseous pollutants that depend on the characteristics of the pollutant, the surface geophysical parameters, and meteorological conditions; the model accounts for the mass of pollutant removed from the plume when deposition occurs.

- Other improvements and refinements: The algorithms in CALPUFF have been designed to take advantage of recent improvements in scientific understanding of boundary layer meteorology dispersion modeling and chemistry.

The most significant advantage the CALPUFF modeling system provides, in comparison to other dispersion models (such as ISCST3) that use meteorological data from a single station, is a more realistic treatment of the wind field including upper air data. The CALPUFF model gets the upper air data input from the Mesoscale Model, version 5 (commonly known as MM5). The MM5 model was run for Washington, Oregon, part of Idaho, and British Columbia by the University of Washington. MM5 is a prognostic model that produces gridded upper air wind fields and is used as input into the CALPUFF model. "Gridded wind fields" indicates that the model provides wind speeds and direction at specific intervals (12 km) over the modeling region and at approximately 20 levels through the atmosphere. So the CALPUFF upper air input is much more comprehensive than simply using a single set of upper air data from one station. Also, note that rather than performing external calculations of the mixing height and providing these results as input into the model (as done when using ISCST3), CALPUFF handles those calculations internally, since it has a very comprehensive set of meterological data as input. Surface wind regimes typically have complex, three-dimensional qualities that are significantly influenced by geophysical parameters, such as topography, so that a single-surface observation site is often not sufficient to accurately characterize the wind flow regime in a region. CALPUFF's three-dimensional wind field provides a more accurate representation of the wind flow influencing regional air quality impacts. The CALPUFF model releases the pollutant puffs into that three-dimensional wind field, which has varying wind flow patterns and accounts for complex terrain features, thereby producing a more realistic depiction of dispersion.

One of the unique characteristics of Hanford is that Battelle's Pacific Northwest National Laboratory (PNNL) operates the meteorological monitoring network in and around the Hanford site. A total of 30 surface monitoring stations is included in the network, which provides a comprehensive set of meteorological conditions throughout the Hanford site and in surrounding areas (8 stations are located outside the Hanford site boundary). Data from 27 of these stations will be included in the CALPUFF run to provide a very representative picture of surface meteorological conditions in the region around the WTP site.

All of the monitoring stations measure wind speed and direction at 10 m and temperature at 1 m. Other variables to be used in the modeling, including relative humidity, dew point temperature, barometric pressure, cloud cover, and ceiling height, are only measured at the main Hanford Meteorological Station, which is located near the center of the Hanford site and approximately 5 miles west of the 200 East Area location where the WTP will be located. These supplemental data is expected to be representative of atmospheric conditions at the WTP.

The most recent version of the CALPUFF model will be used in this analysis and will be supplemented by EPA's *Risk Assessment Guidance for Superfund* (RAGS), Part A (EPA 1989), and RAGS Part B (EPA 1991) models for radionuclides. This model can handle a large number of sources that could occur from a typical industrial source, including point sources (such as stacks) and area sources (such as fugitive emissions from an open area). In the case of the WTP, there are no fugitive emissions and CALPUFF will be used exclusively for point source emissions.

The CALPUFF model will be used to calculate ambient concentrations, and wet and dry deposition rates, for chemicals of potential concern (COPCs) and radionuclides of potential concern (ROPCs) at pre-determined exposure locations. The terrain elevation of each receptor will be included in the model

input. Terrain elevations will be obtained from digitized maps of the Hanford Site for receptors located within the site or from US Geological Survey (USGS) digitized maps for receptors located outside of the site.

6.1.2 Detailed Discussion of CALPUFF Modeling

In the following sections an overview of the components in the CALPUFF modeling system, the application of the CALPUFF model, and post-processing of CALPUFF results to determine air quality impacts are presented, and results for the subsequent health risk assessment are summarized.

The CALPUFF system consists of three main components: CALMET, CALPUFF, and CALPOST. Sufficient data is available from a variety of sources to run these components. The CALMET module is used to combine various types of meteorological and geophysical data with the necessary control information into the particular format required for use in the dispersion modeling component of the CALPUFF model. CALPOST is then used as a post-processing program to read the formatted output file generated by CALPUFF and summarize modeled results. The objective of this section is to describe the collection, preparation, and application of all data necessary to run the CALPUFF modeling system.

6.1.2.1 CALMET Modeling

The CALMET model uses a grid system consisting of square horizontal cells (NX by NY) and vertical layers (NZ) to create a three-dimensional wind field over a specified domain area. To develop the wind field in the domain area, the model must start with an initial “guess” field. Several options are available for initializing the wind field, including a spatially uniform guess field or objective analysis of all available weather observations; however, use of output data from a gridded prognostic model (such as Pennsylvania State’s Mesoscale Model 5 or MM5) is preferred due to its ability to provide a spatially varying wind field and take into account geographic features influencing mesoscale wind patterns. Once defined, this initial wind field is adjusted objectively using local geophysical data and surface meteorological observations.

In addition to MM5 data, the CALMET model incorporates a variety of other meteorological and geophysical datasets in developing the three-dimensional wind fields, including upper air, surface, precipitation, terrain, and land use data. Surface and upper air observations are used to refine the MM5 predictions to account for local scale effects not resolved by the MM5 prognostic model. Inclusion of geophysical data further influences the development of the wind fields, especially in complex flow applications and light wind situations where terrain-induced flows dominate surface wind patterns. Hourly precipitation data is necessary within the CALPUFF modeling system for accurate wet deposition estimates. The CALMET model is used to combine MM5 simulation data with surface meteorological observations, upper air observations, and geophysical data into the format required by the dispersion modeling component CALPUFF.

In the following sections, the preparation of the meteorological and geophysical datasets, as well as the application of the CALMET module, are briefly discussed.

6.1.2.2 Preparation of Data

MM5 Data. A one-year subset of archived MM5 data from MFG, Inc. (MFG) spanning 1 August 2000 to 31 July 2001 was obtained and used in this modeling application. MFG processed the subset from the

University of Washington's archived MM5 output files using the CALMM5 module, which processes the MM5 data for direct input into the CALMET model.

The original MM5 model run was conducted using a 12 km grid size spanning a 696 km by 672 km region covering part of the Pacific Ocean near the northwestern US coast, southern British Columbia, Washington, Oregon, and Idaho. For this modeling application, the original MM5 domain will be reduced to a 240 km by 240 km grid (20 cells by 20 cells) centered on the Hanford Site, to conserve computer memory and reduce processing time. Thus, the Hanford Site, in southeastern Washington, lies directly in the center of the revised MM5 modeling domain, ensuring adequate representation mesoscale meteorological conditions.

Surface Data. Surface meteorological measurements will be used in the construction of CALMET input files to supplement the MM5 wind data in defining the three-dimensional wind field. Hourly surface meteorological data for the 1 August 2000 to 31 July 2001 period from 27 of the 30 stations comprising the Hanford Meteorological Monitoring Network was obtained. These stations cover all quadrants of the Hanford Site and provide a comprehensive set of representative surface wind data for the area. All of this data will be used in developing the three-dimensional wind field for each hour of the one-year modeling period. In addition, the main Hanford Meteorological Station, located near the center of the Hanford Site, also collects precipitation and cloud cover data that will be used in the model. PNNL operates the stations on a continuous basis and maintains a comprehensive quality assurance program to ensure the quality of the data collected in the Hanford Meteorological Monitoring Network.

Integration of MMS and Surface Data. The three-dimensional wind field model uses a combination of upper-level MMS data and surface data to adequately describe wind conditions at plume height. Most surface data is collected from 10 m high towers and the highest tower is 124 m high.

Geophysical Data. Land use and terrain data are both incorporated into the CALMET module to modify wind field projections and, subsequently, affect dispersion calculations in the CALPUFF model. Terrain height and land use data are obtained electronically from the USGS's website (US Geological Survey 2003) and pre-processed using the software provided in the CALPUFF modeling system. Terrain data is available for 1 º digital elevation model data with each file covering a 1 º by 1 º area corresponding to the east or west half of a 1:250,000 topographic map. The terrain dataset's resolution varies from 70 m to 90 m in North America, with an absolute accuracy of 130 m in the horizontal and 30 m in the vertical.

Land use data is also available from the USGS's website (US Geological Survey 2003) at the 1:250,000-scale. Each land use file covers the full 1 º (latitude) by 2 º (longitude) area corresponding to a 1:250,000-scale topographic map with approximately 200 m resolution.

6.1.2.3 CALMET Application

The first phase of this modeling analysis will involve the production of the three-dimensional meteorological fields to be used by the CALPUFF modeling system to characterize pollutant dispersion. The CALMET model is used to generate these wind fields, which are then input into the second module of the system, the dispersion model CALPUFF. A CALMET input file is developed to define all control information and coordinate all datasets necessary for a model run. CALMET is applied using the previously described datasets and the methods explained below.

The CALMET model will be run for a 100 km by 100 km grid with a 1 km grid mesh size and 9 vertical levels, ranging from the surface to 3000 m. The CALMET grid is centered in the middle of the Hanford

Site, near where the WTP facilities are to be built, so that the CALMET model grid extends approximately 50 km out in all directions from the WTP facility (see Figure 6-1).

6.1.2.4 CALPUFF Modeling

This section describes the preparation of the input data necessary for the second module of the CALPUFF system, the dispersion model CALPUFF. This data includes source characteristics, modeling options, and receptor locations. Air quality impacts of emissions from the proposed WTP at the Hanford Site are estimated from CALPUFF model simulations using the year of CALMET-generated meteorological fields previously discussed.

Building wake effects can have a significant impact on the dispersion of emissions near a stack. The turbulence induced by buildings produces a phenomenon, known as *building downwash*, in which a stack plume can be brought downward toward the ground much sooner than if the buildings were not there, resulting in localized areas of high-emission concentrations. The CALPUFF model has built-in algorithms to evaluate the potential for downwash.

6.1.2.5 CALPUFF Model Options

EPA has provided guidance for the operation of both the CALMET and CALPUFF models (Earth Tech Inc. 2000a, 2000b). This guidance will be used in determining the most appropriate model options and settings used for these models. Some of the key options proposed for this application of the CALPUFF model are as follows:

- Wind speed profile: Industrial Source Complex model - rural
- Plume element modeled: puff
- Pasquill-Gifford dispersion curves used with other default dispersion options
- CALPUFF partial path treatment of terrain
- Transitional plume rise, stack downwash, and partial plume penetration modeled
- Default wet and dry deposition parameters for the particle and gaseous deposition

The model will be run for five scenarios to determine the location of the maximum impacts, ensure that the grid is sufficiently extended to capture the worst-case depositions, and focus on areas of particular interest to the risk assessment:

- The entire 100 km by 100 km grid (1 km receptor grid spacing), to determine the maximum impact areas
- Point of maximum onsite impact (100 m receptor grid spacing)
- In the vicinity of Gable Mountain (500 m receptor grid spacing)
- Along the Columbia River (500 m receptor grid spacing)
- Maximum offsite impact area (500 m receptor grid spacing)

6.1.3 Other Modeling Parameters

This section discusses the modeling input parameters for the air dispersion and deposition modeling including emissions data, meteorological data, exposure locations, calculations of deposition rates, and model variable settings.

6.1.3.1 Emissions Source Information

Identification of emission sources and quantification of emission rates for each specific COPC and ROPC are described in section 5, Estimation of Emissions. Stack heights for the WTP have been established at about 200 feet (about 61 m) high. Other data required for model execution, such as stack diameters, stack gas flow velocities, and stack gas temperatures, will be provided in the pre-demonstration test risk assessment (PRA) along with all model output data.

Unit Emission Rates. The CALPUFF model will be run with a unit (normalized) emission rate of 1.0 g/s for each individual flue or stack. There is a linear relationship between the emissions rate from a single flue and the modeled impacts (air concentrations and deposition rates) at an individual location. Therefore, the modeled impact at that location, based on a unit emissions rate from a single flue, can simply be multiplied by the actual emissions rate of an individual COPC and ROPC to determine the actual depositions. By using spreadsheets, the impacts from a specific flue can be determined for each COPC and ROPC at each location in the receptor grid.

Analysis of Multiple Flues. The present WTP design is based on nine flues located in the pretreatment, high-level waste (HLW) vitrification, and low-activity waste (LAW) vitrification facilities; however, only eight flues will be modeled because two adjacent melter offgas and process vessel vent flues with identical configurations will be combined and evaluated as a single flue. The flues will be modeled separately in the air dispersion modeling process.

6.1.3.2 Calculation of Deposition Rates

The determination of deposition rates is an important input into the human health and ecological risk assessments being conducted for the WTP. The CALPUFF model will be used to calculate both wet and dry deposition rates, in addition to ambient concentrations, at each exposure location.

Dry deposition occurs in the absence of precipitation, while wet deposition is influenced by precipitation type and rate. The two types of deposition result from different physical processes and, therefore, must be considered separately. CALPUFF has algorithms built into the model to calculate these processes. CALPUFF requires the use of many parameters. Two references that document many of the parameter values are:

- Bonneville Power Administration, 2001 (*Modeling Protocol, Regional Air Quality Modeling Study, Bonneville Power Administration*, available on the Internet at http://www.efw.bpa.gov/portal/Organizations/Government/Federal/Dept_of_Energy/BPA/Environment/NEPA/AirQuality/cimp.pdf)
- Energy Northwest and Duke Energy North America 2001 (*SATSOP Combustion Turbine Project Application for Prevention of Significant Deterioration [PSD] Permit*, available from the Washington State Department of Ecology).

Dry Deposition. The CALPUFF model calculates the deposition velocity from particle diameter, mass fraction, and particle density, which are the data input into the model for each particle size-fraction. The calculation of deposition velocities within the model includes the effects of Brownian motion, inertial impaction, and gravitational settling. Particularly for the larger particles, the key parameter governing the rate of dry deposition is the terminal settling velocity. The terminal settling velocity, in turn, is affected primarily by the particle size and density: large particles have the highest terminal velocities (and, therefore, the highest deposition rates), and small particles have lower terminal velocities. It is important to note that particles have a positive terminal settling velocity and, therefore, are subject to dry deposition.

Wet Deposition. The wet-deposition flux is calculated by using a scavenging ratio to model the wet removal of particles and gases in the atmosphere. The scavenging coefficient appears to depend on a complex combination of the characteristics of the COPC and ROPC (such as solubility and reactivity for gases, size distribution for particles) as well as the nature of the precipitation (such as liquid or frozen). The input screens of the CALPUFF model have suggested scavenging coefficients for use in the model.

Deposition Rate Calculations. COPC and ROPC emissions can occur in either the vapor or particle phase, and COPCs and ROPCs in both phases are subject to wet and dry deposition. Particle size is a primary influence on the calculation of both dry and wet deposition of COPCs and ROPCs in the particle phase, as discussed above. Therefore, distribution of particle sizes in the stack emissions at the WTP is an important input parameter in the model for determining deposition rates. A single particle size of 1 micron will be assumed to be representative for all particles released from the stacks because of the use of HEPA filtration.

6.1.4 Model Output

The modeled output from CALPUFF will be combined from each flue or stack, at each exposure location, so emissions from the WTP will be presented at each exposure location. Tables of the results will be provided for use in the risk assessment. In addition, plots will be used to graphically represent the concentrations and deposition rates of emissions from the WTP.

6.1.4.1 Chronic Output

Chronic output from the WTP, to be evaluated in the risk assessment, will be based on the annual average ambient air concentrations and deposition rates for each COPC and ROPC at each exposure location, as calculated by the CALPUFF model. The annual average concentrations and deposition rates will be calculated for the period 1 August 2000 to 31 July 2001 when the MM5 and Hanford surface meteorological data are available.

6.1.4.2 Acute Output

The acute output from the WTP, to be evaluated in the risk assessment, will be based on the highest one-hour average air concentrations as required by EPA guidance (EPA 1998a) for each COPC and ROPC at each exposure location, as calculated by the CALPUFF model. The use of one-hour average air concentrations is to support the analysis of worst-case acute effects in the risk assessment. An acute inhalation scenario is recommended by EPA (1998a) because it is possible for air concentrations of COPCs and ROPCs to significantly exceed the annual average concentration for a brief time and, thus, result in acute effects to receptor populations via inhalation and external exposure to radiation. Because the acute effects are only due to direct inhalation and external exposure to radiation, deposition rates are not important in determining the acute risk. Concentrations in soil and other media reflect long-term

deposition of COPCs and ROPCs. The long-term cumulative concentration in these media will be greater than the concentration resulting from any single acute event. Therefore, the acute exposure scenario is only applicable to the inhalation pathway.

The highest one-hour average concentration will be calculated for the worst-case hour (that is, the hour with the meteorological conditions that result in the highest concentration). Acute emissions estimates include process upset and fugitive emissions in addition to normal stack emissions as described in section 5. Acute emissions modeling does not include accidental (that is, catastrophic) releases.

6.1.4.3 Exposure Point Concentrations

Exposure point concentrations (EPCs) used for estimating doses of COPCs and ROPCs depend on the location of the maximum depositional areas. The location of the various receptor populations identified for the quantitative risk assessment will correspond to the receptor grid nodes defined during air dispersion modeling. In keeping with the conservative approach used in the risk assessment, the location with the maximum concentration of COPCs and ROPCs will be used in estimating EPCs. Because the point of maximum concentration may be different for airborne COPCs and ROPCs and COPCs and ROPCs deposited via wet and dry deposition mechanisms, EPA (1998a) recommends the following method for selecting the point of maximum concentration. Emissions will be modeled separately for eight flues (pretreatment C5, vessel vent, and reverse flow diverters/pulse jet mixers [RFDs/PJMs]; LAW C5 and melter offgas and process vessel vent; and HLW C5, RFD/PJM, and two melter offgas and process vessel vent flues that will be combined and evaluated as a single flue) with six points of maximum concentration possible from each flue:

- Maximum vapor-phase air concentration
- Maximum particle- and particle-bound-phase air concentration
- Maximum vapor-phase wet deposition
- Maximum particle- and particle-bound-phase wet deposition
- Maximum vapor-phase dry deposition
- Maximum particle- and particle-bound-phase dry deposition

Thus, there are a total of 48 possible maximum concentrations (8 flues • 6 phases). All 48 possible maximum concentrations will be evaluated in the determination of exposure point concentrations. Because more than one maximum concentration often occurs at the same receptor grid node, it is more likely that a dozen grid nodes or less with maximum concentrations will be identified (rather than 48). To further reduce the number of points evaluated, points of maximum concentration will be grouped based on geographic proximity to each other.

6.2 Soil Accumulation Modeling

Concentrations of COPCs and ROPCs in soil will be estimated from deposition rates predicted by the air dispersion modeling. For the SLRA, deposition is assumed to occur for the potential operating lifespan of the facility (40 years). COPC and ROPC concentrations in soil will be calculated for both vapor-phase and particle-phase (including both particle and particle-bound) emissions; the emissions report, found in Attachment 1 of this work plan, indicates which COPCs and ROPCs are in vapor phase and which COPCs and ROPCs are in particle phase. Both wet and dry deposition of particles and vapors will be considered in the soil modeling.

Various equations are used in the soil accumulation modeling. Some parameter values used in this modeling are functions of other parameters, which are functions of yet other parameters. To avoid confusion, the primary equations for soil accumulation modeling appear in section 6.2; supporting/intermediary equations appear in Appendix B-2. A cross-reference to these supporting/intermediary equations is presented in this section.

EPA guidance (EPA 1998a, 1999c) for calculating emissions concentrations in soil includes terms that account for loss of COPCs by several mechanisms, including:

- Degradation (biotic and abiotic)
- Leaching
- Surface runoff
- Volatilization
- Soil erosion

Although not mentioned in EPA guidance, radiological decay for ROPCs is comparable to degradation for COPCs and is also considered as a soil loss mechanism in the soil modeling. Therefore, all six soil loss mechanisms will be considered as possible soil loss mechanisms in the calculation of soil concentrations. Equations to calculate the soil loss mechanisms can be found in Appendix B-2.

A number of soil loss parameters are dependent on the available water, calculated as ($P+I-RO-E_v$), which is related to precipitation (P), irrigation (I), surface runoff (RO), and evapotranspiration (E_v) in the Hanford Site area. Climate in the region results in greater evapotranspiration than precipitation (DOE 1997). Some areas are irrigated; however, the high evapotranspiration and scarce water resources minimize the potential for runoff due to excessive irrigation. Therefore, neither natural precipitation nor irrigation provides adequate water to generate surface runoff, and these processes should have a negligible effect on the concentration of COPCs and ROPCs in soil.

All six soil loss mechanisms are possible, with varying degrees of influence on the soil modeling. However, based on the discussion above on available water, the calculation of soil concentrations is likely to include soil loss due to degradation (biotic and abiotic), radiological decay, leaching, and volatilization. The calculation of soil concentrations is likely to not include soil loss due to surface runoff and soil erosion. For completeness, the equations presented below and in Appendix B-2 will include all six soil loss mechanisms.

Because some of the soil loss mechanisms are calculated with depth-specific parameters, the total soil loss across all soil loss mechanisms shown above is depth-specific. For this risk assessment, soil concentrations are determined for three specific soil depths: tilled soil, untilled soil, and root zone soil.

The tilled soil condition assumes that deposited emissions are mixed to a tilled depth of 20 cm for plants grown in domestic scenarios (for example, produce grown by a farmer and grain and silage grown for consumption by domestic animals).

The untilled soil condition assumes emissions are deposited on the top 1 cm of soil and stay there (that is, no mixing occurs). Untilled soil concentrations are used to calculate direct exposure to soil (such as ingestion) by human and ecological receptors, but the untilled soil depth of 1 cm is considered too

shallow to estimate plant concentrations for consumption by human and ecological receptors (that is, no plant concentrations are modeled from the untilled soil concentrations).

The root-zone soil depth is where deposited emissions are assumed to be mixed to a root-zone depth of 15 cm for exposure of invertebrates and wild plants collected by Native American receptors and forage ingested by domestic and wild animals. Use of root zone soil concentrations for these pathways is conservative because:

- Mixing will occur naturally as a result of plant roots and digging by worms, insects, and larger animals
- Plant roots and soil invertebrates will exist below 1 cm and, therefore, be exposed to clean soil below this depth

Because soil concentrations may require many years to reach steady state, the equations used to calculate the average soil concentration over the period of deposition are derived by integrating the instantaneous soil concentration equation over the period of deposition. For this risk assessment, the time period over which deposition may occur (denoted as tD) is 40 years. For soil modeling, the time period at the beginning of the WTP operation (denoted as T_1) is 0 years and the length of exposure duration (denoted as T_2) is assumed to be 40 years.

In order to apply the appropriate equation for soil modeling, each contaminant must be classified as either a carcinogen or noncarcinogen. For this risk assessment, a contaminant is classified as a carcinogen if there is a cancer slope factor (SF) available or if the EPA classification is A, B1, B2, or C (see section 7.2.1.1 for more details on cancer SFs and the EPA classifications for contaminants; also, note that all ROPCs are classified as carcinogens). A COPC is classified as a noncarcinogen if there is an oral or inhalation reference dose (RfD) available (see section 7.2.1.1 for more details on RfDs) or if there is no cancer SF or RfD available (note that only COPCs have RfDs; ROPCs do not have RfDs). Some contaminants may be classified as both a carcinogen and a noncarcinogen (if they have both a cancer SF and a RfD); in this case, both the carcinogenic soil model (see Eq. 6-1 and Eq. 6-2 below) and the noncarcinogenic soil model (see Eq. 6-3 and Eq. 6-4 below) will be used to estimate soil concentrations.

Four soil equations are provided below for the various scenarios encountered (that is, the combinations of whether the contaminant is carcinogenic or noncarcinogenic and whether the soil loss constant is a positive value [meaning there is soil loss] or zero [meaning there is no soil loss]). Some of the parameters (such as the soil loss) within the soil equations must be calculated. Some of these supporting equations have other parameters that must be calculated.

Different equations are used for calculating soil concentrations, depending on whether the COPC is carcinogenic (see Eq. 6-1 and Eq. 6-2 below) or noncarcinogenic (Eq. 6-3 and Eq. 6-4 below). These equations follow; parameters for all four equations are defined after Eq. 6-4. Supporting equations are shown in Appendix B-2.

Per the EPA guidance (EPA 1998a), because the length of exposure duration is less than or equal to the operating life of the WTP ($T_2 \leq$ tD), the following equation (Eq. 5-1C in EPA 1998a) is used to model the cumulative soil concentration for carcinogenic COPCs and ROPCs, when the soil loss (denoted by ks) is greater than zero:

$$Cs = \frac{Ds}{ks \cdot (tD - T_1)} \cdot \left(tD - T_1 + \frac{e^{(-ks \cdot tD)} - e^{(-ks \cdot T_1)}}{ks} \right) \quad \text{(Eq. 6-1)}$$

The limiting equation for carcinogenic COPCs and ROPCs (that is, when the soil loss is zero) is:

$$Cs = \frac{Ds \cdot (tD + T_1)}{2} \quad \text{(Eq. 6-2)}$$

The following equation is used to model the cumulative soil concentration for COPCs determined to be noncarcinogenic and when the soil loss is greater than zero (Eq. 5-1E in EPA 1998a):

$$Cs_{tD} = \frac{Ds \cdot \left[1 - e^{(-ks \cdot tD)}\right]}{ks} \quad \text{(Eq. 6-3)}$$

The limiting equation for noncarcinogenic COPCs (that is, when the soil loss is zero) is:

$$Cs_{tD} = Ds \cdot tD \quad \text{(Eq. 6-4)}$$

For Eq. 6-1 through Eq. 6-4, the following parameters are used:

- Cs = average soil concentration over the exposure duration (mg/kg for COPCs and pCi/g for ROPCs)
- Cs_{tD} = cumulative soil concentration for noncarcinogenic COPCs at time tD (mg/kg)
- Ds = deposition term to soil (mg/kg-yr for COPCs and pCi/g-yr for ROPCs). Ds is calculated in Eq. B2-11 through Eq. B2-15, Appendix B2.
- ks = total COPC and ROPC soil loss constant due to biotic and abiotic degradation, radiological decay, leaching, surface runoff, and volatilization (yr^{-1}). ks is calculated in Eq. B2-10, Appendix B2.
- tD = time period over which deposition occurs (time period of WTP operation) (yr). A value of tD = 40 yr (Table 6-1) is used as the operating lifetime of the WTP.
- T_1 = time period at the beginning of WTP operation (yr). T_1 = 0 yr (Table 6-1).
- e = base of the natural logarithm (unitless). $e = \sum_{i=0}^{\infty} \frac{1}{i!} \approx 2.718282$.

6.3 Surface Water Accumulation Modeling

Concentrations of COPCs and ROPCs in surface water will be estimated from deposition rates predicted by the air dispersion modeling. For this risk assessment, deposition is assumed to occur for the potential operating lifespan of the facility (40 years). COPC and ROPC concentrations in surface water (water in a pond, stream, river, or other water body, that is, the Columbia River) are calculated for both vapor-phase and particle-phase emissions. The emissions report, found in Attachment 1 of this work plan, indicates which COPCs and ROPCs are in vapor phase and which are in particle-phase. Both wet and dry deposition of particles and vapors will be considered in the surface water modeling.

Various equations are used in the surface water accumulation modeling. Some parameter values used in this modeling are functions of other parameters, which are functions of yet other parameters. To avoid confusion, the primary equations for surface water accumulation modeling appear in section 6.3; supporting/intermediary equations appear in Appendix B-2. A cross-reference to these supporting/intermediary equations is presented in this section.

COPC and ROPC concentrations in surface water will be calculated for the drinking water, dermal contact, and fish ingestion pathways in this risk assessment. The COPC and ROPC surface water concentrations are determined after considering the following mechanisms loaded into the water column (that is, a volume of water of uniform horizontal cross-section that extends from the surface to the bottom of the water body):

- Direct deposition
- Direct diffusion of vapor phase COPCs and ROPCs into the surface water
- Runoff from impervious surfaces within the watershed (that is, the area potentially contributing water to the Columbia River)
- Runoff from pervious surfaces within the watershed
- Soil erosion over the total watershed
- Chemical, biological, or radiological transformation of compounds within the surface water body (that is, a discrete element of surface water, such as a pond, lake, stream, or river)

As noted previously in section 6.2, evapotranspiration exceeds precipitation in the Hanford Site area, resulting in insufficient water available to cause significant erosion or runoff of COPCs and ROPCs (since evapotranspiration exceeds precipitation, there is no water to run off; the water goes back up into the air). Thus, surface runoff and soil erosion are expected to be insignificant soil loss mechanisms and insignificant surface water loading mechanisms. Therefore, surface runoff and soil erosion will not be included as surface water loading mechanisms unless they are included as soil loss mechanisms (note that EPA 1998a recommends that the soil loss due to soil erosion should not be included in the soil accumulation modeling). Also, as noted in EPA 1998a, the chemical, biological, or radiological transformation of compounds within the surface water body should not be included as a load to the surface water body because of limited data and uncertainty associated with this mechanism.

Therefore, contaminant loading to surface water for the PRA will be from direct deposition and vapor phase dry deposition diffusion. For completeness, the equations presented below include all potential surface water loading mechanisms.

COPCs and ROPCs in surface water will be estimated using equations presented below. These equations are from EPA 1998a; however, because this guidance does not address ROPCs, minor changes (for example, the use of unit conversion factors) have been made to these equations to address ROPCs. Supporting and intermediate equations are presented in Appendix B-2 of this work plan. Values for the Hanford-specific and site-specific parameters used in surface water modeling are presented in Table 6-2. Values for the COPC- and ROPC-specific parameters are presented in Appendix B-1, tables B1-1 (for organic COPCs), B1-2 (for inorganic COPCs), and B1-3 (for ROPCs).

The site-specific equation used to quantify the total COPC and ROPC load to the surface water body (similar to Eq. 5-28 in EPA 1998a) is:

$$L_T = L_{DEP} + L_{DIF} + L_{RI} + L_{RP} + L_E \qquad \text{(Eq. 6-5)}$$

where:

L_T = total COPC or ROPC load to the water body, including deposition, runoff, and erosion (g/yr for COPCs and Ci/yr for ROPCs). Note that because there are multiple flues from the facility, L_T is calculated for each individual flue before summing across flues to obtain a total direct deposition load to the water body.

L_{DEP} = total (wet and dry) particle-phase and total (wet and dry) vapor-phase direct deposition load to water body (g/yr for COPCs and Ci/yr for ROPCs). L_{DEP} is calculated in Eq. B2-16 through Eq. B2-19.

L_{DIF} = vapor-phase dry deposition diffusion load to water body (g/yr for COPCs and Ci/yr for ROPCs). L_{DIF} is calculated in Eq. B2-20 through Eq. B2-24.

L_{RI} = runoff load from impervious surfaces (g/yr for COPCs and Ci/yr for ROPCs). L_{RI} is calculated in Eq. B2-25 through Eq. B2-28.

L_{RP} = runoff load from pervious surfaces (g/yr for COPCs and Ci/yr for ROPCs). L_{RP} is calculated in Eq. B2-29 and Eq. B2-30.

L_E = soil erosion load to the surface water body (g/yr for COPCs and Ci/yr for ROPCs). L_E is calculated in Eq. B2-31.

Note that special equations for mercury modeling of each of these load parameters are stipulated in EPA 1998a and provided in Appendix B-2. The HHRAP (EPA 1998a) and SLERAP (EPA 1999a) state the assumption that stack emissions contain a variable mix of elemental and divalent mercury, but no methyl mercury. These guidance sources state that it should be assumed that 48% of the divalent mercury and 2% of the elemental mercury is deposited. In the RAWP it is assumed that all stack emissions are of mercury will be in the divalent form. Therefore, 48% of the total mercury emitted will be deposited (Appendix B-2, equations B2-13 (land) and B2-17 and B2-26 (surface water). Methyl mercury is assumed to be formed only after deposition to soil or surface water. Per EPA guidance (EPA 1998a and 1999a), it is assumed that the fraction of methyl mercury in dry soil is 2% (Appendix B-2, equations B2-14 and B2-15) and the fraction of methyl mercury in surface water is 15% (Appendix B-2, equations B2-18, B2-19, B2-23, B2-24, B2-27, and B2-28). Note also that because there are multiple flues from the facility, each load type will be calculated for each individual flue before summing across flues to obtain a total load across all flues.

Once the total load to the water body (L_T) is estimated, the total water body COPC or ROPC concentration (C_{wtot}) will be calculated. This total water body concentration is subsequently used to estimate the total concentration in the water column (see below), as well as the concentration sorbed to the bed sediment (see section 6.4). The equation used to estimate the total water body concentration for COPCs (Eq. 5-35 in EPA 1998a) is:

$$C_{wtot} = \frac{L_T}{Vf_x \cdot f_{wc} + k_{wt} \cdot A_W \cdot (d_{wc} + d_{bs})} \qquad \text{(Eq. 6-6)}$$

and the equation used to estimate the total water body concentration for ROPCs (comparable to Eq. 5-35 for COPCs in EPA 1998a) is:

$$C_{wtot} = \frac{L_T \cdot CF_1 \cdot CF_2}{Vf_x \cdot f_{wc} + k_{wt} \cdot A_W \cdot (d_{wc} + d_{bs})} \qquad \text{(Eq. 6-7)}$$

where:

C_{wtot} = total water body COPC or ROPC concentration, including the water column and bed sediment (mg/L for COPCs and pCi/L for ROPCs)

L_T = total COPC or ROPC load to the water body (g/yr for COPCs and Ci/yr for ROPCs). L_T is calculated in Eq. 6-5.

Vf_x = average annual volumetric flow rate through the water body (m^3/yr). Vf_x is site-specific. A value of Vf_x = 4.0E+11 m^3/yr from Water Resources of Washington State (2002) is used (Table 6-2).

f_{wc} = fraction of the total water body COPC or ROPC concentration in the water column (unitless). f_{wc} ranges from 0 to 1 and is calculated in Eq. B2-32.

k_{wt} = overall total water body COPC or ROPC dissipation rate constant (1/yr). k_{wt} is calculated in Eq. B2-34.

A_w = average annual water body surface area (m^2). A value of A_w = 6.0E+06 m^2 is used based on map measurements (Table 6-2).

d_{wc} = average annual depth of the water column (m). An estimated value of d_{wc} = 7.5 m (modeling data from Columbia Basin Research 1996) is used (Table 6-2).

d_{bs} = depth of the upper benthic sediment layer (m). The recommended default value of 0.03 m (EPA 1998a) is used (Table 6-2).

CF_1 = units conversion factor of 1×10^{-3} (m^3/L), used only for ROPCs in Eq. 6-7

CF_2 = units conversion factor of 1×10^{12} (pCi/Ci), used only for ROPCs in Eq. 6-7

Once the total water body COPC and ROPC concentration (C_{wtot}) is estimated, the total COPC and ROPC concentration in the water column (C_{wctot}) will be calculated. This total concentration in the water column will subsequently be used to estimate the dissolved-phase water concentration (see below). The total concentration in the water column includes both dissolved COPCs and ROPCs and COPCs and ROPCs sorbed to suspended solids. The equation used to estimate the total concentration in the water column (Eq. 5-45 in EPA 1998a) is:

$$C_{wctot} = f_{wc} \cdot C_{wtot} \cdot \left(\frac{d_{wc} + d_{bs}}{d_{wc}} \right) \qquad \text{(Eq. 6-8)}$$

where:

C_{wctot} = total COPC or ROPC concentration in the water column (mg/L for COPCs and pCi/L for ROPCs)

f_{wc} = fraction of the total water body COPC or ROPC concentration in the water column (unitless). f_{wc} ranges from 0 to 1 and is calculated in Eq. B2-32.

C_{wtot} = total water body COPC or ROPC concentration, including the water column and bed sediment (mg/L for COPCs and pCi/L for ROPCs). C_{wtot} is calculated in Eq. 6-6 and Eq. 6-7.

d_{wc} = average annual depth of the water column (m). An estimated value of d_{wc} = 7.5 m (modeling data from Columbia Basin Research 1996) is used (Table 6-2).

d_{bs} = depth of the upper benthic sediment layer (m). The recommended default value of 0.03 m (EPA 1998a) is used (Table 6-2).

Once the total COPC and ROPC concentration in the water column (C_{wctot}) is estimated, the dissolved phase COPC and ROPC water concentration (C_{dw}) will be calculated. The equation for this concentration (Eq. 5-46 in EPA 1998a) is:

$$C_{dw} = \frac{C_{wctot}}{1 + Kd_{sw} \cdot TSS \cdot CF} \qquad \text{(Eq. 6-9)}$$

where:

C_{dw} = dissolved-phase water concentration (mg/L for COPCs and pCi/L for ROPCs)

C_{wctot} = total COPC or ROPC concentration in the water column (mg/L for COPCs and pCi/L for ROPCs). C_{wctot} is calculated in Eq. 6-8.

Kd_{sw} = suspended sediments/surface water partition coefficient (L/kg). Kd_{sw} is shown in Appendix B-1, tables B1-1 (organic COPCs), B1-2 (inorganic COPCs), and B1-3 (ROPCs). If no Kd_{sw} value exists for a constituent, a value of 0 L/kg is used for Kd_{sw} to estimate C_{dw}.

TSS = total suspended solids concentration (mg/L). The recommended default value of 10 mg/L (EPA 1998a) is used (Table 6-2).

CF = units conversion factor of 1×10^{-6} (kg/mg)

The dissolved-phase COPC and ROPC water concentration (C_{dw}) will be used in the risk assessment as the source of drinking water, the source of water for the Native American sweat lodge scenario, and, depending on the constituent, for the modeling of fish concentrations (see section 7.1.7.5).

6.4 Sediment Accumulation Modeling

Sediment concentrations are modeled using the previously modeled total water body concentrations (see section 6.3). Sediment concentrations are used in the ecological risk assessment (ERA) and to model fish concentrations for specific COPCs (see section 7.1.7.5).

Various equations are used in the sediment accumulation modeling. Some parameter values used in this modeling are functions of other parameters, which are functions of yet other parameters. To avoid confusion, the primary equations for sediment accumulation modeling appear in section 6.4; supporting/intermediary equations appear in Appendix B-2. A cross-reference to these supporting/intermediary equations is presented in this section.

The equation for calculating COPC concentrations sorbed to bed sediment (Eq. 5-47 in EPA 1998a) is:

$$C_{sed} = f_{bs} \cdot C_{wtot} \cdot \left(\frac{Kd_{bs}}{\theta_{bs} + Kd_{bs} \cdot C_{BS}} \right) \cdot \left(\frac{d_{wc} + d_{bs}}{d_{bs}} \right) \qquad \text{(Eq. 6-10)}$$

and the equation for calculating ROPC concentrations sorbed to bed sediment (comparable to Eq. 5-47 for COPCs in EPA 1998a) is:

$$C_{sed} = f_{bs} \cdot C_{wtot} \cdot \left(\frac{Kd_{bs}}{\theta_{bs} + Kd_{bs} \cdot C_{BS}} \right) \cdot \left(\frac{d_{wc} + d_{bs}}{d_{bs}} \right) \cdot CF \qquad \text{(Eq. 6-11)}$$

where:

C_{sed} = COPC or ROPC concentration in bed sediment (mg/kg for COPCs and pCi/g for ROPCs)

f_{bs} = fraction of total water body COPC or ROPC concentration in the benthic sediment. (unitless). f_{bs} ranges from 0 to 1 and is calculated in Appendix B2, Eq. B2-36.

C_{wtot} = total water body COPC or ROPC concentration, including the water column and bed sediment (mg/L for COPCs and pCi/L for ROPCs). C_{wtot} is calculated in Eq. 6-6 and Eq. 6-7.

Kd_{bs} = bed sediment/sediment pore water partition coefficient (L/kg). Kd_{bs} is shown in Appendix B-1, tables B1-1 (organic COPCs), B1-2 (inorganic COPCs), and B1-3 (ROPCs). If no Kd_{bs} value exists for a constituent, a value of 0 L/kg is used to estimate C_{sed}.

θ_{bs} = bed sediment porosity ($L_{pore\ water}/L_{sediment}$). The recommended default value of 0.6 $L_{pore\ water}/L_{sediment}$ (EPA 1998a) is used (Table 6-2).

C_{BS} = bed sediment concentration (g/cm^3). The recommended default value of 1 g/cm^3 (EPA 1998a) is used (Table 6-2).

d_{wc} = average annual depth of water column (m). An estimated value of d_{wc} = 7.5 m (modeling data from Columbia Basin Research 1996) is used (Table 6-2).

d_{bs} = depth of upper benthic sediment layer (m). The recommended default value of 0.03 m (EPA 1998a) is used (Table 6-2).

CF = units conversion factor of 1×10^{-3} (kg/g), used only to estimate C_{sed} for ROPCs in Eq. 6-11

6.5 Terrestrial Plant Accumulation Modeling

The models used to calculate concentrations of contaminants in plants consumed by both human and nonhuman receptors will be the same. The use of the same models for human and nonhuman receptors is based on previous stakeholder and tribal nations' requests. Plants, such as homegrown vegetables or wild produce, are consumed by humans and animals (for example, as forage for browsing animals and as silage).

Various equations are used in the terrestrial plant accumulation modeling. Some parameter values used in this modeling are functions of other parameters, which are functions of yet other parameters. To avoid confusion, the primary equations for terrestrial plant accumulation modeling appear in section 6.5;

supporting/intermediary equations appear in Appendix B-2. A cross-reference to these supporting/intermediary equations is presented in this section.

COPC and ROPC concentrations in plants will be estimated for aboveground produce and belowground produce. Aboveground produce will be exposed to particulate deposition (that is, direct deposition onto the plant surfaces) and vapor phase contamination (that is, air-to-plant transfer), as well as root uptake from soil and subsequent transfer to aboveground foliage. Aboveground plant parts are categorized as protected (that is, the plant structure prevents accumulation of contaminants through the deposition and air-to-plant pathways) and unprotected. For example, corn kernels are protected by the husk. Protected plant parts will be limited in this evaluation to grain used as animal feed. All other plant parts for human and animal consumption will be considered unprotected (that is, not physically shielded from deposition). Belowground produce will only be exposed to contaminants from the soil through root uptake.

Concentrations of COPCs and ROPCs in plants will be estimated using the equations presented below as recommended by EPA 1998a. Plant modeling for carbon-14 and hydrogen-3 (tritium) are special cases, based on guidance from Regulatory Guide 1.109 (NRC 1977) and are discussed below in section 6.5.2. Note that for all COPCs and ROPCs, except carbon-14 and tritium, concentrations for various types of plants (for example, aboveground plant due to direct deposition, belowground plant due to root uptake) are modeled. For carbon-14 and tritium, a single "concentration in vegetation" is modeled and used in the subsequent risk assessment. Values for site-specific parameters used in plant modeling are found in Table 6-3, while values for the chemical-specific parameters are presented in Appendix B-1.

6.5.1 Aboveground Plants/Direct Deposition

The equations used to estimate the aboveground plant concentration due to direct deposition are presented below. Special consideration is given to modeling for total mercury, divalent mercury, and methyl mercury. No estimates of aboveground plant concentration due to direct deposition will be made for carbon-14 and tritium (see section 6.5.2). The aboveground plant concentrations due to direct deposition will be estimated for the following plant types: produce, forage, and silage.

The equation to calculate the aboveground plant concentration due to direct deposition for all COPCs except total mercury, divalent mercury, and methyl mercury, and for all ROPCs except carbon-14 and tritium (Eq. 5-14 in EPA 1998a), is:

$$Pd = \frac{CF \cdot Q \cdot (1 - F_v) \cdot [Dydp + (Fw \cdot Dywp)] \cdot Rp \cdot [1 - e^{(-kp \cdot Tp)}]}{Yp \cdot kp} \qquad \text{(Eq. 6-12)}$$

and the equation to calculate the aboveground plant concentration due to direct deposition for total mercury (equation for mercury modeling found in Table B-2-7 in EPA 1998a) is:

$$Pd_{(Hg)} = \frac{0.48 \cdot CF \cdot Q \cdot (1 - F_v) \cdot [Dydp + (Fw \cdot Dywp)] \cdot Rp \cdot [1 - e^{(-kp \cdot Tp)}]}{Yp \cdot kp} \qquad \text{(Eq. 6-13)}$$

where:

Pd = concentration of COPC or ROPC in aboveground plant due to direct (wet and dry) deposition (mg COPC/kg plant tissue DW and pCi ROPC/g plant tissue DW)

$Pd_{(Hg)}$ = concentration of total mercury in aboveground plant due to direct (wet and dry) deposition (mg COPC/kg plant tissue DW)

CF = units conversion factor of 1000 (mg/g) for COPCs and 1×10^9 (pCi-kg/Ci-g) for ROPCs

Q = COPC or ROPC-specific emission rate (g/s for COPCs and Ci/s for ROPCs), derived as described in section 5

F_v = fraction of COPC or ROPC air concentration in vapor phase (unitless). F_v is shown in Appendix B-1, tables B1-1 (organic COPCs), B1-2 (inorganic COPCs), and B1-3 (ROPCs). The model uses $F_v = 1$ for constituents modeled as only vapor phase except for total mercury where $F_v = 0.85$. Otherwise, the model uses $F_v = 0$ for constituents modeled in particle-phase or particle-bound phase.

Dydp = unitized yearly average dry deposition from particle phase (s/m^2-yr). Dydp, from the air dispersion modeling, is flue-specific.

Fw = fraction of COPC or ROPC wet deposition that adheres to plant surfaces (unitless). A value of 0.2 is used for anions and two specific organic COPCs (p-chloroaniline and n-nitrosodi-n-propylamine) that ionize to anionic forms (EPA 1998a). A value of 0.6 is used for cations and all other organics (EPA 1998a). See Table 6-3.

Dywp= unitized yearly average wet deposition from particle phase (s/m^2-yr). Dywp, from the air dispersion modeling, is flue-specific.

Rp = interception fraction of the edible portion of plant for aboveground produce (unitless). Rp is plant-type-specific, with a value of 0.39 (representing a weighted average of fruits and vegetables; EPA 1998a) used for produce, a value of 0.05 for forage (EPA 1998a), and a value of 0.459 (calculated per methods in EPA 1998a) for silage. See Table 6-3.

e = base of the natural logarithm (unitless). $e = \sum_{i=0}^{\infty} \frac{1}{i!} \approx 2.718282$.

kp = plant surface loss coefficient (yr^{-1}). The recommended default value of 18 yr^{-1} (EPA 1998a) is used for all constituents (see Table 6-3).

Tp = length of plant exposure to deposition per harvest of edible portion of plant for aboveground produce (yr). The recommended default values from EPA (1998a) of 0.164 yr for produce, 0.12 yr for forage, and 0.16 yr for silage are used (Table 6-3).

Yp = yield or standing crop biomass of the edible portion of the plant for aboveground produce (productivity) (kg/m^2). Yp is site-specific and plant-type-specific. The recommended default value of 2.24 kg/m^2 (representing a weighted average of fruits and vegetables; EPA 1998a) is used for produce, while a value of 0.0195 kg/m^2 (estimated from values found in Wisiol 1984) is used for forage, and a value of 0.8 kg/m^2 (EPA 1998a) is used for silage. See Table 6-3.

0.48 = multiplier for modeling of total mercury (unitless), as shown in EPA 1998a

Per EPA (1998a), the equation to calculate the aboveground plant concentration due to direct deposition for divalent mercury (see the equations for mercury modeling found in Table B-2-7 in EPA 1998a) is:

$$Pd_{(Hg^{2+})} = 0.78 \cdot Pd_{(Hg)} \qquad \text{(Eq. 6-14)}$$

and the equation to calculate the aboveground plant concentration due to direct deposition for methyl mercury (see the equations for mercury modeling found in Table B-2-7 in EPA 1998a) is:

$$Pd_{(MHg)} = 0.22 \cdot Pd_{(Hg)} \qquad \text{(Eq. 6-15)}$$

where:

$Pd_{(Hg2+)}$	=	concentration of divalent mercury in aboveground produce due to direct (wet and dry) deposition (mg COPC/kg plant tissue DW)
$Pd_{(MHg)}$	=	concentration of methyl mercury in aboveground produce due to direct (wet and dry) deposition (mg COPC/kg plant tissue DW)
$Pd_{(Hg)}$	=	concentration of total mercury in aboveground produce due to direct (wet and dry) deposition (mg COPC/kg plant tissue DW). $Pd_{(Hg)}$ is calculated in Eq. 6-13 above for produce, forage, and silage.
0.78	=	multiplier for modeling of divalent mercury (unitless), as shown in EPA 1998a
0.22	=	multiplier for modeling of methyl mercury (unitless), as shown in EPA 1998a

Note that in the equations to calculate the concentration in aboveground plants due to direct deposition, several parameters are flue-specific. This necessitates estimating the concentration in aboveground plants due to direct deposition for each flue individually. Then the individual concentrations from the flues will be summed to obtain the overall concentration in aboveground plants due to direct deposition.

Also, note that in the equations to calculate the concentration in aboveground plants due to direct deposition, several parameters are plant-type-specific (produce, forage, and silage, for example). That is, when estimating the concentration in aboveground plants due to direct deposition for produce, the produce-specific parameters will be used. Likewise, when estimating the concentration in aboveground plants due to direct deposition for forage and silage, the forage-specific parameters and the silage-specific parameters will be used, respectively.

6.5.2 Aboveground Plants/Air-to-Plant Transfer

The equations used to estimate the aboveground plant concentration due to air-to-plant transfer are presented below. Per EPA guidance (EPA 1998a), special consideration is given to modeling for total mercury, divalent mercury, and methyl mercury. Special consideration is also given to modeling for carbon-14 and tritium (see detailed discussion below, based on guidance from NRC 1977). The aboveground plant concentrations due to air-to-plant transfer are estimated for the following plant types: produce, forage, and silage.

The equation to calculate the aboveground plant concentration due to air-to-plant transfer for all vapor-phase COPCs, except total mercury, divalent mercury, and methyl mercury (Eq. 5-18 in EPA 1998a), is:

$$Pv = \frac{Q \cdot F_v \cdot Cyv \cdot Bv_{ag} \cdot VG_{ag}}{\rho_a} \qquad \text{(Eq. 6-16)}$$

and the equation to calculate the aboveground plant concentration due to air-to-plant transfer for all ROPCs, except carbon-14 and tritium (comparable to Eq. 5-18 for COPCs in EPA 1998a), is:

$$Pv = \frac{CF \cdot Q \cdot F_v \cdot Cyv \cdot Bv_{ag} \cdot VG_{ag}}{\rho_a} \qquad \text{(Eq. 6-17)}$$

and the equation to calculate the aboveground plant concentration due to air-to-plant transfer for total mercury (equation for mercury modeling found in Table B-2-8 in EPA 1998a) is:

$$Pv_{(Hg)} = \frac{0.48 \cdot Q \cdot F_v \cdot Cyv \cdot Bv_{ag} \cdot VG_{ag}}{\rho_a} \qquad \text{(Eq. 6-18)}$$

where:

- Pv = concentration of COPC or ROPC in aboveground plant due to air-to-plant transfer (mg COPC/kg plant tissue DW and pCi ROPC/g plant tissue DW)
- $Pv_{(Hg)}$ = concentration of total mercury in aboveground plant due to air-to-plant transfer (mg COPC/kg plant tissue DW)
- Q = COPC- or ROPC-specific emission rate (g/s for COPCs and Ci/s for ROPCs), derived as described in section 5
- F_v = fraction of COPC or ROPC air concentration in vapor phase (unitless). F_v is shown in Appendix B-1, tables B1-1 (organic COPCs), B1-2 (inorganic COPCs), and B1-3 (ROPCs). The model uses $F_v = 1$ for constituents modeled as only vapor phase except for total mercury where $F_v = 0.85$. Otherwise, the model uses $F_v = 0$ for constituents modeled in particle-phase or particle-bound phase.
- Cyv = unitized yearly average air concentration from vapor phase (μg-s/g-m^3 for COPCs and mCi-s/Ci-m^3 for ROPCs). Cyv, from the air dispersion modeling, is flue-specific.
- Bv_{ag} = COPC or ROPC air-to-plant biotransfer factor for aboveground plant (unitless). Bv_{ag} is shown in Appendix B-1, tables B1-1 (organic COPCs) and B1-2 (inorganic COPCs). The Bv_{ag} value for produce is used to estimate aboveground plant concentration due to air-to-plant transfer for produce, while the Bv_{ag} value for forage (denoted as Bv_{forage} in Appendix B-1, tables B1-1 and B1-2) is used to estimate aboveground plant concentration due to air-to-plant transfer for both forage and silage (EPA 1998a). Note that because no values for Bv_{ag} could be found for radionuclides that are in vapor phase, Pv for air-to-plant transfer cannot be quantified for a few ROPCs.
- VG_{ag} = empirical correction factor for the aboveground plant due to air-to-plant transfer (unitless). For produce, the recommended default values (EPA 1998a) for VG_{ag} are

used: a value of 0.01 for COPCs and ROPCs with a log of the octanol/water partitioning coefficient (K_{ow}) ≥ 4 and a VG_{ag} value of 1 for COPCs and ROPCs with a log K_{ow} < 4. If no K_{ow} value exists for a constituent, the model conservatively uses VG_{ag} = 1. K_{ow} is COPC-specific and shown in Appendix B-1, Table B1-1, for organic COPCs. For forage and silage, the recommended default values of 1 and 0.5, respectively (EPA 1998a), are used for VG_{ag}. See Table 6-3.

ρ_a = density of air (g/m^3). The recommended default value of 1200 g/m^3 (EPA 1998a) is used (Table 6-3).

CF = units conversion factor of 1×10^9 (pCi/mCi); used for ROPCs in Eq. 6-17 only

0.48 = multiplier for modeling of total mercury (unitless), as shown in EPA 1998a

Per EPA (1998a), the equation to calculate the aboveground plant concentration due to air-to-plant transfer for divalent mercury (see the equations for mercury modeling found in Table B-2-8 in EPA 1998a) is:

$$Pv_{(Hg^{2+})} = 0.78 \cdot Pv_{(Hg)} \qquad \text{(Eq. 6-19)}$$

and the equation to calculate the aboveground plant concentration due to air-to-plant transfer for methyl mercury (see the equations for mercury modeling found in Table B-2-8 in EPA 1998a) is:

$$Pv_{(MHg)} = 0.22 \cdot Pv_{(Hg)} \qquad \text{(Eq. 6-20)}$$

where:

$Pv_{(Hg2+)}$ = concentration of divalent mercury in aboveground plant due to air-to-plant transfer (mg COPC/kg plant tissue DW)

$Pv_{(MHg)}$ = concentration of methyl mercury in aboveground plant due to air-to-plant transfer (mg COPC/kg plant tissue DW)

$Pv_{(Hg)}$ = concentration of total mercury in aboveground plant due to air-to-plant transfer (mg COPC/kg plant tissue DW). $Pv_{(Hg)}$ is calculated in Eq. 6-18 above.

0.78 = multiplier for modeling of divalent mercury (unitless), as shown in EPA 1998a

0.22 = multiplier for modeling of methyl mercury (unitless), as shown in EPA 1998a

Note that in the equations to calculate the concentration in aboveground plants due to air-to-plant transfer, several parameters are flue-specific. This necessitates estimating the concentration in aboveground plants due to air-to-plant transfer for each flue individually. Then the individual concentrations from the flues will be summed to obtain the overall concentration in aboveground plants due to air-to-plant transfer.

Also note that in the equations to calculate the concentration in aboveground plants due to air-to-plant transfer, several parameters are plant-type-specific. That is, when estimating the concentration in aboveground plants due to air-to-plant transfer for produce, the produce-specific parameters are used. Likewise, when estimating the concentration in aboveground plants due to air-to-plant transfer for forage and silage, the forage-specific parameters and the silage-specific parameters are used, respectively.

As mentioned above, special consideration is given to modeling for carbon-14 and tritium. Risk calculations for most ROPCs are based on the assumption that radionuclides are present as particulates or

vapors. However, special consideration must be given to carbon-14 and tritium, as these ROPCs are processed by vegetation with natural carbon and hydrogen, respectively. Thus, the vegetation ingestion pathway for carbon-14 and tritium is dependent on the exchange of carbon and hydrogen between plants and the environment. For this assessment, guidance from Regulatory Guide 1.109 (NRC 1977) is used to account for the bioaccumulation of carbon-14 and tritium in plants that could lead to human exposure through vegetation ingestion. This is achieved through the use of correction factors and using the assumptions that all carbon-14 is released by the WTP in oxide form (CO or CO_2) and tritium is released in water vapor. These correction factors will be applied to the concentration (for example, pCi/L) estimated at the point of exposure by the air model.

The concentration of carbon-14 in vegetation is calculated assuming that its ratio to the natural carbon in vegetation is equal to the ratio of carbon-14 to natural carbon in the atmosphere surrounding the vegetation (NRC 1977):

$$C_{V(C-14)} = \frac{C_{A(C-14)} \cdot \mathrm{p} \cdot 0.11}{0.16} \qquad \text{(Eq. 6-21)}$$

where:

$C_{V(C-14)}$ = concentration of carbon-14 in vegetation (pCi ROPC/g plant tissue DW)

$C_{A(C-14)}$ = concentration of carbon-14 in the surrounding air (pCi/m^3). $C_{A(C-14)}$ is obtained from the air dispersion modeling.

p = ratio of the total annual release time to the total annual time during which photosynthesis occurs; a conservative ratio of 1.0 is used

0.11 = fraction of the total plant mass that is natural carbon (dimensionless)

0.16 = concentration of natural carbon in the atmosphere (g/m^3)

The concentration of tritium in vegetation will be calculated based on the equilibrium between moisture in the air and water in plants (NRC 1977):

$$C_{V(H-3)} = C_{A(H-3)} \cdot 0.75 \cdot (0.5 \div Humidity) \qquad \text{(Eq. 6-22)}$$

where:

$C_{V(H-3)}$ = concentration of tritium in vegetation (pCi ROPC/g plant tissue DW)

$C_{A(H-3)}$ = concentration of tritium in the surrounding air (pCi/m^3). $C_{A(H-3)}$ is obtained from the air dispersion modeling.

0.75 = fraction of the total plant mass that is water (dimensionless)

0.5 = ratio of tritium concentration in plant water to tritium concentration in atmospheric water (dimensionless)

Humidity = humidity of the atmosphere (g/m^3). A site-specific value of 68%, or 0.68 g/m^3 (US Forest Service, National Park Service, and US Fish and Wildlife Service 2000) is used.

The concentration of carbon-14 and tritium in vegetation will be used as the total plant concentration for these ROPCs throughout the risk assessment, instead of estimating concentrations for specific types of

plants (such as produce, forage, silage, and grain) and specific parts of the plants (that is, aboveground and belowground).

6.5.3 Root Uptake

The concentration of COPCs and ROPCs in plants due to root uptake from the soil will be calculated for aboveground and belowground plants. These concentrations are calculated for all COPCs and all ROPCs except carbon-14 and tritium (see section 6.5.2). The concentration of plants due to root uptake from the soil is a function of the soil concentration and a soil-to-plant bioaccumulation uptake factor. Section 6.5.3.1 discusses the modeling of aboveground plants due to root uptake. Section 6.5.3.2 discusses the modeling of belowground plants due to root uptake. A discussion of uptake factors is presented in section 6.5.3.3.

6.5.3.1 Root Uptake/Aboveground Plants

The concentration in aboveground plants due to root uptake is a function of the soil concentration and the soil-to-plant bioaccumulation uptake factor for aboveground plants. The aboveground plant concentrations due to root uptake will be estimated for the following plant types: produce, forage, silage, and grain. No estimates of aboveground plant concentration due to root uptake will be made for carbon-14 and tritium, because a "vegetation concentration" will be estimated as the total plant concentration for these two isotopes (see section 6.5.2). Also, the untilled soil depth of 1 cm is considered too shallow to estimate plant concentrations for consumption by human and ecological receptors; thus, only root zone soil concentrations (depth of 15 cm) and tilled soil concentrations (depth of 20 cm) are used to model aboveground plants due to root uptake.

The equation used to calculate the aboveground plant concentration due to root uptake (Eq. 5-20A in EPA 1998a) for all COPCs and for all ROPCs, except carbon-14 and tritium, is:

$$\mathrm{Pr}_{ag} = \mathrm{Cs} \cdot \mathrm{Br}_{ag} \qquad \text{(Eq. 6-23)}$$

where:

Pr_{ag} = concentration of COPC or ROPC in aboveground plant due to root uptake (mg COPC/kg plant tissue DW and pCi ROPC/g plant tissue DW). Pr_{ag} is calculated separately for tilled soil (20 cm depth) and root-zone soil (15 cm depth). See the discussion below for appropriate combinations of plant types (that is, produce, forage, silage, and grain) and soil depths.

Cs = soil concentration (mg/kg for COPCs and pCi/g for ROPCs). Cs is depth-specific and calculated in Eq. 6-1 through Eq. 6-4.

Br_{ag} = plant-soil bioconcentration factor for aboveground produce (unitless). Br_{ag} is shown in Appendix B-1, tables B1-1 (organic COPCs), B1-2 (inorganic COPCs), and B1-3 (ROPCs). Separate Br_{ag} values are used for produce (denoted as Br_{ag}), forage (denoted as Br_{forage}), silage (per EPA 1998a, Br_{forage} is used to estimate both forage and silage), and grain (denoted as Br_{grain}). The values for Br_{ag} in Appendix B-1, Table B1-1 (organic COPCs), will be compared against the calculated mass-limited uptake factors that are described in section 6.5.3.3 (values shown in Table 6-4), and the smaller of the two values will be used in the calculation of the aboveground plant concentration due to root uptake (Pr_{ag}). The use of the smaller value in this comparison prevents the

overestimation of Pr_{ag}, because in some cases, the derived uptake factors (Br_{ag}) are not physically possible, leading to the prediction of more chemical being accumulated by an organism from the soil than is released from the facility and deposited onto the soil. In this situation, use of the mass-limited uptake factor prevents the overestimation of Pr_{ag}.

Note that in the equations above, four different plant types (produce, forage, silage, and grain) are modeled. When estimating the concentration in aboveground plants due to root uptake for produce, the produce-specific parameters are used. Likewise, when estimating the concentration in aboveground plants due to root uptake for forage, silage, and grain, the forage-specific parameters, silage-specific parameters, and grain-specific parameters will be used, respectively.

Note also that in the equations above, two different soil depths (tilled soil and root-zone soil) are used because untilled soil (1 cm depth) is considered too shallow for plants with root uptake. However, not every combination of the two soil types with the four plant types is appropriate. The following combinations of soil types and plant types will be used in estimating the aboveground plant concentration due to root uptake:

- When estimating concentrations for aboveground plants due to root uptake for produce, the tilled soil concentrations will be used.
- When estimating concentrations for aboveground plants due to root uptake for wild produce (for consumption by Native Americans), the root-zone soil concentrations will be used.
- When estimating concentrations for aboveground plants due to root uptake for forage, the root-zone soil concentrations will be used.
- When estimating concentrations for aboveground plants due to root uptake for silage, the tilled soil concentrations will be used.
- When estimating concentrations for aboveground plants due to root uptake for grain, both the tilled soil concentrations and root-zone soil concentrations will be used. Grain modeled from tilled soil will be used in subsequent modeling of domesticated animals (for example, animals on a farm, such as chickens), while grain modeled from root-zone soil will be used in subsequent modeling of wild animals (for example, animals ultimately hunted and consumed by Native Americans, such as wild fowl).

6.5.3.2 Root Uptake/Belowground Plants

The concentration in belowground plants due to root uptake is a function of the soil concentration, the soil-to-plant bioaccumulation uptake factor for belowground plants, and a correction factor for belowground produce. The belowground plant concentrations due to root uptake will be estimated for only one plant type: produce. No estimates of belowground plant concentration due to root uptake will be made for carbon-14 and tritium, because a “vegetation concentration” will be estimated as the total plant concentration for these two isotopes (see section 6.5.2). Also, the untilled soil depth of 1 cm is considered too shallow to estimate plant concentrations for consumption by human and ecological receptors; thus, only root zone soil concentrations (depth of 15 cm) and tilled soil concentrations (depth of 20 cm) will be used to model belowground plants due to root uptake.

The equation used to calculate the belowground plant concentration due to root uptake (Eq. 5-20B in EPA 1998a) for all COPCs and for all ROPCs, except carbon-14 and tritium, is:

$$\mathrm{Pr}_{bg} = Cs \cdot Br_{rootveg} \cdot VG_{rootveg} \qquad \text{(Eq. 6-24)}$$

where:

Pr_{bg} = concentration of COPC or ROPC in belowground plant due to root uptake (mg COPC/kg plant tissue DW and pCi ROPC/g plant tissue DW). Pr_{bg} is calculated separately for tilled soil (20 cm depth) and root-zone soil (15 cm depth).

Cs = soil concentration (mg/kg for COPCs and pCi/g for ROPCs). Cs is depth-specific and calculated in Eq. 6-1 through Eq. 6-4.

$\mathrm{Br}_{rootveg}$ = plant-soil bioconcentration factor for belowground plants (unitless). $\mathrm{Br}_{rootveg}$ is shown in Appendix B-1, tables B1-1 (organic COPCs), B1-2 (inorganic COPCs), and B1-3 (ROPCs). Note that per EPA 1998a, for organic COPCs, $\mathrm{Br}_{rootveg}$ can be calculated as RCF ÷ (Kd_s × CF), where RCF is the root concentration factor (mL/g), Kd_s is the soil-water partition coefficient (L/kg), and CF is a units conversion factor of 1 (kg-mL)/(g-L). Values for RCF and Kd_s are shown in Appendix B-1, Table B1-1, for organic COPCs. The values for $\mathrm{Br}_{rootveg}$ in Appendix B-1, Table B1-1, (organic COPCs) will be compared against the calculated mass-limited uptake factors for produce that are described in section 6.5.3.3 (values in Table 6-4), and the smaller of the two values will be used in the calculation of the belowground plant concentration due to root uptake (Pr_{bg}). The use of the smaller value in this comparison prevents the overestimation of Pr_{bg}, because in some cases, the derived uptake factors ($\mathrm{Br}_{rootveg}$) are not physically possible, leading to the prediction of more chemical being accumulated by an organism from the soil than is released from the facility and deposited onto the soil. In this situation, use of the mass-limited uptake factor prevents the overestimation of Pr_{bg}.

$\mathrm{VG}_{rootveg}$ = empirical correction factor for belowground plants (unitless). For belowground plants, the recommended default values (EPA 1998a) for $\mathrm{VG}_{rootveg}$ are used: a value of 0.01 for COPCs and ROPCs with a log $K_{ow} \geq 4$ and a $\mathrm{VG}_{rootveg}$ value of 1 for COPCs and ROPCs with a log $K_{ow} < 4$ (see Table 6-3). If no K_{ow} value exists for a constituent, the model conservatively uses $\mathrm{VG}_{rootveg} = 1$. K_{ow} is COPC-specific and shown in Appendix B-1, Table B1-1, for organic COPCs.

Note that in the equation above, two different soil depths (tilled soil and root-zone soil) will be used because untilled soil (1 cm depth) is considered too shallow for plants with root uptake. Root vegetables grown in tilled soil (20 cm depth) will be used in subsequent human health risk equations for the resident (that is, non-Native American) consuming produce, while root vegetables grown in root-zone soil (15 cm depth) will be used in subsequent human health risk equations for the Native American consuming wild produce (see section 7.1.3 for a description of the receptors and exposure pathways).

6.5.3.3 Mass-Limited Soil-to-Plant Uptake Factors

The concentrations of contaminants in plants due to root uptake, for both aboveground and belowground plants, are a function of the soil concentration and soil-to-plant bioaccumulation uptake factor. Soil

concentrations used in the modeling of aboveground and belowground plants due to root uptake will be from the root-zone depth (15 cm) and from the tilled soil depth (20 cm); the untilled soil depth (1 cm) is considered too shallow for the modeling of aboveground and belowground plants due to root uptake. The uptake factors for organic chemicals recommended in the Human Health Risk Assessment Protocol (HHRAP) (EPA 1998a) and the Screening-Level Ecological Risk Assessment Protocol (SLERAP) (EPA 1999a) are calculated from regression equations developed for a few chemicals and exposure situations. In some cases these derived uptake factors are not physically possible because they predict that more chemical will be accumulated by an organism from the soil than is released from the facility and deposited onto the soil. This problem affects a subset of the 370 organic chemicals being evaluated for the WTP.

For example, if 1 mg of methyl alcohol is deposited per square meter of soil at the point of maximum deposition (calculated as [total deposition rate] [total years of deposition] [units conversion factor]), then using the root-to-aboveground produce transfer factor recommended by EPA guidance (EPA 1998a) would result in an accumulation of 4.28 mg of methyl alcohol in the aboveground edible tissues of plants in one growing season in a 1 square meter area (calculated as [concentration in soil] [EPA uptake factor] [EPA default value for yield for produce]). This is more than 4 times the amount of chemical available from 40 years of WTP emissions ($4.28 \div 1.0 = 4.28$). This overestimate would then be carried through the risk assessment. For example, if the aboveground plant concentration were overestimated by a factor of more than 4, then risk to human and ecological receptors from ingestion of aboveground plant tissue would also be overestimated by a factor of more than 4. This uptake factor problem does not apply to all COPCs but is limited to some organic chemicals. Uptake factors for organic chemicals are calculated using regression equations; uptake factors for inorganic chemicals and radionuclides are taken from more empirical sources, are sufficiently known, and are not included in this discussion.

There are a variety of ways that the above problem may be corrected, depending on the source of the original uptake factor and the amount of uptake information available. Possible solutions include:

- Identify published, empirically derived uptake factors for the organic chemicals, including development of more representative equations for estimating uptake factors for organic chemicals.
- Conduct laboratory experiments to measure realistic, site-specific, uptake factors.
- Calculate “mass-limited” uptake factors assuming all of the chemical deposited onto the soil is taken up by an organism.

For this risk assessment, the calculation of “mass-limited” uptake factors has been determined to be the most reasonable option and has been performed. Maximum (mass-limited) uptake factors based on simple conservation of mass (that is, that result in transfer of 100 % of the deposited chemical into the receiving organism, but no more) can be calculated. These calculations can be shown to be a function of the soil density and the plant yield. Since the soil density is dependent on the soil depth and since the root-zone and untilled soil depths apply to the plant concentration due to root uptake, separate determinations of the soil-to-plant, mass-limited uptake factor must be made for these two depths.

The initial soil-to-plant, mass-limited uptake factor (that is, before adjustments are made for the length of operation for the facility and to divide aboveground and belowground produce) is calculated as:

$$\text{Initial Uptake Factor} = \text{Soil Density} \div \text{Plant Yield} \qquad \text{(Eq. 6-25)}$$

where:

Initial Uptake Factor	=	initial calculation of soil-to-plant uptake factor (kg soil/m^2 per kg DW plant/m^2)
Soil Density	=	soil density (kg soil/m^2), calculated as bulk density (in kg soil/m^3) times soil depth (in meters) (that is, mass per area for a specific depth). For example, using a soil bulk density of 1.3 g/cm^3 (1300 kg/m^3) and a soil depth of 15 cm (0.15 m), the soil density is (1300 kg/m^3) (0.15 m) = 195 kg/m^2. The soil density for tilled soil (that is, at the 20 cm depth) is (1300 kg/m^3) (0.2 m) = 260 kg/m^2. Both soil depths are used to estimate separate mass-limited uptake factors.
Plant Yield	=	yield for the plant (kg DW plant/m^2). Plant yields used are 2.24 kg/m^2 for aboveground produce (EPA 1998a), 0.75 kg/m^2 for belowground produce (Washington Agricultural Statistics Service 2001), 0.0195 kg/m^2 for forage (Wisiol 1984), 0.8 kg/m^2 for silage (EPA 1998a), and 0.25 kg/m^2 for grain (Washington Agricultural Statistics Service 2001); see Table 6-4.

As seen above, the initial soil-to-plant, mass-limited uptake factor is a function of the soil density (which is dependent on the depth of soil) and the plant yield. These mass-limited uptake factors assume that:

- In one growing season, the plant takes up all of the chemical deposited over 40 years.
- The plant concentrates all of the deposited chemical into the aboveground edible portion of the plant.

These assumptions directly contradict other assumptions recommended in the risk assessment guidance (EPA 1998a):

- If the plant takes up the entire deposited chemical in one growing season, a human receptor cannot be exposed to this concentration for the recommended exposure durations (which are longer than one year for the various adult receptors).
- If plants take up all of the deposited chemical in the aboveground portion, the concentration in the belowground portion (that is, root vegetables) must be zero.

To prevent this contradiction, reasonable maximum uptake factors can be calculated using the following assumptions:

- The plants take up one year's worth of deposition each growing season so that for each year of exposure, the plants take up all the deposition available that year.
- The plants take up one-half of the available chemical into the edible aboveground portion and one-half into the edible belowground portion.

Using these assumptions, reasonable maximum uptake factors can be calculated as:

$$\text{Mass-limited Uptake Factor} = \text{Initial Uptake Factor} \bullet \text{Modifying Factor} \qquad \text{(Eq. 6-26)}$$

where:

Mass-limited Uptake Factor	=	final mass-limited, soil-to-plant uptake factor (kg soil/m^2 per kg DW plant/m^2)
Initial Uptake Factor	=	initial estimate of uptake factor, calculated in Eq. 6-25
Modifying Factor	=	adjustments necessary for aboveground versus belowground portions of the plant and for operating duration of the facility that is producing emissions

There are two types of modifying factors used to estimate the mass-limited uptake factor; these modifying factors are dependent on the type of plant (that is, produce, forage, silage, and grain). One type of modifying factor is applied to plant types that have both aboveground and belowground concentrations. For produce, a modifying factor of 1/2 is applied to aboveground produce due to root uptake, and a modifying factor of 1/2 is applied to belowground produce due to root uptake (so as to equally divide the mass-limited uptake factor between aboveground and belowground produce due to root uptake). However, this modifying factor related to aboveground versus belowground is not applied to forage, silage, or grain since the edible portions of these plant types are all totally aboveground. The second type of modifying factor (a modifying factor of 1/40) is used to apportion the depositions over the 40-year duration of the facility. This second type of modifying factor is applied to produce, silage, and grain because these products will be harvested and the chemicals in them removed from the soil. This 40-year modifying factor is not applied to forage because some of the forage will remain and decay in place, thus returning the chemicals to the soil. Therefore, the modifying factors (combining the two types of modifying factors, as appropriate) are:

- 1/80 for aboveground produce due to root uptake (1/2 ·1/40)
- 1/80 for belowground produce due to root uptake (1/2 ·1/40)
- 1 for forage (no modifying factor applied)
- 1/40 for silage (1/2 modifying factor not applied)
- 1/40 for grain (1/2 modifying factor not applied)

Soil-to-plant, mass-limited uptake factors are provided in Table 6-4. The final step in this mass-limited uptake factor approach is to compare the uptake factors as specified in the HHRAP guidance (EPA 1998a) to these calculated mass-limited uptake factors, on a chemical-by-chemical basis for organic COPCs. The smaller of the two values will be used in the estimation of plant concentrations.

6.6 Other Media

Modeling for various animal products (such as wild game and fish) is also necessary for this risk assessment. However, since this modeling effort is slightly different for the human health risk assessment (HHRA), as opposed to the ERA, the modeling will be described in section 7.1.7.5 for human health receptors and in section 8.2.3.1 for ecological receptors.

6.7 Uncertainty in Fate and Transport Modeling

Uncertainties will be presented in the risk assessment for each aspect of the environmental fate and transport modeling. This includes air dispersion modeling, soil accumulation modeling, surface water modeling, sediment modeling, and plant accumulation modeling. The uncertainty assessment will be

presented in the form of both text and tables summarizing the primary contributors and potential magnitude of uncertainties.

A variety of conservative assumptions are used throughout the modeling process to compensate for uncertainties. One limitation of the air dispersion and deposition modeling will result in the overestimation of COPC and ROPC concentrations in all media. This overestimation results from the double counting of COPCs and ROPCs in air and deposited on soil, plants, and surface water. Air dispersion and deposition components of the modeling are conducted separately. Therefore, when estimating ambient air concentrations for inhalation exposure, the model assumes no loss due to deposition. When estimating deposition, the deposition rate at each point on the receptor grid assumes no loss of COPCs and ROPCs in the air due to deposition at any other grid or receptor location. Some important sources of uncertainty in each type of modeling are summarized in the following sections.

6.7.1 Uncertainty in Air Dispersion Modeling

A number of sources of uncertainty exist in the air dispersion modeling, such as:

- Input values, such as stack emission characteristics
- Emission rates of individual COPCs and ROPCs
- Meteorological data
- Accurate simulation of the atmospheric dispersion of emissions plume from each flue

Some of these uncertainties are based on the limited data available, such as estimated emission rates as described in section 5.5. Other uncertainties become larger when the model is used at the limits of its normal application (for instance, in very complex terrain as distances from the source increase).

6.7.2 Uncertainty in Soil Accumulation Modeling

Estimating soil concentrations incorporates numerous uncertainties, which are inherent in the assumptions that are the basis for the calculations. Examples of uncertainty in the parameters would be soil mixing depth, soil bulk density, and volumetric water content, which are assigned a single value, but may vary widely over a relatively small area. The concentration of COPCs and ROPCs in soil will be subject to loss due to biotic and abiotic degradation; however, transformation and subsequent increase of secondary COPCs (that is, degradation products) will not be considered in the assessment. Transformation of ROPCs and formation of daughter products will be included in this assessment through the use of toxicity values that include daughter products.

6.7.3 Uncertainty in Surface Water Accumulation Modeling

Uncertainty in the estimation of surface water and fish concentrations of COPCs and ROPCs results from the assumptions used in the calculations. The equations assume that the water body reaches a steady-state condition; however, for application to the Columbia River and any other flowing surface water, this assumption is extremely conservative. Additionally, many of the equations used to model the fate of COPCs and ROPCs deposited into the water body greatly simplify the mechanisms occurring within such a dynamic system and may overestimate or underestimate the concentration of given COPCs and ROPCs in the surface water. It is also assumed that the maximum deposition of COPCs and ROPCs occurs over the entire depositional area of the water body, which is a source of additional uncertainty and conservatism.

6.7.4 Uncertainty in Sediment Accumulation Modeling

There is uncertainty in assigning COPCs exclusively to either water column or bed sediment for purposes of estimating fish-tissue concentrations as described in the EPA guidance for human health (EPA 1998a) and concentrations of other organisms as described in the SLERAP (EPA 1999a). The problem is that this approach to partitioning COPCs in the aquatic environment may not reflect the multiple pathways by which different kinds of organisms are potentially exposed to any given contaminant.

The EPA approach estimates concentrations of organisms using bioconcentration factors (BCFs) and dissolved water concentrations for COPCs with low values for K_{ow}, bioaccumulation factors (BAFs) and whole-water concentrations for COPCs with moderate values for K_{ow}, and BAFs and sediment concentrations for COPCs with high values for K_{ow}. The uncertainty lies in the source and meaning of the different biotransfer factors used for the different media. If the EPA (1998a) biotransfer factors do not incorporate all the pathways to all organisms from the single medium where each COPC is assumed to predominate, then the exposure will be underestimated. It is unlikely that the EPA transfer factors account for all pathways relevant to all fish.

Fish take up contaminants into their tissue via the water in contact with their gills and via the ingestion of water, abiotic particulates, and biota. Some organisms will be exposed by primarily one pathway, while others will be exposed over multiple pathways:

- Dissolved contaminants are primarily taken up across the gill membrane; thus, all organisms living in the water column will be exposed to dissolved contaminants.
- Filter-feeding organisms, which usually live in the water column, will also be exposed to contaminants bound to suspended particulates that they filter out of the water and ingest.
- Sediment-ingesting organisms that live in the water column will also be exposed to sediment contaminants by direct ingestion.
- Predatory fish, which are also water-column dwellers, will also be exposed to dissolved, particulate-bound, and sediment contaminants by ingesting prey that were so exposed, as well as by direct uptake from the water column and ingestion of suspended particulates.

In fact, there are probably few organisms that are exposed to only dissolved contaminants, perhaps only those that live in the water column and selectively feed on planktonic animals to the exclusion of abiotic particulates. Therefore, assigning each contaminant to a particular class of media (dissolved water, whole water, and bed sediment), based on its tendency to adsorb to particles or organic carbon, potentially neglects pathways from other media. Further discussion of uncertainty related to these pathways is presented in the ecological section (section 8.6) of this work plan.

6.7.5 Uncertainty in Plant Accumulation Modeling

Calculation of COPC and ROPC concentrations in biota incorporates the uncertainties inherent in calculation of air and soil concentrations because the air and soil are the sources of COPCs and ROPCs to plants. Uncertainties also arise from the assumption that the location of maximum soil concentration is the location of exposure to biota over a multiple-year period. Additionally, although COPCs and ROPCs are incorporated into plants and animal tissue, it is assumed that the COPC and ROPC concentration in soil does not decrease due to these processes. Assumptions of the animal feed ingestion rates introduce additional uncertainty because they are based on average rates.

Additional pathways, such as fugitive dust emissions or entrainment of soil in rainwater splash, may contribute to COPC and ROPC concentrations in biota. However, no equations are available to quantify these pathways. In addition, the chemical transport through inedible portions of plants (such as corn husks) may contribute to COPC and ROPC concentrations in edible portions of plants (such as corn kernel). Transfer factors for this type of chemical transport are not available.

6.8 Summary of Environmental Modeling

Air dispersion modeling will be used to determine COPC- and ROPC-specific concentrations and deposition rates resulting from emissions of the WTP. The assessment area will be a 50 km radius extending out from the WTP. These results will be used as input into the human health and ecological risk assessments.

The CALPUFF model will be used for the air quality modeling task. The WTP emissions, as determined by the design engineers, and one year of Hanford Site meteorological data collected by the Hanford Site Meteorological Station will be used as input into the model. COPC and ROPC-specific concentrations and deposition rates will be calculated at a gridded network of receptors and at specific sensitive receptors identified by the risk assessment analysts.

Fate and transport modeling will be used to estimate COPC and ROPC concentrations in various exposure media (air, soil, surface water, sediment, plants, and animal tissue). This modeling effort will utilize assumed emissions rates with a combination of site-specific and default parameters to describe the movement of COPCs and ROPCs through the environment. This modeling is predictive and cannot be confirmed by sampling environmental media since the emissions source does not yet exist. The uncertainty associated with this predictive modeling is addressed through the use of conservative assumptions whenever possible. Estimated media concentrations resulting from this modeling effort will be used in the exposure assessment for the human health (section 7) and ecological (section 8) risk assessments. Environmental modeling will be the same for the PRA and final risk assessment (FRA) with the possible inclusion of additional site-specific modeling parameters in the FRA.

Table 6-1 Site-Specific Parameters Used in Modeling Soil Concentrations

Parameter	Description	Value Used	Unit of Measure	Source	Used to Estimate[a]
a	Empirical intercept coefficient	0.6	unitless	EPA 1998a, based on expected watershed area	Soil loss due to erosion
A_L	Total watershed area receiving COPC deposition	4.00E+09	m^2	Estimated as half the study area	Soil loss due to erosion
BD	Soil bulk density	1.3	(g soil)/ (cm^3 soil)	Halvorson and others. 1998	Various soil loss mechanisms
C	USLE cover management factor	0.1	unitless	EPA 1998a	Soil loss due to erosion
ER	Soil enrichment ratio for organic COPCs	3	unitless	EPA 1998a	Soil loss due to erosion
	Soil enrichment ratio for inorganic COPCs	1	unitless	EPA 1998a	Soil loss due to erosion
E_v	Average annual evapotranspiration	12.045	cm/year	Converted from 0.33 mm/day; National Environmental Research Park 2002	Soil loss due to leaching
f_{oc}	Fraction of organic carbon in soil	0.01	unitless	EPA 1998a	Soil loss due to volatilization
I	Average annual irrigation	0	cm/year	Assumption	Soil loss due to leaching
K	USLE erodibility factor	0.36	ton/acre	EPA 1998a	Soil loss due to erosion
LS	USLE length-slope factor	1.5	unitless	EPA 1998a	Soil loss due to erosion
P	Average annual precipitation	18.19	cm/year	Western Regional Climate Center 2002	Soil loss due to leaching
PF	USLE supporting practice factor	1	unitless	EPA 1998a	Soil loss due to erosion
R	Universal gas constant	8.205E-05	atm-m^3/ mol-°K	EPA 1998a	Soil loss due to volatilization
RF	USLE rainfall (or erosivity) factor	50	1/yr	EPA 1998a	Soil loss due to erosion
ρ_s	Solids particle density	2.65	g/cm^3	EPA 1996a	Soil loss due to volatilization
RO	Average annual surface runoff	2.5	cm/yr	Estimated: assumes the majority of rainfall recharges or evaporates	Soil loss due to leaching
T_1	Time period at the beginning of combustion	0	years	Assumption	Soil concentration
T_2	Length of exposure duration	40	years	Assumption	Soil concentration
tD	Time period over which deposition occurs (time period of combustion)	40	years	Assumption	Soil concentration
θ_{sw}	Volumetric soil water content	2.00E-01	mL/cm^3	EPA 1998a	Various soil loss mechanisms
T_{wk}	Water body temperature	298	^{o}K	EPA 1998a	Soil loss due to volatilization
Z_s	Soil mixing zone depth;				Various soil loss mechanisms and soil concentration
	untilled soil	1	cm	EPA 1998a	
	root zone soil	15	cm	Assumption	
	tilled soil	20	cm	EPA 1998a	

COPC = chemical of potential concern.
EPA = US Environmental Protection Agency.
USLE = Universal Soil Loss Equation.
[a] This column indicates the parameters that are estimated by the parameter listed in the first column. For example, BD (soil bulk density) is used to estimate various soil loss mechanisms. For specific use of these parameters in specific equations for soil modeling, see equations 6-1 through 6-4 and equations B2-1 through B2-15.

Table 6-2 Site-Specific Parameters Used in Modeling Surface Water and Sediment

Parameter	Description	Value Used	Unit of Measure	Source	Used to Estimate[a]
a	Empirical intercept coefficient	0.6	unitless	Based on watershed area (EPA 1998a)	Watershed sediment delivery ratio (SD)
A_I	Impervious watershed area receiving COPC deposition	0	m^2	Estimated: assumes deposited COPCs are all mixed with soil	Load to water body from pervious soil runoff (L_{RP}) and load to water body from impervious soil runoff (L_{RI})
A_L	Total watershed area receiving COPC deposition	4.00E+09	m^2	Estimated as half of the study area	Load to water body from pervious soil runoff (L_{RP}), benthic burial rate constant (k_b), and watershed sediment delivery ratio (SD)
A_w	Water body surface area	6.00E+06	m^2	Estimated from map measurements	Total water body concentration (C_{wtot}), load to water body from direct deposition (L_{DEP}), load to water body from dry vapor diffusion (L_{DIF}), and benthic burial rate constant (k_b)
b	Empirical slope coefficient	0.125	unitless	EPA 1998a	Watershed sediment delivery ratio (SD)
BD	Soil bulk density	1.3	(g soil)/ (cm^3 soil)	Halvorson and others 1998	Load to water body from pervious soil runoff (L_{RP})
C	USLE cover management factor	0.1	unitless	EPA 1998a	Unit soil loss rate (X_e)
C_{BS}	Bed sediment concentration	1	g/cm^3	EPA 1998a	Sediment concentration (C_{sed}), fraction of water body concentration in water column (f_{wc}), and benthic burial rate constant (k_b)
d_{bs}	Depth of upper benthic sediment layer	0.03	m	EPA 1998a	Total water body concentration (C_{wtot}), total concentration in water column (C_{wctot}), sediment concentration (C_{sed}), fraction of water body concentration in water column (f_{wc}), total water body depth (d_z), and benthic burial rate constant (k_b)
d_{wc}	Depth of water column	7.5	m	Modeling data from Columbia Basin Research 1996	Total water body concentration (C_{wtot}), total concentration in water column (C_{wctot}), sediment concentration (C_{sed}), fraction of water body concentration in water column (f_{wc}) and total water body depth (d_z)
K	USLE erodibility factor	0.36	ton/acre	EPA 1998a	Unit soil loss rate (X_e)
K_G	Gas-phase transfer coefficient	36,500	m/yr	Value for flowing system (EPA 1998a)	Overall transfer rate coefficient (K_v)
LS	USLE length-slope factor	1.5	unitless	EPA 1998a	Unit soil loss rate (X_e)

Table 6-2 Site-Specific Parameters Used in Modeling Surface Water and Sediment

Parameter	Description	Value Used	Unit of Measure	Source	Used to Estimate[a]
PF	USLE supporting practice factor	1	unitless	EPA 1998a	Unit soil loss rate (X_e)
R	Universal gas constant	8.205E-05	atm-m^3/ mol-°K	EPA 1998a	Load to water body from dry vapor diffusion (L_{DIF}) and overall transfer rate coefficient (K_v)
RF	USLE rainfall (or erosivity) factor	50	1/yr	EPA 1998a	Unit soil loss rate (X_e)
RO	Average annual surface runoff	2.5	cm/yr	Estimated: assumes the majority of rainfall recharges or evaporates	Load to water body from pervious soil runoff (L_{RP})
θ	Temperature correction factor	1.026	unitless	EPA 1998a	Load to water body from dry vapor diffusion (L_{DIF}) and overall transfer rate coefficient (K_v)
θ_{bs}	Bed sediment porosity	0.6	$L_{pore\ water}$ / $L_{sediment}$	EPA 1998a	Sediment concentration (C_{sed}) and fraction of water body concentration in water column (f_{wc})
θ_{sw}	Soil volumetric water content	0.2	mL/cm^3	EPA 1998a	Load to water body from pervious soil runoff (L_{RP})
TSS	Total suspended solids concentration	10	mg/L	EPA 1998a	Dissolved phase water concentration (C_{dw}), fraction of water body concentration in water column (f_{wc}), water column volatilization rate constant (k_v), and benthic burial rate constant (k_b)
T_{wk}	Water body temperature	298	^{o} K	EPA 1998a	Load to water body from dry vapor diffusion (L_{DIF}) and overall transfer rate coefficient (K_v)
u	Current velocity	1.5	m/s	Modeling data from Columbia Basin Research 1996	Liquid-phase transfer coefficient (K_L)
Vf_x	Average volumetric flow rate through water body	4.00E+11	m^3/yr	Water Resources of Washington State 2002	Total water body concentration (C_{wtot}) and benthic burial rate constant (k_b)

COPC = Chemical of potential concern.
EPA = US Environmental Protection Agency.
USLE = Universal Soil Loss Equation.

[a] This column indicates the parameters that are estimated by the parameter listed in the first column. For example, the parameter a (the empirical intercept coefficient) is used to estimate the watershed sediment delivery ratio (SD). For specific use of these parameters in specific equations for surface water and sediment modeling, see equations 6-5 through 6-11 and equations B2-16 through B2-42.

Table 6-3 Site-Specific Modeling Parameters for Estimating Exposure Point Concentrations in Plants

Parameter	Description	Value Used[a]	Unit of Measure	Used to Estimate[b]
Fw	Fraction of constituent wet deposition that adheres to plant surfaces, for anions and two specific organic COPCs (p-chloroaniline and n-nitrosodi-n-propylamine) that ionize to anionic forms	0.2	unitless	All plants (direct deposition)
	Fraction of constituent wet deposition that adheres to plant surfaces, for cations and most organics (p-chloroaniline and n-nitrosodi-n-propylamine, which ionize to anionic forms, are the exceptions)	0.6	unitless	All plants (direct deposition)
Rp	Interception fraction of the edible portion of plant tissue, for produce (weighted average of fruits and vegetables)	0.39	unitless	Produce (direct deposition)
Rp_{fruit}	Interception fraction of the edible portion of plant tissue, for fruits	0.053	unitless	Fruits (direct deposition)
Rp_{veg}	Interception fraction of the edible portion of plant tissue, for vegetables	0.982	unitless	Vegetables (direct deposition)
Rp_{forage}	Interception fraction of the edible portion of plant tissue, for forage	0.05	unitless	Forage (direct deposition)
Rp_{silage}	Interception fraction of the edible portion of plant tissue, for silage	0.459[c]	unitless	Silage (direct deposition)
kp	Plant surface loss coefficient	18	$year^{-1}$	All plants (direct deposition)
Tp	Length of plant's exposure to deposition per harvest for edible portion of plant - produce (fruits and vegetables)	60/365 (0.164)	years	Produce (direct deposition)
Tp_{forage}	Length of exposure to deposition per harvest for edible portion of plant - forage	0.12	years	Forage (direct deposition)
Tp_{silage}	Length of exposure to deposition per harvest for edible portion of plant - silage	0.16	years	Silage (direct deposition)
Yp	Yield or standing crop biomass of the edible portion of the plant for produce (weighted average of fruits and vegetables)	2.24	(kg DW/m^2)	Produce (direct deposition)
Yp_{fruit}	Yield or standing crop biomass of the edible portion of the plant, for fruits	0.25	(kg DW/m^2)	Fruits (direct deposition)
Yp_{veg}	Yield or standing crop biomass of the edible portion of the plant, for vegetables	5.66	(kg DW/m^2)	Vegetables (direct deposition)
Yp_{forage}	Yield or standing crop biomass of the edible portion of the plant, for forage	0.0195[d]	(kg DW/m^2)	Forage (direct deposition)
Yp_{silage}	Yield or standing crop biomass of the edible portion of the plant, for silage	0.8	(kg DW/m^2)	Silage (direct deposition)
VG_{ag}	Empirical correction factor for aboveground produce with log $K_{ow} \geq 4$	0.01	unitless	Produce (air-to-plant transfer)
	Empirical correction factor for aboveground produce with log $K_{ow} < 4$	1	unitless	Produce (air-to-plant transfer)
$VG_{ag(forage)}$	Empirical correction factor for forage	1	unitless	Forage (air-to-plant transfer)
$VG_{ag(silage)}$	Empirical correction factor for silage	0.5	unitless	Silage (air-to-plant transfer)
ρ_a	Density of air	1200	g/m^3	All plants (air-to-plant transfer)
$VG_{rootveg}$	Empirical correction factor for belowground produce with log $K_{ow} \geq 4$	0.01	unitless	Belowground produce (root uptake)
	Empirical correction factor for belowground produce with log $K_{ow} < 4$	1	unitless	Belowground produce (root uptake)

[a] Parameters taken from Human Health Risk Assessment Protocol (HHRAP) (EPA 1998a) unless otherwise noted.

[b] This column indicates the parameters that are estimated by the parameter listed in the first column. For example, Fw (fraction of constituent wet deposition that adheres to plant surfaces) is used to estimate plant concentrations from direct deposition. For specific use of these parameters in specific equations for plant modeling, see equations 6-12 through 6-26.

[c] Calculated per HHRAP (EPA 1998a) using default value for Yp_{silage}. Rp is calculated as 1 - exp[-(γ)(Yp)] = 1 - exp[-(0.769)(0.8)] = 0.459 where γ is the empirical constant and Yp is the yield for silage.

[d] Fresh yield value of 1500 kg/ha reported for Richland, Washington, in *Estimating Grazingland Yield from Commonly Available Data* (Wisiol 1984) converted to dry yield assuming 87 % moisture content. The calculation is made as follows: (1500 kg/ha fresh yield) ´ (1 ha / 10,000 m2) ´ (1 - 0.87) = 0.0195 kg/m2 dry yield.

Table 6-4 Mass Limited Soil-to-Plant Uptake Factors

Plant Type	Yield (kg/m^2)	Source	Mass-Limited Uptake Factors[a]		
			Tilled[b]	Untilled[c]	Root Zone[d]
Aboveground Produce[e]	2.24	Default value (EPA 1998a)	1.45	NA	1.09
Belowground Produce[e]	0.75	WA Ag. Statistical Service 2001	4.33	NA	3.25
Forage[f]	0.0195	Value for Richland, WA (Wisiol 1984)	NA	NA	10000
Silage[g]	0.8	Default value (EPA 1998a)	8.13	NA	NA
Grain[g]	0.25	Value for processing sweet corn (WA Ag. Statistical Service 2001)	26	NA	19.5

NA = Not applicable.

[a] Calculated as [Soil density (kg/m^2) / Plant yield (kg DW/m^2)] × modifying factor.

[b] Tilled soil is mixed to a depth of 20 cm. Soil density = 260 kg/m^2 (1300 kg/m^3 × 0.2 m). Tilled soil values are used for plants grown for ingestion by resident and subsistence farmer receptors, and feed (silage and grain) grown for domestic animals.

[c] Untilled soil is used for direct contact pathways only.

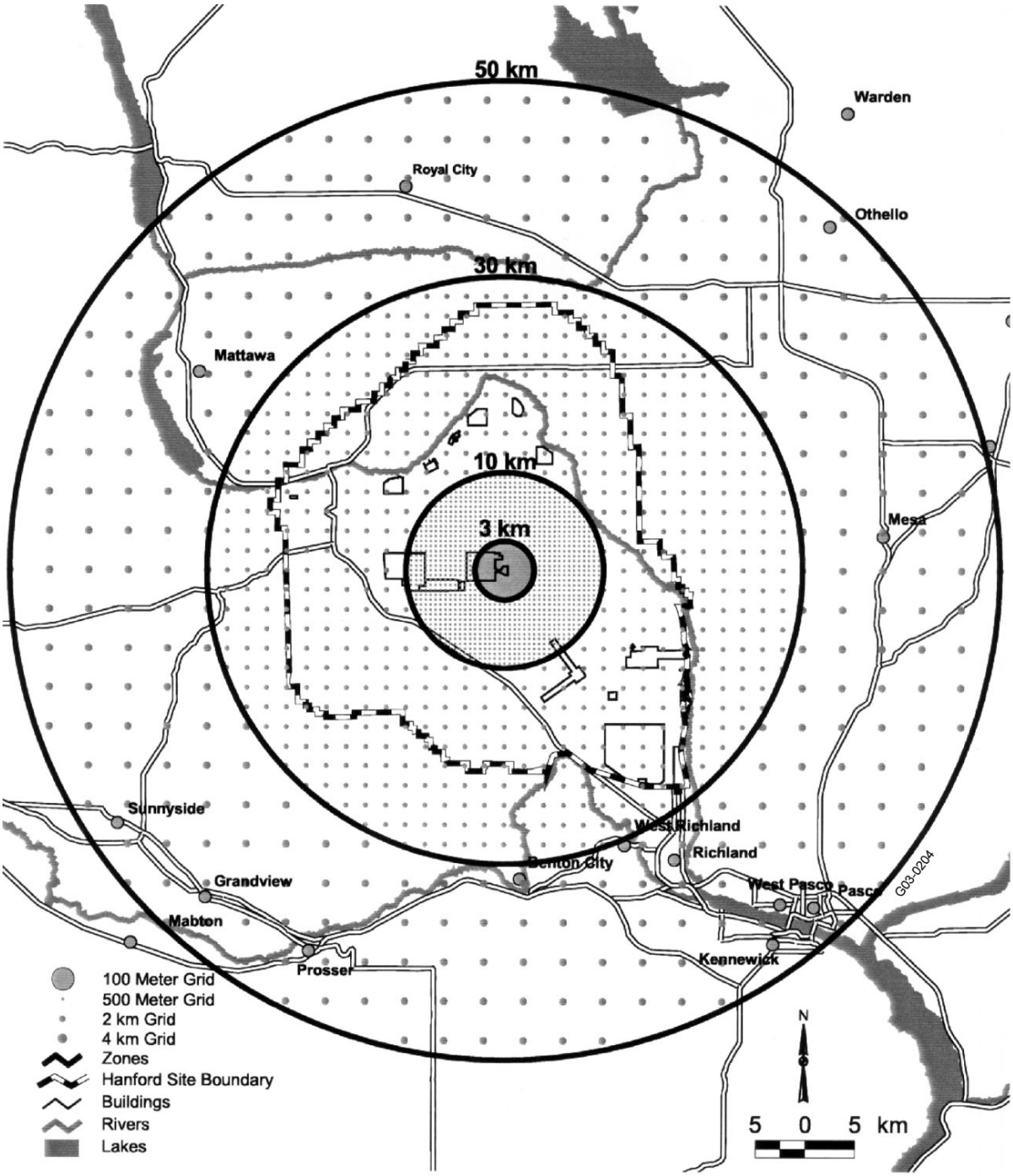
[d] Root zone is mixed to a depth of 15 cm. Soil density = 195 kg/m^2 (1300 kg/m^3 × 0.15 m). Root zone values are used for vegetation ingested by Native Americans and forage for domestic and wild animals.

[e] Modifying factor for produce is 1/2 (for split between above and belowground produce) × 1/40 (for operating duration) = 1/80.

[f] Modifying factor for forage is 1.

[g] Modifying factor for silage and grain is 1/40.

Figure 6-1 Exposure Grids in Each Concentric Zone



Contents

7 Screening Human Health Risk Assessment 7-1

7.1 Exposure Assessment 7-1
7.1.1 Characterization of Exposure Setting 7-2
7.1.2 Identification of Receptor Types 7-3
7.1.3 Description of Exposure Scenarios 7-4
7.1.4 Exposure Pathways 7-14
7.1.5 Quantification of Exposure 7-15
7.1.6 Exposure Parameters 7-26
7.1.7 Exposure Point Concentrations 7-29

7.2 Toxicity Assessment 7-44
7.2.1 General Toxicity Information and EPA Guidance for COPCs 7-44
7.2.2 Toxicity Information and EPA Guidance for Specific COPCs 7-51
7.2.3 Surrogate Values 7-55
7.2.4 Toxicity Information and EPA Guidance for ROPCs 7-55

7.3 Risk Characterization 7-58
7.3.1 Risk Characterization for Carcinogens 7-59
7.3.2 Risk Characterization for Noncarcinogens 7-60
7.3.3 Risk Characterization for Acute Effects 7-61

7.4 Uncertainty in Human Health Risk Assessment 7-61
7.4.1 Uncertainty in Exposure Assessment 7-61
7.4.2 Uncertainty in Toxicity Assessment 7-62
7.4.3 Uncertainty in Risk Characterization 7-63
7.4.4 Summary of Uncertainty 7-64

7.5 Summary for Human Health Risk Assessment 7-64

Tables

Table 7-1 Human Receptor Populations and Exposure Pathways for the Preliminary Risk Assessment for the Hanford WTP 7-65

Table 7-2 Exposure Parameters for Human Health Risk Assessment: Hanford Site Industrial Worker Scenario 7-66

Table 7-3 Exposure Parameters for Human Health Risk Assessment: Residential Scenarios 7-68

Table 7-4 Exposure Parameters for Human Health Risk Assessment: Native American Subsistence Residential Scenario 7-70

Table 7-5 Modeling Parameters for Estimating Exposure Point Concentrations in Biota for Human Consumption 7-72

Table 7-6 Mass Limited Feed-to-Animal Tissue Biotransfer Factors 7-73

Table 7-7 Toxicity Values for Human Health Risk Assessment: Organic COPCs 7-74

Table 7-8 Toxicity Values for Human Health Risk Assessment: Inorganic COPCs 7-82

Table 7-9 **Toxicity Values for Human Health Risk Assessment in Original Units: Organic COPCs** **7-84**

Table 7-10 **Toxicity Values for Human Health Risk Assessment in Original Units: Inorganic COPCs** **7-88**

Table 7-11 **Acute Inhalation Exposure Criteria for COPCs (mg/m^3)** **7-89**

Table 7-12 **Acute Inhalation Exposure Criteria for COPCs in Original Units of Parts per Million (ppm)** **7-102**

Table 7-13 **Toxicity Equivalency Factors (TEFs) Used in Human Health Risk Assessment** **7-111**

Table 7-14 **Toxicity Values for Human Health Risk Assessment: Radionuclide COPCs** **7-112**

Table 7-15 **Acute Radionuclide Exposure Criteria (AREC) Based on Total Acute Radiation Dose of 100 mrem** **7-115**

Figures

Figure 7-1 **Human Health Conceptual Exposure Model** **7-117**

Figure 7-2 **Locations of Potential Human Receptors including Potentially Sensitive Receptors** **7-118**

Figure 7-3 **Hanford Site Existing Land Use Map - 1996** **7-119**

Figure 7-4 **Hanford Site Projected Land Use - 2046** **7-120**

Figure 7-5 **Native American Subsistence Resident Hunting and Gathering Areas** **7-121**

7 Screening Human Health Risk Assessment

The human health risk assessment (HHRA) process includes four fundamental components: (1) data evaluation, (2) exposure assessment, (3) toxicity assessment, and (4) risk characterization. The data evaluation step is the selection of chemicals of potential concern and radionuclides of potential concern (COPCs and ROPCs) discussed in section 4 of this work plan and the quantification of emissions discussed in section 5. Each of the remaining three components is discussed below:

- Exposure assessment – section 7.1
- Toxicity assessment – section 7.2
- Risk characterization – section 7.3

The SLRA is designed to identify, early in the process, any potential risks associated with the WTP. The SLRA has been designed to overestimate potential risks by using conservative exposure assumptions combined with conservative toxicity values. The HHRA is one part of the screening-level risk assessment (SLRA) that focuses on human health.

7.1 Exposure Assessment

Exposure assessment is the process of estimating the magnitude, frequency, duration, and type of potential exposures to COPCs and ROPCs. This section presents the exposure scenarios and approach for conducting the quantitative exposure assessment.

A human health conceptual exposure model identifies exposure scenarios that are defined by potentially exposed populations and exposure pathways. The conceptual exposure model used for this work plan is shown as Figure 7-1 and was developed from guidance and information obtained from the *Human Health Risk Assessment Protocol for Hazardous Waste Combustion Facilities* (HHRAP) (EPA 1998a), the *Screening Assessment and Requirements for a Comprehensive Assessment: Columbia River Comprehensive Impact Assessment* (DOE-RL 1998), *A Native American Exposure Scenario* (Harris and Harper 1997), and discussions with the Washington State Department of Ecology (Ecology), US Environmental Protection Agency (EPA), and Native American tribal representatives.

The conceptual exposure model focuses on identifying complete exposure pathways for potentially exposed populations. An exposure pathway is the means through which an individual may come in contact with a chemical in the environment. Exposure pathways are determined by:

- Environmental conditions (such as location of receptors, vegetative cover, and wind speed and direction)
- The potential for chemical migration through environmental media (such as soil, vegetation, or air)
- Lifestyles and work activities of potentially exposed populations

Although several potential pathways may exist, not all may be complete. For a pathway to be complete, all of the following four factors must exist:

- COPC or ROPC release into the environment

- Release and transport mechanism (such as deposition to soil) that moves the COPC or ROPC from the source to other locations
- Point of contact for receptors to be exposed to the affected media
- Exposure pathway such as breathing vapors or ingesting affected media

These four factors were considered in the development of the conceptual exposure model. The sources of COPC and ROPC release are the WTP stacks and flues (see section 5). Transport processes, potential points of contact, and complete exposure pathways are identified to formulate exposure scenarios that will be the focus of the quantitative risk assessment. The process of exposure assessment is detailed in the following subsections.

7.1.1 Characterization of Exposure Setting

Characterizing the exposure setting is the first step in identifying potentially exposed populations. This characterization includes identifying the location of human populations within the study area and types of activities that can be expected under current and reasonable potential future land use. The brief site characterization provided in this section is adequate to identify most possible human receptors, especially the most significantly exposed receptors. A more detailed site characterization will be supplied in the pre-demonstration test risk assessment (PRA) to describe all the populations evaluated.

The study area is defined as the area within a 50 km radius of the WTP. While it is possible for human populations to be exposed beyond this 50 km radius, the concentration of airborne and deposited emissions will be orders of magnitude less than those within the study area, essentially approaching zero. EPA (1998a) reports that at other facilities the most significant deposition of airborne emissions has been observed within a 3 km radius of a source. The Hanford Site boundary extends approximately 9 km to 28 km from the WTP. The Columbia River is located approximately 8 km to more than 20 km from the WTP. Therefore, the potential for offsite impacts is expected to be minimal; however, because of the importance of the Columbia River as a potable water and recreational resource, it will be included in the quantitative risk assessment. Currently, no residential receptors are present on the Hanford Site, nor are there likely to be any in the near future (that is, within the next 50 years). Game animals that browse on Hanford Site property and plants that grow on Hanford Site property may be harvested by Native Americans living off site.

Characterization of the exposure setting includes the following:

- Characterization of the physical setting, including location of important physical features such as Gable Mountain, surface water bodies, and watersheds
- Characterization of potentially exposed populations, including identifying the location and activity patterns of current populations relative to the facility, determining plausible future land use, and identifying subpopulations of potential concern

Characterization will concentrate on the areas potentially most impacted by emissions, based on the results of the air-dispersion modeling and will include both current and future land use. The exposure assessment will focus on four locations of interest:

- Onsite ground maximum - location of maximum predicted ground-level concentrations of both airborne and deposited emissions. This location generally represents worst-case human and ecological exposures because very few receptors are expected to be present here.
- Hanford offsite maximum - location of maximum predicted ground-level concentrations of both airborne and deposited emissions outside the Hanford Site boundary. This location represents a more plausible location for most human receptors and is an important point of compliance.
- Gable Mountain maximum - location of maximum predicted ground-level concentrations of both airborne and deposited emissions at Gable Mountain. This location is included due to its importance to Native American populations in the Oregon-Washington area.
- Columbia River maximum - location of maximum predicted ground-level concentrations of both airborne and deposited emissions at the Columbia River. This location is used to evaluate potential risks to aquatic ecological receptors and as a source of potable water for human receptors.

7.1.2 Identification of Receptor Types

EPA (1998a) recommends that the following receptor types be evaluated for assessing potential risks from thermal treatment facilities:

- Resident (adult and child)
- Subsistence farmer (adult and child)
- Subsistence fisher (adult and child)
- Nursing infant
- Acute risk

The nursing infant scenario is recommended by EPA guidance (EPA 1998a) to address specific concerns regarding exposure to polychlorinated dibenzo-p-dioxins (PCDDs) and polychlorinated dibenzo-p-furans (PCDFs) because these chemicals are known to accumulate in human milk. EPA guidance recommends inclusion of the nursing infant only for PCDDs/PCDFs; however, coplanar polychlorinated biphenyls (PCBs) will also be evaluated for this pathway in the SLRA due to their potential to behave, physiologically, like PCDDs/PCDFs. Because radionuclides are a major component of the waste to be treated at the facility, several ROPCs will also be evaluated for this pathway. The ROPCs strontium (Sr-90), iodine (I-129), and cesium (Cs-134 and Cs-137) will be evaluated for the nursing infant scenario. These radionuclides were selected because they are potentially present in the waste, are judged to have the highest potential for accumulation in milk, and due to their toxicity (CCN 064327). No other COPCs or ROPCs will be evaluated for the nursing infant scenario, because other COPCs and ROPCs have not been shown to accumulate in human milk. Nursing infant exposure will be evaluated based on intakes for the Hanford Site industrial worker, resident adult, resident subsistence farmer adult, and Native American subsistence resident adult.

Special subpopulations are defined as human receptors or segments of the population that potentially may be at higher risk due to receptor sensitivity to COPCs and ROPCs or due to unique lifestyle activities. To address potentially sensitive subpopulations, the following additional exposure scenarios will be evaluated:

- Hanford Site industrial worker
- Native American subsistence resident

Workers employed at the WTP will not be included in the risk assessment because other regulations exist for occupational exposures within the WTP boundary (for example, DOE standards for occupational safety and health). However, because of the WTP's location within the Hanford Site, the closest and most likely receptors are other Hanford Site workers located outside the WTP boundary. Therefore, the Hanford Site industrial worker scenario will be included in the risk assessment.

Native American tribes (Nez Perce Tribe, Yakama Indian Nation, and Confederated Tribes of the Umatilla Indian Reservation [CTUIR]) ceded the land currently occupied by the US government's Hanford Site. However, these tribes retained the rights to the use of resources on this land. Representatives of these tribes have expressed a desire to be able to use this land to conduct a traditional lifestyle. A wide range of possible Native American activities related to traditional lifestyles exists. The Native American scenario will address a variety of potential exposures associated with food gathering (including hunting, fishing, and Native American plant gathering), as well as cultural and social activities (for example, use of a sweat lodge).

The exposure scenarios included in the quantitative risk assessment are designed to cover a wide range of possible receptor activities, age groups, and lifestyles. These receptors represent the most highly exposed populations that could work or live near the Hanford Site, including adult workers, adult and child residents and farmers, and Native Americans living a traditional lifestyle. The exposure assessment and risk characterization results for the selected receptors are designed to be protective of other populations and special subpopulations of interest. For example, the resident child receptor provides a bounding estimate for other child activities such as children attending school or daycare. This scenario assumes a high level of potential exposure (for example, the resident child is present 7 days per week, 24 hours per day and ingests homegrown produce) at the location of maximum contaminant concentration. Hence, risk-management decisions based on these conservative assumptions will be protective of other child populations (for example, at a school or daycare center where exposure would be less because a child may be present 5 days per week for less than 12 hours per day). Other possible special subpopulations are being evaluated by identifying their locations and determining whether they are located in areas that are potentially at risk from WTP emissions. Figure 7-2 provides a map showing (1) the location of the WTP, (2) the locations of potential receptor populations (such as cities), and (3) locations of potentially sensitive subpopulations (such as daycare centers and preschools, schools, hospitals, and nursing homes).

7.1.3 Description of Exposure Scenarios

Exposure scenarios to be addressed by the risk assessment are described in more detail below and summarized in Table 7-1. Exposure scenarios are defined for current and future land-use conditions. For the SLRA, *current* and *future* are defined as follows.

Current Land Use. For this work plan, *current* is defined as the 40-year operating lifetime of the WTP beginning in approximately 2008. This period corresponds approximately to the period addressed by the *Final Hanford Comprehensive Land-Use Plan (CLUP) Environmental Impact Statement* (DOE 1999a) of at least 50 years from publication of the Record of Decision (ROD) (DOE 1999b), that is, 1999 through 2049.

Current land use within the 50 km study area is characterized based on aerial photographs, zoning maps, land development plans, and information presented in the CLUP and the following additional documents:

- *Record of Decision (ROD): Hanford Comprehensive Land-Use Plan Environmental Impact Statement* (DOE 1999b)
- *The Future for Hanford: Uses and Cleanup* (DOE 1992)

Figure 7-3 shows existing land use within the study area as of 1996 (DOE 1999a). Figure 7-4 shows current (that is, over approximately the next 40 years) land use on the Hanford Site as defined by the CLUP. Representatives of the Nez Perce Tribe, Yakama Indian Nation, and CTUIR are also being consulted in evaluating current land use in the study area.

Future Land Use. For this work plan, future exposure scenarios begin after WTP shutdown (following 40 years of operation). For example, the future resident subsistence farmer is assumed to be exposed from year 40 to year 80.

Plausible future land use is characterized based on information presented in the documents listed above. Representatives of the Nez Perce Tribe, Yakama Indian Nation, and CTUIR are also being consulted in evaluating future land use in the study area.

In addition to the information in DOE 1999b and DOE 1992, DOE has indicated that:

- The 200 Areas (a.k.a. Central Plateau) will remain industrial past the 50-year timeframe of the CLUP because mixed waste has been, and will continue to be, buried there as a result of remedial activities at the rest of the Hanford Site.
- There will not be any onsite residential development (within the Hanford site boundary) in the foreseeable future

Both current and future land-use assumptions must also consider the newly created Hanford Reach National Monument, which includes the Saddle Mountain National Wildlife Refuge north of the Columbia River and the Arid Lands Ecology Reserve in the western portion of the Hanford Site.

Within these timeframes, exposure scenarios may be classified as being either plausible or worst case as defined below.

Plausible exposure scenarios represent receptors that currently exist, or may reasonably be expected to exist in the future, at a given location. For example, workers are currently present in the 200 Areas; therefore, the Hanford Site industrial worker is a current plausible exposure scenario at that location. This does not mean that the exposure scenario as described here (a worker present at the point of maximum emissions concentration, 8 hours per day, 250 days per year, for 20 years) portrays actual current workers, but rather, that this type of receptor (onsite worker) is plausible at that location.

Worst-case exposure scenarios represent receptors that are not reasonably expected to exist now or in the future at the specified location. For example, a resident subsistence farmer will be evaluated as a future worst-case receptor at the point of maximum emissions concentrations (likely at the 200 Areas), but it is unlikely that (1) residential development will ever occur in this location, or (2) such a receptor (a totally self-sustaining farmer) will ever exist at this location.

7.1.3.1 Hanford Site Industrial Worker

General Description

This receptor is an adult worker employed near the WTP and living offsite. Workers employed at the WTP will not be included in the risk assessment because other regulations exist for occupational exposures within the WTP boundary (such as DOE standards for occupational safety and health). The Hanford Site industrial worker will be evaluated using occupational exposure assumptions primarily from DOE-RL 1995 and residential exposure assumptions primarily from EPA (1998a, 2003a, CCN 063810, CCN 063807, CCN 063805, CCN 064331, CCN 063806, CCN 063816), as described in section 7.1.6.

Exposure Pathways

The Hanford Site industrial worker is exposed on site (during work hours) through inhalation of emissions, ingestion of soil, inhalation of resuspended soil, ingestion of drinking water, and external exposure to radionuclides in air and soil. This worker is also assumed to be exposed while at home through these same pathways and through ingestion of homegrown produce.

Current Exposure Location

This receptor is assumed to work at the onsite ground maximum. The onsite ground maximum location is a 100 m by 100 m area (defined in section 6.1) represented by the point or points predicted to have the highest concentration of airborne and deposited emissions. This receptor is assumed to live at the Hanford offsite maximum. This offsite location is a 500 m by 500 m area represented by the single grid point predicted to have the highest concentration of airborne and deposited emissions. The Hanford Site industrial worker is assumed to obtain drinking water from the Columbia River maximum. Current exposure of a Hanford Site industrial worker is considered a plausible scenario since workers are present in this area and may live off site.

Future Exposure Location

The current and future exposure locations for the Hanford Site industrial worker are the same. Future exposure of a Hanford Site industrial worker is also considered a plausible scenario because workers are present and are expected to continue to be present in this area. A future scenario with the Hanford Site industrial worker living at the onsite ground maximum is not evaluated because that location cannot be industrial and residential at the same time.

7.1.3.2 Nursing Infant of Hanford Site Industrial Worker

General Description

The nursing infant of the Hanford Site industrial worker is the infant of the worker described above.

Exposure Pathways

The nursing infant of the Hanford Site industrial worker is assumed to be exposed to PCDDs/PCDFs, PCBs, and four ROPCs through ingestion of breast milk from the worker exposed through:

- Inhalation of emissions, ingestion of soil, inhalation of resuspended soil, ingestion of drinking water, and external exposure to radionuclides in air and soil while at work
- Inhalation of emissions, ingestion of soil, inhalation of resuspended soil, ingestion of drinking water, external exposure to radionuclides in air and soil, and ingestion of homegrown produce while at home

Current Exposure Location

The nursing infant of the Hanford Site industrial worker is assumed to reside with the worker described above at the Hanford offsite maximum point or points. Current exposure of a nursing infant of the Hanford Site industrial worker is considered a plausible scenario since workers are present in this area and may live (be a resident) off site.

Future Exposure Location

The current and future exposure locations for the nursing infant of the Hanford Site industrial worker are the same because if the onsite ground maximum remains industrial (that is, a worker is there), then this area is not residential. Future exposure of a Hanford Site industrial worker is also considered a plausible scenario since workers are present and are expected to continue to be present in this area.

7.1.3.3 Resident

General Description

The resident is assumed to live, work, and play at a single location and, thus, is assumed to be home 24 hours per day, 350 days per year, with 2 weeks per year on vacation or otherwise away from the home. This receptor is assumed to have a garden that supplies fruit and vegetables. Both an adult and a child resident will be evaluated using EPA default (1998a) and other EPA-recommended (CCN 063810, CCN 063807, CCN 063805, CCN 063806) exposure assumptions described in section 7.1.6.

Exposure Pathways

The resident (adult and child) is assumed to be exposed through direct inhalation of airborne emissions, ingestion of soil, inhalation of resuspended soil, ingestion of drinking water, external exposure to radionuclides in air and soil, and ingestion of homegrown produce.

Current Exposure Location

The closest resident at the time of this work plan (2003) is located more than 20 km from the WTP. However, in this work plan, *current* is defined as the 40-year operating lifetime of the WTP (beginning in approximately 2008). Therefore, it is assumed that a current resident may be located at the Hanford offsite maximum sometime during this 40-year period. This offsite location is a 500 m by 500 m area represented by the single grid point or points predicted to have the highest concentration of airborne and deposited emissions. The resident is assumed to obtain drinking water from the point of maximum concentration in the Columbia River. Current exposure of a resident at the Hanford offsite maximum is considered a plausible scenario since residents are present outside the site boundary and residential development could occur at the offsite maximum point or points within the next 40 years.

Future Exposure Location

Residential development is assumed to occur at the onsite ground maximum sometime in the future. This location is a 100 m by 100 m area (defined by the air dispersion modeling grid) represented by the grid point or points predicted to have the highest concentration of airborne and deposited emissions. The resident is assumed to obtain drinking water from the point of maximum concentration in the Columbia River. Future exposure of a resident at the onsite ground maximum is considered a worst-case scenario because future development at this location is unlikely due to the presence of other industrial and mixed waste operations in the 200 Areas.

7.1.3.4 Nursing Infant of Resident

General Description

The nursing infant of the resident is the infant of the adult resident described above.

Exposure Pathways

The nursing infant of the resident is assumed to be exposed to PCDDs/PCDFs, PCBs, and four ROPCs through ingestion of breast milk from the adult resident exposed through inhalation of emissions, ingestion of soil, inhalation of resuspended soil, ingestion of drinking water, and ingestion of homegrown produce.

Current Exposure Location

The nursing infant of the resident is assumed to reside with the resident described above at the Hanford offsite maximum point or points. Current exposure of a nursing infant of the resident at the Hanford offsite maximum is considered a plausible scenario since residents are present outside the site boundary and residential development could occur at the offsite maximum point or points within the next 40 years.

Future Exposure Location

The nursing infant of the resident is assumed to reside with the resident described above at the onsite ground maximum sometime in the future. Future exposure of a nursing infant of a resident at the onsite ground maximum is considered a worst-case scenario because future development at this location is unlikely due to the presence of other industrial and hazardous waste operations in the 200 Areas.

7.1.3.5 Resident Subsistence Farmer

General Description

The resident subsistence farmer is assumed to live, work, and play at a single location (that is, the resident farmer is assumed to be at home 24 hours per day, 350 days per year, with 2 weeks per year on vacation or otherwise away from the home). This receptor is assumed to maintain a farm that supplies his or her produce (fruit and vegetable), meat (beef, pork, and poultry), dairy products, and eggs. Both an adult and a child resident subsistence farmer will be evaluated using EPA default (1998a) and other EPA-recommended (CCN 063807, CCN 064331, CCN 063806, CCN 063804) exposure assumptions described in section 7.1.6.

Exposure Pathways

The resident subsistence farmer (adult and child) is assumed to be exposed through inhalation of emissions, ingestion of soil, inhalation of resuspended soil, ingestion of drinking water, external exposure to radionuclides in air and soil, and ingestion of homegrown produce, beef, pork, poultry, dairy products, and eggs.

Current Exposure Location

The closest resident at the time of this work plan (2003) is located more than 20 km from the WTP. However, in this work plan, *current* is defined as the 40-year operating lifetime of the WTP (beginning in approximately 2008). Therefore, it is assumed that a current resident subsistence farmer may be located at the Hanford offsite maximum. This offsite location is a 500 m by 500 m area represented by the single

grid point-predicted to have the highest concentration of airborne and deposited emissions. The resident subsistence farmer is assumed to obtain drinking water from the point of maximum concentration in the Columbia River. Current exposure of a resident subsistence farmer at the Hanford offsite maximum is considered a worst-case scenario because, while resident farmers may be present outside the site boundary, the defined exposure scenario (that is, a farmer producing his or her own food, as described in section 7.1.6.2, within a 500 m by 500 m area) is unlikely.

Future Exposure Location

Residential development is assumed to occur at the onsite ground maximum location sometime in the future. This location is a 100 m by 100 m area (defined by the CALPUFF air dispersion modeling grid) represented by the single grid point-predicted to have the highest concentration of airborne and deposited emissions. The resident subsistence farmer is assumed to obtain drinking water from the point of maximum concentration in the Columbia River. Future exposure of a resident subsistence farmer at the onsite ground maximum is considered a worst-case scenario because future development at this location is unlikely due to the presence of other industrial and hazardous waste operations in the 200 Areas and because the defined exposure scenario (that is, a farmer producing his or her own food, as described in section 7.1.6.2, within a 100 m by 100 m area) is considered unlikely.

7.1.3.6 Nursing Infant of Resident Subsistence Farmer

General Description

The nursing infant of the resident subsistence farmer is the infant of the adult resident subsistence farmer described above.

Exposure Pathways

The nursing infant of the resident subsistence farmer is assumed to be exposed to PCDDs/PCDFs, PCBs, and four ROPCs through ingestion of breast milk from the adult resident subsistence farmer exposed through inhalation of emissions, ingestion of soil, inhalation of resuspended soil, ingestion of drinking water, and ingestion of homegrown produce, beef, pork, poultry, dairy products, and eggs.

Current Exposure Location

The nursing infant of the resident subsistence farmer is assumed to reside with the resident subsistence farmer described above at the Hanford offsite maximum point or points. Current exposure of a nursing infant of the resident subsistence farmer at the Hanford offsite maximum is considered a worst-case scenario because, while resident farmers may be present outside the site boundary, the defined exposure scenario (that is, an infant nursed for one year by a farmer producing her own food at a single grid node) is unlikely.

Future Exposure Location

The nursing infant of the resident subsistence farmer is assumed to reside with the resident subsistence farmer described above at the onsite ground maximum sometime in the future. Future exposure of a nursing infant of a resident at the onsite ground maximum is considered a worst-case scenario because future development at this location is unlikely due to the presence of other industrial and hazardous waste operations in the 200 Areas and because the defined exposure scenario (that is, an infant nursed for one year by a farmer producing his or her own food within a small home area) is worst-case.

7.1.3.7 Resident Subsistence Fisher

General Description

The resident subsistence fisher scenario is the same as the resident scenario with the addition of fish ingestion. This receptor is assumed to live, work, and play at a single location (that is, the resident is assumed to be at home 24 hours per day, 350 days per year, with 2 weeks per year on vacation or otherwise away from the home). This receptor is assumed to have a garden that supplies fruit and vegetables and to obtain fish from the Columbia River. Both an adult and a child resident subsistence fisher will be evaluated using the EPA default (1998a) and other EPA-recommended (CCN 063810, CCN 063807, CCN 063805, CCN 063806) exposure assumptions described in section 7.1.6.

Exposure Pathways

The resident subsistence fisher (adult and child) is assumed to be exposed through inhalation of emissions, ingestion of soil, inhalation of resuspended soil, ingestion of drinking water, external exposure to radionuclides in air and soil, ingestion of homegrown produce, and ingestion of locally caught fish.

Current Exposure Location

The closest resident at the time of this work plan (2003) is located more than 20 km from the WTP. However, for this risk assessment work plan (RAWP), *current* is defined as the 40-year operating lifetime of the WTP (beginning in approximately 2008). Therefore, it is assumed that a current resident subsistence fisher may be located at the Hanford offsite maximum point or points sometime during this 40-year period. This offsite location is a 500 m by 500 m area represented by the single grid point predicted to have the highest concentration of airborne and deposited emissions. The resident subsistence fisher is assumed to obtain drinking water and fish from the point of maximum concentration in the Columbia River. Current exposure of a resident subsistence fisher at the Hanford offsite maximum is considered a worst-case scenario because, while residents might be present outside the site boundary and fish the Columbia River, the defined exposure scenario (that is, a fisher growing fruit and vegetables and ingesting locally caught fish every day) is unlikely.

Future Exposure Location

Residential development is assumed to occur at the onsite ground maximum sometime in the future. This location is a 100 m by 100 m area (defined in section 6.1) represented by the single grid point predicted to have the highest concentration of airborne and deposited emissions (excluding the 200 Areas, which will remain industrial due to buried waste). The resident subsistence fisher is assumed to obtain drinking water and fish from the point of maximum concentration in the Columbia River. Future exposure of a resident subsistence fisher at the onsite ground maximum is considered a worst-case scenario because future development at this location is unlikely due to the presence of other industrial and hazardous waste operations in the 200 Areas and because the defined exposure scenario is unlikely in any location.

7.1.3.8 Native American Subsistence Resident

General Description

The Native American subsistence resident is assumed to live a traditional subsistence lifestyle. The traditional lifestyles of the Nez Perce, Yakama Indian Nation, and Confederated Tribes of the Umatilla Indian Reservation (CTUIR) were historically based on a seasonal cycle of travel among hunting, plant gathering, and fishing areas. The most common foods were salmon, roots (including camas bulb, bitterroot, wild carrot, and wild potato), berries (including service berries, gooseberries, huckleberries,

chokecherries, and wild strawberries), deer, and elk. Each of these foods was collected in different locations during different seasons. The seasonal cycle of food gathering encompassed a large area including the lowlands along the Columbia River and its tributaries, foothills and prairies, and higher mountainous areas. Presently, tribal members may hunt in areas such as the North Slope (a.k.a. Saddle Mountain National Wildlife Refuge, north of the Columbia River), fish near the Vernita bridge (where the Columbia River enters the western boundary of the Hanford Site), and occasionally gather food at sites such as the McGee Ranch (south of the Columbia River at the western boundary of the Hanford Site). Members of the three tribes potentially impacted at Hanford would be individuals pursuing a traditional lifestyle. The traditional lifestyle of these three tribes is heavily dependent on fish (primarily salmon) in addition to game and plants; therefore, a separate hunter/gatherer and fisher would not exist. A more realistic receptor is a combination hunter/gatherer/fisher.

The Native American subsistence resident is assumed to hunt and fish to supply his or her meat (game and wildfowl), egg (from wildfowl), and fish needs, and to gather native plants to supply his or her plant (fruit and vegetable) needs. Both an adult and a child Native American subsistence resident will be evaluated using exposure assumptions from *A Native American Exposure Scenario* (Harris and Harper 1997), EPA Region 10 (CCN 063810, CCN 063824, CCN 063805, CCN 064331, CCN 063806), and the CTUIR (CCN 064333) provided in section 7.1.6.

Exposure Pathways

The Native American subsistence resident (adult and child) is assumed to be exposed through inhalation of emissions; ingestion of soil; inhalation of resuspended soil; ingestion of drinking water; external exposure to radionuclides in air and soil; and ingestion of wild plants, game, wildfowl, fish, and wildfowl eggs. In addition to these pathways, the Native American subsistence resident adult is also assumed to be exposed through inhalation and dermal exposure to resuspended constituents from water in a sweat lodge.

Current Exposure Location

The Native American subsistence resident is assumed to live off site at the Hanford offsite maximum, visit the Gable Mountain maximum for ceremonial activities, consume fish from the Columbia River maximum, and consume wild game, wildfowl, wildfowl eggs, and plants harvested on site. The Native American subsistence resident is also assumed to obtain drinking water and water for use in a traditional sweat lodge from the Columbia River maximum. The locations for each of these activities are described in more detail below.

Current Residential Location. The Native American subsistence resident is assumed to live off site at the Hanford offsite maximum. This offsite location is a 500 m by 500 m area represented by a single grid point predicted to have the highest concentration of airborne and deposited emissions.

Hunting and Gathering Location. The Native American subsistence resident is assumed to consume food (wild game, wildfowl, wildfowl eggs, and wild plants) harvested on site. The hunting and gathering areas for the Native American subsistence resident are based on the following assumptions:

- The various types of plants eaten or used for ceremonial or medicinal purposes are collected from a variety of habitats (such as river corridor, foothills and mountains, meadow, and shrub-steppe). The exact collecting locations and types of plants collected are unknown; however, it is known that Gable Mountain is important for ceremonial activities, and plants are collected approximately once per year at the McGee Ranch west of the 200 Areas.

- While onsite hunting is currently limited to the area north of the Columbia River, deer and other game may browse anywhere on site.
- The home range of deer at Hanford is located primarily along the riparian corridor of the Columbia River.
- The traditional subsistence lifestyle is a communal lifestyle; therefore, the hunting and gathering area must support more than a single individual or even a single family.
- A conservative scenario should include the locations of maximum emissions concentrations (ground maximum), and the locations of maximum emissions concentrations where it is known that some important activities occur (Gable Mountain maximum, Columbia River maximum).

To meet these needs, two hunting/gathering areas have been identified. The first hunting/gathering area (shown in Figure 7-5) includes the Hanford Reach National Monument and Gable Mountain. This area includes the portions of the Hanford Site most likely to be used by game animals and most likely to be used by Native Americans for collecting wild plants. The second hunting/gathering area (shown in Figure 7-5) includes the entire Hanford Site excluding the 200 Area industrial zones. Like the first hunting/gathering area, this second area includes the riparian zones along the Columbia River, where game animals and important wild plants are likely to be present, and Gable Mountain. This second area also includes the area of maximum contaminant concentrations near the WTP (that is, the onsite ground maximum). This second hunting/gathering area is intended to provide a more conservative estimate of potential exposure and risk by including the area where concentrations are at their maximum but food gathering activities are not likely to occur.

Ceremonial Location. The Native American subsistence resident is assumed to visit the Gable Mountain maximum location to conduct ceremonial activities. This onsite location is a 500 m by 500 m area represented by the single grid point predicted to have the highest concentration of airborne and deposited emissions at Gable Mountain.

Surface Water Location. The Native American subsistence resident is assumed to obtain fish, drinking water, and water for the sweat lodge from the Columbia River maximum.

This approach is conservative because it includes the points of maximum concentration, expected to be located east of the 200 East Area, as well as the areas west and north of the 200 East Area where actual hunting, gathering, and fishing activities currently occur.

Current exposure of a Native American subsistence resident is considered a plausible scenario since (1) residents are present outside the site boundary and development could occur at the offsite maximum point or points, and (2) Native American people are presently allowed to access the Hanford Site. However, this access is limited to individuals with security badges, and then only for limited purposes, such as religious purposes or to gather foods (approximately once per year) for ceremonies.

Future Exposure Location

The Native American subsistence resident is assumed to live on site at the onsite ground maximum location, consume fish from the Columbia River maximum, and consume wild game, wildfowl, wildfowl eggs, and wild plants harvested onsite. The Native American subsistence resident is also assumed to obtain drinking water and water for use in a traditional sweat lodge from the Columbia River maximum. The future hunting and gathering areas are defined as described above and shown in Figure 7-5 (that is, [1] the Hanford Reach National Monument and Gable Mountain, and [2] the entire Hanford Site). Future

exposure of a Native American subsistence resident is considered a worst-case scenario because future development at this location is unlikely due to the presence of other industrial and mixed waste operations in the 200 Areas.

Because the location of sacred sites is confidential within the tribes, representatives of the three tribes will be consulted during the risk assessment process to discuss potential impacts to sacred sites.

7.1.3.9 Nursing Infant of Native American Subsistence Resident

General Description

The nursing infant of the Native American subsistence resident is the infant of the adult Native American subsistence resident described above.

Exposure Pathways

The nursing infant of the Native American subsistence resident is assumed to be exposed to PCDDs/PCDFs, coplanar PCBs, and four ROPCs through ingestion of breast milk from the adult Native American subsistence resident exposed through inhalation of emissions; ingestion of soil; inhalation of resuspended soil; ingestion of drinking water; and ingestion of wild plants, wild game, wildfowl and wildfowl eggs, and fish.

Current Exposure Location

The nursing infant of the Native American subsistence resident is assumed to reside with the Native American subsistence resident described above at the Hanford offsite maximum point or points. Current exposure of a nursing infant of the Native American subsistence resident at the Hanford offsite maximum is considered a plausible scenario because residents are present outside the Hanford site boundary and development could occur at the offsite maximum point or points within the next 40 years.

Future Exposure Location

The nursing infant of the Native American subsistence resident is assumed to reside with the Native American subsistence resident described above at the onsite ground maximum sometime in the future. Future exposure of a nursing infant of a Native American subsistence resident at the onsite ground maximum is considered a worst-case scenario because future development at this location is unlikely due to the presence of other industrial and mixed waste operations in the 200 Areas.

7.1.3.10 Acute Exposure

EPA (1998a) recommends evaluating potential acute exposures in addition to the chronic exposures evaluated by previously described exposure scenarios. The acute exposure scenario includes direct inhalation of airborne COPC and ROPC emissions and exposure to external radiation from airborne ROPC emissions at the estimated maximum one-hour concentration. The receptor for the acute exposure scenario is located at the point of maximum one-hour concentration and is independent of land use. Because the acute exposure scenario is based on the maximum-modeled concentration and assumes that a receptor will be present at the location of that maximum during the hour in which it occurs, this is considered a worst-case scenario.

This acute scenario is designed to evaluate the worst-case air concentration resulting from normal emissions combined with short-term meteorological conditions that result in higher than normal air

concentrations. The acute scenario is not an accident (for example, fire, explosion) scenario. Accident scenarios are evaluated in separate documents to support nuclear licensing requirements.

7.1.4 Exposure Pathways

Exposure pathways to be evaluated for each of these exposure scenarios are summarized in Table 7-1 and the conceptual exposure model (Figure 7-1). Both direct exposure to emissions and indirect exposure to other media (such as soil and food) contaminated by emissions will be evaluated. Direct exposure pathways to be included in the quantitative risk assessment are as follows:

- COPCs and ROPCs
  - Direct inhalation of emissions
- ROPCs only
  - External exposure to radionuclides in air

Indirect exposure pathways to be included in the quantitative risk assessment are as follows:

- COPCs and ROPCs
  - Ingestion of soil
  - Inhalation of resuspended soil
  - Ingestion of homegrown or wild gathered produce
  - Ingestion of homegrown beef, milk, chicken, eggs, and pork
  - Ingestion of wild game, wildfowl, and wildfowl eggs
  - Ingestion of drinking water
  - Ingestion of fish
  - Inhalation of vapors and suspended particulates in sweat lodge
  - Dermal absorption in the sweat lodge
- ROPCs only
  - External exposure to radionuclides in soil
- PCDDs/PCDFs, PCBs, and selected ROPCs (Sr-90, I-129, Cs-134, and Cs-137) only
  - Ingestion of breast milk

External radiation exposure will be quantitatively evaluated for radionuclides in air and soil. External radiation exposure is not expected to be significant for surface water because of the following.

- Distance from the WTP to the Columbia River will result in extremely low concentrations of ROPCs through deposition.
- ROPC concentrations in air near the WTP and in soil following deposition and accumulation will far exceed surface water concentrations.
- Exposure to air and soil is continuous, while potential exposure to surface water is intermittent.

Therefore, external radiation exposure will not be evaluated for surface water because the distance from the WTP to the Columbia River will result in extremely low concentrations of ROPCs through deposition compared with other media.

EPA (1998a) has identified three exposure pathways that are generally insignificant contributors to risk at thermal treatment facilities; they are as follows:

- Groundwater pathways
- Resuspended dust
- Dermal contact

Groundwater pathways are generally not significant contributors to risk from airborne emissions because exposure concentrations in groundwater following air dispersion, deposition, leaching, and groundwater dispersion are much less than concentrations in air, soil, and other media. Conditions at the Hanford Site (that is, low precipitation) will make the contribution to groundwater even less than at other sites. Therefore, exposure to groundwater will not be included in the quantitative risk assessment. However, surface water concentrations will be used to evaluate the ingestion of drinking water, as well as inhalation and dermal absorption for the Native American sweat lodge scenario.

Inhalation of resuspended dust can be an important exposure pathway at contaminated sites where the contaminant source is at the surface or in the soil, as explained in the air dispersion modeling section (6) of this work plan. At these sites, dust resuspension generally represents the only source of inhalation exposure (unless significant volatiles are present). At sites such as the WTP where the source of COPCs and ROPCs is airborne emissions, direct, continuous inhalation of these emissions is a much more important exposure pathway than periodic inhalation of fugitive dust. Although it is considered generally insignificant at most sites, because of the dry, dusty conditions at the Hanford Site, inhalation of resuspended dust will be included in the SLRA (CCN 064332).

Dermal exposure pathways (to soil, surface water, or air) will not be included in the SLRA with the exception of the Native American sweat lodge scenario. This is a non-conservative assumption (that is, it will underestimate exposure to contaminants in soil, surface water, and air), because dermal contact will occur. However, dermal exposure pathways have been identified as insignificant contributors to risk in numerous risk assessments prepared or reviewed, or both, by EPA for airborne emissions from thermal treatment facilities (that is, the amount that exposure that is underestimated due to excluding this pathway is insignificant). If initial PRA results indicate that the soil ingestion pathway results in risks that are borderline for any plausible receptor, then the dermal exposure pathway may be included in the PRA. A discussion of the potential impact associated with exclusion of this minor pathway from the quantitative risk assessment will be included in the uncertainty assessment of the PRA.

7.1.5 Quantification of Exposure

The following subsections provide the equations that will be used to quantify intake (or dose) for each COPC and ROPC. The equations used to quantify exposures to COPCs and ROPCs differ slightly. Estimates of COPC intake will be quantified as the lifetime average daily dose (LADD) and average daily dose (ADD) in units of mg/kg-day. The LADD defines a dose level that is distributed (averaged) over an entire lifetime. Unlike the LADD, the ADD is averaged over a specific incremental exposure period rather than an entire lifetime. Estimates of ROPC intake will be quantified as a total intake in units of picocuries (pCi).

The equations that will be used to quantify each of the exposure pathways are based on those presented in Appendix C of EPA 1998a; these equations are subject to change as the guidance is modified. Exposure point concentrations (EPCs) of each exposure medium (such as air and soil) will be calculated as described in sections 6 and 7.1.7 of this RAWP. EPCs for COPCs have units of mass per mass (mg/kg for soil, sediment, and food) and mass per volume (mg/L for surface water and $\mu g/m^3$ for air). EPCs for ROPCs have units of activity per mass (pCi/g for soil and food) and activity per volume (pCi/L for surface water and pCi/m^3 for air). Receptor-specific exposure parameters (such as exposure frequency and duration) are summarized in tables 7-2 (Hanford Site industrial worker), 7-3 (resident, resident subsistence farmer, resident subsistence fisher), and 7-4 (Native American subsistence resident). The equations provided in the following subsections, along with the source of the EPCs and exposure parameters that will be used in these equations, are summarized below:

Exposure Medium and Pathway	Equation	Source of Exposure Point Concentrations	Location of Receptor-Specific Exposure Parameters
Air (Section 7.1.5.1)			
Inhalation of emissions	7-1	Section 6.1	Tables 7-2, 7-3, 7-4
External exposure to ROPCs in air	7-2	Section 6.1	Tables 7-2, 7-3, 7-4
Soil (Section 7.1.5.2)			
Incidental ingestion	7-3	Equations 6-1 and 6-3	Tables 7-2, 7-3, 7-4
Inhalation of resuspended dust	7-4	Equation 7-4	Tables 7-2, 7-3, 7-4
External exposure to ROPCs in soil	7-5	Equations 6-1 and 6-3	Tables 7-2, 7-3, 7-4
Foodstuffs (Section 7.1.5.3)			
Ingestion of produce and wild plants	7-6	Equations 6-12 through 6-24	Tables 7-2, 7-3, 7-4
Ingestion of beef, pork, chicken, wild game, wildfowl, milk, and eggs	7-7	Equations 7-13 through 7-20	Tables 7-3, 7-4
Ingestion of fish	7-8	Equations 7-23 through 7-25	Tables 7-3, 7-4
Surface Water (Section 7.1.5.4)			
Drinking water ingestion	7-9	Equation 6-9	Tables 7-2, 7-3, 7-4
Native American Sweat Lodge (Section 7.1.5.5)			
Inhalation in sweat lodge	7-10	Equation 6-9	Table 7-4
Dermal exposure in sweat lodge	7-11	Equation 6-9	Table 7-4

7.1.5.1 Direct Exposure to Air

Direct exposure to air includes inhalation of vapor and particulate emissions (Eq. 7-1) and external exposure to ionizing radiation in air (Eq. 7-2).

Direct Inhalation

Equation 7-1 will be used to calculate the inhalation of vapor phase and particulate emissions.

COPCs: $$I_{inh} = \frac{Ca \cdot IR \cdot ET \cdot EF \cdot ED \cdot CF_1}{BW \cdot AT \cdot CF_2} \quad \text{(Eq. 7-1a)}$$

ROPCs: $$I_{inh} = Ca \cdot IR \cdot ET \cdot EF \cdot ED \quad \text{(Eq. 7-1b)}$$

where:

I_{inh}	=	intake of COPCs or ROPCs through inhalation of emissions (mg/kg-day or pCi)
Ca	=	concentration of COPC or ROPC in air (μg/m^3 or pCi/m^3) calculated as described in section 6.1
IR	=	inhalation rate (m^3/hr)
ET	=	exposure time (hr/day)
EF	=	exposure frequency (day/yr)
ED	=	exposure duration (yr)
CF_1	=	units conversion factor of 0.001 (mg/μg)
BW	=	body weight (kg)
AT	=	averaging time for carcinogens (AT_C) or noncarcinogens (AT_N) (yr)
CF_2	=	units conversion factor of 365 (day/yr)

External Exposure in Air

Equation 7-2 will be used to calculate the external exposure to ionizing gamma radiation in air from ROPCs.

ROPCs: $$I_{ira} = Ca \cdot EF \cdot ED \cdot CF_1 \cdot AF \cdot CF_2 \quad \text{(Eq. 7-2)}$$

where:

I_{ira}	=	external exposure to gamma radiation from ROPCs in air (Bq-sec/m^3)
Ca	=	average air concentration of ROPC (pCi/m^3) calculated as described in section 6.1
EF	=	exposure frequency (day/yr)
ED	=	exposure duration (yr)
CF_1	=	units conversion factor of 86,400 (sec/day)
AF	=	age factor (unitless). The model assumes AF = 1 for adults and 1.3 for children.
CF_2	=	units conversion factor of 0.037 (Bq/pCi)

7.1.5.2 Exposure to Soil

Exposure to soil includes ingestion of soil (Eq. 7-3), inhalation of resuspended soil (Eq. 7-4), and external exposure to ROPCs in soil (Eq. 7-5).

Ingestion of Soil

Equation 7-3 will be used to calculate the ingestion of soil.

$$\text{COPCs: } I_{soil} = \frac{Cs \cdot CR_{soil} \cdot F_i \cdot EF \cdot ED}{BW \cdot AT \cdot CF_1} \qquad \text{(Eq. 7-3a)}$$

$$\text{ROPCs: } I_{soil} = Cs \cdot CR_{soil} \cdot F_i \cdot EF \cdot ED \cdot CF_2 \qquad \text{(Eq. 7-3b)}$$

where:

I_{soil}	=	intake of COPC or ROPC due to soil ingestion (mg/kg-day or pCi)
Cs	=	concentration of COPC or ROPC in soil (mg/kg or pCi/g) calculated per section 6.2, Eq. 6-1 and Eq. 6-3
CR_{soil}	=	consumption rate of soil (kg/day)
F_i	=	fraction of ingested soil that is contaminated (unitless)
EF	=	exposure frequency (day/yr)
ED	=	exposure duration (yr)
BW	=	body weight (kg)
AT	=	averaging time for carcinogens (AT_C) or noncarcinogens (AT_N) (yr)
CF_1	=	units conversion factor of 365 (day/yr)
CF_2	=	units conversion factor of 1000 (g/kg)

Inhalation of Resuspended Soil

Equation 7-4 will be used to calculate exposure resulting from inhalation of resuspended soil using the particulate emission factor (PEF) approach from the EPA soil screening guidance (EPA 1996a, 1996b, 2000a, 2000b).

$$\text{COPCs: } I_{inhsoil} = \left(\frac{Cs}{PEF}\right) \cdot \frac{IR \cdot ET \cdot EF \cdot ED}{BW \cdot AT \cdot CF_1} \qquad \text{(Eq. 7-4a)}$$

$$\text{ROPCs: } I_{inhsoil} = \left(\frac{Cs}{PEF}\right) \cdot CF_2 \cdot IR \cdot ET \cdot EF \cdot ED \qquad \text{(Eq. 7-4b)}$$

where:

$I_{inhsoil}$	=	intake of COPC or ROPC through inhalation of resuspended soil (mg/kg-day or pCi)

Cs	=	soil concentration of COPC or ROPC (mg/kg or pCi/g) calculated per section 6.2, Eq. 6-1 and Eq. 6-3
PEF	=	particulate emission factor (m^3/kg); PEF is described below
IR	=	inhalation rate (m^3/hr)
ET	=	exposure time (hr/day)
EF	=	exposure frequency (day/yr)
ED	=	exposure duration (yr)
BW	=	body weight (kg)
AT	=	averaging time for carcinogens (AT_C) or noncarcinogens (AT_N) (yr)
CF_1	=	units conversion factor of 365 (day/yr)
CF_2	=	units conversion factor of 1000 (g/kg)

The PEF relates the concentration of contaminant in soil with the concentration of dust particles in the air. The presence of vegetation, gravel, pavement, or other cover will prevent the generation of fugitive dust. EPA default PEF values assume 50 % vegetative cover and 50 % open soil. EPA provides site-specific dispersion modeling and meteorological factors for 29 cities in the United States and recommends developing a site-specific PEF by identifying the climatic zone for the site (Figure A-1, EPA 2000b) followed by selecting modeling parameters corresponding to the site's climatic zone and size. The Hanford Site is located in climatic zone 4. Using the modeling parameters provided for the five representative cities in zone 4, along with an assumed 30-acre source area and 50 % vegetative cover, results in average and 10th percentile PEF values of 6.22E+09 and 1.41E+09 m^3/kg, respectively. The 10th percentile value is used in this human health risk assessment (HHRA) to provide a conservative estimate of fugitive dust exposure. The 10th percentile value is used rather than the 90th percentile value because air concentration is dependent on the inverse of the PEF value.

External Exposure to Soil

Equation 7-5 will be used to calculate the external exposure to ionizing gamma radiation in soil from ROPCs.

ROPCs: $$I_{irs} = \frac{Cs \cdot EF \cdot ED \cdot \left[ET_o + ET_i \cdot (1 - Se)\right]}{CF} \qquad \text{(Eq. 7-5)}$$

where:

I_{irs}	=	external exposure to gamma radiation from ROPCs in soil (pCi-yr/g)
Cs	=	soil concentration of ROPC (pCi/g) calculated per section 6.2, Eq. 6-1 and Eq. 6-3
EF	=	exposure frequency (day/yr)
ED	=	exposure duration (yr)
ET_o	=	exposure time fraction outdoors (unitless); receptor-specific ET_o values are described below
ET_i	=	exposure time fraction indoors (unitless); receptor-specific ET_i values are described below
Se	=	shielding factor (unitless); Se is described below
CF	=	units conversion factor 365 (day/yr)

The exposure time fraction outdoors (ET_o) represents the fraction of the day that the receptor is on site and outdoors while the fraction indoors (ET_i) represents the fraction of the day that the receptor is on site and indoors.

For the resident scenario, it is assumed that adults spend 94 % of their time indoors and 6 % outdoors (EPA 1997a) while children spend 77 % of their time indoors and 23 % outdoors. The median percent of time spent outdoors on a farm (adults and children) is reported as 12 %, and the 90th percentile is reported as 42 % (EPA 1997a). For the resident subsistence farmer and subsistence fisher scenarios, receptors (both adults and children) are assumed to spend 42 % of their time outdoors and 58 % indoors (approximately an additional 8 hours outdoors each day). For the Native American subsistence resident, the time spent outdoors is assumed to be comparable to the resident subsistence farmer and resident subsistence fisher (that is, 58 % indoors, 42 % outdoors for both adults and children).

For the Hanford Site industrial worker scenario, it is assumed that work is performed both outdoors and indoors; therefore, workers spend 50 % of their work day indoors and 50 % outdoors.

A shielding factor of 0.4 is used, consistent with Office of Solid Waste and Emergency Response Directive 9355.4-14 (EPA 2000d), to account for shielding while the receptor is indoors. No shielding is assumed while the receptor is outdoors, as the gamma radiation originating in soil is not impeded by a solid obstacle prior to intercepting the receptor.

7.1.5.3 Exposure to Foodstuffs

Exposure to foodstuffs includes ingestion of produce by the resident; ingestion of produce, beef, pork, milk, chicken, and eggs by the resident subsistence farmer; ingestion of produce and fish by the resident subsistence fisher; and ingestion of wild plants, wild game, wildfowl, wildfowl eggs, and fish by the Native American subsistence resident.

Ingestion of Produce

Equation 7-6 will be used to calculate the ingestion of COPCs and ROPCs in homegrown produce or wild plants.

COPCs: $$I_{ag} = \frac{\left[(Pd + Pv + \mathrm{Pr}_{ag}) \cdot CR_{ag} + \mathrm{Pr}_{ag} \cdot CR_{pp} + \mathrm{Pr}_{bg} \cdot CR_{bg}\right] \cdot F_i \cdot EF \cdot ED}{AT \cdot CF_1} \quad \text{(Eq. 7-6a)}$$

ROPCs: $$I_{ag} = \left[(Pd + Pv + \mathrm{Pr}_{ag}) \cdot CR_{ag} + \mathrm{Pr}_{ag} \cdot CR_{pp} + \mathrm{Pr}_{bg} \cdot CR_{bg}\right] \cdot F_i \cdot EF \cdot ED \cdot BW \cdot CF_2 \quad \text{(Eq. 7-6b)}$$

where:

I_{ag} = intake of COPC or ROPC through ingestion of produce (mg/kg-day or pCi)

Pd = COPC or ROPC concentration in aboveground produce due to direct deposition onto plant surfaces (mg/kg or pCi/g) calculated per section 6.5, Eq. 6-12 through Eq. 6-15

Pv = COPC or ROPC concentration in aboveground produce due to air-to-plant transfer (mg/kg or pCi/g) calculated per section 6.5, Eq. 6-16 through Eq. 6-22

Pr = COPC or ROPC concentration in aboveground produce due to root uptake (mg/kg or pCi/g) calculated per section 6.5, Eq. 6-23

CR_{ag} = consumption rate of aboveground unprotected produce (kg/kg-body weight/day)

CR_{pp} = consumption rate of aboveground protected produce (kg/kg-body weight/day)

Pr_{bg} = COPC or ROPC concentration in belowground produce due to root uptake (mg/kg or pCi/g) calculated per section 6.5, Eq. 6-24

CR_{bg} = consumption rate of belowground produce (kg/kg-body weight/day)

F_i = fraction of ingested produce that is contaminated (unitless)

EF = exposure frequency (day/yr)

ED = exposure duration (yr)

AT = averaging time for carcinogens (AT_C) or noncarcinogens (AT_N) (yr)

CF_1 = units conversion factor of 365 (day/yr)

BW = body weight (kg)

CF_2 = units conversion factor of 1000 (g/kg)

Ingestion of Animal Products

Equation 7-7 will be used to calculate the ingestion of COPCs and ROPCs in homegrown beef, milk, pork, poultry, wildfowl, eggs, and wild game.

COPCs: $$I_{food} = \frac{A_f \cdot CR \cdot F_i \cdot EF \cdot ED}{AT \cdot CF_1} \quad \text{(Eq. 7-7a)}$$

ROPCs: $$I_{food} = A_f \cdot CR \cdot F_i \cdot EF \cdot ED \cdot BW \cdot CF_2 \quad \text{(Eq. 7-7b)}$$

where:

I_{food} = intake of COPC or ROPC from animal product (such as I_{beef}, I_{milk}) (mg/kg-day or pCi)

A_f = concentration of COPC or ROPC in animal product (mg/kg or pCi/g) calculated per section 7.1.7.4, equations 7-13 (beef), 7-14 (milk), 7-15 (pork), 7-16 (chicken), 7-17 (wildfowl), 7-18 (chicken eggs), 7-19 (wildfowl eggs), 7-20 (game), 7-23, 7-24, and 7-25 (fish)

CR = consumption rate of animal product (kg/kg-day)

F_i = fraction of ingested animal tissue that is contaminated (unitless)

EF = exposure frequency (day/yr)

ED = exposure duration (yr)

AT = averaging time for carcinogens (AT_C) or noncarcinogens (AT_N) (yr)

CF_1 = units conversion factor of 365 (day/yr)

BW = body weight (kg)

CF_2 = units conversion factor of 1000 (g/kg)

Ingestion of Fish

Equation 7-8 will be used to calculate the ingestion of COPCs and ROPCs in fish.

COPCs: $$I_{fish} = \frac{C_{fish} \cdot \left(CR_{fish} + CR_{organs}\right) \cdot F_i \cdot EF \cdot ED}{AT \cdot CF_1} \quad \text{(Eq. 7-8a)}$$

ROPCs: $$I_{fish} = C_{fish} \cdot \left(CR_{fish} + CR_{organs}\right) \cdot F_i \cdot EF \cdot ED \cdot BW \cdot CF_2 \quad \text{(Eq. 7-8b)}$$

where:

I_{fish}	=	intake of COPC or ROPC from fish (mg/kg-day or pCi)
C_{fish}	=	concentration of COPC or ROPC in fish (mg/kg or pCi/g); C_{fish} will be calculated from surface water and sediment concentrations calculated per sections 6.3 and 6.4, Eq. 6-9 (surface water), and Eq. 6-10 and Eq. 6-11 (sediment).
CR_{fish}	=	consumption rate of fish fillets (kg/kg-body weight/day)
CR_{organs}	=	consumption rate of fish parts (kg/kg-body weight/day)
F_i	=	fraction of ingested fish that is contaminated (unitless)
EF	=	exposure frequency (day/yr)
ED	=	exposure duration (yr)
AT	=	averaging time for carcinogens (AT_C) or noncarcinogens (AT_N) (yr)
CF_1	=	units conversion factor of 365 (day/yr)
BW	=	body weight (kg)
CF_2	=	units conversion factor of 1000 (g/kg)

7.1.5.4 Exposure to Surface Water

Exposure to surface water includes the ingestion of surface water as drinking water (Eq. 7-9) and Native American sweat lodge exposures through inhalation and dermal contact (section 7.1.5.5).

Ingestion of Drinking Water

Equation 7-9 will be used to calculate the ingestion of COPCs and ROPCs in drinking water.

COPCs: $$I_{dw} = \frac{C_{dw} \cdot CR_{dw} \cdot F_i \cdot EF \cdot ED}{BW \cdot AT \cdot CF} \quad \text{(Eq. 7-9a)}$$

ROPCs: $$I_{dw} = C_{dw} \cdot CR_{dw} \cdot F_i \cdot EF \cdot ED \quad \text{(Eq. 7-9b)}$$

where:

I_{dw}	=	intake of COPC or ROPC from drinking water (mg/kg-day or pCi)
C_{dw}	=	dissolved-phase COPC or ROPC water concentration (mg/L or pCi/L) calculated per section 6.3, Eq. 6-9
CR_{dw}	=	consumption rate of drinking water (L/day)

F_i = fraction of ingested drinking water that is contaminated (unitless)
EF = exposure frequency (day/yr)
ED = exposure duration (yr)
BW = body weight (kg)
AT = averaging time for carcinogens (AT_C) or noncarcinogens (AT_N) (yr)
CF = units conversion factor of 365 (day/yr)

7.1.5.5 Native American Sweat Lodge Exposures

Two exposure pathways will be evaluated for the Native American sweat lodge: inhalation (Eq. 7-10) and dermal absorption (Eq. 7-11).

Inhalation in Sweat Lodge

Equation 7-10 will be used to calculate inhalation exposure for Native American adults inside the sweat lodge. Volatile and semivolatile organic COPCs and volatile ROPCs (^{14}C and ^{3}H) may be released as vapors from water used in the sweat lodge. Due to the many uncertainties and the potential that aerosols may be generated by mechanical entrainment in addition to volatilization, nonvolatile inorganic COPCs and ROPCs are also evaluated for this scenario.

$$\text{COPCs: } I_{inh} = \frac{C_{dw} \cdot \left(\frac{V_w}{\frac{2}{3} \cdot \pi \cdot r^3} \right) \cdot IR \cdot ET \cdot EF \cdot ED}{BW \cdot AT \cdot CF} \qquad \text{(Eq. 7-10a)}$$

$$\text{ROPCs: } I_{inh} = C_{dw} \cdot \left(\frac{V_w}{\frac{2}{3} \cdot \pi \cdot r^3} \right) \cdot IR \cdot ET \cdot EF \cdot ED \qquad \text{(Eq. 7-10b)}$$

where:

I_{inh} = intake of COPCs and ROPCs from inhalation in the sweat lodge (mg/kg-day or pCi)
C_{dw} = dissolved surface water concentration of COPCs and ROPCs (mg/L or pCi/L) calculated per section 6.3, Eq. 6-9
V_W = volume of water (L); see the discussion of V_W below
π = the constant *pi* (unitless); π ≈ 3.14159265359
r = radius of sweat lodge (m); r = D/2 where D is the diameter of the sweat lodge (m)
IR = inhalation rate (m^3/hr)
ET = exposure time (hr/day)
EF = exposure frequency (day/yr)
ED = exposure duration (yr)
BW = body weight (kg)
AT = averaging time for carcinogens (AT_C) or noncarcinogens (AT_N) (yr)
CF = units conversion factor of 365 (day/yr)

Within the sweat lodge, water is splashed onto heated rocks to produce steam. It is assumed that a total of 4 L of water are used during a one-hour sweat lodge ceremony. For the HHRA, it is conservatively assumed that the entire concentration of volatile COPCs (all organics) and ROPCs (^{3}H and ^{14}C) in the 4 L of water may be volatilized and available for inhalation in the sweat lodge (that is, V_W = 4 L). It is possible that nonvolatile COPCs (inorganics) and ROPCs (all except ^{3}H and ^{14}C) may become airborne as an aerosol mist. The quantity of nonvolatile constituents that may be airborne is limited by the amount of water that may be in the air at any given time (CCN 064329). A hemispheric sweat lodge with a diameter of 2 m has a volume of 2.094 m^3. At 150 °F and 100 % humidity, 0.34 L of water could be airborne in a sweat lodge of this size (that is, V_w = 0.34 L).

Dermal Exposure in Sweat Lodge

Equation 7-11 will be used to calculate the dermal absorption of organic COPCs from water vapor in the sweat lodge.

$$\text{COPCs: } I_d = \frac{C_{dw} \cdot SA \cdot Kp \cdot ET \cdot EF \cdot ED \cdot CF_1}{BW \cdot AT \cdot CF_2} \qquad \text{(Eq. 7-11)}$$

where:

I_d	=	intake of COPCs from adult dermal absorption within the sweat lodge (mg/kg-day)
C_{dw}	=	dissolved-phase surface water concentration (mg/L) calculated per section 6.3, Eq. 6-9
SA	=	body surface area available for contact (m^2)
Kp	=	permeability constant (cm/hr); Kp is COPC-specific and provided in Appendix B-1.
ET	=	exposure time (hr/day)
EF	=	exposure frequency (day/yr)
ED	=	exposure duration (yr)
CF_1	=	units conversion factor of 10 (L/m^2-cm)
BW	=	body weight (kg)
AT	=	averaging time for carcinogens (AT_C) or noncarcinogens (AT_N) (yr)
CF_2	=	units conversion factor of 365 (day/yr)

Dermal absorption of inorganic COPCs and ROPCs is not included because this pathway is considered to be insignificant compared to inhalation for all inorganic COPCs and ROPCs except tritium (see Appendix B-3 for further discussion on this topic). Previously, the inhalation cancer slope factor (SF) provided in the Health Effects Assessment Summary Tables (HEAST) (EPA 1995c) for tritium included a 50 % contribution from dermal absorption. The new inhalation SF for tritium provided in the updated HEAST (EPA 2001b) does not include the contribution from dermal absorption; therefore, dermal absorption of tritium from water vapor in the sweat lodge is evaluated separately. The internal dose from immersion in a plume of tritiated water vapor is approximately 50 % from inhalation and 50 % from dermal absorption (Till and Meyer 1983); therefore, the dose received from dermal absorption of tritium is accounted for by multiplying the inhalation dose for this ROPC by 2.

7.1.5.6 Nursing Infant Exposure

Ingestion of Breast Milk

Equation 7-12 will be used to calculate the ADD of COPCs and intake of ROPCs for an infant exposed to COPCs and ROPCs in breast milk.

$$\text{COPCs: } I_{infant} = \left(\frac{m \cdot CF \cdot h \cdot f_1}{0.693 \cdot f_2}\right) \cdot \frac{f_3 \cdot f_4 \cdot IR_{milk} \cdot ED}{BW_{infant} \cdot AT} \qquad \text{(Eq. 7-12a)}$$

$$\text{ROPCs: } I_{infant} = \left(\frac{m \cdot h \cdot f_1}{BW_{infant} \cdot 0.693 \cdot f_2}\right) \cdot f_3 \cdot f_4 \cdot IR_{milk} \cdot ED \cdot EF \qquad \text{(Eq. 7-12b)}$$

where:

I_{infant} = infant intake of COPCs or ROPCs from breast milk (pg/kg-day for chemicals or pCi for radionuclides)

m = maternal intake of COPCs or ROPCs from all adult exposures (mg/kg-day for chemicals or pCi/day for radionuclides) calculated as:

Hanford Site industrial worker and resident:

$$m = I_{inh} + I_{soil} + I_{inhsoil} + I_{ag} + I_{dw}$$

resident subsistence farmer:

$$m = I_{inh} + I_{soil} + I_{inhsoil} + I_{ag} + I_{beef} + I_{milk} + I_{pork} + I_{chicken} + I_{egg} + I_{dw}$$

Native American subsistence resident:

$$m = I_{inh} + I_{soil} + I_{inhsoil} + I_{ag} + I_{game} + I_{wildfowl} + I_{egg} + I_{game} + I_{fish} + I_{dw}$$

where the individual intake terms will be calculated from equations 7-1, 7-3, 7-4, 7-6, 7-7, and 7-8 without the ED, EF, AT and 365 day/yr terms

CF = units conversion factor of 1E+09 (pg/mg)

h = biological half-life of COPC or ROPC in adults (days); h is COPC- and ROPC-specific and provided in Appendix B-1

f_1 = fraction of ingested COPC or ROPC that is stored in fat (unitless)

f_2 = fraction of mother's weight that is fat (unitless)

f_3 = fraction of breast milk that is fat (unitless)

f_4 = fraction of ingested COPC or ROPC that is absorbed (unitless)

IR_{milk} = ingestion rate of breast milk by infant (kg/day)

ED = exposure duration (yr)

BW_{infant} = body weight of infant (kg)
AT = averaging time (yr)
EF = Exposure frequency (days/yr)

7.1.6 Exposure Parameters

The equations presented above are the basis for quantifying the exposure to COPCs and ROPCs experienced by a potential receptor. The values that will be used for each parameter identified in the equations are provided in tables 7-2, 7-3, and 7-4 and described below. These parameters are conservative to ensure that the exposures calculated in the SLRA overestimate, rather than underestimate, risk.

7.1.6.1 Hanford Site Industrial Worker

For the Hanford Site industrial worker scenario, exposure values are presented in Table 7-2 and are taken primarily from the *Hanford Site Risk Assessment Methodology* (DOE-RL 1995).

The Hanford Site industrial worker is assumed to work both indoors (4 hours per day) and outdoors (4 hours per day) and to consume 200 mg soil per day rather than the default 50 mg per day because of this outdoor activity.

The Hanford Site industrial worker is assumed to live at the Hanford offsite maximum in addition to working at the onsite ground maximum. Exposure assumptions for the time spent at home are the same as those for a resident (section 7.1.6.2) corrected for time spent at work. For example:

- This receptor is assumed to spend 16 hours per day at home for the 250 days per year he or she is also at work, and 24 hours per day at home for the 100 days per year he or she is not at work.
- This receptor consumes a total of 2 L to 3 L per day of drinking water from the Columbia River maximum (that is, on workdays the receptor consumes 2 L at work and 1 L at home, on nonwork days the receptor consumes 2 L at home).
- This receptor is assumed to spend 20 years working at the onsite ground maximum and living at the Hanford offsite maximum and another 10 years living at the Hanford offsite maximum (for a total residential exposure duration of 30 years).

Soil ingestion rates are assumed to be independent of exposure time and, therefore, are not corrected for time spent at work and at home (that is, the worker consumes 200 mg soil per day at work and 100 mg soil per day at home for a total of 300 mg soil per day, 250 days per year and 100 mg soil per day, 100 days per year).

7.1.6.2 Residential Scenarios

For residential scenarios (resident, resident subsistence farmer, resident subsistence fisher, and nursing infants), exposure values are presented in Table 7-3 and are taken primarily from the HHRAP (EPA 1998a). Several exposure parameters (inhalation rate, soil ingestion rate, drinking water ingestion rate) differ from the HHRAP default values in order to be consistent with other EPA Region 10 assessments (CCN 063805, CCN 063806, CCN 063807). The source of each exposure parameter is provided, along with the value used, in Table 7-3.

The adult resident and resident subsistence fisher are assumed to live at the Hanford offsite maximum for 30 years during operation of the WTP for current exposures and at the onsite ground maximum for 30 years starting at WTP shutdown for future exposures. The resident subsistence farmer is assumed to live at the Hanford offsite maximum for 40 years during operation of the WTP for current exposures and at the onsite ground maximum for 40 years starting at WTP shutdown for future exposures. The child is assumed to be exposed for 6 years (from age 1 to 7) for all three residential scenarios.

Consumption rates of food are for contaminated food grown at the receptor's home (or from the Columbia River maximum for fish) and do not include food purchased from uncontaminated sources. Food consumption rates are presented in Table 7-3 in units of kg dry weight (DW) produce per kg body weight per day and kg fresh weight (FW) animal product per kg body weight per day. To put these values into perspective, consumption rates for a 70 kg adult are summarized below:

Food Product	Consumption Rate kg DW/kg-day	Consumption Rate lb FW/day	Approximate Servings/day [a]
Resident and Resident Subsistence Fisher			
Aboveground produce	8.70E-04	0.9 [b]	
Belowground produce	1.40E-04	0.1 [b]	
Total produce	1.01E-03	1.0	4
Fish	1.17E-03	0.18	1
Resident Subsistence Farmer			
Aboveground produce	3.12E-03	3.2 [b]	
Belowground produce	5.52E-04	0.6 [b]	
Total produce	3.67E-03	3.8	15
Beef	4.20E-03	0.6	
Pork	2.00E-03	0.3	
Poultry	2.27E-03	0.4	
Eggs	1.60E-03	0.2	
Total meat and eggs	1.01E-02	1.6	10
Dairy	4.4E-03	0.7	1

[a] Approximate servings based on USDA-recommended servings sizes of 4 oz per serving of fruits and vegetables, 2 oz to 3 oz per serving of meat, fish, and poultry, and 8 oz per serving of milk.

[b] Produce converted from dry to wet weight assuming an average 85 % moisture content.

Exposure parameters for the nursing infant are for an infant from ages 0 to 12 months. Exposure parameters for the mother of the nursing infant are the same as those presented for the adult resident and resident subsistence farmer.

7.1.6.3 Native American Subsistence Resident

For the Native American subsistence resident, exposure values are presented in Table 7-4 and are taken primarily from *A Native American Exposure Scenario* (Harris and Harper 1997). This scenario is most accurate for the CTUIR and less accurate for other Northwestern tribes.

The Native American subsistence resident is assumed to live at the Hanford offsite maximum (current) or onsite ground maximum (future). This receptor spends 1 day (24 hours) per month (12 days per year) at the Gable Mountain maximum conducting ceremonial activities and the remaining 353 days per year at home.

Three separate exposure duration values will be used for this scenario:

- The recommended (Harris and Harper 1997) exposure duration of 70 years assumes that this receptor is exposed during his or her entire lifetime. This exposure duration will be used for adult exposures through all pathways except those noted below.
- An adult exposure duration of 40 years (the operating lifetime of the WTP) will be used for direct exposure to contaminants in air (inhalation and external radiation in air) because these exposures will last only as long as emissions from the WTP are occurring. A 40-year exposure duration will also be used for ingestion of carbon-14 and tritium in plants because these ROPCs are transferred directly to plant tissue from air, rather than being transferred from soil (see section 6.5), and will only accumulate these ROPCs as long as emissions from the melter are occurring
- An exposure duration of 6 years (from ages 1 to 7) will be used for the child Native American subsistence resident.

The Native American subsistence resident is assumed to obtain wild food gathered from the Hanford Site. Consumption rates of wild food gathered from on site presented in Table 7-4 do not include food purchased or collected from uncontaminated sources. Food consumption rates are presented in units of kg dry weight produce per kg body weight per day and kg fresh weight animal product per kg body weight per day. To put these values into perspective, consumption rates for a 70 kg adult are summarized below.

Food Product	Consumption Rate kg DW/kg-day	Consumption Rate lb FW/day	Approximate Servings/day [a]
Aboveground produce	3.08E-03	3.2 [b]	
Belowground produce	7.06E-04	0.7 [b]	
Total produce	3.78E-03	3.9 [b]	16
Wild game	3.57E-03	0.6	
Wildfowl	3.29E-04	0.1	
Fish	8.48E-03	1.3	

Food Product	Consumption Rate kg DW/kg-day	Consumption Rate lb FW/day	Approximate Servings/day [a]
Wildfowl eggs	3.00E-04	0.1	
Total meat and eggs	1.27E-02	2.0	13

[a] Approximate servings based on USDA-recommended servings sizes of 4 oz per serving of fruits and vegetables, and 2 oz to 3 oz per serving of meat, fish, and poultry.

[b] Produce converted from dry to wet weight assuming an average 85 % moisture content.

An inhalation rate of 30 m^3 per day will be used for the Native American subsistence resident adult per Stuart Harris of the CTUIR (CCN 064333). A discussion of this value is provided in Appendix B-4. The assignment of inhalation rate is highly uncertain; several alternative default inhalation rates will be evaluated as part of the uncertainty assessment in the PRA. Exposure parameters for the nursing infant are for an infant ages 0 to 12 months. Exposure parameters for the mother of the nursing infant are the same as those presented for the adult Native American subsistence resident.

7.1.7 Exposure Point Concentrations

The EPCs used for estimating intakes/doses of both COPCs and ROPCs are dependent on the location of the receptor. The location of the various receptor populations identified for the quantitative risk assessment will correspond to the receptor grid nodes defined during air dispersion modeling (section 6.1). In keeping with the protective approach for the SLRA, the location with the maximum concentrations of COPCs and ROPCs will be used in estimating EPCs.

Air dispersion modeling will be used to identify points of maximum emission concentrations and deposition at four locations of interest: at the location of maximum concentration (that is, the onsite ground maximum), at Gable Mountain, outside the Hanford Site boundary (that is, the Hanford offsite maximum), and at the Columbia River. To simplify the risk assessments, it will be assumed that receptor populations are present at these exposure locations. For example, while offsite residential receptor populations are present (for example, in Richland), residents may not be present at the Hanford offsite maximum. However, for the risk assessment, it is assumed that a variety of residential receptors are present at this location.

The four exposure locations are described in section 7.1.1 and again, briefly, below:

- Onsite ground maximum - location of maximum predicted ground-level concentrations of both airborne and deposited emissions
- Hanford offsite maximum - location of maximum predicted ground-level concentrations of both airborne and deposited emissions outside the Hanford Site Boundary
- Gable Mountain maximum - location of maximum predicted ground-level concentrations of both airborne and deposited emissions at Gable Mountain
- Columbia River maximum - location of maximum predicted ground-level concentrations of both airborne and deposited emissions at the Columbia River

Because the point of maximum concentration may be different for airborne COPCs and ROPCs and COPCs and ROPCs deposited through wet and dry deposition mechanisms, EPA (1998a) recommends the following method for selecting the point of maximum concentration. Emissions will be modeled separately for eight flues (pretreatment C5, vessel vent, and reverse flow diverters/pulse jet mixers [RFD/PJM]; LAW C5 and melter offgas and process vessel vent; and HLW C5, RFD/PJM, and two melter offgas and process vessel vent flues that will be combined and evaluated as a single flue) with six points of maximum concentration possible from each flue:

- Maximum vapor-phase air concentration
- Maximum particle- and particle-bound-phase air concentration
- Maximum vapor-phase wet deposition
- Maximum particle- and particle-bound-phase wet deposition
- Maximum vapor-phase dry deposition
- Maximum particle- and particle-bound-phase dry deposition

Thus, there are a total of 48 possible maximum concentrations (8 flues • 6 phases) at each of the four locations of interest. Because more than one maximum concentration often occurs at the same receptor grid node, it is more likely that a dozen grid nodes or less with maximum concentrations will be identified at each location of interest (rather than 48). To further reduce the number of points evaluated, points of maximum concentration will be grouped based on geographic proximity to each other.

7.1.7.1 Exposure Point Concentrations in Air

EPCs will be calculated as described in section 6.1 (air dispersion modeling). Chronic air concentrations are assumed to remain the same for the entire 40-year operating lifetime of the WTP. Acute air concentrations represent the worst-case, one-hour meteorological conditions and will be used for evaluating the acute scenario only.

7.1.7.2 Exposure Point Concentrations in Soil, Surface Water, and Sediment

Concentrations of COPCs and ROPCs in soil, surface water, and sediment are estimated from deposition rates predicted by the air dispersion modeling as described in sections 6.2 (soil), 6.3 (surface water), and 6.4 (sediment). Deposition is assumed to occur for the potential operating lifespan of the facility (40 years).

Separate soil concentrations will be estimated for the current and future exposure periods as described below:

- Current soil concentrations of carcinogenic COPCs and ROPCs are estimated as the average soil concentration over the 40-year operating lifetime of the WTP.
- Future soil concentrations of carcinogenic COPCs and ROPCs are estimated as the average soil concentration over the 40 years immediately following WTP shutdown.
- Current and future soil concentrations of noncarcinogenic COPCs are estimated as the soil concentration at year 40 (that is, after 40 years of deposition).

Annual average surface water and sediment concentrations calculated based on deposition of emissions during WTP operations are used for both current and future exposures to these media.

7.1.7.3 Exposure Point Concentrations in Plants

Exposure point concentrations for produce (fruits and vegetables) and wild plants will be calculated as described in section 6.5. Current EPCs for homegrown and wild plants will include vapor-phase transfer from air to plants, deposition from air onto plants, and root uptake from soil into the aboveground and belowground portions of plants. Future EPCs for home grown and wild plants will include root uptake from soil into the above and belowground portions of plants only because airborne emissions will not be present following WTP shutdown.

7.1.7.4 Exposure Point Concentrations for Animal Tissue (Domestic Livestock and Wild Game)

Exposure point concentrations in animal products (such as beef, milk, wild game) will be modeled as described here. As noted in section 6.6, this modeling effort is slightly different for the human health risk and ecological risk assessments. See section 8 for the modeling required for the ecological risk assessment. This section describes the modeling for use in the HHRA and includes modeling to determine EPCs for the following animal tissue:

- Beef
- Milk
- Pork
- Chicken
- Wildfowl
- Chicken eggs
- Wildfowl eggs
- Wild game (deer)

Edible tissue concentrations will be calculated for the HHRA using feed concentrations, ingestion rates, bioaccumulation factors, and other parameters in model equations from EPA 1998a. Current and future feed concentrations (such as soil, forage, silage, and grain concentrations) will be determined as described in section 6.5. Ingestion rates and other parameters are generally from the HHRAP (EPA 1998a) and can be found in Table 7-5. Bioaccumulation factors are COPC- and ROPC-specific and can be found in Appendix B-1. As with the plant modeling (see section 6.5.3), the bioaccumulation factors used to model animal tissue and animal products must be corrected to account for mass balance. The mass balance correction for animal tissue is presented at the end of this section.

Exposure Point Concentrations in Beef

Beef cattle are assumed to consume forage, silage, and grain, as well as surface soil (that is, 1 cm untilled soil). The equation to determine concentrations in beef tissue (EPA 1998a) for all constituents is:

$$A_{beef} = \left[\left(\sum_{i=1}^{3} F_i \cdot Qp_{i(beef)} \cdot P_{i(beef)} \right) + Qs_{soil(beef)} \cdot Cs \cdot Bs \right] \cdot Ba_{beef} \cdot MF \qquad \text{(Eq. 7-13)}$$

where:

A_{beef} = concentration of COPC or ROPC in beef (mg/kg for COPCs and pCi/g for ROPCs)

F_i = fraction of plant-type *i* grown on contaminated soil and ingested by the beef cattle (unitless). The three plant types consumed by the beef cattle are forage, silage, and grain. The recommended default value of 1.0 (EPA 1998a) shown in Table 7-5 as F_{plant} is used for all plant types.

$Qp_{i(beef)}$ = quantity of plant type *i* eaten by the beef cattle per day (kg/day). $Qp_{i(beef)}$ is shown in Table 7-5. The recommended values (EPA 1998a) for beef cattle raised by subsistence farmers are used: $Qp_{forage(beef)}$ = 8.8 kg/day is the amount of forage eaten by the beef cow, $Qp_{silage(beef)}$ = 2.5 kg/day for is the amount of silage eaten by the beef cow, and $Qp_{grain(beef)}$ = 0.47 kg/day is the amount of grain eaten by the beef cow.

$P_{i(beef)}$ = concentration of COPC or ROPC in plant type *i* that is ingested by the beef cattle (mg/kg for COPCs and pCi/g for ROPCs). $P_{i(beef)}$ is COPC- and ROPC-specific and calculated as follows:

$$P_{forage(beef)} = Pd_{forage} + Pv_{forage} + Pr_{ag(forage)}$$
$$P_{silage(beef)} = Pd_{silage} + Pv_{silage} + Pr_{ag(silage)}$$
$$P_{grain(beef)} = Pr_{ag(grain)}$$

where, for all constituents except carbon-14 and tritium:

Pd_{forage} is calculated in Eq. 6-12 to Eq. 6-15
Pv_{forage} is calculated in Eq. 6-16 to Eq. 6-20
$Pr_{ag(forage)}$ is calculated in Eq. 6-23 using 15 cm soil (root-zone)
Pd_{silage} is calculated in Eq. 6-12 to Eq. 6-15
Pv_{silage} is calculated in Eq. 6-16 to Eq. 6-20
$Pr_{ag(silage)}$ is calculated in Eq. 6-23 using 20 cm soil (tilled)
$Pr_{ag(grain)}$ is calculated in Eq. 6-23 using 20 cm soil (tilled)

For carbon-14 all plant concentrations (that is, $P_{forage(beef)}$, $Pr_{silage(beef)}$, and $Pr_{grain(beef)}$) take on the plant concentration value calculated from Eq. 6-21, and for tritium, all plant concentrations take on the plant concentration value calculated from Eq. 6-22.

$Qs_{soil(beef)}$ = quantity of soil ingested by the beef cattle (kg/day). The recommended default value of 0.5 kg/day (EPA 1998a) is used (see Table 7-5 of this work plan).

Cs = soil concentration at the 1 cm soil depth (mg/kg for COPCs and pCi/g for ROPCs) calculated in Eq. 6-1 to Eq. 6-4

Bs = soil bioavailability factor (unitless). The recommended default value of 1.0 (EPA 1998a) is used (see Table 7-5).

Ba_{beef} = biotransfer factor for beef (day/kg). Ba_{beef} is COPC- and ROPC-specific and shown in Appendix B-1, tables B1-1 (organic COPCs), B1-2 (inorganic COPCs),

and B1-3 (ROPCs). If no value is available for Ba_{beef}, then A_{beef} cannot be calculated and the ingestion of beef pathway cannot be evaluated in the HHRA. The values for Ba_{beef} in Appendix B-1, Table B1-1 (organic COPCs), will be compared against the calculated mass-limited uptake factor for beef (shown in Table 7-6) and the smaller of the two values will be used in the calculation of the beef concentration (A_{beef}).

MF = metabolism factor (unitless). MF is COPC- and ROPC-specific. The recommended default MF values of 0.01 for bis(2-ethylhexyl)phthalate and 1.0 for all other constituents (EPA 1998a) are used (see Table 7-5).

Exposure Point Concentration in Milk

Dairy cattle are assumed to consume forage, silage, and grain, as well as surface soil (that is, 1 cm untilled soil). The equation to determine concentrations in milk (EPA 1998a) for all constituents is:

$$A_{milk} = \left[\left(\sum_{i=1}^{3} F_i \cdot Qp_{i(milk)} \cdot P_{i(milk)} \right) + Qs_{soil(milk)} \cdot Cs \cdot Bs \right] \cdot Ba_{milk} \cdot MF \qquad \text{(Eq. 7-14)}$$

where:

A_{milk} = concentration of COPC or ROPC in milk (mg/kg for COPCs and pCi/g for ROPCs)

F_i = fraction of plant-type *i* grown on contaminated soil and ingested by dairy cattle (unitless). The three plant types consumed by the dairy cattle are forage, silage, and grain. The recommended default value of 1.0 (EPA 1998a) shown in Table 7-5 as F_{plant} is used for all plant types.

$Qp_{i(milk)}$ = quantity of plant type *i* eaten by the dairy cattle per day (kg/day). $Qp_{i(milk)}$ is shown in Table 7-5. The recommended values (EPA 1998a) for dairy cattle raised by subsistence farmers are used: $Qp_{forage(milk)}$ = 13.2 kg/day is the amount of forage eaten by the dairy cow, $Qp_{silage(milk)}$ = 4.1 kg/day is the amount of silage eaten by the dairy cow, and $Qp_{grain(milk)}$ = 3.0 kg/day is the amount of grain eaten by the dairy cow.

$P_{i(milk)}$ = concentration of COPC or ROPC in plant type *i* that is ingested by the dairy cattle (mg/kg for COPCs and pCi/g for ROPCs). $P_{i(milk)}$ is COPC- and ROPC-specific and calculated as follows:

$$P_{forage(milk)} = Pd_{forage} + Pv_{forage} + Pr_{ag(forage)}$$
$$P_{silage(milk)} = Pd_{silage} + Pv_{silage} + Pr_{ag(silage)}$$
$$P_{grain(milk)} = Pr_{ag(grain)}$$

where, for all constituents except carbon-14 and tritium:

Pd_{forage} is calculated in Eq. 6-12 to Eq. 6-15

Pv_{forage} is calculated in Eq. 6-16 to Eq. 6-20

$Pr_{ag(forage)}$ is calculated in Eq. 6-23 using 15 cm soil (root-zone)

Pd_{silage} is calculated in Eq. 6-12 to Eq. 6-15

Pv_{silage} is calculated in Eq. 6-16 to Eq. 6-20

$Pr_{ag(silage)}$ is calculated in Eq. 6-23 using 20 cm soil (tilled)

$Pr_{ag(grain)}$ is calculated in Eq. 6-23 using 20 cm soil (tilled)

For carbon-14, all plant concentrations (that is, $P_{forage(milk)}$, $Pr_{silage(milk)}$, and $Pr_{grain(milk)}$) take on the plant concentration value calculated from Eq. 6-21; for tritium, all plant concentrations take on the plant concentration value calculated from Eq. 6-22.

$Qs_{soil(milk)}$ = quantity of soil ingested by the dairy cattle (kg/day). The recommended default value of 0.4 kg/day (EPA 1998a) is used (see Table 7-5).

Cs = soil concentration at the 1 cm soil depth (mg/kg for COPCs and pCi/g for ROPCs calculated in Eq. 6-1 to Eq. 6-4)

Bs = soil bioavailability factor (unitless). The recommended default value of 1.0 (EPA 1998a) is used (see Table 7-5).

Ba_{milk} = biotransfer factor for milk (day/kg). Ba_{milk} is COPC- and ROPC-specific and shown in Appendix B-1, tables B1-1 (organic COPCs), B1-2 (inorganic COPCs), and B1-3 (ROPCs). If no value is available for Ba_{milk}, then A_{milk} cannot be calculated, and the ingestion of milk pathway cannot be evaluated in the HHRA. The values for Ba_{milk} in Appendix B-1, Table B1-1 (organic COPCs), will be compared against the calculated mass-limited uptake factor for milk (shown in Table 7-6), and the smaller of the two values will be used in the calculation of the milk concentration (A_{milk}).

MF = metabolism factor (unitless). MF is COPC- and ROPC-specific. The recommended default MF values of 0.01 for bis(2-ethylhexyl)phthalate and 1.0 for all other constituents (EPA 1998a) are used (see Table 7-5).

Exposure Point Concentration in Pork

Swine are assumed to consume silage and grain, as well as surface soil (that is, 1 cm untilled soil). The equation to determine pork concentrations (EPA 1998a) for all constituents is:

$$A_{pork} = \left[\left(\sum_{i=2}^{3} F_i \cdot Qp_{i(pork)} \cdot P_{i(pork)} \right) + Qs_{soil(pork)} \cdot Cs \cdot Bs \right] \cdot Ba_{pork} \cdot MF \qquad \text{(Eq. 7-15)}$$

where:

A_{pork} = concentration of COPC or ROPC in pork (mg/kg for COPCs and pCi/g for ROPCs)

F_i = fraction of plant-type *i* grown on contaminated soil and ingested by the swine (unitless). The two plant types consumed by the swine are silage and grain. The recommended default value of 1.0 (EPA 1998a) shown in Table 7-5 as F_{plant} is used for both plant types.

$Qp_{i(pork)}$ = quantity of plant type *i* eaten by the swine per day (kg/day). $Qp_{i(pork)}$ is shown in Table 7-5. The recommended values (EPA 1998a) for swine raised by subsistence

farmers are used: $Qp_{silage(pork)}$ = 1.4 kg/day is the amount of silage eaten by the swine, and $Qp_{grain(pork)}$ = 3.3 kg/day is the amount of grain eaten by the swine.

$P_{i(pork)}$ = concentration of COPC or ROPC in plant type *i* that is ingested by the swine (mg/kg for COPCs and pCi/g for ROPCs). $P_{i(pork)}$ is COPC- and ROPC-specific and calculated as follows:

$$P_{silage(pork)} = Pd_{silage} + Pv_{silage} + Pr_{ag(silage)}$$
$$P_{grain(pork)} = Pr_{ag(grain)}$$

where, for all constituents except carbon-14 and tritium:

Pd_{silage} is calculated in Eq. 6-12 to Eq. 6-15
Pv_{silage} is calculated in Eq. 6-16 to Eq. 6-20
$Pr_{ag(silage)}$ is calculated in Eq. 6-23 using 20 cm soil (tilled)
$Pr_{ag(grain)}$ is calculated in Eq. 6-23 using 20 cm soil (tilled)

For carbon-14, both plant concentrations (that is, $Pr_{silage(pork)}$ and $Pr_{grain(pork)}$) take on the plant concentration value calculated from Eq. 6-21; for tritium, both plant concentrations take on the plant concentration value calculated from Eq. 6-22.

$Qs_{soil(pork)}$ = quantity of soil ingested by the swine (kg/day). The recommended default value of 0.37 kg/day (EPA 1998a) is used (see Table 7-5).

Cs = soil concentration at the 1 cm soil depth (mg/kg for COPCs and pCi/g for ROPCs) calculated in Eq. 6-1 to Eq. 6-4.

Bs = soil bioavailability factor (unitless). The recommended default value of 1.0 (EPA 1998a) is used (see Table 7-5).

Ba_{pork} = biotransfer factor for pork (day/kg). Ba_{pork} is COPC- and ROPC-specific and shown in Appendix B-1, tables B1-1 (organic COPCs), B1-2 (inorganic COPCs), and B1-3 (ROPCs). If no value is available for Ba_{pork}, then A_{pork} cannot be calculated, and the ingestion of pork pathway cannot be evaluated in the HHRA. The values for Ba_{pork} in Appendix B-1, Table B1-1 (organic COPCs), will be compared against the calculated mass-limited uptake factor for pork (shown in Table 7-6), and the smaller of the two values will be used in the calculation of the pork concentration (A_{pork}).

MF = metabolism factor (unitless). MF is COPC- and ROPC-specific. The recommended default MF values of 0.01 for bis(2-ethylhexyl)phthalate and 1.0 for all other constituents (EPA 1998a) are used (see Table 7-5).

Exposure Point Concentration in Chicken

Chickens are assumed to consume grain grown on a farm, as well as surface soil (that is, 1 cm untilled soil). The grain eaten by chickens is grown in tilled (20 cm depth) soil. The equation to determine chicken concentrations (EPA 1998a) for all constituents is:

$$A_{chicken} = \left(F_{grain} \cdot Qp_{grain(chicken)} \cdot P_{grain(chicken)} + Qs_{soil(chicken)} \cdot Cs \cdot Bs\right) \cdot Ba_{chicken} \qquad \text{(Eq. 7-16)}$$

where:

$A_{chicken}$ = concentration of COPC or ROPC in chicken meat (mg/kg for COPCs and pCi/g for ROPCs)

F_{grain} = fraction of grain grown on contaminated soil and ingested by the chicken (unitless). The recommended default value of 1.0 (EPA 1998a) shown in Table 7-5 as F_{plant} is used for grain.

$Qp_{grain(chicken)}$ = quantity of grain eaten by the chicken per day (kg/day). The recommended value of $Qp_{grain(chicken)}$ = 0.2 kg/day (EPA 1998a) shown in Table 7-5 for chickens raised by subsistence farmers is used.

$P_{grain(chicken)}$ = concentration of COPC or ROPC in grain that is ingested by the chicken (mg/kg for COPCs and pCi/g for ROPCs). $P_{grain(chicken)}$ is COPC- and ROPC-specific and calculated as follows:

$$P_{grain(chicken)} = Pr_{ag(grain)}$$

where, for all constituents except carbon-14 and tritium:

$Pr_{ag(grain)}$ is calculated in Eq. 6-23 using 20 cm soil (tilled).

For carbon-14 and tritium, $Pr_{grain(chicken)}$ takes on the plant concentration value calculated from Eq. 6-21 and Eq. 6-22, respectively.

$Qs_{soil(chicken)}$ = quantity of soil ingested by the chicken (kg/day); the recommended default value of 0.022 kg/day (EPA 1998a) is used (see Table 7-5).

Cs = soil concentration at the 1 cm soil depth (mg/kg for COPCs and pCi/g for ROPCs) calculated in Eq. 6-1 to Eq. 6-4

Bs = soil bioavailability factor (unitless); the recommended default value of 1.0 (EPA 1998a) is used (see Table 7-5).

$Ba_{chicken}$ = biotransfer factor for chicken (day/kg); $Ba_{chicken}$ is COPC- and ROPC-specific and shown in Appendix B-1, tables B1-1 (organic COPCs), B1-2 (inorganic COPCs), and B1-3 (ROPCs). If no value is available for $Ba_{chicken}$, then $A_{chicken}$ cannot be calculated, and the ingestion of chicken pathway cannot be evaluated in the HHRA. The values for $Ba_{chicken}$ in Appendix B-1, Table B1-1 (organic COPCs), will be compared against the calculated mass-limited uptake factor for poultry (shown in Table 7-6), and the smaller of the two values will be used in the calculation of the chicken concentration ($A_{chicken}$).

Exposure Point Concentration in Wildfowl

Wildfowl are assumed to consume grain grown in the wild, as well as surface soil (that is, 1 cm untilled soil). The grain eaten by wildfowl is grown in root-zone (15 cm depth) soil. The equation to determine wildfowl concentrations (EPA 1998a) for all constituents is:

$$A_{fowl} = \left(F_{grain} \cdot Qp_{grain(fowl)} \cdot P_{grain(fowl)} + Qs_{soil(fowl)} \cdot Cs \cdot Bs\right) \cdot Ba_{fowl} \qquad \text{(Eq. 7-17)}$$

where:

A_{fowl} = concentration of COPC or ROPC in wildfowl (mg/kg for COPCs and pCi/g for ROPCs)

F_{grain} = fraction of grain grown on contaminated soil and ingested by the wildfowl (unitless). The recommended default value of 1.0 (EPA 1998a) shown in Table 7-5 as F_{plant} is used for grain.

$Qp_{grain(fowl)}$ = quantity of grain eaten by the wildfowl per day (kg/day). The recommended value of $Qp_{grain(fowl)}$ = 0.2 kg/day (EPA 1998a value for chickens) shown in Table 7-5 as $Qp_{grain(chicken)}$ is used for wildfowl.

$P_{grain(fowl)}$ = concentration of COPC or ROPC in grain that is ingested by the wildfowl (mg/kg for COPCs and pCi/g for ROPCs). $P_{grain(fowl)}$ is COPC- and ROPC-specific and calculated as follows:

$$P_{grain(fowl)} = Pr_{ag(grain)}$$

where, for all constituents except carbon-14 and tritium:

$Pr_{ag(grain)}$ is calculated in Eq. 6-23 using 15 cm soil (root-zone)

For carbon-14 and tritium, $P_{grain(fowl)}$ takes on the plant concentration value calculated from Eq. 6-21 and Eq. 6-22, respectively.

$Qs_{soil(fowl)}$ = quantity of soil ingested by the wildfowl (kg/day); the recommended default value of 0.022 kg/day (EPA 1998a value for chickens) shown in Table 7-5 as $Qs_{soil(chicken)}$ is used for wildfowl.

Cs = soil concentration at the 1 cm soil depth (mg/kg for COPCs and pCi/g for ROPCs) calculated in Eq. 6-1 to Eq. 6-4

Bs = soil bioavailability factor (unitless). The recommended default value of 1.0 (EPA 1998a) is used (see Table 7-5).

Ba_{fowl} = biotransfer factor for wil fowl (day/kg). Ba_{fowl} is COPC- and ROPC-specific and shown as $Ba_{chicken}$ in Appendix B-1, tables B1-1 (organic COPCs), B1-2 (inorganic COPCs), and B1-3 (ROPCs). If no value is available for Ba_{fowl}, then A_{fowl} cannot be calculated, and the ingestion of wildfowl pathway cannot be evaluated in the HHRA. The values for $Ba_{chicken}$ in Appendix B-1, Table B1-1 (organic COPCs), will be compared against the calculated mass-limited uptake factor for poultry (shown in Table 7-6), and the smaller of the two values will be used in the calculation of the wildfowl concentration (A_{fowl}).

Exposure Point Concentration in Chicken Eggs

Chicken eggs are from chickens that are assumed to consume grain grown on a farm in tilled (20 cm depth) soil as well as surface soil (that is, 1 cm untilled soil). The equation to determine chicken egg concentrations (EPA 1998a) for all constituents is:

$$A_{egg} = \left(F_{grain} \cdot Qp_{grain(chicken)} \cdot P_{grain(chicken)} + Qs_{soil(chicken)} \cdot Cs \cdot Bs\right) \cdot Ba_{egg} \qquad \text{(Eq. 7-18)}$$

where:

A_{egg} = concentration of COPC or ROPC in chicken eggs (mg/kg for COPCs and pCi/g for ROPCs)

F_{grain} = fraction of grain grown on contaminated soil and ingested by the chicken (unitless). The recommended default value of 1.0 (EPA 1998a) shown in Table 7-5 as F_{plant} is used for grain

$Qp_{grain(chicken)}$ = quantity of grain eaten by the chicken per day (kg/day). The recommended value of $Qp_{grain(chicken)}$ = 0.2 kg/day (EPA 1998a) shown in Table 7-5 for chickens raised by subsistence farmers is used.

$P_{grain(chicken)}$ = concentration of COPC or ROPC in grain that is ingested by the chicken (mg/kg for COPCs and pCi/g for ROPCs). $P_{grain(chicken)}$ is COPC- and ROPC-specific and calculated as follows:

$$P_{grain(chicken)} = Pr_{ag(grain)}$$

where, for all constituents except carbon-14 and tritium:

$Pr_{ag(grain)}$ is calculated in Eq. 6-23 using 20 cm soil (tilled).

For carbon-14 and tritium, $Pr_{grain(chicken)}$ takes on the plant concentration value calculated from Eq. 6-21 and Eq. 6-22, respectively.

$Qs_{soil(chicken)}$ = quantity of soil ingested by the chicken (kg/day). The recommended default value of 0.022 kg/day (EPA 1998a) is used (see Table 7-5).

Cs = soil concentration at the 1 cm soil depth (mg/kg for COPCs and pCi/g for ROPCs) calculated in Eq. 6-1 to Eq. 6-4

Bs = soil bioavailability factor (unitless). The recommended default value of 1.0 (EPA 1998a) is used (see Table 7-5).

Ba_{egg} = biotransfer factor for chicken eggs (day/kg). Ba_{egg} is COPC- and ROPC-specific and shown in Appendix B-1, tables B1-1 (organic COPCs), B1-2 (inorganic COPCs), and B1-3 (ROPCs). If no value is available for Ba_{egg}, then A_{egg} cannot be calculated, and the ingestion of chicken eggs pathway cannot be evaluated in the HHRA. The values for Ba_{egg} in Appendix B-1, Table B1-1 (organic COPCs), will be compared against the calculated mass-limited uptake factor for eggs (shown in Table 7-6), and the smaller of the two values will be used in the calculation of the chicken egg concentration (A_{egg}).

Exposure Point Concentration in Wildfowl Eggs

Wildfowl eggs are from wildfowl, which are assumed to consume grain grown in the wild in root-zone (15 cm depth) soil, as well as surface soil (that is, 1 cm untilled soil). The equation to determine wildfowl egg concentrations (EPA 1998a) for all constituents is:

$$A_{egg(fowl)} = \left(F_{grain} \cdot Qp_{grain(fowl)} \cdot P_{grain(fowl)} + Qs_{soil(fowl)} \cdot Cs \cdot Bs\right) \cdot Ba_{egg(fowl)} \qquad \text{(Eq. 7-19)}$$

where:

$A_{egg(fowl)}$ = concentration of COPC or ROPC in wildfowl eggs (mg/kg for COPCs and pCi/g for ROPCs)

F_{grain} = fraction of grain grown on contaminated soil and ingested by the wildfowl (unitless). The recommended default value of 1.0 (EPA 1998a) shown in Table 7-5 as F_{plant} is used for grain.

$Qp_{grain(fowl)}$ = quantity of grain eaten by the wildfowl per day (kg/day). The recommended value of $Qp_{grain(fowl)}$ = 0.2 kg/day (EPA 1998a value for chickens) shown in Table 7-5 as $Qp_{grain(chicken)}$ is used for wildfowl.

$P_{grain(fowl)}$ = concentration of COPC or ROPC in grain that is ingested by the wildfowl (mg/kg for COPCs and pCi/g for ROPCs). $P_{grain(fowl)}$ is COPC- and ROPC-specific, site-specific, plant type-specific, and calculated as follows:

$$P_{grain(fowl)} = Pr_{ag(grain)}$$

where, for all constituents except carbon-14 and tritium:

$Pr_{ag(grain)}$ is calculated in Eq. 6-23 using 15 cm soil (root-zone).

For carbon-14 and tritium, $P_{grain(fowl)}$ takes on the plant concentration value calculated from Eq. 6-21 and Eq. 6-22, respectively.

$Qs_{soil(fowl)}$ = quantity of soil ingested by the wildfowl (kg/day). The recommended default value of 0.022 kg/day (EPA 1998a value for chickens) shown in Table 7-5 as $Qs_{soil(chicken)}$ is used for wildfowl.

Cs = soil concentration at the 1 cm soil depth (mg/kg for COPCs and pCi/g for ROPCs). Cs is COPC- and ROPC-specific, site-specific, and calculated in Eq. 6-1 to Eq. 6-4.

Bs = soil bioavailability factor (unitless). The recommended default value of 1.0 (EPA 1998a) is used (see Table 7-5).

$Ba_{egg(fowl)}$ = biotransfer factor for wildfowl eggs (day/kg). $Ba_{egg(fowl)}$ is COPC- and ROPC-specific and shown as Ba_{egg} in Appendix B-1, tables B1-1 (organic COPCs), B1-2 (inorganic COPCs), and B1-3 (ROPCs). If no value is available for $Ba_{egg(fowl)}$, then $A_{egg(fowl)}$ cannot be calculated and the ingestion of wildfowl eggs pathway cannot be evaluated in the HHRA. The values for Ba_{egg} in Appendix B-1, Table B1-1 (organic COPCs), will be compared against the calculated mass-limited uptake factor for eggs (shown in Table 7-6), and the smaller of the two values will be used in the calculation of the wildfowl egg concentration ($A_{egg[fowl]}$).

Exposure Point Concentration in Wild Game

Wild game animals (such as deer) are assumed to consume forage grown in root-zone (15 cm) soil only. The equation to determine concentrations in game tissue (EPA 1998a) for all constituents is:

$$A_{game} = \left(F_{forage} \cdot Qp_{forage(deer)} \cdot P_{forage(deer)}\right) \cdot Ba_{deer} \cdot MF \qquad \text{(Eq. 7-20)}$$

where:

A_{game} = concentration of COPC or ROPC in wild game animals (mg/kg for COPCs and pCi/g for ROPCs)

F_{forage} = fraction of forage grown on contaminated soil and ingested by the wild game animals (unitless). The recommended default value of 1.0 (EPA 1998a) shown in Table 7-5 as F_{plant} is used for forage.

$Qp_{forage(deer)}$ = quantity of forage eaten by the wild game animals per day (kg/day). A calculated value of $Qp_{forage(deer)}$ = 1.463 kg/day (using values from Higley and Kuperman 1996) is used for wild game animals.

$P_{forage(deer)}$ = concentration of COPC or ROPC in forage that is ingested by the wild game animals (mg/kg for COPCs and pCi/g for ROPCs). $P_{forage(deer)}$ is COPC- and ROPC-specific and calculated as follows:

$$P_{forage(deer)} = Pd_{forage} + Pv_{forage} + Pr_{ag(forage)}$$

where, for all constituents except carbon-14 and tritium:

Pd_{forage} is calculated in Eq. 6-12 to Eq. 6-15

Pv_{forage} is calculated in Eq. 6-16 to Eq. 6-20

$Pr_{ag(forage)}$ is calculated in Eq. 6-23 using 15 cm soil (root-zone).

For carbon-14 and tritium, $P_{forage(deer)}$ takes on the plant concentration value calculated from Eq. 6-21 and Eq. 6-22, respectively.

Ba_{deer} = biotransfer factor for wild game animals (day/kg). Ba_{deer} is COPC- and ROPC-specific. The biotransfer factor for beef is used as a surrogate biotransfer factor for wild game animals and is shown (as Ba_{beef}) in Appendix B-1, tables B1-1 (organic COPCs), B1-2 (inorganic COPCs), and B1-3 (ROPCs). If no value is available for Ba_{deer}, then A_{game} cannot be calculated, and the ingestion of game pathway cannot be evaluated in the HHRA. The values for Ba_{beef} in Appendix B-1, Table B1-1 (organic COPCs), will be compared against the calculated mass-limited uptake factor for beef (shown in Table 7-6), and the smaller of the two values will be used in the calculation of the wild game concentration (A_{game}).

MF = Metabolism factor (unitless). MF is COPC- and ROPC-specific. The recommended default MF values of 0.01 for bis (2-ethylhexyl) phthalate and 1.0 for all other constituents (EPA 1998a) are used (See Table 7-5).

Feed-to-Animal Tissue Biotransfer Factors: Mass Balance Issues

The EPA (1998a) recommended sources for uptake factors (Ba) for organic chemicals sometimes result in animals predicted to take up more chemical into their tissues than is present in their food.

For example, for n-dioctyl phthalate, using the default uptake factors, more chemical is predicted to accumulate in beef cattle than is available in their feed. Using an assumed soil concentration of 1E-08 mg/kg, the total mass of n-dioctyl phthalate in soil and feed ingested by a steer is 49 mg (calculated as the sum of [concentration of n-dioctyl phthalate in soil and food, such as silage, grain, and forage] x

[respective consumption rate of soil and food] x [730 days exposure duration to raise a steer to market weight]). Using the recommended default uptake factor for beef, the predicted total mass of n-dioctyl phthalate in the beef is 2050 mg (calculated as the sum of [concentration of n-dioctyl phthalate in soil and food, such as silage, grain, and forage] x [respective consumption rate of soil and food] x [default beef uptake factor for n-dioctyl phthalate] x [567 kg, the average live weight for cattle taken to slaughter]). Thus, for a given concentration of n-dioctyl phthalate in soil and feed, cattle are predicted to take up more than 40 times the amount of n-dioctyl phthalate than is available in the soil and feed that is ingested over a two-year period (that is, 2050 mg in beef/49 mg in feed).

A conservative solution to this mass balance problem is to calculate an uptake factor that allows 100 % of the available chemical to transfer to animal tissue, but no more. This mass-limited uptake factor is not chemical-specific but rather it is a function of exposure duration and body weight. The feed-to-animal tissue mass-limited uptake factor is calculated as:

$$\text{Feed-to-Animal Tissue Uptake Factor} = (\text{Exposure Duration}) \div (\text{Tissue Weight}) \qquad \text{(Eq. 7-21)}$$

where:

Uptake Factor = mass-limited feed-to-animal tissue uptake factor (days/kg)
Exposure Duration = duration to bring animal to market weight (days)
Tissue Weight = total mass of animal at market weight (kg)

This mass-limited uptake factor assumes that the animals concentrate the entire mass of chemical ingested into their edible tissue, with no degradation or excretion of the chemical over the exposure duration period. This mass-limited uptake factor can be used to calculate a conservative estimate of potential dose and risk to human receptors without defying the law of conservation of mass.

Equation 7-21 is used to estimate mass-limited feed-to-animal tissue uptake factors for beef, pork, and poultry. Estimating a mass-limited feed-to-animal uptake factor for animal products (that is, milk and eggs) is slightly different. The mass limited feed-to-animal product uptake factor is a function of the daily product weight for the animal. The equation for the mass-limited feed-to-animal product uptake factor is:

$$\text{Feed-to-Animal Product Uptake Factor} = 1 \div (\text{Daily Product Weight}) \qquad \text{(Eq. 7-22)}$$

where:

Uptake Factor = mass-limited feed-to-animal product uptake factor (days/kg)
Daily Product Weight = total expected weight of animal product each day (kg/day)

Equation 7-22 is used to estimate mass-limited feed-to-animal product uptake factors for milk and eggs. All calculated feed-to-animal tissue/product mass-limited uptake factors are shown in Table 7-6. The final step in this mass-limited uptake factor approach is to compare the uptake factors as specified in the HHRAP (EPA 1998a) to the calculated mass-limited uptake factors, on a chemical-by-chemical basis for organic COPCs. The lesser of the two values will be used in the estimation of animal tissue/product concentrations.

7.1.7.5 Exposure Point Concentrations in Fish

Exposure point concentrations in fish tissue for the human health evaluation will be modeled as described here. As noted in section 6.6, this modeling effort is slightly different for the human health and ecological risk assessments. See section 8 for the modeling required for the ecological risk assessment. This section describes the models that will be used to calculate fish tissue concentrations and the uptake factors to be used in these models.

COPCs and ROPCs in fish will be estimated using the equations presented below as recommended by EPA 1998a. ROPCs will be evaluated using equations similar to those presented for COPCs in EPA 1998a. Values for the chemical-specific parameters are presented in Appendix B-1; other parameter values are presented in Table 7-5. It should be noted that the Hanford Surface Environmental Surveillance Program collects and analyzes fish tissues from the Hanford Reach of the Columbia River. However, since the SLRA will be conducted prior to release of emissions from the WTP, the fish data collected does not represent contamination contributed by the WTP and thus cannot be used to calibrate the fish model.

For organic COPCs other than dioxins, furans, and PCBs, where log K_{ow} is less than 4, and all inorganic COPCs and ROPCs with values for BCF, fish concentrations will be estimated as:

COPCs: $$C_{fish} = C_{dw} \cdot BCF_{fish} \quad \text{(Eq. 7-23a)}$$

ROPCs: $$C_{fish} = CF \cdot C_{dw} \cdot BCF_{fish} \quad \text{(Eq. 7-23b)}$$

where:

C_{fish} = concentration of COPC or ROPC in fish (mg/kg for COPCs and pCi/g for ROPCs)

C_{dw} = dissolved-phase water concentration (mg/L for COPCs or pCi/L for ROPCs) calculated in Eq. 6-9

BCF_{fish} = bioconcentration factor for COPCs and ROPCs in fish (L/kg). BCF_{fish} is COPC- and ROPC-specific and is shown in Appendix B-1, tables B1-1 (organic COPCs), B1-2 (inorganic COPCs), and B1-3 (ROPCs).

CF = units conversion factor of 1E-03 (kg/g), used in Eq. 7-23b for ROPCs only

For organic COPCs other than dioxins, furans, and PCBs, where log K_{ow} is greater than 4, and all inorganic COPCs and ROPCs with values for BAF, fish concentrations will be estimated as:

COPCs: $$C_{fish} = C_{dw} \cdot BAF_{fish} \quad \text{(Eq. 7-24a)}$$

ROPCs: $$C_{fish} = CF \cdot C_{dw} \cdot BAF_{fish} \quad \text{(Eq. 7-24b)}$$

where:

C_{fish} = concentration of COPC or ROPC in fish (mg/kg for COPCs and pCi/g for ROPCs)

C_{dw} = dissolved-phase water concentration (mg/L for COPCs or pCi/L for ROPCs) calculated in Eq. 6-9

BAF_{fish} = bioaccumulation factor for COPCs and ROPCs in fish (L/kg). BAF_{fish} is COPC- and ROPC-specific and is shown in Appendix B-1, tables B1-1 (organic COPCs), B1-2 (inorganic COPCs), and B1-3 (ROPCs).

CF = units conversion factor of 1E-03 (kg/g), used in Eq. 7-24b for ROPCs only

For dioxins, furans, and PCBs, fish concentrations will be estimated from sediment concentrations and BSAF values using the following equation:

$$C_{fish} = \frac{C_{sed} \cdot f_{lipid} \cdot BSAF_{fish}}{OC_{sed}} \qquad \text{(Eq. 7-25)}$$

where:

C_{fish} = concentration of COPC in fish (mg/kg)

C_{sed} = COPC concentration in bed sediment (mg/kg) calculated in Eq. 6-10

f_{lipid} = fish lipid content (unitless). The recommended default value of 0.07 (EPA 1998a) is used for f_{lipid} (see Table 7-5).

$BSAF_{fish}$ = biota-to-sediment accumulation factor (unitless) for fish. $BSAF_{fish}$ is COPC-specific and is shown in Appendix B-1, Table B1-1.

OC_{sed} = fraction of organic carbon in bottom sediment (unitless). The recommended default value of 0.04 (EPA 1998a) is used for OC_{sed} (see Table 7-5).

Fish Uptake Factors for Human Health Risk Assessment

In order to estimate fish concentrations from surface water or sediment concentrations, uptake factors are needed. As discussed in the HHRAP (EPA 1998a), three types of uptake factors are used:

- Bioconcentration factors (BCFs)
- Bioaccumulation factors (BAFs)
- Biota-sediment accumulation factors (BSAFs)

Per the HHRAP, for compounds with log K_{ow} less than 4.0, BCFs are used to estimate fish concentrations from surface water concentrations. For COPCs with log K_{ow} greater than 4.0, except for extremely hydrophobic compounds (such as, dioxins, furans, and PCBs), BAFs are used to estimate fish concentrations from surface water concentrations. Since extremely hydrophobic compounds have a high tendency to bioaccumulate, they are expected to be sorbed to the bed sediments more than being associated with the water phase. Therefore, BSAFs are used to estimate fish concentrations from sediment concentrations for dioxins, furans, and PCBs.

The first source of values for BCFs, BAFs, and BSAFs is the HHRAP (EPA 1998a). For values not available in the HHRAP, a literature search (including the SLERAP [EPA 1999a]) was conducted. For values not available in literature, the approaches shown below were used to estimate fish uptake factors (BCFs, BAFs, and BSAFs). The final uptake factors collected or calculated from these sources are provided in Appendix B-1, tables B1-1 (organic COPCs), B1-2 (inorganic COPCs), and B1-3 (ROPCs).

For organic COPCs where published BCFs are not available and where log K_{ow} is less than 4.0, BCFs are calculated using the following equation, from Lyman and others 1982, and cited in the HHRAP (EPA 1998a):

$$\log BCF_{fish} = -0.23 + 0.76 \quad \log K_{ow} \qquad \text{(Eq. 7-26)}$$

For organic COPCs that are not dioxins, furans, or PCBs, where published BAFs are not available and where log K_{ow} is greater than 4.0, the following approach is used to obtain BAFs:

1 Calculate an estimate of BCF by using the following equation, from Bintein and others 1993 and cited in EPA 1999a:

$$\log BCF_{fish} = 0.91 \cdot \log K_{ow} - 1.975 \cdot \log (6.8E\text{-}07 \cdot K_{ow} + 1.0) - 0.786 \qquad \text{(Eq. 7-27)}$$

2 Obtain food chain multipliers (FCMs) for trophic level 3 and 4 fish.

3 Estimate the BAF using the following equation, from the HHRAP (EPA 1998a):

$$BAF_{fish} = BCF_{fish} \cdot FCM \qquad \text{(Eq. 7-28)}$$

where FCM is the largest FCM when considering FCMs for trophic level 3 and 4 fish.

For dioxins, furans, and PCBs where published BSAFs are not available, the approach shown in the SLERAP (EPA 1999a) will be used to obtain BSAFs. This approach uses the following equation from Southworth and others, 1978 (cited in EPA 1999a):

$$\mathit{log}\ BCF_{fish} = 0.819 \cdot \log K_{ow} - 1.146 \qquad \text{(Eq. 7-29)}$$

The BSAF value for the dioxins, furans, and PCBs is assumed to be equal to the BCF calculated using Eq. 7-29.

7.2 Toxicity Assessment

The purpose of the toxicity assessment is to evaluate the potential for COPCs and ROPCs to cause adverse health effects in exposed individuals. Toxic effects have been evaluated extensively by the EPA. This section provides the results of the EPA evaluation of the COPCs and ROPCs that may be emitted by the WTP.

7.2.1 General Toxicity Information and EPA Guidance for COPCs

This section provides the toxicity values that will be used for evaluating COPCs in the PRA and the source/rationale for these values.

7.2.1.1 Chronic Toxicity of COPCs

Chronic toxicity data has been obtained according to the following hierarchy:

1. **Integrated Risk Information System (IRIS)** (EPA 2003b). IRIS is an online database that provides toxicity values for chronic oral and inhalation exposures. All data contained in IRIS is verified by an EPA work group. As such, IRIS serves as the primary source of toxicity values for the risk assessment.
2. **Health Effects Assessment Summary Tables (HEAST)** (EPA 1997b). HEAST is an EPA document that supplements IRIS by providing nonverified toxicity values. Information in HEAST is used as a secondary source for chemicals when information is not available from IRIS.
3. **Provisional Values**. In the absence of established values from IRIS or HEAST, provisional toxicity values are used from several sources (National Center for Environmental Assessment's [NCEA's] Superfund Technical Support Center, EPA regional toxicologists, and Agency for Toxic Substances and Disease Registry [ATSDR] toxicological profiles).
4. **Surrogate Values**. When toxicity values for a chemical are not available from the sources listed above, the use of a surrogate value may be necessary. This process involves applying a toxicity value established for one chemical to another chemical for which no value has been established. The application of surrogate values is based on similarities in structure, mechanism of action, and toxicity. Surrogate values for the SLRA are identified by Ecology and EPA Region 10 (CCN 064330, CCN 063814, CCN 063802, CCN 063817, CCN 063818, CCN 063812, CCN 063803).

The same approach will be used for the toxicity assessment in both the PRA and FRA. Any new toxicity values that become available prior to development of the FRA will be incorporated in the final assessment.

Chronic Noncarcinogenic Toxicity of COPCs

Noncarcinogenic effects of COPCs will be evaluated by comparing a calculated intake or dose with an acceptable daily intake criterion (referred to as the *reference dose* [RfD]) established by EPA (1997b, 2003b).

It is widely accepted that most biological effects of chemicals occur only after a threshold dose is exceeded (Klaassen and others 1996, Paustenbach 1989). For purposes of establishing noncarcinogenic health criteria, this threshold dose is usually estimated from the no observed adverse effect level (NOAEL) or lowest observed adverse effect level (LOAEL) determined from animal or human studies. NOAEL is defined as the exposure level at which no statistically or biologically significant increases are present in the frequency or severity of adverse effects (EPA 1989). The LOAEL is the lowest exposure level at which there are statistically or biologically significant increases in frequency or severity of adverse effects (EPA 1989). The LOAEL or NOAEL from the most sensitive animal or human study is used by the EPA to establish long-term health criteria. An RfD is defined as an estimate (with uncertainty spanning perhaps an order of magnitude) of the dose of a chemical (expressed in mg/kg-day) that is likely to be without an appreciable risk of deleterious effects during a lifetime (EPA 1989). Similarly, a reference concentration (RfC) represents the concentration of a chemical in air (expressed as mg/m^3) that is likely to be without an appreciable risk of deleterious effects during a lifetime (EPA 1989). When deriving RfDs or RfCs, a NOAEL value is used preferentially over a LOAEL value if both are available from the key study. EPA derives RfDs and RfCs by applying uncertainty factors to the NOAEL or LOAEL value to provide a margin of safety. The equation for deriving an RfD or RfC is shown below:

$$\text{RfD or RfC} = (\text{NOAEL or LOAEL})/(\text{UF} \times \text{MF}) \qquad \text{(Eq. 7-30)}$$

where:

RfD	=	reference dose (mg/kg-day)
RfC	=	reference concentration (mg/m^3)
NOAEL	=	no observed adverse effect level (mg/kg-day or mg/m^3)
LOAEL	=	lowest observed adverse effect level (mg/kg-day or mg/m^3)
UF	=	uncertainty factor (unitless)
MF	=	modifying factor (unitless)

Uncertainty factors can range from 1 to 10,000 and may include a factor of up to 10 to account for each of the following:

- Variation in sensitivity within human populations
- Extrapolation of effects observed in animals to humans
- Extrapolation from less-than-lifetime exposures in the critical study to lifetime exposures
- Extrapolation from a LOAEL to a NOAEL, if necessary

In some cases a modifying factor, usually ranging from 1 to 10 (or <1 for most essential nutrients [EPA 1989]), also is applied to the NOAEL/LOAEL. This value reflects a qualitative professional assessment of additional uncertainties in the critical study and in the entire database for the chemical not explicitly addressed by the above uncertainty factors (EPA 1989). EPA establishes RfDs and RfCs for evaluating both subchronic (less than 7 years) and chronic (7 years or more) exposures. Chronic RfDs will be used to evaluate all exposure scenarios, except the acute scenario, and are presented in tables 7-7 (organic COPCs) and 7-8 (inorganic COPCs).

EPA generally reports only RfC values for inhalation in IRIS and HEAST because the EPA observes that it is technically more accurate to base toxicity values directly on measured air concentrations than to make an estimate of the administered dose. Inhalation RfDs are calculated from the corresponding RfC values, when necessary, using the following equation:

$$RfD = (RfC \times IR) / BW \qquad \text{(Eq. 7-31)}$$

where:

RfD	=	chemical-specific inhalation RfD (mg/kg-day)
RfC	=	chemical-specific inhalation RfC (mg/m^3)
IR	=	default inhalation rate (20 m^3/day)
BW	=	default body weight (70 kg)

Uncertainties associated with this type of conversion include those surrounding deposition and absorption of the chemical in the lung, both of which depend on physico-chemical properties of the chemical, the phase of the chemical in air (that is, vapor, particle, or particle-bound), and characteristics of the exposed species. Use of the default inhalation rate of 20 m^3/day can also introduce uncertainty where it differs from the assumed inhalation rate used for a receptor (for example, the Native American subsistence resident has an assumed inhalation rate of 30 m^3/day). EPA recognizes the need for expressing toxicity

values in terms of a dose (mg/kg-day) for risk assessment purposes and acknowledges that, in many cases, the conversion of an RfC to a dose does not add significant uncertainty to the risk assessment process (EPA 1997b). In addition, the appropriateness of this conversion depends on the toxicological endpoint observed in the key study. For example, it may be inappropriate to estimate an internal dose for compounds that act at the point of contact (that is, sensitizers and irritants of the upper respiratory tract). In these cases, the toxicological endpoint depends only on the concentration of the chemical in air and not on the chemical dose expressed on a per-body-weight basis. For example, a chemical irritant will irritate nasal passages and lungs at a given concentration regardless of whether the exposed individual weighs 15 kg or 70 kg. In addition, this conversion might inappropriately imply effects to other organ systems or effects from other exposure routes.

RfC values are provided in tables 7-9 (organic COPCs) and 7-10 (inorganic COPCs). These RfC values were used to calculate the inhalation RfD values presented in tables 7-7 and 7-8 as described above.

Carcinogenic Toxicity of COPCs

The health risk from exposure to a carcinogen is defined in terms of probability. This probability is defined as the likelihood of a carcinogenic response in an individual that receives a given dose of a particular compound. Cancer risks are estimated using chemical-specific slope factors (SFs). For chemicals, the SF is defined as a plausible upper-bound estimate of the probability of a response (that is, cancer) per unit intake of a chemical over a lifetime (EPA 1989). An SF is provided for potentially carcinogenic COPCs in Table 7-7 for organic COPCs and Table 7-8 for inorganic COPCs.

In addition to the quantitative SF, a qualitative weight-of-evidence classification is assigned to characterize the quality and quantity of data used to evaluate the potential carcinogenicity of chemicals. As defined by EPA (1989), chemicals may be assigned to any of six weight-of-evidence groups:

- Group A - Human carcinogen (sufficient evidence of carcinogenicity in humans)
- Group B1 - Probable human carcinogen (limited evidence of carcinogenicity in humans)
- Group B2 - Probable human carcinogen (sufficient evidence of carcinogenicity in animals, with inadequate or lack of evidence in humans)
- Group C - Possible human carcinogen (limited evidence of carcinogenicity in animals, or lack of human data)
- Group D - Not classifiable as to human carcinogenicity (inadequate or no evidence)
- Group E - Evidence of noncarcinogenicity for humans (no evidence of carcinogenicity in adequate studies)

Consistent with EPA guidance (EPA 1989), chemicals assigned a weight-of-evidence classification of A, B1, or B2 are quantitatively evaluated for carcinogenic dose-response. All Group C carcinogens are also quantitatively evaluated for carcinogenic effects. The list of COPCs includes six Group A carcinogens: benzene, 1-chloroethene, dichloromethyl ether, arsenic, hexavalent chromium, and nickel (as nickel refinery dust).

EPA sometimes reports cancer potency as a unit risk (UR) based on chemical concentration in air or drinking water. For chemicals, the UR is defined as a plausible upper-bound estimate of the probability of a response (that is, cancer) per unit concentration of a chemical over a lifetime (EPA 1989) and is expressed in units of risk per $\mu g/m^3$ (air) or risk per µg/L (water).

Inhalation and oral SFs are calculated from the corresponding UR values, when necessary, using the following equation:

$$SF = (UR \times BW \times CF) / IR \qquad \text{(Eq. 7-32)}$$

where:

SF = chemical-specific inhalation or oral SF $(mg/kg\text{-}day)^{-1}$

UR = chemical-specific inhalation or drinking water UR $(\mu g/m^3)^{-1}$ or $(\mu g/L)^{-1}$

BW = default body weight (70 kg)

CF = conversion factor (1000 µg/mg)

IR = default inhalation rate (20 m^3/day) or drinking water ingestion rate (2 L/day)

Expression of the drinking water UR in terms of dose is necessary to evaluate cancer risk associated with exposure media other than drinking water (such as soil). EPA recognizes the need for expressing toxicity values in terms of dose (mg/kg-day) for risk assessment purposes and acknowledges that, in many cases, this conversion does not add significant uncertainty to the risk assessment process (EPA 1997b). Uncertainties associated with this conversion are similar to those described for the conversion of RfC to RfD. UR values are provided in Table 7-9 (organic COPCs) and Table 7-10 (inorganic COPCs).

Chronic Dermal Toxicity of COPCs

Oral and inhalation RfDs and SFs are currently available for many of the COPCs. Dermal RfDs and SFs are estimated for COPCs from oral toxicity values using chemical-specific gastrointestinal absorption factors (GAFs) to calculate total absorbed dose. This conversion is necessary because most oral RfDs and SFs are expressed as the amount of chemical *administered* per time and body weight; however, dermal exposure is expressed as an *absorbed* dose. Dermal toxicity factors are calculated from oral toxicity factors as shown below (EPA 2001a):

$$RfD_{dermal} = RfD_{oral} \times GAF \qquad \text{(Eq. 7-33)}$$

$$SF_{dermal} = SF_{oral}/GAF \qquad \text{(Eq. 7-34)}$$

Chemical-specific GAF values are used when available. Not all COPCs have chemical-specific GAF values. When quantitative data was not available, default GAF values of 0.8 for VOCs, 0.5 for SVOCs, and 0.2 for inorganics are used (Ecology 2002). GAF values are provided in tables 7-7 and 7-8 along with the resulting dermal RfD and SFs.

7.2.1.2 Acute Toxicity of COPCs

Acute effects from direct inhalation of airborne COPCs (vapor and particulate) are evaluated by comparison of modeled one-hour maximum air concentrations to acute inhalation exposure criteria (AIEC). The AIEC values for COPCs were selected based on the following hierarchy:

1 Values from the NCEA (as provided by EPA Region 10)

2 Acute reference exposure levels (ARELs) from California EPA

3 Acute exposure guideline levels (AEGL-1). If an AEGL-1 value is not available but an AEGL-2 value is available, the AEGL-2 value will be used unless a more conservative value is available from one of the other sources in the hierarchy.

4 Emergency response planning guidelines (ERPG-1)

5 Temporary emergency exposure limits (TEEL-1)

The AIEC values selected using this hierarchy are provided in Table 7-11. Only one NCEA provisional value (for PCBs) is used. The ARELs from California EPA include potential effects of intermittent acute exposures. AEGL-1, AEGL-2, and ERPG-1 values are available in units of parts per million (ppm). All units have been converted to mg/m^3 in Table 7-11. Values are provided in their original units, along with conversion factors, in Table 7-12.

7.2.1.3 Toxicity of COPCs to Nursing Infant

Potential infant exposures to PCDD/PCDFs and coplanar PCBs in human breast milk will be evaluated in the SLRA. The interpretation of infant exposure is limited by the lack of infant dose-response data. EPA Region 6 (EPA 1998b) recommends evaluating infant exposures to dioxins in breast milk by comparing a site-specific calculated dose to the infant (ADD_{inf}) to a background ADD_{inf}.

A background infant ADD of 64 pg/kg-day of PCDD/PCDFs as 2,3,7,8-tetrachlorodibenzo-p-dioxin toxic equivalents (TEQ) has been calculated by the EPA based on an average background 2,3,7,8-TCDD TEQ concentration of 17 parts per trillion (ppt) measured in breast milk (Lorber and Phillips 2002).

This background approach will also be used for evaluating potential risks to the nursing infant for exposure to “dioxin-like” coplanar PCBs. The estimated dose (as 2,3,7,8-TCDD equivalents) of coplanar PCBs will be compared to a background infant dose of 23 pg/kg-day (from maternal milk concentration of 8 ppt per Lorber and Phillips 2002). In addition to evaluating dioxin and PCB exposures separately, a total infant dose of dioxin-like compounds (PCDDs/PCDFs and coplanar PCBs expressed as 2,3,7,8-TCDD equivalents) will be calculated and compared to a total background dose of dioxin-like compounds of 87 pg/kg-day. This background dose may overestimate current exposures because dioxin exposures have been decreasing for many years. The source of this value and potential range of background doses will be discussed further in the uncertainty assessment of the PRA report.

This approach is based on the assumption that, if the estimated dose to a nursing infant from site-related dioxins is below the nationwide background dose of dioxins to nursing infants, the site-related risk of cancer or noncancer effects is not significant.

According to the Office of the US Surgeon General (2000), “Scientific evidence states that human milk contains an abundance of factors that are active against infection. Breastfed infants, compared to formula-fed infants, produce enhanced immune responses to polio, tetanus, diphtheria, and common respiratory infections. Recent research also suggests that breastfeeding reduces the risk of chronic diseases among children, including diabetes, inflammatory bowel disease, allergies and asthma, and childhood cancer. These positive effects have been noted despite the ubiquitous presence of dioxin and dioxin-like compounds in the breast milk of U.S. women.”

In discussing infant exposure to background concentrations of dioxins, EPA (1994b) notes that “breast-feeding infants have higher intakes of dioxin and related compounds for a short but

developmentally important part of their lives. However, the benefits of breast feeding are widely recognized to outweigh the risks."

Although background intakes of dioxins by nursing infants (64 pg/kg-day, Lorber and Phillips 2002) are relatively high compared to adult intakes (1 to 3 pg/kg-day, EPA 1998a), the body burden of nursing infants is only about two times that of adults, and the contribution of infant exposure to adult body burden is small. The reduced body burden in nursing infants (relative to intake) may be due to the rapid growth of the infant and a faster elimination/excretion rate in infants. Background concentrations of dioxins in environmental media have been declining in the United States since the 1970s. The background exposure to adults and nursing infants is expected to continue to decline (EPA 2000e).

Transplacental transfer of dioxins from the mother to the fetus may also be a significant source of exposure. Dioxins may produce a broad range of effects in experimental animals exposed in-utero, and limited epidemiological studies have been conducted (EPA 2000e). Potential effects (cancer or noncancer, including developmental effects) of prenatal exposures are not included in the quantitative evaluation of risk.

EPA 2003e, *Supplemental Guidance for Assessing Cancer Susceptibility from Early-Life Exposure to Carcinogens*, provides draft EPA guidance for evaluating early-life exposures to carcinogens. This guidance recommends that cancer risk (including risk from infant exposure to breast milk) be calculated as LADD times a cancer SF, but notes that the timing of exposure to carcinogens may be important, specifically:

- Early life exposures to carcinogens may have a larger or smaller impact on lifetime cancer risk than later exposures, even if the total lifetime exposure is the same.
- Exposures near the end of life may have little effect on lifetime cancer risk.

EPA 2003e recommends calculating a combined lifetime risk rather than separate infant, child, and adult risks. To account for the potential impact of the timing of exposure on risk, EPA 2003e recommends calculating lifetime risk as:

$$\text{Risk} = \Sigma[\text{ADD} \times (\text{ED}/70) \times \text{AF} \times \text{SF}] \qquad \text{(Eq. 7-35)}$$

where:

ADD = average daily dose for the receptor (mg/kg-day)
ED = exposure duration for the receptor (years)
70 = lifetime (years)
AF = adjustment factor for cancer slope factor for mutagenic chemicals (unitless)
SF = cancer slope factor $(\text{mg/kg-day})^{-1}$

For mutagenic chemicals, early life exposures have a larger impact than later exposures on lifetime risk. This impact can be quantified using the following adjustments (EPA 2003e):

- For exposures before 2 years of age, a 10-fold adjustment
- For exposures between 2 and 15 years of age, a 3-fold adjustment
- For exposures after 15 years of age, no adjustment

For carcinogens that act by mechanisms other than mutagenicity, early life exposure may have a larger, smaller, or no impact on lifetime cancer risk. This impact would be chemical- or mechanism-specific and cannot be quantified at this time; therefore, no adjustment factor is recommended. The potential impact of exposures near the end of life also cannot be quantified.

Radionuclides are mutagens; therefore, these adjustment factors will be used in calculating lifetime risks for nursing infants exposed to ROPCs. PCDDs/PCDFs and PCBs are not mutagens; therefore, lifetime risk for these compounds will be calculated with no adjustment to the SF.

There is currently no consensus regarding the most appropriate single approach to quantitatively evaluate potential risks associated with exposure to dioxin-like compounds by nursing infants. Alternative approaches to the two methods described above (that is, comparison to background and lifetime risk) include calculating infant risks using (1) the infant ADD calculated with a one-year exposure duration and a one-year averaging time, and (2) the infant LADD calculated with a one-year exposure duration and a 70-year averaging time. These alternative methods will be presented in the uncertainty assessment of the PRA report.

7.2.2 Toxicity Information and EPA Guidance for Specific COPCs

The toxicity assessments for several COPCs and classes of COPCs with unique toxicity characteristics or methods for assessment are described below.

7.2.2.1 Chromium

Hexavalent chromium (Cr^{+6}) is the most toxic valence state of chromium and has been shown to be a human carcinogen through inhalation. Trivalent chromium (Cr^{+3}) has not been shown to be carcinogenic in either humans or laboratory animals; however, the mechanism of Cr^{+6} carcinogenicity in the lung is believed to be its reduction to Cr^{+3} and its generation of reactive intermediates (Goyer 1996 in Klaassen and others 1996). While chromium emitted from the melter is not likely to be in the hexavalent form, the PRA will conservatively assume that 100 % of the facility emissions are hexavalent chromium (EPA 1998a).

For the FRA, chromium may be assumed to exist in the trivalent form. If this assumption is made in the FRA, the rationale will be provided at that time. Performance test data or design information may also be used to provide more realistic estimates of Cr^{+6}/Cr^{+3} emissions from the WTP for the FRA.

7.2.2.2 Lead

The EPA has not derived an RfD or SF for lead. The potential for adverse health effects associated with exposure to lead will be characterized through comparison of predicted air and soil concentrations with the following health-based levels as recommended by EPA Region 6 (EPA 1998a).

Exposure Medium	EPA Region 6 Health-Based Target Level for Lead
Soil	100 mg/kg
Air	0.2 μg/m^3

The target level for soil is based on acceptable lead concentrations in blood. The EPA recommends that lead exposures be limited so that 95 % of the sensitive subpopulation (children) will have blood lead concentrations below 10 µg/dL. EPA modeling estimates that lead levels in the blood of at least 95 % of children exposed to soil lead concentrations of 400 mg/kg will have blood lead concentrations below 10 µg/dL. EPA Region 6 has incorporated a margin of safety by allowing only 25 % of this 400 mg/kg threshold level as their recommended target level of 100 mg/kg.

The recommended target level of 0.2 µg lead/m^3 for air is 25 % of the National Ambient Air Quality Standard (NAAQS) quarterly average air concentration of 1.5 µg/m^3 translated to an annual value of 0.9 µg/m^3.

7.2.2.3 Nickel

EPA (1998a) recommends that nickel be evaluated as an inhalation carcinogen because some forms of nickel, including nickel carbonyl, nickel subsulfide, and nickel refinery dust, are considered to be carcinogens. This is contrary to EPA's previous analysis of the toxicity of nickel emissions from hazardous waste combustion units because it was previously assumed that nickel can only be emitted as nickel oxide which, by itself, is not considered to be a carcinogen. Nickel oxide is a major component of nickel refinery dust (other major components include nickel subsulfide and nickel sulfide), which is identified as a potential human inhalation carcinogen. The components responsible for the carcinogenicity of nickel refinery dust have not been conclusively established. Therefore, nickel emissions are evaluated as a potential carcinogen through the inhalation pathway using the inhalation SF for nickel refinery dust. For exposure pathways other than inhalation, nickel has not been shown to be carcinogenic and will be evaluated as a noncarcinogen using the oral RfD for nickel-soluble salts.

7.2.2.4 Particulates

Toxicity values (that is, RfDs) are not available to quantitatively evaluate potential adverse health effects associated with inhaling particulates. Therefore, modeled annual average concentrations of respirable particulates will be compared with the following NAAQS values:

Particle Diameter	NAAQs value[a]
< 10 µm (PM_{10})	50 µg/m^3
< 2.5 µm ($PM_{2.5}$)	15 µg/m^3

[a]Values are for annual average concentrations.

For air modeling purposes, it is assumed that all particulates released from the facility will have a diameter of 1 µm; therefore, the $PM_{2.5}$ standard will be used for comparison to predicted air concentrations.

7.2.2.5 Polycyclic Aromatic Hydrocarbons

Potential cancer risks associated with the seven polycyclic aromatic hydrocarbons (PAHs) considered to be carcinogenic (benzo [a]pyrene, benzo[a]anthracene, benzo[b]fluoranthene, benzo[k]fluoranthene, chrysene, dibenz[a,h]anthracene, and indeno[1,2,3-cd]pyrene) will be evaluated using a toxicity equivalency approach. Adequate toxicity data is available to determine an SF only for benzo[a]pyrene. A

relative potency factor (RPF) is assigned to each of the other six carcinogenic PAHs as compared to benzo[a]pyrene. Using the method, exposure concentrations are converted to equivalent concentrations of benzo[a]pyrene by multiplying the concentration by the appropriate RPF. This approach results in toxicity equivalent (TEQ) concentrations of each carcinogenic PAH. The SF for benzo[a]pyrene will then be used to evaluate risk from the equivalent concentration of each PAH. RPFs, available from EPA (1993a), are presented in Table 7-13. This method will be applied to both oral and inhalation exposure pathways. One limitation to this approach is that it does not measure point-of-action effects.

RPFs are available from California EPA (CalEPA) for additional potentially carcinogenic PAHs and may be considered if PAHs are determined to be important risk drivers (that is, cancer risks close to 10^{-5}) at the facility. CalEPA RPFs are available for the following PAHs (CARB 1994):

benzo[a]pyrene	7H-dibenzo[c,g]carbazole	1-nitropyrene
benz[a]anthracene	dibenzo[a,e]pyrene	4-nitropyrene
benzo[b]fluoranthene	dibenzo[a,h]pyrene	1,6-dinitropyrene
benzo[j]fluoranthene	dibenzo[a,i]pyrene	1,8-dinitropyrene
benzo[k]fluoranthene	dibenzo[a,l]pyrene	6-nitrochrysene
dibenz[a,j]acridine	indeno[1,2,3-cd]pyrene	2-nitrofluorene
dibenz[a,h]acridine	5-methylchrysene	chrysene

No RfD values are available for evaluating noncancer effects for PAHs of interest. If PAHs are predicted to be important emissions from the facility based on their estimated cancer risks, surrogate toxicity values may be considered. Any selection of surrogates would be conducted by Ecology and EPA toxicologists. The WTP will provide Ecology and EPA with a list of PAHs for which surrogate values are needed. PAHs with Ecology/EPA-provided surrogates will then be included in the quantitative evaluation. PAHs lacking Ecology/EPA-approved surrogates will be evaluated qualitatively in the uncertainty assessment in the PRA.

7.2.2.6 Polychlorinated Dibenzo-p-dioxins, Polychlorinated Dibenzofurans, and Polychlorinated Biphenyls

Chlorinated dioxins, chlorinated dibenzofurans, and chlorinated biphenyls are thought to act through a common mechanism of toxicity by binding to a protein known as the arylhydrocarbon receptor (AR) (for review, see ATSDR 1997 or WHO 1998). The AR-ligand complex is responsible for the activation of genes that have a deleterious effect when they are not under proper regulation by the receptor's hormones. Interaction of dioxins and similar compounds with AR, therefore, can cause immunological, neurological, endocrine, embryotoxic, and many other effects.

The similarity in action of these compounds is thought to result from their structural similarity. Dioxin is composed of two benzene rings joined by two carbon-oxygen-carbon bonds on two adjacent carbons of each benzene ring. Dibenzofurans have two benzene rings joined by a carbon-oxygen-carbon bond and a carbon-carbon bond on two adjacent carbons of each benzene ring. Biphenyls consist of two benzene rings joined by a single carbon-carbon bond. To form the polychlorinated derivatives, chloro groups are attached at various locations, as designated in the names of the compounds. Benzene rings are planar (that is, flat) in conformation. Because two adjacent carbons on each benzene ring are joined in dioxins and dibenzofurans, both benzene rings are held in the same plane, and the chloro groups are also in that

plane. Therefore, these molecules are said to be coplanar. The coplanar structure appears to be essential for interaction with AR. The benzene rings in biphenyl can rotate relative to each other, unless there are added groups that interfere with rotation (such as 2,2′,6,6′-chloro groups, which occupy the carbons immediately on both sides of the carbon-carbon bond joining the rings). PCB congeners that are able to form a coplanar molecule (and are called *coplanar PCBs*) can interact with AR when they are in that configuration. Therefore, coplanar PCBs are included among the COPCs with similar action to dioxins and dibenzofurans.

Potential cancer risks associated with PCDDs/PCDFs and coplanar PCBs will be evaluated using the cancer SF for 2,3,7,8- TCDD of 1.0E+06 $(mg/kg\text{-}day)^{-1}$ proposed in the *Exposure and Human Health Reassessment of 2,3,7,8-Tetrachlorodibenzo-p-Dioxin (TCDD) and Related Compounds* (EPA 2000e) at the direction of Ecology and EPA Region 10 (CCN 063809). While the proposed SF has not yet been approved by EPA, it is more conservative than the current SF published in HEAST.

A discussion of risk results using both the current (HEAST) and proposed (dioxin reassessment) SFs will appear in the uncertainty section of the PRA.

Because these contaminants have a common mechanism of action, it is assumed that their toxicity to biota is additive (WHO 1998, EPA 1998a). That is, the risks from all dioxins, dibenzofurans, and coplanar PCBs will be added.

Polychlorinated Dibenzo-p-dioxins and Polychlorinated Dibenzofurans

EPA (1998a) recommends evaluating all PCDD/PCDF congeners with chlorine molecules substituted in the 2, 3, 7, and 8 positions as carcinogens. Potential cancer risks associated with these PCDD/PCDFs will be evaluated using a toxicity equivalency approach. This approach assigns a relative toxicity of each of the seventeen 2,3,7,8-substituted PCDDs/PCDFs as compared to 2,3,7,8-TCDD. Using the method, exposure concentrations are converted to equivalent concentrations of 2,3,7,8-TCDD by multiplying the concentration by the appropriate toxicity equivalence factor (TEF). This conversion results in TEQ concentrations of each congener. The SF for 2,3,7,8-TCDD is then used to evaluate risk from the total TEQ concentration. The most recent TEFs, available from the World Health Organization (WHO 1997) and provided in Table 7-13, will be used.

Toxicity values are not available for evaluating potential noncancer effects of PCDDs/PCDFs. EPA (1998a) recommends evaluating potential noncancer hazards by comparing predicted exposures to the national average background exposure levels of 1 to 3 pg/kg-day for adult and child receptors.

Polychlorinated Biphenyls

Coplanar PCBs and PCDDs/PCDFs are similar structurally and may act through common mechanisms of toxicity. EPA (1996c) is implementing the use of dioxin TEFs for coplanar, dioxin-like PCBs. Using this approach, exposure concentrations of coplanar PCBs are converted to equivalent concentrations of 2,3,7,8-TCDD by multiplying the concentration by the appropriate TEF. The SF for 2,3,7,8-TCDD is used to evaluate risk from the total TEQ concentration. Potential cancer risks associated with coplanar PCB emissions will be estimated using TEFs available from WHO (1997) and listed in Table 7-13. Note that TEFs are available for 12 of the 14 coplanar PCBs.

The estimated dose of coplanar PCBs, expressed as 2,3,7,8-TCDD equivalents, will be added to the total estimated dose of dioxins and used to estimate total risk from “dioxin-like” compounds in addition to evaluating coplanar PCB dose separately.

Other (noncoplanar) PCBs will be evaluated using the SF for PCBs shown in Table 7-7. EPA (1996c) recommends different SFs for different exposure routes and chlorine contents. The most conservative SF (that is, SF from the high-risk persistence tier) is presented in Table 7-7 and will be used for the PRA.

Noncancer effects of PCBs will be evaluated using the RfD for Aroclor-1254.

7.2.3 Surrogate Values

When chemical-specific toxicity values for a chemical are not available, the use of a surrogate value may be necessary. This process involves applying a toxicity value established for one chemical to another chemical for which no value has been established. The application of surrogate values is based on similarities in structure, mechanism of action, and toxicity. The following surrogate values for the SLRA have been identified by Ecology and EPA Region 10:

- m-, o-, and p-Xylene - xylene mixed isomers will be used.
- 2-methylnaphthalene - naphthalene will be used.
- Petroleum hydrocarbons - The Washington State *Model Toxics Control Act* (Ecology 2001) method will be used to calculate surrogate toxicity values for the inhalation pathway for hydrocarbons lacking chemical-specific values.

7.2.4 Toxicity Information and EPA Guidance for ROPCs

This section provides the toxicity values that will be used for evaluating ROPCs in the PRA and the source/rationale for these values.

7.2.4.1 Chronic Noncarcinogenic Toxicity of ROPCs

ROPCs are not evaluated for noncarcinogenic effects. However, the stable form of ROPCs with noncarcinogenic effects are evaluated as COPCs. For example, the potential cancer effect of Sr-90 is evaluated as an ROPC while the potential noncancer effects of stable strontium are evaluated as a COPC. The list of inorganic COPCs includes the stable form of 12 ROPCs (antimony, barium, cadmium, cobalt, iodine, nickel, selenium, strontium, tin, uranium, yttrium, and zirconium).

7.2.4.2 Carcinogenic Toxicity of ROPCs

Ionizing radiation, and therefore all ROPCs, is considered to be a Group A carcinogen. Cancer risk from exposure to ROPCs through ingestion, inhalation, and external exposure to radionuclides in soil is estimated using a SF. Ingestion and inhalation SFs are central estimates from a linear model of the age-averaged, lifetime radiation cancer incidence risk per unit of activity inhaled or ingested, and are expressed in units of risk/pCi (that is, pCi^{-1}). Ingestion SFs are taken from the *Health Effects Assessment Summary Tables (HEAST) 2001 Update* (EPA 2001b) and are tabulated separately for ingestion of tap water, dietary intakes, and incidental soil ingestion. Inhalation SFs (EPA 2001b) are provided separately for inhalation of particulates and vapors or gas.

For external exposure to radionuclides in soil, SFs are central estimates of lifetime radiation cancer risk for each year of exposure to external radiation from photon-emitting radionuclides distributed uniformly in a thick layer of soil. These SFs are expressed as risk/yr per pCi/gram soil (that is, $[pCi\text{-}yr/g]^{-1}$). The

SFs provided for external exposure in HEAST (EPA 2001b) are derived from risk coefficients listed in *Federal Guidance Report No. 13* (FGR No. 13) (EPA 1999g) that assume an infinite depth of contaminated soil. For the WTP, however, it is expected that ROPCs will be deposited on the surface and will be uniformly distributed over the top 1 cm of soil and not to an infinite depth (EPA 1998a). FGR No. 12 (EPA 1993b) also provides dose coefficients for a soil depth of 1 cm. HEAST SFs are, therefore, adjusted using dose coefficients provided in FGR No. 12 (EPA 1993b), assuming that risk coefficients (and SFs) scale proportionally with dose coefficients and depth. Using this approach, adjustments to HEAST factors are made using the following equation (CCN 064328):

$$CSF_{adj} = CSF_{HEAST} \times (DC_{1} \div DC_{inf}) \qquad \text{(Eq. 7-36)}$$

where:

CSF_{adj}	=	adjusted cancer slope factor for 1 cm depth
CSF_{HEAST}	=	HEAST factor for an infinite depth
DC_{1}	=	FGR No. 12 dose coefficient for 1 cm depth
DC_{inf}	=	FGR No. 12 dose coefficient for infinite depth

The resulting depth-corrected SFs are provided in Table 7-14.

Cancer risk (morbidity) from external exposure to ionizing radiation in air is evaluated using a cancer risk factor (RF) expressed in units of $(\text{Bq-secs/m}^3)^{-1}$. RFs are obtained from FGR No. 13 (EPA 1999g) and are provided in Table 7-14.

Some ROPCs are given the suffix "+D" to indicate that cancer risk estimates using these SFs include contributions to toxicity from short-lived decay products. For example, the +D slope factor for Sb-125 includes the contribution of Te-125m, which is assumed to be in equilibrium with the parent. Risks are calculated using these +D SFs. Because the +D SFs for Sr-90 and Cs-137 include the contributions from their short-lived decay products Y-90 and Ba-137m, separate risks are not calculated for these decay products (Y-90 and Ba-137m). Quantifying separate cancer risks for Y-90 and Ba-137m, in addition to using +D slope factors for Sr-90 and Cs-137, would result in double counting the toxicity of these two ROPCs.

7.2.4.3 Chronic Dermal Toxicity of ROPCs

Dermal absorption of ROPCs will be evaluated for tritium. The internal dose from immersion in a plume of tritiated water vapor is approximately 50 % from inhalation and 50 % from dermal absorption (Till and Meyer 1983); therefore, dermal absorption of tritium will be accounted for in the exposure assessment by multiplying the inhalation dose for this ROPC by 2. Dermal absorption of other ROPCs will not be evaluated because this pathway is considered to be insignificant compared to inhalation for all ROPCs except tritium (see Appendix B-3 for further discussion).

7.2.4.4 Acute Toxicity of ROPCs

Acute effects from a one-hour exposure to ROPCs will be estimated based on a total acute dose limit of 0.1 rem. Appendix B-3 provides a review of the literature that establishes the basis for defining a LOAEL for radionuclides. Based on this literature review, the lowest dose where clinically significant nonstochastic effects (that is, the acute effects of radiation) have been observed is approximately 10 rem.

Applying the California EPA methodology from *The Determination of Acute Reference Exposure Levels for Airborne Toxicants* (CalEPA 1999), a default uncertainty factor of 10 is applied to convert this LOAEL to a NOAEL of 1 rem. The acute dose limit is then estimated by applying a second default uncertainty factor of 10 to account for intraspecies variability to provide protection to sensitive subpopulations. For radiation effects, children represent a sensitive subpopulation. This acute dose limit applies to a single exposure and does not account for intermittent exposures. This approach is very conservative. Unless 5 rem to 25 rem are delivered in a very acute exposure, there would be no adverse effect; by using 0.1 rem, one would not anticipate any effect at this level. It must be noted that the one-hour radionuclide exposure is not comparable to the one-hour chemical exposures, and 0.1 rem is not an acute criterion.

For each of the ROPCs, acute radionuclide exposure criteria (AREC) corresponding to an acute dose of 0.1 rem were calculated as described below. The calculated ARECs include two exposure pathways associated with submergence in a cloud of particulate and vapor phase radionuclides: external gamma exposure and inhalation. The following equations were used to calculate ARECs for these two pathways:

External Gamma Exposure:

$$AREC_E = DL / (CDE \times CF_1 \times CF_2 \times ET \times CF_3 \times CF_4) \qquad \text{(Eq. 7-37)}$$

Inhalation:

$$AREC_I = DL / (CDE \times CF_1 \times CF_2 \times BR \times ET \times CF_4) \qquad \text{(Eq. 7-38)}$$

Total:

$$AREC_R = 1/(1/AREC_E + 1/AREC_I) \qquad \text{(Eq. 7-39)}$$

where:

$AREC_E$	=	acute radionuclide exposure criteria for external gamma (µCi/cm^3)
$AREC_I$	=	acute radionuclide exposure criteria for inhalation (µCi/cm^3)
$AREC_R$	=	total acute radionuclide exposure criteria (µCi/cm^3)
DL	=	dose limit of 0.1 rem (100 mrem)
CDE	=	committed dose equivalent for radionuclide i (Sv-m^3/Bq-s for external gamma; Sv/Bq for inhalation)
CF_1	=	conversion factor (mrem/Sv)
CF_2	=	conversion factor (Bq/µCi)
ET	=	acute exposure time (1 hr)
CF_3	=	conversion factor (s/hr)
CF_4	=	conversion factor (cm^3/m^3)
BR	=	breathing rate of standard man (1.2 m^3/hr)

ROPC decay products are represented in the calculation based on their respective decay probabilities. Parent radionuclides are given the "+D" designation to indicate that decay products are considered. Table 7-14 lists the parent and decay products included in the calculations. The following equation was

used to calculate the committed dose equivalent (CDE) for the combination of a parent and decay product radionuclides:

$$CDE+D = \Sigma\ CDE_i \times f_i \qquad \text{(Eq. 7-40)}$$

where:

CDE+D	=	committed dose equivalent for radionuclide i and its daughter products
CDE_i	=	committed dose equivalent for radionuclide i
f_i	=	decay probability of radionuclide i

The calculated ARECs shown result in a dose of 0.1 rem from each of the 46 ROPCs; therefore, when combined for all 46 ROPCs, these concentrations would result in a total dose of 4.4 rem. These concentrations are adjusted to ensure that the overall dose from all 46 ROPCs will not exceed 0.1 rem for an acute exposure of one hour as shown below:

$$AREC_M = AREC_R /44 \qquad \text{(Eq. 7-41)}$$

where:

$AREC_M$	=	acute radionuclide exposure criteria for ROPC i corrected for the presence of multiple ROPCs (µCi/cm^3)
$AREC_R$	=	acute radionuclide exposure criteria for ROPC i as calculated above (µCi/cm^3)
44	=	total number of individually quantified ROPCs (Ba-137m and Y-90 are included as daughter products and are not quantified separately)

The $AREC_M$ values for each of the ROPCs are provided in Table 7-15.

7.2.4.5 Toxicity of ROPCs to Nursing Infant

Nursing infant scenarios will be evaluated for exposure to ^{90}Sr, ^{129}I, ^{134}Cs, and ^{137}Cs. Background concentrations of ^{90}Sr, ^{129}I, ^{134}Cs, and ^{137}Cs in human breast milk are not available. The potential toxicity of these ROPCs to an infant will be evaluated using the ingestion SF for each of the ROPCs to calculate lifetime cancer risk as described in section 7.2.1.3. Radionuclides are mutagens; therefore, the adjustment factors listed in section 7.2.1.3 will be applied for this lifetime risk calculation.

7.3 Risk Characterization

The purpose of the risk characterization is to evaluate the information obtained through the exposure (section 7.1) and toxicity (section 7.2) assessments to estimate the potential for receptors to experience adverse effects (cancer risks and noncancer hazards) as a result of exposure to media contaminated by emissions from the WTP. Potential health risks will be characterized separately for noncarcinogenic and carcinogenic endpoints, and chemical (that is, nonradiological) and radiological cancer risks will be evaluated and presented separately.

7.3.1 Risk Characterization for Carcinogens

For carcinogens, risk is expressed as the probability that an individual will develop cancer over a lifetime as a result of exposure to a carcinogen. Cancer risk from exposure to contamination is expressed as incremental lifetime cancer risk (ILCR), or the increased chance of cancer above the normal background rate of cancer. Cancer risk from external exposure to ionizing radiation in air is expressed in terms of morbidity.

Cancer risk is estimated for each potentially carcinogenic COPC and ROPC as:

For all pathways except exposure to ROPCs in air:

$$ILCR = LADD \times SF \qquad \text{(Eq. 7-42)}$$

For exposure to ionizing radiation in air:

$$ILCR = LADD \times RF \qquad \text{(Eq. 7-43)}$$

where:

LADD = lifetime average daily dose (mg/kg-day, or pCi [ingestion or inhalation of ROPCs], or pCi-yr/g [external exposure to ionizing radiation in soil] or Bq-sec/m^3 [external exposure to ionizing radiation in air])

SF = cancer slope factor ([mg/kg-day]$^{-1}$ or pCi^{-1} for ingestion or inhalation of ROPCs, or [pCi-yr/g]$^{-1}$ for external exposure to ionizing radiation in soil)

RF = cancer incidence risk factor (Bq-sec/m^3)$^{-1}$

The threshold for the total ILCR for COPCs, the total ILCR for ROPCs, and the chemical-specific ILCR for COPCs and ROPCs is 1E-05 or 1 in 100,000 exposed individuals (EPA 1998b).

7.3.1.1 Additivity of Dioxins and PCBs

Chlorinated dioxins, chlorinated dibenzofurans, and coplanar chlorinated biphenyls are similar structurally and may act through common mechanisms of toxicity. Because they may have a common mechanism of action, it is assumed that the toxicity of these chemicals is additive (WHO 1998, EPA 1998a). This additivity is addressed in the risk characterization by presenting a total risk from PCDDs, PCDFs, and coplanar PCBs in addition to presenting individual risks from these chemicals.

7.3.1.2 Additivity of Other Potential Carcinogens

The assumption of strict additivity of chemical carcinogens assumes that (1) intakes of individual chemicals are small, and (2) there is no interaction among chemicals (that is, no synergism or antagonism). Uncertainties associated with the assumption of additivity of chemical carcinogens will be discussed in the uncertainty section of the PRA. Despite the uncertainty, a total ILCR from exposure to all carcinogenic COPCs will be calculated as the sum of the chemical-specific ILCRs.

The assumption of strict additivity of cancer risk from radionuclides is much less uncertain. A total ILCR from exposure to all ROPCs will be calculated as the sum of the radionuclide-specific ILCRs.

7.3.2 Risk Characterization for Noncarcinogens

Noncarcinogenic health hazards are characterized using a hazard quotient (HQ) and hazard index (HI) approach. The HQ is the ratio of the calculated ADD to the reference or "safe" dose as shown below:

$$HQ = ADD/RfD \qquad \text{(Eq. 7-44)}$$

where:

HQ = hazard quotient (unitless)
ADD = average daily dose (mg/kg-day)
RfD = reference dose (mg/kg-day)

HQs will be calculated for each noncarcinogenic COPC. ROPCs having potential health effects not associated with radioactivity (that is, noncancer effects) will be evaluated as inorganic COPCs. An HQ of 1 or less indicates that the chemical-specific ADD is below the level associated with adverse effect. An HQ threshold level of 0.25 has been selected as a risk management decision by Ecology and EPA Region 10 to provide a conservative evaluation of hazard and is consistent with other EPA guidance (EPA 1998b).

Additivity of Noncarcinogens

Multiple chemical exposures can result in synergism, antagonism, and/or additivity of biological responses when the chemicals act on similar target organs or when they are metabolized by the same enzymatic pathways. Additivity of noncarcinogenic health effects should only be considered if the chemicals have the same toxicological endpoint (for example, organ or enzyme system), which implies the same mechanism of action. Additivity for all chemicals will initially be assumed for the SLRA regardless of toxicological mechanism or endpoint. This approach is likely to overestimate the true human health risks associated with exposure to the COPCs since many chemicals may act on different target organs. If the target HI is exceeded, a segregation of the HI by toxicological endpoint will be considered. If segregation by toxicological endpoint is used, chemical groupings by endpoint will be assigned with approval by Ecology and EPA. In addition to multiple chemicals, receptors may be exposed through more than one pathway. As EPA (1989) notes:

> There are two steps required to determine whether risks or hazard indices for two or more pathways should be combined for a single exposed individual or group of individuals. The first is to identify reasonable exposure pathway combinations. The second is to examine whether it is likely that the <u>same</u> individuals would consistently face the "reasonable maximum exposure" for more than one pathway.

The simplified equation for calculating a generic HI is presented below:

$$HI = ADD_1/RfD_1 + ADD_2/RfD_2 + \ldots + ADD_n/RfD_n \qquad \text{(Eq. 7-45)}$$

An HI threshold level of 0.25 will be used in the SLRA to provide a conservative evaluation of hazard.

7.3.3 Risk Characterization for Acute Effects

Acute health hazards are characterized using an acute hazard quotient (AHQ). The HQ is the ratio of the one-hour acute air concentration to the appropriate acute reference value as shown below:

COPCs: $AHQ = C_{air}/AIEC$ (Eq. 7-46a)

ROPCs: $AHQ = C_{air}/AREC_M$ (Eq. 7-46b)

where:

C_{air}	=	one-hour acute air concentration (mg/m^3 or $\mu Ci/m^3$)
AHQ	=	acute hazard quotient (unitless)
AIEC	=	acute inhalation exposure criteria (mg/m^3)
$AREC_M$	=	acute radionuclide exposure criteria ($\mu Ci/cm^3$)

As defined by the above equation, an AHQ of 1 or less indicates that the maximum one-hour air concentration is below the reference value. An AHQ threshold level of 1 is used to provide a conservative evaluation of hazard per EPA (CCN 063809).

7.4 Uncertainty in Human Health Risk Assessment

This section provides an overview of some of the primary sources of uncertainty unique to the HHRA. Uncertainties associated with the COPC and ROPC selection, emission rates, and environmental modeling, described in previous sections, also contribute to the uncertainty in the HHRA. As described in Chapter 10 of this RAWP, an uncertainty assessment will be included in the SLRA to evaluate the contributors to, and potential impact of, uncertainty in the risk assessment.

7.4.1 Uncertainty in Exposure Assessment

Sources of uncertainty in the exposure assessment include:

- Contaminant concentrations in exposure media
- Land-use assumptions
- Selection of representative human receptor populations and exposure parameter values

Each of these sources of uncertainty in the exposure assessment is described briefly below.

Contaminant Concentrations in Exposure Media

The uncertainty associated with estimating exposure concentrations in air, soil, surface water, sediment, and plants is described in section 6.7 of this RAWP. The HHRA also includes ingestion of animal products (such as beef and eggs). The uptake models used to estimate contaminant concentrations in animal products are highly uncertain. Conservative assumptions used to compensate for this uncertainty include the assumption that animals feed exclusively on contaminated plants and the use of conservative uptake factors, including some mass-limited uptake factors.

Land-Use Assumptions

Land use can change at any time; therefore, even defining current land use (that is, during WTP operations) has some uncertainty associated with it, and defining future land use (that is, after WTP shutdown) has even greater uncertainty. To compensate for this uncertainty, receptors are assumed to be present at the locations of maximum concentration regardless of actual land use at those locations. For example, a current residential scenario will be evaluated at the Hanford offsite maximum regardless of whether or not this location is presently in residential use.

Selection of Representative Receptor Populations and Exposure Parameter Values

Every individual is unique, with different activity patterns (for example, amount of time spent at home or work) and different physiologic characteristics (for example, body weight). Therefore, modeling broad categories of receptors (for example, resident) introduces uncertainty because (1) a limited number of general receptor categories are evaluated, and (2) exposure parameters are assigned within each receptor category to represent the activity patterns and physiologic characteristics of that receptor type. To compensate for this uncertainty, receptor types representing the highest potential for exposure are evaluated in the risk assessment, and these receptors are modeled using upper-bound assumptions to describe their activity patterns. For example, evaluation of a resident who is assumed to be at home 24 hours per day, 350 days per year at the point of maximum contaminant concentration will overestimate the risk to many other receptor types not included in the quantitative risk assessment, such as a school child at the same location who may be at school 8 hours per day, 180 days per year.

While most assumptions used in the HHRA are designed to overestimate risk, some assumptions could underestimate the risk because of prior experience. For example, dermal exposure to contaminants in soil and air will not be included in the PRA because dermal exposure pathways have been identified as insignificant contributors to risk in numerous risk assessments prepared or reviewed by EPA for airborne emissions from thermal treatment facilities.

7.4.2 Uncertainty in Toxicity Assessment

Sources of uncertainty in the toxicity assessment include uncertainties surrounding the following:

- Toxicity values (RfDs and SFs)
- Cancer weight-of-evidence classifications
- Toxicity value data gaps
- Route-to-route extrapolations

Each of these sources of uncertainty in the toxicity assessment is described briefly below.

Toxicity Values

Because most of the toxicity values (RfDs and SFs) are based on laboratory exposures of animals, actual effects of environmental exposures to humans in unknown. Therefore, EPA-derived toxicity values are designed to provide an upper-bound estimate of risk (for example, by incorporating numerous uncertainty factors).

Cancer Weight-Of-Evidence Classification

Uncertainty in the cancer weight-of-evidence classification will be considered in the HHRA by evaluating all Class A (human carcinogen), Class B (probable human carcinogen), and Class C (possible human carcinogen) chemicals as carcinogens.

Toxicity Value Data Gaps

The lack of toxicity data for some COPCs will contribute to an underestimation of risk if these chemicals are present in the emissions and are toxic to humans at the concentration emitted.

Route-To-Route Extrapolations

Uncertainties are associated with the estimation of dermal toxicity values from oral values, and the conversion of toxicity values from exposure concentration to dose (that is, UR to SF, RfC to RfD).

7.4.3 Uncertainty in Risk Characterization

The risk characterization combines the results of the exposure assessment and toxicity assessment; therefore, all of the uncertainty in these two steps, as well as the steps prior to the exposure assessment (for example, fate and transport modeling), contributes to the uncertainty in the risk characterization. Additional uncertainty in the risk characterization step surrounds the practice of summing cancer risks and noncancer hazard results across all chemicals and exposure pathways, regardless of the mode of action, as described below.

The assumption of strict additivity of chemical carcinogens that will be used in the SLRA assumes that (1) intakes of individual chemicals are small, and (2) there is no interaction among chemicals (that is, no synergism or antagonism). The assumption of strict additivity of cancer risk from radionuclides is much less uncertain than for chemicals because the mode of action is the same for all radionuclides.

Multiple chemical exposures to noncarcinogens can result in synergism, antagonism, and/or additivity of biological responses when the chemicals act on similar target organs or when they are metabolized by the same enzymatic pathways. The assumption of additivity will be used in the SLRA and is likely to overestimate the true human health risks associated with exposure to the COPCs, since many chemicals may act on different target organs.

In addition to multiple chemicals, receptors may be exposed through more than one pathway. As the EPA (1989) notes:

> *There are two steps required to determine whether risks or hazard indices for two or more pathways should be combined for a single exposed individual or group of individuals. The first is to identify reasonable exposure pathway combinations. The second is to examine whether it is likely that the <u>same</u> individuals would consistently face the "reasonable maximum exposure" for more than one pathway.*

To maintain the conservative bias of the risk assessment, it is assumed that each receptor is exposed to all COPCs and ROPCs by all pathways.

7.4.4 Summary of Uncertainty

Human health risk assessment is a multi-step process and uncertainty is introduced at all steps of the process, including COPC and ROPC selection, estimating emission rates, environmental modeling, exposure assessment, toxicity assessment, and risk characterization. Whenever possible, conservative assumptions are used to compensate for uncertainties so that the final estimate of risk represents an overestimate, rather than an underestimate, of risk to actual receptor populations.

As described in section 10 of this RAWP, an uncertainty assessment will be included in the SLRA to evaluate the contributors to, and potential impact of, uncertainty in the risk assessment. The purpose of the uncertainty assessment is to identify and discuss areas of uncertainty associated with the quantitative estimates of risk for the WTP. This discussion serves to place the risk estimates in proper perspective to allow fully informed risk management decisions.

7.5 Summary for Human Health Risk Assessment

Risks to human health from the potential emission of COPCs and ROPCs result from (1) exposure to the COPC or ROPC, and (2) the toxicity of the COPC or ROPC. The screening HHRA utilizes estimated emission rates (section 5) and results of the fate and transport modeling (section 6) to calculate potential human exposure to COPCs and ROPCs. This exposure information is combined with toxicity data to estimate the potential for adverse effects to human populations in the vicinity of the WTP.

The PRA will use conservative exposure assumptions to compensate for the high level of uncertainty associated with conducting a risk assessment for a facility that is still in the design phase. The PRA will include a qualitative uncertainty analysis.

COPCs or ROPCs that exceed risk goals in the PRA will be revisited to determine whether unrealistic parameters were assigned to them in the PRA. If the analysis conducted in the PRA is considered reasonable, it may be necessary to alter operational or design characteristics of the WTP in order to be within acceptable risk limits.

The FRA will focus on COPCs and ROPCs that exceed risk goals in the PRA and may utilize additional site-specific emission, fate and transport, and exposure data collected after completion of the PRA.

Table 7-1 Human Receptor Populations and Exposure Pathways for the Preliminary Risk Assessment for the Hanford WTP

Receptor	Location	Exposure Pathways																	
		Inhalation of emissions[a]	Ingestion of soil	Inhalation of resuspended soil	Ingestion of drinking water[b]	External exposure to radionuclides in air	External exposure to radionuclides in soil	Ingestion of homegrown produce	Ingestion of wild produce	Ingestion of wild game	Ingestion of wildfowl and eggs	Ingestion of milk	Inhalation of vapors in sweat lodge[c]	Dermal absorption in sweat lodge[c]	Ingestion of fish[d]	Ingestion of homegrown beef and milk	Ingestion of homegrown chicken and eggs	Ingestion of homegrown pork	Ingestion of breast milk
Current Plausible Exposure Scenarios																			
Hanford site industrial worker	Receptor works at onsite ground maximum	X	X	X	X	X	X												
	and lives at Hanford offsite maximum	X	X	X	X	X	X	X											
Nursing infant of Hanford site industrial worker	Mother works at onsite ground maximum	X	X	X	X														X
	and lives at Hanford offsite maximum	X	X	X	X			X											
Resident[e]	Hanford offsite maximum	X	X	X	X	X	X	X											
Nursing infant of resident	Mother lives at Hanford offsite maximum	X	X	X	X			X											X
Native American subsistence resident[e]	Receptor lives at Hanford offsite maximum	X	X	X	X	X	X						X	X	X				
	visits Gable Mountain maximum	X	X	X		X	X												
	and harvests food onsite.								X	X	X								
Nursing infant of Native American subsistence resident	Receptor lives at Hanford offsite maximum	X	X	X	X														
	visits Gable Mountain maximum	X	X	X															X
	and harvests food onsite.								X	X	X								
Current Worst-Case Exposure Scenario																			
Resident subsistence farmer[e]	Hanford offsite maximum	X	X	X	X	X	X	X				X				X	X	X	
Nursing infant of resident subsistence farmer	Hanford offsite maximum	X	X	X	X			X				X				X	X	X	X
Resident subsistence fisher[e]	Hanford offsite maximum	X	X	X	X	X	X	X							X				
Acute exposure	Acute maximum	X																	
Future Plausible Exposure Scenarios																			
Hanford site industrial worker	Receptor works at onsite ground maximum		X	X	X		X												
	and lives at Hanford offsite maximum		X	X	X		X	X											
Nursing infant of Hanford site industrial worker	Mother works at onsite ground maximum		X	X	X														X
	and lives at Hanford onsite ground maximum		X	X	X			X											
Future Worst-Case Exposure Scenarios																			
Resident[e]	Onsite ground maximum		X	X	X		X	X											
Nursing infant of resident	Mother lives at onsite ground maximum		X	X	X			X											X
Resident subsistence farmer[e]	Onsite ground maximum		X	X	X		X	X				X				X	X	X	
Nursing infant of resident subsistence farmer	Mother lives at onsite ground maximum		X	X	X			X				X				X	X	X	X
Resident subsistence fisher[e]	Onsite ground maximum		X	X	X		X	X							X				
Native American subsistence resident[e]	Receptor lives at offsite gound maximum		X	X	X		X						X	X	X				
	visits Gable Mountain maximum		X	X			X												
	and harvests food onsite.								X	X	X								
Nursing infant of Native American subsistence resident	Receptor lives at Hanford offsite maximum		X	X	X														
	visits Gable Mountain maximum		X	X															X
	and harvests food onsite.								X	X	X								

Current = any time during the 40-year operating lifetime of the facility (that is, year 0 to 40).
Future = exposure begins in the future after facility shutdown (that is, after year 40).
X = complete exposure pathway for X receptor or x mother.

[a] Includes direct inhalation of vapor phase and particulate emissions.

[b] Surface water used for the drinking water pathway comes from the maximum concentration in the Columbia River.

[c] Inhalation and dermal absorption in the sweat lodge are evaluated for adult Native American receptors only. Surface water used for the sweat lodge pathways comes from the maximum concentration in the Columbia River.

[d] Fish concentrations calculated from maximum surface water or sediment concentration in the Columbia River.

[e] Both adult and child receptors are evaluated.

Table 7-2 Exposure Parameters for Human Health Risk Assessment: Hanford Site Industrial Worker Scenario[a]

Parameter	Description	Units	Value Used[b]
	Exposure at Work		
EF	Exposure frequency	days/year	250[c]
ED	Exposure duration	years	20
BW	Body weight	kg	70
AT_C	Averaging time for carcinogens	years	70
AT_N	Averaging time for noncarcinogens	years	20
IR	Inhalation rate	m^3/hour	1.5[c]
CR_{soil}	Ingestion rate for soil	kg/day	0.0002[c]
CR_{dw}	Ingestion rate for drinking water	L/day	2[c]
ET	Exposure time for inhalation	hr/day	8
F*i*	Fraction of media from contaminated area	unitless	1
Se	Shielding factor for external exposure to ROPCs in soil	unitless	0.4[d]
ET_o	Exposure time factor for outdoor exposure to ROPCs in soil	unitless	4/24[e]
ET_i	Exposure time factor for indoor exposure to ROPCs in soil	unitless	4/24[e]
AF	Age factor for external exposure to ROPCs in air	unitless	1[f]
	Residential Exposure of Worker[g]		
EF	Exposure frequency	days/year	350
ED	Exposure duration	years	30
IR	Inhalation rate	m^3/hour	0.833[c]
CR_{soil}	Ingestion rate: soil	kg/day	0.0001[c]
CR_{dw}	Ingestion rate: drinking water (workdays)	L/day	1[c]
CR_{dw}	Ingestion rate: drinking water (non-workdays)	L/day	2[c]
ET_w	Exposure time for inhalation: workdays	hr/day	16
ET_R	Exposure time for inhalation: non-workdays	hr/day	24
Se	Shielding factor for external exposure to ROPCs in soil	unitless	0.4[d]
AF	Age factor for external exposure to ROPCs in air	unitless	1[f]
FI	Fraction of media from contaminated area	unitless	1[c]
ED	Exposure duration	years	30
ET_o	Exposure time factor for outdoor exposure to ROPCs in soil	unitless	0.06[h]
ET_i	Exposure time factor for indoor exposure to ROPCs in soil	unitless	0.94[h]
CR_{ag}	Consumption rate: aboveground unprotected produce	kg/kg-day DW	3.00E-04
CR_{pp}	Consumption rate: aboveground protected produce	kg/kg-day DW	5.70E-04
CR_{bg}	Consumption rate: belowground produce	kg/kg-day DW	1.40E-04
	Nursing Infant of Worker		
			Infant
EF	Exposure frequency	days/year	365
ED	Exposure duration	years	1
BW_{infant}	Body weight	kg	7.2[i]
AT	Averaging time	years	1
IR_{milk}	Ingestion rate: breast milk	kg/day	0.8

Table 7-2 Exposure Parameters for Human Health Risk Assessment: Hanford Site Industrial Worker Scenario[a]

Parameter	Description	Units	Value Used[b]
CF	Conversion factor	pg/mg	1.00E+09
h	Half-life of COPC/ROPC in adult	days	CS[j]
f_1	Fraction of ingested COPC/ROPC stored in fat	unitless	0.9
f_2	Fraction of mother's weight that is fat	unitless	0.3
f_3	Fraction of mother's breast milk that is fat	unitless	0.04
f_4	Fraction of ingested COPC/ROPC that is absorbed	unitless	0.9

ROPC = Radionuclide of potential concern

[a] The worker is assumed to be a resident during the hours per day and days per year not spent at work.

[b] Exposure parameters from DOE-RL 1995, unless otherwise noted.

[c] EPA Region 10 personal communication (CCN 064331).

[d] EPA 2000a. *Soil Screening Guidance for Radionuclides: User's Guide*, EPA/540-R-00-007.

[e] Assumes worker spends 4 hours at work in outdoor activities and 4 hours at work in indoor activities.

[f] Saito and others (1998).

[g] Default exposure parameters from *Human Health Risk Assessment Protocol for Hazardous Waste Combustion Facilities* (EPA 1998a), unless otherwise noted.

[h] Exposure factors Handbook (EPA 1997a). Child farmer is assumed to be the same as the adult. Adult and child fisher are assumed to be the same as the farmer.

[i] Body weight of infant 0 to 12 months old per CCN 063806.

[j] CS = Constituent specific values for h:

2,3,7,8-TCDD	2555 days
PCBs	2555 days
Cesium-134	114 days
Cesium-137	114 days
Iodine-129	138 days
Strontium-90	2907 days

Table 7-3 Exposure Parameters for Human Health Risk Assessment: Residential Scenarios

Parameter	Description	Units	Value Used[a]	
			Adult	Child
	All Residential Scenarios[b]			
EF	Exposure frequency	days/year	350	350
BW	Body weight	kg	70	15
AT_C	Averaging time for carcinogens	years	70	70
AT_N	Averaging time for noncarcinogens	years	ED	ED
IR	Inhalation rate	m^3/hour	0.833[c]	0.417[c]
CR_{dw}	Ingestion rate: drinking water	L/day	2[c]	1[c]
ET	Exposure time for inhalation	hr/day	24	24
Se	Shielding factor for external exposure to ROPCs in soil	unitless	0.4[d]	0.4[d]
AF	Age factor for external exposure to ROPCs in air	unitless	1[e]	1.3[e]
F_i	Fraction of media from contaminated area	unitless	1[c]	1[c]
	Resident			
ED	Exposure duration	years	30	6
CR_{soil}	Ingestion rate: soil	kg/day	0.0001[c]	0.0002[c]
ET_o	Exposure time factor for outdoor exposure to ROPCs in soil	unitless	0.06[f]	0.23[f]
ET_i	Exposure time factor for indoor exposure to ROPCs in soil	unitless	0.94[f]	0.77[f]
CR_{ag}	Consumption rate: aboveground unprotected produce	kg/kg-day DW	3.00E-04	4.20E-04
CR_{pp}	Consumption rate: aboveground protected produce	kg/kg-day DW	5.70E-04	7.70E-04
CR_{bg}	Consumption rate: belowground produce	kg/kg-day DW	1.40E-04	2.20E-04
	Resident Subsistence Farmer			
ED	Exposure duration	years	40	6
CR_{soil}	Ingestion rate: soil	kg/day	0.0002[m]	0.0002[c]
CR_{ag}	Consumption rate: aboveground unprotected produce	kg/kg-day DW	1.756E-03[g]	1.756E-03[g]
CR_{pp}	Consumption rate: aboveground protected produce	kg/kg-day DW	1.364E-03[h]	1.364E-03[h]
CR_{bg}	Consumption rate: belowground produce	kg/kg-day DW	5.52E-04[i]	5.52E-04[i]
CR_{beef}	Consumption rate: beef	kg/kg-day FW	4.20E-03[j]	1.90E-03[j]
CR_{milk}	Consumption rate: milk	kg/kg-day FW	4.40E-03[j]	4.40E-03[j]
CR_{pork}	Consumption rate: pork	kg/kg-day FW	2.00E-03[j]	1.50E-03[j]
$CR_{poultry}$	Consumption rate: poultry	kg/kg-day FW	2.27E-03[j]	1.60E-03[j]
CR_{eggs}	Consumption rate: eggs	kg/kg-day FW	1.60E-03[j]	1.30E-02[j]
ET_o	Exposure time factor for outdoor exposure to ROPCs in soil	unitless	0.42[f]	0.42[f]
ET_i	Exposure time factor for indoor exposure to ROPCs in soil	unitless	0.58[f]	0.58[f]
	Resident Subsistence Fisher			
ED	Exposure duration	years	30	6
CR_{soil}	Ingestion rate: soil	kg/day	0.0001[c]	0.0002[c]
CR_{ag}	Consumption rate: aboveground unprotected produce	kg/kg-day DW	3.00E-04	4.20E-04
CR_{pp}	Consumption rate: aboveground protected produce	kg/kg-day DW	5.70E-04	7.70E-04
CR_{bg}	Consumption rate: belowground produce	kg/kg-day DW	1.40E-04	2.20E-04
CR_{fish}	Consumption rate: fish	kg/kg-day FW	1.17E-03	7.59E-04
ET_o	Exposure time factor for outdoor exposure to ROPCs in soil	unitless	0.42[f]	0.42[f]
ET_i	Exposure time factor for indoor exposure to ROPCs in soil	unitless	0.58[f]	0.58[f]
	Nursing Infant of Resident			
				Infant
EF	Exposure frequency	days/year	NA	365

Table 7-3 Exposure Parameters for Human Health Risk Assessment: Residential Scenarios

Parameter	Description	Units	Value Used[a]	
			Adult	Child
ED	Exposure duration	years	NA	1
BW_{infant}	Body weight	kg	NA	7.2[k]
AT	Averaging time	years	NA	1
IR_{milk}	Ingestion rate: breast milk	kg/day	NA	0.8
CF	Conversion factor	pg/mg	NA	1.00E+09
h	Half-life of COPC/ROPC in adult	days	NA	CS[l]
f_1	Fraction of ingested COPC/ROPC stored in fat	unitless	NA	0.9
f_2	Fraction of mother's weight that is fat	unitless	NA	0.3
f_3	Fraction of mother's breast milk that is fat	unitless	NA	0.04
f_4	Fraction of ingested COPC/ROPC that is absorbed	unitless	NA	0.9

ROPC = Radionuclide of potential concern.
COPC = Chemical of potential concern.
NA = Not Applicable.

[a] Default exposure parameters from *Human Health Risk Assessment Protocol for Hazardous Waste Combustion Facilities* (EPA 1998a), unless otherwise noted.

[b] These exposure parameters apply to the resident, resident subsistence farmer, and resident subsistence fisher scenarios.

[c] EPA Region 10 personal communication (CCN 064331).

[d] EPA 2000a. *Soil Screening Guidance for Radionuclides: User's Guide*, EPA/540-R-00-007.

[e] Saito and others (1998).

[f] Exposure factors Handbook (EPA 1997a). Child farmer is assumed to be the same as the adult. Adult and child fisher are assumed to be the same as the farmer.

[g] The consumption rates for aboveground unprotected produce are based on the 95th percentile per capita intakes of exposed fruits (7.009 g/kg-d) and aboveground exposed vegetables (4.7 g/kg-d) for the West Region of the US (EPA 1997a). Intake rates are converted from "as consumed" basis to "dry weight" basis, assuming 85 % water content for the fruits and vegetables [IR (dry weight) = IR (as consumed) x (1 - 0.85)]. Thus, the total aboveground unprotected produce consumption rate is 1.051E-03 kg/kg-d (exposed fruits) + 7.05E-04 kg/kg-d (exposed aboveground vegetables) = 1.756E-03 kg/kg-d (per CCN 064331).

[h] The consumption rates for aboveground protected produce are based on the 95th percentile per capita intakes of protected fruits (7.836 g/kg-d) and protected aboveground vegetables (1.257 g/kg-d) for the West Region of the US (EPA 1997a). Intake rates are converted from "as consumed" basis to "dry weight" basis, assuming 85 % water content for the fruits and vegetables [IR (dry weight) = IR (as consumed) x (1 - 0.85)]. Thus, the total aboveground protected produce consumption rate is 1.175E-03 kg/kg-d (protected fruit) + 1.89E-04 kg/kg-d (aboveground protected vegetables) = 1.364E-03 kg/kg-d (per CCN 064331).

[i] The consumption rates for belowground produce are based on the 95th percentile per capita intakes of root vegetables (3.683 g/kg-d) for the West Region of the US (EPA 1997a). Intake rates are converted from "as consumed" basis to "dry weight" basis, assuming 85 % water content for the root vegetables [IR (dry weight) = IR (as consumed) x (1 - 0.85)]. Thus, the total belowground produce consumption rate is 5.52E-04 kg/kg-d (per CCN 064331).

[j] Consumption rates are based on 95th percentile intakes for home-produced meat products from the West Region of the US (EPA 1997a per CCN 064331).

[k] Body weight of infant 0 to 12 months old per CCN 063806.

[l] CS = Constituent specific values for h:

2,3,7,8-TCDD	2555 days
PCBs	2555 days
Cesium-134	114 days
Cesium-137	114 days
Iodine-129	138 days
Strontium-90	2907 days

Table 7-4 Exposure Parameters for Human Health Risk Assessment: Native American Subsistence Resident Scenario[a]

Parameter	Description	Units	Value Used[b]	
			Adult	Child
EF_r	Exposure frequency at residence	days/year	353	353
EF_g	Exposure frequency at Gable Mountain	days/year	12	12
EF_f	Exposure frequency for ingestion of food and drinking water	days/year	365	365
ED	Exposure duration (ingestion of soil, inhalation of resuspended soil, external exposure to soil, ingestion of food products, inhalation and dermal contact in sweat lodge, ingestion of drinking water)	years	70	6[c]
ED	Exposure duration (Inhalation of emissions, external exposure to air)	years	40[d]	6[c]
BW	Body weight	kg	70	15[c]
AT_C	Averaging time for carcinogens	years	70	70
AT_N	Averaging time for noncarcinogens	years	ED	ED
IR	Inhalation rate	m^3/hour	1.25[e]	0.625[e]
CR_{soil}	Ingestion rate: soil	kg/day	0.0002	0.0002[f]
CR_{dw}	Ingestion rate: drinking water	L/day	3	1.5[g]
ET	Exposure time for inhalation of emissions and resuspended soil	hr/day	24	24
F_i	Fraction of media from contaminated area	unitless	1	1
Se	Shielding factor for external exposure to ROPCs in soil	unitless	0.4[h]	0.4[h]
ET_o	Exposure time factor for outdoor exposure to ROPCs in soil	unitless	0.42[i]	0.42[i]
ET_i	Exposure time factor for indoor exposure to ROPCs in soil	unitless	0.58[i]	0.58[i]
AF	Age factor for external exposure to ROPCs in air	unitless	1[j]	1.3[j]
CR_{ag}	Consumption rate: aboveground unprotected produce	kg/kg-day DW	1.247E-03[k]	1.247E-03[k]
CR_{pp}	Consumption rate: aboveground protected produce	kg/kg-day DW	1.827E-03[l]	1.827E-03[l]
CR_{bg}	Consumption rate: belowground produce	kg/kg-day DW	7.06E-04[m]	7.06E-04[m]
CR_{game}	Consumption rate: venison, elk, and other game tissue	kg/kg-day FW	3.57E-03[n]	1.60E-03[n]
$CR_{poultry}$	Consumption rate: poultry and wild fowl	kg/kg-day FW	3.29E-04[o]	2.30E-04[o]
CR_{eggs}	Consumption rate: eggs	kg/kg-day FW	3.00E-04[o]	2.10E-04[o]
CR_{fish}	Consumption rate: fish	kg/kg-day FW	7.71E-03[p]	5.00E-03[p]
CR_{organs}	Consumption rate: fish parts (e.g., head, fins, tails, etc.)	kg/kg-day FW	7.71E-04[p]	5.00E-04[p]
	Sweat Lodge Exposures			
EF	Exposure frequency for sweat lodge	days/year	365	365
V_W	Volume of water used in sweat lodge	L	4	NA
V_W	Volume of water in sweat lodge air at 100 % humidity	L	0.34[q]	NA
D	Diameter of sweat lodge	m	2	NA
ET	Exposure time for sweat lodge	hr/day	4[t]	NA
SA	Dermal Surface Area	m^2	2	NA
	Nursing Infant of Native American Subsistence Resident			
				Infant
EF	Exposure frequency	days/year	NA	365[r]
ED	Exposure duration	years	NA	1[r]
BW_{infant}	Body weight	kg	NA	7.2[s]
AT	Averaging time	years	NA	1[r]
IR_{milk}	Ingestion rate: breast milk	kg/day	NA	0.742
CF	Conversion factor	pg/mg	NA	1.00E+09
h	Half-life of COPC/ROPC in adult	days	NA	Cr
f_1	Fraction of ingested COPC/ROPC stored in fat	unitless	NA	0.9[r]
f_2	Fraction of mother's weight that is fat	unitless	NA	0.3[r]

Table 7-4 Exposure Parameters for Human Health Risk Assessment: Native American Subsistence Resident Scenario[a]

Parameter	Description	Units	Value Used[b]	
			Adult	Child
f_3	Fraction of mother's breast milk that is fat	unitless	NA	0.04[r]
f_4	Fraction of ingested COPC/ROPC that is absorbed	unitless	NA	0.9[r]

ROPC = Radionuclide of potential concern.
COPC = Chemical of potential concern.
NA = Not Applicable.
CS = Constituent-specific values for h:

2,3,7,8-TCDD	2555 days	Cesium-134	114 days	Iodine-129	138 days
PCBs	2555 days	Cesium-137	114 days	Strontium-90	2907 days

[a] These exposure parameters apply to the subsistence hunting, gathering, and fishing.
[b] Default exposure parameters from *A Native American Exposure Scenario* (Harris and Harper 1997), unless otherwise noted.
[c] ED and BW values for children are consistent with those found in Human Health Risk Assessment Protocol (HHRAP) (EPA 1998a).
[d] Exposure duration for direct exposure to emissions in air is set equal to operation duration of the facility.
[e] The inhaltion rate of 30 m^3/day for adults (CCN 064333) was converted to m3/hr by dividing by 24 hours per day. The child inhalation rate is assumed to be one-half that of the adult.
[f] Adult soil ingestion rate is from Harris and Harper 1997; this same rate (200 mg/day) is commonly used as a child's soil ingestion rate (EPA 1989). Therefore, this same rate is used for the Native American child soil ingestion rate.
[g] Value obtained from personal communication with B. Harper (CCN 063811).
[h] EPA 2000a. *Soil Screening Guidance for Radionuclides: User's Guide*, EPA/540-R-00-007.
[i] Assumes Native American exposure time factors are similar to resident subsistence farmer.
[j] Saito and others (1998).
[k] The consumption rates for aboveground unprotected produce are based on the 95th percentile per capita intakes of exposed fruits (4.157 g/kg-d) and aboveground exposed vegetables (4.155 g/kg-d) for Native Americans (EPA 1997a). Intake rates are converted from "as consumed" basis to "dry weight" basis, assuming 85 % water content for the fruits and vegetables [IR (dry weight) = IR (as consumed) x (1 - 0.85)]. Thus, the total aboveground unprotected produce consumption rate is 6.24E-04 kg/kg-d (exposed fruits) + 6.23E-04 kg/kg-d (exposed aboveground vegetables) = 1.247E-03 kg/kg-d (per CCN 063805).
[l] The consumption rates for aboveground protected produce are based on the 95th percentile per capita intakes of protected fruits (10.354 g/kg-d) and protected aboveground vegetables (1.826 g/kg-d) for Native Americans (EPA 1997a). Intake rates are converted from "as consumed" basis to "dry weight" basis, assuming 85 % water content for the fruits and vegetables [IR (dry weight) = IR (as consumed) x (1 - 0.85)]. Thus, the total aboveground protected produce consumption rate is 1.553E-03 kg/kg-d (protected fruits) + 2.74E-04 kg/kg-d (aboveground protected vegetables) = 1.827E-03 kg/kg-d (per CCN 063805).
[m] The consumption rates for belowground produce are based on the 95th percentile per capita intakes of root vegetables (4.705 g/kg-d) for Native Americans (EPA 1997a). Intake rates are converted from "as consumed" basis to "dry weight" basis, assuming 85 % water content for the root vegetables [IR (dry weight) = IR (as consumed) x (1 - 0.85)]. Thus, the total belowground produce consumption rate is 7.06E-04 kg/kg-d (per CCN 063805).
[n] Adult ingestion rate of 250 g/day for a 70 kg adult from Harris and Harper (1997). Child ingestion rate is based on 9.6 % of the adult value of 250 g/day and a child body weight of 15 kgs (per CCN 063805).
[o] Reported Native American consumption rate of 44 g/day of fowl includes both bird and eggs (Harris and Harper 1997); based on a ratio of 0.54 poultry:0.491 eggs for non-Native American intakes (Tables 11-5 and 11-7 in EPA 1997a), the fowl intake of 44 g/day is subdivided as 23 g/day fowl and 21 g/day eggs. The adult consumption rate is then calculated from the corresponding body weight of 70 kgs. The child consumption rate for fowl is based on 14.9 % (3.4 g/day) of the adult rate of 23 g/day and a child body weight of 15 kgs. The child consumption rate for eggs is based on 15.1% (3.17 g/day) of the adult rate of 21 g/day and a child body weight of 15 kgs (per CCN 063805).
[p] Adult consumption rate of fish is estimated based on ingestion rate of 540 g/day and adult body body weight of 70 kg. Child consumption rate of fish is based on 14 % (75.6 g/d) of the adult rate of 540 g/day and a child body weight of 15 kg. Adult consumption rates for fish parts are based on 10 % (54 g/day) of the fish consumption rate of 540 g/day and an adult body weight of 70 kgs. Child consumption rates for fish parts are based on 14 % (7.56 g/d) of the adult rate of 54 g/day and a child body weight of 15 kg (per CCN 063805).
[q] For a hemispheric sweat lodge of 2m diameter (2.094 m^3 total volume) at a temperature of 150 degrees F and 100 % humidity.
[r] Values from infant ingestion of breast milk scenario in EPA 1998a.
[s] Body weight of infant 0 to 12 months old per CCN 063806.
[t] CCN 064333.

Table 7-5 Modeling Parameters for Estimating Exposure Point Concentrations in Biota for Human Consumption

Parameter	Description	Value Used[a]	Units	Used to Estimate
F_{plant}	Fraction of plant grown on contaminated soil and ingested by the specific animal being modeled - applies to all plant types (produce, forage, silage, grain are possibilities) eaten by the animal being modeled	1	unitless	Beef, milk, pork, chicken/fowl, eggs, deer
$Qp_{forage(beef)}$	Quantity of forage eaten by beef cattle per day	8.8	kg DW plant/day	Beef
$Qp_{forage(milk)}$	Quantity of forage eaten by dairy cattle per day	13.2	kg DW plant/day	Milk
$Qp_{forage(pork)}$	Quantity of forage eaten by swine per day	0	kg DW plant/day	Pork
$Qp_{forage(chicken)}$	Quantity of forage eaten by chicken per day	0	kg DW plant/day	Chicken/fowl, eggs
$Qp_{forage(deer)}$	Quantity of forage eaten by deer per day	1.463[d]	kg DW plant/day	Deer
$Qp_{silage(beef)}$	Quantity of silage eaten by beef cattle per day	2.5	kg DW plant/day	Beef
$Qp_{silage(milk)}$	Quantity of silage eaten by dairy cattle per day	4.1	kg DW plant/day	Milk
$Qp_{silage(pork)}$	Quantity of silage eaten by swine per day	1.4	kg DW plant/day	Pork
$Qp_{silage(chicken)}$	Quantity of silage eaten by chicken per day	0	kg DW plant/day	Chicken/fowl, eggs
$Qp_{silage(deer)}$	Quantity of silage eaten by deer per day	0	kg DW plant/day	Deer
$Qp_{grain(beef)}$	Quantity of grain eaten by beef cattle per day	0.47	kg DW plant/day	Beef
$Qp_{grain(milk)}$	Quantity of grain eaten by dairy cattle per day	3	kg DW plant/day	Milk
$Qp_{grain(pork)}$	Quantity of grain eaten by swine per day	3.3	kg DW plant/day	Pork
$Qp_{grain(chicken)}$	Quantity of grain eaten by chicken per day	0.2	kg DW plant/day	Chicken/fowl, eggs
$Qp_{grain(deer)}$	Quantity of grain eaten by deer per day	0	kg DW plant/day	Deer
$Qs_{soil(beef)}$	Quantity of soil eaten by beef cattle per day	0.5	kg/day	Beef
$Qs_{soil(milk)}$	Quantity of soil eaten by dairy cattle per day	0.4	kg/day	Milk
$Qs_{soil(pork)}$	Quantity of soil eaten by swine per day	0.37	kg/day	Pork
$Qs_{soil(chicken)}$	Quantity of soil eaten by chicken per day	0.022	kg/day	Chicken/fowl, eggs
$Qs_{soil(deer)}$	Quantity of soil eaten by deer per day	0	kg/day	Deer
Bs	Soil bioavailability factor	1	unitless	Beef, milk, pork, chicken/fowl, eggs, deer
MF	Metabolism factor for Bis(2-ethylhexyl)phthalate (DEHP)	0.01	unitless	Beef, milk, pork, deer
	Metabolism factor for all other constituents	1	unitless	Beef, milk, pork, deer
f_{lipid}	Fish lipid content	0.07	unitless	Fish
OC_{sed}	Fraction of organic carbon in bottom sediment	0.04	unitless	Fish

[a] Parameters taken from Human Health Risk Assessment Protocol (HHRAP) (EPA 1998a) unless otherwise noted.

[b] Calculated per HHRAP (EPA 1998a) using site-specific Yp_{forage}.

[c] Fresh yield value of 1500 kg/ha reported for Richland, Washington, in *Estimating Grazingland Yield from Commonly Available Data* (Wisiol 1984) converted to dry yield assuming 87 % moisture content. The calculation is made as follows:
(1500 kg/ha fresh yield) x (1 ha / 10,000 m^2) x (1 - 0.87) = 0.0195 kg/m^2 dry yield.

[d] From Sample and others 1997. Value is calculated based on a deer body weight of 66.5 kg and forage ingestion rate of 0.022 kg DW plant/kg Body Weight/day. The calculation is (66.5 kg Body Weight) x (0.022 kg DW plant/kg Body Weight/day) = 1.463 kg DW plant/day.

Table 7-6 Mass Limited Feed-to-Animal Tissue Biotransfer Factors

Tissue Type	Exposure Duration	Mass of Tissue or Product	Mass-Limited Biotransfer Factor
Animal Tissue [a]	days	kg FW	
Beef	730 (Montana 4-H 1996)	567 (WA Ag Statistical Service 2001)	1.3
Pork	162 (Iowa State Univ. 4-H 1992)	99.8 (Iowa State Univ. 4-H 1992)	1.6
Poultry	42 (Northern Territory Govt. of Australia 1999)	2.6 (MD Ag Statistical Service 2001)	16.2
Animal Products [b]	days	kg FW/day	
Milk	1 milk production is per day	28 (WA Ag Statistical Service 2001)	0.036
Eggs	1 egg production is per day	0.044 (WA Ag Statistical Service 2001 and measured weight)	22.5

[a] Mass-limited biotransfer factors for animal tissue calculated as Exposure duration (days) / Mass of tissue (kg FW).

[b] Mass-limited biotransfer factors for animal products calculated as 1/daily product weight (kg FW/day).

Table 7-7 Toxicity Values for Human Health Risk Assessment: Organic COPCs

Chemical of Potential Concern	CAS Registry Number	GAF[a]	Chronic Reference Dose (RfD) (mg/kg-day)			Cancer Slope Factor (SF) (mg/kg-day)$^{-1}$			EPA Class[e]
			Oral	Dermal[b]	Inhalation[c]	Oral	Dermal[d]	Inhalation	
Aromatic Halogenated Hydrocarbons									
2,3,4,6-Tetrachlorophenol	58-90-2	0.50	3.00E-02 [f]	1.50E-02	--	--	--	--	--
4-Chloro-3-methylphenol	59-50-7	0.50	--	--	--	--	--	--	--
Aromatic Nonhalogenated Hydrocarbons									
2-Nitrotoluene	88-72-2	0.80	1.00E-02 [g]	8.00E-03	--	--	--	--	--
4-Nitrobiphenyl	92-93-3	0.50	--	--	--	--	--	--	--
Benzaldehyde	100-52-7	0.80	1.00E-01 [f]	8.00E-02	--	--	--	--	--
Benzene	71-43-2	0.80	1.00E-03 [h]	8.00E-04	2.57E-03 [h]	5.50E-02 [f]	6.88E-02	2.73E-02 [f,j]	A [f]
Benzyl alcohol	100-51-6	0.50	3.00E-01 [g]	1.50E-01	--	--	--	--	--
Ethyl benzene	100-41-4	0.80	1.00E-01 [f]	8.00E-02	2.86E-01 [f]	--	--	--	D [f]
m-Xylene	108-38-3	0.80	2.00E-01 [l]	1.60E-01	2.86E-02 [l]	--	--	--	--
o-Xylene	95-47-6	0.80	2.00E-01 [l]	1.60E-01	2.86E-02 [l]	--	--	--	--
p-Xylene	106-42-3	0.80	2.00E-01 [l]	1.60E-01	2.86E-02 [l]	--	--	--	--
Styrene	100-42-5	0.80	2.00E-01 [f]	1.60E-01	2.86E-01 [f]	--	--	--	--
Toluene	108-88-3	0.80	2.00E-01 [f]	1.60E-01	1.14E-01 [f]	--	--	--	D [f]
Non-aromatic Nonhalogenated Hydrocarbons									
1,2-Epoxybutane	106-88-7	0.50	--	--	5.71E-03 [f]	--	--	--	--
1,3-Butadiene	106-99-0	0.80	--	--	5.71E-04 [f]	--	--	1.05E-01 [f,j]	B2 [f]
1,4-Dioxane	123-91-1	0.80	--	--	5.71E+00 [k]	1.10E-02 [f]	1.38E-02	--	B2 [f]
1-Methylpropyl alcohol	78-92-2	0.50	--	--	5.71E+00 [k]	--	--	--	--
1-Nitropropane	108-03-2	0.50	--	--	5.71E+00 [k]	--	--	--	--
2,2,4-Trimethylpentane	540-84-1	0.50	--	--	8.57E-02 [k]	--	--	--	--
2-Butanone	78-93-3	0.80	6.00E-01 [f]	4.80E-01	2.86E-01 [f]	--	--	--	D [f]
2-Butenaldehyde (2-Butenal)	4170-30-3	0.50	--	--	5.71E+00 [k]	--	--	--	--
2-Ethoxyethanol	110-80-5	0.50	4.00E-01 [g]	2.00E-01	5.71E-02 [f]	--	--	--	--
2-Heptanone	110-43-0	0.50	--	--	5.71E+00 [k]	--	--	--	--
2-Hexanone	591-78-6	0.80	4.00E-02 [l]	3.20E-02	1.43E-03 [l]	--	--	--	--
2-Methoxyethanol	109-86-4	0.50	1.00E-03 [g,m]	5.00E-04	5.71E-03 [f]	--	--	--	--
2-Methyl-2-propanol	75-65-0	0.50	--	--	5.71E+00 [k]	--	--	--	--
2-Methyl-2-propenenitrile	126-98-7	0.80	1.00E-04 [f]	8.00E-05	2.00E-04 [g,m]	--	--	--	--
2-Methylaziridine	75-55-8	0.50	--	--	5.71E+00 [k]	--	--	--	--
2-Methylpropyl alcohol	78-83-1	0.80	3.00E-01 [f]	2.40E-01	5.71E+00 [k]	--	--	--	--
2-Pentanone	107-87-9	0.50	--	--	5.71E+00 [k]	--	--	--	--
2-Propanone (Acetone)	67-64-1	0.80	1.00E-01 [f]	8.00E-02	5.71E+00 [k]	--	--	--	D [f]
2-Propene-1-ol	107-18-6	0.50	5.00E-03 [f]	2.50E-03	5.71E+00 [k]	--	--	--	--
2-Propyl alcohol	67-63-0	0.80	--	--	5.71E+00 [k]	--	--	--	--
3-Heptanone	106-35-4	0.50	--	--	5.71E+00 [k]	--	--	--	--
3-Methyl-1-butanol	123-51-3	0.50	--	--	5.71E+00 [k]	--	--	--	--
3-Methyl-2-butanone	563-80-4	0.50	--	--	5.71E+00 [k]	--	--	--	--
3-Pentanone	96-22-0	0.50	--	--	5.71E+00 [k]	--	--	--	--
4-Heptanone	123-19-3	0.50	--	--	5.71E+00 [k]	--	--	--	--
4-Methyl-2-pentanone	108-10-1	0.80	8.00E-02 [g]	6.40E-02	2.29E-02 [g,m]	--	--	--	--
4-Methyl-3-penten-2-one	141-79-7	0.50	--	--	5.71E+00 [k]	--	--	--	--
5-Methyl-2-hexanone	110-12-3	0.50	--	--	5.71E+00 [k]	--	--	--	--
Acetaldehyde	75-07-0	0.80	--	--	2.57E-03 [f]	--	--	7.70E-03 [f,j]	B2 [f]
Acetamide	60-35-5	0.50	--	--	5.71E+00 [k]	--	--	--	--
Acetic acid	64-19-7	0.50	--	--	5.71E+00 [k]	--	--	--	--
Acetic acid ethyl ester	141-78-6	0.80	9.00E-01 [f]	7.20E-01	5.71E+00 [k]	--	--	--	--
Acetic acid n-butyl ester	123-86-4	0.50	--	--	5.71E+00 [k]	--	--	--	--
Acetonitrile	75-05-8	0.80	-- [n]	--	1.71E-02 [f]	--	--	--	D [f]
Acrolein	107-02-8	0.80	2.00E-02 [g]	1.60E-02	5.71E-06 [f]	--	--	--	C [f]
Acrylonitrile	107-13-1	0.80	1.00E-03 [g]	8.00E-04	5.71E-04 [f]	5.40E-01 [f]	6.75E-01	2.40E-01 [g]	B1 [f]
Bis(isopropyl)ether	108-20-3	0.50	--	--	5.71E+00 [k]	--	--	--	--
Butane	106-97-8	0.50	--	--	5.71E+00 [k]	--	--	--	--
Carbon disulfide	75-15-0	0.80	1.00E-01 [f]	8.00E-02	2.00E-01 [f]	--	--	--	--
Cyanogen	460-19-5	0.80	4.00E-02 [f]	3.20E-02	5.71E+00 [k]	--	--	--	--
Cyclohexane	110-82-7	0.50	5.71E+00 [h,o]	2.85E+00	5.71E+00 [h]	--	--	--	--

Table 7-7 Toxicity Values for Human Health Risk Assessment: Organic COPCs

Chemical of Potential Concern	CAS Registry Number	GAF[a]	Chronic Reference Dose (RfD) (mg/kg-day)			Cancer Slope Factor (SF) (mg/kg-day)$^{-1}$			EPA Class[e]
			Oral	Dermal[b]	Inhalation[c]	Oral	Dermal[d]	Inhalation	
Cyclohexanone	108-94-1	0.50	5.00E+00 [f]	2.50E+00	5.71E+00 [k]	--	--	--	--
Cyclohexene	110-83-8	0.50	--	--	5.71E+00 [k]	--	--	--	--
Cyclopentane	287-92-3	0.50	--	--	5.71E+00 [k]	--	--	--	--
Ethyl alcohol	64-17-5	0.50	--	--	5.71E+00 [k]	--	--	--	--
Ethyl ether	60-29-7	0.80	2.00E-01 [f]	1.60E-01	5.71E+00 [k]	--	--	--	--
Ethyl methacrylate	97-63-2	0.80	9.00E-02 [g]	7.20E-02	5.71E+00 [k]	--	--	--	--
Formaldehyde	50-00-0	0.80	2.00E-01 [f]	1.60E-01	--	--	--	4.50E-02 [g]	B1 [f]
Formamide	75-12-7	0.50	--	--	5.71E+00 [k]	--	--	--	--
Formic acid	64-18-6	0.50	2.00E+00 [g]	1.00E+00	5.71E+00 [k]	--	--	--	--
Formic acid, methyl ester	107-31-3	0.50	--	--	5.71E+00 [k]	--	--	--	--
Glycidylaldehyde	765-34-4	0.50	4.00E-04 [f]	2.00E-04	2.86E-04 [g]	--	--	--	B2 [f]
Methyl acetate	79-20-9	0.50	1.00E+00 [g]	5.00E-01	5.71E+00 [k]	--	--	--	--
Methyl alcohol	67-56-1	0.80	5.00E-01 [f]	4.00E-01	5.71E+00 [k]	--	--	--	--
Methyl isocyanate	624-83-9	0.50	--	--	5.71E+00 [k]	--	--	--	--
Methyl methacrylate	80-62-6	0.80	1.40E+00 [f]	1.12E+00	2.00E-01 [f]	--	--	--	E [f]
Methyl tert-butyl ether	1634-04-4	0.80	--	--	8.57E-01 [f]	--	--	--	--
Methylacetylene	74-99-7	0.50	--	--	5.71E+00 [k]	--	--	--	--
Methylcyclohexane	108-87-2	0.80	--	--	8.57E-01 [g]	--	--	--	--
N,N-Dimethylacetamide	127-19-5	0.50	--	--	5.71E+00 [k]	--	--	--	--
n-Butyl alcohol	71-36-3	0.50	1.00E-01 [f]	5.00E-02	5.71E+00 [k]	--	--	--	D [f]
n-Heptane	142-82-5	0.80	--	--	5.71E+00 [k]	--	--	--	D [f]
n-Hexane	110-54-3	0.80	6.00E-02 [g]	4.80E-02	5.71E-02 [f]	--	--	--	--
Nitromethane	75-52-5	0.50	--	--	5.71E+00 [k]	--	--	--	--
n-Nonane	111-84-2	0.50	--	--	8.57E-02 [k]	--	--	--	--
n-Octane	111-65-9	0.50	--	--	8.57E-02 [k]	--	--	--	--
n-Pentane	109-66-0	0.50	--	--	5.71E+00 [k]	--	--	--	--
n-Propionaldehyde	123-38-6	0.50	--	--	5.71E+00 [k]	--	--	--	--
n-Propyl alcohol	71-23-8	0.50	--	--	5.71E+00 [k]	--	--	--	--
n-Valeraldehyde	110-62-3	0.50	--	--	5.71E+00 [k]	--	--	--	--
Oxirane	75-21-8	0.80	--	--	--	1.02E+00 [g]	1.28E+00	3.50E-01 [g]	B1 [g]
p-Cymene	99-87-6	0.80	--	--	8.57E-02 [k]	--	--	--	--
Phosgene	75-44-5	0.50	--	--	5.71E+00 [k]	--	--	--	--
Propargyl alcohol	107-19-7	0.80	2.00E-03 [f]	1.60E-03	5.71E+00 [k]	--	--	--	--
Propionic acid	79-09-4	0.50	--	--	5.71E+00 [k]	--	--	--	--
Propionitrile	107-12-0	0.50	--	--	5.71E+00 [k]	--	--	--	--
Propylene glycol monomethyl ether	107-98-2	0.50	7.00E-01 [g]	3.50E-01	5.71E-01 [f]	--	--	--	--
p-tert-Butyltoluene	98-51-1	0.50	--	--	5.71E+00 [k]	--	--	--	--
Triethylamine	121-44-8	0.80	--	--	2.00E-03 [f]	--	--	--	--
Trimethylamine	75-50-3	0.50	--	--	5.71E+00 [k]	--	--	--	--
Vinyl acetate	108-05-4	0.80	1.00E+00 [g]	8.00E-01	5.71E-02 [f]	--	--	--	--
Non-aromatic Halogenated Hydrocarbons									
1,1,1,2-Tetrachloro-2,2-difluoroethane	76-11-9	0.50	--	--	--	--	--	--	--
1,1,1,2-Tetrachloroethane	630-20-6	0.80	3.00E-02 [f]	2.40E-02	--	2.60E-02 [f]	3.25E-02	2.60E-02 [g]	C [f]
1,1,1-Trichloroethane	71-55-6	0.80	2.00E-01 [i]	1.60E-01	6.29E-01 [i]	--	--	--	D [f]
1,1,2,2-Tetrachloro-1,2-difluoroethane	76-12-0	0.50	--	--	--	--	--	--	--
1,1,2,2-Tetrachloroethane	79-34-5	0.80	--	--	--	2.00E-01 [f]	2.50E-01	2.00E-01 [g]	C [f]
1,1,2,2-Tetrachloroethene	127-18-4	0.80	6.00E-02 [h]	4.80E-02	1.10E-01 [h]	5.20E-02 [i]	6.50E-02	2.00E-03 [i]	--
1,1,2-Trichloroethane	79-00-5	0.80	4.00E-03 [f]	3.20E-03	--	5.70E-02 [f]	7.13E-02	5.70E-02 [g]	C [f]
1,1,2-Trichloroethylene	79-01-6	0.80	3.00E-04 [h]	2.40E-04	1.14E-02 [h]	4.00E-01 [h]	5.00E-01	4.00E-01 [h]	--
1,1-Dichloroethane	75-34-3	0.80	1.00E-01 [g]	8.00E-02	1.43E-01 [g,m]	--	--	--	C [f]
1,1-Dichloroethene	75-35-4	0.80	5.00E-02 [f]	4.00E-02	5.71E-02 [f]	6.00E-01 [n]	7.50E-01	1.20E+00 [g]	C [f]
1,2,2-Trichloro-1,1,2-trifluoroethane	76-13-1	0.80	3.00E+01 [f]	2.40E+01	8.57E+00 [g]	--	--	--	--
1,2,3-Trichloropropane	96-18-4	0.80	6.00E-03 [f]	4.80E-03	--	7.00E+00 [g]	8.75E+00	--	B2 [g]
1,2-Dibromo-3-chloropropane	96-12-8	0.80	--	--	5.71E-05 [f]	1.40E+00 [g]	1.75E+00	2.40E-03 [g]	B2 [g]
1,2-Dichloro-1,1,2,2-tetrafluoroethane	76-14-2	0.80	--	--	--	--	--	--	--
1,2-Dichloroethane	107-06-2	0.80	3.00E-02 [h]	2.40E-02	1.40E-03 [h]	9.10E-02 [f]	1.14E-01	9.10E-02 [f,j]	B2 [f]
1,2-Dichloroethylene	540-59-0	0.80	9.00E-03 [g]	7.20E-03	--	--	--	--	--

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Chemical of Potential Concern	CAS Registry Number	GAF[a]	Chronic Reference Dose (RfD) (mg/kg-day)			Cancer Slope Factor (SF) (mg/kg-day)$^{-1}$			EPA Class[e]
			Oral	Dermal[b]	Inhalation[c]	Oral	Dermal[d]	Inhalation	
1,2-Dichloropropane	78-87-5	0.80	--	--	1.14E-03 [f]	6.80E-02 [g]	8.50E-02	--	B2 [g]
1,3-Dichloropropene	542-75-6	0.50	3.00E-02 [f]	1.50E-02	5.71E-03 [f]	1.00E-01 [g]	2.00E-01	1.40E-02 [f,j]	B2 [f]
1,4-Dichloro-2-butene	764-41-0	0.80	--	--	--	--	--	9.30E+00 [g]	B2 [g]
1-Chloroethene	75-01-4	0.80	3.00E-03 [f]	2.40E-03	2.86E-02 [f]	1.40E+00 [f]	1.75E+00	3.08E-02 [f,j]	A [g]
2,2-Dichloropropionic acid	75-99-0	0.50	3.00E-02 [f]	1.50E-02	--	--	--	--	--
2-Chloropropane	75-29-6	0.80	--	--	2.86E-02 [g]	--	--	--	--
3-Chloropropene (Allyl chloride)	107-05-1	0.80	-- [n]	--	2.86E-04 [f]	--	--	--	C [f]
Bromochloromethane	74-97-5	0.80	--	--	--	--	--	--	D [f]
Bromodichloromethane	75-27-4	0.80	2.00E-02 [f]	1.60E-02	--	6.20E-02 [f]	7.75E-02	--	B2 [f]
Bromoethene	593-60-2	0.80	--	--	8.57E-04 [f]	--	--	-- [n]	B2 [g]
Bromoform	75-25-2	0.80	2.00E-02 [f]	1.60E-02	--	7.90E-03 [f]	9.88E-03	3.90E-03 [g]	B2 [f]
Bromomethane	74-83-9	0.80	1.40E-03 [f]	1.12E-03	1.43E-03 [f]	--	--	--	D [f]
Carbon tetrachloride	56-23-5	0.80	7.00E-04 [f]	5.60E-04	--	1.30E-01 [f]	1.63E-01	5.30E-02 [g]	B2 [f]
Chlorodibromomethane	124-48-1	0.80	2.00E-02 [f]	1.60E-02	--	8.40E-02 [f]	1.05E-01	--	C [f]
Chlorodifluoromethane	75-45-6	0.80	--	--	1.43E+01 [f]	--	--	--	--
Chloroethane	75-00-3	0.80	--	--	2.86E+00 [f]	--	--	--	--
Chloroform	67-66-3	0.80	1.00E-02 [f]	8.00E-03	8.57E-05 [l]	6.10E-03 [f]	7.63E-03	8.10E-02 [g]	B2 [f]
Chloromethane	74-87-3	0.80	--	--	2.57E-02 [f]	--	--	--	D [f]
Chloropentafluoroethane	76-15-3	0.50	--	--	--	--	--	--	--
cis-1,2-Dichloroethene	156-59-2	0.80	1.00E-02 [g]	8.00E-03	--	--	--	--	D [f]
cis-1,3-Dichloropropene	10061-01-5	0.80	--	--	--	--	--	--	--
Cyanogen bromide	506-68-3	0.80	9.00E-02 [f]	7.20E-02	--	--	--	--	--
Cyanogen chloride	506-77-4	0.80	5.00E-02 [f]	4.00E-02	--	--	--	--	--
Dichlorodifluoromethane	75-71-8	0.80	2.00E-01 [g]	1.60E-01	5.71E-02 [g,m]	--	--	--	--
Dichlorofluoromethane	75-43-4	0.50	--	--	--	--	--	--	--
Dichloromethane	75-09-2	0.80	6.00E-02 [f]	4.80E-02	8.57E-01 [g]	7.50E-03 [f]	9.38E-03	1.65E-03 [f,j]	B2 [f]
Difluorodibromomethane	75-61-6	0.50	--	--	--	--	--	--	--
Hexafluoroacetone	684-16-2	0.50	--	--	--	--	--	--	--
Iodomethane	74-88-4	0.80	--	--	--	--	--	--	--
Methylene bromide	74-95-3	0.80	1.00E-02 [g,m]	8.00E-03	--	--	--	--	--
Pentachloroethane	76-01-7	0.50	--	--	--	--	--	--	--
trans-1,2-Dichloroethylene	156-60-5	0.80	2.00E-02 [h]	1.60E-02	--	--	--	--	--
trans-1,3-Dichloropropene	10061-02-6	0.80	--	--	--	--	--	--	--
Trichloroacetic acid	76-03-9	0.50	--	--	--	--	--	--	C [f]
Trichlorofluoroethane	27154-33-2	0.50	--	--	--	--	--	--	--
Trichlorofluoromethane	75-69-4	0.80	3.00E-01 [f]	2.40E-01	2.00E-01 [g,m]	--	--	--	--
Trifluorobromomethane	75-63-8	0.50	--	--	--	--	--	--	--
Dioxin and Furan Compounds (PCDDs/PCDFs)									
1,2,3,4,6,7,8-Heptachlorodibenzo(p)dioxin	35822-46-9	0.50	--	--	--	TEF [p]	TEF [p]	TEF [p]	--
1,2,3,4,6,7,8-Heptachlorodibenzofuran	67562-39-4	0.50	--	--	--	TEF [p]	TEF [p]	TEF [p]	--
1,2,3,4,7,8,9-Heptachlorodibenzofuran	55673-89-7	0.50	--	--	--	TEF [p]	TEF [p]	TEF [p]	--
1,2,3,4,7,8-Hexachlorodibenzo(p)dioxin	39227-28-6	0.50	--	--	--	TEF [p]	TEF [p]	TEF [p]	--
1,2,3,4,7,8-Hexachlorodibenzofuran	70648-26-9	0.50	--	--	--	TEF [p]	TEF [p]	TEF [p]	--
1,2,3,6,7,8-Hexachlorodibenzo(p)dioxin	57653-85-7	0.50	--	--	--	TEF [p]	TEF [p]	TEF [p]	--
1,2,3,6,7,8-Hexachlorodibenzofuran	57117-44-9	0.50	--	--	--	TEF [p]	TEF [p]	TEF [p]	--
1,2,3,7,8,9-Hexachlorodibenzo(p)dioxin	19408-74-3	0.50	--	--	--	TEF [q]	TEF [q]	TEF [q]	B2 [f]
1,2,3,7,8,9-Hexachlorodibenzofuran	72918-21-9	0.50	--	--	--	TEF [p]	TEF [p]	TEF [p]	--
1,2,3,7,8-Pentachlorodibenzo(p)dioxin	40321-76-4	0.50	--	--	--	TEF [p]	TEF [p]	TEF [p]	--
1,2,3,7,8-Pentachlorodibenzofuran	57117-41-6	0.50	--	--	--	TEF [p]	TEF [p]	TEF [p]	--
2,3,4,6,7,8-Hexachlorodibenzofuran	60851-34-5	0.50	--	--	--	TEF [p]	TEF [p]	TEF [p]	--
2,3,4,7,8-Pentachlorodibenzofuran	57117-31-4	0.50	--	--	--	TEF [p]	TEF [p]	TEF [p]	--
2,3,7,8-Tetrachlorodibenzo(p)dioxin	1746-01-6	0.50	--	--	--	1.00E+06 [w]	2.00E+06	1.00E+06 [w]	B2 [g]
2,3,7,8-Tetrachlorodibenzofuran	51207-31-9	0.50	--	--	--	TEF [p]	TEF [p]	TEF [p]	--
Dibenzofuran	132-64-9	0.50	4.00E-03 [i]	2.00E-03	--	--	--	--	--
Octachlorodibenzo(p)dioxin	3268-87-9	0.50	--	--	--	TEF [p]	TEF [p]	TEF [p]	--
Octachlorodibenzofuran	39001-02-0	0.50	--	--	--	TEF [p]	TEF [p]	TEF [p]	--

Table 7-7 Toxicity Values for Human Health Risk Assessment: Organic COPCs

Chemical of Potential Concern	CAS Registry Number	GAF[a]	Chronic Reference Dose (RfD) (mg/kg-day)			Cancer Slope Factor (SF) (mg/kg-day)$^{-1}$			EPA Class[e]
			Oral	Dermal[b]	Inhalation[c]	Oral	Dermal[d]	Inhalation	
Polychlorinated Biphenyls (PCBs)									
2,2',3,3',4,4',5-Heptachlorobiphenyl	35065-30-6	0.80	--	--	--	TEF [r]	TEF [r]	TEF [r]	--
2,2',3,4,4',5,5'-Heptachlorobiphenyl	35065-29-3	0.80	--	--	--	TEF [r]	TEF [r]	TEF [r]	--
2,3,3',4,4',5'-Hexachlorobiphenyl	69782-90-7	0.80	--	--	--	TEF [r]	TEF [r]	TEF [r]	--
2,3,3',4,4',5-Hexachlorobiphenyl	38380-08-4	0.80	--	--	--	TEF [r]	TEF [r]	TEF [r]	--
2,3,3',4,4',5,5'-Heptachlorobiphenyl	39635-31-9	0.80	--	--	--	TEF [r]	TEF [r]	TEF [r]	--
2,3,3',4,4'-Pentachlorobiphenyl	32598-14-4	0.80	--	--	--	TEF [r]	TEF [r]	TEF [r]	--
2,3',4,4',5,5'-Hexachlorobiphenyl	52663-72-6	0.80	--	--	--	TEF [r]	TEF [r]	TEF [r]	--
2,3,4,4',5-Pentachlorobiphenyl	74472-37-0	0.80	--	--	--	TEF [r]	TEF [r]	TEF [r]	--
2,3',4,4',5-Pentachlorobiphenyl	31508-00-6	0.80	--	--	--	TEF [r]	TEF [r]	TEF [r]	--
2',3,4,4',5-Pentachlorobiphenyl	65510-44-3	0.80	--	--	--	TEF [r]	TEF [r]	TEF [r]	--
3,3',4,4',5,5'-Hexachlorobiphenyl	32774-16-6	0.80	--	--	--	TEF [r]	TEF [r]	TEF [r]	--
3,3',4,4',5-Pentachlorobiphenyl	57465-28-8	0.80	--	--	--	TEF [r]	TEF [r]	TEF [r]	--
3,3',4,4'-Tetrachlorobiphenyl	32598-13-3	0.80	--	--	--	TEF [r]	TEF [r]	TEF [r]	--
3,4,4',5-Tetrachlorobiphenyl	70362-50-4	0.80	--	--	--	TEF [r]	TEF [r]	TEF [r]	--
Polychlorinated biphenyls (PCBs)	1336-36-3	0.80	2.00E-05 [s]	1.60E-05	--	2.00E+00 [f,t]	2.50E+00	2.00E+00 [f,t]	B2 [f]
Phthalates									
Bis(2-ethylhexyl) phthalate (DEHP)	117-81-7	0.50	2.00E-02 [f]	1.00E-02	--	1.40E-02 [f]	2.80E-02	--	B2 [f]
Butylbenzyl phthalate	85-68-7	0.50	2.00E-01 [f]	1.00E-01	--	--	--	--	C [f]
Dibutyl phthalate	84-74-2	0.50	1.00E-01 [f]	5.00E-02	--	--	--	--	D [f]
Diethyl phthalate	84-66-2	0.50	8.00E-01 [f]	4.00E-01	--	--	--	--	D [f]
Dimethyl phthalate	131-11-3	0.50	-- [n]	--	--	--	--	--	D [f]
n-Dioctyl phthalate	117-84-0	0.50	2.00E-02 [g]	1.00E-02	--	--	--	--	--
Light Polycyclic Aromatic Hydrocarbons (molecular weight <200 g/mole)									
2-Chloronaphthalene	91-58-7	0.58	8.00E-02 [f]	4.64E-02	--	--	--	--	--
2-Methyl naphthalene	91-57-6	0.58	2.00E-02 [l]	1.16E-02	8.57E-04 [l]	--	--	--	--
5-Nitroacenaphthene	602-87-9	0.58	--	--	--	--	--	--	--
Acenaphthene	83-32-9	0.58	6.00E-02 [f]	3.48E-02	--	--	--	--	--
Acenaphthylene	208-96-8	0.58	--	--	--	--	--	--	--
Anthracene	120-12-7	0.58	3.00E-01 [f]	1.74E-01	--	--	--	--	D [f]
Fluorene	86-73-7	0.58	4.00E-02 [f]	2.32E-02	--	--	--	--	D [f]
Indene	95-13-6	0.58	--	--	--	--	--	--	--
Naphthalene	91-20-3	0.58	2.00E-02 [f]	1.16E-02	8.57E-04 [f]	--	--	--	C [f]
Phenanthrene	85-01-8	0.58	--	--	--	--	--	--	D [f]
Pyrene	129-00-0	0.58	3.00E-02 [f]	1.74E-02	--	--	--	--	D [f]
Heavy Polycyclic Aromatic Hydrocarbons (molecular weight >200 g/mole)									
3-Methylcholanthrene	56-49-5	0.58	--	--	--	--	--	--	--
5-Methylchrysene	3697-24-3	0.58	--	--	--	--	--	--	--
Benzo[a]anthracene	56-55-3	0.58	--	--	--	TEF [u]	TEF [u]	TEF [u]	B2 [f]
Benzo[a]pyrene	50-32-8	0.58	--	--	--	7.30E+00 [f]	1.26E+01	3.10E+00 [h]	B2 [f]
Benzo[a,i]pyrene	191-30-0	0.58	--	--	--	--	--	--	--
Benzo[b]fluoranthene	205-99-2	0.58	--	--	--	TEF [u]	TEF [u]	TEF [u]	B2 [f]
Benzo[e]pyrene	192-97-2	0.58	--	--	--	--	--	--	--
Benzo[g,h,i]perylene	191-24-2	0.58	--	--	--	--	--	--	D [f]
Benzo[j]fluoranthene	205-82-3	0.58	--	--	--	--	--	--	--
Benzo[k]fluoranthene	207-08-9	0.58	--	--	--	TEF [u]	TEF [u]	TEF [u]	B2 [f]
Chrysene	218-01-9	0.58	--	--	--	TEF [u]	TEF [u]	TEF [u]	B2 [f]
Dibenz[a,h]acridine	226-36-8	0.58	--	--	--	--	--	--	--
Dibenz[a,h]anthracene	53-70-3	0.58	--	--	--	TEF [u]	TEF [u]	TEF [u]	B2 [f]
Dibenz[a,j]acridine	224-42-0	0.58	--	--	--	--	--	--	--
Dibenzo[a,e]fluoranthene	5385-75-1	0.58	--	--	--	--	--	--	--
Dibenzo[a,e]pyrene	192-65-4	0.58	--	--	--	--	--	--	--
Dibenzo[a,h]fluoranthene	No CAS #	0.58	--	--	--	--	--	--	--
Dibenzo[a,h]pyrene	189-64-0	0.58	--	--	--	--	--	--	--
Dibenzo[a,i]pyrene	189-55-9	0.58	--	--	--	--	--	--	--
Fluoranthene	206-44-0	0.58	4.00E-02 [f]	2.32E-02	--	--	--	--	D [f]
Hexachloronaphthalene	1335-87-1	0.58	--	--	--	--	--	--	--

Table 7-7 Toxicity Values for Human Health Risk Assessment: Organic COPCs

Chemical of Potential Concern	CAS Registry Number	GAF[a]	Chronic Reference Dose (RfD) (mg/kg-day)			Cancer Slope Factor (SF) (mg/kg-day)$^{-1}$			EPA Class[e]
			Oral	Dermal[b]	Inhalation[c]	Oral	Dermal[d]	Inhalation	
Indeno[1,2,3-cd]pyrene	193-39-5	0.58	--	--	--	TEF [u]	TEF [u]	TEF [u]	B2 [f]
Octachloronaphthalene	2234-13-1	0.58	--	--	--	--	--	--	--
Pentachloronaphthalene	1321-64-8	0.58	--	--	--	--	--	--	--
Tetrachloronaphthalene	1335-88-2	0.58	--	--	--	--	--	--	--
Trichloronaphthalene	1321-65-9	0.58	--	--	--	--	--	--	--
Light Substituted Benzene Compounds (molecular weight <200 g/mole)									
1,2,3-Trichlorobenzene	87-61-6	0.80	--	--	--	--	--	--	--
1,2,4-Trichlorobenzene	120-82-1	0.50	1.00E-02 [f]	5.00E-03	5.71E-02 [g]	--	--	--	D [f]
1,2,4-Trimethyl benzene	95-63-6	0.80	5.00E-02 [l]	4.00E-02	1.71E-03 [l]	--	--	--	--
1,2-Dichlorobenzene	95-50-1	0.50	9.00E-02 [f]	4.50E-02	5.71E-02 [g,m]	--	--	--	D [f]
1,3,5-Trimethyl benzene	108-67-8	0.80	5.00E-02 [l]	4.00E-02	1.71E-03 [l]	--	--	--	--
1,3-Dichlorobenzene	541-73-1	0.50	--	--	--	--	--	--	D [f]
1,3-Dinitrobenzene	99-65-0	0.50	1.00E-04 [f]	5.00E-05	--	--	--	--	D [f]
1,4-Dichlorobenzene	106-46-7	0.50	--	--	2.29E-01 [f]	2.40E-02 [g]	4.80E-02	--	C [g]
1,4-Dinitrobenzene	100-25-4	0.50	4.00E-04 [g]	2.00E-04	--	--	--	--	--
2,4,5-Trichlorophenol	95-95-4	0.50	1.00E-01 [f]	5.00E-02	--	--	--	--	--
2,4,6-Trichlorophenol	88-06-2	0.50	--	--	--	1.10E-02 [f]	2.20E-02	1.00E-02 [g]	B2 [f]
2,4-Dichlorophenol	120-83-2	0.50	3.00E-03 [f]	1.50E-03	--	--	--	--	--
2,4-Dimethylphenol	105-67-9	0.50	2.00E-02 [f]	1.00E-02	--	--	--	--	--
2,4-Dinitrophenol	51-28-5	0.50	2.00E-03 [f]	1.00E-03	--	--	--	--	--
2,4-Dinitrotoluene	121-14-2	0.50	2.00E-03 [f]	1.00E-03	--	6.80E-01 [f,v]	1.36E+00	--	B2 [f]
2,6-Dinitrotoluene	606-20-2	0.50	1.00E-03 [g]	5.00E-04	--	6.80E-01 [f,v]	1.36E+00	--	B2 [f]
2-Chlorophenol	95-57-8	0.50	5.00E-03 [f]	2.50E-03	--	--	--	--	--
2-Chlorotoluene	95-49-8	0.80	2.00E-02 [f]	1.60E-02	--	--	--	--	--
2-Nitrophenol	88-75-5	0.50	--	--	--	--	--	--	--
4,6-Dinitro-o-cresol	534-52-1	0.50	--	--	--	--	--	--	--
4-Chlorotoluene	106-43-4	0.80	--	--	--	--	--	--	--
4-Nitrophenol	100-02-7	0.50	--	--	--	--	--	--	--
alpha-Methylstyrene	98-83-9	0.80	7.00E-02 [g,m]	5.60E-02	--	--	--	--	--
Aniline	62-53-3	0.50	--	--	2.86E-04 [f]	5.70E-03 [f]	1.14E-02	--	B2 [f]
Benzotrichloride	98-07-7	0.50	--	--	--	1.30E+01 [f]	2.60E+01	--	B2 [f]
Benzyl chloride	100-44-7	0.80	--	--	--	1.70E-01 [f]	2.13E-01	--	B2 [f]
Bromobenzene	108-86-1	0.80	--	--	--	--	--	--	--
Chlorobenzene	108-90-7	0.80	2.00E-02 [f]	1.60E-02	5.71E-03 [g,m]	--	--	--	D [f]
Cumene	98-82-8	0.80	1.00E-01 [f]	8.00E-02	1.14E-01 [f]	--	--	--	D [f]
m-Cresol	108-39-4	0.50	5.00E-02 [f]	2.50E-02	--	--	--	--	C [f]
n-Butyl benzene	104-51-8	0.80	--	--	--	--	--	--	--
Nitrobenzene	98-95-3	0.50	5.00E-04 [f]	2.50E-04	5.71E-04 [g,m]	--	--	--	D [f]
n-Propyl benzene	103-65-1	0.80	--	--	--	--	--	--	--
o-Cresol	95-48-7	0.50	5.00E-02 [f]	2.50E-02	--	--	--	--	C [f]
o-Dinitrobenzene	528-29-0	0.50	4.00E-04 [g]	2.00E-04	--	--	--	--	D [f]
o-Nitroaniline	88-74-4	0.50	--	--	5.71E-05 [g]	--	--	--	--
o-Toluidine	95-53-4	0.50	--	--	--	2.40E-01 [g]	4.80E-01	--	B2 [g]
p-Chloroaniline	106-47-8	0.50	4.00E-03 [f]	2.00E-03	--	--	--	--	--
p-Cresol	106-44-5	0.50	5.00E-03 [g]	2.50E-03	--	--	--	--	C [f]
Phenol	108-95-2	0.50	3.00E-01 [f]	1.50E-01	--	--	--	--	D [f]
p-Nitrochlorobenzene	100-00-5	0.50	--	--	--	--	--	--	--
p-Toluidine	106-49-0	0.50	--	--	--	1.90E-01 [g]	3.80E-01	--	C [g]
sec-Butyl benzene	135-98-8	0.80	--	--	--	--	--	--	--
tert-Butyl benzene	98-06-6	0.80	--	--	--	--	--	--	--
Toluene-2,6-diamine	823-40-5	0.50	2.00E-01 [g]	1.00E-01	--	--	--	--	--
Trimethyl benzene	25551-13-7	0.50	--	--	--	--	--	--	--
Other Light Semivolatile Compounds (molecular weight <200 g/mole)									
1,1'-Biphenyl	92-52-4	0.50	5.00E-02 [f]	2.50E-02	--	--	--	--	D [f]
1,1-Dimethylhydrazine	57-14-7	0.50	--	--	--	2.60E+00 [n]	5.20E+00	3.50E+00 [n]	--
1,2-Dimethylhydrazine	540-73-8	0.50	--	--	--	3.70E+01 [n]	7.40E+01	3.70E+01 [n]	B2 [g]
1,2-Diphenylhydrazine	122-66-7	0.50	--	--	--	8.00E-01 [f]	1.60E+00	8.00E-01 [g]	B2 [f]

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Chemical of Potential Concern	CAS Registry Number	GAF[a]	Chronic Reference Dose (RfD) (mg/kg-day)			Cancer Slope Factor (SF) (mg/kg-day)$^{-1}$			EPA Class[e]
			Oral	Dermal[b]	Inhalation[c]	Oral	Dermal[d]	Inhalation	
1,3-Propane sultone	1120-71-4	0.50	--	--	--	--	--	--	--
2,4-Toluene diisocyanate	584-84-9	0.50	--	--	--	--	--	--	--
2-Chloroacetophenone	532-27-4	0.50	--	--	8.57E-06 [f]	--	--	--	--
2-Propenoic acid	79-10-7	0.50	5.00E-01 [f]	2.50E-01	2.86E-04 [f]	--	--	--	--
4,4'-Methylenedianiline	101-77-9	0.50	--	--	--	-- [n]	--	--	--
Acetophenone	98-86-2	0.50	1.00E-01 [f]	5.00E-02	-- [n]	--	--	--	D [f]
Benzoic acid	65-85-0	0.50	4.00E+00 [f]	2.00E+00	--	--	--	--	D [f]
Bis(2-chloroethoxy)methane	111-91-1	0.50	--	--	--	--	--	--	D [f]
Bis(2-chloroethyl) ether	111-44-4	0.50	--	--	--	1.10E+00 [f]	2.20E+00	1.10E+00 [g]	B2 [f]
Chlorocyclopentadiene	41851-50-7	0.50	--	--	--	--	--	--	D [f]
Cyclohexanol	108-93-0	0.50	--	--	--	--	--	--	--
Dichloroisopropyl ether	108-60-1	0.50	--	--	--	7.00E-02 [g]	1.40E-01	3.50E-02 [g]	C [g]
Dichloromethyl ether	542-88-1	0.50	--	--	--	2.20E+02 [f]	4.40E+02	2.20E+02 [g]	A [f]
Dichloropentadiene	61626-71-9	0.50	--	--	--	--	--	--	--
Dimethyl sulfate	77-78-1	0.50	--	--	--	--	--	--	B2 [f]
Dimethylaniline	121-69-7	0.50	2.00E-03 [f]	1.00E-03	--	--	--	--	--
di-n-Propylnitrosamine	621-64-7	0.50	--	--	--	7.00E+00 [f]	1.40E+01	--	B2 [f]
Diphenyl ether	101-84-8	0.50	--	--	--	--	--	--	--
Epichlorohydrin	106-89-8	0.50	2.00E-03 [g]	1.00E-03	2.86E-04 [f]	9.90E-03 [f]	1.98E-02	4.20E-03 [g]	B2 [f]
Ethyl carbamate (Urethane)	51-79-6	0.50	--	--	--	--	--	--	--
Ethyl methanesulfonate	62-50-0	0.50	--	--	--	--	--	--	--
Ethylene dibromide	106-93-4	0.50	--	--	5.71E-05 [g]	8.50E+01 [f]	1.70E+02	7.60E-01 [g]	B2 [f]
Ethylene glycol	107-21-1	0.50	2.00E+00 [f]	1.00E+00	--	--	--	--	--
Ethylene glycol monobutyl ether	111-76-2	0.50	5.00E-01 [f]	2.50E-01	3.71E+00 [f]	--	--	--	--
Ethylene glycol monoethyl ether acetate	111-15-9	0.50	3.00E-01 [g,m]	1.50E-01	--	--	--	--	--
Ethylene thiourea	96-45-7	0.50	8.00E-05 [f]	4.00E-05	--	1.10E-01 [g]	2.20E-01	--	B2 [g]
Furfural	98-01-1	0.50	3.00E-03 [f]	1.50E-03	1.43E-02 [g,m]	--	--	--	--
Maleic hydrazide	123-33-1	0.50	5.00E-01 [f]	2.50E-01	--	--	--	--	--
Malononitrile	109-77-3	0.50	2.00E-05 [g]	1.00E-05	--	--	--	--	--
Methyl styrene (mixed isomers)	25013-15-4	0.50	6.00E-03 [g,m]	3.00E-03	1.14E-02 [g,m]	--	--	--	--
Methylhydrazine	60-34-4	0.50	--	--	--	1.10E+00 [g]	2.20E+00	1.10E+00 [o]	--
N,N-Diphenylamine	122-39-4	0.50	2.50E-02 [f]	1.25E-02	--	--	--	--	--
Nitric acid, propyl ester	627-13-4	0.50	--	--	--	--	--	--	--
N-Nitrosodi-n-butylamine	924-16-3	0.50	--	--	--	5.40E+00 [f]	1.08E+01	5.40E+00 [g]	B2 [f]
N-Nitrosomorpholine	59-89-2	0.50	--	--	--	--	--	--	--
N-Nitroso-N,N-dimethylamine	62-75-9	0.50	--	--	--	5.10E+01 [f]	1.02E+02	5.10E+01 [g]	B2 [f]
o-Anisidine	90-04-0	0.50	--	--	--	--	--	--	--
Oxalic acid	144-62-7	0.50	--	--	--	--	--	--	--
Phthalic anhydride	85-44-9	0.50	2.00E+00 [f]	1.00E+00	3.43E-02 [g]	--	--	--	--
p-Phthalic acid	100-21-0	0.50	1.00E+00 [g]	5.00E-01	--	--	--	--	--
Pyridine	110-86-1	0.50	1.00E-03 [f]	5.00E-04	--	--	--	--	--
Quinoline	91-22-5	0.50	--	--	--	1.20E+01 [g]	2.40E+01	--	C [g]
Quinone	106-51-4	0.50	--	--	--	--	--	--	--
Safrole	94-59-7	0.50	--	--	--	--	--	--	--
Tetrahydrofuran	109-99-9	0.50	--	--	--	--	--	--	--
Other Heavy Semivolatile Compounds (molecular weight >200 g/mole)									
1,2,4,5-Tetrachlorobenzene	95-94-3	0.50	3.00E-04 [f]	1.50E-04	--	--	--	--	--
1,3,5-Trinitrobenzene	99-35-4	0.50	3.00E-02 [f]	1.50E-02	--	--	--	--	--
2,6-Bis(tert-butyl)-4-methylphenol	128-37-0	0.50	--	--	--	--	--	--	--
2-Cyclohexyl-4,6-dinitrophenol	131-89-5	0.50	2.00E-03 [f]	1.00E-03	--	--	--	--	--
2-sec-Butyl-4,6-dinitrophenol	88-85-7	0.50	1.00E-03 [f]	5.00E-04	--	--	--	--	D [f]
3,3'-Dichlorobenzidine	91-94-1	0.50	--	--	--	4.50E-01 [f]	9.00E-01	--	B2 [f]
3,3'-Dimethoxybenzidine	119-90-4	0.50	--	--	--	1.40E-02 [g]	2.80E-02	--	B2 [g]
4-Bromophenylphenyl ether	101-55-3	0.50	--	--	--	--	--	--	D [f]
Ammonium perfluorooctanoate	3825-26-1	0.50	--	--	--	--	--	--	--
Azobenzene	103-33-3	0.50	--	--	--	1.10E-01 [f]	2.20E-01	1.10E-01 [g]	B2 [f]

Table 7-7 Toxicity Values for Human Health Risk Assessment: Organic COPCs

Chemical of Potential Concern	CAS Registry Number	GAF[a]	Chronic Reference Dose (RfD) (mg/kg-day)			Cancer Slope Factor (SF) $(mg/kg\text{-}day)^{-1}$			EPA Class[e]
			Oral	Dermal[b]	Inhalation[c]	Oral	Dermal[d]	Inhalation	
Bis(3-tert-butyl-4-hydroxy-6-methyl-phenyl)sulfide	96-69-5	0.50	--	--	--	--	--	--	--
Captan	133-06-2	0.50	1.30E-01 [f]	6.50E-02	--	3.50E-03 [g]	7.00E-03	--	B2 [g]
Chlorobenzilate	510-15-6	0.50	2.00E-02 [f]	1.00E-02	--	2.70E-01 [g]	5.40E-01	2.70E-01 [g]	B2 [g]
Dibutylphosphate	107-66-4	0.50	--	--	--	--	--	--	--
Dimethyl aminoazobenzene	60-11-7	0.50	--	--	--	--	--	--	--
Hexachlorobenzene	118-74-1	0.50	8.00E-04 [f]	4.00E-04	--	1.60E+00 [f]	3.20E+00	1.60E+00 [g]	B2 [f]
Hexachlorobutadiene	87-68-3	0.50	2.00E-04 [g]	1.00E-04	--	7.80E-02 [f]	1.56E-01	7.80E-02 [g]	C [f]
Hexachlorocyclopentadiene	77-47-4	0.50	7.00E-03 [f]	3.50E-03	5.71E-05 [g]	--	--	--	D [f]
Hexachloroethane	67-72-1	0.50	1.00E-03 [f]	5.00E-04	--	1.40E-02 [f]	2.80E-02	1.40E-02 [g]	C [f]
Hexachlorophene	70-30-4	0.50	3.00E-04 [f]	1.50E-04	--	--	--	--	--
Hexamethylene-1,5-diisocyanate	822-06-0	0.50	--	--	2.86E-06 [f]	--	--	--	--
Mirex	2385-85-5	0.50	2.00E-04 [f]	1.00E-04	--	1.80E+00 [n]	3.60E+00	1.80E+00 [o]	B2 [g]
Nitrofen	1836-75-5	0.50	--	--	--	--	--	--	--
Pentachlorobenzene	608-93-5	0.50	8.00E-04 [f]	4.00E-04	--	--	--	--	D [f]
Pentachloronitrobenzene	82-68-8	0.50	3.00E-03 [f]	1.50E-03	--	2.60E-01 [g]	5.20E-01	--	C [g]
Pentachlorophenol	87-86-5	0.76	3.00E-02 [f]	2.28E-02	--	1.20E-01 [f]	1.58E-01	--	B2 [f]
Picric acid	88-89-1	0.50	--	--	--	--	--	--	--
Pronamide	23950-58-5	0.50	7.50E-02 [f]	3.75E-02	--	--	--	--	--
Strychnine	57-24-9	0.50	3.00E-04 [f]	1.50E-04	--	--	--	--	--
Terphenyls	26140-60-3	0.50	--	--	--	--	--	--	--
Tributyl phosphate	126-73-8	0.50	--	--	--	--	--	--	--
Trifluralin	1582-09-8	0.50	7.50E-03 [f]	3.75E-03	--	7.70E-03 [f]	1.54E-02	--	C [f]
Triphenylamine	603-34-9	0.50	--	--	--	--	--	--	--
Herbicides and Organochlorinated Pesticides									
2,4,5-T	93-76-5	0.50	1.00E-02 [f]	5.00E-03	--	--	--	--	--
2,4-D and esters	94-75-7	0.90	1.00E-02 [f]	9.00E-03	--	--	--	--	--
4,4'-DDD	72-54-8	0.50	--	--	--	2.40E-01 [f]	4.80E-01	--	B2 [f]
4,4'-DDE	72-55-9	0.50	--	--	--	3.40E-01 [f]	6.80E-01	--	B2 [f]
4,4'-DDT	50-29-3	0.70	5.00E-04 [f]	3.50E-04	--	3.40E-01 [f]	4.86E-01	3.40E-01 [g]	B2 [f]
Aldrin	309-00-2	0.50	3.00E-05 [f]	1.50E-05	--	1.70E+01 [f]	3.40E+01	1.70E+01 [g]	B2 [f]
alpha-BHC	319-84-6	0.50	--	--	--	6.30E+00 [f]	1.26E+01	6.30E+00 [g]	B2 [f]
beta-BHC	319-85-7	0.50	--	--	--	1.80E+00 [f]	3.60E+00	1.80E+00 [g]	C [f]
Chlordane	57-74-9	0.80	5.00E-04 [f]	4.00E-04	2.00E-04 [f]	3.50E-01 [f]	4.38E-01	1.30E+00 [g]	B2 [f]
delta-BHC	319-86-8	0.50	--	--	--	--	--	--	D [f]
Dieldrin	60-57-1	0.50	5.00E-05 [f]	2.50E-05	--	1.60E+01 [f]	3.20E+01	1.60E+01 [g]	B2 [f]
Endothall	145-73-3	0.50	2.00E-02 [f]	1.00E-02	--	--	--	--	--
Endrin	72-20-8	0.50	3.00E-04 [f]	1.50E-04	--	--	--	--	D [f]
gamma-BHC (Lindane)	58-89-9	0.50	3.00E-04 [f]	1.50E-04	--	1.30E+00 [g]	2.60E+00	--	B2 [g]
Heptachlor	76-44-8	0.50	5.00E-04 [f]	2.50E-04	--	4.50E+00 [f]	9.00E+00	4.50E+00 [g]	B2 [f]
Isodrin	465-73-6	0.50	--	--	--	--	--	--	--
Methoxychlor	72-43-5	0.50	5.00E-03 [f]	2.50E-03	--	--	--	--	D [f]
Silvex (2,4,5-TP)	93-72-1	0.50	8.00E-03 [f]	4.00E-03	--	--	--	--	D [f]
Toxaphene	8001-35-2	0.50	--	--	--	1.10E+00 [f]	2.20E+00	1.10E+00 [g]	B2 [f]

-- = no value available

[a] GAF = Gastrointestinal absorption factor (unitless). Values taken from Risk Assessment Guidance for Superfund (RAGS), Part E (CCN 064329), which lists values for specific chemicals, as well as values for groups of chemicals (for example, 80 % for other volatile organics). Where a range of values is provided in RAGS Part E, the lower value in the range (the most conservative value) is used.

[b] Dermal reference dose (RfD_d) calculated from oral RfD (RfD_o) and GAF as: $RfD_d = RfD_o \times GAF$.

[c] Calculated from reference concentration (RfC). RfC values are provided in Table 7-9.

[d] Dermal slope factor (SF_d) calculated from oral SF (SF_o) and GAF as: $SF_d = SF_o/GAF$.

[e] US Environmental Protection Agency (EPA) cancer classification: A = human carcinogen; B = probable human carcinogen (B1 indicates limited human evidence, B2 indicates sufficient evidence in animals and inadequate or no evidence in humans); C = possible human carcinogen; D = not classifiable as to human carcinogenicity; and E = evidence of noncarcinogenicity for humans.

[f] Source: Integrated Risk Information System (IRIS).

[g] Source: Health Effects Assessment Summary Table (HEAST).

Table 7-7 Toxicity Values for Human Health Risk Assessment: Organic COPCs

Chemical of Potential Concern	CAS Registry Number	GAF[a]	Chronic Reference Dose (RfD) (mg/kg-day)			Cancer Slope Factor (SF) (mg/kg-day)$^{-1}$			EPA Class[e]
			Oral	Dermal[b]	Inhalation[c]	Oral	Dermal[d]	Inhalation	

[n] Value withdrawn from IRIS or HEAST.

[o] Route-to-route extrapolation (between oral and inhalation values).

[p] Exposure concentrations are converted to equivalent concentrations of 2,3,7,8-Tetrachlorodibenzo(p)dioxin (2,3,7,8-TCDD) by multiplying the concentration by the toxicity equivalency factor (TEF). The resulting 2,3,7,8-TCDD equivalent concentration is evaluated using the SFs for 2,3,7,8-TCDD. TEF values are provided in Table 7-13.

[q] IRIS reports a slope factor for Hexachlorodibenzo(p)dioxin mixtures; however, this value is not used in the quantitative risk assessment. Instead, these congeners are included in the evaluation of the 2,3,7,8-TCDD equivalent concentration.

[r] Exposure concentrations of coplanar "dioxin-like" PCBs are converted to equivalent concentrations of 2,3,7,8-TCDD by multiplying the concentration by the TEF. The resulting 2,3,7,8-TCDD equivalent concentration is evaluated using the SFs for 2,3,7,8-TCDD. TEF values are provided in Table 7-13.

[s] Value for Aroclor-1254.

[t] The cancer potency of polychlorinated biphenyl (PCB) mixtures is determined using a three-tiered approach that depends on the information available. Criteria for use of the High Risk and Persistence Tier include: food chain exposure; sediment or soil ingestion; dust or aerosol inhalation; dermal exposure if an absorption factor has been applied; any early-life exposure; and the presence of dioxin-like, tumor-promoting, or persistent congeners. This value, 2.00E+00 per (mg/kg)/day, is the upper-bound slope factor for the High Risk and Persistence Tier. The central-estimate slope factor for this tier is 1.00E+00 per (mg/kg)/day.

[u] Exposure concentrations are converted to equivalent concentrations of benzo[a]pyrene by multiplying the concentration by the TEF. The resulting benzo[a]pyrene equivalent concentration is evaluated using the slope factors for benzo[a]pyrene. TEF values are provided in Table 7-13.

[v] Listed as "Dinitrotoluene mixture, 2,4-/2,6-" in IRIS. The value is based on a study using technical-grade DNT.

[w] Value from EPA Headquarters, as directed by EPA Region 10.

Table 7-8 Toxicity Values for Human Health Risk Assessment: Inorganic COPCs

Chemical of Potential Concern	CAS Registry Number	GAF[a]	Chronic Reference Dose (RfD) (mg/kg-day)			Cancer Slope Factor (SF) $(mg/kg\text{-}day)^{-1}$			EPA Class[e]
			Oral	Dermal[b]	Inhalation[c]	Oral	Dermal[d]	Inhalation	
Metals									
Aluminum	7429-90-5	0.20	--	--	--	--	--	--	--
Antimony	7440-36-0	0.15	4.00E-04 [f]	6.00E-05	--	--	--	--	--
Arsenic	7440-38-2	0.95	3.00E-04 [f]	2.85E-04	--	1.50E+00 [f]	1.58E+00	1.51E+01 [f,g]	A [f]
Barium	7440-39-3	0.07	7.00E-02 [f]	4.90E-03	1.43E-04 [h]	--	--	--	D [f]
Beryllium	7440-41-7	0.007	2.00E-03 [f]	1.40E-05	5.71E-06 [f]	-- [i]	--	8.40E+00 [h]	B1 [f]
Bismuth	7440-69-9	0.20	--	--	--	--	--	--	--
Boron	7440-42-8	0.20	9.00E-02 [f]	1.80E-02	5.71E-03 [h]	--	--	--	--
Cadmium (diet and soil)	7440-43-9	0.025	1.00E-03 [f,j]	2.50E-05	--	--	--	6.30E+00 [f,g]	B1 [f]
Cadmium (water)	7440-43-9	0.05	5.00E-04 [f,j]	2.50E-05	--	--	--	6.30E+00 [f,g]	B1 [f]
Calcium	7440-70-2	0.20	--	--	--	--	--	--	--
Chromium (as Cr^{+6})	18540-29-9	0.025	3.00E-03 [f]	7.50E-05	2.86E-05 [f,k]	--	--	4.20E+01 [f,g]	A [f]
Cobalt	7440-48-4	0.20	--	--	--	--	--	--	--
Copper	7440-50-8	0.20	--	--	--	--	--	--	D [f]
Iron	7439-89-6	0.20	--	--	--	--	--	--	--
Lead	7439-92-1	0.20	--	--	--	--	--	--	B2 [f]
Lithium	7439-93-2	0.20	--	--	--	--	--	--	--
Magnesium	7439-95-4	0.20	--	--	--	--	--	--	--
Manganese (diet)	7439-96-5	0.04	1.40E-01 [f,l]	5.60E-03	--	--	--	--	D [f]
Manganese (water and soil)	7439-96-5	0.04	4.60E-02 [l]	1.84E-03	1.43E-05 [f]	--	--	--	D [f]
Mercury	7439-97-6	0.74	--	--	8.57E-05 [f]	--	--	--	D [f]
Mercury - Hg+2	7487-94-7	0.07	3.00E-04 [f]	2.10E-05	--	--	--	--	C [f]
Methylmercury	22967-92-6	0.95	1.00E-04 [f]	9.50E-05	--	--	--	--	C [f]
Molybdenum	7439-98-7	0.20	5.00E-03 [f]	1.00E-03	--	--	--	--	--
Nickel	7440-02-0	0.04	2.00E-02 [f,m]	8.00E-04	--	--	--	8.40E-01 [f,g,n]	A [n]
Potassium	7440-09-7	0.20	--	--	--	--	--	--	--
Rhodium	7440-16-6	0.20	--	--	--	--	--	--	--
Selenium	7782-49-2	0.30	5.00E-03 [f]	1.50E-03	--	--	--	--	D [f]
Silicon	7440-21-3	0.20	--	--	--	--	--	--	--
Silver	7440-22-4	0.04	5.00E-03 [f]	2.00E-04	--	--	--	--	D [f]
Sodium	7440-23-5	0.20	--	--	--	--	--	--	--
Strontium	7440-24-6	0.20	6.00E-01 [f]	1.20E-01	--	--	--	--	--
Tantalum	7440-25-7	0.20	--	--	--	--	--	--	--
Thallium	7440-28-0	1.00	6.60E-05 [f]	6.60E-05	--	--	--	--	D [f]
Tin	7440-31-5	0.20	6.00E-01 [h]	1.20E-01	--	--	--	--	--
Tungsten	7440-33-7	0.20	--	--	--	--	--	--	--
Uranium	7440-61-1	0.20	3.00E-03 [f]	6.00E-04	--	--	--	--	--
Vanadium	7440-62-2	0.026	7.00E-03 [h]	1.82E-04	--	--	--	--	--
Yttrium	7440-65-5	0.20	--	--	--	--	--	--	--
Zinc	7440-66-6	0.19	3.00E-01 [f]	5.70E-02	--	--	--	--	D [f]
Zirconium	7440-67-7	0.20	--	--	--	--	--	--	--
Non-metals and Anions									
Ammonia/Ammonium	7664-41-7	0.20	--	--	2.86E-02 [f]	--	--	--	--
Bromide	24959-67-9	0.20	--	--	--	--	--	--	--
Chloride	16887-00-6	0.20	--	--	--	--	--	--	--
Cyanide	57-12-5	0.47	2.00E-02 [f]	9.40E-03	--	--	--	--	D [f]
Fluoride	16984-48-8	0.20	6.00E-02 [f]	1.20E-02	--	--	--	--	--
Hydroxide	14280-30-9	0.20	--	--	--	--	--	--	--
Iodine	7553-56-2	0.20	--	--	--	--	--	--	--
Nitrate	14797-55-8	0.20	1.60E+00 [f]	3.20E-01	--	--	--	--	--

Table 7-8 Toxicity Values for Human Health Risk Assessment: Inorganic COPCs

Chemical of Potential Concern	CAS Registry Number	GAF[a]	Chronic Reference Dose (RfD) (mg/kg-day)			Cancer Slope Factor (SF) $(mg/kg\text{-}day)^{-1}$			EPA Class[e]
			Oral	Dermal[b]	Inhalation[c]	Oral	Dermal[d]	Inhalation	
Nitrite	14797-65-0	0.20	1.00E-01 [f]	2.00E-02	--	--	--	--	--
Phosphate	14265-44-2	0.20	--	--	--	--	--	--	--
Phosphorus	7723-14-0	0.20	--	--	--	--	--	--	--
Sulfate	14808-79-8	0.20	--	--	--	--	--	--	--
Total sulfur	63705-05-5	0.20	--	--	--	--	--	--	--
Criteria Pollutants									
Carbon monoxide	630-08-0	0.20	--	--	--	--	--	--	--
Nitrogen dioxide	10102-44-0	0.20	-- [i]	--	--	--	--	--	--
Ozone	10028-15-6	0.20	--	--	--	--	--	--	--
Particulate matter	No CAS #	0.20	--	--	--	--	--	--	--
Sulfur dioxide	7446-09-5	0.20	--	--	--	--	--	--	--

-- = no value available.

[a] GAF = Gastrointestinal absorption factor (unitless). Values taken from Risk Assessment Guidance for Superfund (RAGS), Part E (CCN 064329), which lists values for specific chemicals, as well as values for groups of chemicals (e.g., 20 % for other inorganics). Where a range of values is provided in RAGS Part E, the lower value in the range (the most conservative value) is used.

[b] Dermal reference dose (RfD_d) calculated from oral RfD (RfD_o) and GAF as: $RfD_d = RfD_o \times GAF$.

[c] Calculated from reference concentration (RfC). RfC values are provided in Table 7-9.

[d] Dermal slope factor (SF_d) calculated from oral SF (SF_o) and GAF as: $SF_d = SF_o/GAF$.

[e] US Environmental Protection Agency (EPA) cancer classification: A = human carcinogen; B = probable human carcinogen (B1 indicates limited human evidence, B2 indicates sufficient evidence in animals and inadequate or no evidence in humans); C = possible human carcinogen; D = not classifiable as to human carcinogenicity; and E = evidence of noncarcinogenicity for humans.

[f] Source: Integrated Risk Information System (IRIS).

[g] The inhalation slope factor was calculated from inhalation unit risk. Unit risk values are provided in Table 7-10.

[h] Source: Health Effects Assessment Summary Table (HEAST).

[i] Value withdrawn from IRIS or HEAST.

[j] The oral toxicity values for "Cadmium (Diet)" are used for soil and food uses while the oral toxicity values for "Cadmium (Water)" are used for water uses only.

[k] Value shown is for chromium VI particulates.

[l] IRIS no longer separates manganese values for chronic oral RfDs into water and diet RfDs. The chronic oral RfD for the total oral intake of manganese is 1.40E-01. However, when assessing exposure to manganese from drinking water or soil, IRIS recommends using a modifying factor of 3, thereby lowering the RfD to 4.67E-02, which has been rounded to 4.6E-02. Rounding to 4.7E-02 is more accurate, but makes the value less conservative. HEAST values remain separated into water and diet subchronic RfDs.

[m] This entry was formerly listed in IRIS as Nickel (metallic) with the CAS number 7440-02-0. The chemical name was changed to nickel (soluble salts) so that it more accurately indicates the chemicals used in the studies from which the values were derived. Several different nickel salts were used, so the listing of one CAS number has been replaced in IRIS with the word various.

[n] Value shown is for nickel refinery dust.

Table 7-9 Toxicity Values for Human Health Risk Assessment in Original Units: Organic COPCs

Chemical of Potential Concern	CAS Registry Number	Reference Concentration (RfC) (mg/m^3)	Inhalation Reference Dose (RfD) (mg/kg-day)	Inhalation Unit Risk $(mg/m^3)^{-1}$	Inhalation Cancer Slope Factor $(mg/kg\text{-}day)^{-1}$
Aromatic Halogenated Hydrocarbons					
Aromatic Nonhalogenated Hydrocarbons					
Benzene	71-43-2	9.00E-03 [a]	2.57E-03 [a,b]	7.80E-03 [c]	2.73E-02 [c,e]
Ethyl benzene	100-41-4	1.00E+00 [c]	2.86E-01 [b,c]	--	--
m-Xylene	108-38-3	1.00E-01 [h]	2.86E-02 [b,h]	--	--
o-Xylene	95-47-6	1.00E-01 [h]	2.86E-02 [b,h]	--	--
p-Xylene	106-42-3	1.00E-01 [h]	2.86E-02 [b,h]	--	--
Styrene	100-42-5	1.00E+00 [c]	2.86E-01 [b,c]	--	--
Toluene	108-88-3	4.00E-01 [c]	1.14E-01 [b,c]	--	--
Non-aromatic Nonhalogenated Hydrocarbons					
1,2-Epoxybutane	106-88-7	2.00E-02 [c]	5.71E-03 [b,c]	--	--
1,3-Butadiene	106-99-0	2.00E-03 [f]	5.71E-04 [b,f]	3.00E-02 [c]	1.05E-01 [c,e]
1,4-Dioxane	123-91-1	2.00E+01 [f]	5.71E+00 [b,f]	--	--
1-Methylpropyl alcohol	78-92-2	2.00E+01 [f]	5.71E+00 [b,f]	--	--
1-Nitropropane	108-03-2	2.00E+01 [f]	5.71E+00 [b,f]	--	--
2,2,4-Trimethylpentane	540-84-1	3.00E-01 [f]	8.57E-02 [b,f]	--	--
2-Butanone	78-93-3	1.00E+00 [c]	2.86E-01 [b,c]	--	--
2-Butenaldehyde (2-Butenal)	4170-30-3	2.00E+01 [f]	5.71E+00 [b,f]	--	--
2-Ethoxyethanol	110-80-5	2.00E-01 [c]	5.71E-02 [b,c]	--	--
2-Heptanone	110-43-0	2.00E+01 [f]	5.71E+00 [b,f]	--	--
2-Hexanone	591-78-6	5.00E-03 [h]	1.43E-03 [b,h]	--	--
2-Methoxyethanol	109-86-4	2.00E-02 [c]	5.71E-03 [b,c]	--	--
2-Methyl-2-propanol	75-65-0	2.00E+01 [f]	5.71E+00 [b,f]	--	--
2-Methyl-2-propenenitrile	126-98-7	7.00E-04 [g,i]	2.00E-04 [b,g,i]	--	--
2-Methylaziridine	75-55-8	2.00E+01 [f]	5.71E+00 [b,f]	--	--
2-Methylpropyl alcohol	78-83-1	2.00E+01 [f]	5.71E+00 [b,f]	--	--
2-Pentanone	107-87-9	2.00E+01 [f]	5.71E+00 [b,f]	--	--
2-Propanone (Acetone)	67-64-1	2.00E+01 [f]	5.71E+00 [b,f]	--	--
2-Propene-1-ol	107-18-6	2.00E+01 [f]	5.71E+00 [b,f]	--	--
2-Propyl alcohol	67-63-0	2.00E+01 [f]	5.71E+00 [b,f]	--	--
3-Heptanone	106-35-4	2.00E+01 [f]	5.71E+00 [b,f]	--	--
3-Methyl-1-butanol	123-51-3	2.00E+01 [f]	5.71E+00 [b,f]	--	--
3-Methyl-2-butanone	563-80-4	2.00E+01 [f]	5.71E+00 [b,f]	--	--
3-Pentanone	96-22-0	2.00E+01 [f]	5.71E+00 [b,f]	--	--
4-Heptanone	123-19-3	2.00E+01 [f]	5.71E+00 [b,f]	--	--
4-Methyl-2-pentanone	108-10-1	8.00E-02 [g,i]	2.29E-02 [b,g,i]	--	--
4-Methyl-3-penten-2-one	141-79-7	2.00E+01 [f]	5.71E+00 [b,f]	--	--
5-Methyl-2-hexanone	110-12-3	2.00E+01 [f]	5.71E+00 [b,f]	--	--
Acetaldehyde	75-07-0	9.00E-03 [c]	2.57E-03 [b,c]	2.20E-03 [c]	7.70E-03 [c,e]
Acetamide	60-35-5	2.00E+01 [f]	5.71E+00 [b,f]	--	--
Acetic acid	64-19-7	2.00E+01 [f]	5.71E+00 [b,f]	--	--
Acetic acid ethyl ester	141-78-6	2.00E+01 [f]	5.71E+00 [b,f]	--	--
Acetic acid n-butyl ester	123-86-4	2.00E+01 [f]	5.71E+00 [b,f]	--	--
Acetonitrile	75-05-8	6.00E-02 [c]	1.71E-02 [b,c]	--	--
Acrolein	107-02-8	2.00E-05 [c]	5.71E-06 [b,c]	--	--
Acrylonitrile	107-13-1	2.00E-03 [c]	5.71E-04 [b,c]	6.80E-02 [c]	2.40E-01 [g]
Bis(isopropyl)ether	108-20-3	2.00E+01 [f]	5.71E+00 [b,f]	--	--
Butane	106-97-8	2.00E+01 [f]	5.71E+00 [b,f]	--	--
Carbon disulfide	75-15-0	7.00E-01 [c]	2.00E-01 [b,c]	--	--

Table 7-9 Toxicity Values for Human Health Risk Assessment in Original Units: Organic COPCs

Chemical of Potential Concern	CAS Registry Number	Reference Concentration (RfC) (mg/m^3)	Inhalation Reference Dose (RfD) (mg/kg-day)	Inhalation Unit Risk $(mg/m^3)^{-1}$	Inhalation Cancer Slope Factor $(mg/kg\text{-}day)^{-1}$
Cyanogen	460-19-5	2.00E+01 [f]	5.71E+00 [b,f]	--	--
Cyclohexane	110-82-7	2.00E+01 [a]	5.71E+00 [a,b]	--	--
Cyclohexanone	108-94-1	2.00E+01 [f]	5.71E+00 [b,f]	--	--
Cyclohexene	110-83-8	2.00E+01 [f]	5.71E+00 [b,f]	--	--
Cyclopentane	287-92-3	2.00E+01 [f]	5.71E+00 [b,f]	--	--
Ethyl alcohol	64-17-5	2.00E+01 [f]	5.71E+00 [b,f]	--	--
Ethyl ether	60-29-7	2.00E+01 [f]	5.71E+00 [b,f]	--	--
Ethyl methacrylate	97-63-2	2.00E+01 [f]	5.71E+00 [b,f]	--	--
Formaldehyde	50-00-0	--	--	1.30E-02 [c]	4.50E-02 [g]
Formamide	75-12-7	2.00E+01 [f]	5.71E+00 [b,f]	--	--
Formic acid	64-18-6	2.00E+01 [f]	5.71E+00 [b,f]	--	--
Formic acid, methyl ester	107-31-3	2.00E+01 [f]	5.71E+00 [b,f]	--	--
Glycidylaldehyde	765-34-4	1.00E-03 [g]	2.86E-04 [b,g]	--	--
Methyl acetate	79-20-9	2.00E+01 [f]	5.71E+00 [b,f]	--	--
Methyl alcohol	67-56-1	2.00E+01 [f]	5.71E+00 [b,f]	--	--
Methyl isocyanate	624-83-9	2.00E+01 [f]	5.71E+00 [b,f]	--	--
Methyl methacrylate	80-62-6	7.00E-01 [c]	2.00E-01 [b,c]	--	--
Methyl tert-butyl ether	1634-04-4	3.00E+00 [c]	8.57E-01 [b,c]	--	--
Methylacetylene	74-99-7	2.00E+01 [f]	5.71E+00 [b,f]	--	--
Methylcyclohexane	108-87-2	3.00E+00 [g]	8.57E-01 [b,g]	--	--
N,N-Dimethylacetamide	127-19-5	2.00E+01 [f]	5.71E+00 [b,f]	--	--
n-Butyl alcohol	71-36-3	2.00E+01 [f]	5.71E+00 [b,f]	--	--
n-Heptane	142-82-5	2.00E+01 [f]	5.71E+00 [b,f]	--	--
n-Hexane	110-54-3	2.00E-01 [c]	5.71E-02 [b,c]	--	--
Nitromethane	75-52-5	2.00E+01 [f]	5.71E+00 [b,f]	--	--
n-Nonane	111-84-2	3.00E-01 [f]	8.57E-02 [b,f]	--	--
n-Octane	111-65-9	3.00E-01 [f]	8.57E-02 [b,f]	--	--
n-Pentane	109-66-0	2.00E+01 [f]	5.71E+00 [b,f]	--	--
n-Propionaldehyde	123-38-6	2.00E+01 [f]	5.71E+00 [b,f]	--	--
n-Propyl alcohol	71-23-8	2.00E+01 [f]	5.71E+00 [b,f]	--	--
n-Valeraldehyde	110-62-3	2.00E+01 [f]	5.71E+00 [b,f]	--	--
Oxirane	75-21-8	--	--	1.00E-01 [g]	3.50E-01 [g]
p-Cymene	99-87-6	3.00E-01 [f]	8.57E-02 [b,f]	--	--
Phosgene	75-44-5	2.00E+01 [f]	5.71E+00 [b,f]	--	--
Propargyl alcohol	107-19-7	2.00E+01 [f]	5.71E+00 [b,f]	--	--
Propionic acid	79-09-4	2.00E+01 [f]	5.71E+00 [b,f]	--	--
Propionitrile	107-12-0	2.00E+01 [f]	5.71E+00 [b,f]	--	--
Propylene glycol monomethyl ether	107-98-2	2.00E+00 [c]	5.71E-01 [b,c]	--	--
p-tert-Butyltoluene	98-51-1	2.00E+01 [f]	5.71E+00 [b,f]	--	--
Triethylamine	121-44-8	7.00E-03 [c]	2.00E-03 [b,c]	--	--
Trimethylamine	75-50-3	2.00E+01 [f]	5.71E+00 [b,f]	--	--
Vinyl acetate	108-05-4	2.00E-01 [c]	5.71E-02 [b,c]	--	--
Non-aromatic Halogenated Hydrocarbons					
1,1,1,2-Tetrachloroethane	630-20-6	--	--	7.40E-03 [c]	2.60E-02 [g]
1,1,1-Trichloroethane	71-55-6	2.20E+00 [d]	6.29E-01 [b,d]	--	--
1,1,2,2-Tetrachloroethane	79-34-5	--	--	5.80E-02 [c]	2.00E-01 [g]
1,1,2,2-Tetrachloroethene	127-18-4	3.85E-01 [a]	1.10E-01 [a,b]	5.80E-04 [d]	2.00E-03 [d]
1,1,2-Trichloroethane	79-00-5	--	--	1.60E-02 [c]	5.70E-02 [g]
1,1,2-Trichloroethylene	79-01-6	4.00E-02 [a]	1.14E-02 [a,b]	--	4.00E-01 [a]

Table 7-9 Toxicity Values for Human Health Risk Assessment in Original Units: Organic COPCs

Chemical of Potential Concern	CAS Registry Number	Reference Concentration (RfC) (mg/m^3)	Inhalation Reference Dose (RfD) (mg/kg-day)	Inhalation Unit Risk $(mg/m^3)^{-1}$	Inhalation Cancer Slope Factor $(mg/kg\text{-}day)^{-1}$
1,1-Dichloroethane	75-34-3	5.00E-01 [g,i]	1.43E-01 [b,g,i]	--	--
1,1-Dichloroethene	75-35-4	2.00E-01 [c]	5.71E-02 [b,c]	5.00E-02 [j]	1.20E+00 [g]
1,2,2-Trichloro-1,1,2-trifluoroethane	76-13-1	3.00E+01 [g]	8.57E+00 [b,g]	--	--
1,2-Dibromo-3-chloropropane	96-12-8	2.00E-04 [c]	5.71E-05 [b,c]	6.90E-04 [g]	2.40E-03 [g]
1,2-Dichloroethane	107-06-2	4.90E-03 [a]	1.40E-03 [a,b]	2.60E-02 [c]	9.10E-02 [c,e]
1,2-Dichloropropane	78-87-5	4.00E-03 [c]	1.14E-03 [b,c]	--	--
1,3-Dichloropropene	542-75-6	2.00E-02 [c]	5.71E-03 [b,c]	4.00E-03 [c]	1.40E-02 [c,e]
1,4-Dichloro-2-butene	764-41-0	--	--	2.60E+00 [g]	9.30E+00 [g]
1-Chloroethene	75-01-4	1.00E-01 [c]	2.86E-02 [b,c]	8.80E-03 [c]	3.08E-02 [c,e]
2-Chloropropane	75-29-6	1.00E-01 [g]	2.86E-02 [b,g]	--	--
3-Chloropropene (Allyl chloride)	107-05-1	1.00E-03 [c]	2.86E-04 [b,c]	--	--
Bromoethene	593-60-2	3.00E-03 [c]	8.57E-04 [b,c]	--	-- [j]
Bromoform	75-25-2	--	--	1.10E-03 [c]	3.90E-03 [g]
Bromomethane	74-83-9	5.00E-03 [c]	1.43E-03 [b,c]	--	--
Carbon tetrachloride	56-23-5	--	--	1.50E-02 [c]	5.30E-02 [g]
Chlorodifluoromethane	75-45-6	5.00E+01 [c]	1.43E+01 [b,c]	--	--
Chloroethane	75-00-3	1.00E+01 [c]	2.86E+00 [b,c]	--	--
Chloroform	67-66-3	3.00E-04 [h]	8.57E-05 [b,h]	2.30E-02 [c]	8.10E-02 [g]
Chloromethane	74-87-3	9.00E-02 [c]	2.57E-02 [b,c]	--	--
Dichlorodifluoromethane	75-71-8	2.00E-01 [g,i]	5.71E-02 [b,g,i]	--	--
Dichloromethane	75-09-2	3.00E+00 [g]	8.57E-01 [b,g]	4.70E-04 [c]	1.65E-03 [c,e]
Trichlorofluoromethane	75-69-4	7.00E-01 [g,i]	2.00E-01 [b,g,i]	--	--
Polychlorinated Biphenyls (PCBs)					
Polychlorinated biphenyls (PCBs)	1336-36-3	--	--	5.71E-01 [c,l]	2.00E+00 [c,l]
Phthalates					
Light Polycyclic Aromatic Hydrocarbons (molecular weight <200 g/mole)					
2-Methyl naphthalene	91-57-6	3.00E-03 [h]	8.57E-04 [b,h]	--	--
Naphthalene	91-20-3	3.00E-03 [c]	8.57E-04 [b,c]	--	--
Heavy Polycyclic Aromatic Hydrocarbons (molecular weight >200 g/mole)					
Benzo[a]pyrene	50-32-8	--	--		3.10E+00 [a]
Light Substituted Benzene Compounds (molecular weight <200 g/mole)					
1,2,4-Trichlorobenzene	120-82-1	2.00E-01 [g]	5.71E-02 [b,g]	--	--
1,2,4-Trimethyl benzene	95-63-6	6.00E-03 [h]	1.71E-03 [b,h]	--	--
1,2-Dichlorobenzene	95-50-1	2.00E-01 [g,i]	5.71E-02 [b,g,i]	--	--
1,3,5-Trimethyl benzene	108-67-8	6.00E-03 [h]	1.71E-03 [b,h]	--	--
1,4-Dichlorobenzene	106-46-7	8.00E-01 [c]	2.29E-01 [b,c]	--	--
2,4,6-Trichlorophenol	88-06-2	--	--	3.10E-03 [c]	1.00E-02 [g]
Aniline	62-53-3	1.00E-03 [c]	2.86E-04 [b,c]	--	--
Chlorobenzene	108-90-7	2.00E-02 [g,i]	5.71E-03 [b,g,i]	--	--
Cumene	98-82-8	4.00E-01 [c]	1.14E-01 [b,c]	--	--
Nitrobenzene	98-95-3	2.00E-03 [g,i]	5.71E-04 [b,g,i]	--	--
o-Nitroaniline	88-74-4	2.00E-04 [g]	5.71E-05 [b,g]	--	--
Other Light Semivolatile Compounds (molecular weight <200 g/mole)					
1,1-Dimethylhydrazine	57-14-7	--	--	--	3.50E+00 [j]
1,2-Dimethylhydrazine	540-73-8	--	--	--	3.70E+01 [j]
1,2-Diphenylhydrazine	122-66-7	--	--	2.20E-01 [c]	8.00E-01 [g]
2-Chloroacetophenone	532-27-4	3.00E-05 [c]	8.57E-06 [b,c]	--	--
2-Propenoic acid	79-10-7	1.00E-03 [c]	2.86E-04 [b,c]	--	--
Bis(2-chloroethyl) ether	111-44-4	--	--	3.30E-01 [c]	1.10E+00 [g]

Table 7-9 Toxicity Values for Human Health Risk Assessment in Original Units: Organic COPCs

Chemical of Potential Concern	CAS Registry Number	Reference Concentration (RfC) (mg/m^3)	Inhalation Reference Dose (RfD) (mg/kg-day)	Inhalation Unit Risk $(mg/m^3)^{-1}$	Inhalation Cancer Slope Factor $(mg/kg\text{-}day)^{-1}$
Dichloroisopropyl ether	108-60-1	--	--	1.00E-02 [g]	3.50E-02 [g]
Dichloromethyl ether	542-88-1	--	--	6.20E+01 [c]	2.20E+02 [g]
Epichlorohydrin	106-89-8	1.00E-03 [c]	2.86E-04 [b,c]	1.20E-03 [c]	4.20E-03 [g]
Ethylene dibromide	106-93-4	2.00E-04 [g]	5.71E-05 [b,g]	2.20E-01 [c]	7.60E-01 [g]
Ethylene glycol monobutyl ether	111-76-2	1.30E+01 [c]	3.71E+00 [b,c]	--	--
Furfural	98-01-1	5.00E-02 [g,i]	1.43E-02 [b,g,i]	--	--
Methyl styrene (mixed isomers)	25013-15-4	4.00E-02 [g,i]	1.14E-02 [b,g,i]	--	--
Methylhydrazine	60-34-4	--	--		1.10E+00 [m]
N-Nitrosodi-n-butylamine	924-16-3	--	--	1.60E+00 [c]	5.40E+00 [g]
N-Nitroso-N,N-dimethylamine	62-75-9	--	--	1.40E+01 [c]	5.10E+01 [g]
Phthalic anhydride	85-44-9	1.20E-01 [g]	3.43E-02 [b,g]	--	--
Other Heavy Semivolatile Compounds (molecular weight >200 g/mole)					
Azobenzene	103-33-3	--	--	3.10E-02 [c]	1.10E-01 [g]
Chlorobenzilate	510-15-6	--	--	7.80E-02 [g]	2.70E-01 [g]
Hexachlorobenzene	118-74-1	--	--	4.60E-01 [c]	1.60E+00 [g]
Hexachlorobutadiene	87-68-3	--	--	2.20E-02 [c]	7.80E-02 [g]
Hexachlorocyclopentadiene	77-47-4	2.00E-04 [g]	5.71E-05 [b,g]	--	--
Hexachloroethane	67-72-1	--	--	4.00E-03 [c]	1.40E-02 [g]
Hexamethylene-1,5-diisocyanate	822-06-0	1.00E-05 [c]	2.86E-06 [b,c]	--	--
Mirex	2385-85-5	--	--	--	1.80E+00 [m]
Herbicides and Organochlorinated Pesticides					
4,4'-DDT	50-29-3	--	--	9.70E-02 [c]	3.40E-01 [g]
Aldrin	309-00-2	--	--	4.90E+00 [c]	1.70E+01 [g]
alpha-BHC	319-84-6	--	--	1.80E+00 [c]	6.30E+00 [g]
beta-BHC	319-85-7	--	--	5.30E-01 [c]	1.80E+00 [g]
Chlordane	57-74-9	7.00E-04 [c]	2.00E-04 [b,c]	1.00E-01 [c]	1.30E+00 [g]
Dieldrin	60-57-1	--	--	4.60E+00 [c]	1.60E+01 [g]
Heptachlor	76-44-8	--	--	1.30E+00 [c]	4.50E+00 [g]
Toxaphene	8001-35-2	--	--	3.20E-01 [c]	1.10E+00 [g]

-- = no value available.

[a] Provisional value from National Center for Environmental Assessment (NCEA).

[b] The inhalation RfD was calculated from the inhalation RfC.

[c] Source: Integrated Risk Information System (IRIS).

[d] Provisional values provided by the Superfund Health Risk Technical Support Center as noted in the Risk Assessment Information System (RAIS), maintained by the Oak Ridge National Laboratory (see http://risk.lsd.ornl.gov/tox/tox_values.shtml).

[e] The inhalation slope factor was calculated from inhalation unit risk.

[f] Recommended reference doses for petroleum fractions and individual hazardous substances (MTCA hydrocarbon guidance).

[g] Source: Health Effects and Environmental Affects Summary Table (HEAST).

[h] Provisional value from EPA Region 10.

[i] These noncancer toxicity values are found in agency documents, but were calculated by alternative methods that are not currently practiced by the RfD/RfC Work Group. These values are considered to be adequate provisional values for risk assessment purposes at Superfund and RCRA sites, but are subject to be reviewed by the RfD/RfC Work Group.

[j] Withdrawn value from IRIS or HEAST.

[k] Units are $(pg/m^3)^{-1}$.

[l] High risk and persistence tier.

[m] Route-to-route extrapolation (between oral and inhalation values).

[n] Value from EPA Headquarters, as directed by EPA Region 10.

Note: Oral unit risk values are not shown because oral slope factors were available for all COPCs that have oral unit risk values.

Table 7-10 Toxicity Values for Human Health Risk Assessment in Original Units: Inorganic COPCs

Chemical of Potential Concern	CAS Registry Number	Reference Concentration (RfC) (mg/m^3)	Inhalation Reference Dose (RfD) (mg/kg-day)	Inhalation Unit Risk $(mg/m^3)^{-1}$	Inhalation Cancer Slope Factor $(mg/kg\text{-}day)^{-1}$
	Metals				
Arsenic	7440-38-2	--	--	4.30E+00 [a]	1.51E+01 [a,b]
Barium	7440-39-3	5.00E-04 [c,d]	1.43E-04 [c,d,e]	--	--
Beryllium	7440-41-7	2.00E-05 [a]	5.71E-06 [a,e]	2.40E+00 [a]	8.40E+00 [c]
Boron	7440-42-8	2.00E-02 [c]	5.71E-03 [c,e]	--	--
Cadmium	7440-43-9	--	--	1.80E+00 [a]	6.30E+00 [a,b]
Chromium	18540-29-9	1.00E-04 [a,f]	2.86E-05 [a,e,f]	1.20E+01 [a]	4.20E+01 [a,b]
Manganese	7439-96-5	5.00E-05 [a]	1.43E-05 [a,e]	--	--
Mercury	7439-97-6	3.00E-04 [a,g]	8.57E-05 [a,e,g]	--	--
Nickel	7440-02-0	--	--	2.40E-01 [a,h]	8.40E-01 [a,b,h]
	Non-metals and Anions				
Ammonia/Ammonium	7664-41-7	1.00E-01 [a]	2.86E-02 [a,e]	--	--

-- = no value available.

[a] Source: Integrated Risk Information System (IRIS).

[b] The inhalation slope factor was calculated from inhalation unit risk.

[c] Source: Health Effects and Environmental Affects Summary Table (HEAST).

[d] These noncancer toxicity values are found in agency documents, but were calculated by alternative methods that are not currently practiced by the RfD/RfC Work Group. These values are considered to be adequate provisional values for risk assessment purposes at Superfund and RCRA sites, but are subject to be reviewed by the RfD/RfC Work Group.

[e] The inhalation RfD was calculated from the inhalation RfC.

[f] Value is for "Chromium VI (particulates)."

[g] The inhalation RfC from 'Mercury (elemental)' is used to evaluate mercury since neither 'Mercury (inorganic)' nor 'Mercuric Chloride' have an inhalation RfC value.

[h] Value is for Nickel refinery dust.

Note: Oral unit risk values are not shown because oral slope factors were available for all COPCs that have oral unit risk values.

Table 7-11 Acute Inhalation Exposure Criteria for COPCs (mg/m^3)

Chemical of Potential Concern	CAS Registry Number	NCEA Provis. Value [a]	AREL [b]	AEGL-1 [c]	AEGL-2 [c]	ERPG-1 [d]	TEEL-1 [e]	AIEC [f]	Source of AIEC
Organic Compounds									
Aromatic Halogenated Hydrocarbons									
2,3,4,6-Tetrachlorophenol	58-90-2	ND	ND	ND	ND	ND	ND	ND	
4-Chloro-3-methylphenol	59-50-7	ND	ND	ND	ND	ND	2.00E+01	2.00E+01	TEEL-1
Aromatic Nonhalogenated Hydrocarbons									
2-Nitrotoluene	88-72-2	ND	ND	ND	ND	ND	3.50E+01	3.50E+01	TEEL-1
4-Nitrobiphenyl	92-93-3	ND	ND	ND	ND	ND	7.50E-01	7.50E-01	TEEL-1
Benzaldehyde	100-52-7	ND	ND	ND	ND	ND	1.50E+01	1.50E+01	TEEL-1
Benzene	71-43-2	ND	1.30E+00	ND	ND	1.56E+02	1.56E+02	1.30E+00	AREL
Benzyl alcohol	100-51-6	ND	ND	ND	ND	ND	6.00E+01	6.00E+01	TEEL-1
Ethyl benzene	100-41-4	ND	ND	ND	ND	ND	5.00E+02	5.00E+02	TEEL-1
m-Xylene	108-38-3	ND	2.20E+01	ND	ND	ND	6.00E+02	2.20E+01	AREL
o-Xylene	95-47-6	ND	2.20E+01	ND	ND	ND	6.00E+02	2.20E+01	AREL
p-Xylene	106-42-3	ND	2.20E+01	ND	ND	ND	6.00E+02	2.20E+01	AREL
Styrene	100-42-5	ND	2.10E+01	ND	ND	2.13E+02	2.13E+02	2.10E+01	AREL
Toluene	108-88-3	ND	3.70E+01	ND	ND	1.88E+02	1.88E+02	3.70E+01	AREL
Non-aromatic Nonhalogenated Hydrocarbons									
1,2-Epoxybutane	106-88-7	ND	ND	ND	ND	ND	3.50E+02	3.50E+02	TEEL-1
1,3-Butadiene	106-99-0	ND	ND	ND	ND	2.20E+01	2.20E+01	2.20E+01	ERPG-1
1,4-Dioxane	123-91-1	ND	3.00E+00	ND	ND	ND	3.50E+02	3.00E+00	AREL
1-Methylpropyl alcohol	78-92-2	ND	ND	ND	ND	ND	4.00E+02	4.00E+02	TEEL-1
1-Nitropropane	108-03-2	ND	ND	ND	ND	ND	7.50E+01	7.50E+01	TEEL-1
2,2,4-Trimethylpentane	540-84-1	ND	ND	ND	ND	ND	3.50E+02	3.50E+02	TEEL-1
2-Butanone	78-93-3	ND	1.30E+01	ND	ND	ND	7.50E+02	1.30E+01	AREL
2-Butenaldehyde (2-Butenal)	4170-30-3	ND	ND	5.44E-01	1.26E+01	6.00E+00	6.00E+00	5.44E-01	AEGL-1
2-Ethoxyethanol	110-80-5	ND	3.70E-01	ND	ND	ND	5.00E+01	3.70E-01	AREL
2-Heptanone	110-43-0	ND	ND	ND	ND	ND	4.00E+02	4.00E+02	TEEL-1
2-Hexanone	591-78-6	ND	ND	ND	ND	ND	4.00E+01	4.00E+01	TEEL-1
2-Methoxyethanol	109-86-4	ND	9.30E-02	ND	ND	ND	1.50E+01	9.30E-02	AREL
2-Methyl-2-propanol	75-65-0	ND	ND	ND	ND	ND	4.00E+02	4.00E+02	TEEL-1
2-Methyl-2-propenenitrile	126-98-7	ND	ND	ND	3.02E+00	ND	2.50E+00	2.50E+00	TEEL-1
2-Methylaziridine	75-55-8	ND	ND	ND	2.57E+01	ND	1.25E+01	1.25E+01	TEEL-1
2-Methylpropyl alcohol	78-83-1	ND	ND	ND	ND	ND	4.00E+02	4.00E+02	TEEL-1
2-Pentanone	107-87-9	ND	ND	ND	ND	ND	7.50E+02	7.50E+02	TEEL-1
2-Propanone (Acetone)	67-64-1	ND	ND	ND	ND	ND	2.00E+03	2.00E+03	TEEL-1
2-Propene-1-ol	107-18-6	ND	ND	4.27E+00	2.61E+01	ND	7.50E+00	4.27E+00	AEGL-1

Table 7-11 Acute Inhalation Exposure Criteria for COPCs (mg/m^3)

Chemical of Potential Concern	CAS Registry Number	NCEA Provis. Value [a]	AREL [b]	AEGL-1 [c]	AEGL-2 [c]	ERPG-1 [d]	TEEL-1 [e]	AIEC [f]	Source of AIEC
2-Propyl alcohol	67-63-0	ND	3.20E+00	ND	ND	ND	1.00E+03	3.20E+00	AREL
3-Heptanone	106-35-4	ND	ND	ND	ND	ND	3.50E+02	3.50E+02	TEEL-1
3-Methyl-1-butanol	123-51-3	ND	ND	ND	ND	ND	4.00E+02	4.00E+02	TEEL-1
3-Methyl-2-butanone	563-80-4	ND	ND	ND	ND	ND	6.00E+02	6.00E+02	TEEL-1
3-Pentanone	96-22-0	ND	ND	ND	ND	ND	ND	ND	
4-Heptanone	123-19-3	ND	ND	ND	ND	ND	2.00E+02	2.00E+02	TEEL-1
4-Methyl-2-pentanone	108-10-1	ND	ND	ND	ND	ND	3.00E+02	3.00E+02	TEEL-1
4-Methyl-3-penten-2-one	141-79-7	ND	ND	ND	ND	ND	1.00E+02	1.00E+02	TEEL-1
5-Methyl-2-hexanone	110-12-3	ND	ND	ND	ND	ND	6.00E+02	6.00E+02	TEEL-1
Acetaldehyde	75-07-0	ND	ND	ND	ND	1.80E+01	1.80E+01	1.80E+01	ERPG-1
Acetamide	60-35-5	ND	ND	ND	ND	ND	7.50E+01	7.50E+01	TEEL-1
Acetic acid	64-19-7	ND	ND	ND	ND	ND	3.50E+01	3.50E+01	TEEL-1
Acetic acid ethyl ester	141-78-6	ND	ND	ND	ND	ND	1.50E+03	1.50E+03	TEEL-1
Acetic acid n-butyl ester	123-86-4	ND	ND	ND	ND	2.40E+01	2.40E+01	2.40E+01	ERPG-1
Acetonitrile	75-05-8	ND	ND	ND	ND	ND	1.00E+02	1.00E+02	TEEL-1
Acrolein	107-02-8	ND	1.90E-04	6.88E-02	2.29E-01	2.00E-01	2.00E-01	1.90E-04	AREL
Acrylonitrile	107-13-1	ND	ND	ND	ND	2.20E+01	2.20E+01	2.20E+01	ERPG-1
Bis(isopropyl)ether	108-20-3	ND	ND	ND	ND	ND	ND	ND	
Butane	106-97-8	ND	ND	ND	ND	ND	5.00E+03	5.00E+03	TEEL-1
Carbon disulfide	75-15-0	ND	6.20E+00	ND	ND	3.00E+00	3.00E+01	6.20E+00	AREL
Cyanogen	460-19-5	ND	ND	ND	ND	ND	2.00E+01	2.00E+01	TEEL-1
Cyclohexane	110-82-7	ND	ND	ND	ND	ND	3.00E+03	3.00E+03	TEEL-1
Cyclohexanone	108-94-1	ND	ND	ND	ND	ND	2.00E+02	2.00E+02	TEEL-1
Cyclohexene	110-83-8	ND	ND	ND	ND	ND	1.00E+03	1.00E+03	TEEL-1
Cyclopentane	287-92-3	ND	ND	ND	ND	ND	5.00E+03	5.00E+03	TEEL-1
Ethyl alcohol	64-17-5	ND	ND	ND	ND	ND	5.00E+03	5.00E+03	TEEL-1
Ethyl ether	60-29-7	ND	ND	ND	ND	ND	1.50E+03	1.50E+03	TEEL-1
Ethyl methacrylate	97-63-2	ND	ND	ND	ND	ND	7.50E+00	7.50E+00	TEEL-1
Formaldehyde	50-00-0	ND	9.40E-02	ND	ND	1.25E+00	1.25E+00	9.40E-02	AREL
Formamide	75-12-7	ND	ND	ND	ND	ND	1.50E+01	1.50E+01	TEEL-1
Formic acid	64-18-6	ND	ND	ND	ND	ND	1.50E+01	1.50E+01	TEEL-1
Formic acid, methyl ester	107-31-3	ND	ND	ND	ND	ND	3.50E+02	3.50E+02	TEEL-1
Glycidylaldehyde	765-34-4	ND	ND	ND	ND	ND	2.00E-01	2.00E-01	TEEL-1
Methyl acetate	79-20-9	ND	ND	ND	ND	ND	ND	ND	
Methyl alcohol	67-56-1	ND	2.80E+01	ND	ND	2.62E+02	2.62E+02	2.80E+01	AREL
Methyl isocyanate	624-83-9	ND	ND	ND	ND	5.80E-02	5.80E-02	5.80E-02	ERPG-1

Table 7-11 Acute Inhalation Exposure Criteria for COPCs (mg/m^3)

Chemical of Potential Concern	CAS Registry Number	NCEA Provis. Value [a]	AREL [b]	AEGL-1 [c]	AEGL-2 [c]	ERPG-1 [d]	TEEL-1 [e]	AIEC [f]	Source of AIEC
Methyl methacrylate	80-62-6	ND	ND	ND	ND	ND	4.00E+02	4.00E+02	TEEL-1
Methyl tert-butyl ether	1634-04-4	ND	ND	ND	ND	ND	5.00E+02	5.00E+02	TEEL-1
Methylacetylene	74-99-7	ND	ND	ND	ND	ND	2.50E+03	2.50E+03	TEEL-1
Methylcyclohexane	108-87-2	ND	ND	ND	ND	ND	5.00E+03	5.00E+03	TEEL-1
N,N-Dimethylacetamide	127-19-5	ND	ND	ND	ND	ND	1.00E+02	1.00E+02	TEEL-1
n-Butyl alcohol	71-36-3	ND	ND	ND	ND	ND	1.50E+02	1.50E+02	TEEL-1
n-Heptane	142-82-5	ND	ND	ND	ND	ND	1.50E+03	1.50E+03	TEEL-1
n-Hexane	110-54-3	ND	ND	ND	ND	ND	5.00E+02	5.00E+02	TEEL-1
Nitromethane	75-52-5	ND	ND	ND	ND	ND	1.50E+02	1.50E+02	TEEL-1
n-Nonane	111-84-2	ND	ND	ND	ND	ND	3.00E+03	3.00E+03	TEEL-1
n-Octane	111-65-9	ND	ND	ND	ND	ND	1.25E+03	1.25E+03	TEEL-1
n-Pentane	109-66-0	ND	ND	ND	ND	ND	1.50E+03	1.50E+03	TEEL-1
n-Propionaldehyde	123-38-6	ND	ND	ND	ND	ND	7.50E+01	7.50E+01	TEEL-1
n-Propyl alcohol	71-23-8	ND	ND	ND	ND	ND	6.00E+02	6.00E+02	TEEL-1
n-Valeraldehyde	110-62-3	ND	ND	ND	ND	ND	ND	ND	
Oxirane	75-21-8	ND	ND	ND	1.98E+02	ND	7.50E+00	7.50E+00	TEEL-1
p-Cymene	99-87-6	ND	ND	ND	ND	ND	ND	ND	
Phosgene	75-44-5	ND	4.00E-03	ND	1.21E+00	ND	4.00E-01	4.00E-03	AREL
Propargyl alcohol	107-19-7	ND	ND	ND	ND	ND	4.00E+00	4.00E+00	TEEL-1
Propionic acid	79-09-4	ND	ND	ND	ND	ND	3.00E+01	3.00E+01	TEEL-1
Propionitrile	107-12-0	ND	ND	ND	1.67E+01	ND	3.50E+01	1.67E+01	AEGL-2
Propylene gylcol monomethyl ether	107-98-2	ND	ND	ND	ND	ND	5.00E+02	5.00E+02	TEEL-1
p-tert-Butyltoluene	98-51-1	ND	ND	ND	ND	ND	ND	ND	
Triethylamine	121-44-8	ND	2.80E+00	ND	ND	ND	1.25E+01	2.80E+00	AREL
Trimethylamine	75-50-3	ND	ND	ND	ND	2.40E-01	3.50E+01	2.40E-01	ERPG-1
Vinyl acetate	108-05-4	ND	ND	ND	ND	1.50E+01	1.50E+01	1.50E+01	ERPG-1
Non-aromatic Halogenated Hydrocarbons									
1,1,1,2-Tetrachloro-2,2-difluoroethane	76-11-9	ND	ND	ND	ND	ND	ND	ND	
1,1,1,2-Tetrachloroethane	630-20-6	ND	ND	ND	ND	ND	6.00E+01	6.00E+01	TEEL-1
1,1,1-Trichloroethane	71-55-6	ND	6.80E+01	ND	ND	1.93E+03	1.93E+03	6.80E+01	AREL
1,1,2,2-Tetrachloro-1,2-difluoroethane	76-12-0	ND	ND	ND	ND	ND	ND	ND	
1,1,2,2-Tetrachloroethane	79-34-5	ND	ND	ND	ND	ND	2.00E+01	2.00E+01	TEEL-1
1,1,2,2-Tetrachloroethene	127-18-4	ND	2.00E+01	ND	ND	6.89E+02	6.89E+02	2.00E+01	AREL
1,1,2-Trichloroethane	79-00-5	ND	ND	ND	ND	ND	5.00E+01	5.00E+01	TEEL-1
1,1,2-Trichloroethylene	79-01-6	ND	ND	ND	ND	5.38E+02	5.38E+02	5.38E+02	ERPG-1
1,1-Dichloroethane	75-34-3	ND	ND	ND	ND	ND	1.25E+03	1.25E+03	TEEL-1

Table 7-11 Acute Inhalation Exposure Criteria for COPCs (mg/m^3)

Chemical of Potential Concern	CAS Registry Number	NCEA Provis. Value [a]	AREL [b]	AEGL-1 [c]	AEGL-2 [c]	ERPG-1 [d]	TEEL-1 [e]	AIEC [f]	Source of AIEC
1,1-Dichloroethene	75-35-4	ND	ND	ND	ND	ND	7.50E+01	7.50E+01	TEEL-1
1,2,2-Trichloro-1,1,2-trifluoroethane	76-13-1	ND	ND	ND	ND	ND	1.00E+04	1.00E+04	TEEL-1
1,2,3-Trichloropropane	96-18-4	ND	ND	ND	ND	ND	6.00E+01	6.00E+01	TEEL-1
1,2-Dibromo-3-chloropropane	96-12-8	ND	ND	ND	ND	ND	3.00E-02	3.00E-02	TEEL-1
1,2-Dichloro-1,1,2,2-tetrafluoroethane	76-14-2	ND	ND	ND	ND	ND	2.00E+04	2.00E+04	TEEL-1
1,2-Dichloroethane	107-06-2	ND	ND	ND	ND	2.02E+02	2.02E+02	2.02E+02	ERPG-1
1,2-Dichloroethylene	540-59-0	ND	ND	5.30E+01	1.60E+02	ND	2.00E+03	5.30E+01	AEGL-1
1,2-Dichloropropane	78-87-5	ND	ND	ND	ND	ND	5.00E+02	5.00E+02	TEEL-1
1,3-Dichloropropene	542-75-6	ND	ND	ND	ND	ND	1.25E+01	1.25E+01	TEEL-1
1,4-Dichloro-2-butene	764-41-0	ND	ND	ND	ND	ND	7.50E-02	7.50E-02	TEEL-1
1-Chloroethene	75-01-4	ND	1.80E+02	ND	ND	ND	1.25E+01	1.80E+02	AREL
2,2-Dichloropropionic acid	75-99-0	ND	ND	ND	ND	ND	ND	ND	
2-Chloropropane	75-29-6	ND	ND	ND	ND	ND	1.25E+04	1.25E+04	TEEL-1
3-Chloropropene (Allyl chloride)	107-05-1	ND	ND	ND	ND	7.50E+00	7.50E+00	7.50E+00	ERPG-1
Bromochloromethane	74-97-5	ND	ND	ND	ND	ND	3.00E+03	3.00E+03	TEEL-1
Bromodichloromethane	75-27-4	ND	ND	ND	ND	ND	4.00E+00	4.00E+00	TEEL-1
Bromoethene	593-60-2	ND	ND	ND	ND	ND	6.00E+01	6.00E+01	TEEL-1
Bromoform	75-25-2	ND	ND	ND	ND	ND	5.00E+00	5.00E+00	TEEL-1
Bromomethane	74-83-9	ND	3.90E+00	ND	ND	ND	7.50E+01	3.90E+00	AREL
Carbon tetrachloride	56-23-5	ND	1.90E+00	7.54E+01	4.27E+02	1.28E+02	1.28E+02	1.90E+00	AREL
Chlorodibromomethane	124-48-1	ND	ND	ND	ND	ND	6.00E+00	6.00E+00	TEEL-1
Chlorodifluoromethane	75-45-6	ND	ND	ND	ND	ND	4.00E+03	4.00E+03	TEEL-1
Chloroethane	75-00-3	ND	ND	ND	ND	ND	2.50E+03	2.50E+03	TEEL-1
Chloroform	67-66-3	ND	1.50E-01	ND	4.29E+02	ND	1.00E+01	1.50E-01	AREL
Chloromethane	74-87-3	ND	ND	ND	ND	ND	2.00E+02	2.00E+02	TEEL-1
Chloropentafluoroethane	76-15-3	ND	ND	ND	ND	ND	1.50E+04	1.50E+04	TEEL-1
cis-1,2-Dichloroethene	156-59-2	ND	ND	ND	ND	ND	7.50E+02	7.50E+02	TEEL-1
cis-1,3-Dichloropropene	10061-01-5	ND	ND	ND	ND	ND	1.25E+01	1.25E+01	TEEL-1
Cyanogen bromide	506-68-3	ND	ND	ND	ND	ND	4.40E+01	4.40E+01	TEEL-1
Cyanogen chloride	506-77-4	ND	ND	ND	ND	ND	7.50E-01	7.50E-01	TEEL-1
Dichlorodifluoromethane	75-71-8	ND	ND	ND	ND	ND	1.50E+04	1.50E+04	TEEL-1
Dichlorofluoromethane	75-43-4	ND	ND	ND	ND	ND	1.25E+02	1.25E+02	TEEL-1
Dichloromethane	75-09-2	ND	1.40E+01	ND	ND	6.96E+02	6.96E+02	1.40E+01	AREL
Difluorodibromomethane	75-61-6	ND	ND	ND	ND	ND	ND	ND	
Hexafluoroacetone	684-16-2	ND	ND	ND	ND	ND	1.00E+00	1.00E+00	TEEL-1
Iodomethane	74-88-4	ND	ND	ND	ND	1.50E+02	1.50E+02	1.50E+02	ERPG-1

Table 7-11 Acute Inhalation Exposure Criteria for COPCs (mg/m^3)

Chemical of Potential Concern	CAS Registry Number	NCEA Provis. Value [a]	AREL [b]	AEGL-1 [c]	AEGL-2 [c]	ERPG-1 [d]	TEEL-1 [e]	AIEC [f]	Source of AIEC
Methylene bromide	74-95-3	ND	ND	ND	ND	ND	2.50E+02	2.50E+02	TEEL-1
Pentachloroethane	76-01-7	ND	ND	ND	ND	ND	3.00E+01	3.00E+01	TEEL-1
trans-1,2-Dichloroethylene	156-60-5	ND	ND	ND	ND	ND	5.00E+01	5.00E+01	TEEL-1
trans-1,3-Dichloropropene	10061-02-6	ND	ND	ND	ND	ND	1.25E+01	1.25E+01	TEEL-1
Trichloroacetic acid	76-03-9	ND	ND	ND	ND	ND	6.00E+00	6.00E+00	TEEL-1
Trichlorofluoroethane	27154-33-2	ND	ND	ND	ND	ND	ND	ND	
Trichlorofluoromethane	75-69-4	ND	ND	ND	ND	ND	2.50E+03	2.50E+03	TEEL-1
Trifluorobromomethane	75-63-8	ND	ND	ND	ND	ND	1.50E+04	1.50E+04	TEEL-1
Dioxin and Furan Compounds (PCDDs/PCDFs)									
1,2,3,4,6,7,8-Heptachlorodibenzo(p)dioxin	35822-46-9	ND	ND	ND	ND	ND	6.00E-01	6.00E-01	TEEL-1
1,2,3,4,6,7,8-Heptachlorodibenzofuran	67562-39-4	ND	ND	ND	ND	ND	1.50E-01	1.50E-01	TEEL-1
1,2,3,4,7,8,9-Heptachlorodibenzofuran	55673-89-7	ND	ND	ND	ND	ND	2.50E-01	2.50E-01	TEEL-1
1,2,3,4,7,8-Hexachlorodibenzo(p)dioxin	39227-28-6	ND	ND	ND	ND	ND	1.25E-03	1.25E-03	TEEL-1
1,2,3,4,7,8-Hexachlorodibenzofuran	70648-26-9	ND	ND	ND	ND	ND	7.50E-03	7.50E-03	TEEL-1
1,2,3,6,7,8-Hexachlorodibenzo(p)dioxin	57653-85-7	ND	ND	ND	ND	ND	1.50E-02	1.50E-02	TEEL-1
1,2,3,6,7,8-Hexachlorodibenzofuran	57117-44-9	ND	ND	ND	ND	ND	2.50E-03	2.50E-03	TEEL-1
1,2,3,7,8,9-Hexachlorodibenzo(p)dioxin	19408-74-3	ND	ND	ND	ND	ND	1.50E-02	1.50E-02	TEEL-1
1,2,3,7,8,9-Hexachlorodibenzofuran	72918-21-9	ND	ND	ND	ND	ND	1.25E-01	1.25E-01	TEEL-1
1,2,3,7,8-Pentachlorodibenzo(p)dioxin	40321-76-4	ND	ND	ND	ND	ND	2.50E-03	2.50E-03	TEEL-1
1,2,3,7,8-Pentachlorodibenzofuran	57117-41-6	ND	ND	ND	ND	ND	7.50E-03	7.50E-03	TEEL-1
2,3,4,6,7,8-Hexachlorodibenzofuran	60851-34-5	ND	ND	ND	ND	ND	1.50E-03	1.50E-03	TEEL-1
2,3,4,7,8-Pentachlorodibenzofuran	57117-31-4	ND	ND	ND	ND	ND	7.50E-05	7.50E-05	TEEL-1
2,3,7,8-Tetrachlorodibenzo(p)dioxin	1746-01-6	ND	ND	ND	ND	ND	1.50E-03	1.50E-03	TEEL-1
2,3,7,8-Tetrachlorodibenzofuran	51207-31-9	ND	ND	ND	ND	ND	2.00E-03	2.00E-03	TEEL-1
Dibenzofuran	132-64-9	ND	ND	ND	ND	ND	3.00E+01	3.00E+01	TEEL-1
Octachlorodibenzo(p)dioxin	3268-87-9	ND	ND	ND	ND	ND	7.50E-02	7.50E-02	TEEL-1
Octachlorodibenzofuran	39001-02-0	ND	ND	ND	ND	ND	7.50E-03	7.50E-03	TEEL-1
Polychlorinated Biphenyls (PCBs)									
2,2',3,3',4,4',5-Heptachlorobiphenyl	35065-30-6	ND	ND	ND	ND	ND	ND	ND	
2,2',3,4,4',5,5'-Heptachlorobiphenyl	35065-29-3	ND	ND	ND	ND	ND	ND	ND	
2,3,3',4,4',5,5'-Heptachlorobiphenyl	39635-31-9	ND	ND	ND	ND	ND	ND	ND	
2,3,3',4,4',5'-Hexachlorobiphenyl	69782-90-7	ND	ND	ND	ND	ND	ND	ND	
2,3,3',4,4',5-Hexachlorobiphenyl	38380-08-4	ND	ND	ND	ND	ND	ND	ND	
2,3,3',4,4'-Pentachlorobiphenyl	32598-14-4	ND	ND	ND	ND	ND	ND	ND	
2,3',4,4',5,5'-Hexachlorobiphenyl	52663-72-6	ND	ND	ND	ND	ND	ND	ND	
2,3,4,4',5-Pentachlorobiphenyl	74472-37-0	ND	ND	ND	ND	ND	ND	ND	

Table 7-11 Acute Inhalation Exposure Criteria for COPCs (mg/m^3)

Chemical of Potential Concern	CAS Registry Number	NCEA Provis. Value [a]	AREL [b]	AEGL-1 [c]	AEGL-2 [c]	ERPG-1 [d]	TEEL-1 [e]	AIEC [f]	Source of AIEC
2',3,4,4',5-Pentachlorobiphenyl	65510-44-3	ND	ND	ND	ND	ND	ND	ND	
2,3',4,4',5-Pentachlorobiphenyl	31508-00-6	ND	ND	ND	ND	ND	ND	ND	
3,3',4,4',5,5'-Hexachlorobiphenyl	32774-16-6	ND	ND	ND	ND	ND	ND	ND	
3,3',4,4',5-Pentachlorobiphenyl	57465-28-8	ND	ND	ND	ND	ND	ND	ND	
3,3',4,4'-Tetrachlorobiphenyl	32598-13-3	ND	ND	ND	ND	ND	ND	ND	
3,4,4',5-Tetrachlorobiphenyl	70362-50-4	ND	ND	ND	ND	ND	ND	ND	
Polychlorinated biphenyls (PCBs)	1336-36-3	4.00E-02	ND	ND	ND	ND	3.00E+00	4.00E-02	NCEA
	Phthalates								
Bis(2-ethylhexyl)phthalate (DEHP)	117-81-7	ND	ND	ND	ND	ND	1.00E+01	1.00E+01	TEEL-1
Butylbenzyl phthalate	85-68-7	ND	ND	ND	ND	ND	1.50E+01	1.50E+01	TEEL-1
Dibutyl phthalate	84-74-2	ND	ND	ND	ND	ND	1.50E+01	1.50E+01	TEEL-1
Diethyl phthalate	84-66-2	ND	ND	ND	ND	ND	1.50E+01	1.50E+01	TEEL-1
Dimethylphthalate	131-11-3	ND	ND	ND	ND	ND	1.50E+01	1.50E+01	TEEL-1
n-Dioctyl phthalate	117-84-0	ND	ND	ND	ND	ND	5.00E+01	5.00E+01	TEEL-1
	Light Polycyclic Aromatic Hydrocarbons (molecular weight <200 g/mole)								
2-Chloronapthalene	91-58-7	ND	ND	ND	ND	ND	6.00E-01	6.00E-01	TEEL-1
2-Methyl naphthalene	91-57-6	ND	ND	ND	ND	ND	2.00E+01	2.00E+01	TEEL-1
5-Nitroacenaphthene	602-87-9	ND	ND	ND	ND	ND	ND	ND	
Acenaphthene	83-32-9	ND	ND	ND	ND	ND	1.25E+00	1.25E+00	TEEL-1
Acenaphthylene	208-96-8	ND	ND	ND	ND	ND	2.00E-01	2.00E-01	TEEL-1
Anthracene	120-12-7	ND	ND	ND	ND	ND	6.00E+00	6.00E+00	TEEL-1
Fluorene	86-73-7	ND	ND	ND	ND	ND	2.50E+01	2.50E+01	TEEL-1
Indene	95-13-6	ND	ND	ND	ND	ND	4.00E+01	4.00E+01	TEEL-1
Naphthalene	91-20-3	ND	ND	ND	ND	ND	7.50E+01	7.50E+01	TEEL-1
Phenanthrene	85-01-8	ND	ND	ND	ND	ND	1.00E+00	1.00E+00	TEEL-1
Pyrene	129-00-0	ND	ND	ND	ND	ND	1.50E+01	1.50E+01	TEEL-1
	Heavy Polycyclic Aromatic Hydrocarbons (molecular weight >200 g/mole)								
3-Methylcholanthrene	56-49-5	ND	ND	ND	ND	ND	6.00E-01	6.00E-01	TEEL-1
5-Methylchrysene	3697-24-3	ND	ND	ND	ND	ND	ND	ND	
Benzo(a)anthracene	56-55-3	ND	ND	ND	ND	ND	3.00E-01	3.00E-01	TEEL-1
Benzo(a)pyrene	50-32-8	ND	ND	ND	ND	ND	6.00E-01	6.00E-01	TEEL-1
Benzo(a,i)pyrene	191-30-0	ND	ND	ND	ND	ND	ND	ND	
Benzo(b)fluoranthene	205-99-2	ND	ND	ND	ND	ND	6.00E-01	6.00E-01	TEEL-1
Benzo(e)pyrene	192-97-2	ND	ND	ND	ND	ND	ND	ND	
Benzo(g,h,i)perylene	191-24-2	ND	ND	ND	ND	ND	3.00E+01	3.00E+01	TEEL-1
Benzo(j)fluoranthene	205-82-3	ND	ND	ND	ND	ND	ND	ND	

Table 7-11 Acute Inhalation Exposure Criteria for COPCs (mg/m^3)

Chemical of Potential Concern	CAS Registry Number	NCEA Provis. Value [a]	AREL [b]	AEGL-1 [c]	AEGL-2 [c]	ERPG-1 [d]	TEEL-1 [e]	AIEC [f]	Source of AIEC
Benzo(k)fluoranthene	207-08-9	ND	ND	ND	ND	ND	6.00E-01	6.00E-01	TEEL-1
Chrysene	218-01-9	ND	ND	ND	ND	ND	6.00E-01	6.00E-01	TEEL-1
Dibenz(a,h)acridine	226-36-8	ND	ND	ND	ND	ND	ND	ND	
Dibenz(a,h)anthracene	53-70-3	ND	ND	ND	ND	ND	3.00E+01	3.00E+01	TEEL-1
Dibenz(a,j)acridine	224-42-0	ND	ND	ND	ND	ND	ND	ND	
Dibenzo(a,e)fluoranthene	5385-75-1	ND	ND	ND	ND	ND	ND	ND	
Dibenzo(a,e)pyrene	192-65-4	ND	ND	ND	ND	ND	1.00E-01	1.00E-01	TEEL-1
Dibenzo(a,h)fluoranthene	No CAS #	ND	ND	ND	ND	ND	ND	ND	
Dibenzo(a,h)pyrene	189-64-0	ND	ND	ND	ND	ND	ND	ND	
Dibenzo(a,i)pyrene	189-55-9	ND	ND	ND	ND	ND	ND	ND	
Fluoranthene	206-44-0	ND	ND	ND	ND	ND	1.50E-02	1.50E-02	TEEL-1
Hexachloronaphthalene	1335-87-1	ND	ND	ND	ND	ND	2.00E-01	2.00E-01	TEEL-1
Indeno(1,2,3-cd)pyrene	193-39-5	ND	ND	ND	ND	ND	5.00E-01	5.00E-01	TEEL-1
Octachloronaphthalene	2234-13-1	ND	ND	ND	ND	ND	3.00E-01	3.00E-01	TEEL-1
Pentachloronaphthalene	1321-64-8	ND	ND	ND	ND	ND	ND	ND	
Tetrachloronaphthalene	1335-88-2	ND	ND	ND	ND	ND	ND	ND	
Trichloronaphthalene	1321-65-9	ND	ND	ND	ND	ND	ND	ND	
Light Substituted Benzene Compounds (molecular weight <200 g/mole)									
1,2,3-Trichlorobenzene	87-61-6	ND	ND	ND	ND	ND	1.50E+01	1.50E+01	TEEL-1
1,2,4-Trichlorobenzene	120-82-1	ND	ND	ND	ND	ND	3.50E+01	3.50E+01	TEEL-1
1,2,4-Trimethyl benzene	95-63-6	ND	ND	ND	ND	ND	1.50E+02	1.50E+02	TEEL-1
1,2-Dichlorobenzene	95-50-1	ND	ND	ND	ND	ND	3.00E+02	3.00E+02	TEEL-1
1,3,5-Trimethyl benzene	108-67-8	ND	ND	ND	ND	ND	1.25E+02	1.25E+02	TEEL-1
1,3-Dichlorobenzene	541-73-1	ND	ND	ND	ND	ND	1.25E+01	1.25E+01	TEEL-1
1,3-Dinitrobenzene	99-65-0	ND	ND	ND	ND	ND	3.00E+00	3.00E+00	TEEL-1
1,4-Dichlorobenzene	106-46-7	ND	ND	ND	ND	ND	6.00E+02	6.00E+02	TEEL-1
1,4-Dinitrobenzene	100-25-4	ND	ND	ND	ND	ND	3.00E+00	3.00E+00	TEEL-1
2,4,5-Trichlorophenol	95-95-4	ND	ND	ND	ND	ND	3.00E+01	3.00E+01	TEEL-1
2,4,6-Trichlorophenol	88-06-2	ND	ND	ND	ND	ND	3.00E+01	3.00E+01	TEEL-1
2,4-Dichlorophenol	120-83-2	ND	ND	ND	ND	ND	3.00E+01	3.00E+01	TEEL-1
2,4-Dimethylphenol	105-67-9	ND	ND	ND	ND	ND	6.00E+00	6.00E+00	TEEL-1
2,4-Dinitrophenol	51-28-5	ND	ND	ND	ND	ND	7.50E+00	7.50E+00	TEEL-1
2,4-Dinitrotoluene	121-14-2	ND	ND	ND	ND	ND	6.00E-01	6.00E-01	TEEL-1
2,6-Dinitrotoluene	606-20-2	ND	ND	ND	ND	ND	6.00E-01	6.00E-01	TEEL-1
2-Chlorophenol	95-57-8	ND	ND	ND	ND	ND	6.00E+00	6.00E+00	TEEL-1
2-Chlorotoluene	95-49-8	ND	ND	ND	ND	ND	4.00E+02	4.00E+02	TEEL-1

Table 7-11 Acute Inhalation Exposure Criteria for COPCs (mg/m^3)

Chemical of Potential Concern	CAS Registry Number	NCEA Provis. Value [a]	AREL [b]	AEGL-1 [c]	AEGL-2 [c]	ERPG-1 [d]	TEEL-1 [e]	AIEC [f]	Source of AIEC
2-Nitrophenol	88-75-5	ND	ND	ND	ND	ND	4.00E+00	4.00E+00	TEEL-1
4,6-Dinitro-o-cresol	534-52-1	ND	ND	ND	ND	ND	2.00E-01	2.00E-01	TEEL-1
4-Chlorotoluene	106-43-4	ND	ND	ND	ND	ND	3.50E+02	3.50E+02	TEEL-1
4-Nitrophenol	100-02-7	ND	ND	ND	ND	ND	2.50E+00	2.50E+00	TEEL-1
alpha-Methylstyrene	98-83-9	ND	ND	ND	ND	ND	ND	ND	
Aniline	62-53-3	ND	ND	3.00E+01	4.60E+01	ND	2.00E+01	3.00E+01	AEGL-1
Benzotrichloride	98-07-7	ND	ND	ND	ND	ND	1.00E-01	1.00E-01	TEEL-1
Benzyl chloride	100-44-7	ND	2.40E-01	ND	ND	5.20E+00	5.20E+00	2.40E-01	AREL
Bromobenzene	108-86-1	ND	ND	ND	ND	ND	1.50E+01	1.50E+01	TEEL-1
Chlorobenzene	108-90-7	ND	ND	ND	ND	ND	1.25E+02	1.25E+02	TEEL-1
Cumene	98-82-8	ND	ND	ND	ND	ND	2.50E+02	2.50E+02	TEEL-1
m-Cresol	108-39-4	ND	ND	ND	ND	ND	2.00E+01	2.00E+01	TEEL-1
n-Butyl benzene	104-51-8	ND	ND	ND	ND	ND	1.25E+02	1.25E+02	TEEL-1
Nitrobenzene	98-95-3	ND	ND	ND	ND	ND	1.50E+01	1.50E+01	TEEL-1
n-Propyl benzene	103-65-1	ND	ND	ND	ND	ND	4.00E+02	4.00E+02	TEEL-1
o-Cresol	95-48-7	ND	ND	ND	ND	ND	2.00E+01	2.00E+01	TEEL-1
o-Dinitrobenzene	528-29-0	ND	ND	ND	ND	ND	3.00E+00	3.00E+00	TEEL-1
o-Nitroaniline	88-74-4	ND	ND	ND	ND	ND	2.00E+01	2.00E+01	TEEL-1
o-Toluidine	95-53-4	ND	ND	ND	ND	ND	2.50E+01	2.50E+01	TEEL-1
p-Chloroaniline	106-47-8	ND	ND	ND	ND	ND	3.00E+01	3.00E+01	TEEL-1
p-Cresol	106-44-5	ND	ND	ND	ND	ND	2.00E+01	2.00E+01	TEEL-1
Phenol	108-95-2	ND	5.80E+00	ND	ND	4.00E+01	4.00E+01	5.80E+00	AREL
p-Nitrochlorobenzene	100-00-5	ND	ND	ND	ND	ND	1.92E+00	1.92E+00	TEEL-1
p-Toluidine	106-49-0	ND	ND	ND	ND	ND	6.00E+00	6.00E+00	TEEL-1
sec-Butyl benzene	135-98-8	ND	ND	ND	ND	ND	2.50E+01	2.50E+01	TEEL-1
tert-Butyl benzene	98-06-6	ND	ND	ND	ND	ND	1.25E+02	1.25E+02	TEEL-1
Toluene-2,6-diamine	823-40-5	ND	ND	ND	ND	ND	4.00E+00	4.00E+00	TEEL-1
Trimethyl benzene	25551-13-7	ND	ND	ND	ND	ND	ND	ND	
Other Light Semivolatile Compounds (molecular weight <200 g/mole)									
1,1'-Biphenyl	92-52-4	ND	ND	ND	ND	ND	3.90E+00	3.90E+00	TEEL-1
1,1-Dimethylhydrazine	57-14-7	ND	ND	ND	7.40E+00	ND	7.50E-02	7.50E-02	TEEL-1
1,2-Dimethylhydrazine	540-73-8	ND	ND	ND	7.40E+00	ND	1.25E+00	1.25E+00	TEEL-1
1,2-Diphenylhydrazine	122-66-7	ND	ND	ND	ND	ND	3.00E+01	3.00E+01	TEEL-1
1,3-Propane sultone	1120-71-4	ND	ND	ND	ND	ND	1.25E+00	1.25E+00	TEEL-1
2,4-Toluene diisocyante	584-84-9	ND	ND	1.42E-01	8.54E-01	7.00E-02	7.00E-02	1.42E-01	AEGL-1
2-Chloroacetophenone	532-27-4	ND	ND	ND	ND	ND	ND	ND	

Table 7-11 Acute Inhalation Exposure Criteria for COPCs (mg/m^3)

Chemical of Potential Concern	CAS Registry Number	NCEA Provis. Value [a]	AREL [b]	AEGL-1 [c]	AEGL-2 [c]	ERPG-1 [d]	TEEL-1 [e]	AIEC [f]	Source of AIEC
2-Propenoic acid	79-10-7	ND	6.00E+00	ND	ND	6.00E+00	6.00E+00	6.00E+00	AREL
4,4'-Methylenedianiline	101-77-9	ND	ND	ND	ND	ND	7.50E-01	7.50E-01	TEEL-1
Acetophenone	98-86-2	ND	ND	ND	ND	ND	3.00E+01	3.00E+01	TEEL-1
Benzoic acid	65-85-0	ND	ND	ND	ND	ND	1.25E+01	1.25E+01	TEEL-1
Bis(2-chloroethoxy)methane	111-91-1	ND	ND	ND	ND	ND	1.50E+01	1.50E+01	TEEL-1
Bis(2-chloroethyl) ether	111-44-4	ND	ND	ND	ND	ND	6.00E+01	6.00E+01	TEEL-1
Chlorocyclopentadiene	41851-50-7	ND	ND	ND	ND	ND	ND	ND	
Cyclohexanol	108-93-0	ND	ND	ND	ND	ND	2.00E+02	2.00E+02	TEEL-1
Dichloroisopropyl ether	108-60-1	ND	ND	ND	ND	ND	7.50E+01	7.50E+01	TEEL-1
Dichloromethyl ether	542-88-1	ND	ND	ND	ND	ND	1.25E-02	1.25E-02	TEEL-1
Dichloropentadiene	61626-71-9	ND	ND	ND	ND	ND	ND	ND	
Dimethyl sulfate	77-78-1	ND	ND	ND	ND	ND	5.00E+00	5.00E+00	TEEL-1
Dimethylaniline	121-69-7	ND	ND	ND	ND	ND	5.00E+01	5.00E+01	TEEL-1
di-n-Propylnitrosamine	621-64-7	ND	ND	ND	ND	ND	2.00E-01	2.00E-01	TEEL-1
Diphenyl ether	101-84-8	ND	ND	ND	ND	ND	ND	ND	
Epichlorohydrin	106-89-8	ND	1.30E+00	1.89E+01	9.08E+01	7.50E+00	7.50E+00	1.30E+00	AREL
Ethyl carbamate (Urethane)	51-79-6	ND	ND	ND	ND	ND	5.00E+02	5.00E+02	TEEL-1
Ethyl methanesulfonate	62-50-0	ND	ND	ND	ND	ND	1.50E+00	1.50E+00	TEEL-1
Ethylene dibromide	106-93-4	ND	ND	ND	ND	ND	2.00E+02	2.00E+02	TEEL-1
Ethylene glycol	107-21-1	ND	ND	ND	ND	ND	5.00E+01	5.00E+01	TEEL-1
Ethylene glycol monobutyl ether	111-76-2	ND	1.40E+01	ND	ND	ND	2.50E+02	1.40E+01	AREL
Ethylene glycol monoethyl ether acetate	111-15-9	ND	1.40E-01	ND	ND	ND	7.50E+01	1.40E-01	AREL
Ethylene thiourea	96-45-7	ND	ND	ND	ND	ND	1.00E+01	1.00E+01	TEEL-1
Furfural	98-01-1	ND	ND	ND	ND	8.00E+00	8.00E+00	8.00E+00	ERPG-1
Maleic hydrazide	123-33-1	ND	ND	ND	ND	ND	2.00E+00	2.00E+00	TEEL-1
Malononitrile	109-77-3	ND	ND	ND	ND	ND	8.00E+00	8.00E+00	TEEL-1
Methyl styrene (mixed isomers)	25013-15-4	ND	ND	ND	ND	ND	ND	ND	
Methylhydrazine	60-34-4	ND	ND	ND	1.90E+00	ND	3.50E-01	3.50E-01	TEEL-1
N,N-Diphenylamine	122-39-4	ND	ND	ND	ND	ND	3.00E+01	3.00E+01	TEEL-1
Nitric acid, propyl ester	627-13-4	ND	ND	ND	ND	ND	1.50E+02	1.50E+02	TEEL-1
N-Nitrosodi-n-butylamine	924-16-3	ND	ND	ND	ND	ND	ND	ND	
N-Nitrosomorpholine	59-89-2	ND	ND	ND	ND	ND	3.00E+01	3.00E+01	TEEL-1
N-Nitroso-N,N-dimethylamine	62-75-9	ND	ND	ND	ND	ND	1.00E+01	1.00E+01	TEEL-1
o-Anisidine	90-04-0	ND	ND	ND	ND	ND	1.50E+00	1.50E+00	TEEL-1
Oxalic acid	144-62-7	ND	ND	ND	ND	ND	2.00E+00	2.00E+00	TEEL-1
Phthalic anhydride	85-44-9	ND	ND	ND	ND	ND	1.20E+01	1.20E+01	TEEL-1

Table 7-11 Acute Inhalation Exposure Criteria for COPCs (mg/m^3)

Chemical of Potential Concern	CAS Registry Number	NCEA Provis. Value [a]	AREL [b]	AEGL-1 [c]	AEGL-2 [c]	ERPG-1 [d]	TEEL-1 [e]	AIEC [f]	Source of AIEC
p-Phthalic acid	100-21-0	ND	ND	ND	ND	ND	ND	ND	
Pyridine	110-86-1	ND	ND	ND	ND	ND	5.00E+01	5.00E+01	TEEL-1
Quinoline	91-22-5	ND	ND	ND	ND	ND	3.50E+00	3.50E+00	TEEL-1
Quinone	106-51-4	ND	ND	ND	ND	ND	1.25E+00	1.25E+00	TEEL-1
Safrole	94-59-7	ND	ND	ND	ND	ND	1.50E+01	1.50E+01	TEEL-1
Tetrahydrofuran	109-99-9	ND	ND	ND	ND	ND	7.50E+02	7.50E+02	TEEL-1
Other Heavy Semivolatile Compounds (molecular weight >200 g/mole)									
1,2,4,5-Tetrachlorobenzene	95-94-3	ND	ND	ND	ND	ND	3.00E+01	3.00E+01	TEEL-1
1,3,5-Trinitrobenzene	99-35-4	ND	ND	ND	ND	ND	3.00E+01	3.00E+01	TEEL-1
2,6-Bis(tert-butyl)-4-methylphenol	128-37-0	ND	ND	ND	ND	ND	6.00E+00	6.00E+00	TEEL-1
2-Cyclohexyl-4,6-dinitrophenol	131-89-5	ND	ND	ND	ND	ND	ND	ND	
2-sec-Butyl-4,6-dinitrophenol	88-85-7	ND	ND	ND	ND	ND	4.50E+00	4.50E+00	TEEL-1
3,3'-Dichlorobenzidine	91-94-1	ND	ND	ND	ND	ND	6.00E+00	6.00E+00	TEEL-1
3,3'-Dimethoxybenzidine	119-90-4	ND	ND	ND	ND	ND	5.00E+00	5.00E+00	TEEL-1
4-Bromophenylphenyl ether	101-55-3	ND	ND	ND	ND	ND	6.00E+00	6.00E+00	TEEL-1
Ammonium perfluorooctanoate	3825-26-1	ND	ND	ND	ND	ND	ND	ND	
Azobenzene	103-33-3	ND	ND	ND	ND	ND	ND	ND	
Bis(3-tert-butyl-4-hydroxy-6-methyl-phenyl)sulfide	96-69-5	ND	ND	ND	ND	ND	3.00E+01	3.00E+01	TEEL-1
Captan	133-06-2	ND	ND	ND	ND	ND	1.50E+01	1.50E+01	TEEL-1
Chlorobenzilate	510-15-6	ND	ND	ND	ND	ND	2.50E-01	2.50E-01	TEEL-1
Dibutylphosphate	107-66-4	ND	ND	ND	ND	ND	1.50E+01	1.50E+01	TEEL-1
Dimethyl aminoazobenzene	60-11-7	ND	ND	ND	ND	ND	5.00E+01	5.00E+01	TEEL-1
Hexachlorobenzene	118-74-1	ND	ND	ND	ND	ND	6.00E-03	6.00E-03	TEEL-1
Hexachlorobutadiene	87-68-3	ND	ND	ND	ND	3.00E+01	3.00E+01	3.00E+01	ERPG-1
Hexachlorocyclopentadiene	77-47-4	ND	ND	ND	ND	ND	2.00E-01	2.00E-01	TEEL-1
Hexachloroethane	67-72-1	ND	ND	ND	ND	ND	3.00E+01	3.00E+01	TEEL-1
Hexachlorophene	70-30-4	ND	ND	ND	ND	ND	1.00E+01	1.00E+01	TEEL-1
Hexamethylene-1,5-diisocyanate	822-06-0	ND	ND	ND	ND	ND	1.00E-01	1.00E-01	TEEL-1
Mirex	2385-85-5	ND	ND	ND	ND	ND	7.50E-02	7.50E-02	TEEL-1
Nitrofen	1836-75-5	ND	ND	ND	ND	ND	ND	ND	
Pentachlorobenzene	608-93-5	ND	ND	ND	ND	ND	3.00E+01	3.00E+01	TEEL-1
Pentachloronitrobenzene	82-68-8	ND	ND	ND	ND	ND	1.50E+00	1.50E+00	TEEL-1
Pentachlorophenol	87-86-5	ND	ND	ND	ND	ND	1.50E+00	1.50E+00	TEEL-1
Picric acid	88-89-1	ND	ND	ND	ND	ND	3.00E-01	3.00E-01	TEEL-1
Pronamide	23950-58-5	ND	ND	ND	ND	ND	ND	ND	
Strychnine	57-24-9	ND	ND	ND	ND	ND	3.00E-01	3.00E-01	TEEL-1

Table 7-11 Acute Inhalation Exposure Criteria for COPCs (mg/m^3)

Chemical of Potential Concern	CAS Registry Number	NCEA Provis. Value [a]	AREL [b]	AEGL-1 [c]	AEGL-2 [c]	ERPG-1 [d]	TEEL-1 [e]	AIEC [f]	Source of AIEC
Terphenyls	26140-60-3	ND	ND	ND	ND	ND	5.00E+00	5.00E+00	TEEL-1
Tributyl phosphate	126-73-8	ND	ND	ND	ND	ND	6.00E+00	6.00E+00	TEEL-1
Trifluralin	1582-09-8	ND	ND	ND	ND	ND	7.50E-02	7.50E-02	TEEL-1
Triphenylamine	603-34-9	ND	ND	ND	ND	ND	ND	ND	
	Herbicides and Organochlorinated Pesticides								
2,4,5-T	93-76-5	ND	ND	ND	ND	ND	3.00E+01	3.00E+01	TEEL-1
2,4-D and esters	94-75-7	ND	ND	ND	ND	ND	1.00E+01	1.00E+01	TEEL-1
4,4'-DDD	72-54-8	ND	ND	ND	ND	ND	3.00E+01	3.00E+01	TEEL-1
4,4'-DDE	72-55-9	ND	ND	ND	ND	ND	3.00E+01	3.00E+01	TEEL-1
4,4'-DDT	50-29-3	ND	ND	ND	ND	ND	3.00E+00	3.00E+00	TEEL-1
Aldrin	309-00-2	ND	ND	ND	ND	ND	7.50E-01	7.50E-01	TEEL-1
alpha-BHC	319-84-6	ND	ND	ND	ND	ND	1.50E+00	1.50E+00	TEEL-1
beta-BHC	319-85-7	ND	ND	ND	ND	ND	1.50E+00	1.50E+00	TEEL-1
Chlordane	57-74-9	ND	ND	ND	ND	ND	1.50E+00	1.50E+00	TEEL-1
delta-BHC	319-86-8	ND	ND	ND	ND	ND	ND	ND	
Dieldrin	60-57-1	ND	ND	ND	ND	ND	7.50E-01	7.50E-01	TEEL-1
Endothall	145-73-3	ND	ND	ND	ND	ND	ND	ND	
Endrin	72-20-8	ND	ND	ND	ND	ND	3.00E-01	3.00E-01	TEEL-1
gamma-BHC (Lindane)	58-89-9	ND	ND	ND	ND	ND	1.50E+00	1.50E+00	TEEL-1
Heptachlor	76-44-8	ND	ND	ND	ND	ND	1.50E-01	1.50E-01	TEEL-1
Isodrin	465-73-6	ND	ND	ND	ND	ND	4.00E+00	4.00E+00	TEEL-1
Methoxychlor	72-43-5	ND	ND	ND	ND	ND	3.00E+01	3.00E+01	TEEL-1
Silvex (2,4,5-TP)	93-72-1	ND	ND	ND	ND	ND	3.00E+01	3.00E+01	TEEL-1
Toxaphene	8001-35-2	ND	ND	ND	ND	ND	1.00E+00	1.00E+00	TEEL-1
Inorganic Chemicals and Compounds									
	Metals								
Aluminum	7429-90-5	ND	ND	ND	ND	ND	3.00E+01	3.00E+01	TEEL-1
Antimony	7440-36-0	ND	ND	ND	ND	ND	1.50E+00	1.50E+00	TEEL-1
Arsenic	7440-38-2	ND	1.90E-04	ND	ND	ND	1.50E+00	1.90E-04	AREL
Barium	7440-39-3	ND	ND	ND	ND	ND	1.50E+00	1.50E+00	TEEL-1
Beryllium	7440-41-7	ND	ND	ND	ND	ND	5.00E-03	5.00E-03	TEEL-1
Bismuth	7440-69-9	ND	ND	ND	ND	ND	5.00E+00	5.00E+00	TEEL-1
Boron	7440-42-8	ND	ND	ND	ND	ND	7.50E+00	7.50E+00	TEEL-1
Cadmium	7440-43-9	ND	ND	ND	ND	ND	3.00E-02	3.00E-02	TEEL-1
Calcium	7440-70-2	ND	ND	ND	ND	ND	3.00E+01	3.00E+01	TEEL-1
Chromium	18540-29-9	ND	ND	ND	ND	ND	1.50E+00	1.50E+00	TEEL-1

Table 7-11 Acute Inhalation Exposure Criteria for COPCs (mg/m^3)

Chemical of Potential Concern	CAS Registry Number	NCEA Provis. Value [a]	AREL [b]	AEGL-1 [c]	AEGL-2 [c]	ERPG-1 [d]	TEEL-1 [e]	AIEC [f]	Source of AIEC
Cobalt	7440-48-4	ND	ND	ND	ND	ND	1.00E-01	1.00E-01	TEEL-1
Copper	7440-50-8	ND	1.00E-01	ND	ND	ND	3.00E+00	1.00E-01	AREL
Iron	7439-89-6	ND	ND	ND	ND	ND	3.00E+01	3.00E+01	TEEL-1
Lead	7439-92-1	ND	ND	ND	ND	ND	1.50E-01	1.50E-01	TEEL-1
Lithium	7439-93-2	ND	ND	ND	ND	ND	3.00E+01	3.00E+01	TEEL-1
Magnesium	7439-95-4	ND	ND	ND	ND	ND	3.00E+01	3.00E+01	TEEL-1
Manganese	7439-96-5	ND	ND	ND	ND	ND	3.00E+00	3.00E+00	TEEL-1
Mercury	7439-97-6	ND	1.80E-03	ND	ND	ND	1.00E-01	1.80E-03	AREL
Molybdenum	7439-98-7	ND	ND	ND	ND	ND	3.00E+01	3.00E+01	TEEL-1
Nickel	7440-02-0	ND	6.00E-03	ND	ND	ND	4.50E+00	6.00E-03	AREL
Potassium	7440-09-7	ND	ND	ND	ND	ND	2.00E+00	2.00E+00	TEEL-1
Rhodium	7440-16-6	ND	ND	ND	ND	ND	3.00E+00	3.00E+00	TEEL-1
Selenium	7782-49-2	ND	ND	ND	ND	ND	6.00E-01	6.00E-01	TEEL-1
Silicon	7440-21-3	ND	ND	ND	ND	ND	3.00E+01	3.00E+01	TEEL-1
Silver	7440-22-4	ND	ND	ND	ND	ND	3.00E-01	3.00E-01	TEEL-1
Sodium	7440-23-5	ND	ND	ND	ND	ND	5.00E-01	5.00E-01	TEEL-1
Strontium	7440-24-6	ND	ND	ND	ND	ND	3.00E+01	3.00E+01	TEEL-1
Tantalum	7440-25-7	ND	ND	ND	ND	ND	ND	ND	
Thallium	7440-28-0	ND	ND	ND	ND	ND	3.00E-01	3.00E-01	TEEL-1
Tin	7440-31-5	ND	ND	ND	ND	ND	6.00E+00	6.00E+00	TEEL-1
Tungsten	7440-33-7	ND	ND	ND	ND	ND	1.00E+01	1.00E+01	TEEL-1
Uranium	7440-61-1	ND	ND	ND	ND	ND	6.00E-01	6.00E-01	TEEL-1
Vanadium	7440-62-2	ND	3.00E-02	ND	ND	ND	7.50E-02	3.00E-02	AREL
Yttrium	7440-65-5	ND	ND	ND	ND	ND	3.00E+00	3.00E+00	TEEL-1
Zinc	7440-66-6	ND	ND	ND	ND	ND	3.00E+01	3.00E+01	TEEL-1
Zirconium	7440-67-7	ND	ND	ND	ND	ND	1.00E+01	1.00E+01	TEEL-1
Non-metals and Anions									
Ammonia/Ammonium	7664-41-7	ND	3.20E+00	1.74E+01	7.66E+01	1.75E+01	1.75E+01	3.20E+00	AREL
Bromide	24959-67-9	ND	ND	ND	ND	ND	ND	ND	
Chloride	16887-00-6	ND	ND	ND	ND	ND	ND	ND	
Cyanide	57-12-5	ND	ND	ND	ND	ND	5.00E+00	5.00E+00	TEEL-1
Fluoride	16984-48-8	ND	ND	ND	ND	ND	2.50E+00	2.50E+00	TEEL-1
Hydroxide	14280-30-9	ND	ND	ND	ND	ND	ND	ND	
Iodine	7553-56-2	ND	ND	ND	ND	1.00E+00	1.00E+00	1.00E+00	ERPG-1
Nitrate	14797-55-8	ND	ND	ND	ND	ND	3.00E+01	3.00E+01	TEEL-1
Nitrite	14797-65-0	ND	ND	ND	ND	ND	ND	ND	

Table 7-11 Acute Inhalation Exposure Criteria for COPCs (mg/m^3)

Chemical of Potential Concern	CAS Registry Number	NCEA Provis. Value [a]	AREL [b]	AEGL-1 [c]	AEGL-2 [c]	ERPG-1 [d]	TEEL-1 [e]	AIEC [f]	Source of AIEC
Phosphate	14265-44-2	ND	ND	ND	ND	ND	ND	ND	
Phosphorus	7723-14-0	ND	ND	ND	ND	ND	3.00E-01	3.00E-01	TEEL-1
Sulfate	14808-79-8	ND	1.20E-01	ND	ND	ND	ND	1.20E-01	AREL
Total sulfur	63705-05-5	ND	ND	ND	ND	ND	4.00E-01	4.00E-01	TEEL-1
Criteria Pollutants									
Carbon monoxide	630-08-0	ND	2.30E+01	ND	ND	2.30E+02	2.30E+02	2.30E+01	AREL
Nitrogen dioxide	10102-44-0	ND	4.70E-01	9.40E-01	2.26E+01	ND	7.50E+00	4.70E-01	AREL
Ozone	10028-15-6	ND	1.80E-01	ND	ND	ND	2.00E-01	1.80E-01	AREL
Particulate matter	No CAS #	ND	ND	ND	ND	ND	3.00E+01	3.00E+01	TEEL-1
Sulfur dioxide	7446-09-5	ND	6.60E-01	ND	ND	7.50E-01	7.50E-01	6.60E-01	AREL

ND - no data available.

[a] Provisional acute one-hour inhalation value, obtained from National Center for Environmental Assessment (NCEA).

[b] Acute reference exposure levels (AREL) values, obtained from California Environmental Protection Agency (EPA) (see http://oehha.ca.gov/air/acute_rels/allAcRELs.html). AREL values are shown in units of ug/m^3 by California EPA; these values were converted to mg/m^3 by dividing by 1000.

[c] Acute exposure guideline level (AEGL-1 and AEGL-2) values (one-hour averaging time) converted to mg/m^3. Original values in ppm obtained from EPA Region 10 or from EPA Federal Register, October 30, 1997 (Volume 62, Number 210) provided in Table 7-12.

[d] Emergency response planning guidelines (ERPG-1) values converted to mg/m^3. Original values in ppm obtained from http://www.bnl.gov/scapa/scapawl.htm are provided in Table 7-12.

[e] Temporary emergency response limits (TEEL-1) values (Rev. 19), obtained from http://tis.eh.doe.gov/web/chem_safety/teel.html.

[f] Acute inhalation exposure criteria (AIEC) in mg/m^3, used to quantify hazard quotients for short term inhalation exposures to chemicals of potential concern (COPCs).
The following hierarchy was used in selecting the AIEC:

1. Values from NCEA (as provided by EPA Region 10)
2. AREL
3. AEGL-1
4. ERPG-1
5. TEEL-1
6. AEGL-2 if AEGL-1 missing and AEGL-2 value is smaller than all other available values.

Table 7-12 Acute Inhalation Exposure Criteria for COPCs in Original Units of Parts per Million (ppm)

Chemical of Potential Concern	CAS Registry Number	AEGL-1[a]	AEGL-2[a]	ERPG-1[b]	Conversion Factor[c]
Organic Compounds					
	Aromatic Halogenated Hydrocarbons				
2,3,4,6-Tetrachlorophenol	58-90-2	ND	ND	ND	ND
4-Chloro-3-methylphenol	59-50-7	ND	ND	ND	5.83E+00
	Aromatic Nonhalogenated Hydrocarbons				
2-Nitrotoluene	88-72-2	ND	ND	ND	5.61E+00
4-Nitrobiphenyl	92-93-3	ND	ND	ND	8.14E+00
Benzaldehyde	100-52-7	ND	ND	ND	4.34E+00
Benzene	71-43-2	ND	ND	5.00E+01	3.19E+00
Benzyl alcohol	100-51-6	ND	ND	ND	4.42E+00
Ethyl benzene	100-41-4	ND	ND	ND	4.34E+00
m-Xylene	108-38-3	ND	ND	ND	4.34E+00
o-Xylene	95-47-6	ND	ND	ND	4.34E+00
p-Xylene	106-42-3	ND	ND	ND	4.34E+00
Styrene	100-42-5	ND	ND	5.00E+01	4.26E+00
Toluene	108-88-3	ND	ND	5.00E+01	3.77E+00
	Non-aromatic Nonhalogenated Hydrocarbons				
1,2-Epoxybutane	106-88-7	ND	ND	ND	2.95E+00
1,3-Butadiene	106-99-0	ND	ND	1.00E+01	2.21E+00
1,4-Dioxane	123-91-1	ND	ND	ND	3.60E+00
1-Methylpropyl alcohol	78-92-2	ND	ND	ND	3.03E+00
1-Nitropropane	108-03-2	ND	ND	ND	3.64E+00
2,2,4-Trimethylpentane	540-84-1	ND	ND	ND	4.67E+00
2-Butanone	78-93-3	ND	ND	ND	2.95E+00
2-Butenaldehyde (2-Butenal)	4170-30-3	1.90E-01	4.40E+00	2.00E+00	2.86E+00
2-Ethoxyethanol	110-80-5	ND	ND	ND	3.68E+00
2-Heptanone	110-43-0	ND	ND	ND	4.67E+00
2-Hexanone	591-78-6	ND	ND	ND	4.09E+00
2-Methoxyethanol	109-86-4	ND	ND	ND	3.11E+00
2-Methyl-2-propanol	75-65-0	ND	ND	ND	3.03E+00
2-Methyl-2-propenenitrile	126-98-7	ND	1.10E+00	ND	2.74E+00
2-Methylaziridine	75-55-8	ND	1.10E+01	ND	2.33E+00
2-Methylpropyl alcohol	78-83-1	ND	ND	ND	3.03E+00
2-Pentanone	107-87-9	ND	ND	ND	3.52E+00
2-Propanone (Acetone)	67-64-1	ND	ND	ND	2.37E+00
2-Propene-1-ol	107-18-6	1.80E+00	1.10E+01	ND	2.37E+00
2-Propyl alcohol	67-63-0	ND	ND	ND	2.46E+00
3-Heptanone	106-35-4	ND	ND	ND	4.67E+00
3-Methyl-1-butanol	123-51-3	ND	ND	ND	3.60E+00
3-Methyl-2-butanone	563-80-4	ND	ND	ND	3.52E+00
3-Pentanone	96-22-0	ND	ND	ND	ND
4-Heptanone	123-19-3	ND	ND	ND	4.67E+00
4-Methyl-2-pentanone	108-10-1	ND	ND	ND	4.09E+00
4-Methyl-3-penten-2-one	141-79-7	ND	ND	ND	4.01E+00
5-Methyl-2-hexanone	110-12-3	ND	ND	ND	4.67E+00
Acetaldehyde	75-07-0	ND	ND	1.00E+01	1.80E+00
Acetamide	60-35-5	ND	ND	ND	2.41E+00
Acetic acid	64-19-7	ND	ND	ND	2.45E+00
Acetic acid ethyl ester	141-78-6	ND	ND	ND	3.60E+00
Acetic acid n-butyl ester	123-86-4	ND	ND	5.00E+00	4.75E+00
Acetonitrile	75-05-8	ND	ND	ND	1.68E+00
Acrolein	107-02-8	3.00E-02	1.00E-01	1.00E-01	2.29E+00

Table 7-12 Acute Inhalation Exposure Criteria for COPCs in Original Units of Parts per Million (ppm)

Chemical of Potential Concern	CAS Registry Number	AEGL-1[a]	AEGL-2[a]	ERPG-1[b]	Conversion Factor[c]
Acrylonitrile	107-13-1	ND	ND	1.00E+01	2.17E+00
Bis(isopropyl)ether	108-20-3	ND	ND	ND	ND
Butane	106-97-8	ND	ND	ND	2.38E+00
Carbon disulfide	75-15-0	ND	ND	1.00E+00	3.11E+00
Cyanogen	460-19-5	ND	ND	ND	2.13E+00
Cyclohexane	110-82-7	ND	ND	ND	3.44E+00
Cyclohexanone	108-94-1	ND	ND	ND	4.01E+00
Cyclohexene	110-83-8	ND	ND	ND	3.36E+00
Cyclopentane	287-92-3	ND	ND	ND	2.87E+00
Ethyl alcohol	64-17-5	ND	ND	ND	1.88E+00
Ethyl ether	60-29-7	ND	ND	ND	3.03E+00
Ethyl methacrylate	97-63-2	ND	ND	ND	4.67E+00
Formaldehyde	50-00-0	ND	ND	1.00E+00	1.23E+00
Formamide	75-12-7	ND	ND	ND	1.84E+00
Formic acid	64-18-6	ND	ND	ND	1.88E+00
Formic acid, methyl ester	107-31-3	ND	ND	ND	2.45E+00
Glycidylaldehyde	765-34-4	ND	ND	ND	2.95E+00
Methyl acetate	79-20-9	ND	ND	ND	ND
Methyl alcohol	67-56-1	ND	ND	2.00E+02	1.31E+00
Methyl isocyanate	624-83-9	ND	ND	2.50E-02	2.33E+00
Methyl methacrylate	80-62-6	ND	ND	ND	4.09E+00
Methyl tert-butyl ether	1634-04-4	ND	ND	ND	3.60E+00
Methylacetylene	74-99-7	ND	ND	ND	1.64E+00
Methylcyclohexane	108-87-2	ND	ND	ND	4.01E+00
N,N-Dimethylacetamide	127-19-5	ND	ND	ND	3.56E+00
n-Butyl alcohol	71-36-3	ND	ND	ND	3.03E+00
n-Heptane	142-82-5	ND	ND	ND	4.10E+00
n-Hexane	110-54-3	ND	ND	ND	3.52E+00
Nitromethane	75-52-5	ND	ND	ND	2.50E+00
n-Nonane	111-84-2	ND	ND	ND	5.24E+00
n-Octane	111-65-9	ND	ND	ND	4.67E+00
n-Pentane	109-66-0	ND	ND	ND	2.95E+00
n-Propionaldehyde	123-38-6	ND	ND	ND	2.37E+00
n-Propyl alcohol	71-23-8	ND	ND	ND	2.46E+00
n-Valeraldehyde	110-62-3	ND	ND	ND	ND
Oxirane[d]	75-21-8	ND	1.10E+02	ND	1.80E+00
p-Cymene	99-87-6	ND	ND	ND	ND
Phosgene	75-44-5	ND	3.00E-01	ND	4.04E+00
Propargyl alcohol	107-19-7	ND	ND	ND	2.29E+00
Propionic acid	79-09-4	ND	ND	ND	3.03E+00
Propionitrile	107-12-0	ND	7.40E+00	ND	2.25E+00
Propylene gylcol monomethyl ether	107-98-2	ND	ND	ND	3.68E+00
p-tert-Butyltoluene	98-51-1	ND	ND	ND	ND
Triethylamine	121-44-8	ND	ND	ND	4.14E+00
Trimethylamine	75-50-3	ND	ND	1.00E-01	2.42E+00
Vinyl acetate	108-05-4	ND	ND	5.00E+00	3.52E+00
	Non-aromatic Halogenated Hydrocarbons				
1,1,1,2-Tetrachloro-2,2-difluoroethane	76-11-9	ND	ND	ND	ND
1,1,1,2-Tetrachloroethane	630-20-6	ND	ND	ND	6.86E+00
1,1,1-Trichloroethane	71-55-6	ND	ND	3.50E+02	5.45E+00
1,1,2,2-Tetrachloro-1,2-difluoroethane	76-12-0	ND	ND	ND	ND
1,1,2,2-Tetrachloroethane	79-34-5	ND	ND	ND	6.86E+00

Table 7-12 Acute Inhalation Exposure Criteria for COPCs in Original Units of Parts per Million (ppm)

Chemical of Potential Concern	CAS Registry Number	AEGL-1[a]	AEGL-2[a]	ERPG-1[b]	Conversion Factor[c]
1,1,2,2-Tetrachloroethene	127-18-4	ND	ND	1.00E+02	6.78E+00
1,1,2-Trichloroethane	79-00-5	ND	ND	ND	5.45E+00
1,1,2-Trichloroethylene	79-01-6	ND	ND	1.00E+02	5.37E+00
1,1-Dichloroethane	75-34-3	ND	ND	ND	4.04E+00
1,1-Dichloroethene	75-35-4	ND	ND	ND	3.96E+00
1,2,2-Trichloro-1,1,2-trifluoroethane	76-13-1	ND	ND	ND	7.66E+00
1,2,3-Trichloropropane	96-18-4	ND	ND	ND	6.03E+00
1,2-Dibromo-3-chloropropane	96-12-8	ND	ND	ND	9.66E+00
1,2-Dichloro-1,1,2,2-tetrafluoroethane	76-14-2	ND	ND	ND	6.99E+00
1,2-Dichloroethane	107-06-2	ND	ND	5.00E+01	4.04E+00
1,2-Dichloroethylene[d]	540-59-0	1.30E+01	4.00E+01	ND	3.96E+00
1,2-Dichloropropane	78-87-5	ND	ND	ND	4.62E+00
1,3-Dichloropropene	542-75-6	ND	ND	ND	4.54E+00
1,4-Dichloro-2-butene	764-41-0	ND	ND	ND	5.11E+00
1-Chloroethene	75-01-4	ND	ND	ND	2.55E+00
2,2-Dichloropropionic acid	75-99-0	ND	ND	ND	ND
2-Chloropropane	75-29-6	ND	ND	ND	3.21E+00
3-Chloropropene (Allyl chloride)	107-05-1	ND	ND	3.00E+00	3.13E+00
Bromochloromethane	74-97-5	ND	ND	ND	5.29E+00
Bromodichloromethane	75-27-4	ND	ND	ND	6.70E+00
Bromoethene	593-60-2	ND	ND	ND	4.37E+00
Bromoform	75-25-2	ND	ND	ND	1.03E+01
Bromomethane	74-83-9	ND	ND	ND	3.88E+00
Carbon tetrachloride	56-23-5	1.20E+01	6.80E+01	2.00E+01	6.29E+00
Chlorodibromomethane	124-48-1	ND	ND	ND	8.51E+00
Chlorodifluoromethane	75-45-6	ND	ND	ND	3.53E+00
Chloroethane	75-00-3	ND	ND	ND	2.64E+00
Chloroform	67-66-3	ND	8.80E+01	ND	4.88E+00
Chloromethane	74-87-3	ND	ND	ND	2.06E+00
Chloropentafluoroethane	76-15-3	ND	ND	ND	6.31E+00
cis-1,2-Dichloroethene	156-59-2	ND	ND	ND	3.96E+00
cis-1,3-Dichloropropene	10061-01-5	ND	ND	ND	4.54E+00
Cyanogen bromide	506-68-3	ND	ND	ND	4.33E+00
Cyanogen chloride	506-77-4	ND	ND	ND	2.51E+00
Dichlorodifluoromethane	75-71-8	ND	ND	ND	4.94E+00
Dichlorofluoromethane	75-43-4	ND	ND	ND	4.21E+00
Dichloromethane	75-09-2	ND	ND	2.00E+02	3.47E+00
Difluorodibromomethane	75-61-6	ND	ND	ND	ND
Hexafluoroacetone	684-16-2	ND	ND	ND	6.79E+00
Iodomethane	74-88-4	ND	ND	2.50E+01	5.80E+00
Methylene bromide	74-95-3	ND	ND	ND	7.11E+00
Pentachloroethane	76-01-7	ND	ND	ND	8.27E+00
trans-1,2-Dichloroethylene	156-60-5	ND	ND	ND	3.96E+00
trans-1,3-Dichloropropene	10061-02-6	ND	ND	ND	4.54E+00
Trichloroacetic acid	76-03-9	ND	ND	ND	6.68E+00
Trichlorofluoroethane	27154-33-2	ND	ND	ND	ND
Trichlorofluoromethane	75-69-4	ND	ND	ND	5.61E+00
Trifluorobromomethane	75-63-8	ND	ND	ND	6.09E+00
	Dioxin and Furan Compounds (PCDDs/PCDFs)				
1,2,3,4,6,7,8-Heptachlorodibenzo(p)dioxin	35822-46-9	ND	ND	ND	ND
1,2,3,4,6,7,8-Heptachlorodibenzofuran	67562-39-4	ND	ND	ND	1.67E+01
1,2,3,4,7,8,9-Heptachlorodibenzofuran	55673-89-7	ND	ND	ND	1.67E+01

Table 7-12 Acute Inhalation Exposure Criteria for COPCs in Original Units of Parts per Million (ppm)

Chemical of Potential Concern	CAS Registry Number	AEGL-1[a]	AEGL-2[a]	ERPG-1[b]	Conversion Factor[c]
1,2,3,4,7,8-Hexachlorodibenzo(p)dioxin	39227-28-6	ND	ND	ND	1.60E+01
1,2,3,4,7,8-Hexachlorodibenzofuran	70648-26-9	ND	ND	ND	1.53E+01
1,2,3,6,7,8-Hexachlorodibenzo(p)dioxin	57653-85-7	ND	ND	ND	1.60E+01
1,2,3,6,7,8-Hexachlorodibenzofuran	57117-44-9	ND	ND	ND	1.55E+01
1,2,3,7,8,9-Hexachlorodibenzo(p)dioxin	19408-74-3	ND	ND	ND	1.60E+01
1,2,3,7,8,9-Hexachlorodibenzofuran	72918-21-9	ND	ND	ND	1.53E+01
1,2,3,7,8-Pentachlorodibenzo(p)dioxin	40321-76-4	ND	ND	ND	1.46E+01
1,2,3,7,8-Pentachlorodibenzofuran	57117-41-6	ND	ND	ND	1.39E+01
2,3,4,6,7,8-Hexachlorodibenzofuran	60851-34-5	ND	ND	ND	1.53E+01
2,3,4,7,8-Pentachlorodibenzofuran	57117-31-4	ND	ND	ND	1.39E+01
2,3,7,8-Tetrachlorodibenzo(p)dioxin	1746-01-6	ND	ND	ND	1.32E+01
2,3,7,8-Tetrachlorodibenzofuran	51207-31-9	ND	ND	ND	1.25E+01
Dibenzofuran	132-64-9	ND	ND	ND	6.87E+00
Octachlorodibenzo(p)dioxin	3268-87-9	ND	ND	ND	1.88E+01
Octachlorodibenzofuran	39001-02-0	ND	ND	ND	1.81E+01
	Polychlorinated Biphenyls (PCBs)				
2,2',3,3',4,4',5-Heptachlorobiphenyl	35065-30-6	ND	ND	ND	ND
2,2',3,4,4',5,5'-Heptachlorobiphenyl	35065-29-3	ND	ND	ND	ND
2,3,3',4,4',5,5'-Heptachlorobiphenyl	39635-31-9	ND	ND	ND	ND
2,3,3',4,4',5'-Hexachlorobiphenyl	69782-90-7	ND	ND	ND	ND
2,3,3',4,4',5-Hexachlorobiphenyl	38380-08-4	ND	ND	ND	ND
2,3,3',4,4'-Pentachlorobiphenyl	32598-14-4	ND	ND	ND	ND
2,3',4,4',5,5'-Hexachlorobiphenyl	52663-72-6	ND	ND	ND	ND
2,3,4,4',5-Pentachlorobiphenyl	74472-37-0	ND	ND	ND	ND
2',3,4,4',5-Pentachlorobiphenyl	65510-44-3	ND	ND	ND	ND
2,3',4,4',5-Pentachlorobiphenyl	31508-00-6	ND	ND	ND	ND
3,3',4,4',5,5'-Hexachlorobiphenyl	32774-16-6	ND	ND	ND	ND
3,3',4,4',5-Pentachlorobiphenyl	57465-28-8	ND	ND	ND	ND
3,3',4,4'-Tetrachlorobiphenyl	32598-13-3	ND	ND	ND	ND
3,4,4',5-Tetrachlorobiphenyl	70362-50-4	ND	ND	ND	ND
Polychlorinated biphenyls (PCBs)	1336-36-3	ND	ND	ND	ND
	Phthalates				
Bis(2-ethylhexyl)phthalate (DEHP)	117-81-7	ND	ND	ND	1.60E+01
Butylbenzyl phthalate	85-68-7	ND	ND	ND	1.28E+01
Dibutyl phthalate	84-74-2	ND	ND	ND	1.14E+01
Diethyl phthalate	84-66-2	ND	ND	ND	9.08E+00
Dimethylphthalate	131-11-3	ND	ND	ND	7.94E+00
n-Dioctyl phthalate	117-84-0	ND	ND	ND	1.60E+01
	Light Polycyclic Aromatic Hydrocarbons (molecular weight <200 g/mole)				
2-Chloronapthalene	91-58-7	ND	ND	ND	6.65E+00
2-Methyl naphthalene	91-57-6	ND	ND	ND	5.81E+00
5-Nitroacenaphthene	602-87-9	ND	ND	ND	ND
Acenaphthene	83-32-9	ND	ND	ND	6.30E+00
Acenaphthylene	208-96-8	ND	ND	ND	6.22E+00
Anthracene	120-12-7	ND	ND	ND	7.28E+00
Fluorene	86-73-7	ND	ND	ND	6.79E+00
Indene	95-13-6	ND	ND	ND	4.75E+00
Naphthalene	91-20-3	ND	ND	ND	5.24E+00
Phenanthrene	85-01-8	ND	ND	ND	7.28E+00
Pyrene	129-00-0	ND	ND	ND	8.27E+00
	Heavy Polycyclic Aromatic Hydrocarbons (molecular weight >200 g/mole)				
3-Methylcholanthrene	56-49-5	ND	ND	ND	1.10E+01

Table 7-12 Acute Inhalation Exposure Criteria for COPCs in Original Units of Parts per Million (ppm)

Chemical of Potential Concern	CAS Registry Number	AEGL-1[a]	AEGL-2[a]	ERPG-1[b]	Conversion Factor [c]
5-Methylchrysene	3697-24-3	ND	ND	ND	ND
Benzo(a)anthracene	56-55-3	ND	ND	ND	9.33E+00
Benzo(a)pyrene	50-32-8	ND	ND	ND	1.03E+01
Benzo(a,i)pyrene	191-30-0	ND	ND	ND	ND
Benzo(b)fluoranthene	205-99-2	ND	ND	ND	1.03E+01
Benzo(e)pyrene	192-97-2	ND	ND	ND	ND
Benzo(g,h,i)perylene	191-24-2	ND	ND	ND	1.13E+01
Benzo(j)fluoranthene	205-82-3	ND	ND	ND	ND
Benzo(k)fluoranthene	207-08-9	ND	ND	ND	1.03E+01
Chrysene	218-01-9	ND	ND	ND	9.33E+00
Dibenz(a,h)acridine	226-36-8	ND	ND	ND	ND
Dibenz(a,h)anthracene	53-70-3	ND	ND	ND	1.14E+01
Dibenz(a,j)acridine	224-42-0	ND	ND	ND	ND
Dibenzo(a,e)fluoranthene	5385-75-1	ND	ND	ND	ND
Dibenzo(a,e)pyrene	192-65-4	ND	ND	ND	1.24E+01
Dibenzo(a,h)fluoranthene	No CAS #	ND	ND	ND	ND
Dibenzo(a,h)pyrene	189-64-0	ND	ND	ND	ND
Dibenzo(a,i)pyrene	189-55-9	ND	ND	ND	ND
Fluoranthene	206-44-0	ND	ND	ND	8.27E+00
Hexachloronaphthalene	1335-87-1	ND	ND	ND	1.37E+01
Indeno(1,2,3-cd)pyrene	193-39-5	ND	ND	ND	1.13E+01
Octachloronaphthalene	2234-13-1	ND	ND	ND	1.65E+01
Pentachloronaphthalene	1321-64-8	ND	ND	ND	ND
Tetrachloronaphthalene	1335-88-2	ND	ND	ND	ND
Trichloronaphthalene	1321-65-9	ND	ND	ND	ND
	Light Substituted Benzene Compounds (molecular weight <200 g/mole)				
1,2,3-Trichlorobenzene	87-61-6	ND	ND	ND	7.42E+00
1,2,4-Trichlorobenzene	120-82-1	ND	ND	ND	7.42E+00
1,2,4-Trimethyl benzene	95-63-6	ND	ND	ND	4.91E+00
1,2-Dichlorobenzene	95-50-1	ND	ND	ND	6.01E+00
1,3,5-Trimethyl benzene	108-67-8	ND	ND	ND	4.91E+00
1,3-Dichlorobenzene	541-73-1	ND	ND	ND	6.01E+00
1,3-Dinitrobenzene	99-65-0	ND	ND	ND	6.87E+00
1,4-Dichlorobenzene	106-46-7	ND	ND	ND	6.01E+00
1,4-Dinitrobenzene	100-25-4	ND	ND	ND	6.87E+00
2,4,5-Trichlorophenol	95-95-4	ND	ND	ND	8.07E+00
2,4,6-Trichlorophenol	88-06-2	ND	ND	ND	8.07E+00
2,4-Dichlorophenol	120-83-2	ND	ND	ND	6.66E+00
2,4-Dimethylphenol	105-67-9	ND	ND	ND	4.99E+00
2,4-Dinitrophenol	51-28-5	ND	ND	ND	7.53E+00
2,4-Dinitrotoluene	121-14-2	ND	ND	ND	7.44E+00
2,6-Dinitrotoluene	606-20-2	ND	ND	ND	7.44E+00
2-Chlorophenol	95-57-8	ND	ND	ND	5.25E+00
2-Chlorotoluene	95-49-8	ND	ND	ND	5.17E+00
2-Nitrophenol	88-75-5	ND	ND	ND	5.69E+00
4,6-Dinitro-o-cresol	534-52-1	ND	ND	ND	8.10E+00
4-Chlorotoluene	106-43-4	ND	ND	ND	5.17E+00
4-Nitrophenol	100-02-7	ND	ND	ND	5.69E+00
alpha-Methylstyrene	98-83-9	ND	ND	ND	ND
Aniline [d]	62-53-3	8.00E+00	1.20E+01	ND	3.81E+00
Benzotrichloride	98-07-7	ND	ND	ND	7.99E+00
Benzyl chloride	100-44-7	ND	ND	1.00E+00	5.17E+00

Table 7-12 Acute Inhalation Exposure Criteria for COPCs in Original Units of Parts per Million (ppm)

Chemical of Potential Concern	CAS Registry Number	AEGL-1[a]	AEGL-2[a]	ERPG-1[b]	Conversion Factor[c]
Bromobenzene	108-86-1	ND	ND	ND	6.42E+00
Chlorobenzene	108-90-7	ND	ND	ND	4.60E+00
Cumene	98-82-8	ND	ND	ND	4.91E+00
m-Cresol	108-39-4	ND	ND	ND	4.42E+00
n-Butyl benzene	104-51-8	ND	ND	ND	5.49E+00
Nitrobenzene	98-95-3	ND	ND	ND	5.03E+00
n-Propyl benzene	103-65-1	ND	ND	ND	4.91E+00
o-Cresol	95-48-7	ND	ND	ND	4.42E+00
o-Dinitrobenzene	528-29-0	ND	ND	ND	6.87E+00
o-Nitroaniline	88-74-4	ND	ND	ND	5.65E+00
o-Toluidine	95-53-4	ND	ND	ND	4.38E+00
p-Chloroaniline	106-47-8	ND	ND	ND	5.21E+00
p-Cresol	106-44-5	ND	ND	ND	4.42E+00
Phenol	108-95-2	ND	ND	1.00E+01	3.85E+00
p-Nitrochlorobenzene	100-00-5	ND	ND	ND	6.44E+00
p-Toluidine	106-49-0	ND	ND	ND	4.38E+00
sec-Butyl benzene	135-98-8	ND	ND	ND	5.49E+00
tert-Butyl benzene	98-06-6	ND	ND	ND	5.49E+00
Toluene-2,6-diamine	823-40-5	ND	ND	ND	4.99E+00
Trimethyl benzene	25551-13-7	ND	ND	ND	ND
Other Light Semivolatile Compounds (molecular weight <200 g/mole)					
1,1'-Biphenyl	92-52-4	ND	ND	ND	6.30E+00
1,1-Dimethylhydrazine[d]	57-14-7	ND	3.00E+00	ND	2.46E+00
1,2-Dimethylhydrazine[d]	540-73-8	ND	3.00E+00	ND	2.46E+00
1,2-Diphenylhydrazine	122-66-7	ND	ND	ND	7.53E+00
1,3-Propane sultone	1120-71-4	ND	ND	ND	4.99E+00
2,4-Toluene diisocyante	584-84-9	2.00E-02	1.20E-01	1.00E-02	7.12E+00
2-Chloroacetophenone	532-27-4	ND	ND	ND	ND
2-Propenoic acid	79-10-7	ND	ND	2.00E+00	2.95E+00
4,4'-Methylenedianiline	101-77-9	ND	ND	ND	8.10E+00
Acetophenone	98-86-2	ND	ND	ND	4.91E+00
Benzoic acid	65-85-0	ND	ND	ND	4.99E+00
Bis(2-chloroethoxy)methane	111-91-1	ND	ND	ND	7.07E+00
Bis(2-chloroethyl) ether	111-44-4	ND	ND	ND	5.85E+00
Chlorocyclopentadiene	41851-50-7	ND	ND	ND	ND
Cyclohexanol	108-93-0	ND	ND	ND	4.09E+00
Dichloroisopropyl ether	108-60-1	ND	ND	ND	6.99E+00
Dichloromethyl ether	542-88-1	ND	ND	ND	4.70E+00
Dichloropentadiene	61626-71-9	ND	ND	ND	ND
Dimethyl sulfate	77-78-1	ND	ND	ND	5.16E+00
Dimethylaniline	121-69-7	ND	ND	ND	4.95E+00
di-n-Propylnitrosamine	621-64-7	ND	ND	ND	5.32E+00
Diphenyl ether	101-84-8	ND	ND	ND	ND
Epichlorohydrin	106-89-8	5.00E+00	2.40E+01	2.00E+00	3.78E+00
Ethyl carbamate (Urethane)	51-79-6	ND	ND	ND	3.64E+00
Ethyl methanesulfonate	62-50-0	ND	ND	ND	5.07E+00
Ethylene dibromide	106-93-4	ND	ND	ND	7.68E+00
Ethylene glycol	107-21-1	ND	ND	ND	2.54E+00
Ethylene glycol monobutyl ether	111-76-2	ND	ND	ND	4.83E+00
Ethylene glycol monoethyl ether acetate	111-15-9	ND	ND	ND	5.40E+00
Ethylene thiourea	96-45-7	ND	ND	ND	4.18E+00
Furfural	98-01-1	ND	ND	2.00E+00	3.93E+00

Table 7-12 Acute Inhalation Exposure Criteria for COPCs in Original Units of Parts per Million (ppm)

Chemical of Potential Concern	CAS Registry Number	AEGL-1[a]	AEGL-2[a]	ERPG-1[b]	Conversion Factor[c]
Maleic hydrazide	123-33-1	ND	ND	ND	4.58E+00
Malononitrile	109-77-3	ND	ND	ND	2.70E+00
Methyl styrene (mixed isomers)	25013-15-4	ND	ND	ND	ND
Methylhydrazine[d]	60-34-4	ND	1.00E+00	ND	1.88E+00
N,N-Diphenylamine	122-39-4	ND	ND	ND	6.92E+00
Nitric acid, propyl ester	627-13-4	ND	ND	ND	4.30E+00
N-Nitrosodi-n-butylamine	924-16-3	ND	ND	ND	ND
N-Nitrosomorpholine	59-89-2	ND	ND	ND	4.75E+00
N-Nitroso-N,N-dimethylamine	62-75-9	ND	ND	ND	3.03E+00
o-Anisidine	90-04-0	ND	ND	ND	5.03E+00
Oxalic acid	144-62-7	ND	ND	ND	3.68E+00
Phthalic anhydride	85-44-9	ND	ND	ND	6.05E+00
p-Phthalic acid	100-21-0	ND	ND	ND	ND
Pyridine	110-86-1	ND	ND	ND	3.23E+00
Quinoline	91-22-5	ND	ND	ND	5.28E+00
Quinone	106-51-4	ND	ND	ND	4.42E+00
Safrole	94-59-7	ND	ND	ND	6.63E+00
Tetrahydrofuran	109-99-9	ND	ND	ND	2.95E+00
Other Heavy Semivolatile Compounds (molecular weight >200 g/mole)					
1,2,4,5-Tetrachlorobenzene	95-94-3	ND	ND	ND	8.82E+00
1,3,5-Trinitrobenzene	99-35-4	ND	ND	ND	8.71E+00
2,6-Bis(tert-butyl)-4-methylphenol	128-37-0	ND	ND	ND	9.01E+00
2-Cyclohexyl-4,6-dinitrophenol	131-89-5	ND	ND	ND	ND
2-sec-Butyl-4,6-dinitrophenol	88-85-7	ND	ND	ND	9.82E+00
3,3'-Dichlorobenzidine	91-94-1	ND	ND	ND	1.03E+01
3,3'-Dimethoxybenzidine	119-90-4	ND	ND	ND	9.99E+00
4-Bromophenylphenyl ether	101-55-3	ND	ND	ND	1.02E+01
Ammonium perfluorooctanoate	3825-26-1	ND	ND	ND	ND
Azobenzene	103-33-3	ND	ND	ND	ND
Bis(3-tert-butyl-4-hydroxy-6-methyl-phenyl)sulfide	96-69-5	ND	ND	ND	1.47E+01
Captan	133-06-2	ND	ND	ND	1.23E+01
Chlorobenzilate	510-15-6	ND	ND	ND	1.33E+01
Dibutylphosphate	107-66-4	ND	ND	ND	8.59E+00
Dimethyl aminoazobenzene	60-11-7	ND	ND	ND	9.21E+00
Hexachlorobenzene	118-74-1	ND	ND	ND	1.16E+01
Hexachlorobutadiene	87-68-3	ND	ND	3.00E+00	1.07E+01
Hexachlorocyclopentadiene	77-47-4	ND	ND	ND	1.11E+01
Hexachloroethane	67-72-1	ND	ND	ND	9.68E+00
Hexachlorophene	70-30-4	ND	ND	ND	1.66E+01
Hexamethylene-1,5-diisocyanate	822-06-0	ND	ND	ND	6.88E+00
Mirex	2385-85-5	ND	ND	ND	2.23E+01
Nitrofen	1836-75-5	ND	ND	ND	ND
Pentachlorobenzene	608-93-5	ND	ND	ND	1.02E+01
Pentachloronitrobenzene	82-68-8	ND	ND	ND	1.21E+01
Pentachlorophenol	87-86-5	ND	ND	ND	1.09E+01
Picric acid	88-89-1	ND	ND	ND	9.36E+00
Pronamide	23950-58-5	ND	ND	ND	ND
Strychnine	57-24-9	ND	ND	ND	1.37E+01
Terphenyls	26140-60-3	ND	ND	ND	9.41E+00
Tributyl phosphate	126-73-8	ND	ND	ND	1.09E+01
Trifluralin	1582-09-8	ND	ND	ND	1.37E+01
Triphenylamine	603-34-9	ND	ND	ND	ND

Table 7-12 Acute Inhalation Exposure Criteria for COPCs in Original Units of Parts per Million (ppm)

Chemical of Potential Concern	CAS Registry Number	AEGL-1[a]	AEGL-2[a]	ERPG-1[b]	Conversion Factor[c]
Herbicides and Organochlorinated Pesticides					
2,4,5-T	93-76-5	ND	ND	ND	1.04E+01
2,4-D and esters	94-75-7	ND	ND	ND	9.03E+00
4,4'-DDD	72-54-8	ND	ND	ND	1.31E+01
4,4'-DDE	72-55-9	ND	ND	ND	1.30E+01
4,4'-DDT	50-29-3	ND	ND	ND	1.45E+01
Aldrin	309-00-2	ND	ND	ND	1.49E+01
alpha-BHC	319-84-6	ND	ND	ND	1.19E+01
beta-BHC	319-85-7	ND	ND	ND	1.19E+01
Chlordane	57-74-9	ND	ND	ND	1.67E+01
delta-BHC	319-86-8	ND	ND	ND	ND
Dieldrin	60-57-1	ND	ND	ND	1.56E+01
Endothall	145-73-3	ND	ND	ND	ND
Endrin	72-20-8	ND	ND	ND	1.56E+01
gamma-BHC (Lindane)	58-89-9	ND	ND	ND	1.19E+01
Heptachlor	76-44-8	ND	ND	ND	1.53E+01
Isodrin	465-73-6	ND	ND	ND	1.49E+01
Methoxychlor	72-43-5	ND	ND	ND	1.41E+01
Silvex (2,4,5-TP)	93-72-1	ND	ND	ND	1.10E+01
Toxaphene	8001-35-2	ND	ND	ND	1.69E+01
Inorganic Chemicals and Compounds					
Metals					
Aluminum	7429-90-5	ND	ND	ND	1.10E+00
Antimony	7440-36-0	ND	ND	ND	4.98E+00
Arsenic	7440-38-2	ND	ND	ND	3.06E+00
Barium	7440-39-3	ND	ND	ND	5.61E+00
Beryllium	7440-41-7	ND	ND	ND	3.68E-01
Bismuth	7440-69-9	ND	ND	ND	8.54E+00
Boron	7440-42-8	ND	ND	ND	4.42E-01
Cadmium	7440-43-9	ND	ND	ND	4.59E+00
Calcium	7440-70-2	ND	ND	ND	1.64E+00
Chromium	18540-29-9	ND	ND	ND	2.13E+00
Cobalt	7440-48-4	ND	ND	ND	2.41E+00
Copper	7440-50-8	ND	ND	ND	2.60E+00
Iron	7439-89-6	ND	ND	ND	2.28E+00
Lead	7439-92-1	ND	ND	ND	8.47E+00
Lithium	7439-93-2	ND	ND	ND	2.84E-01
Magnesium	7439-95-4	ND	ND	ND	9.94E-01
Manganese	7439-96-5	ND	ND	ND	2.25E+00
Mercury	7439-97-6	ND	ND	ND	8.20E+00
Molybdenum	7439-98-7	ND	ND	ND	3.92E+00
Nickel	7440-02-0	ND	ND	ND	2.40E+00
Potassium	7440-09-7	ND	ND	ND	1.60E+00
Rhodium	7440-16-6	ND	ND	ND	4.21E+00
Selenium	7782-49-2	ND	ND	ND	3.23E+00
Silicon	7440-21-3	ND	ND	ND	1.15E+00
Silver	7440-22-4	ND	ND	ND	4.41E+00
Sodium	7440-23-5	ND	ND	ND	9.40E-01
Strontium	7440-24-6	ND	ND	ND	3.58E+00
Tantalum	7440-25-7	ND	ND	ND	ND
Thallium	7440-28-0	ND	ND	ND	8.35E+00
Tin	7440-31-5	ND	ND	ND	4.85E+00

Table 7-12 Acute Inhalation Exposure Criteria for COPCs in Original Units of Parts per Million (ppm)

Chemical of Potential Concern	CAS Registry Number	AEGL-1[a]	AEGL-2[a]	ERPG-1[b]	Conversion Factor[c]
Tungsten	7440-33-7	ND	ND	ND	7.51E+00
Uranium	7440-61-1	ND	ND	ND	9.73E+00
Vanadium	7440-62-2	ND	ND	ND	2.08E+00
Yttrium	7440-65-5	ND	ND	ND	3.63E+00
Zinc	7440-66-6	ND	ND	ND	2.67E+00
Zirconium	7440-67-7	ND	ND	ND	3.73E+00
	Non-metals and Anions				
Ammonia/Ammonium	7664-41-7	2.50E+01	1.10E+02	2.50E+01	6.96E-01
Bromide	24959-67-9	ND	ND	ND	ND
Chloride	16887-00-6	ND	ND	ND	ND
Cyanide	57-12-5	ND	ND	ND	1.06E+00
Fluoride	16984-48-8	ND	ND	ND	7.76E-01
Hydroxide	14280-30-9	ND	ND	ND	ND
Iodine	7553-56-2	ND	ND	1.00E-01	1.04E+01
Nitrate	14797-55-8	ND	ND	ND	ND
Nitrite	14797-65-0	ND	ND	ND	ND
Phosphate	14265-44-2	ND	ND	ND	ND
Phosphorus	7723-14-0	ND	ND	ND	1.27E+00
Sulfate	14808-79-8	ND	ND	ND	ND
Total sulfur	63705-05-5	ND	ND	ND	1.31E+00
	Criteria Pollutants				
Carbon monoxide	630-08-0	ND	ND	2.00E+02	1.14E+00
Nitrogen dioxide	10102-44-0	5.00E-01	1.20E+01	ND	1.88E+00
Ozone	10028-15-6	ND	ND	ND	1.96E+00
Particulate matter	No CAS #	ND	ND	ND	ND
Sulfur dioxide	7446-09-5	ND	ND	3.00E-01	2.62E+00

ND = No Data available.

[a] Acute exposure guideline level (AEGL-1 and AEGL-2) values (1-hour averaging time) from EPA Region X or from EPA Federal Register, October 30, 1997 (Volume 62, Number 210).

[b] Emergency Response Planning Guidelines (ERPG-1) from http://www.scapa.bnl.gov/scapawl.htm (current as of July 2, 2002).

[c] Conversion Factor, for converting from ppm to mg/m^3, as presented for TEEL-1 values (Rev. 19) from http://tis.eh.doe.gov/web/chem_safety/teel.html. Conversions from ppm to mg/m^3 are performed as follows:

Value in mg/m^3 = Value in ppm x Conversion Factor.

[d] Conversion Factor not used to convert from ppm to mg/m^3 for this COPC; values shown in this table for AEGL-1 and AEGL-2 are in ppm and are from EPA Federal Register, October 30, 1997 (Volume 62, Number 210); comparable values for this COPC in mg/m^3 (shown on Table 7-11) are also shown in the EPA Federal Register for this COPC. Conversion factor shown is from the TEEL web site (see footnote c).

Table 7-13 Toxicity Equivalency Factors (TEFs) Used in Human Health Risk Assessment

Chemical of Potential Concern	CAS Registry Number	2,3,7,8-TCDD Equivalency Factors[a]	Benzo[a]pyrene Equivalency Factors[b]
Dioxin and Furan Compounds (PCDDs/PCDFs)			
1,2,3,4,6,7,8-Heptachlorodibenzo(p)dioxin	35822-46-9	0.01	NA
1,2,3,4,6,7,8-Heptachlorodibenzofuran	67562-39-4	0.01	NA
1,2,3,4,7,8,9-Heptachlorodibenzofuran	55673-89-7	0.01	NA
1,2,3,4,7,8-Hexachlorodibenzo(p)dioxin[c]	39227-28-6	0.1	NA
1,2,3,4,7,8-Hexachlorodibenzofuran	70648-26-9	0.1	NA
1,2,3,6,7,8-Hexachlorodibenzo(p)dioxin[c]	57653-85-7	0.1	NA
1,2,3,6,7,8-Hexachlorodibenzofuran	57117-44-9	0.1	NA
1,2,3,7,8,9-Hexachlorodibenzo(p)dioxin[c]	19408-74-3	0.1	NA
1,2,3,7,8,9-Hexachlorodibenzofuran	72918-21-9	0.1	NA
1,2,3,7,8-Pentachlorodibenzo(p)dioxin	40321-76-4	1.0	NA
1,2,3,7,8-Pentachlorodibenzofuran	57117-41-6	0.05	NA
2,3,4,6,7,8-Hexachlorodibenzofuran	60851-34-5	0.1	NA
2,3,4,7,8-Pentachlorodibenzofuran	57117-31-4	0.5	NA
2,3,7,8-Tetrachlorodibenzo(p)dioxin	1746-01-6	1.0	NA
2,3,7,8-Tetrachlorodibenzofuran	51207-31-9	0.1	NA
Octachlorodibenzo(p)dioxin	3268-87-9	0.0001	NA
Octachlorodibenzofuran	39001-02-0	0.0001	NA
Polychlorinated Biphenyls (PCBs)			
2,2',3,3',4,4',5-Heptachlorobiphenyl	35065-30-6	W	NA
2,2',3,4,4',5,5'-Heptachlorobiphenyl	35065-29-3	W	NA
2,3,3',4,4',5,5'-Heptachlorobiphenyl	39635-31-9	0.0001	NA
2,3,3',4,4',5'-Hexachlorobiphenyl	69782-90-7	0.0005	NA
2,3,3',4,4',5-Hexachlorobiphenyl	38380-08-4	0.0005	NA
2,3,3',4,4'-Pentachlorobiphenyl	32598-14-4	0.0001	NA
2,3',4,4',5,5'-Hexachlorobiphenyl	52663-72-6	0.00001	NA
2,3,4,4',5-Pentachlorobiphenyl	74472-37-0	0.0005	NA
2',3,4,4',5-Pentachlorobiphenyl	65510-44-3	0.0001	NA
2,3',4,4',5-Pentachlorobiphenyl	31508-00-6	0.0001	NA
3,3',4,4',5,5'-Hexachlorobiphenyl	32774-16-6	0.01	NA
3,3',4,4',5-Pentachlorobiphenyl	57465-28-8	0.1	NA
3,3',4,4'-Tetrachlorobiphenyl	32598-13-3	0.0001	NA
3,4,4',5-Tetrachlorobiphenyl	70362-50-4	0.0001	NA
Heavy Polycyclic Aromatic Hydrocarbons (molecular weight >200 g/			
Benzo[a]anthracene	56-55-3	NA	0.1
Benzo[a]pyrene	50-32-8	NA	1.0
Benzo[b]fluoranthene	205-99-2	NA	0.1
Benzo[k]fluoranthene	207-08-9	NA	0.01
Chrysene	218-01-9	NA	0.001
Dibenz[a,h]anthracene	53-70-3	NA	1.0
Indeno[1,2,3-cd]pyrene	193-39-5	NA	0.1

NA = Not Applicable. -- = No Value.

W = Value Withdrawn.

[a] Exposure concentrations are converted to equivalent concentrations of 2,3,7,8-Tetrachlorodibenzo(p)dioxin (2,3,7,8-TCDD) by multiplying the concentration by the toxicity equivalency factor (TEF). TEFs are from WHO 1997, *Meeting on the Derivation of Toxic Equivalency Factors (TEFs) for PCBs, PCDDs, PCDFs, and Other Dioxin-like Compounds for Human Health and Wildlife.*

[b] Exposure concentrations are converted to equivalent concentrations of benzo[a]pyrene by multiplying the concentration by the TEF. Values taken from: EPA 1993a. *Provisional Guidance for Quantitative Risk Assessment of Polycyclic Aromatic Hydrocarbons*, EPA-600-R-93-089.

[c] IRIS reports a slope factor for Hexachlorodibenzo(p)dioxin mixtures; however, this value is not used in the quantitative risk assessment. Instead, these congeners are included in the evaluation of TCDD equivalent concentration.

Table 7-14 Toxicity Values for Human Health Risk Assessment: ROPCs

Radionuclide of Potential Concern	CAS #	ICRP Lung Class [a]	Water Ingestion [b] (risk/pCi)	Food Ingestion [b] (risk/pCi)	Soil Ingestion [b] (risk/pCi)	Inhalation [b] (risk/pCi)	External Radiation to Soil [b] (risk/year per pCi/g soil)	External Radiation for Air Submersion [c] (m^3/Bq-sec)	Isotopes used to Calculate Slope Factor [d]
Actinium-227+D [e]	14952-40-0	S	4.86E-10	6.53E-10	1.16E-09	2.09E-07	3.35E-07	1.34E-15	Ac-227, Th-227 (98.62%), Fr-223 (1.38%), Ra-223, Rn-219, Po-215, Pb-211, Bi-211, Tl-207 (99.73%), Po-211 (0.27%)
Americium-241	14596-10-2	M	1.04E-10	1.34E-10	2.17E-10	2.81E-08	1.36E-08	5.00E-17	Am-241
Americium-243+D [e]	14993-75-0	M	1.08E-10	1.42E-10	2.32E-10	2.70E-08	1.75E-07	6.83E-16	Am-243, Np-239
Antimony-125+D [e]	14234-35-6	M	5.13E-12	7.21E-12	1.32E-11	1.93E-11	3.71E-07	1.50E-15	Sb-125, Te-125m (22.8%)
Cadmium-113m [f]	14336-66-4	F	2.87E-11	3.64E-11	5.11E-11	1.30E-10	1.54E-10	1.29E-18	Cd-113m
Carbon-14 [g]	14762-75-5	M	1.55E-12	2.00E-12	2.79E-12	7.07E-12	4.68E-12	3.66E-20	C-14
Carbon-14 [g]	14762-75-5	G	NA	NA	NA	1.99E-14	NA	3.66E-20	C-14
Cesium-134	13967-70-9	F	4.22E-11	5.14E-11	5.81E-11	1.65E-11	1.37E-06	5.68E-15	Cs-134
Cesium-137+D [e]	10045-97-3	F	3.04E-11	3.74E-11	4.33E-11	1.19E-11	4.97E-07	2.04E-15	Cs-137, Ba-137m (94.6%)
Barium-137m [f]	13981-97-0	NA	Included in slope factor for Cesium-137+D						
Cobalt-60	10198-40-0	M	1.57E-11	2.23E-11	4.03E-11	3.58E-11	2.17E-06	9.63E-15	Co-60
Curium-242	15510-73-3	M	3.85E-11	5.48E-11	1.05E-10	1.51E-08	6.41E-11	2.59E-19	Cm-242
Curium-243	15757-87-6	M	9.47E-11	1.23E-10	2.05E-10	2.69E-08	1.05E-07	4.16E-16	Cm-243
Curium-244	13981-15-2	M	8.36E-11	1.08E-10	1.81E-10	2.53E-08	4.71E-11	2.15E-19	Cm-244
Europium-152	14683-23-9	M	6.07E-12	8.70E-12	1.62E-11	9.10E-11	9.94E-07	4.25E-15	Eu-152
Europium-154	15585-10-1	M	1.03E-11	1.49E-11	2.85E-11	1.15E-10	1.08E-06	4.63E-15	Eu-154
Europium-155	14391-16-3	M	1.90E-12	2.77E-12	5.40E-12	1.48E-11	4.29E-08	1.64E-16	Eu-155
Iodine-129 [h]	15046-84-1	F	1.48E-10	3.22E-10	2.71E-10	6.07E-11	5.24E-09	1.85E-17	I-129
Iodine-129 [h]	15046-84-1	V	NA	NA	NA	1.60E-10	NA	NA	I-129
Neptunium-237+D [e]	13994-20-2	M	6.74E-11	9.10E-11	1.62E-10	1.77E-08	1.87E-07	7.43E-16	Np-237, Pa-233
Nickel-59 [i]	14336-70-0	M	2.74E-13	3.89E-13	7.33E-13	4.66E-13	0.00E+00	0.00E+00	Ni-59
Nickel-59 [i]	14336-70-0	V	NA	NA	NA	2.41E-12	NA	NA	Ni-59
Nickel-63 [i]	13981-37-8	M	6.70E-13	9.51E-13	1.79E-12	1.64E-12	0.00E+00	0.00E+00	Ni-63
Nickel-63 [i]	13981-37-8	V	NA	NA	NA	5.77E-12	NA	NA	Ni-63
Niobium-93m [f]	7440-03-1	M	8.03E-13	1.17E-12	2.31E-12	1.90E-12	3.84E-11	1.92E-19	Nb-93m
Plutonium-238	13981-16-3	M	1.31E-10	1.69E-10	2.72E-10	3.36E-08	5.65E-11	2.28E-19	Pu-238
Plutonium-239	15117-48-3	M	1.35E-10	1.74E-10	2.76E-10	3.33E-08	7.10E-11	2.56E-19	Pu-239
Plutonium-240	14119-33-6	M	1.35E-10	1.74E-10	2.77E-10	3.33E-08	5.51E-11	2.24E-19	Pu-240
Plutonium-241	14119-32-5	M	1.76E-12	2.28E-12	3.29E-12	3.34E-10	1.25E-12	4.89E-21	Pu-241

Table 7-14 Toxicity Values for Human Health Risk Assessment: ROPCs

Radionuclide of Potential Concern	CAS #	ICRP Lung Class [a]	Water Ingestion [b] (risk/pCi)	Food Ingestion [b] (risk/pCi)	Soil Ingestion [b] (risk/pCi)	Inhalation [b] (risk/pCi)	External Radiation to Soil [b] (risk/year per pCi/g soil)	External Radiation for Air Submersion [c] (m^3/Bq-sec)	Isotopes used to Calculate Slope Factor [d]
Plutonium-242	13982-10-0	M	1.28E-10	1.65E-10	2.63E-10	3.13E-08	4.77E-11	1.91E-19	Pu-242
Protactinium-231	14331-85-2	S	1.73E-10	2.26E-10	3.74E-10	4.55E-08	3.13E-08	1.24E-16	Pa-231
Radium-226+D [e]	13982-63-3	M	3.86E-10	5.15E-10	7.30E-10	1.16E-08	1.53E-06	6.74E-15	Ra-226, Rn-222, Po-218, Pb-214 (99.98%), At-218 (0.02%), Bi-214 (99.99%), Po-214 (99.98%), Tl-210 (0.02%)
Radium-228+D [e]	15262-20-1	M	1.04E-09	1.43E-09	2.29E-09	5.23E-09	8.45E-07	3.61E-15	Ra-228, Ac-228
Ruthenium-106+D [e]	13967-48-1	M	4.22E-11	6.11E-11	1.19E-10	1.02E-10	1.90E-07	7.85E-16	Ru-106, Rh-106
Samarium-151	15715-94-3	M	5.55E-13	8.07E-13	1.59E-12	4.88E-12	3.57E-13	1.52E-21	Sm-151
Selenium-79	15758-45-9	F	7.29E-12	9.69E-12	1.60E-11	3.33E-12	6.37E-12	5.39E-20	Se-79
Strontium-90+D [e]	10098-97-2	M	7.40E-11	9.53E-11	1.44E-10	1.13E-10	4.81E-09	2.10E-17	Sr-90, Y-90
Yttrium-90	10098-91-6	S	Included in slope factor for Strontium-90+D						
Technetium-99	14133-76-7	M	2.75E-12	4.00E-12	7.66E-12	1.41E-11	3.54E-11	3.72E-19	Tc-99
Thorium-229+D [e]	15594-54-4	S	5.28E-10	7.16E-10	1.29E-09	2.25E-07	2.68E-07	1.08E-15	Th-229, Ra-225, Ac-225, Fr-221, At-217, Bi-213, Po-213 (97.8%), Tl-209 (2.2%), Pb-209
Thorium-232	7440-29-1	S	1.01E-10	1.33E-10	2.31E-10	4.33E-08	1.42E-10	5.35E-19	Th-232
Tin-126+D [e]	15832-50-5	M	2.72E-11	3.92E-11	7.50E-11	1.01E-10	1.75E-06	7.19E-15	Sn-126, Sb-126m, Sb-126 (14%)
Tritium [j]	10028-17-8	V	5.07E-14	6.51E-14	9.25E-14	5.62E-14	0.00E+00	0.00E+00	H-3
Tritium [j]	10028-17-8	M	1.12E-13	1.44E-13	2.20E-13	1.99E-13	NA	NA	H-3
Uranium-232	14158-29-3	M	2.92E-10	3.85E-10	5.74E-10	1.95E-08	2.33E-10	8.67E-19	U-232
Uranium-233	13968-55-3	M	7.18E-11	9.69E-11	1.60E-10	1.16E-08	2.84E-10	1.09E-18	U-233
Uranium-234	13966-29-5	M	7.07E-11	9.55E-11	1.58E-10	1.14E-08	1.18E-10	4.37E-19	U-234
Uranium-235+D [e]	15117-96-1	M	7.18E-11	9.76E-11	1.63E-10	1.01E-08	1.37E-07	5.43E-16	U-235, Th-231
Uranium-236	13982-70-2	M	6.70E-11	9.03E-11	1.49E-10	1.05E-08	7.10E-11	2.67E-19	U-236
Uranium-238+D [e]	7440-61-1	M	8.71E-11	1.21E-10	2.10E-10	9.35E-09	2.19E-08	9.03E-17	U-238, Th-234, Pa-234m (99.87%), Pa-234 (0.13%)
Zirconium-93	15751-77-6	M	1.11E-12	1.44E-12	2.12E-12	7.29E-12	0.00E+00	0.00E+00	Zr-93

NA = not available.

[a] Lung absorption type recommended by the International Commission on Radiological Protection (ICRP): F = fast (particulate), M = medium (particulate), S = slow (particulate), V = vapor, G = gas.

[b] Cancer slope factors are from Health Effects Assessment Summary Table (HEAST) (EPA 2001b). Slope factors for external exposure to soil have been adjusted for depth in soil (assumed to be 1 cm) by multiplying the infinite source external exposure slope factor by the ratio of the effective dose coefficients at 1 cm and at infinite depth; see Tables III.4 and III.7, respectively, in EPA Federal Guidance Report 12 (EPA 1993b).

Table 7-14 Toxicity Values for Human Health Risk Assessment: ROPCs

Radionuclide of Potential Concern	CAS #	ICRP Lung Class [a]	Water Ingestion [b] (risk/pCi)	Food Ingestion [b] (risk/pCi)	Soil Ingestion [b] (risk/pCi)	Inhalation [b] (risk/pCi)	External Radiation to Soil [b] (risk/year per pCi/g soil)	External Radiation for Air Submersion [c] (m^3/Bq-sec)	Isotopes used to Calculate Slope Factor [d]

[c] External exposure slope factors for air submersion (for morbidity) are from Table 2.3 in EPA Federal Guidance Report 13 (EPA 1999g).

[d] Isotopes used to calculate the slope factors are listed. See footnote e for information regarding "+D" slope factors.

[e] +D slope factors from HEAST include contributions from short-lived daughter products (see far right column for the list of isotopes used to calculate the +D slope factors).

[f] m designates isotopes in a metastable state.

[g] For this isotope, the first row of values listed correspond to ICRP Lung Type of "M" (medium particulate) and the second row of values listed correspond to ICRP Lung Type of "G" (gas).

[h] For radioisotopes of iodine, the values listed for food ingestion represent ingestion of milk; corresponding values for ingestion of nondairy foods would be lower by a factor of approximately 2. Inhalation values are provided both for inhalation of particulate aerosols (with default ICRP lung absorption type F; see first line of values) and inhalation of vapor (ICRP lung absorption type V; see second line of values). Corresponding values for inhalation of methyl iodide vapor are also provided in Federal Guidance Report 13, and are slightly lower than the vapor entries in each case.

[i] The first row of values listed correspond to ICRP Lung Type of "M" (medium particulate) and the second row of values listed correspond to ICRP Lung Type of "V" (vapor).

[j] For tritium, two sets of values are provided for ingestion and inhalation pathways. The values in the first line represent ingestion of H-3 in the form of tritiated water and inhalation of tritiated water vapor, while values in the second line represent ingestion of organically bound tritium and inhalation of H-3 in particulate form (with default ICRP lung absorption type M). The corresponding value for inhalation of H-3 in organically bound gas would be greater than the value for tritiated water vapor by a factor of 2.3, while the value for inhalation of elemental hydrogen gas would be lower by a factor of 10,000.

Table 7-15 Acute Radionuclide Exposure Criteria (AREC) Based on Total Acute Radiation Dose of 100 mrem

Radionuclide of Potential Concern	External CDE [a] (Sv-m^3/Bq-s)	$AREC_E$ [b] (uCi/cm^3)	Inhalation CDE [c] (Sv/Bq)	$AREC_I$ [d] (uCi/cm^3)	$AREC_R$ [e] (uCi/cm^3)	$AREC_M$ [f] (uCi/cm^3)
Actinium-227+D [g]	1.9E-14	4.1E-04	3.6E-04	6.3E-11	6.3E-11	1.44E-12
Americium-241	8.2E-16	9.2E-03	1.2E-04	1.9E-10	1.9E-10	4.27E-12
Americium-243+D [g]	9.9E-15	7.6E-04	1.2E-04	1.9E-10	1.9E-10	4.30E-12
Antimony-125+D [g]	2.0E-14	3.7E-04	3.7E-09	6.0E-06	5.9E-06	1.34E-07
Cadmium-113m [h]	6.9E-18	1.1E+00	4.1E-07	5.5E-08	5.5E-08	1.24E-09
Carbon-14	2.2E-19	3.4E+01	7.8E-13	2.9E-02	2.9E-02	6.53E-04
Cesium-134	7.6E-14	9.9E-05	1.3E-08	1.8E-06	1.8E-06	4.02E-08
Cesium-137+D [g]	2.7E-14	2.8E-04	8.6E-09	2.6E-06	2.6E-06	5.88E-08
Barium-137m [h]	Included in acute radionuclide exposure criterion for Cesium-137+D					
Cobalt-60	1.3E-13	6.0E-05	8.9E-09	2.5E-06	2.4E-06	5.49E-08
Curium-242	5.7E-18	1.3E+00	4.7E-06	4.8E-09	4.8E-09	1.10E-10
Curium-243	5.9E-15	1.3E-03	8.3E-05	2.7E-10	2.7E-10	6.17E-12
Curium-244	4.9E-18	1.5E+00	6.7E-05	3.4E-10	3.4E-10	7.64E-12
Europium-152	5.7E-14	1.3E-04	6.0E-08	3.8E-07	3.8E-07	8.55E-09
Europium-154	6.1E-14	1.2E-04	7.7E-08	2.9E-07	2.9E-07	6.61E-09
Europium-155	2.5E-15	3.0E-03	1.1E-08	2.0E-06	2.0E-06	4.57E-08
Iodine-129	3.8E-16	2.0E-02	4.7E-08	4.8E-07	4.8E-07	1.09E-08
Neptunium-237+D [g]	1.0E-14	7.2E-04	1.5E-04	1.5E-10	1.5E-10	3.51E-12
Nickel-59	0.0E+00	0.0E+00	2.5E-10	9.1E-05	9.1E-05	2.06E-06
Nickel-63	0.0E+00	0.0E+00	6.2E-10	3.6E-05	3.6E-05	8.23E-07
Niobium-93m [h]	4.4E-18	1.7E+00	8.7E-10	2.6E-05	2.6E-05	5.90E-07
Plutonium-238	4.9E-18	1.5E+00	1.1E-04	2.1E-10	2.1E-10	4.83E-12
Plutonium-239	4.2E-18	1.8E+00	1.2E-04	1.9E-10	1.9E-10	4.41E-12
Plutonium-240	4.8E-18	1.6E+00	1.2E-04	1.9E-10	1.9E-10	4.41E-12
Plutonium-241	7.3E-20	1.0E+02	2.2E-06	1.0E-08	1.0E-08	2.30E-10
Plutonium-242	4.0E-18	1.9E+00	1.1E-04	2.0E-10	2.0E-10	4.61E-12
Protactinium-231	1.7E-15	4.4E-03	2.3E-04	9.7E-11	9.7E-11	2.21E-12
Radium-226+D [g]	8.9E-14	8.5E-05	2.3E-06	9.7E-09	9.7E-09	2.20E-10
Radium-228+D [g]	4.8E-14	1.6E-04	1.3E-06	1.7E-08	1.7E-08	3.87E-10
Ruthenium-106+D [g]	1.0E-14	7.2E-04	3.2E-08	7.1E-07	7.1E-07	1.61E-08

Table 7-15 Acute Radionuclide Exposure Criteria (AREC) Based on Total Acute Radiation Dose of 100 mrem

Radionuclide of Potential Concern	External CDE [a] (Sv-m^3/Bq-s)	$AREC_E$ [b] (uCi/cm^3)	Inhalation CDE [c] (Sv/Bq)	$AREC_I$ [d] (uCi/cm^3)	$AREC_R$ [e] (uCi/cm^3)	$AREC_M$ [f] (uCi/cm^3)
Samarium-151	0.0E+00	0.0E+00	8.1E-09	2.8E-06	2.8E-06	6.32E-08
Selenium-79	3.0E-19	2.5E+01	1.8E-09	1.3E-05	1.3E-05	2.89E-07
Strontium-90+D [g]	2.0E-16	3.8E-02	6.7E-08	3.4E-07	3.4E-07	7.64E-09
Yttrium-90	Included in acute radionuclide exposure criterion for Strontium-90+D					
Technetium-99	1.6E-18	4.6E+00	2.3E-09	1.0E-05	1.0E-05	2.27E-07
Thorium-229+D [g]	1.5E-14	5.0E-04	4.7E-04	4.8E-11	4.8E-11	1.09E-12
Thorium-232	8.7E-18	8.6E-01	3.1E-04	7.2E-11	7.2E-11	1.65E-12
Tin-126+D [g]	9.6E-14	7.8E-05	2.7E-08	8.2E-07	8.1E-07	1.85E-08
Tritium	3.3E-19	2.3E+01	1.7E-11	1.3E-03	1.3E-03	2.96E-05
Uranium-232	1.4E-17	5.3E-01	4.0E-06	5.6E-09	5.6E-09	1.27E-10
Uranium-233	1.6E-17	4.6E-01	2.2E-06	1.0E-08	1.0E-08	2.37E-10
Uranium-234	7.6E-18	9.8E-01	2.1E-06	1.1E-08	1.1E-08	2.40E-10
Uranium-235+D [g]	7.7E-15	9.7E-04	2.0E-06	1.1E-08	1.1E-08	2.60E-10
Uranium-236	5.0E-18	1.5E+00	2.0E-06	1.1E-08	1.1E-08	2.55E-10
Uranium-238+D [g]	1.2E-15	6.4E-03	1.9E-06	1.2E-08	1.2E-08	2.68E-10
Zirconium-93	0.0E+00	0.0E+00	2.3E-08	1.0E-06	1.0E-06	2.28E-08

[a] Committed dose equivalent (CDE) for external exposure from Federal Guidance Report 12. CDE for +D radionucides calculated as the sum of the product of the CDE and decay frequency for each daughter radionuclide in the decay chain.

[b] Acute radionuclide exposure criteria for external exposure.

[c] Committed dose equivalent for inhalation from Federal Guidance Report 11. CDE for +D radionucides calculated as the sum of the product of the CDE and decay frequency for each daughter radionuclide in the decay chain.

[d] Acute radionuclide exposure criteria for inhalation exposure.

[e] Combined acute radionuclide exposure criteria for both external exposure and inhalation for individual radionuclides of potential concern (ROPCs).

[f] Combined acute radionuclide exposure criteria for both external exposure and inhalation corrected for total 100 mrem dose from all ROPCs ($AREC_R$/44).

[g] +D values include contributions from short-lived daughter products (see list of daughter products on Table 7-14).

[h] The "m" designates radionuclides in the metastable state.

Figure 7-1 Human Health Conceptual Exposure Model

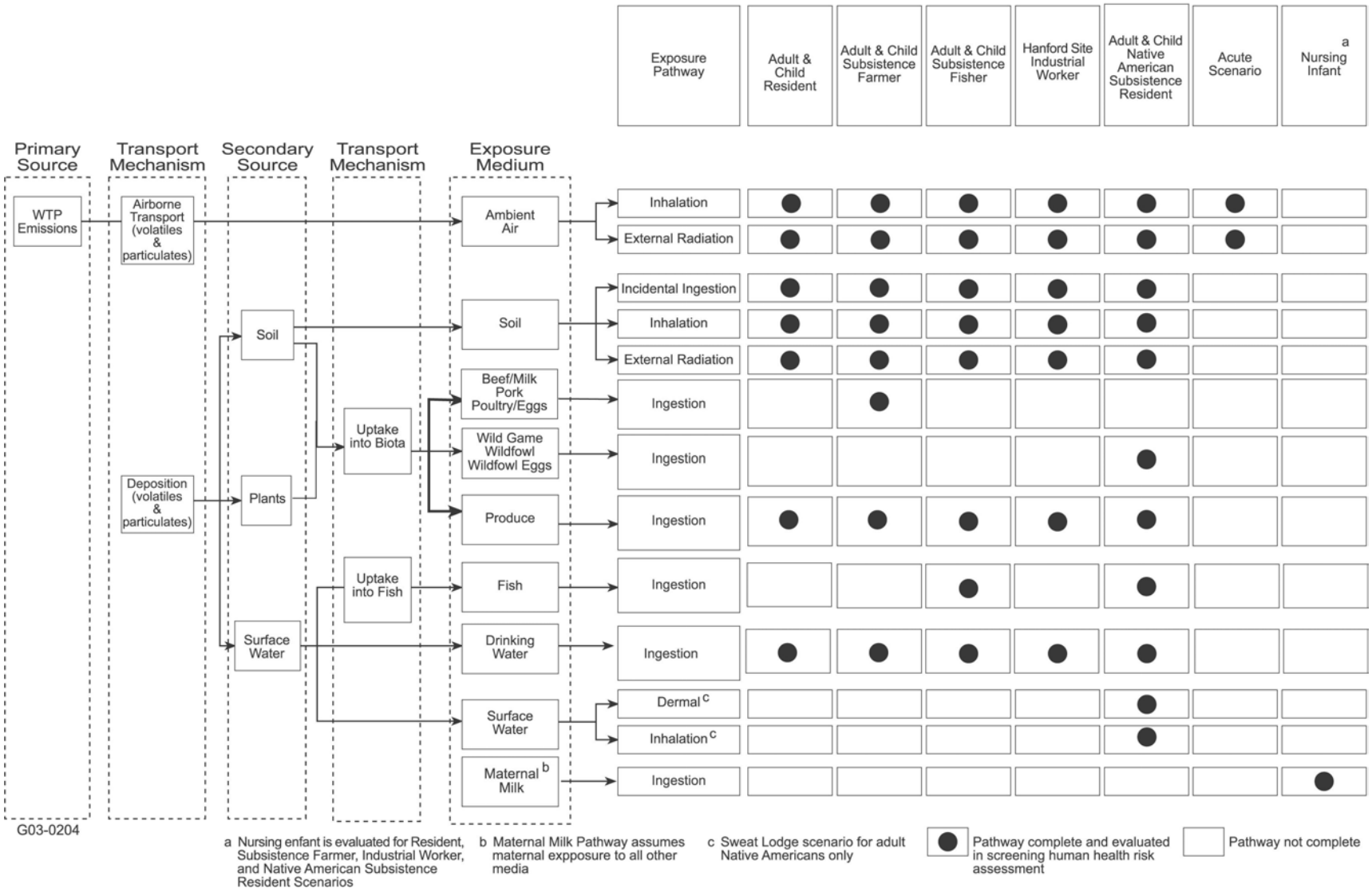


Figure 7-2 Locations of Potential Human Receptors including Potentially Sensitive Receptors

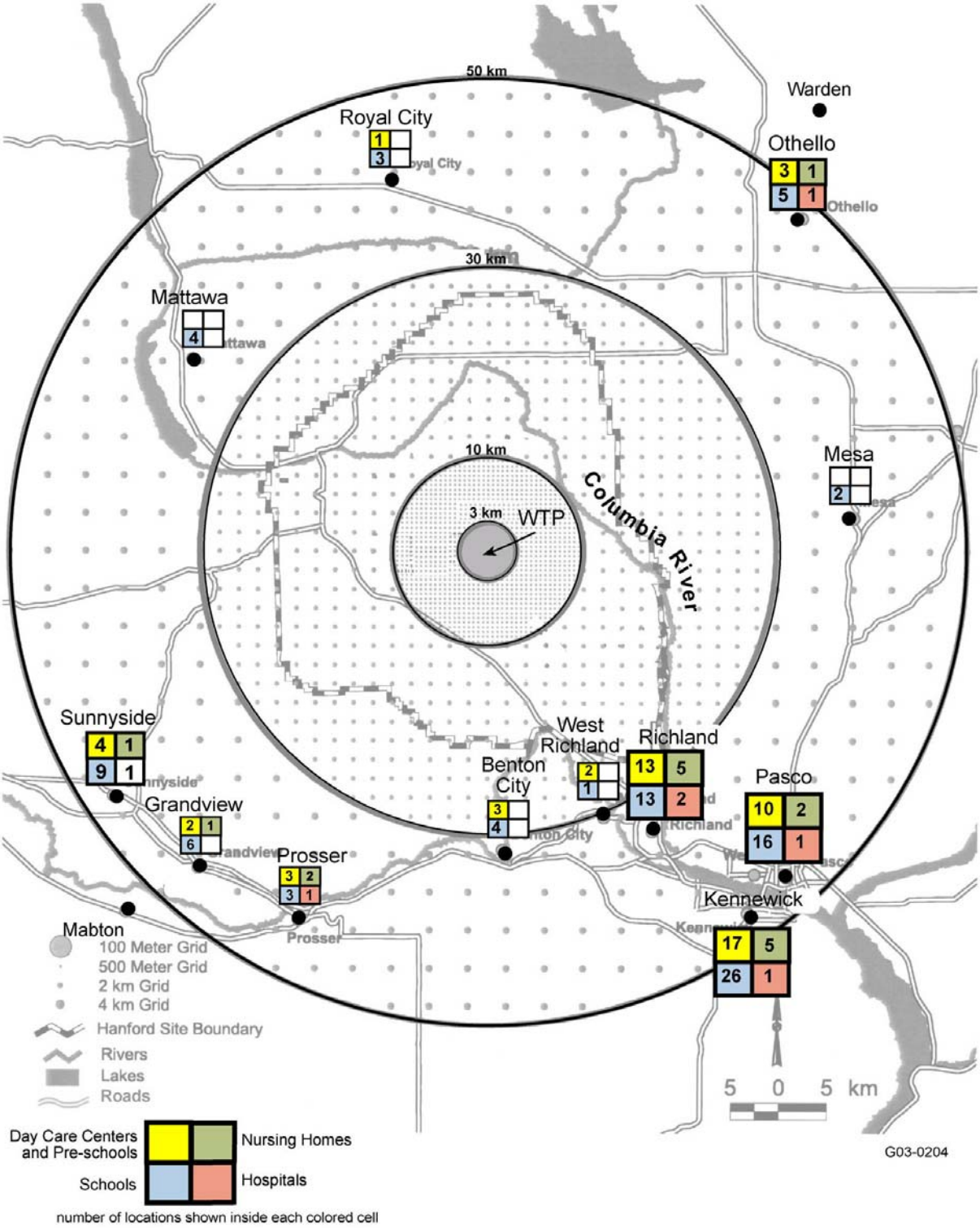
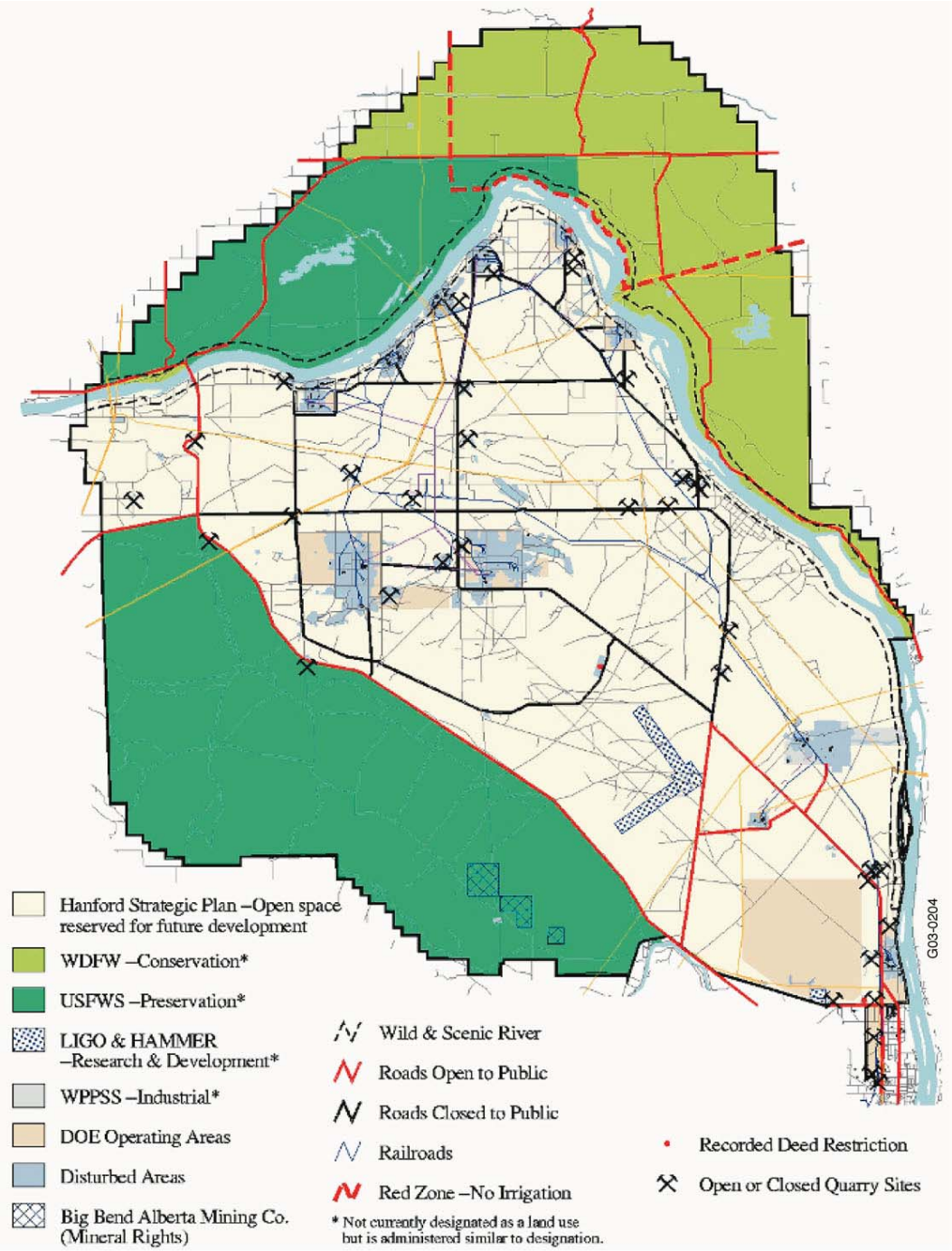


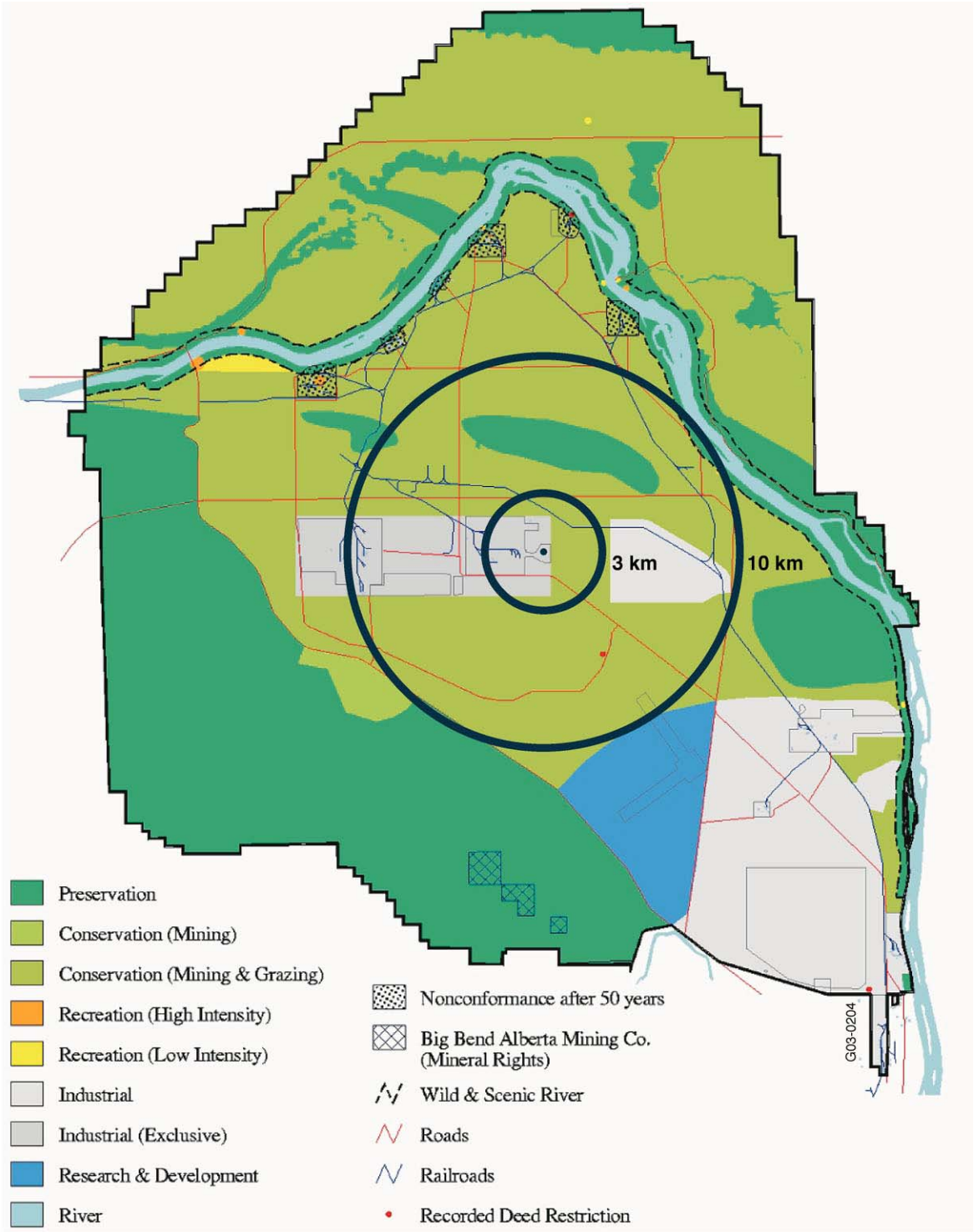
Figure 7-3 Hanford Site Existing Land Use Map - 1996



BHI:rpp 04/23/98 clup/noactionalt.aml Database: 07-DEC-1998

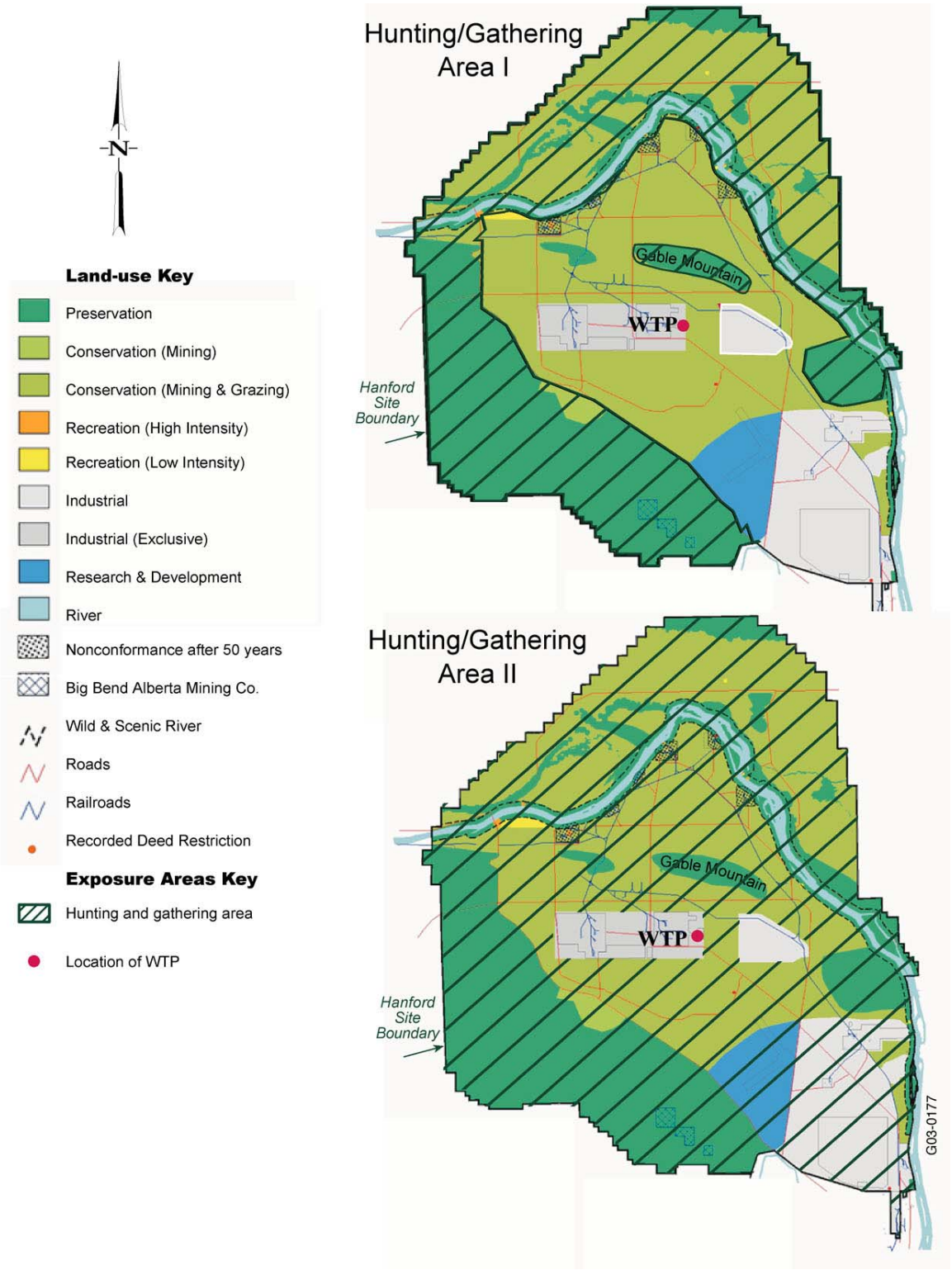
WDFW	Washington Department of Fish and Wildlife
USFWS	U.S. Fish and Wildlife Service
LIGO	Laser Interferometer Gravitational Wave Observatory
HAMMER	Hazardous Materials Management and Emergency Response
WPPSS	Washington Public Power Supply System

Figure 7-4 Hanford Site Projected Land Use - 2046



BHI:rpp 04/23/98 clup/prefalt.aml Database: 07-DEC-1998

Figure 7-5 Native American Subsistence Resident Hunting and Gathering Areas



Contents

8 Screening-Level Ecological Risk Assessment 8-1

8.1 Problem Formulation 8-1
8.1.1 Ecological Conceptual Exposure Model 8-1
8.1.2 Ecological Characterization 8-2
8.1.3 Receptor Identification 8-11
8.1.4 Assessment Endpoints 8-28

8.2 Exposure Assessment 8-28
8.2.1 Diet 8-30
8.2.2 Exposure Point Concentrations in Abiotic Media 8-31
8.2.3 Quantification of Exposure at the Onsite, Offsite, and Gable Mountain Maxima (Terrestrial Receptors) 8-31
8.2.4 Quantification of Exposure at the Columbia River Maximum (Aquatic Receptors) 8-44
8.2.5 Exposure Variables 8-58

8.3 Effects Assessment Calculations 8-68
8.3.1 Toxicity Reference Values for Terrestrial Receptors 8-69
8.3.2 Toxicity Reference Values for Aquatic Receptors 8-71
8.3.3 Toxicity Equivalence Factors for Dioxins, Dibenzofurans, and PCBs 8-72

8.4 Risk Characterization 8-73
8.4.1 Terrestrial Receptors 8-73
8.4.2 Aquatic Receptors 8-74
8.4.3 Hazard Index 8-75

8.5 Reporting of Major Ecological Risk Findings 8-75

8.6 Uncertainty in Ecological Risk Assessment 8-76
8.6.1 Problem Formulation 8-77
8.6.2 Exposure Assessment 8-77
8.6.3 Effects Assessment 8-78
8.6.4 Risk Characterization 8-79
8.6.5 Summary of Uncertainties 8-79

8.7 Summary for Screening-Level Ecological Risk Assessment 8-79

Tables

Table 8-1 Policy Goals, Ecological Assessment Endpoints, Measures, and Decision Rules for 200 Area and Surroundings 8-80

Table 8-2 Toxicity Equivalence Factors for Chlorinated Dioxins, Chlorinated Dibenzofurans, and Polychlorinated Biphenyls 8-84

Figures

Figure 8-1 Ecological Conceptual Exposure Model 8-85

Figure 8-2 Recreation and Wildlife Areas and the Hanford Reach 8-86

Figure 8-3 Vegetation Types of the Hanford Site 8-87

Figure 8-4 Selected Raptor Nesting and Perching Locations on the Hanford Site 8-88

Figure 8-5 WTP Areas Vegetation Types (Simplified) 8-89

Figure 8-6 Fall Chinook Salmon Spawning Areas Along the Columbia River 8-90

Figure 8-7 Trophic Levels and Receptor Species Considered in the 200 Area and Vicinity Terrestrial Conceptual Exposure Model 8-91

Figure 8-8 Trophic Levels and Receptor Species in the Columbia River Aquatic Conceptual Exposure Model 8-92

Figure 8-9 Trophic Levels and Selected Receptor Species (names in bold) Considered in the 200 Area and Vicinity Terrestrial Conceptual Exposure Model 8-93

Figure 8-10 Trophic Levels and Selected Receptor Species (names in bold) in the Columbia River Aquatic Conceptual Exposure Model 8-94

Figure 8-11 Relationship Between Sources and Biotransfer Factors for Calculating Terrestrial Exposures 8-95

Figure 8-12 Relationship Between Sources and Biotransfer Factors for Calculating Aquatic Exposures 8-96

Figure 8-13 Exclusive Diets for Omnivores 8-97

Figure 8-14 Exclusive Diets for Carnivores 8-98

8 Screening-Level Ecological Risk Assessment

The screening-level ecological risk assessment (SLERA) incorporates four fundamental components of the ERA process: (1) problem formulation, (2) exposure assessment, (3) effects assessment, and (4) risk characterization. Selection of chemicals of potential concern (COPCs) and radionuclides of potential concern (ROPCs) (discussed in section 4 of this work plan), quantification of emissions (discussed in section 5), and dispersion modeling (discussed in section 6) feed critical information to this process. The SLERA is intended to meet three goals identified in US Environmental Protection Agency (EPA) draft guidance (EPA 1999a): the SLERA (1) provides the maximum, most conservative exposure estimate, (2) "identifies which pathways are driving risk specific to a COPC and receptor", and (3) "allows risk management efforts to be prioritized." These methods will be used for both the pre-demonstration test risk assessment (PRA) and the final risk assessment (FRA), which will differ in that the PRA will use soil and surface water concentrations modeled from estimated stack emissions, whereas the FRA will use soil and surface water concentrations that are based on the results of a performance demonstration test using surrogate waste as well as estimated stack emissions. As indicated in section 2, the Hanford Tank Waste Treatment and Immobilization Plant (WTP) recognizes that there are significant limitations to using a limited performance demonstration test to predict the ability of the melter offgas systems to control emissions. However, proven thermal treatment approaches will be used to select test constituents that are representative of the worst-case constituents and operating conditions so that a conservative estimate of performance is obtained.

8.1 Problem Formulation

This section of the risk assessment work plan (RAWP) focuses on the conceptual exposure model (section 8.1.1), ecological setting (section 8.1.2), ecological receptor identification (section 8.1.3), and assessment/measurement endpoints (section 8.1.4). Each is defined below.

8.1.1 Ecological Conceptual Exposure Model

A conceptual exposure model has been developed that identifies ecological receptors and complete exposure pathways (that is, exposure scenarios). The conceptual exposure model is shown as Figure 8-1. The end product of the conceptual exposure model is the identification of exposure scenarios that are defined by exposure pathways and potentially exposed populations. The conceptual model was developed from information obtained from EPA (1999a) and *Screening Assessment and Requirements for a Comprehensive Assessment: Columbia River Comprehensive Impact Assessment* (DOE-RL 1998).

The conceptual model focuses on identifying complete exposure pathways for potentially exposed receptor populations. An exposure pathway is the means through which an organism comes in contact with a chemical or radionuclide in the environment. Exposure pathways are determined by environmental conditions (such as location of habitat and home ranges as well as wind speed/direction), the potential for chemical migration among media (such as air, soil, or surface water), and the behavior and diet of potentially exposed plant and animal populations. Although several potential pathways may exist, not all pathways may be complete. For a pathway to be complete, all of the following four factors must exist:

1. A source of COPC or ROPC release into the Hanford Site environment
2. A release and transport mechanism (such as deposition to soil) that moves the COPC or ROPC from the source, such as stack, to other locations in the environment

3 A point of contact with a contaminated medium

4 An exposure route to the receptor, such as ingesting or inhaling affected media

These four factors were considered in the conceptual model. The sources of COPC and ROPC release are the stack and process cell emissions from the WTP (section 3). Air dispersion (section 6.1), soil and surface water accumulation (sections 6.2 and 6.3, respectively), potential points of contact, and complete exposure pathways are identified to formulate exposure scenarios that will be the focus of the quantitative risk assessment.

8.1.2 Ecological Characterization

The ecological setting and habitats at Hanford determine what receptors will be potentially exposed and the important complete pathways. For example, deserts and water bodies have different receptors and exposure pathways. The Hanford Site and adjacent region are a shrub-steppe vegetation zone with a shrub overstory and an understory of grasses. Ecological resources at the Hanford Site are extensive, diverse, and important as explained by Neitzel and others (1998). Because the Hanford Site has not been farmed or grazed for over 50 years, it has become a refuge for a variety of plant and animal species (Gray and Rickard 1989) containing one of the largest remaining undisturbed shrub-steppe ecosystems in Washington State (see Appendix C1 for a listing of plants and animals observed on the site). About 665 km^2 (257 mi^2) of undeveloped lands located on site (almost half of the total area of the Hanford Site) have been designated as ecological study areas or refuges (Figure 8-2).

8.1.2.1 Physiographic Setting

The Hanford Site lies within the Intermountain Semidesert Province (USFS 1994). This province includes the plains and plateaus of the Columbia-Snake River Plateau and the Wyoming Basin. The climate is cool, the average temperature being about 50 °F, and semi-arid, with the average annual precipitation ranging from approximately 6 inches to 20 inches across the province from west to east. At the Hanford Site, the average annual precipitation totals about 6 inches. This precipitation is evenly distributed throughout the fall, winter, and spring months, with little precipitation during the summer months.

The Hanford Site lies within the semi-arid Pasco Basin of the Columbia Plateau in southeastern Washington State and occupies an area of approximately 1450 km^2 (560 mi^2) north of the confluence of the Yakima River with the Columbia River. The Pasco Basin lies within the southwest corner of the larger Columbia Basin. The Hanford Site occupies approximately one-third of the land area within the Pasco Basin. The Columbia River flows through the northern part of the Hanford Site and forms part of the Hanford Site's eastern boundary after turning south. The Yakima River runs near the southern boundary. Rattlesnake Mountain, Yakima Ridge, and Umtanum Ridge form the southwestern and western boundaries of the Hanford Site. The Saddle Mountains form the northern boundary. Adjoining lands to the west, north, and east are principally range and agricultural land. The Hanford Site exhibits low relief, ranging from 120 m above mean sea level (MSL) at the Columbia River to 230 m MSL in the vicinity of the WTP sites.

The 200 Area and WTP site are located on the Central Plateau. The Central Plateau is characterized by generally low-relief hills with deeply incised river drainages. Gable Butte and Gable Mountain (small east to west ridges) are prominent features of the Central Plateau.

8.1.2.2 Regional Ecology

The region has been characterized as shrub-steppe. Shrub-steppe vegetation is dominated by a shrub overstory with an understory of grasses (Daubenmire 1970). Nonindustrialized lands on the Hanford Site have not been farmed or grazed by livestock for over 50 years, allowing it to serve as a refuge for a variety of plant and animal species (Gray and Rickard 1989). As stated earlier, approximately 665 km^2 (257 mi^2) of undeveloped lands within the Hanford Site have been designated as refuges or ecological study areas. Shrub-steppe is considered a priority habitat by the state of Washington because of its importance to wildlife species of concern (Neitzel and others 1998). The National Biological Service has identified native shrub and grassland steppes in Washington and Oregon as endangered ecosystems (DOE 1999a).

Biodiversity on the Hanford Site is enhanced by the large, relatively undisturbed tract of native shrub-steppe habitat and by the Hanford Reach, which is a stretch of the Columbia River below the Priest Rapids Dam (DOE 1999a). Additional factors influencing biodiversity include topographic features such as Rattlesnake Mountain, Gable Butte, Gable Mountain, and the presence of a variety of soils ranging from sand to silty and sandy loam. Unique terrestrial habitats include basalt outcrops, scarps (cliffs), scree slopes, and sand dunes. Aquatic habitats are mostly associated with the Columbia River and include open water habitat, wetlands, and riparian areas (Figure 8-3).

Cold Creek and a tributary, Dry Creek, are ephemeral streams within the Yakima River drainage system that roughly parallel State Route 240 through the Hanford Site. Both streams drain areas to the west of Hanford Site. Surface flow, when it occurs, infiltrates and disappears into the surface sediments in the western portion of the Hanford Site. Rattlesnake Springs, located on the western portion of the Hanford Site, forms a small surface stream that flows for about 3 km (1.8 mi) before disappearing into the ground.

West Lake is located north of the 200 East Area (Figure 8-2) and is recharged from groundwater (Neitzel and others 1998). West Lake has not received direct effluent discharges from any Hanford Site facilities. This water body is created by an elevated water table within a low surface area south of Gable Mountain. This artificially elevated water table occurs under much of the Hanford Site, reflecting the augmented recharge from Hanford Site operations. Currently, West Lake has been reduced to a collection of small pools and mudflats (Neitzel and others 1998).

Gable Mountain Pond (also to the north of the 200 East Area but south of West Lake) and the B Pond System (immediately east of the 200 East Area) received cooling water discharges from several facilities at the Hanford Site (Rogers and Rickard 1977). These artificial water bodies, formed by the wastewater discharges from the operation of the separation facilities, were decommissioned and covered with soil.

Vegetation

The Hanford Site is a shrub-steppe ecosystem characterized by bunchgrasses and sagebrushes (Figure 8-3). This ecosystem is also referred to as high desert, northern desert shrub, or desert scrub (Franklin and Dyrness 1973). Prior to settlement by western Europeans, the dominant plant in the area was big sagebrush (*Artemisia tridentata*) with an understory of perennial bunchgrasses, especially Sandberg's bluegrass (*Poa sandbergii*) and bluebunch wheatgrass (*Agropyron spicatum*). Following settlement in the early 1800s, grazing and agriculture disrupted the native vegetation and opened the way for invasive species such as Russian thistle (*Salsola kali*) and cheatgrass (*Bromus tectorum*). Cheatgrass is now dominant in fields that were cultivated prior to the establishment of the Hanford Site. Cheatgrass also is well established on rangelands at elevations less than 244 m (800 ft) (DOE 1999a). Establishment

of the Hanford Site as a nuclear complex in 1943 resulted in the creation of a secured area of mostly undeveloped land with scattered, small industrial facilities. Consequently, the Hanford Site is one of a small number of remaining shrub-steppe tracts in Washington State that is relatively undisturbed. Wildfire is a common occurrence and can significantly alter the shrub component of the vegetation. The most recent extensive fire on the Hanford Site was in 2000 and burned over 660 km^2 (250 mi^2). Trees were planted and irrigated on most of the pre-1943 farms to provide windbreaks and shade. Some of these trees have persisted and serve as nesting platforms for several species of birds (hawks, owls, ravens, magpies, and great blue herons) and as night roosts for wintering bald eagles (DOE 1999a) (Figure 8-4).

Almost 600 species of plants have been identified on the Hanford Site (Neitzel and others 1998). The dominant plants are big sagebrush, rabbitbrush, cheatgrass, and Sandberg's bluegrass, with cheatgrass providing half of the total plant cover on much of the Hanford Site. Cheatgrass and Russian thistle are annuals introduced to the United States from Eurasia in the late 1800s that invade disturbed areas. Big sagebrush and bitterbrush (*Purshia* spp.) are widely spaced and usually provide less than 20 % canopy cover. Bitterbrush provides important browse for the resident mule deer herd. The dominant understory plants are grasses, especially cheatgrass, Sandberg's bluegrass, Indian ricegrass (*Orysopsis hymenoides*), June grass (*Koeleria macrantha*), and needle-and-thread grass (*Stiba thurberiana*).

Central Plateau. The Central Plateau and surrounding areas have been identified as predominantly shrub-steppe (Neitzel and others 1998 and Duranceau 1995). This designation includes communities dominated by big sagebrush and bitterbrush (*Purshia tridentata*) with an understory of cheatgrass or Sandberg's bluegrass. Past wildfires in the Central Plateau have opened up some areas, creating a mosaic of shrub- and grass-dominated areas. More than 100 species of plants have been identified on the Central Plateau (Cushing 1992). Common species include big sagebrush, rabbitbrush (*Chrysothamnus nauseous*), cheatgrass, and Sandberg's bluegrass. Cheatgrass provides approximately 50 % of the total plant cover. Cheatgrass also is common where native plant communities have been disturbed by wildfire or past construction activities. Three vegetation subtypes occurring in the vicinity of the 200 West Area of the Central Plateau are sagebrush and Sandberg's bluegrass, sagebrush and needle-and-thread grass, and spiny hopsage and Sandberg's bluegrass.

The WTP site in the 200 East Area and the immediately surrounding area are approximately 40 % big sagebrush and rabbitbrush (Figure 8-5). Another 20 % is dominated by Russian thistle, with the remainder being disturbed vegetation or bare gravel (PNL 1994). Other vegetation in the 200 Area includes introduced perennial grasses planted to revegetate and stabilize disturbed areas such as waste burial grounds. Siberian wheatgrass (*Agropyron sibericum*) has been used extensively and has proven to be drought tolerant and better adapted to sandy soil than other species (Stegen 1993).

Wetland and riparian species, such as cattail, reeds, and various trees, such as willow (*Salix* spp.), cottonwood (*Populus* spp.), and Russian olive (*Eleagnus angustifolia*), are established around some of the man-made ditches and ponds in the area (Neitzel and others 1998). The decommissioning of some facilities has eliminated the supply of industrial water feeding some ponds. Without this water supply, the artificially supported wetland habitats have also been eliminated.

Introduced perennial grasses (that is, Siberian wheatgrass) have been used extensively in the Central Plateau to revegetate and stabilize waste burial grounds against wind and water erosion (DOE 1999a). Siberian wheatgrass has proven to be drought tolerant and better adapted to sandy soils than other cultivars used in Central Plateau revegetation efforts (WHC 1993).

Columbia River. The two major vegetation types occurring along the Hanford Reach of the Columbia River are riparian and upland (NPS 1994). Riparian habitats are found along the shoreline, slack water and slough areas, and on islands in the river. Riparian vegetation at these locations includes both woody and herbaceous species maintained by the high water table immediately adjacent to the river. Common plant species occurring in the riparian zone include black cottonwood, mulberry, willow, dogbane, and a variety of grasses and forbs (Neitzel and others 1998). Sensitive habitats within the riparian zone include islands and cobbled shorelines occurring as a narrow band along the Hanford Reach. Plant species occurring in these areas include perennial, summer-blooming forbs adapted to seasonal changes in water levels (NPS 1994). Upland habitats along the Hanford Reach are composed of shrub-steppe vegetation similar to that found on the Central Plateau (DOE 1999a). Sand dunes are often colonized by needle-and-thread grass on the north-facing slopes and a mixture of shrubs and forbs at the crest (Sackschewsky and others 1992).

In summary, special topographic features include Gable Butte and Gable Mountain north of the Central Plateau and an extensive series of active sand dunes in the southeast portion of the area. The dominant plant communities are cheatgrass, sagebrush-bitterbrush and Sandberg's bluegrass, sagebrush and cheatgrass, Sandberg's bluegrass, and riparian plant communities (Sackschewsky and others 1992). Depending on the location, many of the terrestrial plants occurring in this area are the same as those found in the adjacent Columbia River and Central Plateau. Big sagebrush, bitterbrush, rabbitbrush, cheatgrass, and Sandberg's bluegrass are common species in the 300 and 400 areas in the southeast corner of the Hanford Site (Neitzel and others 1998). Common plants growing in riparian areas along the Columbia River include reed canarygrass, common witchgrass, large barnyard grass, summer-blooming forbs, sandbar willow, poplar, white mulberry, and Russian olive (NPS 1994). Vegetation occurring on scree slopes, outcrops, and scarps on Gable Butte and Gable Mountain is limited to scattered individual and groups of plants. Plant species include squaw currant, bluebunch wheatgrass, rock buckwheat, and thyme buckwheat. Rigid sagebrush (*Artemesia rigida*) occurs at the Hanford Site only on Gable Mountain and Umtanum Ridge (Downs and others 1993).

Wildlife

Almost 300 species of terrestrial vertebrates have been observed at the Hanford Site. This number includes 41 species of mammals, 246 species of birds, 4 species of amphibians, and 9 species of reptiles (Neitzel and others 1998).

Mammals. Large herbivorous mammal species that are found on the Hanford Site include mule deer, elk, and white-tailed deer. Mule deer, with an onsite herd of several hundred, occur just about everywhere on the Hanford Site but are most often found near the Columbia River. White-tailed deer (*Odocoileus virginianus*) and elk (*Cervus elaphus*) began to appear on the Hanford Site during the early 1970s. White-tailed deer tend to remain in the riparian habitats along the rivers, while elk generally are restricted to the Fitzner-Eberhardt Arid Lands Ecology Reserve (FEALE Reserve). Elk frequently move off the reserve to private lands to the north and west, particularly during late spring, summer, and early fall. This herd grew from an estimated 8 animals in 1975 to almost 600 animals in 1997 (Neitzel and others 1998).

Black-tailed jackrabbits (*Lepus californicus*) are common on the Hanford Site and are most often found in mature stands of sagebrush. Cottontail rabbits (*Sylvilagus* spp.) also are common but are more closely associated with the developed areas of the Hanford Site. Townsend's ground squirrels (*Spermophilus townsendii mollis*) occur in colonies of various sizes scattered across the Hanford Site. The most abundant mammal inhabiting the site is the Great Basin pocket mouse (*Perognathus parvus*). This mouse occurs all across the Columbia River plain and on the slopes of the surrounding ridges. Other small

mammals include the western harvest mouse (*Reithrodontomys megalotis*), grasshopper mouse (*Onychomys leucogaster*), deer mouse (*Peromyscus maniculatus*), house mouse (*Mus musculus*), mountain vole (*Microtus montanus*), sagebrush vole (*Lagurus curtatus*), brushy-tailed woodrat (*Neotoma cinerea*), Northern pocket gopher (*Thomomys talpoides*), vagrant shrew (*Sorex vagrans*), and Merriam's shrew (*Sorex merriami*) (DOE 1999a).

Common mammalian predators are the coyote (*Canis latrans*), bobcat (*Lynx rufus*), and badger (*Taxidea taxus*). These carnivores feed primarily on the several species of small mammals found on the Hanford Site, including the Great Basin pocket mouse, western harvest mouse, grasshopper mouse, deer mouse, house mouse, Townsend's ground squirrel, mountain vole, sagebrush vole, black-tailed jackrabbit, brushy-tailed woodrat, and northern pocket gopher. Of these small mammals, the Great Basin pocket mouse is the most abundant. Coyotes have been a major predator of Canada goose (*Branta canadensis leucopareia*) nests on Columbia River islands, especially upstream from the abandoned Hanford townsite (DOE 1999a).

Up to 14 species of bats are known or have the potential to be present on the Hanford Site or in the vicinity. They include the pallid bat (*Antrozous pallidus*), hoary bat (*Lasiurus cinereus*), silver-haired bat (*Lasionycteris noctivagan*), little brown bat (*Myotis lucifugus*), California brown bat (*Myotis californicus*), Yuma brown bat (*Myotis yamanensis*), and Pacific western big-eared bat (*Plecotus townsendii*) (Fitzner and Gray 1991). The pallid bat, which roosts in abandoned buildings, is considered to be the most abundant. All of these bat species feed on flying insects.

Birds. Nearly 250 species of birds occur on or near the Hanford Site as year-round residents, seasonal residents, migrants, and accidentals (Neitzel and others 1998).

Eleven raptors have been documented as nesting on the Hanford Site. These include the northern harrier (*Circus cyaneus*), red-tailed hawk (*Buteo jamaicensis*), Swainson's hawk (*Buteo swainsoni*), golden eagle (*Aquila chrysaetos*), prairie falcon (*Falco mexicanus*), American kestrel (*Falco sparverius*), barn owl (*Tyto alba*), great horned owl (*Bubo virginianus*), long-eared owl (*Asio otus*), short-eared owl (*Asio flammeus*), and burrowing owl (*Athene cunicularia*) (Fitzner and Gray 1991, Rickard and others 1988). Raptors use a variety of habitats for nesting and foraging on the Hanford Site. Nesting habitats include outcrops, cliffs, trees, marshes, fields, and utility towers. Depending on raptor species, prey may include small mammals, birds, reptiles such as snakes, and insects.

Several songbird species occur in the shrub-steppe vegetation. These include the western meadowlark (*Sturnella neglecta*), grasshopper sparrow (*Ammodramus savannarum*), horned lark (*Eremophila alpestris*), and sage thrasher (*Oreoscoptes montanus*) (Downs and others 1993). The western meadowlark and horned lark are the most abundant breeding bird species within the shrub-steppe habitat (Rickard and Poole 1989). These two species nest on the ground in the open, while other species (such as sage sparrow, sage thrasher, and loggerhead shrike) require sagebrush or bitterbrush as nesting structures.

Common upland game bird species include the chukar partridge (*Alectoris chukar*), California quail (*Callipepla californicus*), and Chinese ring-necked pheasant (*Phasianus colchicus*). Sage grouse (*Centrocercus urophasianus*) and gray partridge (*Perdix perdix*) are less common and are rarely seen. A 1997 inventory conducted by The Nature Conservancy did not record any sage grouse in the sagebrush-steppe habitat of the Fitzner-Eberhardt Arid Lands Ecology (FEALE) Reserve (Neitzel and others 1998). None of the upland birds is native to the area except the sage grouse.

Reptiles and Amphibians. Nine species of reptiles and four species of amphibians are found at the Hanford Site (Neitzel and others 1998). The side-blotched lizard (*Uta stansburiana*) is the most abundant reptile (Neitzel and others 1998). The short-horned lizard (*Phrynosoma douglassii*) and northern sagebrush lizard (*Sceloporous graciosus*) are also common in mature sagebrush habitats with sandy soil. Commonly encountered snakes include the gopher snake (*Pituophis melanoleucus*), yellow-bellied racer (*Coluber constrictor*), and Pacific rattlesnake (*Crotalus viridis*). Less common are striped whipsnakes (*Masticophis taeniatus*) and desert night snakes (*Hyspiglena torquata*). Amphibians on the Hanford Site are associated with riparian habitats located along the Columbia River or other permanent water bodies (Fitzner and Gray 1991). Species include the Great Basin spadefoot toad (*Spea intermontana*), Woodhouses toad (*Bufo woodhouseii*), and the Pacific tree frog (*Hyla regilla*).

Terrestrial Invertebrates. Most of the terrestrial invertebrate species on the Hanford Site are insects and spiders. Butterflies, grasshoppers, and darkling beetles represent some of the more conspicuous insect groups. The populations of all three of these species of insects are subject to seasonal changes and weather variations (Rogers and Rickard 1977). Many of the insect species are important in the food web of birds and mammals found on the Hanford Site. Species like the darkling beetle play an important role in the decomposition process by feeding on decaying plant material, animal feces, fungi, and live plant tissue (Weiss and Mitchell 1992). Spiders are also abundant, especially in the riparian and shrub-steppe habitat (DOE 2001).

The Nature Conservancy has identified nearly 1500 species of insects on the Hanford Site (Hall 1998). The Nature Conservancy identified 41 new species of insects, including 6 new species of bees, 6 new species of flies, 5 new species of leafhopper and planthopper insects, 1 new species of wasp, and 1 new species of beetle (Neitzel and others 1998). The Nature Conservancy focused on the FEALE Reserve, the Wahluke Slope, and along the Columbia River. Consequently, none of these new species has been reported from the 200 Area.

Distribution of Wildlife. Because the habitats of the Central Plateau are considerably different from those near the Columbia River, terrestrial animals are described separately for those locations in the following paragraphs.

Central Plateau: A characterization study of small mammals performed south of the 200 East Area resulted in the following five species being trapped: the Great Basin pocket mouse, deer mouse, northern grasshopper mouse, sagebrush vole, and western harvest mouse (Rogers and Rickard 1977). The Great Basin pocket mouse represented more than 90 % of the individuals caught. Medium- and large-size mammals that may occur in the Central Plateau include rabbits, coyotes, badgers, and mule deer (Rogers and Rickard 1977). Some of these organisms are receptors in the SLERA. Other mammals potentially using areas associated with ponds and ditches in the 200 Area include muskrats, porcupines, and raccoons (DOE 1999a). Many common bird species, such as the western meadowlark and sage sparrow, are likely to occur on the Central Plateau where suitable habitats exist. Thirty-seven species of terrestrial birds were recorded during surveys conducted in the 200 Area in 1986 (Schuler and others 1993).

Unique habitats can be found on Gable Butte and Gable Mountain situated north of the Central Plateau. These unique habitats include basalt outcrops, scarps, and scree slopes. Birds likely to occur in these habitats are the prairie falcon, rock wren, poorwill, and chukar; small mammals include the yellow-bellied marmot and wood rat; reptiles include rattlesnakes, gopher snakes, and horned lizards (Downs and others 1993).

Columbia River: Terrestrial wildlife species use both shoreline riparian and shrub-steppe habitats occurring along the Columbia River and on the islands. Wildlife reported to use the Hanford Reach include 184 species of birds, 36 species of mammals, 9 species of reptiles, and 4 species of amphibians (NPS 1994). The Canada goose uses islands along the Hanford Reach extensively for nesting. Monitoring of nesting geese that use the Hanford Site has been ongoing since 1950. These studies indicate that Canada geese nest more frequently on islands in the downstream reach because of heavy predation by coyotes further upstream (Neitzel and others 1998). Mule deer use the islands and other riparian areas for fawning habitat. Wildlife occurring in shoreline habitat includes 46 species that use willow communities and 49 species that use grass areas (NPS 1994).

The Hanford Reach begins at the foot of Priest Rapids Dam in the northwest portion of the area within a 50 km radius of the WTP stacks. It extends through the Hanford Reservation to the reservoir of McNary Dam, just north of the city of Richland. The Hanford Reach includes a variety of habitat types that encompass habitat types that are also found outside the Hanford Reach but within the 50 km radius. Therefore, biota in and outside of the Hanford Reach are expected to be similar. Evaluating risks wherever the concentration in the Columbia River is highest ensures that all biota in the 50 km radius are protected.

8.1.2.3 Aquatic Ecosystems

Washington State has classified the stretch of the Columbia River that includes the Hanford Reach as Class A, Excellent (Neitzel and others 1998). Class A waters must be suitable for essentially all uses, including raw drinking water, recreation, and wildlife habitat. Water from the Columbia River is used for both irrigation and municipal water supplies. Federal and state drinking water quality standards apply to the Columbia River and are being met (Neitzel and others 1998). Water samples from the Columbia River and three ponds on the Hanford Site are routinely collected and analyzed.

The Columbia River supports an ecosystem of plankton, benthic invertebrates, fish, and other communities. Algae are abundant in the river and provide food for herbivores, such as immature insects, which are then eaten by carnivorous species, such as bass. Aquatic plants in the Hanford Reach include water milfoil, waterweed, pondweed, Columbia yellowcress, watercress, and duckweed. Water milfoil is an aggressive, introduced aquatic plant and is becoming a nuisance in the river. Other aquatic species found in the Hanford Reach include microflora, zooplankton, and benthic invertebrates. Microflora include both sessile types (periphyton) and free-floating types (phytoplankton). Microflora species include diatoms, golden or yellow-brown algae, green algae, blue-green algae, red algae, and dinoflagellates. Dominant zooplankton taxa include *Bosmina*, *Diaptomus*, and *Cyclops*. Benthic invertebrate taxa occurring in the Hanford Reach include insect larvae such as caddisflies, midge flies, and black flies; snails, freshwater sponges, limpets, and crayfish are also present (Neitzel and others 1998).

The Hanford Reach supports over 40 species of fish. The anadromous chinook salmon, sockeye salmon, coho salmon, and steelhead trout use the river to migrate to and from upstream spawning areas. Chinook salmon and steelhead trout also spawn in the Hanford Reach in the fall (Figure 8-6). Shad may also spawn in this stretch of river. Mountain whitefish, white sturgeon, smallmouth bass, crappie, catfish, walleye, and yellow perch are important game fish to sport fisherman and Native Americans. A healthy rough fish population includes carp, redside shiner, suckers, and northern squawfish (Neitzel and others 1998).

West Lake, near the 200 Area, is created by a rise in the water table under the Central Plateau and is not fed by surface flow. This results in the pond being highly saline, as well as alkaline, and having a low species diversity (DOE 1999a). West Lake, located southwest of Gable Mountain, fluctuates in size with changes in the water table and is currently reduced to a collection of small pools and mudflats (Neitzel and others 1998). Unlike other ponds on the Hanford Site, West Lake does not receive direct effluent discharges from Hanford Site facilities (PNL 1993). Wetland vegetation found at West Lake is limited to scattered patches of emergent macrophytes, such as cattails and bulrushes. No jurisdictional wetland has been identified at West Lake.

Other wetland habitats found on the Hanford Site are associated with man-made ponds and ditches occurring on the Hanford Site, including the B Pond system located near the 200 East Area and a small cooling and wastewater pond in the 400 Area. The B Pond system was constructed in 1945 to receive cooling water from facilities in that area. Since that time, effluent flow to the B Pond has halted. One lobe of the pond received cooling water until recently; the rest of the B Pond system is slowly reverting to a shrub-steppe ecosystem. Gable Mountain Pond (also to the north of 200 East Area but south of West Lake) also received cooling water discharges from several facilities on the Hanford Site (PNNL 1997). These artificial water bodies, formed by the wastewater discharges from the operation of the separation facilities, no longer receive discharges.

8.1.2.4 Threatened and Endangered Species

Species of concern on the Hanford Site include federally listed threatened and endangered (T&E) species, state-listed T&E species, state-listed candidate species, state-listed plant species of concern, and species of ethnobiological concern to Native Americans.

No federally listed T&E plant or mammal species is documented as occurring on the Hanford Site (Neitzel and others 1998). Three birds on the federal list occur regularly or incidentally on the site; two federally-listed species of fish occur within the Hanford Reach. The threatened bald eagle (*Haliaeetus leucocephalus*) is found regularly along the Hanford Reach, while the threatened Aleutian Canada goose (*Branta canadensis leucopareia*) and the endangered peregrine falcon (*Falco peregrinus*) occur only as incidental visitors to the Hanford Site (Neitzel and others 1998). The two fish species are the anadromous chinook salmon (*Oncorhynchus tshawytscha*) and steelhead (*Oncorhynchus mykiss*). These species are regulated as evolutionarily significant units (ESUs) by NOAA Fisheries, an arm of the National Oceanic and Atmospheric Administration (NOAA), based on historical geographic spawning areas. One ESU of the chinook salmon, the Upper Columbia River spring-run ESU, is listed as endangered (64 FR 14308). Two ESUs of the steelhead have been listed: the Upper Columbia River steelhead ESU is listed as endangered (Neitzel and others 1998), and the Middle Columbia River steelhead ESU is listed as threatened (64 FR 14517). The Upper Columbia River ESU is the portion of the Columbia River between the US-Canada border and the Yakima River, and it includes the Hanford Reach.

Washington State lists the peregrine falcon, Aleutian Canada goose, American white pelican (*Pelecanus erythrorhynchos*), and sandhill crane (*Grus canadensis*) as endangered and the ferruginous hawk (*Buteo regalis*) and the bald eagle as threatened. The peregrine falcon is a casual migrant to the Hanford Site between November and January (DOE 2001), the Aleutian Canada goose is an accidental fall and winter migrant (DOE 2001), the American white pelican is a year-round resident (DOE 2001), the sandhill crane is a rare fall and spring visitor (DOE 2001), and the ferruginous hawk is a breeding resident. The bald eagle is a regular winter resident along the Columbia River (Neitzel and others 1998).

Eight species of plants listed by Washington State as T&E are found on the Hanford Site. Columbia milk-vetch (*Astragalus columbianus*), loeflingia (*Loeflingia squarrosa*), Hoover's desert parsley (*Lomatium tuberosum*), and dwarf evening primrose (*Oenothera pygmaea*) are designated as threatened. Columbia yellowcress (*Rorippa columbiae*), Umtanum desert buckwheat (*Erigonium codium*), and White Bluffs bladderpod (*Lesquerella tuplashensis*) are listed as endangered. Columbia milkvetch occurs on upland terraces along the Columbia River and on Yakima Ridge within the FEALE Reserve. Dwarf evening primrose has been found north of Gable Mountain and on disturbed areas near the Wye Barricade. Umtanum desert buckwheat and White Bluffs bladderpod are indigenous to the Hanford Site (Neitzel and others 1998). Piper's daisy (*Erigeron piperianus*), a state-listed sensitive species, has been found at B Pond near the 200 East Area and at Pit 30. Crouching milkvetch, stalked-pod milkvetch, and scilla onion, all state-listed plant species of concern, are also found in the 200 East Area.

Wildlife state-listed candidate species observed or considered likely to be found on or near the Central Plateau include the sage sparrow (*Amphispiza belli*) and the loggerhead shrike (*Lanius ludovicianus*). Both of these birds commonly nest in undisturbed shrub-steppe habitat. The sage sparrow is one of the most common nesting birds on the Hanford Site (Downs and others 1993). Other listed T&E bird species that may be found include the burrowing owl, ferruginous hawk, golden eagle, sage thrasher, and merlin (Neitzel and others 1998). Another wildlife species of concern inhabiting the Central Plateau and vicinity is the striped whipsnake (*Mastocophis taeniatus*), a state-listed candidate species.

Central Plateau. No federally or state-listed T&E plant or animal species occur in the Central Plateau (DOE 1999a). Several state-listed plant species are found on the Central Plateau. Piper's daisy has been found at B Pond near the 200 East Area, and may occur in sagebrush-steppe habitat elsewhere on the Hanford Site (WHC 1992). Dwarf evening primrose has been found on disturbed areas near the Wye Barricade (Neitzel and others 1998) and might also be found on the Central Plateau.

Wildlife species of state concern occurring in the 200 Area include the loggerhead shrike and sage sparrow. Both species nest in undisturbed sagebrush habitat in the Central Plateau (PNL 1993). Other listed T&E bird species that may occur in shrub-steppe habitat in the Central Plateau are the burrowing owl, golden eagle, long-billed curlew, and Swainson's hawk. Reptile species of concern using the Central Plateau include the striped whipsnake (Rogers and Rickard 1977, Neitzel and others 1998).

Columbia River. No federally listed T&E plant species occur on the Hanford Reach (DOE 1999a). State-listed endangered plant species occurring along the Hanford Reach include the Columbia yellowcress. Preferred habitat for Columbia yellowcress is shoreline areas with gently sloping, cobbly, or sandy substrate (PNL 1993). State-listed plant species of concern have been found along the shoreline and on islands of the Hanford Reach between the Vernita Bridge and the 300 Area, including the southern mudwort, dense sedge, and shining flatsedge (WHC 1992, Neitzel and others 1998).

Federally listed T&E birds include the Aleutian Canada goose, peregrine falcon, and bald eagle. The Aleutian Canada goose and the peregrine falcon are incidental migrants on the Hanford Site (Neitzel and others 1998). State-listed bird species that occur along the Hanford Reach that are considered relatively common include the American white pelican (endangered), bald eagle (threatened), and sandhill crane (endangered). The common loon (*Gavia immer*), a state-listed candidate species, is also found within the Hanford Reach.

8.1.2.5 Sensitive Environments

Sensitive habitats on the Hanford Site include wetlands and riparian habitats. Wetlands include those transitional lands occurring between terrestrial and aquatic ecosystems where the water table is usually close to the surface or where shallow water covers the surface (Cowardin and others 1979). The primary wetlands found on site occur along the Hanford Reach of the Columbia River and include the riparian habitats located along the river shoreline. Other wetland habitats found on the Hanford Site are associated with man-made ponds and ditches. These include B Pond and its associated ditches located near the 200 East Area. The B Pond complex was constructed in 1945 to receive cooling water from facilities in that area. Wetland plants occurring along the shoreline of B Pond include herbaceous species such as showy milkweed (*Asclepias speciosa*), western goldenrod (*Solidago occidentalis*), three square bulrush (*Scirpus americanus*), horsetails (*Equisetum* spp.), rushes (*Juncus* spp.), and common cattail (*Typha latifolia*); and woody species such as mulberry (*Morus alba*), silver poplar (*Populus alba*), black cottonwood (*Populus trichocarpa*), and willow (*Salix* spp.) (Sackschewsky and others 1992). Wildlife species observed at B Pond include a variety of mammals, such as muskrats, porcupines, and raccoons, (DOE 1999a) and waterfowl (Meinhardt and Frostenson 1979).

There are also special ecological areas outside the Hanford Site but within the 50 km radius included in deposition modeling. These include the Columbia National Wildlife Refuge, which extends from approximately 30 km to approximately 50 km north of the WTP, and habitats classified as priority habitats by the state of Washington. Priority habitats near the Hanford Site include in-stream and riparian habitats on the Columbia and Yakima rivers, Crab Creek, and shrub-steppe habitat types surrounding the Hanford Site. The variety of habitats on the Hanford Site are special ecological areas. For example, the Hanford Site includes nesting sites for bird species of concern, salmon and steelhead spawning areas, riparian habitat, and part of the largest remaining tract of shrub-steppe habitat in the Columbia Basin (DOE 1999).

The SLERA will implicitly include the special ecological areas because it will use the maximum soil or sediment and water concentrations either within the Hanford Reservation or at the site boundary and because it will assume that all representative ecological receptors are present at each of the maximum deposition locations regardless of habitat. Therefore, ecological receptors within the special ecological areas outside the Hanford Reservation will have lower exposures than the receptors evaluated in the SLERA.

8.1.3 Receptor Identification

The receptors present in the ecological setting and habitats at Hanford will be exposed by routes that are defined by how the receptors live and what they eat. Food webs represent the transfer of matter among the components of an ecosystem. This transfer occurs through the uptake and absorption of substances from abiotic media or consumption of animal and plant tissue. Figure 8-7 shows the food web representing the terrestrial organisms of the Hanford Site and their general trophic relationships. Figure 8-8 shows the food web representing the aquatic organisms of the Hanford Site and their general trophic relationships. Food webs highlighting the selected receptors are presented in Figure 8-9 for terrestrial receptors and Figure 8-10 for aquatic receptors.

8.1.3.1 Terrestrial Receptors

Figure 8-9 presents a simplified food web for selected terrestrial receptors. The receptors selected for use in the SLERA and their trophic levels are shown in bold in the figure:

- Plants (trophic level 1): cheatgrass, rabbitbrush
- Terrestrial invertebrates (trophic level 2): earthworms, darkling beetles
- Herbivorous mammals (trophic level 2): mule deer
- Herbivorous birds (trophic level 2): mourning dove
- Omnivorous mammals (trophic level 3): Great Basin pocket mouse
- Omnivorous birds (trophic level 3): western meadowlark
- Carnivorous mammals (trophic level 4): coyote
- Carnivorous birds (trophic level 4): burrowing owl, red-tailed hawk

The reasons for selecting the representative receptors are given in the following paragraphs.

Terrestrial Plants. Terrestrial plants are essential to the function of any terrestrial ecosystem and are a major route of entry of contaminants into the food web. Therefore, terrestrial plant populations will be evaluated in the SLERA. Terrestrial plants are assumed to be exposed to the onsite ground maximum, the offsite maximum, and the Gable Mountain maximum by direct uptake of COPCs in volatile emissions, uptake of COPCs and ROPCs deposited on leaf surfaces, root uptake from soil, external exposure to radionuclides in soil, and external exposure to radionuclides in soil and air (Figure 8-11).

Terrestrial Invertebrates. Terrestrial invertebrates are essential to the function of any terrestrial ecosystem and are a major route of entry of contaminants into the food web. The number of earthworms at the Hanford Site is expected to be low because of the aridity of most of the habitat. However, there is more data available to evaluate exposure of earthworms than there is for other terrestrial invertebrates. Therefore, earthworm populations will be evaluated as representatives of terrestrial invertebrates in the SLERA. Earthworms are assumed to be exposed to the onsite ground maximum, the offsite maximum, and the Gable Mountain maximum by uptake of COPCs and ROPCs deposited on soil and by external exposure to ROPCs in soil and air (Figure 8-11). There are no uptake factors for transfer of COPCs from air to terrestrial invertebrates that are separate from the experimental soil exposures used to derive the uptake factors.

Mule Deer. Mule deer populations are evaluated as representative of herbivorous mammals that consume vegetation contaminated by COPCs and ROPCs. Mule deer are assumed to be exposed by ingestion of COPCs and ROPCs deposited on soil, by ingestion of plants containing COPCs and ROPCs taken up from soil, and by external radiation from soil and air (Figure 8-11). The predominant diet of the mule deer is browse.

Mourning Dove. Mourning dove populations are evaluated as representative of herbivorous birds that consume vegetation contaminated by COPCs and ROPCs. The mourning dove is assumed to be exposed by ingestion of COPCs and ROPCs deposited on soil, by ingestion of plants (mainly grass seeds) containing COPCs and ROPCs taken up from soil, and by external radiation from soil and air (Figure 8-11).

Great Basin Pocket Mouse. Great Basin pocket mouse populations are evaluated as representative of omnivorous mammals. The Great Basin pocket mouse is assumed to be exposed by ingestion of COPCs and ROPCs deposited on soil, by ingestion of plants (mainly grass seeds) and terrestrial invertebrates containing COPCs and ROPCs taken up from soil, and by external radiation from soil and air (Figure 8-11).

Western Meadowlark. Western meadowlark populations are evaluated as representative of omnivorous birds. The meadowlark is assumed to be exposed by ingestion of COPCs and ROPCs deposited on soil, by ingestion of plants (mainly grass seeds) and terrestrial invertebrates containing COPCs and ROPCs taken up from soil, and by external radiation from soil and air (Figure 8-11).

Coyote. Coyote populations are evaluated as representative of carnivorous mammals. The coyote is assumed to be exposed by ingestion of COPCs and ROPCs deposited on soil, by ingestion of small mammals and birds containing COPCs and ROPCs taken up from soil, and by external radiation from soil and air (Figure 8-11).

Burrowing Owl. Burrowing owl populations are evaluated as representative of carnivorous and insectivorous birds. The burrowing owl is assumed to be exposed by ingestion of COPCs and ROPCs deposited on soil, by ingestion of small mammals and birds containing COPCs and ROPCs taken up from soil, and by external radiation from soil and air (Figure 8-11).

Red-Tailed Hawk. Red-tailed hawks are evaluated as representative of federal and state-listed carnivorous birds of special interest. The red-tailed hawk is assumed to be exposed by ingestion of small mammals and birds containing COPCs and ROPCs taken up from soil and by external radiation from soil and air (Figure 8-11).

8.1.3.2 Aquatic Receptors

Figure 8-10 presents a simplified food web of selected aquatic receptors. The receptors selected for use in the SLERA are shown in bold on the figure and are listed below:

- Plants (trophic level 1): aquatic plants and plants rooted in sediment
- Benthic invertebrates (trophic level 2): sediment-dwelling clams and insects
- Aquatic organisms, fish, and other aquatic biota (trophic levels 2 through 4): bass, salmon, channel catfish, water fleas, other invertebrates
- Herbivorous waterfowl (trophic level 2): Canada goose
- Shorebirds (trophic level 3): spotted sandpiper
- Piscivorous terrestrial birds (trophic level 4): great blue heron, bald eagle
- Piscivorous terrestrial mammals (trophic level 4): mink

The reasons for selecting the representative receptors are given in the following paragraphs.

Aquatic Plants. Aquatic plants are important to the function of an aquatic ecosystem. Plankton, floating plants, and emergent plants contribute to the base of the food web. However, because of the lack of toxicity information, they are handled as ingestion exposure to fish and other aquatic life.

Benthic Invertebrates. Benthic invertebrates are essential for the functioning of an aquatic ecosystem and are a major route of entry of contaminants into aquatic food webs. Therefore, benthic invertebrates will be evaluated in the SLERA. Benthic invertebrates are likely to be present in the Columbia River at the location of maximum deposition of COPCs and ROPCs. Benthic invertebrates are assumed to be exposed by uptake from sediment and by external radiation from water and sediment (Figure 8-12).

Aquatic Biota. Aquatic biota are essential for the functioning of an aquatic ecosystem and are a major route of entry of contaminants into aquatic food webs. Therefore, aquatic biota populations will be evaluated in the SLERA. Aquatic biota are likely to be present in the Columbia River at the location of maximum deposition of COPCs and ROPCs. Aquatic biota are assumed to be exposed by uptake from surface water, ingestion of food containing COPCs and ROPCs taken up from water, and by external radiation from water and sediment (Figure 8-12).

Salmonids. Chinook salmon and steelhead trout populations in the Hanford Reach of the Columbia River have been designated ESUs (Neitzel and others 1998). Therefore, special care must be taken to prevent harm to these salmonids. Salmonids are also fish species of special interest because of their economic and recreational importance and, as carnivorous fish, they are at the top of aquatic food webs. Salmonids are also of particular cultural importance to the Native American tribes, whose way of life has inextricably included salmon and trout as food throughout their history. Therefore, salmonid populations will be evaluated in the SLERA. Salmonids are likely to be present in the Columbia River at the location of maximum deposition of COPCs and ROPCs. Salmonids are assumed to be exposed by uptake from surface water, ingestion of food containing COPCs and ROPCs taken up from water, and by external radiation from water and sediment (Figure 8-12).

Canada Goose. Canada goose populations are evaluated as representative of herbivorous birds that consume vegetation contaminated by COPCs and ROPCs from water. Because the Canada goose is a year-round resident at the Hanford Site (DOE 2001), it could be expected to spend its life at the location of maximum deposition of COPCs and ROPCs. The Canada goose is assumed to be exposed by uptake from ingested surface water and sediment, ingestion of vegetation that contains COPCs and ROPCs taken up from sediment and water, and external radiation from water and air (Figure 8-12).

Spotted Sandpiper. Spotted sandpiper populations are evaluated as representative of carnivorous birds that consume benthic invertebrates contaminated by COPCs and ROPCs from near-shore sediment. The spotted sandpiper resides along the shores of the Columbia River, where it preys on aquatic and terrestrial invertebrates and small fish. It represents the group of carnivorous shorebirds, which are exposed to contaminants in aquatic biota, benthic organisms, and water. The spotted sandpiper could be expected to spend its life at the location of maximum deposition of COPCs and ROPCs. The spotted sandpiper is assumed to be exposed by uptake from ingested surface water and sediment, ingestion of benthic invertebrates that contain COPCs and ROPCs taken up from sediment, and external radiation from water and air (Figure 8-12).

Great Blue Heron. Great blue heron populations are evaluated as representative of carnivorous birds that consume small fish contaminated by COPCs and ROPCs from water. The great blue heron could be expected to spend its life at the location of maximum deposition of COPCs and ROPCs. The great blue heron is assumed to be exposed by uptake from ingested surface water, ingestion of omnivorous fish that contain COPCs and ROPCs taken up from water, and external radiation from water and air (Figure 8-12).

Bald Eagle. Bald eagle populations are evaluated as representative of carnivorous birds of special interest that consume carnivorous fish contaminated by COPCs and ROPCs from water. The bald eagle is known to nest along the Columbia River, but often leaves the area before laying eggs (WHC 1994). Resident eagles are exposed to contaminants in fish as well as waterfowl, small mammals, and carrion, on which they prey. The bald eagle is a threatened species and, therefore, deserves special attention. It is also the best representative of top predators of aquatic biota on the Hanford Site. For conservatism in the SLERA, the bald eagle will be assumed to be exposed year round to ingestion to surface water, fish that contain COPCs and ROPCs taken up from water, and external radiation from water and air (Figure 8-12).

Mink. Mink populations are evaluated as representative of carnivorous mammals that consume carnivorous fish contaminated by COPCs and ROPCs from water. The mink could be expected to spend its life at the location of maximum deposition of COPCs and ROPCs. The mink is assumed to be exposed by uptake from ingested surface water, ingestion of fish that contain COPCs and ROPCs taken up from water, and external radiation from water and air (Figure 8-12).

8.1.3.3 Species Profiles

Quantitative descriptions of the receptor species are necessary to model exposure to COPCs and ROPCs. The following species profiles for mammals and birds provide the necessary quantitative information for each receptor, as well as text describing the species and its relation to the Hanford Site. Species profiles are not required for plants (cheatgrass and rabbitbrush) and terrestrial invertebrates (earthworms and darkling beetles) because exposures of these receptors are not modeled using receptor-specific parameters. Similarly, species profiles are not required for the following:

- Benthic invertebrates (clams, insects, snails, and worms)
- Planktivorous fish and small invertebrates (small carp, small northern squaw fish, small suckers, water fleas, and other invertebrates)
- Fish (bass, salmon, and channel catfish)

Mule Deer (*Odocoileus hemionus*)

Mule deer, with an onsite herd of several hundred, occur just about everywhere on the Hanford Site, but are most often found near the Columbia River. Mule deer use the islands and other riparian areas as fawning habitat. Bitterbrush provides important browse for the resident mule deer herd. Summer browse is chiefly herbaceous plants and the young shoots of woody plants, while winter browse includes twigs of woody plants and trees, including cedar, yew, aspen, willow, dogwood, juniper, and sage. Coyotes are a major predator, along with bobcats to a lesser extent. Mule deer are most active in the mornings and evenings.

Parameter	Definition	Value	Reference/Notes
BW	Body weight (kg)	66.5	Average of males and females, north central Colorado (Sample and others 1997)
HR	Home range (ha)	285	(Sample and others 1997)
TUF	Temporal use factor	1	Will be 1 unless specific value exists for a receptor
IR_F	Food ingestion rate (g/g/d=kg/kgBW/d)[a]	0.035	Adjusted from 0.022 kg/kg BW dry weight per day (Sample and others 1997) by assuming a 37 % moisture content in browse (USFS 2003)
PF	Plant fraction	1	(Sample and others 1997)
AF	Animal fraction	0	(Sample and others 1997)
SFr	Soil fraction	0.02	(Arthur and Alldredge 1979 in Beyer and others 1994)

[a] Food ingestion rate (g/g/d) re-expressed as kg/kg BW/d is assumed not to include ingested soil; therefore, PF + AF = 1.0.

Mourning Dove (*Zenaidura macroura*)

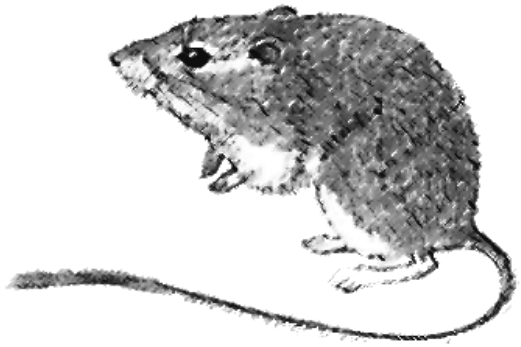
The mourning dove has the widest distribution of any North American game bird; it is the only species nesting in all 48 conterminous US states. During the winter it lives in small to large flocks where food is plentiful and good roosting and protective cover are available in nearby trees. The mourning dove feeds mostly on the ground in harvested crop fields, along railroads, and roadsides. About 98 % of its diet in all seasons is seeds. It eats some insects and snails, and picks up grit from gravel roads or sea beaches. It nests from southeastern Alaska to western Panama, and it winters from southern Canada, but mainly from northern California, south into Central America.

Parameter	Definition	Value	Reference/Notes
BW	Body weight (kg)	0.128	Numerical average of males and females (Martin and Nelson 1952 in Terres 1980)
HR	Foraging distance (km)	≤ 1	(CDFG 2003)
TUF	Temporal use factor	1	Will be 1 unless specific value exists for a receptor
IR_F	Food ingestion rate (g/g/d = kg/kgBW/d)[a]	0.212	Calculated by allometric equation, 0.398 × $BW(g)^{0.85}$/BW(g) (EPA 1993c, Eq. 3-4), adjusted to wet-weight basis by assuming a water content of 9.3 % for seeds (EPA 1993c, Table 4-2): 0.192 / (1-0.093) = 0.212
PF	Plant fraction	1	Diet stated to be >98 % seeds and other vegetation (Terres 1980)
AF	Animal fraction	0	<2 % invertebrates (Terres 1980)
SFr	Soil fraction	0.09	Assumed to be 10 % of dry weight of diet (EPA 1999a) : 0.1 × (1 – 0.093) = 0.09

[a] Food ingestion rate (g/g/d) re-expressed as kg/kg BW/d is assumed not to include ingested soil; therefore, PF + AF = 1.0.

Great Basin Pocket Mouse (*Perognathus parvus*)

The Great Basin pocket mouse eats mostly seeds, but also eats insects (Fitzner and Gray 1991). It is the principal prey of the burrowing, great horned, long-eared, and barn owls at the Hanford Site (Downs and others 1993) and serves as a vector for contaminant movement through the food chain from plants to mammalian and avian carnivores. The Great Basin pocket mouse is a nocturnal, burrowing mammal, with most burrows being between 35 cm and 193 cm deep (1.2 ft to 6.3 ft deep) (Gano and Rickard 1982). The mouse has no need for drinking water, obtaining all its water from its food. Its small home range could cause it to spend all of its time within a contaminated area and obtain all food there (DOE 1999a).



Parameter	Definition	Value	Reference/Notes
BW	Body weight (kg)	0.016	Average, males and females, Washington State (Sample and others 1997)
HR	Home range (ha)	0.14	Mid-range for females, Washington State (Sample and others 1997)
TUF	Temporal use factor	1	(DOE 1999a)
IR_F	Food ingestion rate (g/g/d=kg/kgBW/d)[a]	0.285	(Calder 1984 in DOE-RL 1995)
PF	Plant fraction	0.62[b]	Annual average (based on four seasons normalized to 100% and then averaged), Colorado, short-grass prairie (EPA 1993c)
AF	Animal fraction	0.38[b]	Annual average, Colorado, short-grass prairie (EPA 1993c)
SFr	Soil fraction	0.01	Estimated 2 % of dry weight of diet (Beyer and others 1994). Dry weight is estimated to be 57 % of a mixed diet of 55 % seeds with 9.3 % water content and 45 % terrestrial invertebrates with 84 % water content (EPA 1993c, Tables 4-1 and 4-2).

[a] Food ingestion rate (g/g/d) re-expressed as kg/kg BW/d is assumed not to include ingested soil; therefore, PF + AF = 1.0.

[b] Values used for the Great Basin pocket mouse taken from values established for the deer mouse (*Peromyscus maniculatus*). (Flake 1973 in EPA 1993c)

Western Meadowlark (*Sturnella neglecta*)

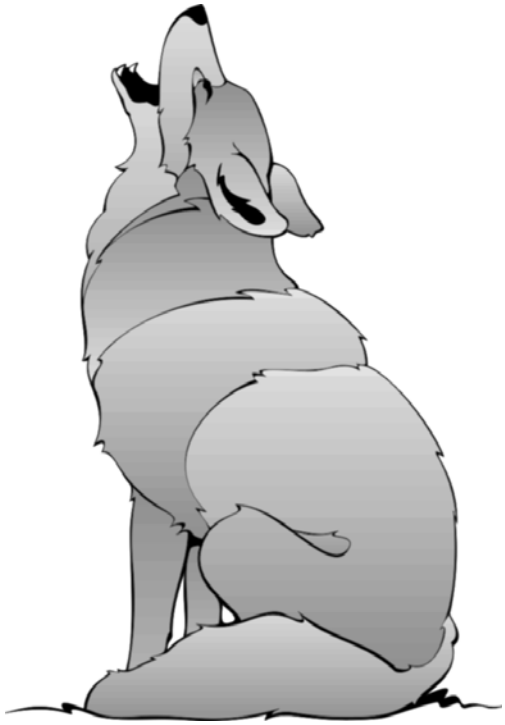
The western meadowlark is a ground-nesting bird that nests in cheatgrass and sagebrush-bunchgrass communities (Rickard and others 1988, Schuler and others 1988). This species exhibits resistance to plant community structure changes resulting from grazing or wildfires (Rickard and others 1988). The western meadowlark is a common, omnivorous bird of open habitats in southeastern Washington State and is abundant in the shrub-steppe ecosystem (Schuler and others 1988). It feeds on a variety of items, which include both insects and plant material, mostly seeds. One study (Bent 1958 in Sample and others 1997) reports that the western meadowlark's diet consists of roughly 70 % insects and 30 % plant material. Studies conducted in southeastern Washington State indicate that it is the main bird prey item in the diets of the red-tailed, ferruginous, and Swainson's hawks (Rickard and others 1988). Adult female western meadowlarks average 94.2 grams in weight and lay three to seven eggs in dome-shaped nests concealed in the grass or weeds and constructed of the same materials.

Parameter	Definition	Value	Reference/Notes
BW	Body weight (kg)	0.094	Adult female, Washington State (Sample and others 1997)
HR	Home range (ha)	3.0	Adult male, Wisconsin, average (Sample and others 1997)
TUF	Temporal use factor	1	Will be 1 unless specific value exists for a receptor
IR_F	Food ingestion rate (g/g/d=kg/kgBW/d)[a]	0.028	(ATG 1998)
PF	Plant fraction	0.30	(Bent 1958 in Sample and others 1997)
AF	Animal fraction	0.70	(Bent 1958 in Sample and others 1997)
SFr	Soil fraction	0.04	Estimated 10.4 % of dry weight of diet of woodcock (Beyer and others 1994) was used for the meadowlark. Dry weight is estimated to be 38 % of a mixed diet of 30 % seeds with 9.3 % water content and 70 % terrestrial invertebrates with 84 % water content (EPA 1993c, Tables 4-1 and 4-2).

[a] Food ingestion rate (g/g/d) re-expressed as kg/kg BW/d is assumed not to include ingested soil; therefore PF + AF = 1.0.

Coyote (*Canis latrans*)

The coyote is the most common carnivore on the Hanford Site. They are nocturnal but may be active at any time of day. Primarily carnivorous, coyotes feed mainly on birds and small mammals, but also feed on insects and fruits in season. The typical hunting range is 10 miles, but may extend to 100 miles, reflecting the coyote's variable home range. Being an upper-trophic-level receptor, the coyote could be particularly susceptible to chemicals that bioaccumulate. Coyotes living in the shrub-steppe feed on pocket mice, northern pocket gopher, Nuttall's cottontail, black-tailed jackrabbit, and occasionally small mule deer. Favored den sites are riverbanks and the sides of canyons or gulches.

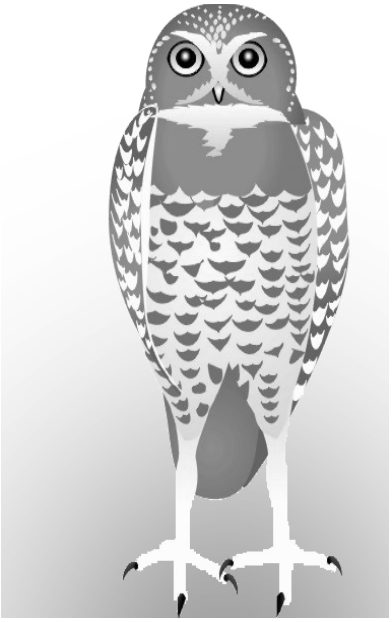


Parameter	Definition	Value	Reference/Notes
BW	Body weight (kg)	12.4	Average of adult male and female from Iowa (Sample and others 1997)
HR	Home range (ha)	3010	Living singly or in pairs (Sample and others 1997)
TUF	Temporal use factor	1	Will be 1 unless specific value exists for a receptor
IR_F	Food ingestion rate (g/g/d=kg/kgBW/d)[a]	0.018	Desert coyote adults (Sample and others 1997)
PF	Plant fraction	0.02	Average for western states (Sample and others 1997)
AF	Animal fraction	0.98	Average for western states (Sample and others 1997)
SFr	Soil fraction	0.002	Estimated soil ingestion rate divided by food ingestion rate

[a] Food ingestion rate (g/g/d) re-expressed as kg/kg BW/d is assumed not to include ingested soil; therefore, PF + AF = 1.0.

Burrowing Owl (*Athene cunicularia)*

The burrowing owl is the most abundant of the owls that nest on the Hanford Site. Burrowing owls nest in holes in the ground that are abandoned by burrowing mammals. Their diet consists of pocket mice, deer mice, pocket gophers, mountain voles, black-tailed jackrabbits, Nuttall's cottontail, rock doves, mallards, and American coots.



The burrowing owl is more diurnal than most owls. The female lays five to seven eggs in a long, underground burrow lined with grasses, roots, and dung. The burrows are usually abandoned prairie dog or pocket gopher burrows, but burrowing owls are capable of digging their own.

Parameter	Definition	Value	Reference/Notes
BW	Body weight (kg)	0.15	Mean, males and females, throughout North America (Sample and others 1997)
HR	Home range (ha)	241	Mean, Saskatchewan (Sample and others 1997)
TUF	Temporal use factor	1	Will be 1 unless specific value exists for a receptor
IR_F	Food ingestion rate (g/g/d=kg/kgBW/d)[a]	0.042	Estimated (Sample and others 1997) from reported energy requirement, average of winter and summer
PF	Plant fraction	0	Colorado (Sample and others 1997)
AF	Animal fraction	1	Colorado (Sample and others 1997)
SFr	Soil fraction	0.1	Estimated from mean of 5 % of volume (Thomsen 1971 in Sample and others 1997)

[a] Food ingestion rate (g/g/d) re-expressed as kg/kg BW/d is assumed not to include ingested soil; therefore, PF + AF = 1.0.

Red-Tailed Hawk (*Buteo jamaicensis)*

The red-tailed hawk may be found on the Hanford Site year-round (Fitzner and Gray 1991). Forty-one nesting pairs of hawks (red-tailed, Swainson's, and ferruginous) were observed on site during the 1994 breeding season (Neitzel and others 1998). Nests were constructed in trees, cliffs, basalt outcrops, and high-voltage transmission line towers (Neitzel and others 1998).

The red-tailed hawk is a diurnal predator of rodents and other small mammals, including mice, shrews, voles, rabbits, and squirrels. Generally opportunistic, the red-tailed hawk feeds on whatever is most abundant and readily available. Red-tailed hawks maintain a territory year-round (Brown and Amadon 1968).

Parameter	Definition	Value	Reference/Notes
BW	Body weight (kg)	1.06	Average of adult male and female, southwest Idaho (Steenhof 1983 in EPA 1993c)
HR	Home range (ha)	1,770	Adult, both male and female, Colorado upland prairie (Andersen and Rongstad 1989 in EPA 1993c)
TUF	Temporal use factor	1	Will be 1 unless specific value exists for a receptor
IR_F	Food ingestion rate (g/g/d=kg/kgBW/d)[a]	0.105	Average of adult male and female, winter, Michigan, captive, outdoors (Craighead and Craighead 1956 in EPA 1993c)
PF	Plant fraction	0	Not stated in EPA 1993c; assumed to be negligible
AF	Animal fraction	1	Prey brought to nests in Alberta, Canada, Oregon, and California (EPA 1993c)
SFr	Soil fraction	0	Not stated in EPA (1993c) or Beyer and others (1994); assumed to be negligible

[a] Food ingestion rate (g/g/d) re-expressed as kg/kg BW/d is assumed not to include ingested soil; therefore, PF + AF = 1.0.

Canada Goose (*Branta canadensis)*

Canada geese forage primarily in open fields, feeding on grains, grass sprouts, and some aquatic vegetation. Breeding habitats includes tall grass prairies and shortgrass prairies, marshes, ponds, and lakes. Most nesting sites are close to open water, often on islands (EPA 1993c). The Canada goose uses islands along the Hanford Reach extensively for nesting. Studies on the nesting habits of geese that use the Hanford Site have been ongoing since 1953. These studies indicate a general decline over the years in numbers of nests on islands in the Hanford Reach because of heavy predation by coyotes (Cushing and others 1995).

Parameter	Definition	Value	Reference/Notes
BW	Body weight (kg)	3.72	Average of adult male and female, Nova Scotia (EPA 1993c)
HR	Home range (ha)	983	Adult female and brood, Washington State (EPA 1993c)
TUF	Temporal use factor	1	Considered a year-round resident at the Hanford Site (DOE 2001)
IR_F	Food ingestion rate (g/g/d=kg/kgBW/d)[a]	0.031	Average of adult male and female, winter and spring, British Columbia interior (EPA 1993c)
PF	Plant fraction	1	North Carolina, lake; and Ontario, bay (EPA 1993c)
AF	Animal fraction	0	< 1 % invertebrates (EPA 1993c)
SFr	Soil fraction	0.07	Estimated 8.2 % of dry weight of diet (Beyer and others 1994). Dry weight is estimated to be 0.89 × wet weight for grain and seeds (EPA 1993c).
IR_W	Water ingestion rate (g/g/d=L/kgBW/d)	0.038	Average of adult male and female, estimated (EPA 1993c) by using allometric equation, $0.059 \times BW(kg)^{0.67}/BW(kg)$ (EPA 1993c, Eq. 3-15)

[a] Food ingestion rate (g/g/d) re-expressed as kg/kg BW/d is assumed not to include ingested soil; therefore, PF + AF = 1.0.

Spotted Sandpiper (*Actitus macularia*)

The spotted sandpiper requires open water for drinking, semi-open habitat for nesting, and dense vegetation for breeding (Bent 1929 and Oring and others 1983). The nest is a grassy scrape near water or in brush with a determinate clutch size of four eggs. Several clutches may be laid during a given breeding season. The diet of the spotted sandpiper consists mostly of terrestrial and aquatic insects (Bent 1929), with adult flying insects making up the bulk of the diet (Oring and others 1983).

Parameter	Definition	Value	Reference/Notes
BW	Body weight (kg)	0.0425	Arithmetic mean, adult, males and females, Minnesota (EPA 1993c)
HR	Home range (ha)	0.25	Single value, sex not specified, Nova Scotia (EPA 1993c)
TUF	Temporal use factor	1	Will be 1 unless a specific value exists for a receptor
IR_F	Food ingestion rate (g/g/d=kg/kgBW/d)[a]	0.88	Calculated by allometric equation, $0.648 \times BW(g)^{0.651}/BW(g)$ (EPA 1993c, Eq. 3-3), adjusted to wet- weight basis by assuming food moisture content of 80 % for benthic invertebrates (EPA 1993c, Table 4-1). $IR_F = 0.175 / (1-0.8) = 0.88$
PF	Plant fraction	0	None listed as dietary intake in EPA (1993c)
AF	Animal fraction	1	Benthic invertebrates, Minnesota, lake (EPA 1993c)
SFr	Soil fraction	0.036	Estimated 18 % of dry weight of diet (Beyer and others 1994). Dry weight is estimated to be 0.2 × wet weight for benthic invertebrates (EPA 1993c, Table 4-1). SFr = 0.18 × 0.2 = 0.036.
IR_W	Water ingestion rate (g/g/d=L/kgBW/d)	0.165	Average of adult male and female rates (EPA 1993c), estimated by using allometric equation, $0.059 \times W(kg)^{0.67}/BW(kg)$ (EPA 1993c, Eq. 3-15)

[a] Food ingestion rate (g/g/d) re-expressed as kg/kg BW/d is assumed not to include ingested soil; therefore, PF + AF = 1.0.

Great Blue Heron (*Ardea herodius*)

Great blue herons are year-round residents of the Hanford Reach. This bird is relatively common along the Hanford Reach (Fitzner and Gray 1991). Some of the trees planted on pre-1943 farms have persisted and serve as nesting platforms for several species of birds, including the great blue herons (DOE-RL 1995). Its nest is a platform of sticks lined with finer material and is sometimes found on the ground or in a reedbed. Principal prey items of the great blue heron are fish and frogs, although it will also feed on small mammals, reptiles, and occasionally birds.

Parameter	Definition	Value	Reference/Notes
BW	Body weight (kg)	2.39	Arithmetic mean, adult, both sexes, location not stated (EPA 1993c)
HR	Foraging range (km)	3.1	Foraging distance, mean, adults, both sexes, South Dakota, stream (EPA 1993c)
TUF	Temporal use factor	1	Will be 1 unless a specific value exists for a receptor
IR_F	Food ingestion rate (g/g/d=kg/kgBW/d)[a]	0.18	(EPA 1993c)
PF	Plant fraction	0	None listed as dietary intake in EPA (1993c)
AF	Animal fraction	1	98 % aquatic vertebrates, a river in lower Michigan (EPA 1993c)
SFr	Soil fraction	0	Not reported in EPA (1993c); assumed to be negligible
IR_W	Water ingestion rate (g/g/d=L/kgBW/d)	0.045	Estimated (EPA 1993c) by using allometric equation, $0.059 \times BW(kg)^{0.67}/BW\ (kg)$ (EPA 1993c, Eq. 3-15)

[a] Food ingestion rate (g/g/d) re-expressed as kg/kg BW/d is assumed not to include ingested soil; therefore, PF + AF = 1.0.

Bald Eagle (*Haliaetus leucocephalus*)

The bald eagle is a common winter resident, usually arriving in October. These birds forage throughout the Hanford Reach. Bald eagles use trees during the day for perching and occasionally at night for communal roosts (DOE 1999a). Wintering eagles tend to concentrate where food is abundant and human disturbance is minimal. The diet of bald eagles varies locally as well as seasonally. Food may vary from spawned salmon and waterfowl (often killed by other predators or disease) during the winter to fish, small mammals, carrion, and waterfowl during the breeding season (EPA 1993c). Although bald eagles exhibit nesting behavior at the Hanford Site, most leave before laying eggs (WHC 1994).

Parameter	Definition	Value	Reference/Notes
BW	Body weight (kg)	3.75	Arithmetic mean, adult, both sexes, Florida (EPA 1993c)
HR	Foraging distance (km)	10	Territory length, mean, adults, coastal Washington State (EPA 1993c)
TUF	Temporal use factor	1	Will be 1 unless specific value exists for a receptor
IR_F	Food ingestion rate (g/g/d=kg/kgBW/d)[a]	0.12	Adult, both sexes, Washington State, free-flying (EPA 1993c)
PF	Plant fraction	0	None listed as dietary intake in EPA (1993c)
AF	Animal fraction	1	53 % birds, 27 % fish, 20 % other, Washington State, river (EPA 1993c)
SFr	Soil fraction	0	Not reported in EPA 1993c; assumed to be negligible
IR_W	Water ingestion rate (g/g/d=L/kgBW/d)	0.036	Average of adult male and female rates, estimated (EPA 1993c) by using allometric equation, $0.059 \times BW(kg)^{0.67}/BW\ (kg)$ (EPA 1993c, Eq. 3-15)

[a] Food ingestion rate (g/g/d) re-expressed as kg/kg BW/d is assumed not to include ingested soil; therefore, PF + AF = 1.0.

Mink (*Mustela vision*)

The mink is the most abundant and widespread carnivorous mammal in North America. The home range of mink encompasses both their foraging areas around waterways and their dens along the Columbia River. The mink is found in aquatic habitats of all kinds, including waterways such as rivers, streams, lakes, and ditches, as well as swamps, marshes, and backwater areas (Linscombe and others 1982 in EPA 1993c). Mink are particularly sensitive to certain chemicals. Mink are predominantly nocturnal hunters, although they are sometimes active during the day. They can often be found along the Columbia River. Mammals are the mink's most important prey year-round in many parts of their range (Eagle and Whitman 1987 in Novak and others 1987), but mink also hunt aquatic prey (such as fish, amphibians, and crustaceans) and other terrestrial prey (such as birds, reptiles, and insects) depending on the season (Linscombe and others 1982 in EPA 1993c).

Parameter	Definition	Value	Reference/Notes
BW	Body weight (kg)	0.85	Average of adult male and female (summer and fall) (EPA 1993c)
HR	Foraging distance (km)	2.24	Foraging distance, mean, adults, both sexes, Sweden/stream (EPA 1993c)
TUF	Temporal use factor	1	Will be 1 unless specific value exists for a receptor
IR_F	Food ingestion rate (g/g/d=kg/kgBW/d)[a]	0.14	Michigan (farm raised) (EPA 1993c)
PF	Plant fraction	0.09	Michigan/stream, river (% wet wt; stomach contents normalized to 97.5% of contents identified) (EPA 1993c)
AF	Animal fraction	0.91	Michigan/stream, river (% wet wt; stomach contents normalized to 97.5% of contents identified) (EPA 1993c)
SFr	Soil fraction	0	(Sample and others 1997)
IR_W	Water ingestion rate (g/g/d=L/kgBW/d)	0.11	Estimated (EPA 1993c) by using allometric equation, $0.099 \times BW(kg)^{0.90}/BW$ (kg) (EPA 1993c, Eq. 3-17)

[a] Food ingestion rate (g/g/d) re-expressed as kg/kg BW/d is assumed not to include ingested soil; therefore, PF + AF = 1.0.

8.1.4 Assessment Endpoints

An assessment endpoint is defined by EPA (1997c) to be "an expression of an ecological attribute that is to be protected". Environmental statutes govern the protection of ecological resources, including:

- Preservation and conservation of T&E organisms
- Maintenance and protection of terrestrial organism populations and ecosystems
- Maintenance and protection of aquatic organism populations and ecosystems

To fulfill these requirements, the assessment endpoints were chosen to:

- Protect and conserve individuals and populations of T&E species (Table 8-1, assessment endpoint 1)
- Maintain and protect terrestrial populations and ecosystems, including plants (Table 8-1, assessment endpoint 2), invertebrates (Table 8-1, assessment endpoint 3), herbivorous animals (Table 8-1, assessment endpoint 4), omnivorous animals (Table 8-1, assessment endpoint 5), and terrestrial predators (Table 8-1, assessment endpoint 6)
- Maintain and protect aquatic populations and ecosystems, including sediment-dwelling organisms (Table 8-1, assessment endpoint 7), planktivorous fish and small aquatic invertebrates (Table 8-1, assessment endpoint 8), waterfowl (Table 8-1, assessment endpoint 9), large carnivorous fish (Table 8-1, assessment endpoint 10), and fish-eating predators (Table 8-1, assessment endpoint 11)

The assessment endpoints reflect the conceptual exposure model and are based on the identified receptors and their recognized complete exposure pathways. Critical attributes of identified ecological receptors (population, community, or individual in the case of a threatened or endangered species) are abundance and productivity, which are functions of survival and reproduction. Protection of receptors' survival and reproduction is assumed to protect the structure and function of the local ecosystem (EPA 1999a). Measures of effect are defined as measures of change in critical attributes in response to a stressor to which receptors are exposed. For the Hanford Site risk assessment, modeled exposure concentrations and doses are compared to published concentrations and doses associated with measures of toxicological effect on the identified receptors or related species. Decision criteria prescribe how the endpoints are evaluated using the measures of effect.

Policy goals, assessment endpoints, measures of effect, and decision rules used for the SLERA are presented in Table 8-1.

8.2 Exposure Assessment

Estimation of the risk to ecological receptors from COPCs and ROPCs in environmental media at an exposure location requires an estimate of exposure and a toxicity reference value (TRV), that is, an exposure level associated with little or no adverse effect. TRVs are discussed in section 8.3. This section describes how the exposures of ecological receptors are estimated for environmental media at the WTP exposure locations. Exposure locations at the Hanford Site are areas within the deposition grid at which ecological receptors come into contact with COPCs and ROPCs in media contaminated by stack emissions. Contamination at a given location is represented by modeled concentrations of COPCs and ROPCs in environmental media. Terrestrial receptor locations are the same as in the human health risk assessment. They were chosen as the grid nodes where deposition was maximal at four points of interest:

- Onsite ground maximum - This location generally represents worst-case human and ecological exposures because potential receptor populations are assumed to be present at the point of maximum concentration despite the fact that very few receptors are expected to actually be present there.
- Hanford offsite maximum - This location represents a more plausible location for most human receptors and is an important point of compliance.
- Gable Mountain maximum - This location is included because of its importance to Native American populations in the Oregon-Washington area.
- Columbia River maximum - This location is used to evaluate potential risks to aquatic ecological receptors and as a source of potable water for human receptors.

For the risk assessment, all of the terrestrial receptors are placed at each of the terrestrial maxima, regardless of habitat. This approach ensures that a conservative risk assessment results, since exposure at any other location would be less. Similarly, the grid node at which deposition into the Columbia River is highest was chosen to represent deposition into the entire Hanford Reach, and all of the aquatic receptors and their predators were assumed to be present there.

The exposure assessments for ecological receptors estimate the exposure from ingestion of food and environmental media containing COPCs and ROPCs under certain assumptions. The ingestion rates of food and environmental media (soil, sediment, and water) and the proportions of different types of food that WTP receptors realistically ingest are given in section 8.1 of this work plan. The proportions of different types of food that a receptor ingests (that is, its diet) are an important factor in determining the exposure because different food types have different uptake rates of COPCs and ROPCs and, therefore, different concentrations in tissues. The diets to be used for the SLERA are defined in section 8.2.1.

The assessment of exposure for ecological receptors requires estimates of the exposure point concentrations (EPCs) of COPCs and ROPCs in environmental media, including plants and animals ingested by receptors. EPCs are discussed in section 8.2.2. The SLERA will use modeled whole-body concentrations in food items to estimate doses to wildlife receptors.

The equations to be used to estimate exposure for terrestrial and aquatic receptors at the WTP exposure locations are described below (sections 8.2.3 and 8.2.4). Two types of exposure estimates are required:

- The exposure estimate for receptors living immersed in a medium containing COPCs or ROPCs (such as vegetation and terrestrial invertebrates living in soil, fish and other aquatic life living in surface water, and benthic organisms living in sediment) is the concentration of COPC or ROPC in the medium.
- The exposure estimate for a wildlife receptor that does not live in a medium containing COPCs or ROPCs but is exposed by ingestion is the estimated average daily dose (ADD).

The exposure equations for wildlife are variations of wildlife exposure equations from EPA 1999a and implied in other sources (EPA 1997c, 1998c). These equations are used to calculate both the concentrations of COPCs and ROPCs in the tissues of receptors that are used for food (and in the case of ROPCs, the tissues of all other wildlife receptors) and the ingested doses of COPCs and ROPCs. The equations for ecological receptors are functionally equivalent to the equations in section 7.1 of this work plan that are used to quantify exposure of humans by ingestion of contaminated food (EPA 1998a). All ingested dose equations calculate the amount of contaminant ingested per unit biomass per unit time by multiplying the concentration of the contaminant in the ingested medium (abiotic medium or food item)

by the receptor's ingestion rate for that medium and dividing by the receptor's body weight. The wildlife equations allow for the contaminant concentration in a food item to be calculated as the product of the contaminant concentration in an abiotic medium and the bioaccumulation (uptake or transfer) factor for the medium.

The modeled whole-body concentrations of contaminants in plants and fish consumed by both humans and nonhuman receptors will be calculated by using bioaccumulation factors, ingestion rates, and other parameters (section 8.2.5) in model equations described by EPA (1999a). The SLERA will use these modeled whole-body concentrations to estimate doses to wildlife receptors.

The diets to be used in the PRA and the FRA for WTP receptors are discussed in the following subsection.

8.2.1 Diet

The proportions of different types of food that a receptor eats (that is, its diet) are an important factor in determining the exposure because different food types have different concentrations of COPCs and ROPCs. Two general types of diet by which ingestion exposure of omnivores and carnivores can be estimated are discussed in this section. An *exclusive diet* is a diet consisting of a single type of prey or food, and a *realistic diet* is a diet where the fractions of different types of prey or food eaten are more or less the fractions reported to actually occur in one or more cases for the receptor or similar species. The exposure assessment will evaluate an exclusive diet in the PRA and in the FRA. The exclusive diet scenario will be evaluated as a worst-case scenario (that is, it gives the most conservative risk estimate). If risks above a hazard index (HI) of 0.25 are identified, the realistic diet will be evaluated as well. In general, the fractions of prey or food types in a given animal's diet, the body burdens in each prey or food type, and the animal's bioaccumulation factor (BAF) for the COPC or ROPC determines the animal's body burden and, thus, the exposure of its predator.

For 12 of the WTP receptors, a diet must be specified to quantify the dose of COPCs and ROPCs resulting from ingested food. Three of the receptors—mule deer, mourning dove, and Canada goose—eat only plants; five of the receptors—burrowing owl, red-tailed hawk, spotted sandpiper, great blue heron, and bald eagle—eat only animals; and four of the receptors—Great Basin pocket mouse, western meadowlark, coyote, and mink—typically eat a mixed diet of both plants and animals. Use of the realistic diet would reduce the ingestion exposure of mice and meadowlarks. It would also reduce the tissue concentrations in mice and meadowlarks and, thereby, reduce the ingestion exposure of the terrestrial carnivores—coyotes, owls, and hawks.

For the omnivores (pocket mouse and western meadowlark) and the top predators (coyote, burrowing owl, and red-tailed hawk), the SLERA will evaluate only the exclusive diet comprising the food type with the highest concentration for a given COPC. For the omnivores, if the plant food has the highest concentration for a given COPC, then the diet of 100 % plants will be evaluated (Figure 8-13), and vice versa if the soil-dwelling invertebrate food has the highest tissue concentration. For the top predators, if the small mammal prey (pocket mouse) has the highest concentration for a given COPC, then the diet of 100 % pocket mice will be evaluated (Figure 8-14), and vice versa if the western meadowlark has the highest tissue concentration. For mink, the SLERA will evaluate a diet of 100 % fish, because the fish always has a higher tissue concentration than aquatic plants. This approach always results in the most conservative, highest exposure estimate for a given COPC for omnivores (pocket mouse and meadowlark) and predators (coyote, owl, hawk, and mink) that eat multiple types of food. For ROPCs, the assessment

will evaluate only the exclusive diet of the food type resulting in the highest tissue concentration in the receptor.

If use of the exclusive diet results in an HI > 0.25 for an omnivore or one of its predators, exposure will be reevaluated using realistic diets, provided the regulatory agencies agree. Likely diets would be:

- Great Basin pocket mouse, 62 % plants, 34 % herbivorous insects, and 4 % soil-dwelling invertebrates (based on dietary information for deer mouse [EPA 1993c])
- Western meadowlark, 30 % plant, 63 % herbivorous insect, and 7 % soil-dwelling invertebrate (Sample and others 1997)
- Coyote, 2 % plant and 98 % pocket mouse (Sample and others 1997)
- Burrowing owl, 25 % herbivorous insect, 70 % pocket mouse, and 5 % meadowlark (assumed distribution)
- Red-tailed hawk, 75 % pocket mouse and 25 % meadowlark (assumed distribution)
- Mink, 2 % aquatic plants and 98 % fish (EPA 1993c)

Concentrations used to estimate exposure for ecological receptors, exposure equations for terrestrial and aquatic receptors, and the variables and parameters used in these equations to estimate exposures for ecological receptors are provided in the following sections.

8.2.2 Exposure Point Concentrations in Abiotic Media

Exposure of ecological receptors to COPCs and ROPCs in this work plan will be estimated from the concentrations predicted by the aerial dispersion and other fate and transport models (section 6). Dispersion model output concentrations will be used to calculate exposure concentrations for gases and particulates in air (mg/m^3, pCi/m^3) and surface soil (mg/kg, pCi/g) at the onsite ground maximum, the Hanford offsite maximum, and the Gable Mountain maximum; and gases and particulates in air (mg/m^3, pCi/m^3), surface water (µg/L, mg/L, pCi/L), and sediment (µg/kg, mg/kg, pCi/g) at the Columbia River maximum. For each of these exposure locations on the dispersion grid, the modeled concentration will be used to estimate the exposure to terrestrial (section 8.2.3) and aquatic (section 8.2.4) ecological receptors as appropriate. Use of maximum modeled concentrations represents a conservative estimate of potential exposure due to the WTP.

In keeping with the protective approach that will be used in the SLERA, EPCs used to estimate doses of COPCs and ROPCs for the quantitative SLERA will correspond to the maximum concentrations at the locations of maximum deposition, and potential exposure to all ecological receptors will be evaluated there.

8.2.3 Quantification of Exposure at the Onsite, Offsite, and Gable Mountain Maxima (Terrestrial Receptors)

Quantifying exposures for receptors exposed by direct contact with air and soil and ingestion of soil and biota requires the EPCs of COPCs and ROPCs in air, soil, and biota. The method for calculating EPCs in air and soil is described in section 8.2.2. The EPCs of COPCs and ROPCs in biota (section 8.2.3.1) are required in order to calculate the ADD by ingestion (sections 8.2.3.2 and 8.2.3.3) and the internal radiation dose for wildlife receptors (section 8.2.3.4).

Terrestrial receptors at Hanford can find water in many sources, including rain, snow, dew, and incidental surface sources. However, climate in the region results in greater evapotranspiration than precipitation (DOE 1997). Therefore, most potential water sources are ephemeral and are not appropriate for deposition modeling, which assumes a 40-year accumulation of COPCs and ROPCs. It is assumed for the RAWP that the terrestrial receptors do not ingest contaminated surface water but get their water from other sources. For example, moisture in food is a major source of water for receptors such as the Great Basin pocket mouse. In the RAWP, exposure by ingestion of drinking water will be evaluated only at the Columbia River maximum location, where the river is the source of drinking water for Canada goose, spotted sandpiper, great blue heron, bald eagle, and mink.

8.2.3.1 EPCs in Terrestrial Biota

Calculating EPCs for tissues of terrestrial plants and animals exposed by direct contact with air and soil requires the EPCs of COPCs and the ROPCs in air (C_{air}) and soil (Cs) and the receptor bioaccumulation and uptake factors for the COPCs and ROPCs (section 8.2.5.3). Unless specifically stated otherwise, all tissue and body weights are wet weights, whereas soil weights are dry weights.

EPCs in Terrestrial Plants (Trophic Level 1)

The EPC for plants (C_p) exposed to COPCs and ROPCs in air and surface soil and fed upon by herbivores and omnivores is given by:

$$C_p = Pd + Pv + Pr \qquad \text{(Eq. 8-1)}$$

where:

C_p = concentration of COPC or ROPC in plant tissue (mg/kg or pCi/g)

Pd = concentration resulting from uptake from particles deposited on leaf surfaces (mg/kg or pCi/g)

Pv = concentration resulting from uptake of vapors by direct contact with air (mg/kg or pCi/g)

Pr = concentration resulting from uptake from soil through roots (mg/kg or pCi/g)

Equations for the calculation of Pd and Pv are presented in sections 6.5.1 and 6.5.2, respectively. Pr is calculated as:

$$Pr = Cs \times SPv \times 0.12 \qquad \text{(Eq. 8-2)}$$

where:

Pr = concentration resulting from uptake from soil through roots (mg/kg or pCi/g)

Cs = concentration of COPC or ROPC in soil (mg/kg or pCi/g)

SPv = soil-to-tissue uptake factor for plants (kg soil/kg dry weight tissue or g soil/g dry weight tissue)

0.12 = dry-weight to wet-weight conversion (EPA 1999a)

The values of SPv are discussed in section 8.2.5.3. Values of SPv for all COPCs and ROPCs are given in Appendix C2, Table C2-1.

EPCs in Terrestrial Invertebrates (Trophic Level 2)

For terrestrial invertebrates exposed to COPCs and ROPCs in air and surface soil and fed upon by omnivores, the tissue EPC will be calculated by using either a measured soil-to-invertebrate uptake factor or a calculated soil porewater concentration and an empirically determined water-to-invertebrate uptake factor. EPCs for COPCs and ROPCs with measured uptake factors are calculated in accordance with EPA (1999a) draft guidance:

$$C_a = Cs \times BAF\text{-}S \qquad \text{(Eq. 8-3)}$$

where:

C_a = fresh weight concentration of COPC or ROPC in animal tissue (mg/kg or pCi/g)

Cs = concentration of COPC or ROPC in soil (mg/kg or pCi/g)

BAF-S = soil-to-tissue uptake factor for terrestrial invertebrates (kg soil/kg fresh weight tissue or g soil/g fresh weight tissue)

The values of BAF-S are discussed in section 8.2.5.3. Values of BAF-S for all COPCs and ROPCs are given in Appendix C2, Table C2-1.

For many organic COPCs, measured BAF-S values are not available. Instead, per EPA draft guidance (EPA 1999a), values of BAF-S for organic COPCs for which no measured values were available were calculated with an equation (Eq. 8-63) derived by regression analysis of uptake of several organic chemicals from water by aquatic invertebrates as a function of log K_{ow} (Southworth and others 1978 [see section 8.2.5.3 for further discussion of the equation]). According to EPA draft guidance (EPA 1999a), it is appropriate to use a calculated concentration of COPC in soil porewater when using the BAF-S calculated by the regression equation (Eq. 8-63). The concentration in soil porewater will be calculated by assuming equilibrium partitioning, which is explained in the following paragraphs.

To be taken up by terrestrial invertebrates, chemicals must be in solution in soil porewater. For most organic COPCs, only a small fraction of the COPC in soil is dissolved in porewater, and the biologically available fraction of these organic COPCs in soil (that is, the fraction in soil porewater) is small. Chemicals in soil porewater are assumed to be in equilibrium with chemicals bound to soil particles. The ratio of concentration in soil porewater to concentration on soil particles is given by the partitioning coefficient (K_D) that is characteristic of the chemical and the soil. However, most organic COPCs in soil are bound to organic carbon rather than to the mineral structure of soil particles (EPA 1993e), and K_D is not constant for soils with different organic carbon contents. A more useful partitioning coefficient is the ratio of the concentration in soil porewater (µg/L) to the concentration relative to soil carbon (µg/kg carbon) and is designated K_{oc}. K_{oc} can be multiplied by the fraction of organic carbon in the soil to derive the porewater-to-soil concentration ratio:

$$K_D = K_{oc} \times f_{oc} \qquad \text{(Eq. 8-4)}$$

where:

K_D = soil-water partitioning coefficient (L/kg soil)

K_{oc} = octanol-water partitioning coefficient (L/kg carbon)

f_{oc} = fraction of soil that is organic carbon (kg carbon/kg soil)

The concentration in porewater (C_{PW}) can be calculated by dividing the concentration in soil (Cs) by K_D:

$$C_{PW} = Cs / K_D \quad \text{(Eq. 8-5)}$$

and by substitution (as shown in Eq. 5-5 of EPA draft guidance [EPA 1999a]):

$$C_{PW} = Cs / (K_{oc} \times f_{oc}) \quad \text{(Eq. 8-6)}$$

where:

C_{PW} = concentration of organic COPC in soil porewater (mg/L)
Cs = concentration of organic COPC in soil (mg/kg soil)
K_{oc} = octanol-water partitioning coefficient (L/kg carbon)
f_{oc} = fraction of soil that is organic carbon (kg carbon/kg soil)

Thus, the tissue EPC for organic COPCs derived by using the calculated BAF-S would be:

$$C_a = C_{PW} \times \text{BAF-S} \quad \text{(Eq. 8-7)}$$

and:

$$C_a = Cs \times \text{BAF-S} / (f_{oc} \times K_{oc}) \quad \text{(Eq. 8-8)}$$

where:

C_a = concentration of organic COPC in animal tissue (mg/kg)
C_{PW} = concentration of organic COPC in soil porewater (mg/L)
BAF-S = water-to-tissue uptake factor for terrestrial invertebrates (L/kg)
Cs = concentration of organic COPC in soil (mg/kg)
f_{oc} = fraction of soil that is organic carbon
K_{oc} = soil organic carbon partitioning coefficient (L/kg) (Appendix C2, Table C2-1)

The EPA draft guidance (section 5.3.2.1 of EPA 1999a) quoted for the use of equilibrium partitioning to estimate porewater concentrations states that the equilibrium-partitioning approach may be applied only when certain conditions are met:

- The fraction of organic carbon in soil (f_{oc}) is known
- The COPCs must be nonpolar hydrophobic organic compounds
- The COPCs must have mathematically derived water-to-tissue bioconcentration factors (BCFs)

For this work plan, equilibrium partitioning can be applied to the subset of organic COPCs that have log K_{ow} and log K_{oc} values but do not have measured BAF-S values because each the above conditions are met, as described below:

- The approach is considered valid if f_{oc} is > 0.002 (EPA 1993e), whereas it has been accepted that f_{oc} is 0.01 for the SLRA. Therefore, the soils meet the requirement of having a known organic carbon fraction.
- The hydrophobic nature of a compound is indicated by its log K_{ow}. In the discussion of the technical basis for using equilibrium partitioning to derive sediment quality criteria (EPA 1993e), EPA shows sediment quality criteria for compounds with log K_{ow}s above about 2.6, so any compound with a log K_{ow} above 2.6 should be considered sufficiently hydrophobic to meet the requirements of the method. There are 259 organic COPCs with BAF-S values calculated by Eq. 8-65, and 97 of them have log K_{ow} values above 2.6 and, thus, meet the requirement of being nonpolar, hydrophobic compounds with mathematically derived water BCFs. They are footnoted in Appendix C2, Table C2-1.
- The organic COPCs for which K_{ow} is known have mathematically determined water-to-invertebrate BAFs.

The equilibrium-partitioning approach will be used for the 97 organic COPCs that do not have measured BAF-S values but have log K_{ow} values above 2.6. For the remaining 162 organic COPCs that do not have measured BAF-S values but have log K_{ow} values below 2.6, the calculated BAF-S will be used in Eq. 8-3 to calculate tissue concentrations.

EPCs in Mammal and Bird Tissues (Trophic Levels 2, 3, and 4)

For mammal and bird receptors that are preyed upon by other predator receptors, the tissue EPC (C_n) will be calculated as the sum of the contributions from the different types of material ingested. For transfer of COPCs and ROPCs to receptors by ingestion of plants and soil, BAFs are used. For transfer of COPCs and ROPCs from prey to predators by ingestion of prey tissue, the food-chain multiplier (FCM) approach (EPA 1999a) will be used to model transfer from one trophic level to another. FCMs are discussed in section 8.2.5.3. The equation describing the concentration of COPCs and ROPCs in receptor tissues is adapted from EPA draft guidance (EPA 1999a, Eq. 5-12):

$$C_n = Cs \times BAF\text{-}T_s + C_p \times BAF\text{-}T_p \times PF + C_a \times FCM_n/FCM_j \times AF \qquad \text{(Eq. 8-9)}$$

where:

C_n	=	concentration of COPC or ROPC in receptor tissue (mg/kg or pCi/g)
Cs	=	concentration of COPC or ROPC in ingested soil (mg/kg or pCi/g)
$BAF\text{-}T_s$	=	soil-to-tissue uptake factor for receptor (unitless)
C_p	=	concentration of COPC or ROPC in ingested plant tissue (mg/kg or pCi/g)
$BAF\text{-}T_p$	=	plant-to-tissue uptake factor for receptor (unitless)
PF	=	fraction of diet from plant tissue (unitless)
C_a	=	concentration of COPC or ROPC in ingested animal prey (mg/kg or pCi/g)
FCM_n	=	food-chain multipliers for the receptor (unitless)
FCM_j	=	food-chain multipliers for ingested prey type (unitless)
AF	=	fraction of diet from animal tissue (unitless)

Per EPA draft guidance (EPA 1999a), the plant-to-tissue and soil-to-tissue BAFs are calculated from the receptor's ingestion rate and the published biotransfer factor (Ba). The BAFs are defined as:

$$BAF\text{-}T_s = Ba \times IR_F \times SFr \times BW \quad \text{(Eq. 8-10)}$$

and:

$$BAF\text{-}T_p = Ba \times IR_F \times BW \quad \text{(Eq. 8-11)}$$

where:

$BAF\text{-}T_s$	=	soil-to-tissue uptake factor for receptor (kg soil/kg tissue or g soil/g tissue)
Ba	=	ingestion-to-tissue transfer factor (d/kg)
IR_F	=	daily food ingestion rate (kg/kg BW/d)
SFr	=	soil ingested per unit of food ingested (unitless)
BW	=	body weight of receptor (kg)
$BAF\text{-}T_p$	=	plant-to-tissue uptake factor for receptor (kg plant/kg tissue or g plant/g tissue)

According to EPA (1999a), the fraction of diet that is plants (PF) is included in the calculation of $BAF\text{-}T_p$. Thus, an omnivore whose diet is 50 % plants would have a $BAF\text{-}T_p$ half that of an herbivore with the same body weight and food ingestion rate. However, because PF must be adjusted to either 1 or 0 for the exclusive diet, a fixed value of PF cannot be included in the calculation of $BAF\text{-}T_p$. Therefore, PF is not included as a part of $BAF\text{-}T_p$ but appears as a separate term in Eq. 8-9.

Values for IR_F, PF, BW, and SFr for receptors exposed at terrestrial areas are given in the receptor profiles in section 8.1.3.3. The values of BAF-T are discussed in section 8.2.5.3. Values of Ba, $BAF\text{-}T_p$, and $BAF\text{-}T_s$ for all COPCs and ROPCs for each receptor are given in Appendix C2, tables C2-1, C2-3, and C2-2, respectively.

The EPCs for COPCs in plants, terrestrial invertebrates, and mammal and bird receptors will be used in the equations for modeling intake to terrestrial ecological receptors (that is, the ingestion ADD). EPCs for ROPCs are used to calculate internal radiation exposure.

8.2.3.2 Modeling Intake to Terrestrial Ecological Receptors

The ingestion ADD for terrestrial receptors will be calculated as the sum of the intakes of plant tissue, animal tissue, and soil. Thus:

$$ADD = ADD_p + ADD_a + ADD_s \quad \text{(Eq. 8-12)}$$

where:

ADD	=	average daily dose by ingestion (mg/kg-d)
ADD_p	=	average daily dose by plant ingestion (mg/kg-d)
ADD_a	=	average daily dose by animal ingestion (mg/kg-d)
ADD_s	=	average daily dose by soil ingestion (mg/kg-d)

Plant intake (ADD_p) is calculated as follows:

$$ADD_p = C_p \times IR_F \times PF \quad \text{(Eq. 8-13)}$$

where:

ADD_p = average daily dose by plant ingestion (mg/kg-d)
C_p = concentration of COPC in ingested plant tissue (mg/kg)
IR_F = food ingestion rate of receptor (kg/kg/d)
PF = fraction of diet from plants (unitless)

Similarly, animal intake (ADD_a) is calculated as:

$$ADD_a = C_a \times IR_F \times AF \quad \text{(Eq. 8-14)}$$

where:

ADD_a = average daily dose by animal ingestion (mg/kg-d)
C_a = concentration of COPC in ingested animal tissue (mg/kg)
IR_F = food ingestion rate of receptor (kg/kg/d)
AF = fraction of diet from animals (unitless)

Soil intake (ADD_s) is calculated as:

$$ADD_s = Cs \times IR_F \times SFr \quad \text{(Eq. 8-15)}$$

where:

ADD_s = average daily dose by soil ingestion (mg/kg-d)
Cs = concentration of COPC in ingested soil (mg/kg)
IR_F = food ingestion rate of receptor (kg/kg/d)
SFr = soil ingested per unit of food ingested (unitless)

The plant and animal food fractions sum to 1 (PF + AF = 1), and SFr is defined as the amount of soil ingested per unit of food ingested. Therefore, the total ingested fraction of food plus soil (PF + AF + SFr) is greater than 1 (for example, for the western meadowlark PF = 0.3, AF = 0.7, and SFr = 0.29, so the total ingested fraction is 1.29).

Absorption efficiency (AE), the area use factor (AUF), and the temporal use factor (TUF) are assumed to be equal to 1, so they do not appear in the exposure equations.

8.2.3.3 Receptor-Specific Exposure Equations for Terrestrial Receptors

The complete equations for daily ingestion intake (ADD) and tissue concentration (C_n) for each receptor are presented below.

Herbivores: Mule Deer and Mourning Dove (Trophic Level 2)

Mule deer and mourning doves are strict herbivores but ingest soil incidentally with their plant food (Figure 8-11). Thus:

$$ADD = ADD_p + ADD_s \qquad \text{(Eq. 8-16)}$$

where ADD_p and ADD_s are as given above. The mule deer and mourning dove food ingestion rate (IR_F) and dietary fractions (PF and SFr) are given in the receptor profiles in section 8.1.3.3.

Deer and dove tissue concentrations are calculated by an equation adapted from EPA draft guidance (EPA 1999a, Eq. 5-11):

$$C_n = C_p \times BAF\text{-}T_p + Cs \times BAF\text{-}T_s \qquad \text{(Eq. 8-17)}$$

where:

C_n	=	concentration of COPC or ROPC in receptor tissue (mg/kg or pCi/g)
C_p	=	concentration of COPC or ROPC in ingested plant tissue (mg/kg or pCi/g)
$BAF\text{-}T_p$	=	plant-to-tissue uptake factor for receptor (unitless)
Cs	=	concentration of COPC or ROPC in ingested soil (mg/kg or pCi/g)
$BAF\text{-}T_s$	=	soil-to-tissue uptake factor for receptor (unitless)

For herbivores, PF = 1, so PF does not appear in Eq. 8-17. The soil-to-tissue uptake factors ($BAF\text{-}T_s$) and plant-to-tissue uptake factors ($BAF\text{-}T_p$), respectively, for mule deer and mourning doves are given in Appendix C2, tables C2-2 and C2-3.

Omnivores: Great Basin Pocket Mouse and Western Meadowlark (Trophic Level 3)

Pocket mice and western meadowlarks are omnivores that ingest plants and invertebrates but ingest soil incidentally with their food (Figure 8-11). Thus:

$$ADD = ADD_p + ADD_a + ADD_s \qquad \text{(Eq. 8-12)}$$

where ADD_p, ADD_a and ADD_s are as given above (equation 8-12 first appears in section 8.2.3.2). The pocket mouse and western meadowlark food ingestion rates (IR_F) and dietary fractions (PF, AF, and SFr) will be given in the receptor profiles in section 8.1.3.3. The SLERA will evaluate the exposure of mice and meadowlarks assuming ingestion of only the food type with the highest tissue concentration. The terrestrial food web (Figure 8-9) shows that the sole animal prey type for the Great Basin pocket mouse and western meadowlark is terrestrial invertebrates. Whether plants or terrestrial invertebrates have the highest tissue concentration is a function of the soil-to-tissue uptake factor for the two food types. For the exclusive diets, PF is one and AF is zero if $C_p > C_a$, and PF is zero and AF is one if $C_a > C_p$ (Figure 8-13). The use of the exclusive diet in the evaluation of the worst-case scenario is discussed in section 8.2.1.

Great Basin pocket mouse and western meadowlark tissue concentrations are calculated by an equation adapted from EPA draft guidance (EPA 1999a, Eq. 5-12):

$$C_n = C_p \times BAF\text{-}T_p \times PF + C_a \times FCM_n/FCM_j \times AF + Cs \times BAF\text{-}T_s \qquad \text{(Eq. 8-18)}$$

where:

C_n	=	concentration of COPC or ROPC in receptor tissue (mg/kg or pCi/g)
C_p	=	concentration of COPC or ROPC in ingested plant tissue (mg/kg or pCi/g)
$BAF\text{-}T_p$	=	plant-to-tissue uptake factor for receptor (unitless)
PF	=	fraction of diet from plants (unitless)
C_a	=	concentration of COPC or ROPC in ingested animal prey (mg/kg or pCi/g)
FCM_n	=	food-chain multipliers for the receptor (unitless)
FCM_j	=	food-chain multipliers for ingested prey type (unitless)
AF	=	fraction of diet from animal tissue (unitless)
Cs	=	concentration of COPC or ROPC in ingested soil (mg/kg or pCi/g)
$BAF\text{-}T_s$	=	soil-to-tissue uptake factor for receptor (unitless)

Values of PF and AF depend on the concentrations of COPCs and ROPCs in food (C_p and C_a). If $C_p > C_a$, PF is 1 and AF is 0. Conversely, if $C_p < C_a$, PF is 0 and AF is 1. C_a is the concentration of COPCs or ROPCs in terrestrial invertebrates. The FCMs for the pocket mouse and western meadowlark (FCM_3) and their prey (FCM_2) are given in Appendix C2, Table C2-5. The soil-to-tissue uptake factors ($BAF\text{-}T_s$) and plant-to-tissue uptake factors ($BAF\text{-}T_p$) are given in Appendix C2, tables C2-2 and C2-3, respectively.

Predators: Coyote and Burrowing Owl (Trophic Level 4)

Coyotes and burrowing owls are omnivores that ingest primarily small animals, but also a small fraction of soil incidentally with their food (Figure 8-11). The SLERA will evaluate the exposure of coyotes and burrowing owls as carnivores, assuming ingestion of only the animal prey type with the highest tissue concentration (Figure 8-14). Whether meadowlarks or pocket mice have the highest tissue concentration is a function of the soil-to-tissue and other uptake factors for those prey types. Thus:

$$ADD = ADD_a + ADD_s \qquad \text{(Eq. 8-19)}$$

where ADD_a is calculated for the prey type with the highest expected body burden for a given COPC and ADD_a and ADD_s are as given above.

Coyote and burrowing owl food ingestion rate (IR_F) and soil dietary fraction (SFr) are given in the receptor profiles in section 8.1.3.3. The terrestrial food web (Figure 8-9) shows that the sole prey types of the coyote and burrowing owl to be evaluated in the SLERA are the Great Basin pocket mouse and the western meadowlark.

Coyote and burrowing owl tissue concentrations will be calculated by an equation adapted from EPA draft guidance (EPA 1999a, Eq. 5-13):

$$C_n = C_a \times FCM_n/FCM_j \times AF + Cs \times BAF\text{-}T_s \qquad \text{(Eq. 8-20)}$$

where:

C_n	=	concentration of COPC or ROPC in receptor tissue (mg/kg or pCi/g)
C_a	=	concentration of COPC or ROPC in ingested animal prey (mg/kg or pCi/g)
FCM_n	=	food-chain multipliers for the receptor (unitless)

FCM_j = food-chain multipliers for ingested prey type (unitless)
AF = fraction of diet from animal tissue (unitless)
Cs = concentration of COPC or ROPC in ingested soil (mg/kg or pCi/g)
$BAF\text{-}T_s$ = soil-to-tissue uptake factor for receptor (unitless)

and where C_a is the tissue concentration of the animal prey type (either Great Basin pocket mouse or western meadowlark) with the highest body burden. For the exclusive diet, AF = 1. The FCMs for the coyote and burrowing owl (FCM_4) and their prey (FCM_3) are given in Appendix C2, Table C2-5. Soil-to-tissue uptake factors ($BAF\text{-}T_s$) for the coyote and burrowing owls are given in Appendix C2, Table C2-2.

Predator: Red-Tailed Hawk (Trophic Level 4)

Red-tailed hawks are carnivores that ingest small animals but do not ingest soil incidentally with their food (Figure 8-11). The SLERA will evaluate the exposure of red-tailed hawks assuming ingestion of only the prey type with the highest tissue concentration (Figure 8-14). Whether western meadowlarks or Great Basin pocket mice have the highest tissue concentration is a function of the soil-to-tissue and other uptake factors for those prey types. Thus:

$$ADD\ (mg/kg\text{-}d) = ADD_a \qquad \text{(Eq. 8-21)}$$

where ADD_a is calculated for prey type with the highest expected body burden for a given COPC, and ADD_a is calculated as given above with AF = 1.

Red-tailed hawk food ingestion rate (IR_F) is given in the receptor profiles in section 8.1.3.3. The terrestrial food web (Figure 8-9) shows the prey types for the hawk. The hawk prey types to be evaluated in the SLERA are the Great Basin pocket mouse and the western meadowlark.

Red-tailed hawk tissue concentration will be calculated by an equation adapted from EPA draft guidance (EPA 1999a, Eq. 5-13):

$$C_n = C_a \times FCM_n/FCM_j \qquad \text{(Eq. 8-22)}$$

where:

C_n = concentration of COPC or ROPC in receptor tissue (mg/kg or pCi/g)
C_a = concentration of COPC or ROPC in ingested animal prey (mg/kg or pCi/g)
FCM_n = food-chain multipliers for the receptor (unitless)
FCM_j = food-chain multipliers for ingested prey type (unitless)

where the prey type is the prey with the highest expected body burden. For carnivores, AF = 1, so AF does not appear in Eq. 8-22. The FCMs for hawks (FCM_4) and their prey (FCM_3) are given in Appendix C2, Table C2-5.

8.2.3.4 External and Internal Radiation Dose

The total radiological dose to all receptors is calculated as the sum of the external and internal radiation doses for all ROPCs, using methods presented by Sample and others (1997). External doses to all

receptors result from exposure to ROPCs in soil and air. The internal dose to plants and terrestrial invertebrates results from the uptake of radionuclides into their tissues from soil. The internal dose to wildlife receptors results from the uptake of radionuclides into their tissues from ingested food and soil.

All radiation damage results from interaction of ionizing radiation with molecules in the tissues. As each ROPC decays, it emits radiation that is characteristic for that ROPC. The energy absorbed by tissues depends on the type and energy of radiation and the amount of tissue that absorbs the energy. Thus, alpha particles and most beta radiation do not penetrate the skin and do not cause damage by external radiation. Also, the fraction of gamma radiation from any ROPC that is absorbed by tissue is higher for large animals than for small animals. Internal alpha radiation does more damage to tissues per unit of energy. To adjust for the additional damage, a quality factor (QF) is used: the alpha energy is multiplied by QF in the exposure equations. A QF of 5 has been suggested for ecological receptors (Kocher and Trabalka 2000) and is used in the following calculations.

External Dose

External radiation doses from air, soil, water, and sediment are calculated by methods presented by Blaylock, Frank, and O'Neal (1993) and Sample and others (1997). External irradiation by immersion in air containing ROPCs and by standing, sitting, or lying on the soil surface (aboveground radiation) is modeled by using external dose conversion factors (DCFs) presented by EPA (1993b) and the activity of ROPCs in the medium. Aboveground external radiation from soil is adjusted for the fraction of time that the receptor is assumed to spend on the soil surface. Those fractions are assumed to be:

- Plants, 0.5
- Terrestrial invertebrates, 0.5
- Mule deer, 1
- Mourning dove, 1
- Great Basin pocket mouse, 0.3
- Western meadowlark, 1
- Coyote, 0.7
- Burrowing owl, 0.5
- Red-tailed hawk, 0.05

There is also a roughness factor to correct for absorption of radiation by uneven soil contours and an elevation correction factor (ECF) to adjust DCFs to account for most ecological receptors having most of their bodies closer to the ground than the humans for which the DCFs were derived. ECF is 2 for all receptors except mule deer, which are large enough to receive radiation at approximately the same height as humans (Sample and others 1997). External radiation DCFs are presented in Appendix C2, Table C2-6.

Belowground external radiation from soil will be modeled by using the decay energies and tissue absorption fractions presented in Appendix C2, Table C2-6. Equations to calculate belowground external exposure are presented by Sample and others (1997). Belowground exposure is adjusted for the fraction of time that the receptor is assumed to be exposed underground. Those fractions are assumed to be:

- Plants, 0.5
- Terrestrial invertebrates, 0.5
- Mule deer, 0
- Mourning dove, 0

- Great Basin pocket mouse, 0.7
- Western meadowlark, 0
- Coyote, 0.3
- Burrowing owl, 0.5
- Red-tailed hawk, 0

Per EPA (1993b), the external dose (rad/d) to all receptors from soil is calculated as:

$$RDExt_{soil} = Cs \times DF_{soil} \quad \text{(Eq. 8-23)}$$

where:

$RDExt_{soil}$	=	external radiation dose from soil (rad/d)
Cs	=	activity of radionuclide in untilled soil (pCi/g)
DF_{soil}	=	factor for converting activity in soil to external dose from untilled soil

The total external dose from all ROPCs in soil is the sum of the external doses from each ROPC. Per Sample and others (1997), the external dose factor for soil (DF_{soil}) is calculated as:

$$DF_{soil} = F_{above} \times F_{ruf} \times DCF \times CFb \times ECF + 1.05 \times F_{below} \times E_{\gamma}n_{\gamma} \times \Phi_{\gamma} \times CFa \quad \text{(Eq. 8-24)}$$

where:

F_{above}	=	fraction of time spent above ground (unitless)
F_{ruf}	=	dose rate reduction factor accounting for ground roughness (unitless)
DCF	=	dose conversion factor for external radiation from soil contaminated to a depth of 1 cm (EPA 1993b)
CFb	=	5.12×10^{11}, factor to convert Sv/s per Bq/m^3 to rad/d per pCi/g
ECF	=	elevation correction factor to adjust dose coefficient for effective height of receptor above ground (unitless, Sample and others 1997)
1.05	=	conversion factor to account for immersion in soil rather than water
F_{below}	=	fraction of time spent below ground surface (unitless)
$E_{\gamma}n_{\gamma}$	=	photon energy emitted during transition from a higher to a lower energy state (MeV) × proportion of disintegrations producing γ radiation
Φ_{γ}	=	absorbed fraction of energy from gamma energy E_{γ}
CFa	=	unit conversion factor, 5.11×10^{-5} rad/d per pCi/g per MeV/disintegration

For all ROPCs, values of DF_{soil} for all receptors, DCF for untilled soil (1 cm), and Φ_{γ} and $E_{\gamma}n_{\gamma}$ are given in Appendix C2, Table C2-6. To calculate external exposure to radionuclides in soil, DF_{soil} values will be multiplied by the modeled activities of the corresponding radionuclides in surface soil at each exposure location.

Per EPA (1993b), the external dose (rad/d) to all receptors from air is calculated as:

$$RDExt_{air} = C_{air} \times DF_{air} \quad \text{(Eq. 8-25)}$$

where:

$RDExt_{air}$ = external radiation dose from air (rad/d)
C_{air} = activity of radionuclide in air (pCi/m^3)
DF_{air} = factor for converting activity in air to external dose from air

The external dose conversion factor for air (DF_{air}) is calculated as follows:

$$DF_{air} = 3.2 \times 10^5 \times DCF \qquad \text{(Eq. 8-26)}$$

where:

3.2×10^5 = conversion factor to convert Sv/s per Bq/m^3 to rad/d (EPA 1993b)
DCF = dose conversion factor for external radiation from immersion in air (EPA 1993b)

For all ROPCs, values of DCF for air are given in Appendix C2, Table C2-6. To calculate external exposure to radionuclides in air, DCF values will be multiplied by the modeled activities of the corresponding radionuclides in air at each exposure location.

Internal Dose

The internal exposure to radionuclides is calculated from the activity in the receptor's tissues rather than from the daily ingestion. The internal activities of ROPCs are calculated by using BCFs and ROPC activities in soil and food. Internal radiation doses will be calculated by multiplying the activity in tissues by the sum of alpha, beta, and gamma decay energies, where alpha and beta energies are assumed to be completely absorbed. Because gamma rays, like X-rays, may pass through the tissues without depositing their energy, gamma energies are adjusted to account for greater absorption by larger organisms at a given energy level and for greater absorption by all receptors at lower energy levels.

Per Sample and others (1997), the internal dose (rad/d) to plants, terrestrial invertebrates, and wildlife receptors will be calculated as follows:

$$RDInt = C_n \times DF_{int} \qquad \text{(Eq. 8-27)}$$

where:

$$DF_{int} = CFa \times (QF \times E_\alpha n_\alpha \times \Phi_\alpha + E_\beta n_\beta \times \Phi_\beta + E_\gamma n_\gamma \times \Phi_\gamma) \qquad \text{(Eq. 8-28)}$$

and:

RDInt = internal radiation dose (rad/d)
C_n = activity of radionuclide in receptor tissue (pCi/g)
DF_{int} = factor for converting ROPC activity in tissue to internal dose
CFa = unit conversion factor, 5.11×10^{-5} rad/d per pCi/g per MeV/disintegration
QF = quality factor for biological effect of alpha radiation (unitless), 5 (Kocher and Trabalka 2000)

$E_\alpha n_\alpha$ = average energy emitted as alpha radiation (MeV per disintegration) × proportion of disintegrations producing a α-particle

Φ_α = absorbed fraction of energy from alpha energy E_α

$E_\beta n_\beta$ = average energy emitted as beta radiation (MeV per disintegration) × proportion of disintegrations producing a β-particle

Φ_β = absorbed fraction of energy from beta energy E_β

$E_\gamma n_\gamma$ = photon energy emitted during transition from a higher to a lower energy state (MeV) × proportion of disintegrations producing γ radiation

Φ_γ = absorbed fraction of energy from gamma energy Eγ

For all ROPCs, values of DF_{int} for each receptor and Φ_α, $E_\alpha n_\alpha$, Φ_β, $E_\beta n_\beta$, Φ_γ, and $E_\gamma n_\gamma$ are given in Appendix C2, Table C2-6. To calculate external exposure to radionuclides in soil, DF_{int} values will be multiplied by the modeled activities of the corresponding radionuclides in receptor tissues at each exposure location.

8.2.4 Quantification of Exposure at the Columbia River Maximum (Aquatic Receptors)

Calculating hazard quotients (HQs) for receptors exposed to contaminated air, water, and sediment in the Columbia River area by direct contact with air, sediment, and water and by ingestion of water, sediment, and biota requires the EPCs of COPCs and ROPCs in air, water, sediment, and aquatic biota. The EPCs of COPCs in biota (section 8.2.4.1) are required to calculate the ADD by ingestion (sections 8.2.4.2 and 8.2.4.3) and internal radiation dose for predator receptors. The total radiation dose for all receptors exposed to ROPCs is the sum of the external and internal radiation doses for all ROPCs (section 8.2.4.4).

8.2.4.1 EPCs in Aquatic Biota

Calculating EPCs for tissues of aquatic plants and animals exposed by direct contact with air, water, and sediment requires the EPCs of COPCs and the ROPCs in air (C_{air}), dissolved in water (C_{dw}), in water column as a total (C_{wctot}), in sediment (Cs), as well as the receptor bioaccumulation and uptake factors for the COPCs and ROPCs (section 8.2.5.4).

EPCs in Aquatic Plants (Trophic Level 1)

For floating and rooted aquatic plants exposed to COPCs and ROPCs in surface water and sediment, respectively, and fed upon by Canada geese, the tissue EPC will be calculated in accordance with EPA (1999a) draft guidance:

for organic COPCs:

$$C_p = C_{dw} \times WP \times 0.001 + Cs \times SP \times 0.001 \qquad \text{(Eq. 8-29)}$$

for inorganic COPCs:

$$C_p = C_{dw} \times WP + Cs \times SP \qquad \text{(Eq. 8-30)}$$

and for ROPCs:

$$C_p = C_{dw} \times WP \times 0.001 + Cs \times SP \quad \text{(Eq. 8-31)}$$

where:

C_p = concentration or activity of COPCs or ROPCs in aquatic plant tissue (mg/kg or pCi/g)

C_{dw} = concentration or activity of COPCs or ROPCs dissolved in surface water (µg/L, mg/L, or pCi/L)

WP = water-to-tissue uptake factor for floating plants (L/kg)

0.001 = factor to convert µg/kg to mg/kg (mg/µg) for organic COPCs and pCi/kg to pCi/g (kg/g) for ROPCs

Cs = concentration or activity of COPCs or ROPCs in sediment (µg/kg, mg/kg, or pCi/g)

SP = sediment-to-tissue uptake factor for rooted aquatic plants (unitless)

In order to be conservative, it is assumed that the diet of the Canada goose is exposed to COPCs and ROPCs in both surface water and sediment (Figure 8-12). The values of WP and SP for the SLERA are discussed in section 8.2.5.4. For all COPCs and ROPCs, values for WP and SP are given in Appendix C2, Table C2-1.

EPCs in Benthic Invertebrates (Trophic Level 2)

For benthic invertebrates exposed to organic COPCs and ROPCs in sediment and fed upon by spotted sandpipers, the tissue EPC will be calculated by using either a measured sediment-to-invertebrate uptake factor or a calculated sediment porewater concentration and an empirically determined water-to-invertebrate uptake factor. EPCs for COPCs with measured uptake factors are calculated in accordance with EPA (1999a) draft guidance:

$$C_a = Cs \times BASF \times 0.001 \quad \text{(Eq. 8-32)}$$

and for inorganic COPCs and ROPCs:

$$C_a = Cs \times BASF \quad \text{(Eq. 8-33)}$$

where:

C_a = concentration or activity of COPCs or ROPCs in benthic invertebrate tissue (mg/kg, pCi/g)

Cs = concentration or activity of COPCs or ROPCs in sediment (µg/kg, mg/kg, or pCi/g)

BASF = sediment-to-tissue uptake factor for benthic invertebrates (unitless)

0.001 = factor to convert µg to mg (mg/µg) for organic COPCs

For many organic COPCs, measured sediment-to-tissue uptake factors for benthic invertebrates (BASF) values are not available. Instead, per EPA draft guidance, values of BASF for organic COPCs for which no measured values were available were calculated with an equation (EPA 1999a, Eq. 8-75) derived by regression analysis of uptake of several organic chemicals from water by aquatic invertebrates as a function of log K_{ow} (Southworth and others 1978). According to EPA draft guidance, it is appropriate to

use a calculated concentration of an organic COPC in sediment porewater when using an aquatic BCF for the BASF value, as calculated by the regression equation for aquatic invertebrates (EPA 1999a, Eq. 8-75). The concentration in soil porewater is determined by equilibrium partitioning, which is explained in section 8.2.3.1. Thus, the tissue EPC calculated by using the calculated BASF would be:

$$C_a = C_{PW} \times BASF \times 0.001 \qquad \text{(Eq. 8-34)}$$

and (as shown in Eq. 5-5 of EPA draft guidance [EPA 1999a]):

$$C_{PW} = Cs / (K_{oc} \times f_{oc}) \qquad \text{(Eq. 8-6)}$$

where:

C_a	=	concentration of organic COPC in animal tissue (mg/kg)
C_{PW}	=	concentration of organic COPC in sediment porewater (µg/L)
BASF	=	sediment-to-tissue uptake factor for benthic invertebrates (L/kg)
0.001	=	conversion factor, mg/µg
Cs	=	concentration of organic COPC in sediment (µg/kg)
K_{oc}	=	soil organic carbon partitioning coefficient (L/kg) (Appendix C2, Table C2-1)
f_{oc}	=	fraction of sediment that is organic carbon

Note: Equation 8-6 first appears in section 8.2.3.1.

The values of BASF for the SLERA are discussed in section 8.2.5.4. For all COPCs and ROPCs, values for BASF are given in Appendix C2, Table C2-1.

EPCs in Aquatic Invertebrates (Trophic Level 2)

For aquatic invertebrates exposed to organic COPCs and ROPCs in surface water and fed upon by fish, the tissue EPC will be calculated in accordance with EPA (1999a) draft guidance:

$$C_a = C_{dw} \times BCF_{inv} \times 0.001 \qquad \text{(Eq. 8-35)}$$

and for inorganic COPCs the tissue EPC is:

$$C_a = C_{dw} \times BCF_{inv} \qquad \text{(Eq. 8-36)}$$

where:

C_a	=	concentration or activity of COPC or ROPC in benthic invertebrate tissue (mg/kg or pCi/g)
C_{dw}	=	concentration or activity of COPC or ROPC dissolved in surface water (µg/L, mg/L, or pCi/L)
BCF_{inv}	=	water-to-tissue uptake factor for aquatic invertebrates (L/kg)
0.001	=	conversion factors (mg/µg for organic COPCs and kg/g for ROPCs)

The values of BCF_{inv} for the SLERA are discussed in section 8.2.5.4. For all COPCs and ROPCs, values for BCF_{inv} are given in Appendix C2, Table C2-1.

EPCs in Fish (Trophic Levels 2, 3, and 4)

Trophic-level-specific FCMs will be used to calculate the concentrations of COPCs and ROPCs in fish. FCMs adjust the calculated concentration in fish tissue to account for bioaccumulation from one trophic level to another (see section 8.2.5.3). For planktivorous fish (trophic level 2, FCM_2), omnivorous fish (trophic level 3, FCM_3), and carnivorous fish (trophic level 4, FCM_4) exposed to COPCs and ROPCs in surface water, aquatic biota, and fish, the tissue EPC will be calculated, respectively, as follows:

$$C_a = C_{dw} \times BCF_{fish} \times FCM_i \qquad \text{(Eq. 8-37)}$$

where:

C_a = concentration or activity of COPC or ROPC in fish tissue (mg/kg or pCi/g)

C_{dw} = concentration or activity of COPC or ROPC dissolved in surface water (mg/L or pCi/L)

BCF_{fish} = water-to-tissue uptake factor for fish (L/kg)

FCM_i = food chain multiplier for trophic level i fish (unitless)

For organic COPCs, C_{dw} is in µg/L and must be multiplied by 0.001 mg/µg to convert to mg/L. For ROPCs, the equations are identical, but the ROPC concentration in prey tissue ($C_{dw} \times BCF_{fish}$) must be converted from pCi/kg to pCi/g by multiplying by 0.001 kg/g.

The values of BCF_{fish} and FCMs for the SLERA are discussed in section 8.2.5.4. For all COPCs and ROPCs, values for BCF_{fish} are given in Appendix C2, Table C2-1, and values for FCM_2, FCM_3 and FCM_4 are given in Appendix C2, Table C2-5.

EPCs in Mammal and Bird Tissues (Trophic Levels 2, 3, and 4)

For wildlife receptors, the tissue EPC (C_n) will be calculated in accordance with EPA (1999a) draft guidance as the sum of the contributions from the different types of material ingested. Trophic-level-specific FCMs will be used to calculate the concentrations of COPCs and ROPCs in animal tissue ingested by mammals and birds. FCMs adjust the calculated concentration in animal tissue to account for bioaccumulation from one trophic level to another (see section 8.2.5.3). The equations are adapted from EPA draft guidance (EPA 1999a, Eq. 5-12):

for organic COPCs:

$$C_n = C_p \times BAF\text{-}T_p \times PF + \Sigma C_a \times FCM_n/FCM_j \times AF_j + C_{wctot} \times BAF\text{-}T_w \times 0.001 + Cs \times BAF\text{-}T_s \times 0.001. \qquad \text{(Eq. 8-38)}$$

for inorganic COPCs:

$$C_n = C_p \times BAF\text{-}T_p \times PF + \Sigma C_a \times FCM_n/FCM_j \times AF_j + C_{wctot} \times BAF\text{-}T_w + Cs \times BAF\text{-}T_s \qquad \text{(Eq. 8-39)}$$

and for ROPCs:

$$C_n = C_p \times BAF\text{-}T_p \times PF + \Sigma C_a \times FCM_n/FCM_j \times AF_j + C_{wctot} \times BAF\text{-}T_w \times 0.001 + Cs \times BAF\text{-}T_s \quad \text{(Eq. 8-40)}$$

where:

C_n	=	concentration or activity of COPC or ROPC in receptor tissue (mg/kg or pCi/g)
C_p	=	concentration or activity of COPC or ROPC in ingested plant tissue (mg/kg or pCi/g)
$BAF\text{-}T_p$	=	plant-to-tissue uptake factor for receptor (unitless)
PF	=	fraction of diet plants (unitless)
C_{aj}	=	concentration or activity of COPC or ROPC in ingested animal prey type *j* (mg/kg or pCi/g)
FCM_n	=	food-chain multipliers for the receptor (unitless)
FCM_j	=	food-chain multipliers for ingested prey type *j* (unitless)
AF_j	=	fraction of diet from animals of prey type *j* (unitless)
C_{wctot}	=	total concentration or activity of COPC or ROPC in ingested water (µg/L, mg/L, or pCi/L)
$BAF\text{-}T_w$	=	water-to-tissue uptake factor for receptor (L/kg)
0.001	=	conversion factors (mg/µg for organic COPCs and pCi/kg to pCi/g [kg/g] for ROPCs)
Cs	=	concentration or activity of COPC or ROPC in ingested sediment (µg/kg, mg/kg, or pCi/g)
$BAF\text{-}T_s$	=	sediment-to-tissue uptake factor for receptor (unitless)

The plant-to-tissue uptake factors, water-to-tissue uptake factors, and soil-to-tissue uptake factors, which will be used for sediment, are calculated per EPA (1999a) draft guidance from the receptor's ingestion rate and the published biotransfer factor (Ba), that is:

$$BAF\text{-}T_p = Ba \times IR_F \times PF \times BW \quad \text{(Eq. 8-41)}$$

$$BAF\text{-}T_w = Ba \times IR_w \times BW \quad \text{(Eq. 8-42)}$$

and:

$$BAF\text{-}T_s = Ba \times IR_F \times SFr \times BW \quad \text{(Eq. 8-10)}$$

where:

$BAF\text{-}T_p$	=	plant-to-tissue uptake factor for receptor (unitless)
Ba	=	biotransfer factor for receptor for a given substance (d/kg)
IR_F	=	ingestion rate of food by the receptor (kg/d)
PF	=	fraction of diet from plants (unitless)
BW	=	body weight of receptor (kg)
$BAF\text{-}T_w$	=	water-to-tissue uptake factor for receptor (L/kg)

IR_w = water ingestion rate of receptor (L/d)
$BAF\text{-}T_s$ = sediment-to-tissue uptake factor for receptor (unitless)
SFr = sediment ingested per unit of food ingested (unitless)

Note: Equation 8-10 first appears in section 8.2.3.1.

The values of Ba, $BAF\text{-}T_p$, $BAF\text{-}T_w$, and $BAF\text{-}T_s$ for the SLERA are discussed in section 8.2.5.4. Values of Ba, $BAF\text{-}T_s$, $BAF\text{-}T_p$, and $BAF\text{-}T_w$ for all COPCs and ROPCs for each receptor are given in Appendix C2, tables C2-1, C2-2, C2-3, and C2-4, respectively. Values for IR_F, IR_w, PF, BW, and SFr for receptors exposed at that Columbia River are given in the receptor profiles in section 8.1.3.3.

The EPCs for COPCs in aquatic plants, benthic invertebrates, and aquatic biota are used in the equations for modeling intake to aquatic ecological receptors (that is, the ingestion ADD). EPCs for ROPCs will be used to calculate internal radiation doses.

8.2.4.2 Modeling Intake to Aquatic Ecological Receptors

The ingestion ADD (mg/kg-d) for aquatic receptors exposed to COPCs in sediment or surface water will be calculated as the sum of plant tissue, animal tissue, water, and sediment intakes:

$$ADD = ADD_p + ADD_a + ADD_w + ADD_s \qquad \text{(Eq. 8-43)}$$

where:

ADD = average daily dose by ingestion (mg/kg-d)
ADD_p = average daily dose by plant ingestion (mg/kg-d)
ADD_a = average daily dose by animal ingestion (mg/kg-d)
ADD_w = average daily dose by water ingestion (mg/kg-d)
ADD_s = average daily dose by sediment ingestion (mg/kg-d)

Plant intake (ADD_p) will be calculated as follows:

$$ADD_p = C_p \times IR_F \times PF \qquad \text{(Eq. 8-13)}$$

where:

ADD_p = average daily dose by plant ingestion (mg/kg-d)
C_p = concentration of COPC in ingested plant tissue (mg/kg)
IR_F = food ingestion rate of receptor (kg/kg/d)
PF = fraction of food ingested that is plant tissue (unitless)

Note: Equation 8-13 first appears in section 8.2.3.2.

Similarly, animal intake (ADD_a) will be calculated as:

$$ADD_a = C_a \times IR_F \times AF \qquad \text{(Eq. 8-14)}$$

where:

ADD_a = average daily dose by animal ingestion (mg/kg-d)
C_a = concentration of COPC in ingested animal tissue (mg/kg)
IR_F = food ingestion rate of receptor (kg/kg/d)
AF = fraction of food ingested that is animal tissue (unitless)

Note: Equation 8-14 first appears in section 8.2.3.2.

Water intake (ADD_w) for organic COPCs will be calculated as:

$$ADD_w = C_{wctot} \times IR_w \times 0.001 \quad \text{(Eq. 8-44)}$$

and water intake for inorganic COPCs will be calculated as:

$$ADD_w = C_{wctot} \times IR_w \quad \text{(Eq. 8-45)}$$

where:

ADD_w = average daily dose by water ingestion (mg/kg-d)
C_{wctot} = total concentration of COPC in water (µg/L or mg/L)
IR_w = water ingestion rate of receptor (L/kg/d)
0.001 = factor to convert µg to mg (mg/µg)

Sediment intake (ADD_s) for organic COPCs will be calculated as:

$$ADD_s = Cs \times IR_F \times SFr \times 0.001 \quad \text{(Eq. 8-46)}$$

and sediment intake for inorganic COPCs will be calculated as:

$$ADD_s = Cs \times IR_F \times SFr \quad \text{(Eq. 8-15)}$$

where:

ADD_s = average daily dose by sediment ingestion (mg/kg-d)
Cs = concentration of COPC in ingested sediment (µg/kg or mg/kg)
IR_F = food ingestion rate of receptor (kg/kg/d)
SFr = sediment ingested per unit of food ingested (unitless)
0.001 = factor to convert µg to mg (mg/µg)

Note: Equation 8-15 first appears in section 8.2.3.2.

For the SLERA, the plant and animal food fractions sum to 1 (PF + AF = 1), and SFr is defined as the amount of sediment ingested per unit food ingested.

For the SLERA, AE, AUF, and TUF will be assumed to be equal to 1, so they do not appear in the exposure equations.

8.2.4.3 Receptor-specific Exposure Equations for Aquatic Receptors

The complete equations for ADD and C_n for each receptor are presented below.

Canada Goose (Trophic Level 2)

Canada geese are herbivores that ingest aquatic plants, but they ingest water and sediment also with their food. Thus:

$$ADD = ADD_p + ADD_w + ADD_s \qquad \text{(Eq. 8-47)}$$

where ADD_p, ADD_w, and ADD_s are as given above. The Canada goose food ingestion rate (IR_F), water ingestion rate (IR_w), and dietary fractions (PF and SFr) are given in the receptor profiles in section 8.1.3.3. The aquatic food web (Figure 8-10) shows the prey types for the Canada goose.

Canada goose tissue concentration will be calculated by an equation adapted from EPA draft guidance (EPA 1999a, Eq. 5-11):

$$C_n = C_p \times BAF\text{-}T_p + C_{wctot} \times BAF\text{-}T_w + Cs \times BAF\text{-}T_s \qquad \text{(Eq. 8-48)}$$

For organic COPCs and ROPCs, the tissue concentration resulting from ingested water ($C_{wctot} \times BAF\text{-}T_w$) must be converted from µg/kg to mg/kg (organic COPCs) or from pCi/kg to pCi/g (ROPCs) by multiplying by 0.001 mg/µg or kg/g, respectively. For organic COPCs, the tissue concentration resulting from ingested sediment ($Cs \times BAF\text{-}T_s$) must be converted from µg/kg to mg/kg by multiplying by 0.001 mg/µg. Sediment-to-tissue uptake factors ($BAF\text{-}T_s$), plant-to-tissue uptake factors ($BAF\text{-}T_p$), and water-to-tissue uptake factors ($BAF\text{-}T_w$) for the Canada goose are given in Appendix C2, tables C2-2, C2-3, and C2-4, respectively.

Spotted Sandpiper (Trophic Level 3)

Spotted sandpipers are carnivores that ingest benthic invertebrates, but they also ingest water and sediment with their food (Figure 8-12). Thus:

$$ADD = ADD_a + ADD_w + ADD_s \qquad \text{(Eq. 8-49)}$$

where ADD_a, ADD_w, and ADD_s are as given above. The spotted sandpiper food ingestion rate (IR_F) and dietary fractions (AF and SFr) are given in the receptor profiles in section 8.1.3.3. The aquatic food web (Figure 8-10) shows the prey types of the spotted sandpiper.

Sandpiper tissue concentration will be calculated by an equation adapted from EPA draft guidance (EPA 1999a, Eq. 5-13). FCMs (FCM_3 for trophic level 3) are used to account for bioaccumulation from ingested animal tissue:

$$C_n = C_a \times FCM_3/FCM_2 \times AF + C_{wctot} \times BAF\text{-}T_w + Cs \times BAF\text{-}T_s \qquad \text{(Eq. 8-50)}$$

For organic COPCs and ROPCs, the tissue concentration resulting from ingested water ($C_{wctot} \times BAF\text{-}T_w$) must be converted from µg/kg to mg/kg (organic COPCs) or from pCi/kg to pCi/g (ROPCs) by

multiplying by 0.001 mg/μg or kg/g, respectively. For organic COPCs, the tissue concentration resulting from ingested sediment ($Cs \times BAF\text{-}T_s$) must be converted from μg/kg to mg/kg by multiplying by 0.001 mg/μg. Because the diet of the spotted sandpiper is assumed to be benthic invertebrates, AF = 1. The FCMs for the sandpipers (FCM_3) and their invertebrate prey (FCM_2) are given in Appendix C2, Table C2-5. Sediment-to-tissue uptake factors ($BAF\text{-}T_s$) and water-to-tissue uptake factors ($BAF\text{-}T_w$) for the sandpiper are given in Appendix C2, tables C2-2 and C2-4, respectively.

Great Blue Heron (Trophic Level 4)

Great blue heron are carnivores that ingest omnivorous fish, planktivorous fish, and small invertebrates, but they also ingest water with their food (Figure 8-10). The SLERA will evaluate the exposure of heron assuming ingestion of omnivorous fish and water (Figure 8-12). Thus:

$$ADD = ADD_a + ADD_w \qquad \text{(Eq. 8-51)}$$

where ADD_a and ADD_w are as given above (equations 8-13, 8-44, and 8-45), and ADD_a will be calculated for omnivorous fish only. The great blue heron food ingestion rate (IR_F) and water ingestion rate (IR_w) are given in the receptor profiles in section 8.1.3.3. The aquatic food web (Figure 8-10) shows the prey types of the great blue heron.

The great blue heron tissue concentration will be calculated by an equation adapted from EPA draft guidance (EPA 1999a, Eq. 5-13). FCMs (FCM_4 for trophic level 4) are used to account for bioaccumulation from ingested animal tissue:

$$C_n = C_a \times FCM_4/FCM_3 \times AF + C_{wctot} \times BAF\text{-}T_w \qquad \text{(Eq. 8-52)}$$

For organic COPCs and ROPCs, the tissue concentration resulting from ingested water ($C_{wctot} \times BAF\text{-}T_w$) must be converted from μg/kg to mg/kg or from pCi/kg to pCi/g (ROPCs) by multiplying by 0.001 mg/μg or kg/g, respectively. Because the diet of the great blue heron is assumed to be exclusively fish, AF = 1. The FCMs for the heron (FCM_4) and their omnivorous fish prey (FCM_3) are given in Appendix C2, Table C2-5. Water-to-tissue uptake factors ($BAF\text{-}T_w$) for the great blue heron are given in Appendix C2, Table C2-4.

Bald Eagle and Mink (Trophic Level 4)

Bald eagles and mink are carnivores that ingest omnivorous and piscivorous fish and other animals, but they also ingest water incidentally with their food (Figure 8-10). Ingestion of terrestrial prey at the Columbia River maximum site will not be evaluated because the concentrations of COPCs and ROPCs in soil near the Columbia River would be less than at the onsite ground maximum. Ingestion of terrestrial prey by red-tailed hawks will be evaluated at the onsite ground maximum, where concentrations in terrestrial prey will be higher than at the Columbia River. Because the exposure of hawks to terrestrial receptors at the onsite ground maximum is more conservative than exposure of predators to terrestrial receptors at the Columbia River, the SLERA will evaluate the exposure of bald eagles and mink assuming ingestion of only carnivorous fish (trophic level 4) and water (Figure 8-12). Thus:

$$ADD_{total} = ADD_a + ADD_w \qquad \text{(Eq. 8-51)}$$

where ADD_a and ADD_w are as given above (equations 8-13, 8-44 and 8-45), and ADD_a is calculated for piscivorous fish (fish whose diet is fish) only. Note that equation 8-51 first appears in section 8.2.4.3. The eagle and mink food ingestion rates (IR_F) and water ingestion rate (IR_w) are given in the receptor

profiles in section 8.1.3.3. The aquatic food web (Figure 8-10) shows the prey types of the bald eagle and mink.

Bald eagle and mink tissue concentrations will be calculated by an equation adapted from EPA draft guidance (EPA 1999a, Eq. 5-13). FCMs (FCM_4 for trophic level 4) are used to account for bioaccumulation from ingested animal tissue:

$$C_n = C_a \times FCM_4/FCM_4 \times AF + C_{wctot} \times BAF\text{-}T_w \qquad \text{(Eq. 8-52a)}$$

C_a is the concentration of COPC or ROPC in carnivorous fish ($C_a = C_{dw} \times FCM_4$).

For organic COPCs and ROPCs, the tissue concentration resulting from ingested water ($C_{wctot} \times BAF\text{-}T_w$) must be converted from µg/kg to mg/kg or from pCi/kg to pCi/g (ROPCs) by multiplying by 0.001 mg/µg or kg/g, respectively. Because the diet of the mink and the diet of the eagle are assumed to be exclusively fish, AF = 1. For the mink, a realistic diet would require the addition of a term for ingestion of plants (see Eq. 8-9). The FCMs for the eagle and mink (FCM_4) and their carnivorous prey (FCM_4) are given in Appendix C2, Table C2-5. Water-to-tissue uptake factors ($BAF\text{-}T_w$) for the bald eagle and mink are given in Appendix C2, Table C2-4.

8.2.4.4 External and Internal Radiation Dose

The total radiological dose to all receptors is calculated as the sum of the external and internal radiation doses. External doses to all aquatic receptors result from exposure to ROPCs in water and sediment. Wildlife receptors (heron, eagle, and mink) are exposed externally to ROPCs in air and water. The internal dose to plants and benthic invertebrates results from the uptake of radionuclides into their tissues from water and sediment. The internal dose to wildlife receptors results from the uptake of radionuclides into their tissues from ingested food, water, and sediment.

External Dose

External radiation from water and sediment will be modeled as described by Blaylock, Frank, and O'Neal (1993). Radiation doses will be adjusted for the fraction of time that the receptors were assumed to be immersed in water away from sediment or near enough to the water to receive external radiation, resting on sediment, and immersed in sediment. Those fractions are assumed to be:

- Aquatic biota including salmonids, immersed in water 0.9, resting on sediment 0.1, and immersed in sediment 0
- Canada goose, near water 0.5, resting on sediment 0, and immersed in sediment 0
- Spotted sandpiper, near water 0.5, resting on sediment 0, and immersed in sediment 0
- Great blue heron, near water 0.5, resting on sediment 0, and immersed in sediment 0
- Bald eagle, near water 0.05, resting on sediment 0, and immersed in sediment 0
- Mink, near water 0.2, resting on sediment 0, and immersed in sediment 0
- Benthic invertebrates, immersed in water 0.1, resting on sediment 0, and immersed in sediment 0.9

The birds and mink will also be assumed to receive external radiation from air.

The external doses (rad/d) to all aquatic receptors from water and sediment will be calculated, respectively, as follows:

$$RDExt_{water,\ imm} = C_{wctot} \times DF_{water,\ imm} \qquad \text{(Eq. 8-53)}$$

and:

$$RDExt_{sed} = Cs \times DF_{sediment} \qquad \text{(Eq. 8-54)}$$

where:

$RDExt_{water,\ imm}$	=	external radiation dose from immersion in water
C_{wctot}	=	total activity of ROPC in ingested water (pCi/L)
$DF_{water,\ imm}$	=	factor for converting activity in water to external dose from water immersion
$RDExt_{sed}$	=	external radiation dose from sediment
Cs	=	activity of radionuclide in sediment (pCi/g),
$DF_{sediment}$	=	factor for converting activity in sediment to external dose from sediment

Per Blaylock, Frank, and O'Neal (1993), the external dose factor for water (DF_{water}) is calculated as:

$$DF_{water,\ imm} = (1-F_s-F_{in}) \times 0.001 \times CFa \times [(1-\Phi_\beta) \times E_\beta n_\beta + (1-\Phi_\gamma) \times E_\gamma n_\gamma] \qquad \text{(Eq. 8-55)}$$

where:

F_s	=	fraction of time receptor spends at the sediment-water interface (unitless)
F_{in}	=	fraction of time receptor spends buried in sediment (unitless)
0.001	=	factor to convert L to g (0.001 L/ml x 1 ml/g = 0.001 L/g)
CFa	=	unit conversion factor, 5.11×10^{-5} rad/d per pCi/g per MeV/disintegration
Φ_β	=	absorbed fraction of energy from beta energy E_β
$E_\beta n_\beta$	=	average energy emitted as beta radiation (MeV per disintegration) × proportion of disintegrations producing a beta-particle
Φ_γ	=	absorbed fraction of energy from gamma energy E_γ
$E_\gamma n_\gamma$	=	photon energy emitted during transition from a higher to a lower energy state (MeV) × proportion of disintegrations producing gamma radiation

The exposures of ecological receptors to ROPCs in sediment was calculated by assuming that the decay products of all short-lived ROPCs in sediment are in secular equilibrium. The activities of each of the daughter radionuclides are, therefore, equal to the activity of the parent multiplied by the fraction of the decays in the immediately preceding generation that yield the daughter radionuclide. For example, the activities of radium-225, actinium-225, francium-221, astatine-217, and bismuth-213 are assumed to be equal to the activity of their parent, thorium-229. However, when bismuth-213 decays, 97.8 % of the decays yield polonium-213 and 2.2 % of the decays yield thallium-209. Therefore, the activities of polonium-213 and thallium-209 are assumed to be 97.8 % and 2.2 %, respectively, of the activity of thorium-229. Exposure factors for the daughter radionuclides were used to calculate the summed

exposures from the ultimate parent and all of the daughter radionuclides for both external and internal radiation.

Per Blaylock, Frank, and O'Neal (1993), the external dose factor for sediment ($DF_{sediment}$) will be calculated as:

$$DF_{sediment} = (0.5 \times F_s + F_{in}) \times CFa \times [(1-\Phi_\beta) \times E_\beta n_\beta + (1-\Phi_\gamma) \times E_\gamma n_\gamma] \quad \text{(Eq. 8-56)}$$

where:

0.5	=	factor to account for assumption that a receptor at the sediment-water interface receives external radiation from sediment only from below, so the dose is only half of the dose from immersion
F_s	=	fraction of time receptor spends at the sediment-water interface (unitless)
F_{in}	=	fraction of time receptor spends buried in sediment (unitless)
CFa	=	unit conversion factor, 5.11×10^{-5} rad/d per pCi/g per MeV/disintegration
Φ_β	=	absorbed fraction of energy from beta energy E_β
$E_\beta n_\beta$	=	average energy emitted as beta radiation (MeV per disintegration) × proportion of disintegrations producing a β-particle
Φ_γ	=	absorbed fraction of energy from gamma energy E_γ
$E_\gamma n_\gamma$	=	photon energy emitted during transition from a higher to a lower energy state (MeV) × proportion of disintegrations producing γ radiation

Values of F_s and F_{in} are given in the second paragraph of this subsection. Values of $DF_{water,\ imm}$ and $DF_{sediment}$ for each receptor and Φ_α, $E_\alpha n_\alpha$, Φ_β, $E_\beta n_\beta$, Φ_γ, and $E_\gamma n_\gamma$ for each ROPC are given in Appendix C2, tables C2-6 and C2-7, for all ROPCs and their daughters, respectively. To calculate external exposure to all aquatic receptors from ROPCs in water and sediment, $DF_{water,\ imm}$ and $DF_{sediment}$ values will be multiplied by the modeled activities of the corresponding radionuclides in surface water and sediment at the Columbia River maximum location.

Per EPA (1993b), the external dose (rad/d) to all wildlife receptors from air will be calculated as:

$$RDExt_{air} = C_{air} \times DF_{air} \quad \text{(Eq. 8-25)}$$

where:

$RDExt_{air}$	=	external radiation dose from air (rad/d)
C_{air}	=	activity of radionuclide in air (pCi/m^3)
DF_{air}	=	factor for converting activity in air to external dose from air

Note: equation 8-25 first appears in section 8.2.3.4.

The external dose conversion factor for air (DF_{air}) will be calculated as follows:

$$DF_{air} = 3.2 \times 10^5 \times DCF \quad \text{(Eq. 8-26)}$$

where:

3.2×10^5 = conversion factor to convert Sv/s per Bq/m^3 to rad/d (EPA 1993b)

DCF = dose conversion factor for external radiation from immersion in air (EPA 1993b)

Note: Equation 8-26 first appears in section 8.2.3.4.

For all ROPCs, values of DCF for air are given in Appendix C2, Table C2-6. To calculate external exposure to all aquatic receptors from ROPCs in air, DCF values will be multiplied by the modeled activities of the corresponding radionuclides in air at the Columbia River maximum location.

Per EPA (1993b), the external dose (rad/d) for all wildlife receptors from proximity to water containing ROPCs will be calculated as:

$$RDExt_{watter,\ prox} = C_{wctot} \times DF_{water,\ prox} \qquad \text{(Eq. 8-57)}$$

where:

$RDExt_{watter,\ prox}$ = external radiation dose from proximity to water (rad/d)

C_{wctot} = total activity of ROPC in surface water (pCi/L)

$DF_{water,\ prox}$ = factor for converting activity in water to external dose from water

Per Blaylock, Frank, and O'Neal (1993), the external dose factor for water (DF_{water}) for wildlife receptors will be calculated as:

$$DF_{water,\ prox} = C_{wctot} \times F_{near} \times 0.001 \times CFa \times [(1-\Phi_\gamma) \times E_\gamma n_\gamma] \qquad \text{(Eq. 8-58)}$$

where:

C_{wctot} = total activity of ROPC in ingested water (pCi/L)

F_{near} = fraction of time receptor spends near the water (unitless)

0.001 = factor to convert L to g (L/g)

CFa = unit conversion factor, 5.11×10^{-5} rad/d per pCi/g per MeV/disintegration

Φ_γ = absorbed fraction of energy from gamma energy E_γ

$E_\gamma n_\gamma$ = photon energy emitted during transition from a higher to a lower energy state (MeV) × proportion of disintegrations producing γ radiation

Values of $DF_{water,\ prox}$ for each receptor and Φ_γ and $E_\gamma n_\gamma$ for each ROPC are given in Appendix C2, Table C2-6, for all ROPCs. To calculate external exposure to all aquatic receptors from ROPCs in water, $DF_{water,\ prox}$ values will be multiplied by the modeled total activities of the corresponding radionuclides in surface water at the Columbia River maximum location.

Internal Dose

The internal exposure to radionuclides is calculated from the activity in tissues rather than from the daily ingestion. The internal activities of ROPCs are calculated by using BCFs and ROPC activities in sediment, food, and water. Internal radiation doses are calculated by multiplying the activity in tissues by

the sum of alpha, beta, and gamma decay energies, where alpha and beta energies are assumed to be completely absorbed. Because gamma rays, like X-rays, may pass through the tissues without depositing their energy, gamma energies are adjusted to account for greater absorption by larger organisms at a given energy level and for greater absorption by all receptors at lower energy levels. Decay energies (EPA 1993b) and absorption fractions for gamma radiation (Blaylock, Frank, and O'Neal 1993; Sample and others 1997) for ROPCs are given in Appendix C2, Table C2-6. For radionuclides in sediment, radiation by daughter radionuclides was also included in internal dose calculations. Daughter radionuclides are produced by decay of parent radionuclides and could be expected to accumulate in sediment. Decay energies (EPA 1993b) and absorption fractions for gamma radiation (Blaylock, Frank, and O'Neal 1993; Sample and others 1997) of daughter radionuclides are given in Appendix C2, Table C2-7.

Per Sample and others (1997), the internal dose (rad/d) to aquatic receptors and wildlife receptors will be calculated as follows:

$$RDInt = C_n \times DF_{int} \qquad \text{(Eq. 8-27)}$$

where:

$$DF_{int} = CFa \times (QF \times E_\alpha n_\alpha \times \Phi_\alpha + E_\beta n_\beta \times \Phi_\beta + E_\gamma n_\gamma \times \Phi_\gamma) \qquad \text{(Eq. 8-28)}$$

and:

RDInt	=	internal radiation dose from ingestion of ROPCs (rad/d)
C_n	=	activity of radionuclide in receptor tissue (pCi/g) (Eq. 8-35 and Eq. 8-39 for aquatic biota, Eq. 8-32 through Eq. 8-34 for benthic invertebrates, Eq. 8-40 through Eq. 8-42 for Canada goose, spotted sandpiper, mink, and bald eagle)
DF_{int}	=	factor for converting ROPC activity in tissue to internal dose
CFa	=	unit conversion factor, 5.11×10^{-5} rad/d per pCi/g per MeV/disintegration
QF	=	5 (Kocher and Trabalka 2000), quality factor for biological effect of alpha radiation (unitless)
$E_\alpha n_\alpha$	=	average energy emitted as alpha radiation (MeV per disintegration) × proportion of disintegrations producing an α-particle
Φ_α	=	absorbed fraction of energy from alpha energy E_α
$E_\beta n_\beta$	=	average energy emitted as beta radiation (MeV per disintegration) × proportion of disintegrations producing a β-particle
Φ_β	=	absorbed fraction of energy from beta energy E_β
$E_\gamma n_\gamma$	=	photon energy emitted during transition from a higher to a lower energy state (MeV) × proportion of disintegrations producing γ radiation
Φ_γ	=	absorbed fraction of energy from gamma energy E_γ

Note: Equations 8-27 and 8-28 first appear in section 8.2.3.4.

Values of DF_{int} for each receptor and $E_\alpha n_\alpha$, Φ_α, $E_\beta n_\beta$, Φ_β, $E_\gamma n_\gamma$, and Φ_γ are given in Appendix C2, tables C2-6 and C2-7, for all ROPCs and their daughters, respectively. To calculate internal exposure to all aquatic receptors from ingested ROPCs, DF_{int} values will be multiplied by the modeled activities of the corresponding radionuclides in receptor tissues at the Columbia River maximum location.

8.2.5 Exposure Variables

The magnitude of exposure of ecological receptors to COPCs and ROPCs in environmental media depends on various parameters and variables in the above exposure equations. These variables are discussed in this section. The exposure variables include space and time factors correcting for the fraction of a receptor's total exposure that can originate at the exposure location (section 8.2.5.1), variables determining the rate of ingestion and absorption of COPCs and ROPCs (section 8.2.5.2), and factors accounting for the accumulation in tissues of substances present in exposure media or food (section 8.2.5.3). The exposure variables for ecological receptors are briefly discussed below.

8.2.5.1 Space and Time Factors for Exposure Calculations

For wildlife receptors that are exposed to COPCs and ROPCs by ingestion and inhalation, the calculation of exposure requires exposure factors that quantify the fraction of a receptor's exposure obtained from the contaminated site. A receptor may obtain only a fraction of its exposure to a contaminant from the exposure location as a result of the receptor foraging over an area larger than the exposure location or spending only a fraction of its lifetime at the exposure location, or both. The exposure assumptions for use and derivation of area-use and temporal-use factors follow.

Area-Use Factor

The AUF estimates the fraction of a receptor's exposure that comes from the exposure location. The AUF is the smaller of 1 and the ratio of the area of the exposure location and the area in which a receptor lives or forages, whichever is more appropriate to the routes by which the receptor is exposed. The AUF is calculated as follows:

$$AUF = 1, \text{ if } A \geq HR$$
$$AUF = A/HR, \text{ if } A < HR \qquad \text{(Eq. 8-59)}$$

where:

AUF	=	area use factor (unitless)
A	=	area of exposure (ha)
HR	=	home range of the receptor (ha)

For the SLERA, the AUF will be assumed to be 1 for all receptors. This assumption is highly conservative for wide-ranging receptors such as mule deer, coyote, red-tailed hawk, and bald eagle.

Temporal-Use Factor

There are several approaches to dealing with the temporal aspect of exposure. The first approach is to assume, conservatively, that receptors are exposed throughout their lifetime to COPCs and ROPCs present at the exposure location. The second approach is to estimate the TUF as the fraction of time each year that a receptor is in the vicinity of the exposure location during which it forages or resides at the exposure location. The remaining time is assumed to be spent in an area free of contamination due to the source being evaluated.

For the SLERA, the TUF will be assumed to be 1 for all receptors. This assumption is conservative because some species at each trophic level are nonmigratory year-round residents, even if the specific receptor species evaluated may not be.

8.2.5.2 Uptake Variables

The exposure equations for ecological receptors include parameters for body weight, the ingestion rate, and dietary distribution of ecological receptors and the efficiency of absorption of COPCs and ROPCs from ingested media. Where possible, data was taken from published sources (especially EPA 1993c, 1999a) and Sample and others (1997). In some cases, measured values were not available. However, EPA 1993c provides allometric equations that allow various intake parameters to be calculated from the receptor's body weight. These equations were derived by fitting curves to the measured parameters for animals with various body weights but with similar metabolic characteristics. Such parameters as total food ingestion and water ingestion depend on the caloric requirements and metabolic rate of the receptor, both of which are related to body weight. Allometric equations were used to calculate the water ingestion rate for the western meadowlark and the total food ingestion rate for the spotted sandpiper. Source data included allometric calculations of the food ingestion rate of the great blue heron and water ingestion rates of coyote, red-tailed hawk, Canada goose, spotted sandpiper, great blue heron, bald eagle, and mink. Uptake variables are shown in the receptor parameter descriptions in section 8.1.3.3. Diets are discussed in section 8.3.2.1.

Ingestion Rates

The magnitude of exposure of ecological receptors to COPCs and ROPCs in environmental media depends on the rate of intake of the contaminated media. For wildlife receptors exposed by ingestion, receptor-specific ingestion rates are required to estimate exposure. Published values for food ingestion (IR_F), soil and sediment fraction (SFr), and water ingestion (IR_W) will be used to estimate exposure.

Absorption Efficiency

Substances ingested or inhaled by ecological receptors are absorbed and taken up into the receptor's cells and organs to varying degrees. The efficiency of absorption depends on the relative affinity of the substance for the environmental medium (soil, particulate, sediment, water, and tissue) and on the relative affinity of the substance for the receptor's tissues. For both the PRA and the FRA, the AE for ingested media will be assumed to be the same as or 100 % of the actual absorption of the contaminant in the experiment or field observation used to derive the TRV. Therefore, AE does not appear in the exposure equations. This assumption is conservative for COPCs and ROPCs ingested as soil, sediment, or particulates in water.

8.2.5.3 Bioaccumulation Factors for Calculating Terrestrial Exposures

The calculation of exposure for ecological receptors may require one or more bioaccumulation and transfer factors. These factors are used to estimate the concentration in the tissue of an organism from the concentrations in the contaminated media to which it is exposed. Such factors are required to estimate exposure for wildlife receptors, such as mammals and birds, that are exposed to COPCs and ROPCs in soil or water by ingestion of soil, water, plants, or soil-dwelling invertebrates or other wildlife when the concentration in the ingested organism is not measured directly (Figure 8-11). In each case, the numerator of the factor must have units corresponding to the units of concentration in the medium taking up the substance (tissue) and the denominator must have units corresponding to the units of concentration

in the "source" medium (soil, water, or tissue). The rules for use and derivation of bioaccumulation or transfer factors follow:

Direct Deposition-to-Plant Tissue Transfer Factor

The uptake of COPCs and ROPCs by direct deposition to leaf surfaces, including transfer factors, is discussed in section 6.5.1.

Air-to-Plant Tissue Transfer Factor

The uptake of COPCs in vapor, including transfer factors, is discussed in section 6.5.2.

Soil-to-Plant Transfer Factor

The concentration in aboveground portions of plants through root uptake from soil is a function of the COPC- and ROPC-specific soil concentration (see section 8.2.3.1) and COPC- or ROPC-specific plant BCF (SPv). The SPv is the ratio of the COPC or ROPC concentration in plant tissue to the COPC or ROPC concentration in soil. The SPv will be used to estimate the tissue concentration in plants exposed to COPCs and ROPCs in soil from the concentration of COPC or ROPC in bulk soil. The exposure evaluation will consider three kinds of SPv, measured or empirically derived values, mass-limited values, and bioaccumulation efficiency factors (BEFs), as well as methods to calculate concentrations of carbon-14 and tritium in plants.

Measured or Empirically Derived Values. When measured or empirically derived SPVs are used, the concentrations of COPCs and ROPCs from soil in plant tissue are proportional to the concentrations in soil. That is:

SPv= soil-to-plant transfer factor for COPC or ROPC [(mg/kg$_{tissue}$-dry wt.)/(mg/kg$_{soil}$-dry wt.)] = (kg$_{soil}$-dry wt./kg$_{tissue}$-dry wt.)

Concentrations are estimated for plant tissues that are fed upon by wildlife receptors.

Values of SPv are given in Appendix C2, Table C2-1. The first choice for SPv values will be EPA (1999a) values and values developed using EPA methods. Per EPA draft guidance (1999a) values of SPv for organic COPCs for which no field or laboratory data is available are estimated using the Travis and Arms (1988) regression on K_{ow}:

$$\log SPv = 1.588 - (0.578 \times \log K_{ow}) \qquad \text{(Eq. 8-60)}$$

K_{ow} and log K_{ow} values are given in Appendix B1, Table B1-1. Where K_{ow} values are not available, default values are not used.

Travis and Arms (1988) measured soil-to-plant uptake values for 29 organic chemicals (primarily pesticides) to establish a linear relationship between these two parameters. The equations used to calculate SPvs rely on empirical data from a few chemicals, plants, and growing media to extrapolate to all other organic chemicals and growing situations. As noted by EPA (1999a), this regression equation, derived from experiments conducted on three classes of compounds (pesticides, polychlorinated dibenzo-p-dioxins [PCDDs], and polychlorinated biphenyls [PCBs]), may not accurately represent the behavior of all organic COPCs under site-specific conditions, and further research is needed to evaluate the applicability and limitations associated with the use of this equation for all classes of compounds.

Per EPA draft guidance (1999a), recommended SPv values for inorganic elements are values published in Baes and others (1984), Cappon (1981), and EPA (1992b). For COPCs and ROPCs with no published measured or estimated data, the arithmetic average of the available SPv values for the other inorganics will be used as the SPv (EPA 1999a).

Mass-Limited Values. In some cases, Eq. 8-58 (Travis and Arms 1988) predicts the accumulation in plants of more organic COPC than is deposited on the soil (see section 6.5.3.3 for a detailed discussion). Mass-limited SPv caps were derived for organic COPCs by (1) assuming that all of the COPC emitted from the WTP and deposited on the soil is taken up by the plants, (2) calculating the concentration of COPC in all of the plants in 1 m^2, and (3) dividing that concentration by the concentration of COPC in the soil if all of the COPC is mixed in the rooting zone, which is the upper 15 cm.

The maximum possible uptake factor is calculated as shown in the following equations:

$$\text{Maximum possible uptake factor} = \frac{\text{Total COPC deposited (mg/m}^2\text{) / Plant mass density (kg/m}^2\text{)}}{\text{Total COPC deposited (mg/m}^2\text{) / Soil density (kg/m}^2\text{)}} \qquad \text{(Eq. 8-61)}$$

This equation can be reduced to:

$$\text{Maximum possible uptake factor} = \text{Soil density (kg soil/m}^2\text{)/Plant mass density (kg plant/m}^2\text{)} \qquad \text{(Eq. 8-62)}$$

The mass of soil per m^2 is 1300 $kg/m^3 \times 0.15$ m = 195 kg/m^2. The mass of plants used as food for herbivores is assumed to be the yield of forage, which is 0.0195 kg/m^2 (Table 6-4). Therefore, the mass-limited SPv is 195/0.0195 = 10,000. All of the published or calculated values of SPv presented in Appendix C2, Table C2-1 are less than that upper limit, so the mass-limited SPv was not used.

Bioaccumulation Equivalency Factors. EPA recommends using BEFs to estimate the bioaccumulation of PCDD and polychlorinated dibenzofuran (PCDF) congeners for which field or laboratory measurements are not available. The BEF is the predicted ratio of bioaccumulation of a PCDD or PCDF congener in soil to the bioaccumulation of 2,3,7,8-tetrachlorodioxin (TCDD) (EPA 1999a). BEFs were used by EPA (1999a) to calculate the SPvs, BAFs, and SPs presented in Appendix C2, Tables C2-1 through C2-4, for PCDD and PCDF congeners.

Carbon-14 and Tritium. SPvs are used for all ROPCs except carbon-14 and tritium. Exposure calculations for most ROPCs are based on the assumption that radionuclides are present as particulates or vapors. However, special consideration must be given to carbon-14 and tritium (hydrogen-3), as these ROPCs are processed by vegetation with natural carbon and hydrogen, respectively. Thus, the vegetation pathways for carbon-14 and tritium are dependent on the exchange of carbon and hydrogen between plants and the environment. For this assessment, guidance from Regulatory Guide 1.109 (NRC 1977) is used to account for the bioaccumulation of carbon-14 and tritium in plants. This is done through the use of correction factors, along with the assumption that all carbon-14 is released by the WTP in oxide form (CO or CO_2) and tritium is released as water vapor. These correction factors are applied to the air concentration (for example, pCi/m^3) estimated at the point of exposure by the air model.

The concentration of carbon-14 in vegetation is calculated assuming that its ratio to the natural carbon in vegetation is equal to the ratio of carbon-14 to natural carbon in the atmosphere surrounding the vegetation as described in section 6.5.2.

The concentration of tritium in vegetation is based on the equilibrium between moisture in the air and water in plants as described in section 6.5.2.

Soil-to-plant uptake values are also used for aboveground protected and unprotected plant parts for human health exposure (section 6.5.3).

Soil-to-Terrestrial Invertebrate Tissue Transfer Factor

The concentration in terrestrial invertebrates through uptake from soil is a function of the COPC- or ROPC-specific soil concentration (see section 8.2.3.1) and COPC- or ROPC-specific invertebrate BAF-S. The BAF-S is the ratio of the COPC or ROPC concentration in invertebrate tissue to the COPC or ROPC concentration in soil. The BAF-S will be used to estimate the tissue concentration in invertebrates exposed to COPCs and ROPCs in soil from the concentration of COPC or ROPC in bulk soil. The exposure evaluation will consider two versions of BAF-S, measured or empirically derived values and mass-limited values.

Measured or Empirically Determined Values. The soil-to-terrestrial invertebrate tissue transfer factor (BAF-S) is the ratio of the COPC or ROPC concentration in terrestrial invertebrate tissue to the COPC or ROPC concentration in soil [(mg/kg$_{tissue}$-wet wt.)/(mg/kg$_{soil}$-dry wt.)]. The BAF-S is used to estimate the tissue concentration of terrestrial invertebrates exposed to COPCs and ROPCs in soil by all exposure routes (ingestion, direct contact, and inhalation) from the concentration of a COPC or ROPC in bulk soil. That is:

$$\text{BAF-S} = \text{soil-to-terrestrial invertebrate tissue transfer factor}\ (\text{kg}_{soil}\text{-dry wt./kg}_{tissue}\text{-wet wt.})$$

for soil-dwelling invertebrates, such as the worms or insects, which is an important diet item of many omnivores, such as pocket mice and meadowlarks. Tissue concentrations will be estimated for terrestrial invertebrates that are fed upon by wildlife receptors. Although the habitat at most of the Hanford Site is not favorable to earthworms, earthworms are used as a representative of soil invertebrates because most of the data about soil invertebrates pertain to earthworms. This is consistent with EPA draft guidance (EPA 1999a), which uses measured uptake factors for earthworms to represent all soil invertebrates.

The first choice for terrestrial soil-to-soil invertebrate bioaccumulation (BAF-S) values will be field or laboratory values and calculated values for earthworms reported by EPA (1999a). Per EPA draft guidance (1999a), recommended BAF-S values for inorganic elements with no published field or laboratory data is arithmetic averages of the BAF-S values available for other inorganics. For organic compounds with no field or laboratory data, BAF-S values will be calculated with a regression equation described by EPA (1999a):

$$\log \text{BAF-S} = 0.819 \times \log K_{ow} - 1.146 \qquad \text{(Eq. 8-63)}$$

This equation uses values derived from K_{ow}s and uptake by daphnids, an aquatic macroinvertebrate, exposed to polycyclic aromatic hydrocarbons (PAHs) (Southworth and others 1978). Where no appropriate published surrogate data is available, no default BAF-S for organic compounds is used.

BAF-S values are listed in Appendix C2, Table C2-1. Note that the earthworm data serves as proxy for the darkling beetle and other desert terrestrial invertebrates (Figure 8-9) for which there are no known BAF-S values.

Mass-Limited Values. In some cases, BAF-S predicts the accumulation in soil invertebrates of more COPC than is deposited on the soil. Mass-limited BAF-S values were derived for organic COPCs by (1) assuming that all of the COPC is taken up by the soil invertebrates, (2) calculating the concentration of COPC in all of the soil invertebrates in 1 m^2, and (3) dividing that concentration by the concentration of COPC in the soil if all of the COPC is mixed in the rooting zone, which is the upper 15 cm. The maximum possible uptake factor can be calculated by assuming that all of the COPC deposited in a unit area of soil in a specified time period is taken up into the mass of soil invertebrates contained in that area as shown in the following equation.

$$\text{Maximum possible uptake factor} = \frac{\text{Total COPC deposited (mg/m}^2\text{) / Soil invertebrate mass density (kg/m}^2\text{)}}{\text{Total COPC deposited (mg/m}^2\text{) / Soil density (kg/m}^2\text{)}} \qquad \text{(Eq. 8-64)}$$

This equation can be reduced to:

$$\text{Maximum possible uptake factor} = \text{Soil density (kg soil/m}^2\text{)} \div \text{Soil invertebrate mass density (kg soil invertebrate/m}^2\text{)} \qquad \text{(Eq. 8-65)}$$

The mass of soil per m^2 is 1300 kg/m^3 × 0.15 m = 195 kg/ m^2. The mass of soil invertebrates per m^2 is assumed to be 0.04 kg/m^2 (Gonzalez and others 1999; average reported for *Dacryodes* community). Therefore, the maximum possible BAF-S is 195/0.04 = 4875. The mass-limited maximum possible value is the same for all organic COPCs because it does not depend on deposition rate or K_{ow}, rather soil density and mass density of the receptor. It is mass-limited or deposition-limited because all the mass deposited is accumulated by the receptor. Seventeen organic COPCs had BAF-S values higher than the mass-limited value; the mass-limited value was substituted for those BAF-Ss in Appendix C2, Table C2-1.

Transfer Factors to Mammal and Bird Tissues

The transfer factor to tissues (BAF-T) is the ratio of the COPC or ROPC concentrations in animal tissue to the COPC or ROPC concentration in the material it ingests [(mg/kg_{tissue}-wet wt.)/ (mg/kg ingested)]. The BAF-T is used to estimate the tissue concentration of animals exposed to COPCs and ROPCs by ingestion of soil, water, and plants from the concentration of COPC or ROPC in the ingested material. The exposure evaluation will consider two versions of BAF-T, measured or empirically derived values and mass-limited values.

Measured or empirically determined values. The measured or empirically determined BAF-T is defined as:

BAF-T = Tissue-to-tissue transfer factor for ingesta for COPC or ROPC (kg ingested/kg_{tissue}-wet wt.)

Tissue concentrations of COPCs are estimated for animals that are fed upon by wildlife receptors, and tissue concentrations of ROPCs are estimated for all animals.

For medium-to-tissue accumulation factors for mammals and birds, EPA draft guidance (1999a) calls for the use of Baes and others (1984) and Travis and Arms (1988) Ba values (d/kg) multiplied by the receptor's absolute ingestion rate for the medium (kg-medium/d). Thus, three BAF-T values are calculated for each COPC and ROPC and each receptor:

$$\text{BAF-T}_s = \text{Ba} \times \text{IR}_F \times \text{SFr} \times \text{BW} \qquad \text{(Eq. 8-10)}$$

$$BAF\text{-}T_p = Ba \times IR_F \times PF \times BW \quad \text{(Eq. 8-41)}$$

$$BAF\text{-}T_w = Ba \times IR_w \times BW \quad \text{(Eq. 8-42)}$$

where:

$BAF\text{-}T_s$	=	soil-to-tissue uptake factor for receptor (kg soil/kg tissue)
$BAF\text{-}T_p$	=	plant-to-tissue uptake factor for receptor (kg plant/kg tissue)
$BAF\text{-}T_w$	=	water-to-tissue uptake factor (L water/kg tissue)
Ba	=	ingestion-to-tissue transfer factor (d/kg)
IR_F	=	daily food ingestion rate (kg/kg BW/d)
SFr	=	soil ingested per unit of food ingested (unitless)
BW	=	body weight of receptor (kg)
PF	=	fraction of diet from plants (unitless)
IR_w	=	ingestion rate of water by receptor (L/d)

Note: Equation 8-10 first appears in section 8.2.3.1 and equations 8-41 and 8-42 first appear in section 8.2.4.1.

Ba values are given in Appendix C2, Table C2-1. BAF-T values are given in Appendix C2, tables C2-2, C2-3, and C2-4. The first choice for Ba values for mammals was EPA draft guidance (1999a). Ba values for inorganic COPCs and ROPCs that were not included in EPA draft guidance (1999a) were taken from Baes and others (1984), as recommended by EPA (1999a). When published field or laboratory values for organic COPCs are not available for mammals, EPA (1999a) guidance was followed by using the following regression on K_{ow} (Travis and Arms 1988) for organic compounds (except dioxins/furans):

$$\log Ba = \log K_{ow} - 7.6 \quad \text{(Eq. 8-66)}$$

Ba values for dioxins/furans presented by EPA (1999a) are Ba values presented in EPA (1995c). If neither a Ba value nor a K_{ow} is available, no tissue concentration will be calculated.

The first choice for Ba values for birds was EPA draft guidance (1999a). Ba values for inorganic COPCs and ROPCs that were not included in EPA draft guidance (1999a) are the same as for mammals. For organic COPCs (except dioxins/furans) the Travis and Arms (1988) Ba values for mammals were adjusted for the lower fat content of birds. Per EPA (1999a) draft guidance, biotransfer factors for uptake of organic compounds by birds were adjusted for body fat content by multiplying the biotransfer factor by 0.8, which is the assumed ratio of body fat in birds to body fat in mammals.

Mass-Limited Values. It is possible for Ba values to predict the accumulation of more mass of a COPC or ROPC than is ingested by the receptor (see section 7 for a detailed discussion). The maximum possible uptake factor can be calculated by (1) assuming that all of the COPC or ROPC deposited in a unit area of soil in a specified time period is taken up into the food consumed by animals in that area, (2) assuming that the food is consumed by the receptor at a uniform rate during its lifetime, (3) calculating the ingestion rate of COPC or ROPC by the receptor, and (4) assuming that the receptor accumulates all of the COPC or ROPC during its lifetime. The maximum possible uptake factor is calculated as shown in the following equation:

Maximum possible uptake factor =

$$\frac{\text{COPC or ROPC concentration in receptor tissue (mg/kg)}}{\text{Consumption rate of COPC or ROPC (mg/d)}} \quad \text{(Eq. 8-67)}$$

Assuming 100 % of the COPC or ROPC in the ingested food is transferred to the animal tissue, the tissue concentration can be calculated as:

$$\text{Concentration in receptor tissue} = \frac{\text{Total COPC or ROPC ingested (mg COPC or ROPC)}}{\text{Tissue weight (kg FW)}} \quad \text{(Eq. 8-68)}$$

The total COPC or ROPC ingested can be expressed as:

Total COPC or ROPC ingested = Concentration in food (mg/kg) × Consumption rate of feed (kg/d) × Exposure duration (d) (Eq. 8-69)

Combining equations, the general equation for calculating the mass limited food-to-receptor tissue uptake factor can be expressed as:

Mass limited uptake factor =

$$\frac{\text{Concentration in food (mg/kg)} \times \text{Consumption rate of feed (kg/d)} \times \text{Exposure duration (d)}}{\text{Tissue weight (kg FW)} \times \text{Concentration in food (mg/kg)} \times \text{Consumption rate of feed (kg/d)}} \quad \text{(Eq. 8-70)}$$

This equation can be reduced to:

Mass limited uptake factor = Exposure duration (d) / Tissue weight (kg FW) (Eq. 8-71)

The maximum Ba value in Appendix C2, Table C2-1, is 53.7. Only receptors with high body weights relative to the lengths of their lives could have mass-limited uptake factors less than the reported or calculated Ba values, so the mass-limited Ba value will not be used for birds and mammals.

FCMs. FCMs are factors that are used to quantify bioaccumulation through the food chain. As chemicals from the environment pass up the food chain, they may become successively more concentrated at each trophic level. This is especially true of organic chemicals that are not metabolized rapidly. Typically, organic chemicals that dissolve in lipids bioaccumulate because they are stored in body fat, and the more soluble in lipids the chemical is, the more it bioaccumulates. To model this tendency quantitatively, EPA (1995d) measured bioaccumulation factors for organic chemicals taken up through the food chain from water by fish. An FCM was derived for each chemical tested by dividing the observed BAF by the K_{ow}. EPA 1995d was able to show an orderly relationship between FCM and K_{ow} for many organic chemicals taken up by fish at trophic levels 2, 3, and 4. By using this relationship, the concentration of a chemical in fish tissue, normalized to lipid content, can be calculated by multiplying the concentration of the chemical dissolved in water by the BCF of the chemical and by the chemical's FCM.

EPA (1995d) has published FCMs to describe the ratio of bioaccumulation from animal prey to each of the trophic levels of aquatic predators. EPA (1999a) has adopted the use of FCMs to estimate the concentrations of organic COPCs in mammals and birds from ingested animal tissue. FCMs will be used to calculate bioaccumulation from animal prey only. Bioaccumulation from ingested plants will be calculated by using a BAF-T_p (Eq. 8-9).

The concentration of a contaminant in a predator will be calculated as the concentration in the prey multiplied by the ratio of the predator's FCM and the prey's FCM. For example, if a coyote, which is a carnivore at trophic level 4, has a diet of pocket mice, which are omnivores at trophic level 3, the resulting concentration of COPC or ROPC in the coyote is calculated as the concentration of COPC or ROPC in the mouse multiplied by the FCM for level 4 and divided by the FCM for level 3 (Figure 8-11). FCMs for organic COPCs are given in Appendix C2, Table C2-5. K_{ow} and log K_{ow} values are given in Appendix C2, Table C2-1. Where K_{ow} values are not available, default values are not used.

All FCMs for inorganic COPCs and for ROPCs are assumed to equal 1.

8.2.5.4 Bioaccumulation Factors for Calculating Aquatic Exposures

The calculation of exposure for ecological receptors may require one or more bioaccumulation or transfer factors to estimate the concentration in the tissue of an organism from the concentrations in the contaminated media to which it is exposed (Figure 8-12). Such factors are required to estimate exposure for wildlife receptors, such as mammals and birds that are exposed to COPCs and ROPCs in sediment or surface water by ingestion of plants, benthic invertebrates, or aquatic biota, when the concentration in the ingested organism is not measured directly. In each case, the numerator of the factor must have units corresponding to the units of concentration in the medium taking up the substance (tissue) and the denominator must have units corresponding to the units of concentration in the "source" medium (sediment, water, and tissue). The rules for use and derivation of these factors follow.

Water-to-Plant Transfer Factor

The water-to-plant transfer factor (WP) is the ratio of the COPC or ROPC concentration in aquatic plant tissue to that dissolved in water [(mg/kg$_{tissue}$-wet wt.)/(mg/L)]. The WP will be used to estimate the tissue concentration of aquatic plants exposed to COPCs and ROPCs in surface water from the concentration of COPC or ROPC dissolved in surface water (Figure 8-12). That is:

WP = water-to-plant transfer factor for aquatic plant tissue for COPC or ROPC dissolved in water (L/kg$_{tissue}$-wet wt.)

Aquatic plants will be assumed to be exposed only to the dissolved phase of contaminants in surface water. Concentrations will be estimated for aquatic plant tissues that are fed upon by terrestrial receptors (that is, Canada goose).

WP values presented by EPA (1999a) are used if they are available. Per EPA draft guidance (1999a), values of WP for organic COPCs for which no measured values were available were calculated with an empirically derived equation for uptake from water by aquatic invertebrates (Southworth, Beauchamp, and Schmieder 1978). The equation is:

$$\log WP = 0.819 \times \log K_{ow} - 1.146 \qquad \text{(Eq. 8-72)}$$

Values of WP for inorganic COPCs and ROPCs for which no measured values were available were calculated as the arithmetic mean of all available inorganic WPs. WP values are presented in Appendix C2, Table C2-1.

Sediment-to-Plant Transfer Factor

The sediment-to-plant transfer factor (SP) is the ratio of the COPC or ROPC concentration in aquatic plant tissue to that in sediment [(mg/kg_{tissue}-wet wt.)/(mg/$kg_{sediment}$-dry wt.)]. The SP will be used to estimate the tissue concentration of aquatic plants exposed to COPCs and ROPCs in sediment (Figure 8-12). That is:

SP = sediment-to-plant transfer factor for aquatic plant tissue ($kg_{sediment}$-dry wt./kg_{tissue}-wet wt.)

Per EPA draft guidance (1999a), SPs are assumed to be the same as SPv values for uptake from soil by terrestrial plants. SPs for organic COPCs are taken from EPA (1999a). For organic compounds with no field or laboratory data, SPs are estimated using the Travis and Arms (1988) regression on K_{ow}:

$$\log SP = 1.588 - (0.578 \times \log K_{ow}) \qquad \text{(Eq. 8-73)}$$

SPs for inorganic COPCs are taken from EPA draft guidance (1999a), Baes and others (1984), and Cappon (1981) and are provided in Appendix C2, Table C2-1. SPs for ROPCs are also taken from Baes and others (1984) and provided in Appendix C2, Table C2-1. Values of SP for inorganic COPCs and ROPCs for which no measured values were available were calculated as the arithmetic mean of all available inorganic SPs.

Water-to-Fish Tissue Transfer Factor

COPCs and ROPCs are taken up by fish both directly from water and through the food chain. Direct uptake will be calculated by using a BCF, and trophic transfer through the food chain will be calculated by using FCMs. These factors are discussed below.

Direct Uptake. The water-to-fish tissue transfer factor (BCF) is the ratio of the concentration of COPC or ROPC in the tissue of an aquatic receptor to the concentration in water [(mg/kg_{tissue}-wet wt.)/(mg/L)]. The fish BCF will be used to estimate the tissue concentration of fish from the concentration in the water to which the fish is exposed (Figure 8-12). That is:

BCF_{fish} = water-to-fish tissue transfer factor (L/kg_{tissue}-wet wt.)

The fish tissue concentrations are estimated because fish are consumed by wildlife receptors such as herons, bald eagles, and mink.

The first choice for BCFs for fish are values reported in EPA draft guidance (1999a) or developed using EPA methods (EPA 1999a). For organic compounds for which no measured data were available, BCFs for fish were calculated using the following regression on the K_{ow} (Bintein and others 1993):

$$\log BCF_{fish} = 0.91 \times \log K_{ow} - 1.975 \times \log (6.8 \times 10^{-7} \times K_{ow} + 1.0) - 0.786 \qquad \text{(Eq. 8-74)}$$

For inorganic COPCs and ROPCs for which no measured data is available, per EPA draft guidance (1999a), the BCF_{fish} was estimated as the arithmetic average of available BCF_{fish} values for other inorganics. BCF_{fish} values are presented in Appendix C2, Table C2-1.

FCMs. EPA (1995d) has published FCMs to describe the ratio of bioaccumulation from entry into the food chain to each of four trophic levels of predators. The concentration of a contaminant in an aquatic

predator is calculated as the concentration in the prey multiplied by the ratio of the predator's FCM and the prey's FCM. For example, if a heron, which is a carnivore at trophic level 4, has a diet of omnivorous fish at trophic level 3, the resulting concentration of COPC or ROPC in the heron is calculated as the concentration of COPC or ROPC in the omnivorous fish multiplied by the FCM for level 4 and divided by the FCM for level 3 (Figure 8-12). FCMs for organic COPCs are given in Appendix C2, Table C2-5. All FCMs for inorganic COPCs and for ROPCs are assumed to equal 1.

Sediment-to-Animal Tissue Transfer Factor

The BASF is the ratio of the COPC or ROPC concentrations in benthic invertebrate tissue to the COPC or ROPC concentration in bulk sediment [(mg/kg_{tissue}-wet wt.)/(mg/$kg_{sediment}$-dry wt.)]. The BASF is used to estimate the tissue concentration of benthic invertebrates exposed to COPCs and ROPCs in sediment by all exposure routes (ingestion, direct contact) from the concentration of COPC or ROPC in bulk sediment (Figure 8-12). The tissue concentration is estimated for animals that are fed upon by wildlife receptors. That is:

BASF = sediment-to-animal tissue transfer factor ($kg_{sediment}$-dry wt./kg_{tissue}-wet wt.)

where the animal is typically a benthic invertebrate, such as a burrowing crustacean or insect, which are important diet items of predators, such as the spotted sandpiper and certain fishes.

BASFs are available in the literature for only a few COPCs and ROPCs. The first choice for BASFs is field or laboratory values provided by the EPA (1999a). Values of BASF for inorganic COPCs and ROPCs for which no measured values are available are calculated as the arithmetic mean of all available inorganic BASF values. BASF values are given in Appendix C2, Table C2-1.

For organic COPCs for which no measured data is available, BASF values for benthic invertebrates were calculated per EPA (1999a) from the octanol water-partitioning coefficient (K_{ow}) using the regression equation for daphnids (Southworth and others 1978):

$$\log \text{BASF} = 0.819 \times \log K_{ow} - 1.146 \qquad \text{(Eq. 8-75)}$$

where:

BASF = sediment-to-tissue transfer factor for invertebrate sediment biota (L/kg_{tissue}-wet wt.)
K_{ow} = octanol-water partition coefficient of COPC (Appendix C2, Table C2-1)

For organic COPCs with log K_{ow} values >2.6, the equilibrium partitioning approach will be used (section 8.2.3.1). Thus, the calculated BASF will be multiplied by the calculated sediment porewater concentration rather than the concentration in sediment.

Default Bioaccumulation Values

Default values for BAFs were used only when they were explicitly identified in draft guidance (EPA 1999a).

8.3 Effects Assessment Calculations

TRVs are concentrations or doses of constituents that are associated with a specified level of adverse effect, usually a no observed adverse effects level (NOAEL) or a lowest observed adverse effects level

(LOAEL), for ecological receptors. TRVs are used as the denominator in hazard quotients, as shown in the HQ equations (section 8.4).

8.3.1 Toxicity Reference Values for Terrestrial Receptors

TRVs for receptors dwelling in and, thus, exposed by direct contact with soil (plants, terrestrial invertebrates) are typically values from published sources, if field observations or site-specific toxicity tests of these media are not available. TRVs are tabulated in Appendix C3.

8.3.1.1 Single Chemical TRVs for Direct Contact with Soil

TRVs for plants and soil-dwelling invertebrates are derived values associated with some level of inhibition of growth or reproduction based on a review of published single-chemical laboratory studies (for example, Efroymson and others 1997a and 1997b).

Terrestrial Plants

Toxicity of COPCs to plants is assumed to be a result of uptake from soil into the plant tissues. Therefore, soil concentrations that are associated with toxicity, usually under experimental conditions, are used as TRVs. For terrestrial plant TRVs, the hierarchy of choices is values from EPA draft guidance (EPA 1999a), then values from the *Model Toxics Control Act* (MTCA) (Ecology 2001), then values from Efroymson and others (1997a), then values in the Phytotox database (EPA 2003f). No data were found in MTCA (Ecology 2001) or the Phytotox database (EPA 2003f) that were not in references higher in the hierarchy. COPCs with no TRVs will not be evaluated for toxicity, and this lack of data will be handled as an uncertainty.

EPA draft guidance (1999a) presents 21 published plant TRVs and 7 surrogate values. The TRV of benzo[a]pyrene was used as a surrogate TRV for PAHs for which published TRVs were not available (EPA 1999a). For COPCs that are not included in the EPA draft guidance (1999a), TRVs were based on a review of published single-chemistry laboratory studies (Efroymson and others 1997a). The derivation of TRVs for terrestrial plants is presented in Appendix C3, Table C3-1, and TRVs are summarized in Appendix C3, Table C3-8.

Terrestrial Invertebrates

Toxicity of COPCs to terrestrial invertebrates is assumed to be a result of uptake from soil into the invertebrate's tissues. Therefore, soil concentrations that are associated with toxicity, usually under experimental conditions, are used as TRVs. For terrestrial invertebrate TRVs, the hierarchy of choices will be values from EPA draft guidance (EPA 1999a), then values from the MTCA (Ecology 2001), then values from Efroymson and others (1997b), then values in published literature. COPCs with no TRVs will not be evaluated for toxicity, and this lack of data will be handled as an uncertainty.

EPA draft guidance (1999a) presents 16 published terrestrial invertebrate TRVs and 8 surrogate values. Per EPA draft guidance (1999a), for PAHs for which published TRVs were not available, the TRV of benzo[a]pyrene was used as a surrogate TRV. For the many COPCs that are not included in the EPA draft guidance (1999a) or Washington State Department of Ecology guidance (Ecology 2001), TRVs were based on a review of published single-chemistry laboratory studies (Efroymson and others 1997b). The development of TRVs for terrestrial invertebrates is presented in Appendix C3, Table C3-2, and TRVs are summarized in Appendix C3, Table C3-8.

8.3.1.2 TRVs for Ingestion Exposure of Terrestrial Receptors

For wildlife receptors, ingestion TRVs will be used to calculate HQs for the ingestion exposure pathway. For terrestrial mammal and bird TRVs, the hierarchy of choices was values from EPA (1999a) draft guidance, then values from Sample and others (1996), then values from the ECOTOXicology Database System (EPA 2002l). COPCs with no TRVs will not be evaluated for toxicity, and this lack of data will be handled as an uncertainty.

EPA draft guidance (1999a) presents 42 published TRVs and 3 surrogate values for mammals and 32 published TRVs and 4 surrogate values for birds. For the many COPCs that are not included in the EPA draft guidance (1999a), TRVs were based on a review of published single-chemistry laboratory studies (Sample and others 1996).

The outputs from the toxicity studies are subchronic or chronic NOAEL or LOAEL doses (mg/kg BW/d) for the test species. Per EPA draft guidance (1999a), if the NOAEL is from a subchronic study, the benchmark is adjusted downward by a factor of 10 to estimate the chronic benchmark. If the benchmark is a LOAEL for a mortality or reproduction endpoint, it is adjusted downward by a factor of 10 to estimate the NOAEL. A subchronic LOAEL is adjusted downward by a factor of 100 to estimate the chronic NOAEL. The development of TRVs for terrestrial receptors is presented in Appendix C3, Table C3-3, for mammals and Table C3-4 for birds. TRVs for all receptor species are summarized in Appendix C3, Table C3-8.

If the desired TRV is that corresponding to the NOAEL, then the endpoint observed in the study should be mortality or reproduction. Nonlethal or nonreproductive NOAELs are conservative, that is, lower than necessary to protect the receptor, but are used if a NOAEL for mortality or reproduction is not available. If the TRV is a LOAEL, then the endpoint observed in the study should be nonlethal or a nonreproductive effect. If the observed LOAEL endpoint is mortality or reproduction, then the nonconservative nature of the TRV should be considered in the risk characterization.

8.3.1.3 TRVs for Radiation Exposure of Terrestrial Receptors

Exposure to ionizing radiation (alpha particles, beta particles, and gamma rays) will be evaluated for toxicity to ecological receptors. The risk of cancer as a result of exposure to ionizing radiation is not calculated for ecological receptors because low doses of radiation typically do not induce cancer that would be lethal before the receptors are able to reproduce. Doses that would be associated with cancer risks that would cause marked reductions in populations would be extremely high. Instead, naturally occurring exposures that have been associated with little or no damage to populations are used to derive radiological TRVs.

The benchmark values for radiation given by the International Atomic Energy Agency (IAEA) (1992) are 1 mGy/d (0.1 rad/d) for terrestrial mammals and birds and 10 mGy/d (1 rad/d) for plants, invertebrates, and aquatic biota. These benchmarks are confirmed in *Effects of Ionizing Radiation on Terrestrial Plants and Animals: A Workshop Report* (Barnthouse 1995). Alpha radiation has a much higher effect on biological tissue than beta and gamma radiation because of the large mass of the alpha particle. When internal exposure is being evaluated, it is particularly important to consider the relative effectiveness of the radiation (CCN 063808). To adjust for the greater damage done by alpha particles than by beta and gamma radiation, a QF of 5 (Kocher and Trabalka 2000) for alpha radiation was included in the dose calculations to evaluate exposure to ROPCs.

8.3.2 Toxicity Reference Values for Aquatic Receptors

TRVs for receptors dwelling in and, thus, exposed by direct contact to sediment (benthic invertebrates) or surface water (fish, aquatic biota) are typically values from published sources if field observations or site-specific toxicity tests of these media are not available. The units of these values vary by source and medium (for example, μg/L for surface water and mg/kg-dry wt. for sediment).

8.3.2.1 Single Chemical TRVs for Direct Contact with Water and Sediment

TRVs for aquatic biota and benthic invertebrates are concentrations of COPCs in the medium to which the receptors are exposed.

Aquatic Biota

TRVs for aquatic biota are, in order of preference, values published in EPA draft guidance (1999a) and then other published TRVs. EPA draft guidance (1999a) presents 44 published TRVs for aquatic biota and 6 surrogate values. The hierarchy of TRVs not found in the EPA draft guidance (1999a) is Washington State MTCA values (Ecology 2001), National Ambient Water Quality Criteria (NAWQC) (Suter and Tsao 1996), the Final Chronic Values (Suter and Tsao 1996), Great Lakes Tier II Secondary Chronic Values (Suter and Tsao 1996), then toxicity values from recently published aquatic toxicity literature. If there is no toxicity value for a COPC, no TRV will be listed, and this lack of data will be handled as an uncertainty. The development of TRVs for aquatic biota is presented in Appendix C3, Table C3-5, and TRVs are summarized in Appendix C3, Table C3-8.

Chinook Salmon and Other Salmonids

Salmonids comprise salmon and trout species. These species have special regulatory, economic, and recreational interest in the Columbia River Basin. Chinook salmon and steelhead trout populations in the Hanford Reach of the Columbia River have been designated ESUs. Salmonids are also of particular cultural importance to the Native American tribes, whose way of life has inextricably included salmon and trout as food throughout their history. Because of their sensitive status, salmonids will be evaluated separately from other aquatic biota, and more stringent TRVs were sought for exposure of salmonids in the Columbia River. EPA draft guidance (EPA 1999a) offers no specific TRV data for salmonids. Data from toxicity testing of salmonids in the AQUIRE database about sensitive species EC20s presented by Suter and Tsao (1996) were used whenever they were lower than the TRVs used for other aquatic biota.

Sensitive species chronic values (Suter and Tsao 1996) were used as TRVs for salmonids in preference to TRVs for aquatic biota, whether or not they came from tests on salmonids. Other published toxicity values for salmonids were also used as TRVs for salmonids if they were lower than the TRVs for aquatic biota. These data did not necessarily meet criteria for use to calculate NAWQC but were used as highly conservative screening TRVs. The derivation of TRVs for salmonids is presented in Appendix C3, Table C3-6, and TRVs are summarized in Appendix C3, Table C3-8.

Benthic Invertebrates

TRVs for benthic invertebrates are, in order of preference, values published in EPA draft guidance (1999a) and then other published TRVs. EPA draft guidance (1999a) presents 27 published benthic invertebrate TRVs and 19 calculated or surrogate values. The hierarchy of TRVs not found in the EPA draft guidance (1999a) is no effect levels and lowest effect levels from Persaud and others (1993), then apparent effects thresholds from Ecology (1994), then values published by Ingersoll and others (1996).

For COPCs whose values are not available from those sources, values and methods found in Jones, Suter, and Hull (1997) were used. If there is no TRV in these sources, no TRV is listed, and this lack of data will be handled as an uncertainty. The development of TRVs for benthic invertebrates is presented in Appendix C3, Table C3-7, and TRVs are summarized in Appendix C3, Table C3-8.

8.3.2.2 TRVs for Ingestion Exposure of Predators of Aquatic Biota

TRVs for ingestion exposure of predators of aquatic biota are the same as those for terrestrial mammals and birds (section 8.3.1.2). The derivation of TRVs for mammal and bird receptors is presented in Appendix C3, tables C3-3 and C3-4, respectively. TRVs for all species are summarized in Appendix C3, Table C3-8.

8.3.2.3 TRVs for Radiation Exposure of Aquatic Biota

Exposure to ionizing radiation (alpha particles, beta particles, and gamma rays) will be evaluated for toxicity to ecological receptors. The risk of cancer as a result of exposure to ionizing radiation is not calculated for ecological receptors because low doses of radiation typically do not induce cancer that would be lethal before the receptors are able to reproduce. Doses that would be associated with cancer risks that would cause marked reductions in populations would be extremely high. Instead, naturally occurring exposures that have been associated with little or no damage to populations are used to derive radiological TRVs.

For all sediment and aquatic biota, the TRV for total (external + internal) whole-body radiological dose from combined external and internal exposure for all ROPCs combined is 1.0 rad/d (IAEA 1992). However, the TRV for aquatic wildlife receptors (that is, birds and mammals) is 0.1 rad/d.

8.3.3 Toxicity Equivalence Factors for Dioxins, Dibenzofurans, and PCBs

Chlorinated dioxins, chlorinated dibenzofurans, and chlorinated biphenyls are evaluated as a group because they are thought to act through a common mechanism of toxicity. These chemicals are thought to act by binding to a protein known as the arylhydrocarbon receptor (AR) (see ATSDR 1997 or WHO 1998). The AR-ligand complex is responsible for the activation of genes that have a deleterious effect when they are not under proper regulation by the receptor's hormones. Interaction of dioxins and similar compounds with AR, therefore, can cause immunological, neurological, endocrine, embryotoxic, and other effects.

The similarity in action of these compounds is thought to result from their structural similarity. Dioxin is composed of two benzene rings joined by two carbon-oxygen-carbon bonds on two adjacent carbons of each benzene ring. Dibenzofurans have two benzene rings joined by a carbon-oxygen-carbon bond and a carbon-carbon bond on two adjacent carbons of each benzene ring. Biphenyls consist of two benzene rings joined by a single carbon-carbon bond. To form the polychlorinated derivatives, chloro groups are attached at various locations, as designated in the names of the compounds. Benzene rings are planar (flat) in conformation. Because two adjacent carbons on each benzene ring are joined in dioxins and dibenzofurans, both benzene rings are held in the same plane, and the chloro groups are also in that plane. Therefore, these molecules are said to be coplanar. The coplanar structure appears to be essential for interaction with AR. The benzene rings in biphenyl can rotate relative to each other, unless there are added groups that interfere with rotation (such as 2,2',6,6'-chloro groups, which occupy the carbons immediately on both sides of the carbon-carbon bond joining the rings). PCB congeners that are able to form a coplanar molecule (and are called *coplanar* PCBs) can interact with AR when they are in that

configuration. Therefore, coplanar PCBs are included among the COPCs with similar action to dioxins and dibenzofurans.

EPA has recommended that toxicity equivalence factors (TEFs) be used to evaluate the cumulative toxicity of chlorinated dioxins, chlorinated dibenzofurans, and chlorinated biphenyls. Because these contaminants have a common mechanism of action, it is assumed that their toxicity to biota is additive (WHO 1998, EPA 1999a). That is, the toxicity of all dioxins, dibenzofurans, and PCBs should be added. Furthermore, their relative potency as chronic toxins is assumed to be related to the degree of affinity for AR, which can be measured much more conveniently than chronic toxic effects. TEFs have been proposed for several chlorinated dioxins, chlorinated dibenzofurans, and chlorinated biphenyls (WHO 1998, EPA 1999a), always assigning the toxicity of TCDD, the most potent chlorinated dioxin, a TEF of 1.0. Separate lists were developed for mammals, birds, and fish, and these lists are presented in Table 8-2.

TEFs are reported in Table 8-2 for individual PCB congeners (such as 2,3,3',4,4',5-hexachlorobiphenyl), but analytical values for individual congeners in the exposure media are sometimes not available. It is also possible to calculate TEFs for Aroclors, which are mixtures of PCB congeners, using the typical composition of Aroclor mixtures (Hutzinger, Safe, and Zitko 1983).

Using TEFs, HQs can be calculated for chlorinated dioxins, chlorinated dibenzofurans, and PCBs for which TRVs are not available. The TRV for TCDD is divided by the COPC's TEF to calculate an equivalent TRV of TCDD. The TCDD-equivalent TRV of the COPC is then used to calculate the HQ for the COPC. Because the mechanism of action of these compounds is thought to be the same, the TCDD-equivalent HQs are added to determine the hazard index (HI) for the set of dioxins and dibenzofurans.

8.4 Risk Characterization

Risk estimates for a receptor at an exposure location are calculated as the HQ, which is the ratio of the estimated exposure to the TRV. That is:

$$HQ = \text{Estimated Exposure}/TRV$$

The HQ is an index of the total risk to the receptor from exposure to the COPC if the COPC does not occur in the environment from any other source and if the home range of the receptor is smaller than the area of the exposure location, that is, if the AUF = 1.

The HQ equation takes different forms depending on how the receptor is exposed, which also determines how the TRV is expressed. In the SLERA for the WTP, the exposure to ecological receptors will be either a media concentration (EPC), an average daily dose of a COPC (ADD), or a daily total (external + internal) whole-body radiological dose (R).

8.4.1 Terrestrial Receptors

For receptors living in soil (such as plants and terrestrial invertebrates), the HQ will be calculated as the ratio of the concentration of COPC in soil and the TRV for the receptor and the COPC. That is:

$$HQ = Cs/TRV \qquad \text{(Eq. 8-76)}$$

where:

HQ = hazard quotient for the receptor at its exposure location for the COPC (unitless)

Cs = concentration of the COPC in soil at the exposure location (mg/kg_{soil})

TRV = toxicity reference value of the receptor for the COPC (mg/kg_{soil})

The HQ for a wildlife receptor that does not live in the medium containing COPCs, but is exposed by ingestion and other routes, will be calculated as the ratio of the ADD and the TRV. That is:

$$HQ = ADD/TRV \qquad \text{(Eq. 8-77)}$$

where:

ADD = average daily dose of the COPC to the receptor at the exposure location (mg/kg BW/d) calculated using the concentration of the COPC at the exposure location

TRV = toxicity reference value of the COPC for the receptor (mg/kg BW/d)

The second equation will be used to estimate risk for the wildlife receptors in the terrestrial food web: mule deer, mourning dove, Great Basin pocket mouse, western meadowlark, coyote, burrowing owl, and red-tailed hawk.

8.4.2 Aquatic Receptors

For receptors living in surface water or sediment (for example, aquatic life and salmon and other fish living in surface water, and benthic organisms living in sediment), the HQ will be calculated as the ratio of the measured concentration of COPC in the medium and the TRV. That is:

$$HQ = C/TRV \qquad \text{(Eq. 8-76)}$$

where:

HQ = hazard quotient for the receptor at its exposure location for the COPC (unitless)

C = concentration of the COPC in water or sediment at the exposure location (µg/L, mg/L, µg/kg, or mg/kg)

TRV = toxicity reference value of the COPC for the receptor (µg/L, mg/L, µg/kg, or mg/kg)

Note: Equation 8-76 first appears in section 8.4.1.

The HQ for a wildlife receptor that does not live in the surface water or sediment containing the COPCs but is exposed from aquatic food webs by ingestion, inhalation, and other routes is calculated as the ratio of the estimated ADD (mg/kg BW/d) to the TRV (mg/kg BW/d). That is:

$$HQ = ADD/TRV \qquad \text{(Eq. 8-77)}$$

Note: Equation 8-77 first appears in section 8.4.1.

The above equation will be used to estimate risk for the wildlife receptors in the aquatic food web: Canada goose, spotted sandpiper, great blue heron, bald eagle, and mink.

8.4.3 Hazard Index

The HI for a receptor at a given exposure location is the sum of the HQs for all COPCs with similar modes of toxicity and is an index of the combined risk from exposure to multiple COPCs. A preliminary classification of inorganic COPCs grouped arsenic, antimony, selenium, and vanadium as respiratory inhibitors; lead, manganese, and mercury as central nervous system inhibitors; and aluminum, chromium, and nickel as deoxyribonucleic acid (DNA) and protein reactors. Organic COPCs are typically grouped by chemical structure: volatile organic compounds (VOCs), PAHs, organochloride pesticides, and PCBs. These chemical groupings are based on experience. However, for the SLERA, HQs for all organic COPCs, all inorganic COPCs, and all ROPCs, regardless of mode of actions, will be grouped and summed because such summing represents the most conservative case. When the HI exceeds 0.25, additional HIs by mode of action will be developed with approval of Ecology if a scientific management decision so indicates. The HI for a receptor at an exposure location is calculated from the HQs for the individual COPCs as follows:

$$HI = \Sigma\, HQ \qquad \text{(Eq. 8-78)}$$

where:

HI = hazard index for the receptor at the exposure location (unitless)

HQ = hazard quotient for the receptor at the exposure location for each COPC (unitless)

Calculating HI assumes an additive effect on receptors from the summed COPCs.

The HQ equation for receptors exposed to ROPCs is equivalent to an HI because the dose from all radionuclides is summed to estimate the total-body dose from internal and external exposures.

The threshold value for HQs and HIs for COPCs will be 0.25, unless a similar mode of action can be demonstrated and approved by Ecology. HIs for organic COPCs, inorganic COPCs, and ROPCs will not be added together.

8.5 Reporting of Major Ecological Risk Findings

Risk characterization will be reported in such a way as to meet three goals identified in EPA guidance (EPA 1999a); it: (1) provides the maximum, most conservative exposure estimate; (2) “identifies which pathways are driving risk specific to a COPC and receptor”; and (3) “allows risk management efforts to be prioritized.” The characterization will interpret risk findings in terms of the receptor groups represented rather than individual receptor species. For example, if there is excess risk to the Great Basin pocket mouse, the result will be interpreted as indicating potential harm to small omnivorous mammals in general.

The following outline of headings is proposed for the PRA:

- Current Risk for Terrestrial Conditions: Central Plateau
  - Onsite Ground Maximum Location

    - a Organic COPCs
    - b Inorganic COPCs
    - c ROPCs
  - Offsite Ground Maximum Location
    - a Organic COPCs
    - b Inorganic COPCs
    - c ROPCs
  - Gable Mountain Maximum Location
    - a Organic COPCs
    - b Inorganic COPCs
    - c ROPCs
- Current Risk for Aquatic Conditions: Columbia River
  - Columbia River Maximum Location
    - a Organic COPCs
    - b Inorganic COPCs
    - c ROPCs
- Future Risk
  - Terrestrial Conditions
  - Aquatic Conditions

At each location, every COPC that exceeds an HQ of 0.25 will be identified along with the receptor for which the exceedance occurs. In addition, locations and receptors for which HIs exceed 0.25 will be identified, and for each such combination, COPCs whose HQs exceed 0.025 will be identified as significant contributors to the HI. If the results of the SLERA indicate that one or more COPC or ROPC is a potential hazard (that is, HQ $\geq$ 0.25), then exposure and toxicity information for that COPC will be re-evaluated to determine whether the evaluation was overly conservative. Evaluation of sources and pathways will help identify which pathways drive the risk. This information will allow risk managers to prioritize further investigation.

Evaluation of HQs, HIs, sources, and pathways will be done for the PRA as well as the FRA within the SLERA.

8.6 Uncertainty in Ecological Risk Assessment

Evaluation of uncertainties is part of the SLERA process (EPA 1998c). Uncertainties in each of the four interrelated steps of the EPA approach to the SLERA will be discussed as follows:

- Problem formulation
- Exposure assessment
- Effects assessment
- Risk characterization

Uncertainties about the data will be evaluated in the exposure assessment and the effects assessment steps.

8.6.1 Problem Formulation

Environmental concentrations of contaminants deposited on the soil and water at exposure locations will be based on many predictions. A degree of uncertainty exists about the predicted spatial distribution of contaminants. Exposure concentrations could be overestimated or underestimated, depending on how good the model is at predicting contaminant distribution. The assumption that all soil or surface water in a given exposure area contains the COPC concentrations and ROPC activities modeled for the maximum location results in an overestimate of risk to populations.

Because conservative exposure parameters (section 8.6.2) will be used to calculate HQs, the estimates of risk from ecological COPCs and ROPCs are conservative (that is, protective). Using conservative exposure concentrations decreases the likelihood of underestimating the risk posed by each ecological COPC/ROPC and increases the likelihood of overestimating the risk. Note that for wildlife receptors not living in soil, sediment, or surface water, HQ is a function of COPC dose (ADD) or radiological dose (R), which, in turn, depends on a number of exposure factors (in addition to contaminant exposure concentration). Thus, several factors determine how conservative an HQ might be (in addition to contaminant exposure concentration).

The distribution and abundance of organisms comprising the ecological receptors at exposure locations have not been quantified by field studies. The lack of quantitative data introduces uncertainties concerning whether, and to what extent, the risk characterization based on the selected receptor species underestimates, or overestimates, the risk to organisms that are not used in the risk computations but are found at exposure locations.

One (or more) unobserved species at exposure locations is possibly more sensitive than those ecological species for which toxicity data were available. It does not necessarily follow that these unevaluated species are at significantly greater risk of harmful ecological effects than that estimated in the SLERA, because their exposure may be less than the conservatively estimated exposure for WTP receptors.

8.6.2 Exposure Assessment

Movement of contaminants from the exposure locations through direct and indirect pathways to ecological receptors will be modeled rather than measured for the SLERA. The lack of site-specific measurements introduces uncertainties about the actual modes and pathways of exposure and the actual exposure concentrations of these contaminants to the ecological receptors. Exposure concentrations can differ from the predicted environmental concentrations as a result of physical and chemical processes during transport from source to receptor. These processes will not be predicted quantitatively in the SLERA.

The modes and pathways used to characterize the exposure of ecological receptors are the most important ones for the relatively large and active species in terrestrial habitats. Soil-dwelling terrestrial animals may be exposed to contaminants in soil by way of inhalation. However, it is expected that concentrations of VOCs will be very small and that gaseous concentrations in soil interstices, cavities, and burrows do not exist. Inhalation exposures will not be evaluated in the SLERA. Therefore, the exposure to burrowing organisms at the site from contaminated soil and porewater in the soil may be underestimated if gas concentrations are larger than soil concentrations. Overestimating exposure by using conservative exposure concentrations is thought to offset the underestimation of exposure that results from neglecting certain

exposure modes and pathways of lesser importance. Additional uncertainties are inherent in ingestion rates and dietary fractions of plants and animals. Likewise, the effects of dermal exposure may be underestimated; uncertainty about those effects will be discussed qualitatively. Exposure concentrations are likely overestimated because of conservative exposure factors. Sources of conservatism in the exposure factors include using published BAFs, irrespective of species and environmental conditions.

8.6.3 Effects Assessment

Toxicity thresholds are based on concentrations reported to have no, or little, effect on the test organism or are estimated conservatively from published toxicity data. TRVs for wildlife receptors exposed to soils are derived from NOAELs or LOAELs reduced by safety factors of 10 for chronic LOAELs and subchronic NOAELs or 100 for subchronic LOAELs (Sample and others 1996). These thresholds would underestimate the risks only to organisms at the exposure locations that are considerably more sensitive than the receptor organisms for the specific toxicological endpoint. The thresholds are more likely to overestimate the risk to organisms that are equally or less sensitive than the receptor organisms. The possibility remains that some thresholds are set at levels at or above which some harm would occur to organisms at the exposure locations because receptors may be more sensitive to other toxicological endpoints.

There is limited data for developing inhalation TRVs and very limited data for developing dermal TRVs. Little is known about the actual absorption across the dermal layer of wildlife receptors. There is also uncertainty about the extrapolation of TRVs for ingestion to inhalation. Therefore, inhalation exposures will not be evaluated quantitatively. The uncertainties associated with neglecting dermal contact and inhalation toxicity will be discussed in the PRA.

The risks from exposure to multiple contaminants depend on contaminant interactions; effects could be greater or less than those from a single chemical. This RAWP provides methods for estimating ecological COPC-specific risk estimates and assumes additivity for calculating HIs. Overall, the effects assessment probably overestimates toxicity because the TRVs are based on concentrations that cause no observed effect in test animals rather than an effect that may be observable but is not great enough to threaten populations.

TRVs are not available for some COPCs. This lack of TRVs is especially true for organic COPCs. This situation will likely result in underestimated risks.

The TRVs for radiation exposure were proposed as doses that are unlikely to harm populations (IAEA 1992, Barnthouse 1995). Individual plants or animals or tissues of plants and animals may be more sensitive to radiation damage than the populations evaluated by IAEA (1992). For example, rapidly growing tissues such as root hairs may be particularly sensitive to external radiation if they are in close contact with contaminated media. Therefore, the SLERA may underestimate risks from radiation by an unknown amount.

Additional uncertainty exists as to the pertinence of individual organism toxicity for characterizing the risk to individuals, populations, and ecosystems. Populations possibly may compensate for the loss of large numbers of juveniles or adults with increased survival or birth rates, and habitats or ecosystems may possess functionally redundant species that are less sensitive to contaminants. Although the desert habitat at the exposure locations likely possesses some buffering mechanisms, a conservative risk assessment approach is still justified based on organismal toxicity thresholds (that is, NOAELs), which probably result in an overestimate of risk.

8.6.4 Risk Characterization

The uncertainties described above ultimately produce uncertainty in the quantification of current and future risks to plants and animals at the exposure locations. An additional area of uncertainty in the risk characterization is risk to receptors outside of the four exposure areas to be modeled.

It is unlikely that receptors outside the areas of maximum concentration and within the 50 km study area would have lower toxicity thresholds for contaminants than the thresholds used for receptors within those exposure areas. All representative organisms are assumed to be present at the locations of maximum concentration regardless of their actual distribution. In addition, there is little reason to expect that contaminants migrating outside the study area would be concentrated above predicted concentrations at the exposure locations. In general, the risk to receptors outside the exposure areas is likely to be overestimated rather than underestimated by the risk estimate for receptors outside the four exposure areas and within the 50 km radius of the site (Spromberg and others 1998).

8.6.5 Summary of Uncertainties

The most important uncertainties in the ecological portion of the SLERA for exposure locations are those surrounding the estimates of the contaminant concentrations to which ecological receptors are actually exposed (EPCs) and the concentrations that present an acceptable level of risk or harmful effects (toxicity thresholds or reference values). These uncertainties arise from multiple sources, for example, the lack of site-specific data on contaminant transport and transformation processes, organismal toxicity, animal behavior and diet, population dynamics, and the response of arid land plant and animal populations to stressors in their environments. Despite these uncertainties, the modeled exposure concentrations and published exposure and effects information will allow risks to be characterized for various exposure locations according to exposure/effects scenarios.

8.7 Summary for Screening-Level Ecological Risk Assessment

Risks to ecological receptors from the potential emission of COPCs and ROPCs result from exposure to and ecological toxicity of the COPCs and ROPCs. The SLERA will utilize the estimated emission rates (section 5) and results of fate and transport modeling (section 6) to calculate potential ecological receptor exposure to COPCs and ROPCs. This exposure information is combined with toxicity data to estimate the potential for adverse effects to terrestrial and aquatic organisms and populations in the vicinity of the WTP.

The SLERA will use conservative exposure assumptions to compensate for the high level of uncertainty associated with conducting a risk assessment for a facility that is still in the final design phases. The PRA will include a qualitative uncertainty analysis. The exact procedures that may be used to identify and evaluate the primary sources of uncertainty in the FRA will be determined at a later time.

The FRA will focus on ecological COPCs and ROPCs that exceed risk thresholds in the PRA and may utilize additional site-specific emissions, fate and transport, and exposure data collected after the completion of the PRA.

Table 8-1 Policy Goals, Ecological Assessment Endpoints, Measures, and Decision Rules for 200 Areas and Surroundings

Policy Goals	Assessment Endpoint	Measures	Decision Rule
Policy Goal 1: The conservation of threatened and endangered species and their critical habitats.	**Assessment Endpoint 1:** Protection of individuals of state or federally designated threatened or endangered (T&E) species. Endpoint species: bald eagle.	**Measure 1:** Modeled contaminant concentrations in prey (such as, deer mouse, western meadowlark, Great Basin pocket mouse, mourning dove, and fish) based on modeled concentrations of vapors in air and particulates, depositions of contaminant particulates to soil and surface water, and measured concentrations of contaminants in abiotic media. These concentrations are used to evaluate exposure of threatened and endangered predators. Chronic exposure concentrations and doses associated with no adverse effect on survival and reproduction.	**Decision Rule for Assessment Endpoint 1:** If threatened or endangered species are not present, or exposure point concentrations in the media do not contribute to the chronic NOAEL, then it is indicated that the contaminant alone is unlikely to cause adverse ecological effects and, therefore, the threatened or endangered species should be preserved. If the HQ $\geq$0.25, lines of evidence will be evaluated to determine the potential for ecological risk and the need for any additional measurements or calculations.
Policy Goal 2: The protection of terrestrial populations and ecosystems.	**Assessment Endpoint 2:** Stable plant community for erosion control and energy production. Endpoint species: cheatgrass, rabbitbrush.	**Measure 2**: Modeled concentrations of vapors in air and particulates and depositions of contaminant particulates to soil. Chronic exposure concentrations associated with no adverse effect on survival and reproduction.	**Decision Rule for Assessment Endpoint 2:** If the HQ is <0.25, then it is indicated that the contaminant alone is unlikely to cause adverse ecological effects and, therefore, the plant populations and communities are maintained. If the HQ $\geq$0.25, lines of evidence will be evaluated to determine the potential for ecological risk and the need for any additional measurements or calculations.

Table 8-1 Policy Goals, Ecological Assessment Endpoints, Measures, and Decision Rules for 200 Areas and Surroundings

Policy Goals	Assessment Endpoint	Measures	Decision Rule
Policy Goal 2: The protection of terrestrial populations and ecosystems.	**Assessment Endpoint 3:** Stable soil-dwelling invertebrate community for nutrient and energy processing. Endpoint species: earthworms and darkling beetles.	**Measure 3:** Modeled concentrations of vapors in air and particulates and depositions of contaminant particulates to soil. Chronic exposure concentrations associated with no adverse effect on survival and reproduction.	**Decision Rule for Assessment Endpoint 3:** If the HQ is <0.25, then it is indicated that the contaminant alone is unlikely to cause adverse ecological effects and, therefore, the terrestrial invertebrate community is maintained. If the HQ ≥0.25, lines of evidence will be evaluated to determine the potential for ecological risk and the need for any additional measurements or calculations.
	Assessment Endpoint 4: Stable populations of herbivorous animals. Endpoint species: mammals - mule deer; birds - mourning dove.	**Measure 4:** Modeled contaminant concentrations in food chain (such as, plants) based on modeled concentrations of vapors in air and particulates and depositions of contaminant particulates to soil. Chronic exposure doses associated with no adverse effect on survival and reproduction.	**Decision Rule for Assessment Endpoint 4:** If the HQ is <0.25, then it is indicated that the contaminant alone is unlikely to cause adverse ecological effects and, therefore, populations of the herbivores (such as, mule deer and mourning dove) are maintained. If the HQ ≥0.25, lines of evidence will be evaluated to determine the potential for ecological risk and the need for any additional measurements or calculations.
	Assessment Endpoint 5: Stable populations of plant-eating or insectivorous animals (omnivores). Endpoint species: bird - western meadowlark.	**Measure 5:** Modeled contaminant concentrations in earthworms, plants, and other prey based on modeled concentrations of vapors in air and particulates and depositions of contaminant particulates to soil. Chronic exposure doses associated with no adverse effect on survival and reproduction.	**Decision Rule for Assessment Endpoint 5:** If the HQ is <0.25, then it is indicated that the contaminant alone is unlikely to cause adverse ecological effects and, therefore, populations of omnivores (such as, western meadowlark) are maintained. If the HQ ≥0.25, lines of evidence will be evaluated to determine the potential for ecological risk and the need for any additional measurements or calculations.

Table 8-1 Policy Goals, Ecological Assessment Endpoints, Measures, and Decision Rules for 200 Areas and Surroundings

Policy Goals	Assessment Endpoint	Measures	Decision Rule
Policy Goal 2: The protection of terrestrial populations and ecosystems.	**Assessment Endpoint 6:** Stable populations of terrestrial predators. Endpoint species: mammal - coyote; bird - burrowing owl and red-tailed hawk.	**Measure 6:** Modeled contaminant concentrations in prey (such as, western meadowlark and Great Basin pocket mouse) based on modeled concentrations of vapors in air and particulates and depositions of contaminant particulates to soil. These concentrations are used to evaluate exposure of predators. Chronic exposure doses associated with no adverse effect on survival and reproduction.	**Decision Rule for Assessment Endpoint 6:** If the HQ is <0.25, then it is indicated that the contaminant alone is unlikely to cause adverse ecological effects and, therefore, populations of terrestrial predators are maintained. If the HQ ≥0.25, lines of evidence will be evaluated to determine the potential for ecological risk and the need for any additional measurements or calculations.
Policy Goal 3: The protection of aquatic populations and ecosystems.	**Assessment Endpoint 7:** Stable populations of sediment-dwelling organisms. Endpoint species: clams, insects, snails, and worms.	**Measure 7:** Modeled sediment contaminant concentrations from dispersion and deposition. Chronic exposure concentrations associated with no adverse effect on survival and reproduction.	**Decision Rule for Assessment Endpoint 7:** If the HQ is <0.25, then it is indicated that the contaminant alone is unlikely to cause adverse ecological effects and, therefore, populations of sediment-dwelling organisms are maintained. If the HQ ≥0.25, lines of evidence will be evaluated to determine the potential for ecological risk and the need for any additional measurements or calculations.
	Assessment Endpoint 8: Stable planktivorous fish and small invertebrate populations. Endpoint species: water fleas and other invertebrates.	**Measure 8:** Modeled surface water contaminant concentrations. Chronic exposure concentrations associated with no adverse effect on survival and reproduction.	**Decision Rule for Assessment Endpoint 8:** If the HQ is <0.25, then it is indicated that the contaminant alone is unlikely to cause adverse ecological effects and, therefore, populations of small invertebrates are maintained. If the HQ ≥0.25, lines of evidence will be evaluated to determine the potential for ecological risk and the need for any additional measurements or calculations.

Table 8-1 Policy Goals, Ecological Assessment Endpoints, Measures, and Decision Rules for 200 Areas and Surroundings

Policy Goals	Assessment Endpoint	Measures	Decision Rule
Policy Goal 3: The protection of aquatic populations and ecosystems.	**Assessment Endpoint 9:** Stable waterfowl and shorebird populations. Endpoint species: Canada goose, spotted sandpiper.	**Measure 9:** Modeled contaminant concentrations in benthic invertebrates or aquatic plants based on modeled contaminant concentrations in surface water or sediments from dispersion and deposition. These concentrations are used to evaluate exposure of predators. Chronic exposure doses associated with no adverse effect on survival and reproduction.	**Decision Rule for Assessment Endpoint 9:** If the HQ is <0.25, then it is indicated that the contaminant alone is unlikely to cause adverse ecological effects and, therefore, populations of waterfowl and shorebirds are maintained. If the HQ ≥0.25, lines of evidence will be evaluated to determine the potential for ecological risk and the need for any additional measurements or calculations.
	Assessment Endpoint 10: Stable populations of large carnivorous fish population for regulation. Endpoint species: salmon, bass, channel catfish.	**Measure 10:** Modeled surface water and sediment contaminant concentrations. Chronic exposure concentrations associated with no adverse effect on survival and reproduction.	**Decision Rule for Assessment Endpoint 10:** If the HQ is <0.25, then it is indicated that the contaminant alone is unlikely to cause adverse ecological effects and, therefore, populations of large carnivorous fish are maintained. If the HQ ≥0.25, lines of evidence will be evaluated to determine the potential for ecological risk and the need for any additional measurements or calculations.
	Assessment Endpoint 11: Stable fish-eating terrestrial predator populations for population regulation. Endpoint species: mammal - mink; birds - great blue heron, bald eagle.	**Measure 11:** Modeled contaminant concentrations in large carnivorous fish and planktivorous fish and small invertebrates based on modeled surface water and sediment concentrations. These concentrations are used to evaluate exposure of predators. Chronic exposure doses associated with no adverse effect on survival and reproduction.	**Decision Rule for Assessment Endpoint 11:** If the HQ is <0.25, then it is indicated that the contaminant alone is unlikely to cause adverse ecological effects and, therefore, populations of fish-eating terrestrial predators are maintained. If the HQ ≥0.25, lines of evidence will be evaluated to determine the potential for ecological risk and the need for any additional measurements or calculations.

T&E = Threatened and endangered.
NOAEL = No observed adverse effects level.
HQ = Hazard quotient.

Table 8-2 Toxicity Equivalence Factors for Chlorinated Dioxins, Chlorinated Dibenzofurans, and Polychlorinated Biphenyls[a]

Congener	Receptor		
	Mammals	Birds	Fish
Dioxins [b]			
2,3,7,8-TCDD	1	1	1
1,2,3,7,8-PeCDD	1	1	1
1,2,3,4,7,8-HxCDD	0.1	0.05	0.5
1,2,3,6,7,8-HxCDD	0.1	0.01	0.01
1,2,3,7,8,9-HxCDD	0.1	0.1	0.01
1,2,3,4,6,7,8-HpCDD	0.01	<0.001	0.001
OCDD	0.0001	NA	NA
Dibenzofurans [c]			
2,3,7,8-TCDF	0.1	1	0.05
1,2,3,7,8-PeCDF	0.05	0.1	0.05
2,3,4,7,8-PeCDF	0.5	1	0.5
1,2,3,4,7,8-HxCDF	0.1	0.1	0.1
1,2,3,6,7,8-HxCDF	0.1	0.1	0.1
2,3,4,6,7,8-HxCDF	0.1	0.1	0.1
1,2,3,7,8,9-HxCDF	0.1	0.1	0.1
1,2,3,4,6,7,8-HpCDF	0.01	0.01	0.01
1,2,3,4,7,8,9-HpCDF	0.01	0.01	0.01
OCDD	0.0001	0.0001	0.0001
Polychlorinated Biphenyls [d]			
3,4,4',5-TCB	0.0001	0.1	0.0005
3,3',4,4'-TCB	0.0001	0.05	0.0001
3,3',4,4',5-PeCB	0.1	0.1	0.005
3,3',4,4',5,5'-HxCB	0.01	0.001	0.00005
2,3,3',4,4'-PeCB	0.0001	0.0001	<0.000005
2,3,4,4',5-PeCB	0.0005	0.0001	<0.000005
2,3',4,4',5-PeCB	0.0001	0.00001	<0.000005
2',3,4,4',5-PeCB	0.0001	0.00001	<0.000005
2,3,3',4,4',5-HxCB	0.0005	0.0001	<0.000005
2,3',4,4',5,5'-HxCB	0.00001	0.00001	<0.000005
2,3,3',4,4',5,5'-HpCB	0.0001	0.00001	<0.000005
2,2',3,3',4,4',5'-HpCB	NA	NA	NA
2,2',3,4,4',5,5'-HpCB	NA	NA	NA

T = tetra, Pe = penta, Hx = hexa, Hp = hepta, O = octa, NA = not available.

[a] Values from WHO 1997.

[b] CDD = chlorinated dibenzodioxin.

[c] CDF = chlorinated dibenzofuran.

[d] CB = chlorinated biphenyl.

Figure 8-1 Ecological Conceptual Exposure Model

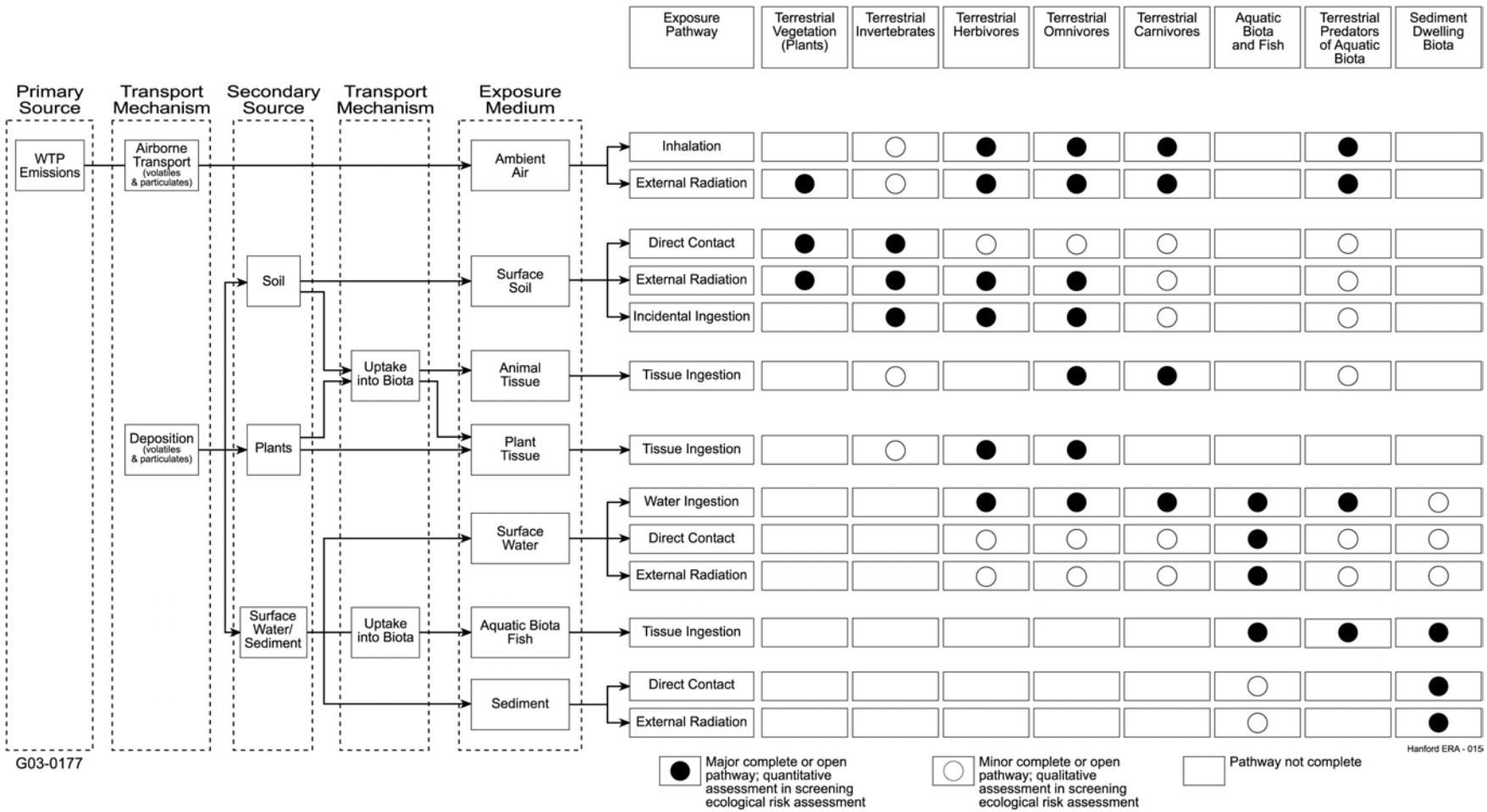


Figure 8-2 Recreation and Wildlife Areas and the Hanford Reach

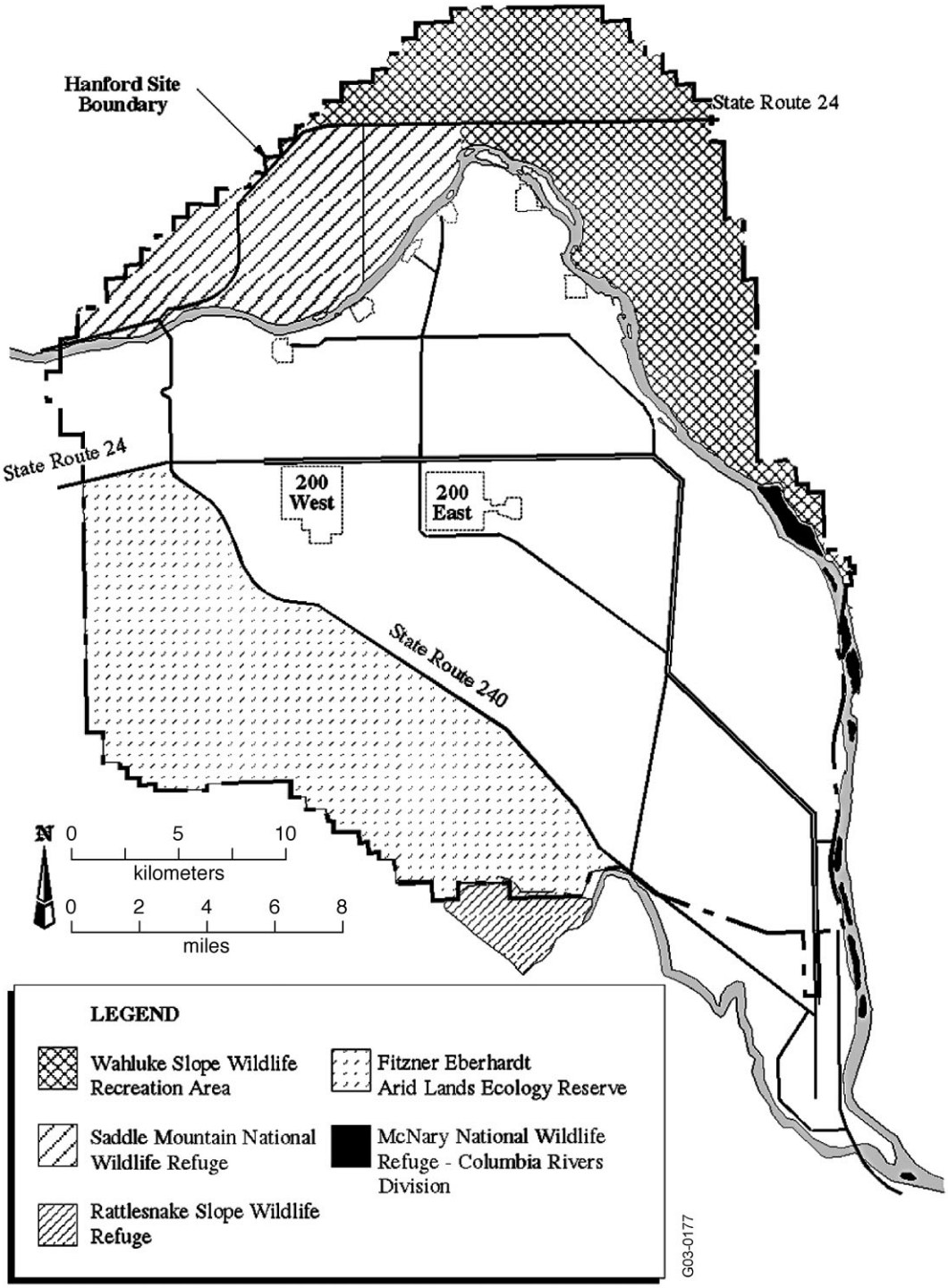
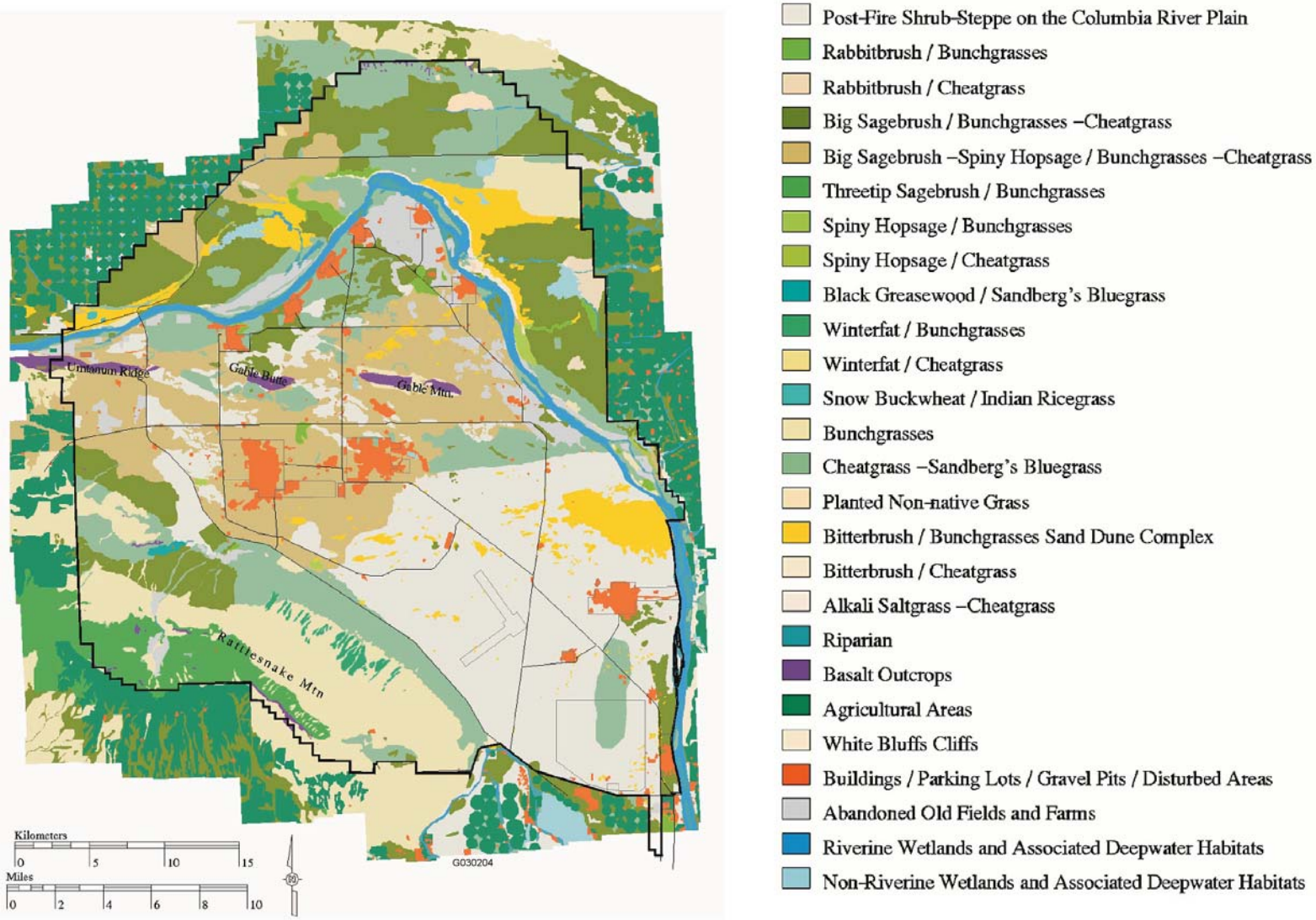


Figure 8-3 Vegetation Types of the Hanford Site



BHI:rpp 04/22/96 clup/brmap d02.aml Database: 07-DEC-1998

Figure 8-4 Selected Raptor Nesting and Perching Locations on the Hanford Site

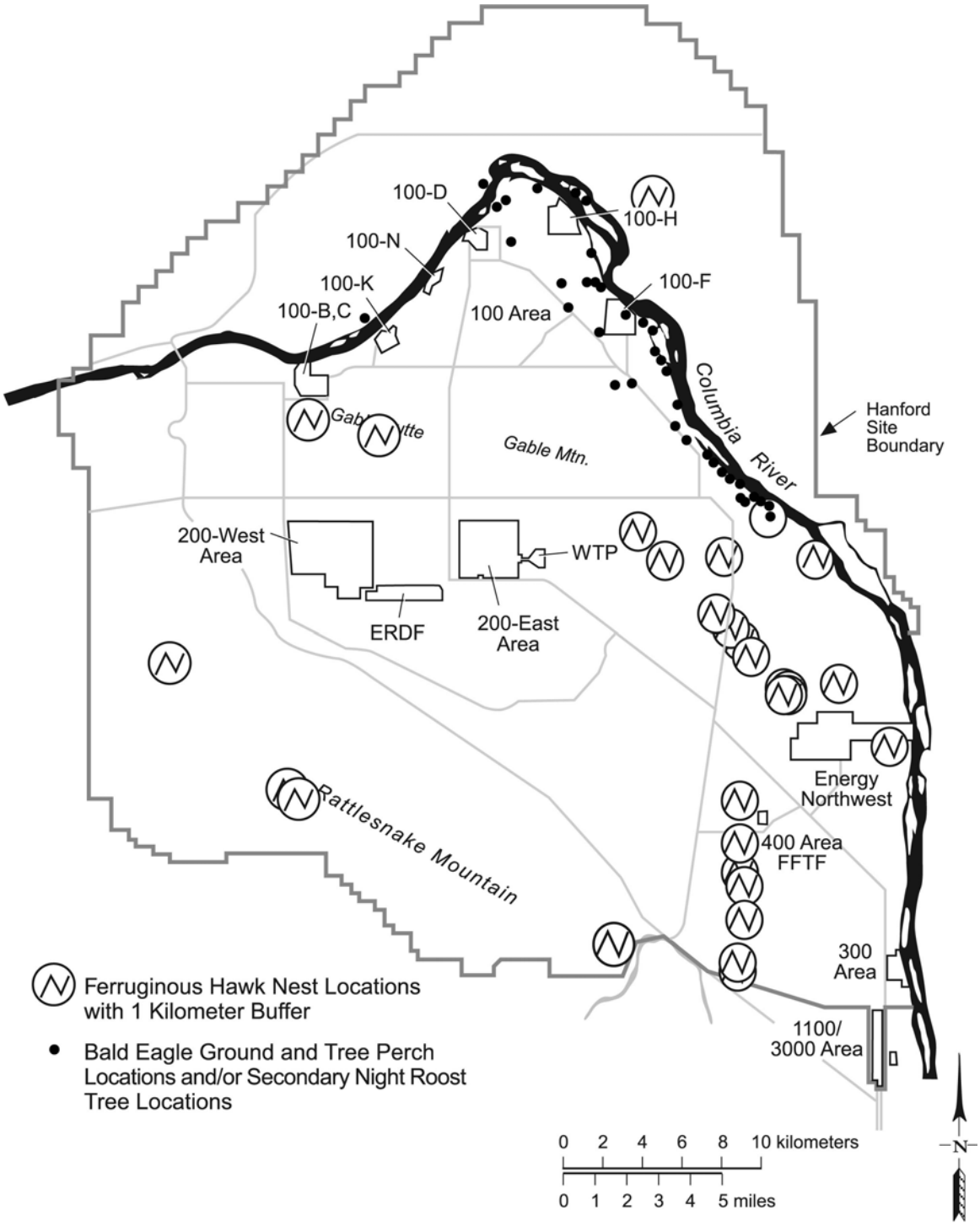


Figure 8-5 WTP Areas Vegetation Types (Simplified)

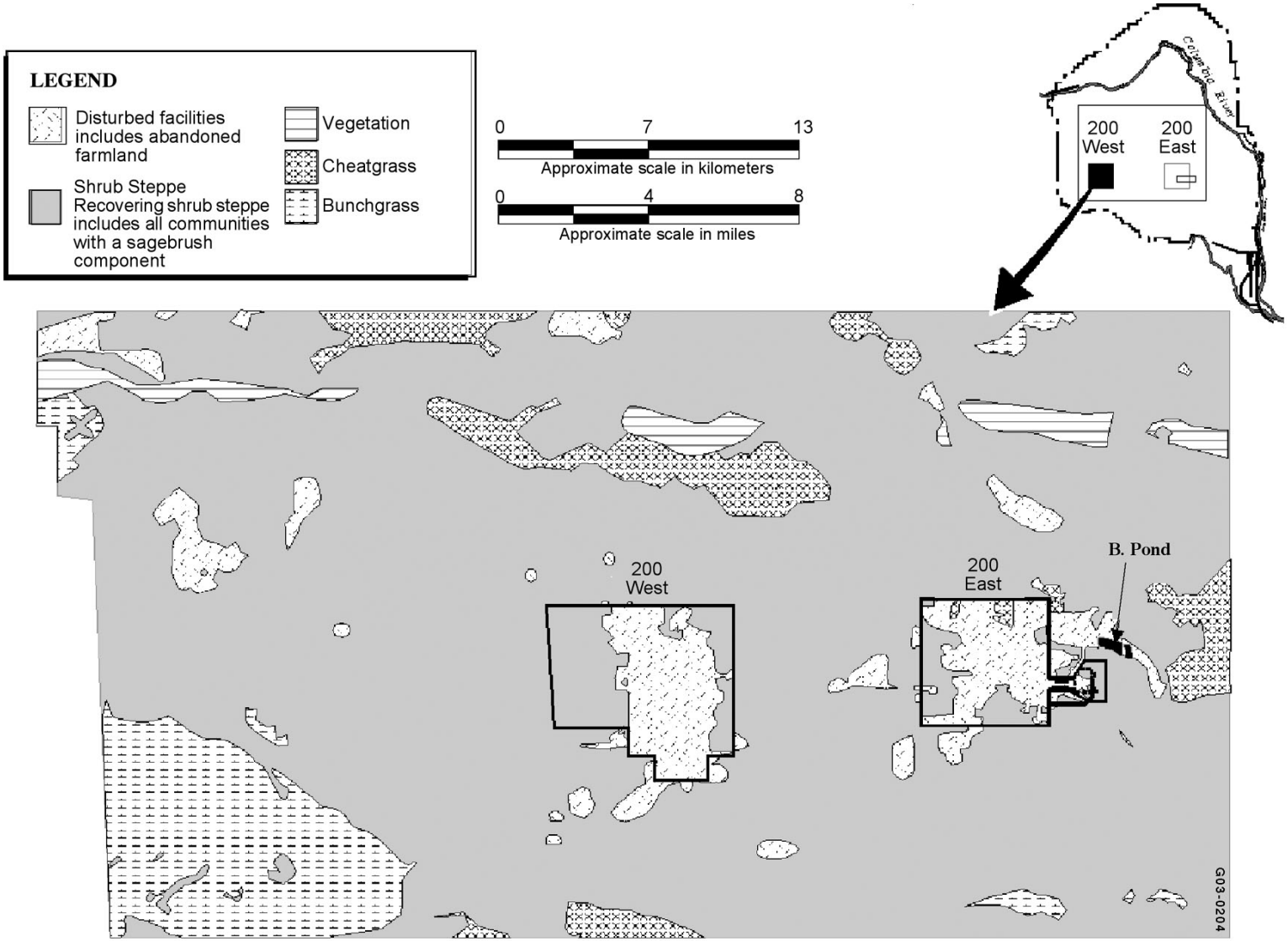


Figure 8-6 Fall Chinook Salmon Spawning Areas Along the Columbia River

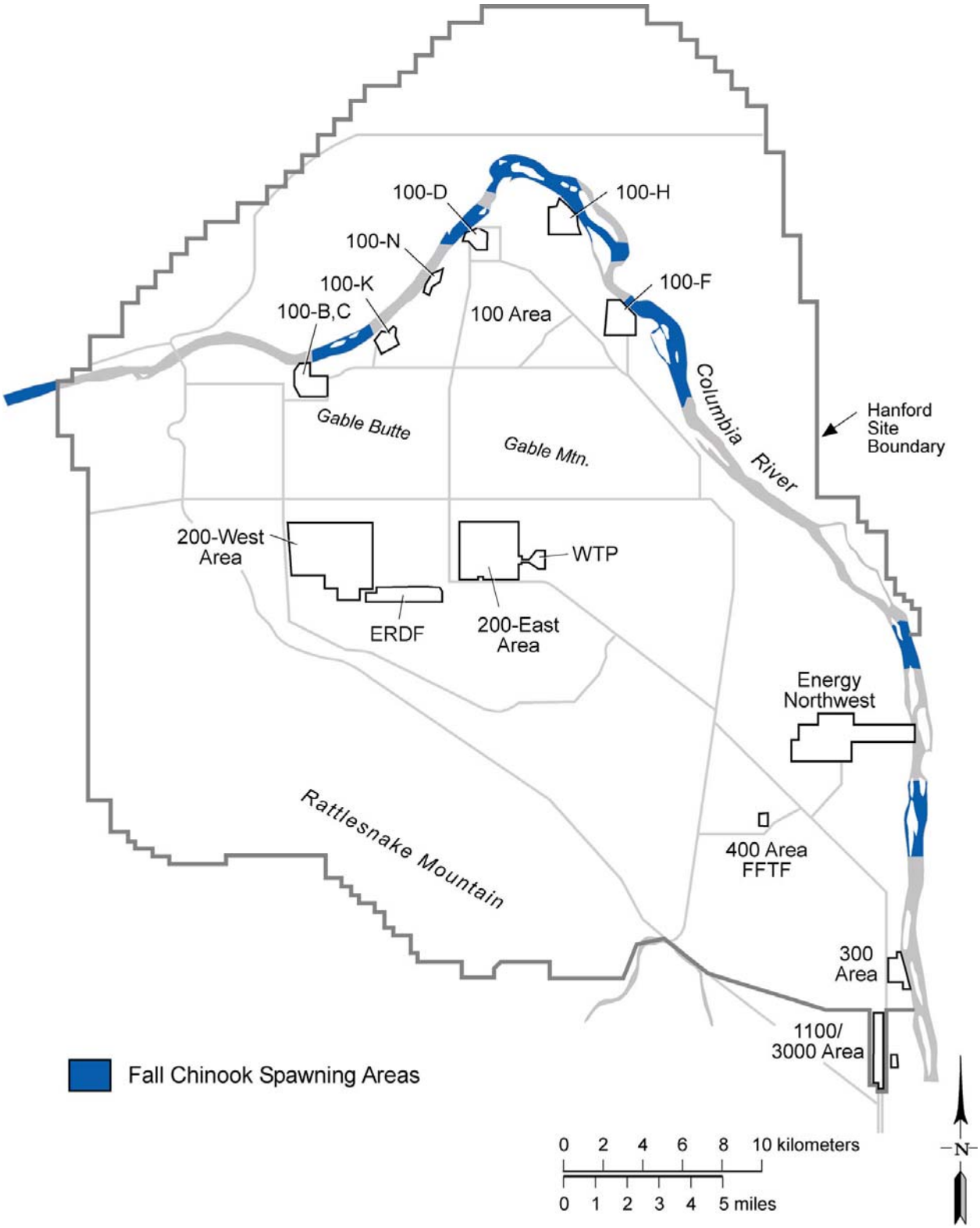


Figure 8-7 Trophic Levels and Receptor Species Considered in the 200 Area and Vicinity Terrestrial Conceptual Exposure Model

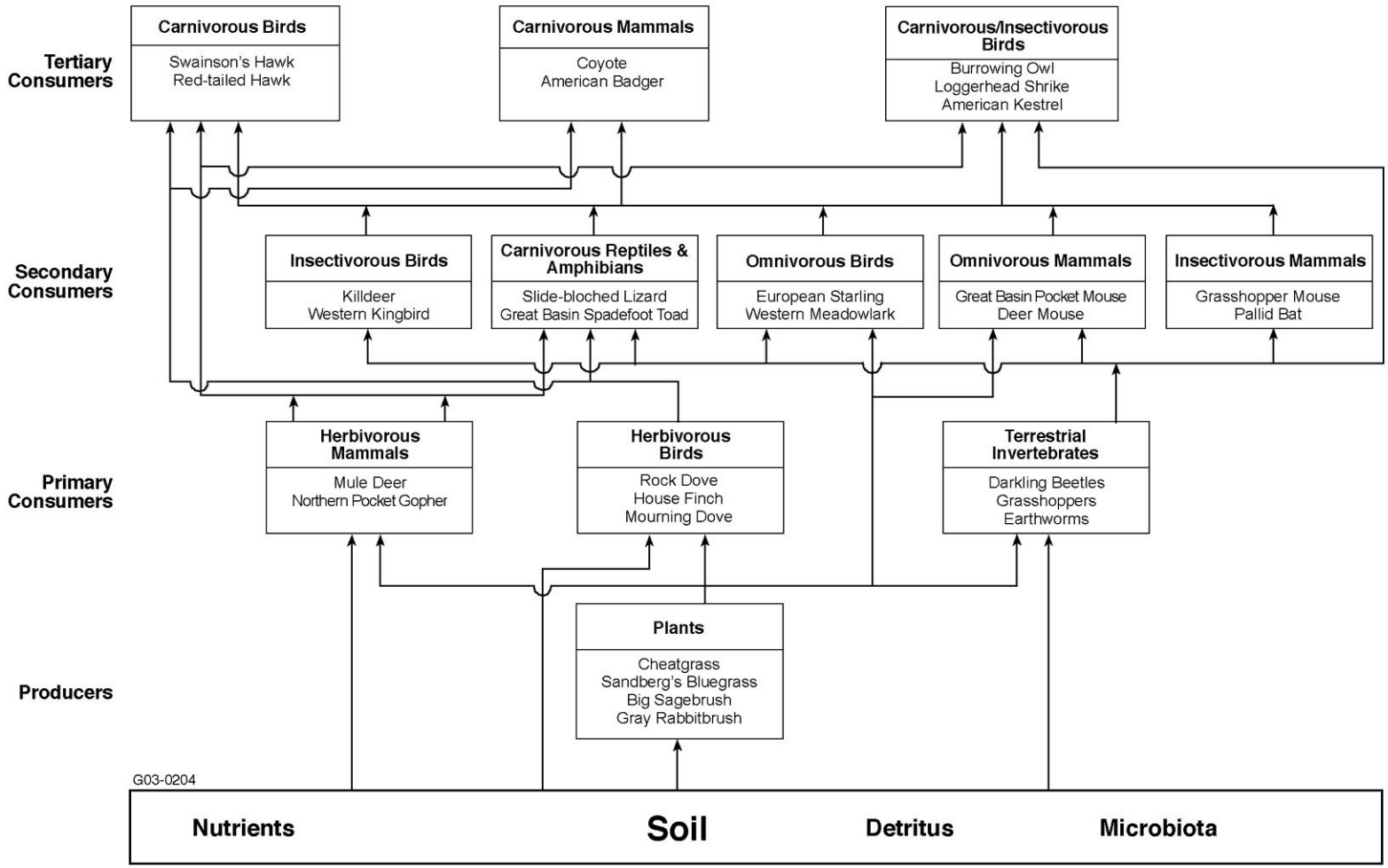


Figure 8-8 Trophic Levels and Receptor Species in the Columbia River Aquatic Conceptual Exposure Model

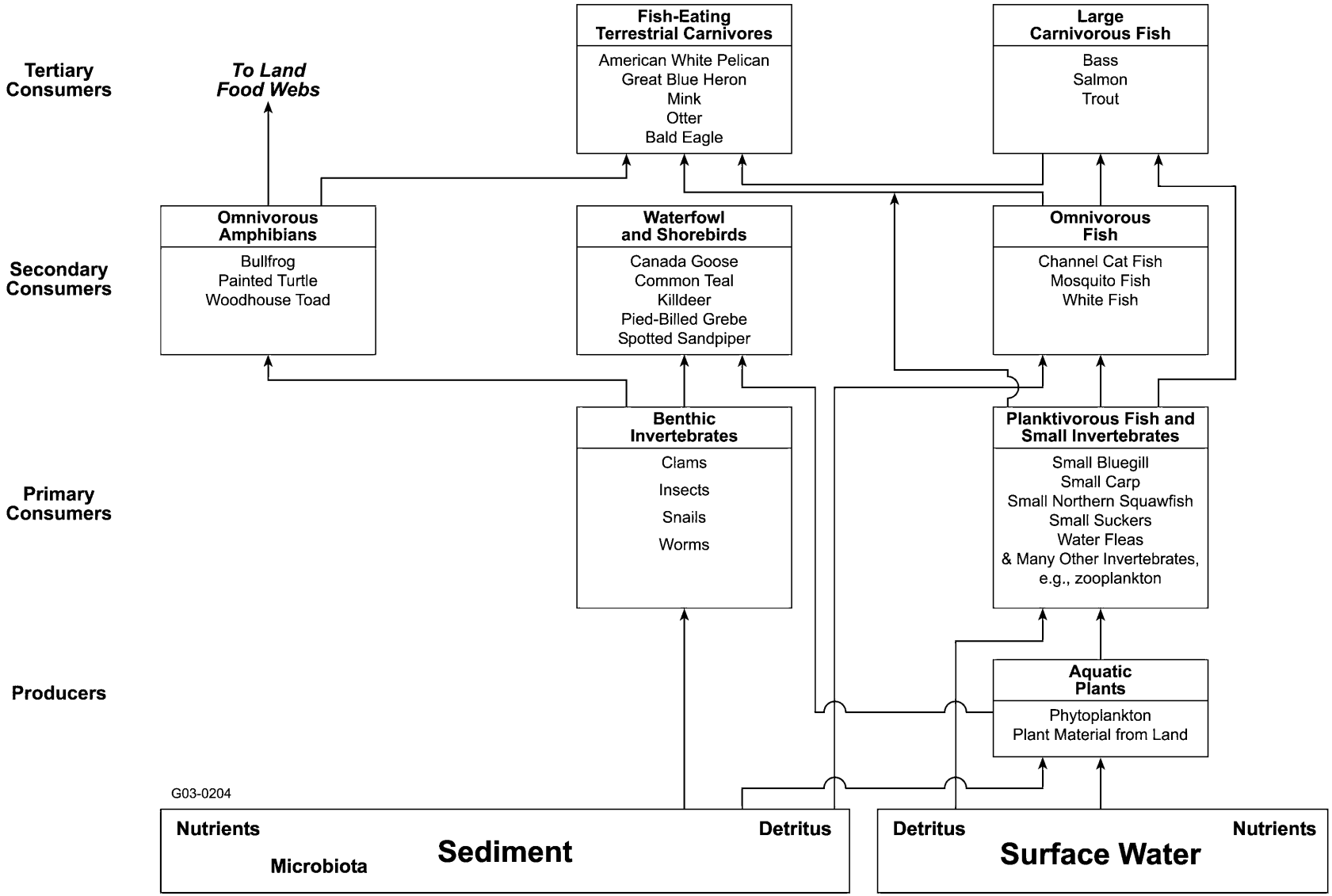


Figure 8-9 Trophic Levels and Selected Receptor Species (names in bold) Considered in the 200 Area and Vicinity Terrestrial Conceptual Exposure Model

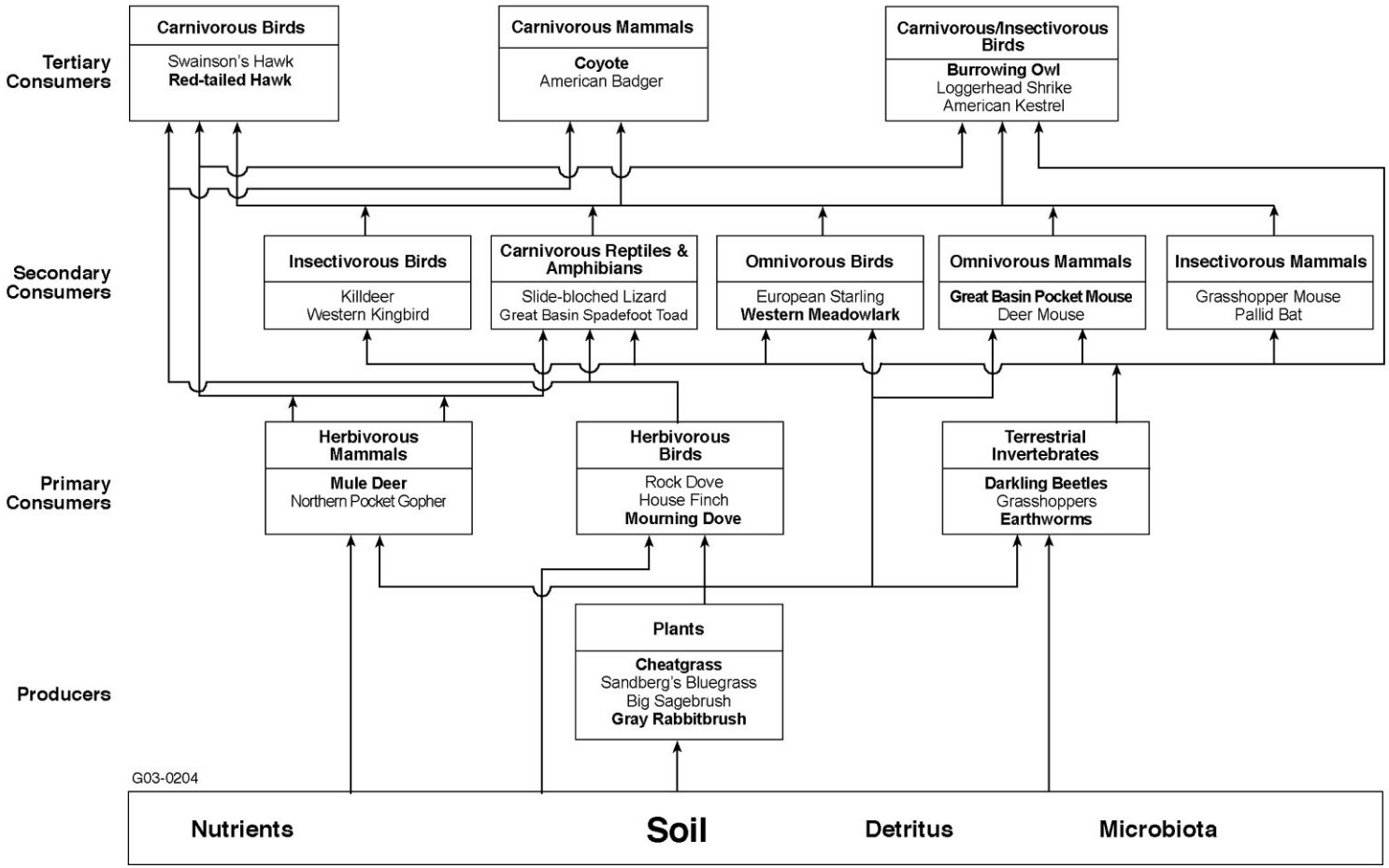


Figure 8-10 Trophic Levels and Selected Receptor Species (names in bold) in the Columbia River Aquatic Conceptual Exposure Model

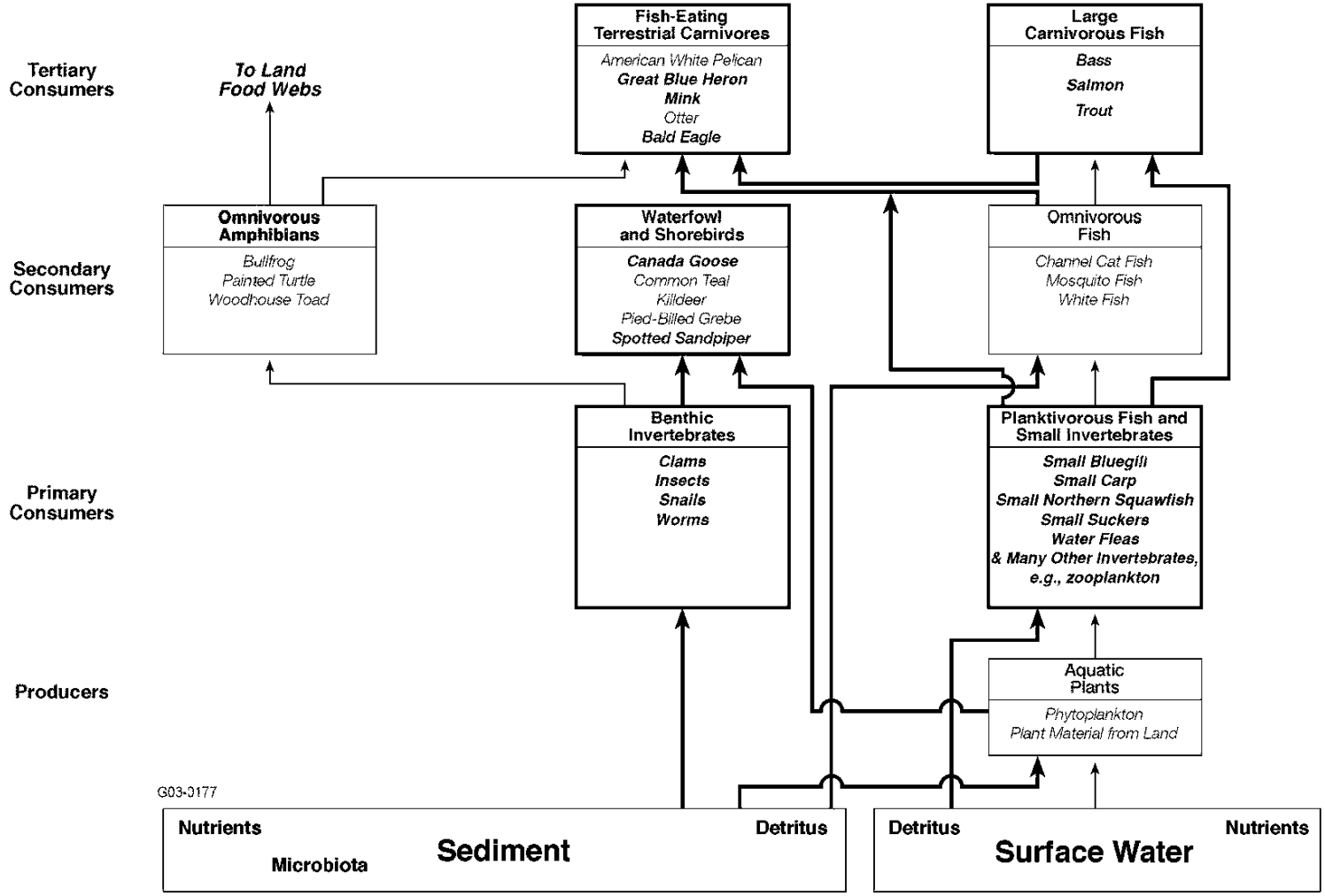


Figure 8-11 Relationship Between Sources and Biotransfer Factors for Calculating Terrestrial Exposures

(endpoint receptors shown in bold font)

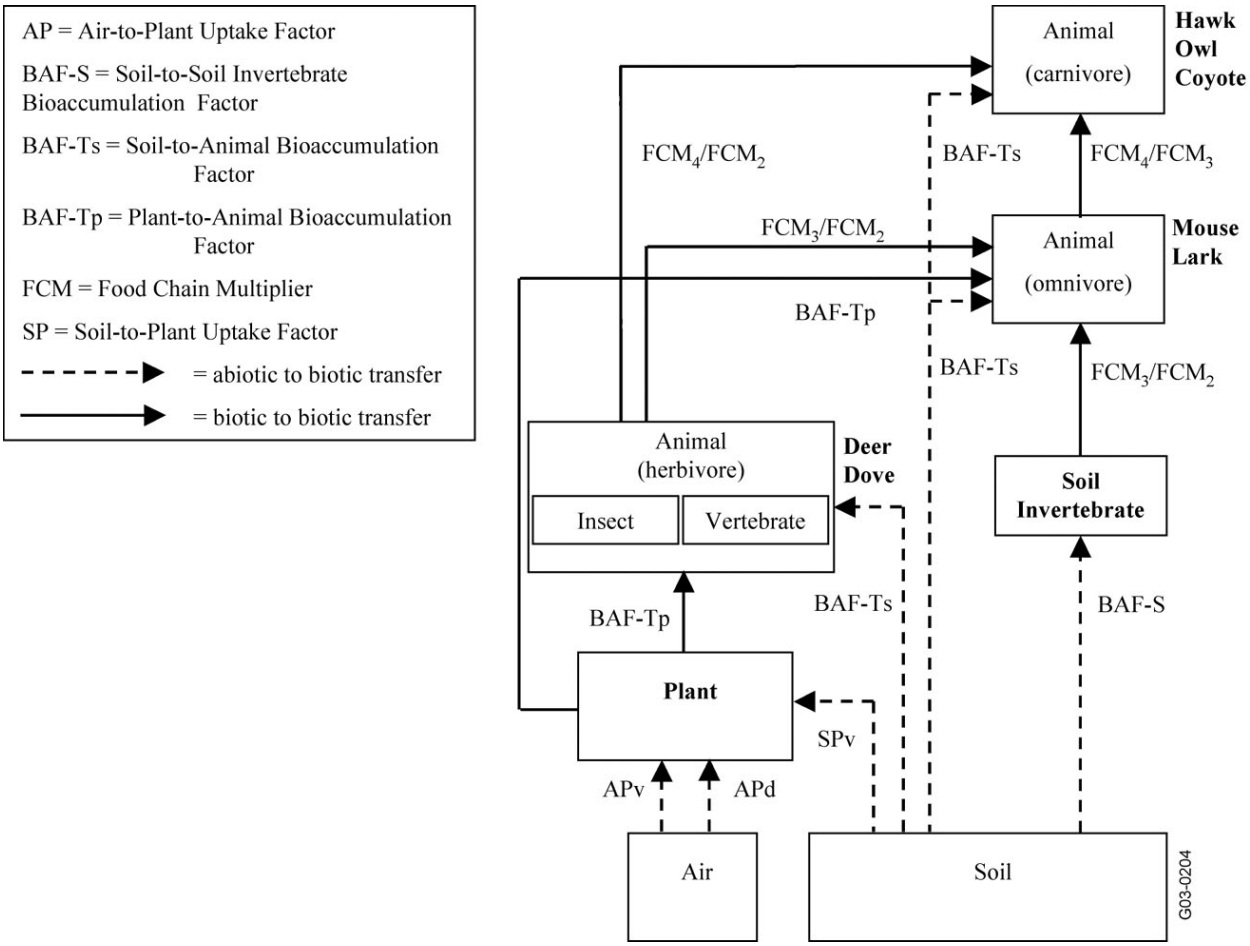


Figure 8-12 Relationship Between Sources and Biotransfer Factors for Calculating Aquatic Exposures

(endpoint receptor species shown in bold font)

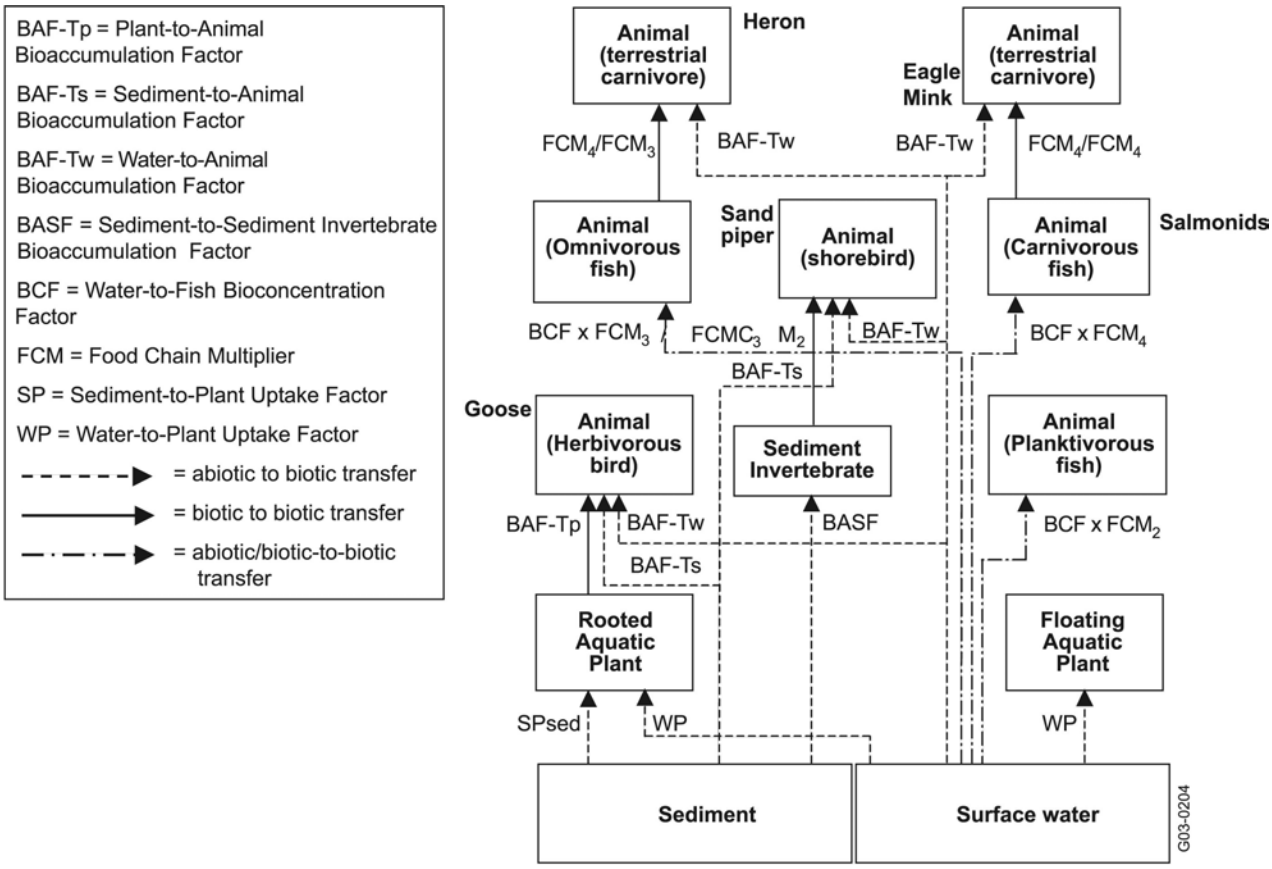


Figure 8-13 Exclusive Diets for Omnivores

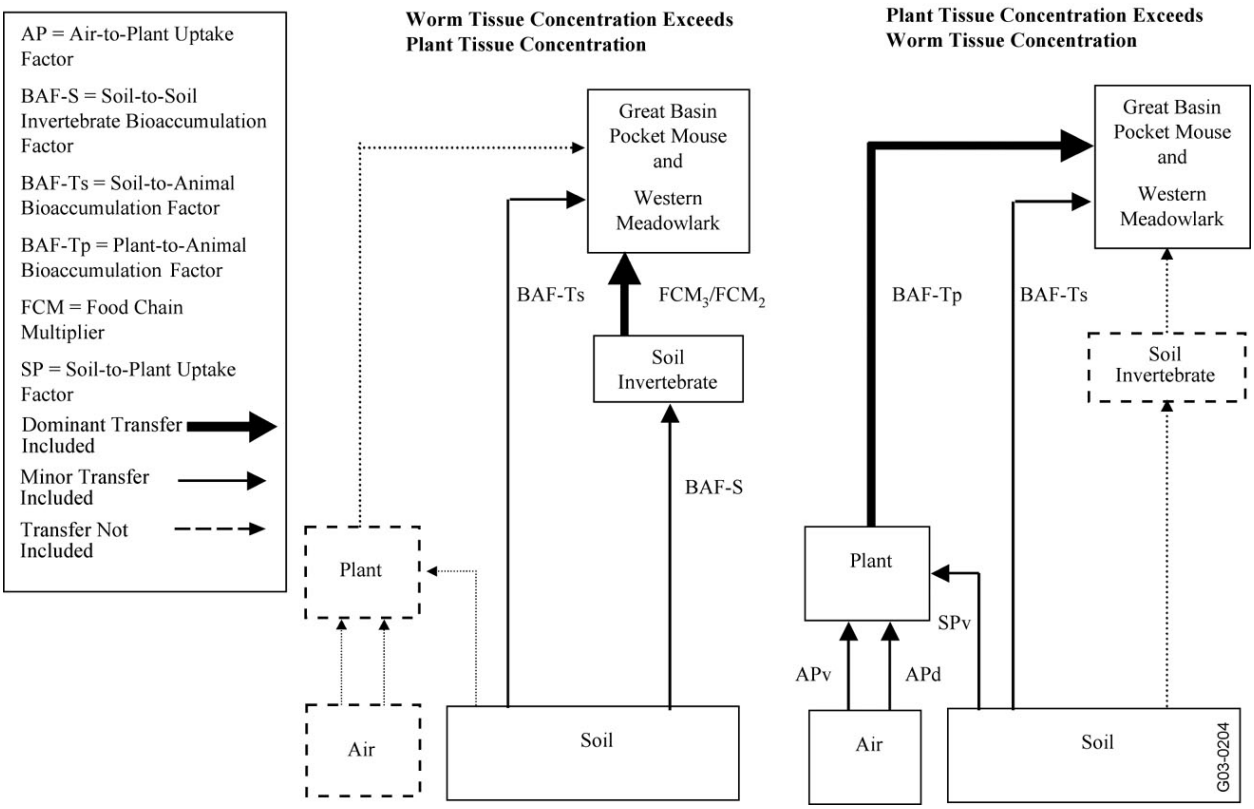
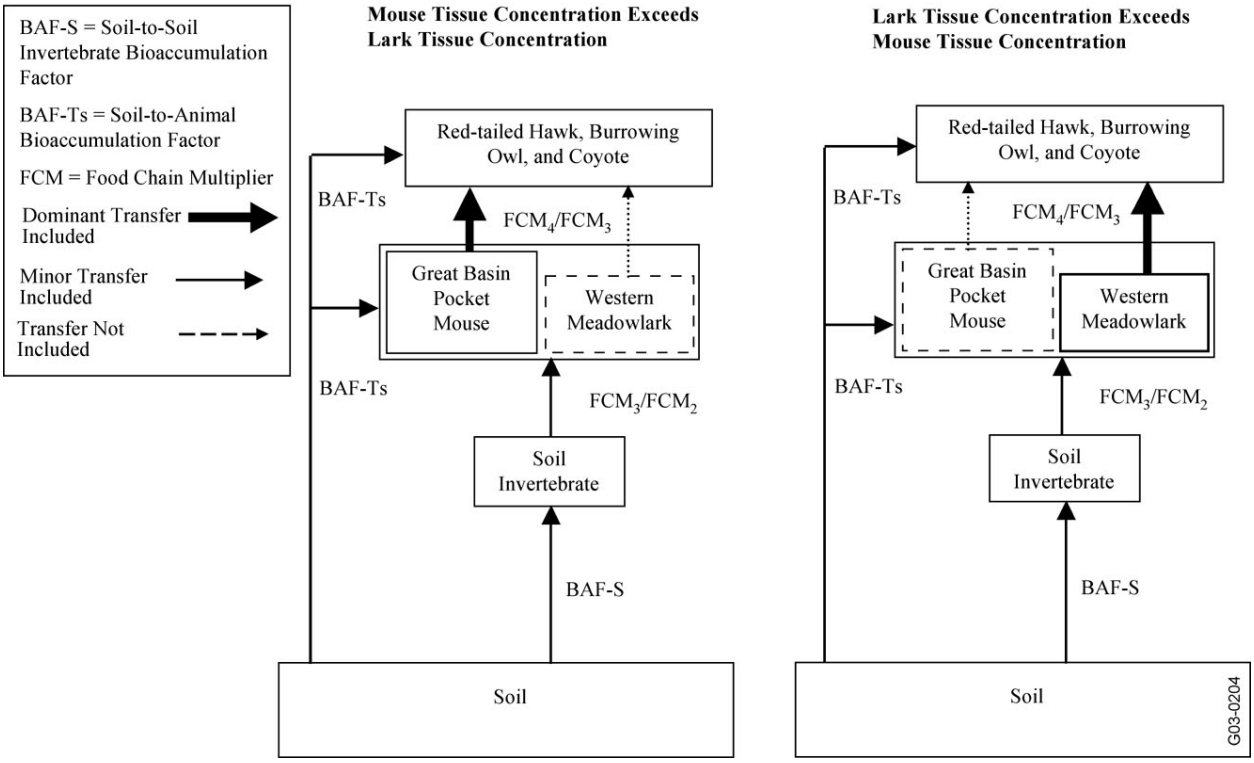


Figure 8-14 Exclusive Diets for Carnivores



Contents

9 Relationship of Risk Assessment to WTP 9-1

9.1 Relationship of the PRA and FRA 9-1

9.2 Sources of Potential Changes in the Risk Assessment 9-2

9.3 Risk-Based Emissions Limits 9-2

9.3.1 Human Health Risk-Based Emission Limits 9-2

9.3.2 Ecological Risk-Based Emission Limits 9-2

9.4 Summary 9-3

Tables

Table 9-1 Overview of Risk Thresholds for COPCs and ROPCs in the PRA for the WTP 9-4

9 Relationship of Risk Assessment to WTP

The intent of the screening-level risk assessment (SLRA) is to ensure that airborne emissions from the Hanford Tank Waste Treatment and Immobilization Plant (WTP) are safe to people who live near or work on or near the Hanford Site, to Native Americans who use resources on or near the Hanford Site, and to plants and animals on or near the Hanford Site. It is important that people and the environment are not harmed because potential exposures are overlooked or underestimated. It is also important to maximize the ability of the WTP to treat and immobilize tank wastes and, in doing so, minimize potential release of tank contents into the environment through leaks or spills. A balance of these goals will result through the iterative process of reviewing the environmental risk assessment work plan (RAWP), reviewing and updating environmental parameters for the SLRA and WTP engineering design, and calculating risk-based emission limits, as needed. This iterative process is shown on Figure 2-1.

During the pre-demonstration test risk assessment (PRA) and final risk assessment (FRA), any chemicals of potential concern (COPCs) or radionuclides of potential concern (ROPCs) that exceed risk or hazard thresholds will be evaluated further to determine the driving factors behind the risk and the potential uncertainty associated with them. When the uncertainty associated with exposure parameters and toxicity values becomes reduced as much as possible and when there are exceedances of the thresholds, risk-based emission criteria for COPCs will be evaluated. Engineering design specifications, including changes to feed rate, may be revised based on risk-based emission limits. Each major step of the process will include review from regulatory agencies, Native American tribes, and the public.

To better understand this iterative process, it is important to identify the relationship of the PRA and FRA (section 9.1), the sources of potential changes that could affect the risk assessments (section 9.2), and risk-based emission limits (section 9.3). Each is briefly described below.

9.1 Relationship of the PRA and FRA

The PRA will be reviewed by regulatory agencies, by Native American tribes, and by the public. Input from all these reviewers will be included in decisions about succeeding steps in the SLRA process, including refinement of the risk assessment assumptions for the FRA.

The PRA is designed to overestimate exposures to human and ecological receptors, whereas the FRA may refine exposure assumptions and use updated toxicity data to result in a more accurate estimate of risk while continuing to overestimate risk. To help make risk management decisions, predicted risks and hazards are compared to thresholds. There are thresholds for both human and ecological receptors. If the PRA indicates that total human health risks or hazards to plausible receptors are below the thresholds of 1E-05 (excess cancer risk expressed as incremental lifetime cancer risk [ILCR]) or 0.25 (hazard quotient [HQ] and hazard index [HI]), or if ecological HQs and HIs are less than the threshold of 0.25, the process will move on to the FRA following the environmental performance demonstration tests. Additionally, for acute exposure, the human HQ is set at 1.0.

These threshold values are summarized in Table 9-1 and described in sections 7.3.1 and 7.3.2 (human health) and section 8.4.3 (ecological). If the PRA indicates that human risks to plausible receptors are greater than 1E-05 (ILCR), or if human noncancer HQs and HIs are greater than 0.25, or if ecological HQs or HIs are greater than 0.25, or if human acute HQs are greater than 1.0, a number of actions will be

considered. Potential actions will include reevaluation of conservative exposure parameters for the risk assessment and reevaluation of engineering design.

9.2 Sources of Potential Changes in the Risk Assessment

A risk assessment represents the status of receptors, facility, and toxicity knowledge at a point in time. If land use changes or if new site-specific data becomes available to replace default exposure assumptions, the assumptions used in the PRA will change. If there are changes in engineering design of the WTP that result in changes in emissions estimates, exposures will change; if site-specific uptake factors for the food chain become available, exposures will change; if there are revisions to toxicity data for some COPCs or ROPCs, ILCR risks and HQs and HIs for those COPCs and ROPCs will change. If any of these changes occur, the SLRA could be revisited to ensure public welfare and environmental protection.

9.3 Risk-Based Emissions Limits

Risk-based emission limits will be developed if there are exceedances of the risk and hazard thresholds and if modification of overly conservative assumptions do not resolve any exceedances. These emission limits will be established following the FRA. Risk-based emission limits will be provided for plausible exposure scenarios. Risk-based emission limits will be calculated for any COPC that exceeds risk thresholds in the FRA. If no individual COPC risks or hazards exceed these thresholds but the total risk or hazard exceeds thresholds, risk-based emission limits will be calculated for the COPCs having the largest contribution to this total risk or hazard. Additional site-specific information, and the results of the environmental performance demonstration test, will be available for the FRA and considered in development of risk-based emissions limits. Risk thresholds that are exceeded will be addressed to the satisfaction of Ecology and EPA and submitted for public comment prior to approval of the FRA.

9.3.1 Human Health Risk-Based Emission Limits

Risk-based emission limits will be calculated for COPCs with human health risks or hazards to plausible receptors greater than 1E-05 (ILCR) or 0.25 (HQ and HI). If no individual COPC risks or hazards exceed these thresholds but the total risk or hazard exceeds thresholds, risk-based emission limits will be calculated for the COPCs having the largest contribution to this total risk or hazard. Risk-based emission limits will be calculated using the same exposure scenarios, pathways, toxicity values, and equations used to calculate plausible risk estimates. The risk equations will be used to back-calculate acceptable COPC concentrations in various media to result in a total risk or hazard across all media below the threshold values of 1E-05 (ILCR) and 0.25 (HQ and HI) for each plausible receptor. For acute exposure, the HQ threshold is 1.0. Air dispersion modeling results will then be used to convert these media concentrations to risk-based emission limits.

9.3.2 Ecological Risk-Based Emission Limits

Risk-based emission limits will be calculated for COPCs with ecological HQs greater than 0.25, or for driver chemicals if the total HI is greater than 0.25. Risk-based emission limits will be calculated for a given ecological receptor using the same exposure and food-web assumptions, toxicity values, and equations used to calculate plausible ecological risk estimates. The risk equations will be used to back-calculate acceptable COPC concentrations in various media starting with an HQ or HI of 0.25. Air dispersion modeling results will then be used to convert these media concentrations to risk-based emissions limits.

9.4 Summary

In summary, the PRA will be submitted for review by regulatory agencies, Native American tribes, and the public. If the PRA shows risks and hazards below the thresholds, the FRA will be performed and submitted following the environmental performance demonstration tests. If hazards or risks predicted in the PRA are above the thresholds, regulatory authorities will be consulted and the next course of action will be decided. Examples of potential actions are re-evaluating exposure parameters to determine whether the risk assessment was overly conservative and revising the engineering design to reduce emissions. If thresholds are still exceeded in the PRA, then risk-based criteria will be developed. All of these steps will ensure that WTP operations will be conducted in a manner safe to human and ecological receptors on and near the Hanford Site.

Table 9-1 Overview of Risk Thresholds for COPCs and ROPCs in the PRA for the WTP

Receptor	Chronic Exposures			Acute Exposures	
	Carcinogens	Noncarcinogens			
	Incremental Lifetime Cancer Risk (ILCR)	Hazard Quotient (HQ)	Hazard Index (HI)	Acute Hazard Quotient (AHQ)	Acute Hazard Index (AHI)
Chemicals of Potential Concern					
Human	1E-05 or 1 in 100,000	0.25	0.25	1.0	1.0
Plants and Animals	NA	0.25	0.25	NA	NA
Radionuclides of Potential Concern					
Human	1E-05 or 1 in 100,000	0.25	0.25	1.0	1.0
Plants and Animals	NA	0.25	0.25	NA	NA

NA = Not applicable.

Contents

10 Uncertainty Assessment 10-1

10.1 Sources of Uncertainty in the SLRA 10-2
10.1.1 Identification of Constituents of Potential Concern 10-2
10.1.2 Estimation of Emissions 10-2
10.1.3 Environmental Modeling 10-2
10.1.4 Human Health Risk Assessment 10-2
10.1.5 Ecological Risk Assessment 10-3

10.2 Uncertainty Assessment in the PRA 10-3
10.2.1 Uncertainty Tables 10-4
10.2.2 Uncertainty Analysis of Key Assumptions 10-4
10.2.3 Other Specific Uncertainty Issues 10-4

10.3 Summary of Uncertainty Assessment 10-6

Tables

Table 10-1 Example of Sources of Uncertainty in Identification of COPCs and ROPCs 10-7

Table 10-2 Example of Sources of Uncertainty in Emissions Estimate 10-8

Table 10-3 Example of Sources of Uncertainty in Environmental Modeling 10-9

Table 10-4 Example of Sources of Uncertainty in Human Health Risk Assessment 10-12

Table 10-5 Example of Sources of Uncertainty in Ecological Risk Assessment 10-14

10 Uncertainty Assessment

Uncertainty or technical doubt is introduced into the human health and ecological risk assessments at every step of the process. As noted by EPA (1998a), uncertainty occurs because risk assessment is a complex process, requiring integration of source information, fate and transport in various environments, exposure assessment, and effects assessment. Uncertainty is inherent in the risk assessment process even when the most accurate, up-to-date data and the most sophisticated models are used. Four types of uncertainty are addressed here:

- General (that is, non-effects) parameter uncertainty and variability
- Effects parameter uncertainty and variability
- Model uncertainty
- Decision-rule uncertainty

General parameter uncertainty occurs when variables used in equations cannot be measured precisely or accurately or have not been measured (such as lack of data). Other parameters are measurable and are represented by single fixed values, but actually have variability (such as body weight).

Effects parameter uncertainty and variability are associated with toxicity values (cancer slope factors [SFs] and reference doses [RfDs] for human receptors, and toxicity reference values [TRVs] and benchmarks for ecological receptors), ecological measurement endpoints, and ecological assessment endpoints. Uncertainty occurs as a result of deficiencies in experimental design, extrapolation from experimental conditions to environmental conditions, or complete lack of effects information. Variability occurs as a result of variations in receptor sensitivity due to age, genetics, pre-existing conditions, presence of predators, or other environmental stressors.

Model uncertainty is associated with all models used in all phases of the risk assessments, including air dispersion and other environmental models, animal models used as surrogates for testing human health effects, and dose response models used in extrapolation of laboratory data to human health or ecological effects. All models are simplifications of reality, and therefore exclude some variables to reduce complexity and/or to compensate for missing data. The models identified in this environmental risk assessment work plan (RAWP) were selected on the basis of scientific policy because they provide the information needed to conduct the risk assessments and are considered by Ecology and EPA to be state-of-the-science models.

Decision-rule uncertainty arises out of the need to balance different social concerns when determining an acceptable level of risk. Decision-rule uncertainty is associated with the choice of models used, the selection of constituents to be included in the analysis, the default parameter values used, the dependence on single-point estimates of toxicity (human RfDs and SFs and ecological TRVs), and the selection of risk and hazard thresholds for evaluating the results of the screening-level risk assessment (SLRA).

An overview of the potential sources of uncertainty in the SLRA is provided in section 10.1. A discussion of how uncertainty will be addressed in the pre-demonstration test risk assessment (PRA) is provided in section 10.2.

10.1 Sources of Uncertainty in the SLRA

A brief summary of the sources of uncertainty in each step of the risk assessment is provided below. Additional discussion is provided in sections 4.4, 5.5, 6.7, 7.4, and 8.6 of this RAWP. One or more of the four types of uncertainty described above impact each of these steps.

10.1.1 Identification of Constituents of Potential Concern

The identification of chemicals of potential concern (COPCs) and radionuclides of potential concern (ROPCs) shown in section 4 is uncertain because these constituents are identified before operation of the Hanford Tank Waste Treatment and Immobilization Plant (WTP) and must rely on assumptions regarding what may be in the waste feed and what may be produced as products of incomplete combustion (PICs). Test data collected for the final risk assessment (FRA) during the environmental performance demonstration will reduce, but not eliminate, this uncertainty because this test data will include uncertainty due to tentatively identified compounds (TICs), detection limits, and variations in actual waste feed.

10.1.2 Estimation of Emissions

The primary sources of uncertainty in the emissions estimate are as follows:

- Characterization data that describes the waste feed streams to WTP pretreatment
- Decontamination efficiency of the air pollution control equipment
- Creation of PICs by the WTP
- Potential impact of upset conditions and abated fugitive emissions on the overall emission rates

10.1.3 Environmental Modeling

Uncertainties are associated with each aspect of the environmental modeling (air-dispersion modeling, soil accumulation modeling, surface water accumulation modeling, sediment accumulation modeling, and plant accumulation modeling). Uncertainties are associated with both the models themselves, because models are simplifications of reality, and with the parameters and data used in the models.

10.1.4 Human Health Risk Assessment

Uncertainties associated with the COPC and ROPC selection, emission rates, and environmental modeling all contribute to the uncertainty in the human health risk assessment (HHRA). Sources of uncertainty unique to the HHRA are associated with each step of the HHRA: data evaluation, exposure assessment, toxicity assessment, and risk characterization.

Sources of uncertainty in the data evaluation are described above in sections 10.1.1 and 10.1.2. Sources of uncertainty in the exposure assessment include contaminant concentrations in exposure media, exposure parameter uncertainty and variability in land-use assumptions, and selection of representative receptor populations and exposure parameter values. Sources of uncertainty in the toxicity assessment include effects uncertainty and variability in toxicity values (RfDs and SFs) and cancer weight-of-evidence classifications, toxicity value data gaps, and the use of route-to-route extrapolations and surrogates to fill some toxicity data gaps. The risk characterization combines the results of the exposure assessment and toxicity assessment. Therefore, all of the uncertainty in these two steps, as well

as the steps prior to the exposure assessment (such as environmental modeling), contributes to the uncertainty in the risk characterization. Additional uncertainty in the risk characterization step surrounds the practice of summing risks and hazard results across all chemicals and exposure pathways, regardless of the mode of action. Also, uncertainty is associated with the eventual human health risk and hazard outcomes and their interpretation.

10.1.5 Ecological Risk Assessment

Uncertainties associated with the COPC and ROPC selection, emission rates, and environmental modeling also contribute to the uncertainty in the ecological risk assessment (ERA). Sources of uncertainty unique to the ERA are associated with each of the four inter-related steps of the ERA: problem formulation, exposure assessment, effects assessment, and risk characterization.

Sources of uncertainty in the problem formulation include identification of representative receptor populations and exposure media. Sources of uncertainty in the exposure assessment include exposure parameter uncertainty and variability included in selection of representative exposure parameter values and contaminant concentrations in exposure media. Sources of uncertainty in the effects assessment include effects uncertainty and variability in toxicity values (TRVs and benchmark values) and toxicity value data gaps. The risk characterization combines the results of the exposure assessment and effects assessment. Therefore, all of the uncertainty in these two steps, as well as the steps prior to the exposure assessment (such as environmental modeling) contributes to the uncertainty in the ecological risk characterization. Additional uncertainty in the risk characterization step surrounds the practice of summing hazard results across all chemicals regardless of the mode of action. Also, uncertainty is associated with the eventual ecological risk outcomes and their interpretation.

10.2 Uncertainty Assessment in the PRA

The purpose of the uncertainty assessment is to identify and discuss uncertainty associated with the quantitative estimates of human health and ecological risk for the WTP. This discussion serves to place the risk estimates in proper perspective to allow fully informed risk management decisions.

EPA (1998a) notes that: “The science of risk assessment is evolving; where the science base is incomplete and uncertainties exist, science policy assumptions must be made.” Therefore, it is important for risk assessments of treatment facilities such as the WTP to identify uncertainties in the assessment. To meet this obligation, the PRA report will provide an uncertainty analysis that will include:

- Tables listing the general assumptions in each step of the assessments, the rationale for these assumptions, their potential effect on estimates of risk, and the direction and approximate magnitude of the effect
- An analysis of the key assumptions impacting the COPCs and ROPCs, receptors, and exposure pathways that are risk drivers (such as result in risks above or slightly below the established threshold values)
- An evaluation of several other specific sources of uncertainty associated with gaps in our scientific knowledge, or scientific debates over the most appropriate approaches

Each of these items is addressed in more detail below.

10.2.1 Uncertainty Tables

Tables listing the general assumptions in each step of the assessments, the rationale for these assumptions and their potential effect on estimates of risk (overestimation or underestimation), and the approximate magnitude of the effect (minor or major) will be included in the uncertainty assessment. These tables will focus on categories of assumptions rather than specific assumptions. For example, residential exposure parameters may be included, whereas details of each exposure parameter (such as soil ingestion rate or body weight) will not be included. Examples of the planned table formats and contents are provided as tables 10-1 through 10-5.

10.2.2 Uncertainty Analysis of Key Assumptions

In addition to the tables described above, a more detailed analysis of the key assumptions impacting the COPCs and ROPCs, human and ecological receptors, and exposure pathways that are risk drivers (such as a result in risks above or slightly below the established threshold values) will be included in the PRA. Examples of possible scenarios resulting in an analysis of key assumptions for the HHRA and ERA are provided below.

- If the total estimated incremental lifetime cancer risk to a resident at the Hanford offsite maximum is 9E-06 (that is, 9 excess cancers in 1,000,000 people) and slightly below the risk threshold of 1E-05 (that is, 10 excess cancers in 1,000,000 people), the uncertainty analysis will focus on the specific constituents and exposure pathways that result in this risk and any assumptions that could result in the actual risk being higher or lower. For example, if the risk due to ingestion of one COPC in homegrown produce is 8E-06 and the total risk from all other COPCs and pathways is 1E-06, the uncertainty analysis would focus on the models and assumptions used to estimate the concentration of that chemical in plants, the residential produce ingestion assumptions, and the toxicity data for the one chemical of interest. This analysis will serve to evaluate whether this risk estimate is likely to be an overestimate or underestimate of reality, and if so, to what extent.
- If the total estimated hazard index (HI) to a Great Basin pocket mouse at the onsite ground maximum is 0.35 (slightly above the hazard threshold of 0.25), the uncertainty analysis will focus on the specific chemicals and specific exposure pathways that result in this hazard and any assumptions that could result in the actual hazard being higher or lower. For example, if the hazard due to ingestion of one COPC in soil invertebrates is 0.20 and the hazard due to ingestion of another COPC in soil invertebrates is 0.10, the uncertainty analysis will focus on whether or not it is appropriate to add the hazard quotients (HQs) for these two chemicals, the models and assumptions used to estimate the concentrations of these two chemicals in soil invertebrates, the assumption that the mouse has an exclusive diet of soil invertebrates, and the toxicity data for these two chemicals. This analysis will serve to evaluate whether this hazard estimate is likely to be an over- or underestimate of reality, and if so, to what extent.

These are just two examples of the type of specific uncertainty assessment that may be triggered by the findings of the PRA.

10.2.3 Other Specific Uncertainty Issues

Several sources of uncertainty associated with gaps in our scientific knowledge or scientific debates over the most appropriate approaches to use are identified throughout this RAWP. These issues, as detailed below, will be discussed in the PRA uncertainty assessment.

- Nursing infant assessment - Potential risks to nursing infants from dioxin-like compounds will be evaluated by comparing the estimated infant dose of dioxins and coplanar polychlorinated biphenyls (PCBs) from the WTP to the background infant dose of these chemicals throughout the United States. The background infant dose referenced in this RAWP may overestimate current exposures because dioxin exposures in the United States have been decreasing for many years. The source of this value and potential range of background infant doses will be discussed further in the uncertainty assessment of the PRA report. There is currently no consensus regarding the most appropriate single approach to quantitatively evaluate potential risks associated with exposure to dioxin-like compounds by nursing infants. Alternative approaches to the two preferred methods to be used in the PRA (that is, comparison to background and lifetime risk) include calculating infant risks using (1) the estimated infant average daily dose (ADD) calculated with a 1-year exposure duration and a 1-year averaging time, and (2) the estimated infant lifetime average daily dose (LADD) calculated with a 1-year exposure duration and a 70-year averaging time. These alternative methods will be presented in the uncertainty assessment of the PRA report.
- Human inhalation rates - An inhalation rate of 30 m^3/day will be used for the Native American subsistence resident adult, per Stuart Harris of the Confederated Tribes of the Umatilla Indian Reservation (CCN 064333). The assignment of inhalation rate is uncertain; several alternative default inhalation rates will be evaluated as part of the uncertainty assessment in the PRA.
- Partial exclusion of dermal pathway from the HHRA - Dermal exposure pathways (to soil, surface water, or air) will not be included in the PRA, with the exception of the Native American sweat lodge scenario, because dermal exposure pathways have been identified as insignificant contributors to risk in numerous risk assessments prepared or reviewed by EPA for airborne emissions from thermal treatment facilities. If initial PRA results indicate that the soil or surface water ingestion or inhalation pathways result in risks that are borderline (that is, close to the risk or hazard threshold) for any plausible receptor, then dermal exposure to that medium may be included in the PRA. A discussion of the potential impact associated with exclusion of this minor pathway from the quantitative risk assessment will be included in the uncertainty assessment of the PRA.
- Evaluation of PAHs - Potential human cancer risks associated with 7 polycyclic aromatic hydrocarbons (PAHs) considered to be carcinogenic by EPA (1993a) will be evaluated using a relative potency factor (RPF) approach. RPFs for an additional 15 PAHs are available from the California (Cal EPA 1999). If the total estimated risk from PAHs is near 1E-05, these additional 15 PAHs will be considered in the uncertainty analysis.
- Dioxin slope factor - Potential human cancer risks associated with dioxins and coplanar PCBs will be evaluated using the cancer SF of 1.0E+06 $(mg/kg\text{-}day)^{-1}$ proposed in the *Exposure and Human Health Reassessment of 2,3,7,8-Tetrachlorodibenzo-p-Dioxin (TCDD) and Related Compounds* (EPA 2000e), and as suggested by Ecology and EPA Region 10 (CCN 063809). While this proposed SF has not yet been approved by EPA, it is more conservative than the current SF published in the Health Effects Assessment Summary Table (HEAST) (EPA 1997b). A discussion of comparative risk results will appear in the uncertainty section of the PRA.
- Toxicity data gaps - COPCs without toxicity values (RfDs, SFs, TRVs, ecological benchmarks) cannot be included in the quantitative risk assessments. The potential impact of these COPCs on the risk results will be discussed in the uncertainty assessment.
- Radiation benchmarks - The whole-organism radiation benchmarks for ecological receptors identified in this RAWP have uncertainty associated with them, because they do not take into account effects on sensitive tissues, critical organ effects, relative biological effectiveness, and microdosimetry issues.

These issues are currently being investigated by the scientific community and will be mentioned in the uncertainty assessment.

- Microdosimetry of radionuclides - Possible synergistic effects of multiple radionuclides and microdosimetry to root hairs, eggs, embryos, and so forth for ecological receptors are currently being investigated and developed by researchers. The current status of this research will be mentioned in the uncertainty discussion in the PRA.
- Exclusion of external alpha radiation - The possible effects of external alpha radiation on ecological receptors will be included in the uncertainty assessment of the PRA because external alpha radiation should add only insignificantly to the whole-body dose for organisms (Blaylock and others 1993). The potential impact of omitting alpha radiation will be identified in the uncertainty assessment.
- Summations of risks– The PRA will include summations of the total COPC and ROPC risks and hazards as listed below.
  - Total cancer risk to human receptors from all COPCs
  - Total cancer risk to human receptors from all ROPCs
  - Total HI for human receptors from all COPCs
  - Total HI for ecological receptors from all COPCs
  - Total HI for ecological receptors from all ROPCs

These total risk and hazard calculations will be based on the assumption that the effects of all COPCs or ROPCs to a given receptor are summed. If risk or hazard thresholds are exceeded, a segregation of the constituents by toxicological mode of action and endpoint will be considered. If segregation by toxicological mode of action or endpoint is used, chemical groupings by endpoint will be assigned with approval by Ecology and EPA.

These issues, associated with gaps in our scientific knowledge or with scientific debates over the most appropriate approaches, and any other issues identified while conducting the PRA, will be included in the PRA uncertainty assessment.

10.3 Summary of Uncertainty Assessment

Uncertainty is inherent in every step of the risk assessment process. An uncertainty assessment will be included in the PRA to (1) identify sources of uncertainty associated with the quantitative estimates of human health and ecological risk from the WTP, (2) estimate the potential magnitude of key uncertainties that could influence the results of the PRA, and (3) show other analyses associated with data gaps and scientific discussion. The uncertainty assessment will be used to place the risk estimates in proper perspective to allow fully informed risk management decisions.

Table 10-1 Example[a] of Sources of Uncertainty in Identification of COPCs and ROPCs

Examples of Sources of Uncertainty	Description	Potential Direction and Magnitude of Risk[b]		
		Over-estima-tion	Not defined	Under-estima-tion
Tank characterization data	Constituents identified in tank waste are included as COPCs and ROPCs.			
Nondetected constituents	Constituents not detected in tank waste but which may have been used at Hanford are included as COPCs and ROPCs.			
PICs identified in bench-scale testing	Constituents identified in bench-scale testing are included as COPCs and ROPCs.			
PICs identified at hazardous waste combustion facilities	Constituents identified in emissions from hazardous waste combustion facilities are included as COPCs and ROPCs.			

[a]This is an example of the information to be included in the uncertainty table in the PRA report and is not intended to be inclusive of all sources of uncertainty.

[b]These columns will indicate whether the assumption used to compensate for the uncertainty is likely to overestimate or underestimate the actual risk, or whether the direction cannot be identified. The potential magnitude of this impact will be identified as minor (+, o, -) or major (++, oo, --).

Table 10-2 Example[a] of Sources of Uncertainty in Emissions Estimate

Examples of Sources of Uncertainty	Description	Potential Direction and Magnitude of Risk[b]		
		Over-estima-tion	Not defined	Under-estima-tion
Starting concentration of constituents in tank waste	Identified organics are multiplied by a scaling factor to adjust for unidentified organics.			
	Tanks assumed to have highest organic concentration were used for analysis.			
Throughput of treatment system	System is assumed to run at full capacity for 40 years.			
Efficacy of pollution control equipment	Removal is based on engineering design and assumptions rather than measured values			
Assignment of phase	Each COPC and ROPC is assumed to be present as either vapor, particulate, or particulate-bound. Some constituents may be present as a combination of phases.			
Default upset factors for vapor-phase emissions	Default upset factors are based on recorded operating conditions at hazardous waste combustion units.			

[a]This is an example of the information to be included in the uncertainty table in the PRA report and is not intended to be inclusive of all sources of uncertainty.

[b]These columns will indicate whether the assumption used to compensate for the uncertainty is likely to overestimate or underestimate the actual risk, or whether the direction cannot be identified. The potential magnitude of this impact will be identified as minor (+, o, -) or major (++, oo, --).

Table 10-3 Example[a] of Sources of Uncertainty in Environmental Modeling

Examples of Sources of Uncertainty	Description	Potential Direction and Magnitude of Risk[b]		
		Over-estima-tion	Not defined	Under-estima-tion
Air Dispersion Modeling				
COPC and ROPC lists	All COPCs and ROPCs are modeled; therefore, uncertainty in this list will be carried into the air dispersion modeling.			
Emission Rates of COPCs and ROPCs	Estimated emission rates are the starting point for predicting airborne dispersion; therefore, uncertainty in these estimates will be carried into the air dispersion modeling.			
Use of CALPUFF air dispersion model	Simulation of the atmospheric dispersion of emissions is limited by data limitations and simplifications inherent in the model.			
Surface meteorological data for 01 August 2000 through 31 July 2001	This represents the most complete year of data and is considered representative of long-term conditions.			
Particle size distribution	Particle size influences deposition. A single particle size of 1 µm is assumed.			
Land use and terrain data	Data represents land uses at a point in time, with terrain resolution that varies from 70 m to 90 m, with an absolute accuracy of 130 m in the horizontal and 30 m in the vertical.			
Soil Accumulation Modeling				
COPC and ROPC list	All COPCs and ROPCs are modeled; therefore, uncertainty in this list will be carried into the soil accumulation modeling.			
Emission rates of COPCs and ROPCs	Estimated emission rates are the starting point for predicting airborne dispersion and air dispersion is the starting point for predicting soil concentrations; therefore, uncertainty in these estimates will be carried into the soil accumulation modeling.			
Constituent deposition rates	Air dispersion is the starting point for predicting soil concentrations; therefore, uncertainty in these estimates will be carried into the soil accumulation modeling.			

Table 10-3 Example[a] of Sources of Uncertainty in Environmental Modeling

Examples of Sources of Uncertainty	Description	Potential Direction and Magnitude of Risk[b]		
		Over-estima-tion	Not defined	Under-estima-tion
Descriptive soil parameters	Parameters such as mixing depth, bulk density, and volumetric water content, which are assigned a single value, may vary widely over a relatively small area.			
Soil loss mechanisms – degradation	COPCs in soil are subject to loss due to biotic and abiotic degradation; however, transformation and subsequent increase of secondary COPCs are not considered in the assessment.			
	Degradation rates, which are assigned a single value, generally from laboratory testing, may vary widely under environmental conditions.			
Surface Water and Sediment Accumulation Modeling				
COPC and ROPC list	All COPCs and ROPCs are modeled; therefore, uncertainty in this list will be carried into the surface water and sediment modeling.			
Emission rates of COPCs and ROPCs	Estimated emission rates are the starting point for predicting airborne dispersion and air dispersion is the starting point for predicting surface water concentrations; therefore, uncertainty in these estimates will be carried into the surface water and sediment modeling.			
Constituent deposition rates	Air dispersion is the starting point for predicting surface water concentrations; therefore, uncertainty in these estimates will be carried into the surface water and sediment modeling.			
Surface water and sediment model	Equations used to model the fate of COPCs and ROPCs deposited into the water body greatly simplify the mechanisms occurring within such a dynamic system.			
Deposition area	The maximum deposition of COPCs and ROPCs is assumed over the entire depositional area of the water body.			
Descriptive surface water and sediment parameters	Parameters such as depth of water column and depth of upper benthic sediment layer, which are assigned a single value, may vary widely.			

Table 10-3 Example[a] of Sources of Uncertainty in Environmental Modeling

Examples of Sources of Uncertainty	Description	Potential Direction and Magnitude of Risk[b]		
		Over-estima-tion	Not defined	Under-estima-tion
Plant Accumulation Modeling				
COPC and ROPC list	All COPCs and ROPCs are modeled; therefore, uncertainty in this list will be carried into the plant modeling.			
Emission rates of COPCs and ROPCs	Estimated emission rates are the starting point for predicting environmental concentrations; therefore, uncertainty in these estimates will be carried into the plant modeling.			
Air dispersion modeling	Airborne concentrations are the starting point for predicting direct uptake from air; therefore, uncertainty in these estimates will be carried into the plant modeling.			
Constituent deposition rates	Deposition is the starting point for predicting plant concentrations from direct deposition; therefore, uncertainty in these estimates will be carried into the plant modeling.			
Soil accumulation modeling	Soil concentration is the starting point for predicting uptake into plants; therefore, uncertainty in these estimates will be carried into the plant modeling.			
Plant uptake factors	Air-to-plant and soil-to-plant uptake factors, which are assigned a single value, generally from laboratory testing of a limited number of chemicals, may vary widely depending on constituent, plant species, and environmental conditions.			
Descriptive plant parameters	Parameters such as length of growing season and yield, which are assigned a single value, may vary widely among plant species and agricultural practices.			

[a]This is an example of the information to be included in the uncertainty table in the PRA report and is not intended to be inclusive of all sources of uncertainty.

[b]These columns will indicate whether the assumption used to compensate for the uncertainty is likely to overestimate or underestimate the actual risk, or whether the direction cannot be identified. The potential magnitude of this impact will be identified as minor (+, o, -) or major (++, oo, --).

Table 10-4 Example[a] of Sources of Uncertainty in Human Health Risk Assessment

Examples of Sources of Uncertainty	Description	Potential Direction and Magnitude of Risk[b]		
		Over-estima-tion	Not defined	Under-estima-tion
Exposure Assessment				
COPC and ROPC list	All COPCs and ROPCs are modeled; therefore, uncertainty in this list will be carried into the HHRA.			
Emission Rates of COPCs and ROPCs	Estimated emission rates are the starting point for predicting environmental concentrations; therefore, uncertainty in these estimates will be carried into the HHRA.			
Air dispersion modeling	Airborne concentrations are the starting point for predicting inhalation exposures; therefore, uncertainty in these estimates will be carried into the HHRA			
Soil accumulation modeling	Soil concentration is the starting point for predicting soil ingestion exposures and uptake into foodstuffs; therefore, uncertainty in these estimates will be carried into the HHRA.			
Surface water accumulation modeling	Surface water concentration is the starting point for predicting drinking water, fish ingestion, and sweat lodge exposures; therefore, uncertainty in these estimates will be carried into the HHRA.			
Plant accumulation modeling	Plant concentration is the starting point for predicting produce ingestion exposures and concentrations in animal products; therefore, uncertainty in these estimates will be carried into the HHRA.			
Evaluation of current residential receptors[c] at Hanford offsite maximum	There are presently no residential receptors at the Hanford offsite maximum.			
Evaluation of future residential receptors[c] at onsite ground maximum	Residential development is not likely to occur at the onsite ground maximum.			
Exposure parameters	Exposure parameters are a combination of average (such as body weight) and upper-bound (such as soil ingestion) point estimates of parameters that vary widely among individuals.			

Table 10-4 Example[a] of Sources of Uncertainty in Human Health Risk Assessment

Examples of Sources of Uncertainty	Description	Potential Direction and Magnitude of Risk[b]		
		Over-estima-tion	Not defined	Under-estima-tion
Toxicity Assessment				
Cancer slope factors (SFs) for COPCs	SFs are a plausible upper-bound estimate of the probability of a cancer, per unit intake of a chemical, over a lifetime. Most chemical SFs are based on animal data.			
Cancer slope factors for ROPCs	SFs are central estimates of the age-averaged, lifetime radiation cancer incidence risk and are based on human data.			
Risk Characterization				
Exposure assessment	All uncertainties in the exposure assessment are carried into the risk characterization.			
Toxicity assessment	All uncertainties in the toxicity assessment are carried into the risk characterization.			
Additivity of COPC cancer risk	The assumption of additivity of COPC cancer risk assumes intakes of individual chemicals are small, and there is no interaction among chemicals.			
Additivity of ROPC cancer risk	The assumption of additivity of ROPC cancer risk is much less uncertain than for COPCs because the mode of action is the same for all radionuclides.			
Additivity of COPC hazard quotients	The assumption of additivity is likely to overestimate risk since many chemicals act on different target organs.			

[a]This is an example of the information to be included in the uncertainty table in the PRA report and is not intended to be inclusive of all sources of uncertainty.

[b]These columns will indicate whether the assumption used to compensate for the uncertainty is likely to overestimate or underestimate the actual risk, or whether the direction cannot be identified. The potential magnitude of this impact will be identified as minor (+, o, -) or major (++, oo, --).

[c]In this context, residential receptors include resident (adult and child), resident subsistence farmer (adult and child), resident fisher (adult and child), Native American subsistence resident (adult and child), and the residential portion of the Hanford Site industrial worker exposure.

Table 10-5 Example[a] of Sources of Uncertainty in Ecological Risk Assessment

Examples of Sources of Uncertainty	Description	Potential Direction and Magnitude of Risk[b]		
		Over-estima-tion	Not defined	Under-estima-tion
Problem Formulation				
Identification of ecological receptors	Receptors are identified to represent various feeding guilds and trophic levels.			
Choice of assessment endpoints	Endpoints are chosen to represent key species in the Hanford Site ecosystem.			
Choice of measurement endpoints	Endpoints are chosen to represent significant deleterious effects to ecological receptors.			
Exposure Assessment				
COPC and ROPC list	All COPCs and ROPCs are modeled; therefore, uncertainty in this list will be carried into the ERA.			
Emission Rates of COPCs and ROPCs	Estimated emission rates are the starting point for predicting environmental concentrations; therefore, uncertainty in these estimates will be carried into the ERA.			
CALPUFF air dispersion modeling	Airborne concentrations are used to predict environmental concentrations; therefore, uncertainty in these estimates will be carried into the ERA.			
Soil accumulation modeling	Soil concentration is the starting point for predicting soil ingestion exposures and uptake into food; therefore, uncertainty in these estimates will be carried into the ERA.			
Surface water and sediment accumulation modeling	Surface water and sediment concentrations are the starting point for predicting exposure to aquatic biota; therefore, uncertainty in these estimates will be carried into the ERA.			
Plant accumulation modeling	Plant concentration is the starting point for predicting plant ingestion exposures and concentrations in higher trophic levels; therefore, uncertainty in these estimates will be carried into the ERA.			
Food chain multiplier (FCM) approach for aquatic receptors	The challenge of extrapolating from one aquatic species to another will be identified.			
FCM approach for terrestrial receptors	The challenge of extrapolating from aquatic species (which make up the database for FCMs) to terrestrial food chains will be identified.			

Table 10-5 Example[a] of Sources of Uncertainty in Ecological Risk Assessment

Examples of Sources of Uncertainty	Description	Potential Direction and Magnitude of Risk[b]		
		Over-estima-tion	Not defined	Under-estima-tion
Exclusive diets	Exclusive diets mathematically make the animal too dependant on one food source (whether plants or animals). This represents a large departure from realistic real diets for desert omnivores.			
Exposure parameters	Exposure parameters are a combination of average and upper-bound point estimates of parameters that vary widely among individuals.			
Effects Assessment				
Toxicity reference values for terrestrial receptors	Toxicity thresholds are based on concentrations reported to have no, or little, effect on the test organism or are estimated conservatively from published toxicity data.			
Toxicity reference values for aquatic receptors	Toxicity thresholds are based on concentrations reported to have no, or little, effect on the test organism or are estimated conservatively from published toxicity data.			
Risk Characterization				
Exposure assessment	All uncertainties in the exposure assessment are carried into the risk characterization.			
Effects assessment	All uncertainties in the effects assessment are carried into the risk characterization.			
Additivity of COPC hazard quotients	The assumption of additivity is likely to overestimate risk since many chemicals act on different target organs.			

[a]This is an example of the information to be included in the uncertainty table in the PRA report and is not intended to be inclusive of all sources of uncertainty.

[b]These columns will indicate whether the assumption used to compensate for the uncertainty is likely to overestimate or underestimate the actual risk, or whether the direction cannot be identified. The potential magnitude of this impact will be identified as minor (+, o, -) or major (++, oo, --).

Contents

11 References 11-1

11.1 Project Documents 11-1

11.2 Codes and Standards 11-2

11.3 Other Documents 11-3

11 References

11.1 Project Documents

24590-WTP-HAC-50-00001, *Estimated Organic Emissions from Process Cells*.

24590-WTP-RPT-PO-03-008, Rev 0, *Integrated Emissions Baseline Report for the Hanford Tank Waste Treatment and Immobilization Plant*.

CCN 063802, E-mail communications from Marcia Bailey, EPA Region 10, to Sharon Robers, SAIC, 17 and 18 July 2002.

CCN 063803, E-mail communication from Marcia Bailey, EPA Region 10, to Sharon Robers, SAIC, 11 April 2003.

CCN 063804, E-mail communication from Marcia Bailey, EPA Region 10, to Sharon Robers, SAIC, 31 October 2002 (3:22 p.m.).

CCN 063805, E-mail communication from Cathy Massimino, EPA Region 10, to Sharon Robers, SAIC, 4 September 2002.

CCN 063806, E-mail communication from Marcia Bailey, EPA Region 10, to Sharon Robers, SAIC, 31 October 2002 (2:26 p.m.).

CCN 063807, E-mail communication from Marcia Bailey, EPA Region 10, to Sharon Robers, SAIC, 13 June 2002.

CCN 063808, Personal communication between CT Hadden, SAIC and PM Achey, University of Florida, 20 September 1999.

CCN 063809, Personal communication between SAIC, US Environmental Protection Agency, Region 10, and Washington Department of Ecology, at a meeting held on 23 and 24 April 2003 in Seattle, Washington, USA.

CCN 063810, Personal communication between SAIC and US Environmental Protection Agency, Region 10, at a meeting held on 16 September 1999, in Richland, Washington, USA.

CCN 063811, Personal communication to Sharon Robers, SAIC, September 1999.

CCN 063812, E-mail communication from Marcia Bailey, EPA Region 10 to Sharon Robers, SAIC, 16 January 2003.

CCN 063813, E-mail communication from Marcia Bailey, EPA Region 10 to Sharon Robers, SAIC, 10 January 2003.

CCN 063814, E-mail communication from Marcia Bailey, EPA Region 10, to Sharon Robers, SAIC, 11 June 2002.

CCN 063816, E-mail communication from Marcia Bailey, EPA Region 10, to Sharon Robers, SAIC, 19 December 2002.

CCN 063817, E-mail communication from Marcia Bailey, EPA Region 10, to Sharon Robers, SAIC, 30 October 2002.

CCN 063818, E-mail communication from Marcia Bailey, EPA Region 10, to Sharon Robers, SAIC, 4 November 2002.

CCN 063824, Personal communication between SAIC and US Environmental Protection Agency, Region 10, during a conference call held on 30 September 1999.

CCN 064327, Personal communication between SAIC and US Environmental Protection Agency, Region 10, during a conference call held on 28 October 1999.

CCN 064328, Personal communication between SAIC and US Environmental Protection Agency, Region 10, at a meeting held on 1 and 2 November 2000 in Seattle, Washington, USA.

CCN 064329, Personal communication between SAIC, US Environmental Protection Agency Region 10, Ecology, and WTP, at a meeting held on 6 and 7 September 2001 in Seattle, Washington, USA.

CCN 064330, Personal communication between SAIC and US Environmental Protection Agency, Region 10, at a meeting held on 29 and 30 May 2002, in Seattle, Washington, USA.

CCN 064331, Personal communication between SAIC and US Environmental Protection Agency, Region 10, at a meeting held on 8 and 9 October 2002 in Seattle, Washington, USA.

CCN 064332, Personal communication between SAIC and US Environmental Protection Agency, Region 10, at a meeting held on 15 September 1999, in Richland, Washington, USA.

CCN 064333, Personal Communication with SAIC, US Environmental Protection Agency, Ecology, and WTP, 23 April 2003, in Seattle, Washington, USA.

11.2 Codes and Standards

WAC 173-400-030. *General Regulations for Air Pollution Sources*, Washington Administrative Code, last updated 7/11/02.

WAC 173-460-150. *Class A Toxic Air Pollutants: Known, Probable and Potential Human Carcinogens and Acceptable Source Impact Levels*, Washington Administrative Code, effective 14 February 1994.

WAC 173-460-160. *Class B Toxic Air Pollutants and Acceptable Source Impact Levels*, Washington Administrative Code, effective 14 February 1994.

40 CFR 268.48. "Universal Treatment Standards", US Environmental Protection Agency, *Code of Federal Regulations*, as amended.

11.3 Other Documents

Andersen DE and Rongstad OJ. 1989. "Home-range Estimates of Red-tailed Hawks Based on Random and Systematic Relocations," *J. Wildl. Manage*, Volume 53, p 802-807. In Sample and others (1997).

Arthur WJ, III, and Alldredge AW. 1979. "Soil Ingestion by Mule Deer in North Central Colorado," *J. Range Manage*, Volume 32, p 67-70. In Beyer and others (1994).

ATG. 1998. *Risk Assessment Work Plan. Mixed Waste Facility RCRA/TSCA Permit Application*. ATG Inc., Richland, Washington, USA.

ATSDR. 1997. *Technical Support Document for ATSDR Interim Policy Guideline: Dioxin and Dioxin-Like Compounds in Soil*. US Department of Health and Human Services, Public Health Service, Agency for Toxic Substances and Disease Registry, Atlanta, Georgia, USA.

Baes CF, III, Sharp RD, Sjoreen AL, and Shor RW. 1984. *A Review and Analysis of Parameters for Assessing Transport of Environmentally Released Radionuclides Through Agriculture*, ORNL-5786. Oak Ridge National Laboratory, Oak Ridge, Tennessee, USA.

Barnthouse LW. 1995. *Effects of Ionizing Radiation on Terrestrial Plants and Animals: A Workshop Report*, ORNL/TM-13141. Oak Ridge National Laboratory, Oak Ridge, Tennessee, USA.

Bent AC. 1929. "Life Histories of North American Shore Birds," Part 2, *US Nat. Nus., Bull*. 146, US Government Printing Office, Washington, DC, USA. In Sample and others (1997).

Bent AC. 1958. "Life Histories of North American Blackbirds, Orioles, Tanagers and Their Allies," *US Natl. Mus. Bull.* 211, US Government Printing Office, Washington, DC, USA. In Sample and others (1997).

Beyer WN, Conner E, and Gerould S. 1994. "Estimates of Soil Ingestion by Wildlife. " *J. Wildl. Manage*, Volume 58, p 375-382.

Bintein S, Devillers J, and Karcher W. 1993. "Nonlinear Dependence of Fish Bioconcentration on n-Octanol/Water Partition Coefficients," SAR and QSAR in *Environ. Res.*, Volume 1, p 29–39.

Blaylock BG, Frank ML, and O'Neal BR. 1993. *Methodology for Estimating Radiation Dose Rates to Freshwater Biota Exposed to Radionuclides in the Environment*, ES/ER/TM-78. Oak Ridge National Laboratory, Oak Ridge, Tennessee, USA.

Bonneville Power Administration. 2001. Modeling Protocol, Regional Air Quality Modeling Study, Bonneville Power Administration. Available at: http://www.efw.bpa.gov/portal/organizations/ government/federal/dept_of_energy/BPA/environment/NEPA/airquality/cimp.pdf

Brown L and Amadon D. 1968. *Eagles, Hawks, and Falcons of the World, Volume 1*, McGraw-Hill Book Company, New York, New York, USA.

Cal EPA. 1999. *Air Toxics Hot Spots Program Risk Assessment Guidelines. Part I, The Determination of Acute Reference Exposure Levels for Airborne Toxicants*, March 1999. California Environmental Protection Agency, Sacramento, California, USA.

Cappon CJ. 1981. "Mercury and Selenium Content and Chemical Form in Vegetable Crops Grown in Sludge-Amended Soil," *Arch. Environ. Contam. Toxicol.*, Volume 10, p 673–689.

CARB. 1994. *Benzo[a]Pyrene as a Toxic Air Contaminant*, July 1994. California Air Resources Board. Available at http://www.arb.ca.gov/toxics/summary/bap.htm

CDFG. 2003. *Mourning Dove*. California Department of Fish and Game, California Interagency Wildlife Task Group, Sacramento, California, USA. Available at http://www.dfg.ca.gov/whdab/html/b255.html

Columbia Basin Research. 1996. *Columbia River Salmon Passage Model CriSP.1.5 Theory, Calibration & Validation Manual, Copyright © 1996*. Available at http://www.cqs.washington.edu/crisp/models/crisp1manual/theory/theory.mif14.html. (Accessed in 2002.)

Cowardin LM, Carter V, Golet FC, and LaRoe ET. 1979. *Classification of Wetlands and Deepwater Habitats of the United States*, FWS/OBS-79/31, December 1979. US Department of the Interior, Fish and Wildlife Service, Office of Biological Services, Washington, DC, USA.

Craighead JJ and Craighead FC. 1956. *Hawks, Owls, and Wildlife*. Dover Publ. Co., New York, New York, USA, pp. 443. In EPA (1993c).

Cushing CE, ed. 1992. *Hanford Site National Environmental Policy Act (NEPA) Characterization*, PNL-6415, Rev 5, December 1992. Pacific Northwest Laboratory, Richland, Washington, USA.

Cushing CE, ed., and others. 1995. *Hanford Site National Policy Act (NEPA) Characterization*, PNL-6415, Rev 7, September 1995. Pacific Northwest Laboratory, Richland, Washington, USA.

Daubenmire R. 1970. "Steppe Vegetation of Washington," *Technical Bulletin* 62, Experimental Station. Washington State University, Pullman, Washington, USA.

DOE. 1992. *The Future for Hanford: Uses and Cleanups, 1992*, US Department of Energy, Washington, DC, USA.

DOE. 1997. *Vadose Zone Characterization Project at the Hanford Tank Farms - AX Tank Farm Report*. GJO-97-14-TAR, GJO-HAN-12. August 1997. DOE Grand Junction Office, Grand Junction, Colorado, USA.

DOE. 1999a. *Final Hanford Comprehensive Land-Use Plan Environmental Impact Statement*, DOE/EIS-0222-F. US Department of Energy, Richland Operations Office, Richland, Washington, USA. Available at http://www.hanford.gov/eis/hraeis/hraeis.htm.

DOE. 1999b. *Record of Decision (ROD): Hanford Comprehensive Land-Use Plan Environmental Impact Statement*. US Department of Energy, Richland Operations Office, Richland, Washington, USA. Available at http://www.hanford.gov/eis/hraeis/rod/hcprod.html.

DOE. 2001. *Hanford Site Biological Resources Management Plan*, DOE/RL 96-32. US Department of Energy, Richland, Washington, USA.

DOE-RL. 1991. *Double-Shell Tank (DST) System Dangerous Waste Permit Application*, DOE/RL-90-39, Rev 0, June 1991. US Department of Energy, Richland Operations Office, Richland, Washington, USA.

DOE-RL. 1995. *Hanford Site Risk Assessment Methodology*, DOE/RL-91-45, Rev 3, May 1995. US Department of Energy, Richland Operations Office, Richland, Washington, USA.

DOE-RL. 1998. *Screening Assessment and Requirements for a Comprehensive Assessment: Columbia River Comprehensive Impact Assessment*, DOE/RL-96-16, Rev 1, March 1998. US Department of Energy, Richland Operations Office, Richland, Washington, USA. Available at http://www.hanford.gov/docs/rl-96-16/.

Downs JL, Rickard WH, Brandt CA, Cadwell LL, Cushing CE, and others. 1993. *Habitat Types on the Hanford Site: Wildlife and Plant Species of Concern*, PNL-8942, December 1993. Pacific Northwest Laboratory, Richland, Washington, USA.

Duranceau DA. 1995. *Site Evaluation Report for Candidate Basalt Quarry Sites*, BHI-00005, Rev 0, February 1995. Bechtel Hanford Inc., Richland, Washington, USA.

Eagle TC and Whitman JS. 1987. "Mink," In Novak M, Baker JA, Obbrel ME, and others, eds. *Wild Furbearer Management and Conservation*, p 615-624. University of Pittsburgh Press, Pittsburgh, Pennsylvania, USA.

Earth Tech Inc. 2000a. *A User's Guide for the CALMET Meteorological Model, Version 5*. Concord, Massachusetts, USA. Available at: http://www.src.com/calpuff/calpuff1.htm.

Earth Tech Inc. 2000b. *A User's Guide for the CALPUFF Dispersion Model, Version 5*. Concord, Massachusetts, USA. Available at: http://www.src.com/calpuff/calpuff1.htm.

Ecology. 1994. *Creation of Freshwater Sediment Quality Database and Preliminary Analysis of Freshwater Apparent Effects Thresholds*, June 1994. Washington State Department of Ecology, Olympia, Washington, USA.

Ecology. 2001. *Cleanup Levels and Risk Calculations under the Model Toxics Control Act (MTCA) Cleanup Regulation (CLARC) Version 3.1*, pp. 94–145, February 2001. Washington State Department of Ecology, Olympia, Washington, USA.

Ecology. 2002. *Terrestrial Ecological Evaluation Process Exclusions*. Toxic Cleanup Program. Washington State Department of Ecology, Olympia, Washington, USA. Available at http://www.ecy.wa.gov/programs/tcp/policies/terrestrial/exclusions_main.htm

Efroymson RA, Will ME, Suter II GW, and Wooten AC. 1997a. *Toxicological Benchmarks for Screening Contaminants of Potential Concern for Effects on Terrestrial Plants: 1997 Revision*, ES/ER/TM-85/R3. Lockheed Martin Energy Systems, Inc., Oak Ridge National Laboratory, Oak Ridge, Tennessee, USA.

Efroymson RA, Will ME, and Suter II GW. 1997b. *Toxicological Benchmarks for Screening Contaminants of Potential Concern for Effects on Soil and Litter Invertebrates and Heterotrophic Process: 1997 Revision*, ES/ER/TM-126/R2. Lockheed Martin Energy Systems, Inc., Oak Ridge National Laboratory, Oak Ridge, Tennessee, USA.

Emergency Response Planning Guidelines. 2002. Current as of 2 July 2002. Available at http://www.scapa.bnl.gov/scapawl.htm

Energy Northwest and Duke Energy North America. 2001. SATSOP Combustion Turbine Project Application for Prevention of Significant Deterioration Permit. Available from Washington State Department of Ecology.

EPA. 1986. *Test Methods for Evaluating Solid Waste, Physical and Chemical Methods*, SW-846, Third Edition (as amended by Updates I, II, IIA, IIB, and III). US Environmental Protection Agency, Washington, DC, USA.

EPA. 1989. *Risk Assessment Guidance for Superfund (RAGS), Vol. 1: Human Health Evaluation Manual (Part A)*, Interim Final, EPA/540/1-89/002. Office of Emergency and Remedial Response, US Environmental Protection Agency, Washington, DC, USA.

EPA. 1991. *Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual (Part B, Development of Risk-Based Preliminary Remediation Goals*), OSWER Directive 9285.7-01B. Office of Emergency and Remedial Response, US Environmental Protection Agency, Washington, DC, USA.

EPA. 1992b. *Technical Support Document for the Land Application of Sewage Sludge*, Volumes I and II, EPA 822/R-93-001a. Office of Water, US Environmental Protection Agency, Washington, DC, USA.

EPA. 1993a. *Provisional Guidance for Quantitative Risk Assessment of Polycyclic Aromatic Hydrocarbons*, EPA-600-R-93-089, July 1993. US Environmental Protection Agency, Washington, DC, USA.

EPA. 1993b. *External Exposures to Radionuclides in Air, Water, and Soil*, Federal Guidance Report No. 12, Office of Radiation and Indoor Air, US Environmental Protection Agency, Washington, DC, USA. Available at http://homer.ornl.gov/VLAB/FedGR12.html.

EPA. 1993c. *Wildlife Exposure Factors Handbook, Volume I of II*, EPA/600/R-93/187a, December 1993. Office of Health and Environmental Assessment, Office of Research and Development, US Environmental Protection Agency, Washington, DC, USA.

EPA. 1993d. *Review Draft Addendum to the Methodology for Assessing Health Risks Associated with Indirect Exposure to Combustor Emissions*, EPA-600-AP-93-003, 10 November 1993. Office of Health and Environmental Assessment, Office of Research and Development, US Environmental Protection Agency, Washington, DC, USA.

EPA. 1993e. *Technical Basis for Deriving Sediment Quality Criteria for Nonionic Organic Contaminants for the Protection of Benthic Organisms by Using Equilibrium Partitioning*, EPA-822-R-93-011. Office of Water, US Environmental Protection Agency, Washington, DC, USA.

EPA. 1994a. *Draft Exposure Assessment Guidance for Resource Conservation and Recovery Act Hazardous Waste Combustion Facilities: Attachment, April 15, 1994*, Table 1 – Chemicals Recommended for Identification and Table 2 – Chemicals for Potential Identification. US Environmental Protection Agency, Washington, DC, USA.

EPA 1994b. *Estimating Exposure to Dioxin-Like Compounds*, Review Draft, Office of Research and Development, US Environmental Protection Agency, EPA/600/6-88/0055Cc, Washington, DC, USA.

EPA. 1994c. *Implementation Guidance for Conducting Indirect Exposure Analysis at RCRA Combustion Units*, Draft. Waste Management Branch, Office of Solid Waste and Emergency Response, US Environmental Protection Agency, Washington, DC, USA.

EPA. 1994d. *Errata, Guidance for Performing Screening Level Risk Analysis at Combustion Facilities Burning Hazardous Wastes*, Revised draft. Waste Management Branch, Office of Solid Waste and Emergency Response, US Environmental Protection Agency, Washington, DC, USA.

EPA. 1994e. *Modification of Screening Guidance Fate and Transport Equations*. Waste Management Branch, Office of Solid Waste and Emergency Response, US Environmental Protection Agency, Washington, DC, USA.

EPA. 1995a. "Environmental Protection Agency Risk Characterization Policy", memorandum from Carol Browner, Administrator, to EPA staff, Office of the Administrator, 21 March 1995. US Environmental Protection Agency, Washington, DC, USA.

EPA. 1995b. *Protocol for Equipment Leak Emission Estimates*, EPA-453/R-95-017. US Environmental Protection Agency, Research Triangle Park, North Carolina, USA.

EPA. 1995c. "Further Studies for Modeling the Indirect Exposure Impacts from Combustor Emissions", memorandum from Matthew Lorber, Exposure Assessment Group, and Glenn Rice, Indirect Exposure Team, Environmental Criteria and Assessment Office. US Environmental Protection Agency, Washington, DC, USA.

EPA. 1995d. *Great Lakes Water Quality Initiative Technical Support Document for Wildlife Criteria*, EPA-820-B-95-009. Office of Water, US Environmental Protection Agency, Washington, DC, USA.

EPA. 1995e. *User's Guide for the Industrial Source Complex (ISC3) Dispersion Models*, Volume I – User Instructions. EPA-454/B-95-003a. Office of Air Quality Planning and Standards, Research Triangle Park, NC, USA. Available at: http://www.epa.gov/ttn/scram.

EPA. 1996a. *Soil Screening Guidance: Technical Background Document*, EPA/540/R-95/128. Office of Solid Waste and Emergency Response, US Environmental Protection Agency, Washington, DC, USA.

EPA. 1996b. *Soil Screening Guidance: User's Guide*, EPA/540/R-96/018. Office of Solid Waste and Emergency Response, US Environmental Protection Agency, Washington, DC, USA.

EPA. 1996c. *PCBs: Cancer Dose-Response Assessment and Application to Environmental Mixtures*, EPA/600/P-96/001F. National Center for Environmental Assessment, Office of Research and Development, US Environmental Protection Agency, Washington, DC, USA.

EPA. 1997a. *Exposure Factors Handbook*, EPA/600/P-95/002Fa. Office of Research and Development, US Environmental Protection Agency, Washington, DC, USA.

EPA. 1997b. *Health Effects Assessment Summary Tables (HEAST) FY-1995 Annual*, EPA/540/R-95/036. Office of Solid Waste and Emergency Response, US Environmental Protection Agency, Washington, DC, USA.

EPA. 1997c. *Ecological Risk Assessment Guidance for Superfund: Process for Designing and Conducting Ecological Risk Assessments. Interim Final*, EPA/540/R/97/006, 9285.7-25, PB97-963211, June 1997. Office of Solid Waste and Emergency Response, US Environmental Protection Agency, Washington, DC, USA.

EPA. 1997d. *Mercury Study Report to Congress. Volume I through III: Fate and Transport of Mercury in the Environment*, EPA-452/R-97-005, December 1997. Office of Air Quality Planning and Standards and Office of Research and Development, US Environmental Protection Agency, Washington, DC, USA.

EPA. 1998a. *Human Health Risk Assessment Protocol for Hazardous Waste Combustion Facilities*, Peer Review Draft, EPA/530/D-98/001B. US Environmental Protection Agency, Washington, DC, USA. Available at http://www.epa.gov/epaoswer/hazwaste/combust/risk.htm.

EPA. 1998b. *Region 6 Risk Management Addendum – Draft Human Health Risk Assessment Protocol for Hazardous Waste Combustion Facilities*, EPA-R6-98-002. US Environmental Protection Agency, Washington, DC, USA.

EPA. 1998c. *Guidelines for Ecological Risk Assessment*. EPA/630/R-95/002F. Risk Assessment Forum, US Environmental Protection Agency, Washington, DC, USA.

EPA. 1999a. *Screening Level Ecological Risk Assessment Protocol for Hazardous Waste Combustion Facilities*, Peer Review Draft, EPA 530-D-99-001A. Office of Solid Waste and Emergency Response, US Environmental Protection Agency, Washington, DC, USA. Available at http://www.epa.gov/epaoswer/hazwaste/combust/ecorisk.htm.

EPA. 1999c. *Errata to Human Health Risk Assessment Protocol for Hazardous Waste Combustion Facilities*, Peer Review Draft, 2 August 1999. US Environmental Protection Agency, Washington, DC, USA.

EPA. 1999g. *Cancer Risk Coefficients for Environmental Exposure to Radionuclides*, Federal Guidance Report No. 13, EPA 402-R-99-001, Air and Radiation, September 1999. US Environmental Protection Agency, Washington, DC, USA.

EPA. 2000a. *Soil Screening Guidance for Radionuclides: User's Guide*, EPA/540-R-00-007. Office of Radiation and Indoor Air, Office of Solid Waste and Emergency Response, US Environmental Protection Agency, Washington, DC, USA.

EPA. 2000b. *Soil Screening Guidance for Radionuclides: Technical Background Document*, EPA/540-R-00-006. Office of Radiation and Indoor Air, Office of Solid Waste and Emergency Response (OSWER Directive 9355.4-16), US Environmental Protection Agency, Washington, DC, USA.

EPA. 2000d. OSWER directive 9355.4-14.

EPA. 2000e. *Exposure and Human Health Reassessment of 2,3,7,8-Tetrachlorodibenzo-p-Dioxin (TCDD) and Related Compounds*, EPA/600/P-00/001Be, September 2000, Draft Final. US Environmental Protection Agency, Washington, DC, USA.

EPA. 2001a. *Risk Assessment Guidance for Superfund: Volume I Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment)*, Interim, EPA/540/R/99/005, September 2001. US Environmental Protection Agency, Washington, DC, USA.

EPA. 2001b. *Health Effects Assessment Summary Tables (HEAST) 2001 Update*. Office of Solid Waste and Emergency Response, US Environmental Protection Agency, Washington, DC, USA.

EPA. 2002a. *Industrial Source Complex (ISC3) Dispersion Model, Version 02035*. Office of Air Quality Planning and Standards, Research Triangle Park, North Carolina, USA. Available at: http://www.epa.gov/ttn/scram.

EPA. 2002l. *ECOTOXicology Database System*. US Environmental Protection Agency, Washington, DC, USA. Available at http://www.epa.gov/ecotox.

EPA. 2003b. *Integrated Risk Information System (IRIS) On-line Database of Toxicity Measures*. Office of Research and Development, Environmental Criteria and Assessment Office, US Environmental Protection Agency, Cincinnati, Ohio, USA.

EPA. 2003e. *Supplemental Guidance for Assessing Cancer Susceptibility from Early-Life Exposure to Carcinogens* (Supplemental Guidance), EPA/630/R-03/003, February 2003. US Environmental Protection Agency, Washington, DC, USA. Available at www.epa.gov/ncea/raf/cancer2003.htm.

EPA. 2003f. *Phytotox Database*, US Environmental Protection Agency, Washington, DC, USA. Available at http://www.epa.gov/med/databases/databases.htm#phytotox

Federal Register. 1997. US Environmental Protection Agency Federal Register of Environmental Documents for October 20, 1997. US Environmental Protection Agency, Washington, DC, USA. Available at http://www.epa.gov/fedrgstr/EPA-impact/1997/october/day-30/i28794.htm

Fitzner RE and Gray RH. 1991. "The Status, Distribution, and Ecology of Wildlife on the US DOE Hanford Site: A Historical Overview of Research Activities," *Environ. Monitor. Assess*., Volume 18, p 173–202.

Flake LD. 1973. "Food Habits of Four Species of Rodents on a Short-grass Prairie in Colorado," *J. Mammal*, Volume 54, p 636-347.

Franklin JF and Dyrness CT. 1973. *Natural Vegetation of Oregon and Washington*, General Technical Report PNW-8. Pacific Northwest Forest and Range Experiment Station, US Department of Agriculture, Forest Service, Portland, Oregon, USA.

Gano KA and Rickard WH. 1982. "Small Mammals of a Bitterbrush-Cheatgrass Community," *Northwest Sci*., Volume 56, p 1–7.

Gonzalez G, Zou X, Sabat A, and Fetcher N. 1999. "Earthworm Abundance and Distribution Pattern in Contrasting Plant Communities Within a Tropical Wet Forest in Puerto Rico," *Carib. J. Science*, Volume 35, p 93-100.

Goyer RA. 1996. "Toxic Effects of Metals" In Klaassen and others, eds., *Casarret and Doull's Toxicology: The Basic Science of Poisons*, 5th edition, p 582-609. MacMillan Publishing Co., Inc., New York, New York, USA.

Gray RH and Rickard WH. 1989. "The Protected Area of Hanford as a Refugium for Native Plants and Animals," *Environ. Conservation*, Volume 16, p 251–260. The Foundation for Environmental Conservation, Switzerland.

Hall JA, ed. 1998. *Biodiversity Inventory and Analysis of the Hanford Site, 1997 Annual Report*. The Nature Conservancy of Washington, Seattle, Washington, USA.

Halvorson JJ, McCool DK, King LG, and Gatto LW. 1998. *Ground Freezing Effects on Soil Erosion of Army Training Lands. Part 2. Overwinter Changes to Tracked-Vehicle Ruts, Yakima Training Center, Washington*, Special Report 98-8. Cold Regions Research and Engineering Laboratory, US Army Corps of Engineers.

Harris SG and Harper BL. 1997. "A Native American Exposure Scenario," *Risk Anal*., Volume 17, Issue 6, p 789–795.

Hutzinger O, Safe S, and Zitko V. 1983. *The Chemistry of PCBs*. Drieger Publishing Co., Malabar, Florida, USA.

IAEA. 1992. "Effects of Ionizing Radiation on Plants and Animals at Levels Implied by Current Radiation Protection Standards," *IAEA Technical Report Series 332*. International Commission on Radiological Protection, Vienna, Austria.

Ingersoll CG, Haverland PS, Brunson EL, Canfield TJ, Dwyer FJ, and others. 1996. "Calculation and Evaluation of Sediment Effect Concentrations," *J. Great Lakes Res*., Volume 22, p 602–623.

Iowa State University 4-H. 1992. *4-H Market Hog Project*.

Jones DS, Suter II GW, and Hull RN. 1997. *Toxicological Benchmarks for Screening Contaminants of Potential Concern for Effects on Sediment-Associated Biota: 1997 Revision*, ES/ER/TM-95/R4. Lockheed Martin Energy Systems, Inc., Oak Ridge National Laboratory, Oak Ridge, Tennessee, USA.

Klassen CD, Amdur MO, and Doull J, eds. 1996. *Casarret and Doull's Toxicology: The Basic Science of Poisons*, 5th Edition. MacMillan Publishing Co., Inc., New York, New York, USA.

Kocher DC and Trabalka JR. 2000. "On the Application of a Radiation Weighting Factor for Alpha Particles in Protection of Non-Human Biota," *Health Phys. Soc. J*, Volume 79, p 407–411.

Kupfer MJ, Boldt AL, Hodgson KM, Shelton LW, Simpson BC, and others. 1997. *Standard Inventories of Chemicals and Radionuclides in Hanford Site Tank Wastes*, HNF-SD-WM-TI-740, Rev 9, August 1997. Fluor Daniel Hanford, Inc., Richland, Washington, USA.

Linscombe G, Kinler N, and Aulerich RJ. 1982. "Mink," In Chapman JA, Feldhammer GA, eds. *Wild Mammals of North America*, p 329-343. Johns Hopkins University Press, Baltimore, Maryland, USA.

Lorber M and Phillips L. 2002. "Infant Exposure to Dioxin-like Compounds in Breast Milk," *Environmental Health Perspectives*, Volume 110, Issue 6, p A325 – A332.

Lorber M and Pinsky P. 2000. "An Evaluation of Three Empirical Air-to-Leaf Models for Polychlorinated Dibenzo-p-Dioxins and Dibenzofurans," *Chemosphere*, Volume 41, Issue 6, p 931–941.

Martin AC and Nelson AL. 1952. "Every Ounce Counts," *Sports Afield*, September 1952, pp. 17-23. In Terres (1980).

Matlock KS and Pegg IL. 1999. *Determination of the Fate of Hazardous Organics During Vitrification of TWRS LAW and HLW Simulants*, Preliminary Data Summary Report, VSL-99R3580-1, Rev 0, 19 February 1999. Vitreous Sate Laboratory, The Catholic University of America, Washington, DC, USA.

MD Ag Statistical Service. 2001. *Maryland Agrifacts* (AF-18-01). Maryland Agricultural Statistical Service and Maryland Department of Agriculture, Annapolis, Maryland, USA.

Meinhardt CC and Frostenson JC. 1979. *Current Status of the 200 Area Ponds*, RHO-CD-798, November 1979. US Department of Energy, Richland Hanford Operations, Richland, Washington, USA.

Montana 4-H. 1996. *4-H Market Beef Project Manual*, July 1996.

NERP. 2002. Data for the Hanford Site, National Environmental Research Park. Available at http://www.uga.edu/srel/ESSite/Hanford.html (accessed in August 2002).

Neitzel DA, Fosmire CJ, Fowler, RA, Goodwin, SM, Harvey, DW, and others. 1998. *Hanford Site National Environmental Policy Act (NEPA) Characterization*, PNL-6415, Rev 10, September 1998, Pacific Northwest National Laboratory, Richland, Washington, USA.

Northern Territory Government of Australia. 1999. "Keeping a Small Poultry Flock in the Top End", Agnote J57. Available at http://www.nt.gov.au/dbird/dpif/pubcat/agnotes/animalmanagement/572.pdf.

Novak M, Baker JA, Obbarel ME, and others, eds. 1987. *Wild Furbearer Management and Conservation*, p 615–624. University of Pittsburgh Press, Pittsburgh, Pennsylvania, USA.

NPS. 1994. *The Hanford Reach of the Columbia River Final River Conservation Study and Environmental Impact Statement, June 1994*. US Department of Interior, Pacific Northwest Regional Office, National Park Service, Seattle, Washington, USA.

Office of the US Surgeon General. 2000. Press Release, 30 October 2000. Available at http://www.4woman.gov/breastfeeding/press.htm.

Nuclear Regulatory Commission. 1977. *Calculation of Annual Doses to man from Routine Releases of Reactor Effluents for the Purpose of Evaluating Compliance with 10 CFR Part 50, Appendix I*, Regulatory Guide 1.109, October 1977. Office of Standard Development, US Nuclear Regulatory Commission, Washington, DC, USA.

Oring LW, Lank DB, and Maxson SJ. 1983. "Population Studies of the Polyandrous Spotted Sandpiper," *Auk*, Volume 100, p 272–285.

Paustenbach DJ. 1989. *The Risk Assessment Of Environmental Hazards: A Textbook of Case Studies*, 1st edition, John Wiley & Sons, New York, New York, USA.

Persaud D, Jaagumagi R, and Hayton A. 1993. *Guidelines for the Protection and Management of Aquatic Sediment Quality in Ontario*. Ontario Ministry of the Environment and Energy, Ontario, Canada.

PNL. 1993. *Hanford Site Environmental Report for Calendar Year 1992*, PNL-8682, June 1993. Pacific Northwest Laboratory, Richland, Washington, USA.

PNL. 1994. "Biological Review of the Tank Waste Remediation System (TWRS) Sites," Letter 94-WHC-142 from C. A. Brandt, Pacific Northwest Laboratory, to J. G. Granger, Westinghouse Hanford Corporation, Richland, Washington, USA.

PNNL. 1997. *Hanford Site Environmental Report for Calendar Year 1996*, PNNL-11472, August 1997. Pacific Northwest National Laboratory, Richland, Washington, USA.

Rickard W, Rogers LE, Vaughn BE, and Liebetrau SF, eds. 1988. *Shrub-Steppe Balance and Charge in a Semi-Arid Terrestrial Ecosystem*, Elsevier, Amsterdam, Holland.

Rickard WH and Poole LD. 1989. "Terrestrial Wildlife of the Hanford Site: Past and Future," *Northwest Sci*., Volume 63, Issue 4.

Rogers LE and Rickard WH. 1977. *Ecology of the 200 Area Plateau Waste Management Environs: A Status Report*, PNL-2253, October 1977. Pacific Northwest Laboratory, Richland, Washington, USA.

Sackschewsky MR, Landeen DS, Downs JL, Rickard WH, and Baird GI. 1992. *Vascular Plants of the Hanford Site*, WHC-EP-0554, Rev 1, July 1992. Westinghouse Hanford Company, Richland, Washington, USA.

Saito K, Petoussi-Henss N, and Zankl M. 1998. "Calculation of the Effective Dose and Its Variation from Environmental Gamma Ray Sources," *Health Phys*., Volume 74, Issue 6, p 698.

Sample BE, Opresko DM, and Suter II GW. 1996. *Toxicological Benchmarks for Wildlife: 1996 Revision*, ES/ER/TM-86/R3. Lockheed Martin Energy Systems, Inc., Oak Ridge National Laboratory, Oak Ridge, Tennessee, USA.

Sample BE, Aplin MS, Efroymson RA, Suter II GW, and Welsh CJE. 1997. *Methods and Tools for Estimation of the Exposure of Terrestrial Wildlife to Contaminants*, ORNL/TM-13391. Environmental Sciences Division, Oak Ridge National Laboratory, Oak Ridge, Tennessee, USA.

Schuler CA, Rickard WH, and Sargeant GA. 1988. *Bird Associations with Shrub-steppe Plant Communities at the Proposed Reference Repository Location in Southeastern Washington*, PNL-6493, March 1988. Pacific Northwest Laboratory, Richland, Washington, USA.

Schuler CA, Rickard WH, and Sargeant GA. 1993. "Conservation of Habitats for Shrub-Steppe Birds," *Environ. Conserv*., Volume 20, Issue 1, p 57–64.

Southworth GR, Beauchamp JJ, and Schmieder PK. 1978. "Bioaccumulation Potential of Polycyclic Aromatic Hydrocarbons in *Daphnia pulex*," *Water Res.*, Volume 12, p 973–977.

Spromberg JAB, Ettina JM, and Landis WG. 1998. "Metapopulation Dynamic: Indirect Effects in Multidistinct Outcome in Ecological Risk Assessments," *Environ. Toxicol. Chem*., Volume 17, p 1640–1649.

Steenhof K. 1983. "Prey Weights for Computing Percent Biomass in Raptor Diets," *Raptor Res.*, Volume 17, p 15-27. In EPA (1993c).

Stegen JA. 1993. *Vegetation Communities Associated with the 100-Area and 200-Area Facilities on the Hanford Site*, WHC-SD-EN-TI-216, Rev 0, January 1993. Westinghouse Hanford Company, Richland, Washington, USA.

Suter II GW and Tsao CL. 1996. *Toxicological Benchmarks for Screening Potential Contaminants of Concern for Effects on Aquatic Biota: 1996 Revision*, ES/ER/TM-96/R2. Lockheed Martin Energy Systems, Inc., Oak Ridge National Laboratory, Oak Ridge, Tennessee, USA.

Terres JK. 1980. *The Audubon Society Encyclopedia of North American Birds*. Alfred A. Knopf, New York, New York, USA.

Thomsen L. 1971. "Behavior and Ecology of Burrowing Owls on the Oakland Municipal Airport," *Condor*, Volume 73, p 177-192. In Sample and others (1997).

Till JE and Meyer HR. 1983. *Radiological Assessment—A Textbook on Environmental Dose Analysis*, NUREG/CR-3332, ORNL-5968, 7.3.5.1. US Nuclear Regulatory Commission, Washington, DC, USA.

Travis CC and Arms AD. 1988. "Bioconcentration of Organics in Beef, Milk, and Vegetation," *Environ. Sci. Technol*., Volume 22, p 271–274.

USFS. 1994. *Ecological Subregions of the United States*, WO-WSA-5. US Department of Agriculture, Forest Services, Washington, DC, USA.

US Census. 2000. US Census Bureau, Department of Commerce, Washington, DC, USA. Accessed 2003.

US Forest Service, National Park Service, and US Fish and Wildlife Service. 2000. *Federal Land Managers' Air Quality Related Values Workgroup (FLAG), Phase I Report (December 2000*).

US Geological Survey. 2003. *Terrain Data and Land Use Data*. Available at http://edc.usgs.gov/geodata

WA7890008967. *Dangerous Waste Portion of the Hanford Facility Resource Conservation and Recovery Act Permit for the Treatment, Storage, and Disposal of Dangerous Waste*, Chapter 10, and Attachment 51, "Waste Treatment and Immobilization Plant".

Washington Agricultural Statistics Service. 2001. *2001 Washington Agricultural Statistics*. Olympia, Washington, USA.

Water Resources of Washington State. 2002. *Volumetric Flow Rates*. US Department of Interior, US Geological Survey. Available at http://wa.water.usgs.gov/. (Accessed in 2002.)

Weiss SG and Mitchell RM. 1992. *A Synthesis of Ecological Data from the 100 Areas of the Hanford Site*, WHC-EP-0601, October 1992. Westinghouse Hanford Company, Richland, Washington, USA.

Western Regional Climate Center. 2002. *Washington Annual Precipitation Summary*. Available at http://www.wrcc.dri.edu/htmlfiles/wa/wa.ppt.ext.html. (Accessed in August 2002.)

WHC. 1992. *Biological Assessment for Rare and Endangered Plant Species Related to CERCLA Characterization Activities*, WHC-EP-0562, April 1992. Westinghouse Hanford Company, Richland, Washington, USA.

WHC. 1993. *100 Areas CERCLA Ecological Investigations*, WHC-EP-0620, September 1993. Westinghouse Hanford Company, Richland, Washington, USA.

WHC. 1994. *Threatened and Endangered Wildlife Species of the Hanford Site Related to CERCLA Characterization Activities*, WHC-EP-0513, 2 June 1994. Westinghouse Hanford Company, Richland, Washington, USA.

WHO. 1997. Meeting on the Derivation of Toxic Equivalency Factors (TEFs) for PCBs, PCDDs, PCDFs, and Other Dioxin-like Compounds for Human Health and Wildlife. Institute for Environmental Medicine, Karolinska Institute, Stockholm, Sweden, 15 through 18 June 1997. Draft report, 30 July 1997.

WHO. 1998. *Assessment of the Health Risk of Dioxins: Re-evaluation of the Tolerable Daily Intake (TDI)*. WHO Consultation, WHO European Centre for Environment and Health, International Programme on Chemical Safety, 25 through 29 May 1998.

Wiemers KD, Lerchen ME, Miller M, and Meier K. 1998. *Regulatory Data Quality Objectives Supporting Tank Waste Remediation System Privatization Project*, PNNL-12040, Rev 0, December 1998. Pacific Northwest National Laboratory, Richland, Washington, USA.

Wisiol K. 1984. "Estimating Grazingland Yield from Commonly Available Data," in *J. Range Mgmt*., Volume 37, Issue 5, p 471–475, September 1984.

Appendix A

Constituents of Potential Concern

Appendix A
Constituents of Potential Concern

Contents

References for Appendix A ..... **A-iii**

Project Documents ..... **A-iii**

Codes and Standards ..... **A-iii**

Other Documents ..... **A-iii**

Tables

Table A-1 **Organic Constituents of Potential Concern Retained by the Regulatory Data Quality Objective Process** **A-1**

Table A-2 **Inorganic Constituents of Potential Concern Retained by the Regulatory Data Quality Objective Process** **A-3**

Table A-3 **Constituents of Potential Concern from the Environmental Protection Agency's Recommended Products of Incomplete Combustion (PIC) List** **A-4**

Table A-4 **Constituents of Potential Concern Identified as PICs During Bench-Scale Melter Testing** **A-6**

Table A-5 **Constituents of Potential Concern Eliminated by Regulatory DQO Process and Added Back to COPC list** **A-7**

Table A-6 **Constituents of Potential Concern: Radionuclides** **A-8**

Table A-7 **Constituents with Data Available to Estimate Human Cancer Risk and/or Noncancer Hazard: Hanford Site Industrial Worker** **A-9**

Table A-8 **Constituents with Data Available to Estimate Human Cancer Risk and/or Noncancer Hazard: Resident Receptors** **A-17**

Table A-9 **Constituents with Data Available to Estimate Human Cancer Risk and/or Noncancer Hazard: Native American Subsistence Receptors** **A-29**

Table A-10 **Constituents with Data Available to Quantify Human Infant Ingestion of Breast Milk** **A-41**

Table A-11 **Constituents with Data Available to Estimate Potential for Acute Human Hazards from Emissions** **A-42**

Table A-12 **Constituents with Data Available to Estimate Potential for Hazards to Terrestrial Plants and Invertebrates from Emissions** **A-50**

Table A-13 **Constituents with Data Available to Estimate Potential for Hazards to Terrestrial Mammals and Birds from Emissions** **A-58**

Table A-14 **Constituents with Data Available to Estimate Potential for Hazards to Aquatic Biota, Salmonids, and Benthic Invertebrates from Emissions** **A-66**

References for Appendix A

Project Documents

None

Codes and Standards

None

Other Documents

Boothe GF. 1996. *Predominant Radionuclides in Hanford Site Waste Tanks*, WHC-SD-WM-TI-731, Revision 0. Westinghouse Hanford Company, Richland, Washington, USA.

DOE. 1996. *Draft Environmental Impact Statement for the Tank Waste Remediation System*, DOE/EIS-01. US Department of Energy, Washington, DC, USA.

Kupfer MJ, Boldt AL, Hodgson KM, Shelton LW, Simpson BC, and others. 1997. *Standard Inventories of Chemicals and Radionuclides in Hanford Site Tank Wastes*, HNF-SD-WM-TI-740, Revision 9. Fluor Daniel Hanford, Inc., Richland, Washington, USA.

Table A-1 Organic Constituents of Potential Concern Retained by the Regulatory Data Quality Objective Process

Constituent of Potential Concern	CAS Registry Number	Constituent of Potential Concern	CAS Registry Number
1,1,1-Trichloroethane	71-55-6	Chloroform	67-66-3
1,1,2,2-Tetrachloroethane	79-34-5	Chloromethane	74-87-3
1,1,2,2-Tetrachloroethene	127-18-4	Cyclohexane	110-82-7
1,1,2-Trichloroethane	79-00-5	Cyclohexanone	108-94-1
1,1,2-Trichloroethylene	79-01-6	Cyclohexene	110-83-8
1,1'-Biphenyl	92-52-4	Cyclopentane	287-92-3
1,1-Dichloroethane	75-34-3	Dibenz[a,h]anthracene	53-70-3
1,1-Dichloroethene	75-35-4	Dichlorodifluoromethane	75-71-8
1,1-Dimethylhydrazine	57-14-7	Dichlorofluoromethane	75-43-4
1,2,2-Trichloro-1,1,2-trifluoroethane	76-13-1	Dichloromethane	75-09-2
1,2,4-Trichlorobenzene	120-82-1	Dieldrin	60-57-1
1,2-Dichloro-1,1,2,2-tetrafluoroethane	76-14-2	Endrin	72-20-8
1,2-Dichlorobenzene	95-50-1	Ethyl alcohol	64-17-5
1,2-Dichloroethane	107-06-2	Ethyl benzene	100-41-4
1,2-Dichloropropane	78-87-5	Ethylene dibromide	106-93-4
1,3-Butadiene	106-99-0	Formic acid	64-18-6
1,3-Dichlorobenzene	541-73-1	gamma-BHC (Lindane)	58-89-9
cis-1,3-Dichloropropene	10061-01-5	Heptachlor	76-44-8
trans-1,3-Dichloropropene	10061-02-6	Hexachlorobenzene	118-74-1
1,4-Dichlorobenzene	106-46-7	Hexachlorobutadiene	87-68-3
1,4-Dinitrobenzene	100-25-4	Hexachloronaphthalene	1335-87-1
1,4-Dioxane	123-91-1	Hexafluoroacetone	684-16-2
1-Chloroethene	75-01-4	Isodrin	465-73-6
1-Methylpropyl alcohol	78-92-2	Methyl alcohol	67-56-1
2,6-Bis(tert-butyl)-4-methylphenol	128-37-0	Methylcyclohexane	108-87-2
2-Butanone	78-93-3	Methylhydrazine	60-34-4
2-Butenaldehyde (2-Butenal)	4170-30-3	Methyl isocyanate	624-83-9
2-Heptanone	110-43-0	N,N-Diphenylamine	122-39-4
2-Hexanone	591-78-6	n-Butyl alcohol	71-36-3
2-Methyl-2-propanol	75-65-0	n-Heptane	142-82-5
2-Methyl-2-propenenitrile	126-98-7	n-Hexane	110-54-3
2-Pentanone	107-87-9	Nitric acid, propyl ester	627-13-4
2-Propanone (Acetone)	67-64-1	Nitrobenzene	98-95-3
2-Propenoic acid	79-10-7	p-Nitrochlorobenzene	100-00-5
2-Propyl alcohol	67-63-0	N-Nitroso-N,N-dimethylamine	62-75-9
2-sec-Butyl-4,6-dinitrophenol	88-85-7	n-Nonane	111-84-2
3-Chloropropene (Allyl chloride)	107-05-1	n-Octane	111-65-9
3-Heptanone	106-35-4	n-Pentane	109-66-0
3-Methyl-2-butanone	563-80-4	n-Propionaldehyde	123-38-6
3-Pentanone	96-22-0	n-Propyl alcohol	71-23-8
4-Heptanone	123-19-3	Octachloronaphthalene	2234-13-1
4-Methyl-2-pentanone	108-10-1	Oxalic acid	144-62-7
5-Methyl-2-hexanone	110-12-3	Oxirane	75-21-8

Table A-1 Organic Constituents of Potential Concern Retained by the Regulatory Data Quality Objective Process

Constituent of Potential Concern	CAS Registry Number	Constituent of Potential Concern	CAS Registry Number
Acetic acid	64-19-7	Pentachloronaphthalene	1321-64-8
Acetic acid ethyl ester	141-78-6	Pentachloronitrobenzene	82-68-8
Acetic acid n-butyl ester	123-86-4	Pentachlorophenol	87-86-5
Acetonitrile	75-05-8	Phenol	108-95-2
Acetophenone	98-86-2	Picric acid	88-89-1
Acrolein	107-02-8	Polychlorinated biphenyls (PCBs)	1336-36-3
Acrylonitrile	107-13-1	Propionitrile	107-12-0
Aldrin	309-00-2	Pyridine	110-86-1
Ammonium perfluorooctanoate	3825-26-1	Styrene	100-42-5
Benzene	71-43-2	Tetrachloronaphthalene	1335-88-2
Benzo[a]pyrene	50-32-8	Tetrahydrofuran	109-99-9
alpha-BHC	319-84-6	Toluene	108-88-3
beta-BHC	319-85-7	Toxaphene	8001-35-2
Bromomethane	74-83-9	Tributyl phosphate	126-73-8
Butane	106-97-8	Trichlorofluoromethane	75-69-4
Carbon disulfide	75-15-0	Triethylamine	121-44-8
Carbon tetrachloride	56-23-5	m-Xylene	108-38-3
Chlorobenzene	108-90-7	o-Xylene	95-47-6
Chlorodifluoromethane	75-45-6	p-Xylene	106-42-3
Chloroethane	75-00-3		
Coplanar PCBs			
2,2',3,3',4,4',5-Heptachlorobiphenyl	35065-30-6	2,3,4,4',5-Pentachlorobiphenyl	74472-37-0
2,2',3,4,4',5,5'-Heptachlorobiphenyl	35065-29-3	2',3,4,4',5-Pentachlorobiphenyl	65510-44-3
2,3,3',4,4',5,5'-Heptachlorobiphenyl	39635-31-9	2,3',4,4',5-Pentachlorobiphenyl	31508-00-6
2,3,3',4,4',5'-Hexachlorobiphenyl	69782-90-7	3,3',4,4',5,5'-Hexachlorobiphenyl	32774-16-6
2,3,3',4,4',5-Hexachlorobiphenyl	38380-08-4	3,3',4,4',5-Pentachlorobiphenyl	57465-28-8
2,3,3',4,4'-Pentachlorobiphenyl	32598-14-4	3,3',4,4'-Tetrachlorobiphenyl	32598-13-3
2,3',4,4',5,5'-Hexachlorobiphenyl	52663-72-6	3,4,4',5-Tetrachlorobiphenyl	70362-50-4

CAS = Chemical Abstracts Service.

Table A-2 Inorganic Constituents of Potential Concern Retained by the Regulatory Data Quality Objective Process

Constituent of Potential Concern	CAS Registry Number	Constituent of Potential Concern	CAS Registry Number
Aluminum	7429-90-5	Molybdenum	7439-98-7
Ammonia/Ammonium	7664-41-7	Nickel	7440-02-0
Antimony	7440-36-0	Nitrate	14797-55-8
Arsenic	7440-38-2	Nitrite	14797-65-0
Barium	7440-39-3	Phosphate	14265-44-2
Beryllium	7440-41-7	Phosphorus	7723-14-0
Bismuth	7440-69-9	Potassium	7440-09-7
Boron	7440-42-8	Rhodium	7440-16-6
Bromide	24959-67-9	Selenium	7782-49-2
Cadmium	7440-43-9	Silicon	7440-21-3
Calcium	7440-70-2	Silver	7440-22-4
Chloride	16887-00-6	Sodium	7440-23-5
Chromium	18540-29-9	Strontium	7440-24-6
Cobalt	7440-48-4	Sulfate	14808-79-8
Copper	7440-50-8	Tantalum	7440-25-7
Cyanide	57-12-5	Thallium	7440-28-0
Fluoride	16984-48-8	Tin	7440-31-5
Hydroxide	14280-30-9	Total sulfur	63705-05-5
Iodine	7553-56-2	Tungsten	7440-33-7
Iron	7439-89-6	Uranium	7440-61-1
Lead	7439-92-1	Vanadium	7440-62-2
Lithium	7439-93-2	Yttrium	7440-65-5
Magnesium	7439-95-4	Zinc	7440-66-6
Manganese	7439-96-5	Zirconium	7440-67-7
Mercury	7439-97-6		

CAS = Chemical Abstracts Service.

Table A-3 Constituents of Potential Concern from the Environmental Protection Agency's Recommended Products of Incomplete Combustion (PIC) List

Constituent of Potential Concern	CAS Registry Number	Constituent of Potential Concern	CAS Registry Number
1,1,1,2-Tetrachloroethane	630-20-6	Butylbenzyl phthalate	85-68-7
1,2,3,4,6,7,8-Heptachlorodibenzo(p)dioxin	35822-46-9	Captan	133-06-2
1,2,3,4,6,7,8-Heptachlorodibenzofuran	67562-39-4	Chlordane	57-74-9
1,2,3,4,7,8,9-Heptachlorodibenzofuran	55673-89-7	p-Chloroaniline	106-47-8
1,2,3,4,7,8-Hexachlorodibenzo(p)dioxin	39227-28-6	Chlorobenzilate	510-15-6
1,2,3,4,7,8-Hexachlorodibenzofuran	70648-26-9	Chlorocyclopentadiene	41851-50-7
1,2,3,6,7,8-Hexachlorodibenzo(p)dioxin	57653-85-7	Chlorodibromomethane	124-48-1
1,2,3,6,7,8-Hexachlorodibenzofuran	57117-44-9	Chrysene	218-01-9
1,2,3,7,8,9-Hexachlorodibenzo(p)dioxin	19408-74-3	m-Cresol	108-39-4
1,2,3,7,8,9-Hexachlorodibenzofuran	72918-21-9	o-Cresol	95-48-7
1,2,3,7,8-Pentachlorodibenzo(p)dioxin	40321-76-4	p-Cresol	106-44-5
1,2,3,7,8-Pentachlorodibenzofuran	57117-41-6	Cumene	98-82-8
1,2,3-Trichloropropane	96-18-4	Cyanogen	460-19-5
1,2,4,5-Tetrachlorobenzene	95-94-3	Cyanogen bromide	506-68-3
1,2-Dibromo-3-chloropropane	96-12-8	Cyanogen chloride	506-77-4
trans-1,2-Dichloroethylene	156-60-5	Dibenzo[a,e]fluoranthene	5385-75-1
1,2-Dimethylhydrazine	540-73-8	Dibenzo[a,h]fluoranthene	No CAS #
1,2-Diphenylhydrazine	122-66-7	Dibenzofuran	132-64-9
1,3,5-Trimethyl benzene	108-67-8	Dibutyl phthalate	84-74-2
1,3,5-Trinitrobenzene	99-35-4	Dichloroisopropyl ether	108-60-1
1,3-Dichloropropene	542-75-6	Dichloromethyl ether	542-88-1
1,3-Dinitrobenzene	99-65-0	Dichloropentadiene	61626-71-9
1,3-Propane sultone	1120-71-4	Diethyl phthalate	84-66-2
1,4-Dichloro-2-butene	764-41-0	Dimethyl aminoazobenzene	60-11-7
2,2,4-Trimethylpentane	540-84-1	Dimethyl phthalate	131-11-3
2,3,4,6,7,8-Hexachlorodibenzofuran	60851-34-5	Dimethyl sulfate	77-78-1
2,3,4,7,8-Pentachlorodibenzofuran	57117-31-4	o-Dinitrobenzene	528-29-0
2,3,7,8-Tetrachlorodibenzo(p)dioxin	1746-01-6	di-n-Propylnitrosamine	621-64-7
2,3,7,8-Tetrachlorodibenzofuran	51207-31-9	Endothall	145-73-3
2,4,5-Trichlorophenol	95-95-4	Epichlorohydrin	106-89-8
2,4,6-Trichlorophenol	88-06-2	Ethyl carbamate (Urethane)	51-79-6
2,4-D and esters	94-75-7	Ethyl methacrylate	97-63-2
2,4-Dichlorophenol	120-83-2	Ethyl methanesulfonate	62-50-0
2,4-Dimethylphenol	105-67-9	Ethylene glycol	107-21-1
2,4-Dinitrophenol	51-28-5	Ethylene glycol monobutyl ether	111-76-2
2,4-Dinitrotoluene	121-14-2	Ethylene glycol monoethyl ether acetate	111-15-9
2,4-Toluene diisocyanate	584-84-9	Ethylene thiourea	96-45-7
2,6-Dinitrotoluene	606-20-2	Fluoranthene	206-44-0
2-Chloroacetophenone	532-27-4	Formaldehyde	50-00-0
2-Chloronaphthalene	91-58-7	Furfural	98-01-1
2-Chlorophenol	95-57-8	Glycidylaldehyde	765-34-4
2-Chloropropane	75-29-6	Hexachlorocyclopentadiene	77-47-4
2-Cyclohexyl-4,6-dinitrophenol	131-89-5	Hexachloroethane	67-72-1
2-Ethoxyethanol	110-80-5	Hexachlorophene	70-30-4
2-Methoxyethanol	109-86-4	Hexamethylene-1,5-diisocyanate	822-06-0

Table A-3 Constituents of Potential Concern from the Environmental Protection Agency's Recommended Products of Incomplete Combustion (PIC) List

Constituent of Potential Concern	CAS Registry Number	Constituent of Potential Concern	CAS Registry Number
2-Nitrophenol	88-75-5	Indeno[1,2,3-cd]pyrene	193-39-5
3,3'-Dichlorobenzidine	91-94-1	Maleic hydrazide	123-33-1
3,3'-Dimethoxybenzidine	119-90-4	Malononitrile	109-77-3
4,4'-DDE	72-55-9	Methoxychlor	72-43-5
4,4'-Methylenedianiline	101-77-9	Methyl styrene (mixed isomers)	25013-15-4
4,6-Dinitro-o-cresol	534-52-1	Methyl tert-butyl ether	1634-04-4
4-Nitrophenol	100-02-7	Methylene bromide	74-95-3
Acetaldehyde	75-07-0	Naphthalene	91-20-3
Aniline	62-53-3	n-Dioctyl phthalate	117-84-0
o-Anisidine	90-04-0	o-Nitroaniline	88-74-4
Anthracene	120-12-7	N-Nitrosodi-n-butylamine	924-16-3
Azobenzene	103-33-3	Octachlorodibenzo(p)dioxin	3268-87-9
Benzaldehyde	100-52-7	Octachlorodibenzofuran	39001-02-0
Benzo[a]anthracene	56-55-3	Pentachlorobenzene	608-93-5
Benzo[b]fluoranthene	205-99-2	Pentachloroethane	76-01-7
Benzo[e]pyrene	192-97-2	Phosgene	75-44-5
Benzo[g,h,i]perylene	191-24-2	Phthalic anhydride	85-44-9
Benzo[j]fluoranthene	205-82-3	Pronamide	23950-58-5
Benzo[k]fluoranthene	207-08-9	Propargyl alcohol	107-19-7
Benzoic acid	65-85-0	Propylene glycol monomethyl ether	107-98-2
Benzotrichloride	98-07-7	Pyrene	129-00-0
Benzyl chloride	100-44-7	Quinoline	91-22-5
Bis(2-chloroethoxy)methane	111-91-1	Quinone	106-51-4
Bis(2-chloroethyl) ether	111-44-4	Safrole	94-59-7
Bis(2-ethylhexyl) phthalate (DEHP)	117-81-7	Strychnine	57-24-9
Bromochloromethane	74-97-5	Toluene-2,6-diamine	823-40-5
Bromodichloromethane	75-27-4	o-Toluidine	95-53-4
Bromoethene	593-60-2	p-Toluidine	106-49-0
Bromoform	75-25-2	Vinyl acetate	108-05-4

CAS = Chemical Abstracts Service.

Table A-4 Constituents of Potential Concern Identified as PICs During Bench-Scale Melter Testing

Constituent of Potential Concern	CAS Registry Number
1,2,3-Trichlorobenzene	87-61-6
1,2,4-Trimethyl benzene	95-63-6
cis-1,2-Dichloroethene	156-59-2
2-Chlorotoluene	95-49-8
2-Methyl naphthalene	91-57-6
4-Chlorotoluene	106-43-4
Benzyl alcohol	100-51-6
Bromobenzene	108-86-1
sec-Butyl benzene	135-98-8
tert-Butyl benzene	98-06-6
p-Cymene	99-87-6
Iodomethane	74-88-4
Methyl methacrylate	80-62-6
n-Butyl benzene	104-51-8
n-Propyl benzene	103-65-1
Phenanthrene	85-01-8

CAS = Chemical Abstracts Service.
PIC = Product of incomplete combustion.

Table A-5 Constituents of Potential Concern Eliminated by Regulatory DQO Process and Added Back to COPC List

Constituent of Potential Concern	CAS Registry Number	Constituent of Potential Concern	CAS Registry Number
Detected Chemicals Eliminated from DQO		**Non-Detected Chemicals Eliminated from DQO**	
1,2-Epoxybutane	106-88-7	1,1,1,2-Tetrachloro-2,2-difluoroethane	76-11-9
1-Nitropropane	108-03-2	1,1,2,2-Tetrachloro-1,2-difluoroethane	76-12-0
2-Methylaziridine	75-55-8	1,2-Dichloroethylene	540-59-0
2-Methylpropyl alcohol	78-83-1	2,2-Dichloropropionic acid	75-99-0
2-Propene-1-ol	107-18-6	2,3,4,6-Tetrachlorophenol	58-90-2
3-Methyl-1-butanol	123-51-3	2,4,5-T	93-76-5
4-Chloro-3-methylphenol	59-50-7	2-Nitrotoluene	88-72-2
4-Methyl-3-penten-2-one	141-79-7	3-Methylcholanthrene	56-49-5
Acenaphthene	83-32-9	4,4'-DDD	72-54-8
Acetamide	60-35-5	4,4'-DDT	50-29-3
alpha-Methylstyrene	98-83-9	4-Bromophenylphenyl ether	101-55-3
Bis(3-tert-butyl-4-hydroxy-6-methyl-phenyl)sulfide	96-69-5	4-Nitrobiphenyl	92-93-3
		5-Methylchrysene	3697-24-3
Bis(isopropyl)ether	108-20-3	5-Nitroacenaphthene	602-87-9
Cyclohexanol	108-93-0	Acenaphthylene	208-96-8
Diphenyl ether	101-84-8	Benzo[a,i]pyrene	191-30-0
Fluorene	86-73-7	BHC	319-86-8
Formamide	75-12-7	Butyltoluene	98-51-1
Formic acid, methyl ester	107-31-3	Chloropentafluoroethane	76-15-3
Methyl acetate	79-20-9	Dibenz[a,h]acridine	226-36-8
Methylacetylene	74-99-7	Dibenz[a,j]acridine	224-42-0
N,N-Dimethylacetamide	127-19-5	Dibenzo[a,e]pyrene	192-65-4
Nitromethane	75-52-5	Dibenzo[a,h]pyrene	189-64-0
N-Nitrosomorpholine	59-89-2	Dibenzo[a,i]pyrene	189-55-9
n-Valeraldehyde	110-62-3	Dibutylphosphate	107-66-4
Propionic acid	79-09-4	Difluorodibromomethane	75-61-6
Trimethylamine	75-50-3	Dimethylaniline	121-69-7
		Ethyl ether	60-29-7
		Indene	95-13-6
		Mirex	2385-85-5
		Nitrofen	1836-75-5
		Phthalic acid	100-21-0
		Silvex (2,4,5-TP)	93-72-1
		Terphenyls	26140-60-3
		Trichloroacetic acid	76-03-9
		Trichlorofluoroethane	27154-33-2
		Trichloronaphthalene	1321-65-9
		Trifluorobromomethane	75-63-8
		Trifluralin	1582-09-8
		Trimethyl benzene	25551-13-7
		Triphenylamine	603-34-9

CAS = Chemical Abstracts Service.
DQO = Data Quality Objectives.

Table A-6 Constituents of Potential Concern: Radionuclides

Constituent of Potential Concern	CAS Registry Number	Estimated Contribution to Total Activity of Waste[a]	
		% Total Activity	Cumulative % Total Activity
Strontium-90	10098-97-2	30.39	30.30
Yttrium-90	10098-91-6	30.39	60.78
Cesium-137	10045-97-3	19.75	80.53
Barium-137	13981-97-0	18.73	99.26
Samarium-151	15715-94-3	0.35	99.61
Niobium-93	7440-03-1[b]	0.15	99.76
Americium-241	1596-10-2	0.06	99.82
Plutonium-241	14119-32-5	0.04	99.86
Europium-155	14391-16-3	0.03	99.89
Europium-154	15585-10-1	0.03	99.92
Antimony-125	14234-35-6	0.02	99.94
Technetium-99	14133-79-7	0.02	99.96
Cadmium-113	14336-66-4	0.01	99.97
Cesium-134	13967-70-9	0.01	99.98
Plutonium-239	15117-48-3	0.01	99.99
Tritium	10028-17-8	0.01	100.00
Actinium-227	14952-40-0	0	100.00
Americium-243	14993-75-0	0	100.00
Carbon-14	14762-75-5	0	100.00
Cobalt-60	10198-40-0	0	100.00
Curium-242	15510-73-3	0	100.00
Curium-243	15757-87-6	0	100.00
Curium-244	13981-15-2	0	100.00
Europium-152	14683-23-9	0	100.00
Iodine-129	15046-84-1	0	100.00
Neptunium-237	13994-20-2	0	100.00
Nickel-59	14336-70-0	0	100.00
Nickel-63	13981-37-8	0	100.00
Plutonium-238	13981-16-3	0	100.00
Plutonium-240	14119-33-6	0	100.00
Plutonium-242	13982-10-0	0	100.00
Protactinium-231	14331-85-2	0	100.00
Radium-226	13982-63-3	0	100.00
Radium-228	15262-20-1	0	100.00
Ruthenium-106	13967-48-1	0	100.00
Selenium-79	15758-45-9	0	100.00
Thorium-229	15594-54-4	0	100.00
Thorium-232	7440-29-1	0	100.00
Tin-126	15832-50-5	0	100.00
Uranium-232	14158-29-3	0	100.00
Uranium-233	13968-55-3	0	100.00
Uranium-234	13966-29-5	0	100.00
Uranium-235	15117-96-1	0	100.00
Uranium-236	13982-70-2	0	100.00
Uranium-238	7440-61-1	0	100.00
Zirconium-93	15751-77-6	0	100.00

CAS = Chemical Abstracts Service.

[a] From *Predominant Radionuclides in Hanford Site Waste Tanks* (Boothe 1996) and *Draft Environmental Impact Statement for the Tank Waste Remediation System* DOE 1996 as reported in *Standard Inventories of Chemicals and Radionuclides in Hanford Site Tank Wastes* (Kupfer 1997).

[b] CAS Registry Number for niobium metal.

Table A-7 Constituents with Data Available to Estimate Human Cancer Risk and/or Noncancer Hazard: Hanford Site Industrial Worker[a]

Constituent of Potential Concern	CAS Registry Number	Exposure Media/Pathway					
		Direct Air Exposure		Direct Soil Exposure			Surface Water
		Inhalation	External Exposure	Ingestion	Inhalation	External Exposure	Ingestion
Organic Compounds							
Aromatic Halogenated Hydrocarbons							
2,3,4,6-Tetrachlorophenol	58-90-2	--	--	X	--	--	X
4-Chloro-3-methylphenol	59-50-7	--	--	--	--	--	--
Aromatic Nonhalogenated Hydrocarbons							
2-Nitrotoluene	88-72-2	--	--	X	--	--	X
4-Nitrobiphenyl	92-93-3	--	--	--	--	--	--
Benzaldehyde	100-52-7	--	--	X	--	--	X
Benzene	71-43-2	X	--	X	X	--	X
Benzyl alcohol	100-51-6	--	--	X	--	--	X
Ethyl benzene	100-41-4	X	--	X	X	--	X
m-Xylene	108-38-3	X	--	X	X	--	X
o-Xylene	95-47-6	X	--	X	X	--	X
p-Xylene	106-42-3	X	--	X	X	--	X
Styrene	100-42-5	X	--	X	X	--	X
Toluene	108-88-3	X	--	X	X	--	X
Non-aromatic Nonhalogenated Hydrocarbons							
1,2-Epoxybutane	106-88-7	X	--	--	X	--	--
1,3-Butadiene	106-99-0	X	--	--	X	--	--
1,4-Dioxane	123-91-1	X	--	X	X	--	X
1-Methylpropyl alcohol	78-92-2	X	--	--	X	--	--
1-Nitropropane	108-03-2	X	--	--	X	--	--
2,2,4-Trimethylpentane	540-84-1	X	--	--	X	--	--
2-Butanone	78-93-3	X	--	X	X	--	X
2-Butenaldehyde (2-Butenal)	4170-30-3	X	--	--	X	--	--
2-Ethoxyethanol	110-80-5	X	--	X	X	--	X
2-Heptanone	110-43-0	X	--	--	X	--	--
2-Hexanone	591-78-6	X	--	X	X	--	X
2-Methoxyethanol	109-86-4	X	--	X	X	--	X
2-Methyl-2-propanol	75-65-0	X	--	--	X	--	--
2-Methyl-2-propenenitrile	126-98-7	X	--	X	X	--	X
2-Methylaziridine	75-55-8	X	--	--	X	--	--
2-Methylpropyl alcohol	78-83-1	X	--	X	X	--	X
2-Pentanone	107-87-9	X	--	--	X	--	--
2-Propanone (Acetone)	67-64-1	X	--	X	X	--	X
2-Propene-1-ol	107-18-6	X	--	X	X	--	X
2-Propyl alcohol	67-63-0	X	--	--	X	--	--
3-Heptanone	106-35-4	X	--	--	X	--	--
3-Methyl-1-butanol	123-51-3	X	--	--	X	--	--
3-Methyl-2-butanone	563-80-4	X	--	--	X	--	--
3-Pentanone	96-22-0	X	--	--	X	--	--
4-Heptanone	123-19-3	X	--	--	X	--	--
4-Methyl-2-pentanone	108-10-1	X	--	X	X	--	X
4-Methyl-3-penten-2-one	141-79-7	X	--	--	X	--	--
5-Methyl-2-hexanone	110-12-3	X	--	--	X	--	--
Acetaldehyde	75-07-0	X	--	--	X	--	--
Acetamide	60-35-5	X	--	--	X	--	--
Acetic acid	64-19-7	X	--	--	X	--	--
Acetic acid ethyl ester	141-78-6	X	--	X	X	--	X
Acetic acid n-butyl ester	123-86-4	X	--	--	X	--	--
Acetonitrile	75-05-8	X	--	--	X	--	--
Acrolein	107-02-8	X	--	X	X	--	X
Acrylonitrile	107-13-1	X	--	X	X	--	X
Bis(isopropyl)ether	108-20-3	X	--	--	X	--	--
Butane	106-97-8	X	--	--	X	--	--
Carbon disulfide	75-15-0	X	--	X	X	--	X
Cyanogen	460-19-5	X	--	X	X	--	X
Cyclohexane	110-82-7	X	--	X	X	--	X
Cyclohexanone	108-94-1	X	--	X	X	--	X
Cyclohexene	110-83-8	X	--	--	X	--	--
Cyclopentane	287-92-3	X	--	--	X	--	--
Ethyl alcohol	64-17-5	X	--	--	X	--	--
Ethyl ether	60-29-7	X	--	X	X	--	X

Table A-7 Constituents with Data Available to Estimate Human Cancer Risk and/or Noncancer Hazard: Hanford Site Industrial Worker[a]

Constituent of Potential Concern	CAS Registry Number	Exposure Media/Pathway					
		Direct Air Exposure		Direct Soil Exposure			Surface Water
		Inhalation	External Exposure	Ingestion	Inhalation	External Exposure	Ingestion
Ethyl methacrylate	97-63-2	X	--	X	X	--	X
Formaldehyde	50-00-0	X	--	X	X	--	X
Formamide	75-12-7	X	--	--	X	--	--
Formic acid	64-18-6	X	--	X	X	--	X
Formic acid, methyl ester	107-31-3	X	--	--	X	--	--
Glycidylaldehyde	765-34-4	X	--	X	X	--	X
Methyl acetate	79-20-9	X	--	X	X	--	X
Methyl alcohol	67-56-1	X	--	X	X	--	X
Methyl isocyanate	624-83-9	X	--	--	X	--	--
Methyl methacrylate	80-62-6	X	--	X	X	--	X
Methyl tert-butyl ether	1634-04-4	X	--	--	X	--	--
Methylacetylene	74-99-7	X	--	--	X	--	--
Methylcyclohexane	108-87-2	X	--	--	X	--	--
N,N-Dimethylacetamide	127-19-5	X	--	--	X	--	--
n-Butyl alcohol	71-36-3	X	--	X	X	--	X
n-Heptane	142-82-5	X	--	--	X	--	--
n-Hexane	110-54-3	X	--	X	X	--	X
Nitromethane	75-52-5	X	--	--	X	--	--
n-Nonane	111-84-2	X	--	--	X	--	--
n-Octane	111-65-9	X	--	--	X	--	--
n-Pentane	109-66-0	X	--	--	X	--	--
n-Propionaldehyde	123-38-6	X	--	--	X	--	--
n-Propyl alcohol	71-23-8	X	--	--	X	--	--
n-Valeraldehyde	110-62-3	X	--	--	X	--	--
Oxirane	75-21-8	X	--	X	X	--	X
p-Cymene	99-87-6	X	--	--	X	--	--
Phosgene	75-44-5	X	--	--	X	--	--
Propargyl alcohol	107-19-7	X	--	X	X	--	X
Propionic acid	79-09-4	X	--	--	X	--	--
Propionitrile	107-12-0	X	--	--	X	--	--
Propylene glycol monomethyl ether	107-98-2	X	--	X	X	--	X
p-tert-Butyltoluene	98-51-1	X	--	--	X	--	--
Triethylamine	121-44-8	X	--	--	X	--	--
Trimethylamine	75-50-3	X	--	--	X	--	--
Vinyl acetate	108-05-4	X	--	X	X	--	X
Non-aromatic Halogenated Hydrocarbons							
1,1,1,2-Tetrachloro-2,2-difluoroethane	76-11-9	--	--	--	--	--	--
1,1,1,2-Tetrachloroethane	630-20-6	X	--	X	X	--	X
1,1,1-Trichloroethane	71-55-6	X	--	X	X	--	X
1,1,2,2-Tetrachloro-1,2-difluoroethane	76-12-0	--	--	--	--	--	--
1,1,2,2-Tetrachloroethane	79-34-5	X	--	X	X	--	X
1,1,2,2-Tetrachloroethene	127-18-4	X	--	X	X	--	X
1,1,2-Trichloroethane	79-00-5	X	--	X	X	--	X
1,1,2-Trichloroethylene	79-01-6	X	--	X	X	--	X
1,1-Dichloroethane	75-34-3	X	--	X	X	--	X
1,1-Dichloroethene	75-35-4	X	--	X	X	--	X
1,2,2-Trichloro-1,1,2-trifluoroethane	76-13-1	X	--	X	X	--	X
1,2,3-Trichloropropane	96-18-4	--	--	X	--	--	X
1,2-Dibromo-3-chloropropane	96-12-8	X	--	X	X	--	X
1,2-Dichloro-1,1,2,2-tetrafluoroethane	76-14-2	--	--	--	--	--	--
1,2-Dichloroethane	107-06-2	X	--	X	X	--	X
1,2-Dichloroethylene	540-59-0	--	--	X	--	--	X
1,2-Dichloropropane	78-87-5	X	--	X	X	--	X
1,3-Dichloropropene	542-75-6	X	--	X	X	--	X
1,4-Dichloro-2-butene	764-41-0	X	--	--	X	--	--
1-Chloroethene	75-01-4	X	--	X	X	--	X
2,2-Dichloropropionic acid	75-99-0	--	--	X	--	--	X
2-Chloropropane	75-29-6	X	--	--	X	--	--
3-Chloropropene (Allyl chloride)	107-05-1	X	--	--	X	--	--
Bromochloromethane	74-97-5	--	--	--	--	--	--
Bromodichloromethane	75-27-4	--	--	X	--	--	X
Bromoethene	593-60-2	X	--	--	X	--	--
Bromoform	75-25-2	X	--	X	X	--	X

Table A-7 Constituents with Data Available to Estimate Human Cancer Risk and/or Noncancer Hazard: Hanford Site Industrial Worker[a]

Constituent of Potential Concern	CAS Registry Number	Exposure Media/Pathway					
		Direct Air Exposure		Direct Soil Exposure			Surface Water
		Inhalation	External Exposure	Ingestion	Inhalation	External Exposure	Ingestion
Bromomethane	74-83-9	X	--	X	X	--	X
Carbon tetrachloride	56-23-5	X	--	X	X	--	X
Chlorodibromomethane	124-48-1	--	--	X	--	--	X
Chlorodifluoromethane	75-45-6	X	--	--	X	--	--
Chloroethane	75-00-3	X	--	--	X	--	--
Chloroform	67-66-3	X	--	X	X	--	X
Chloromethane	74-87-3	X	--	--	X	--	--
Chloropentafluoroethane	76-15-3	--	--	--	--	--	--
cis-1,2-Dichloroethene	156-59-2	--	--	X	--	--	X
cis-1,3-Dichloropropene	10061-01-5	--	--	--	--	--	--
Cyanogen bromide	506-68-3	--	--	X	--	--	X
Cyanogen chloride	506-77-4	--	--	X	--	--	X
Dichlorodifluoromethane	75-71-8	X	--	X	X	--	X
Dichlorofluoromethane	75-43-4	--	--	--	--	--	--
Dichloromethane	75-09-2	X	--	X	X	--	X
Difluorodibromomethane	75-61-6	--	--	--	--	--	--
Hexafluoroacetone	684-16-2	--	--	--	--	--	--
Iodomethane	74-88-4	--	--	--	--	--	--
Methylene bromide	74-95-3	--	--	X	--	--	X
Pentachloroethane	76-01-7	--	--	--	--	--	--
trans-1,2-Dichloroethylene	156-60-5	--	--	X	--	--	X
trans-1,3-Dichloropropene	10061-02-6	--	--	--	--	--	--
Trichloroacetic acid	76-03-9	--	--	--	--	--	--
Trichlorofluoroethane	27154-33-2	--	--	--	--	--	--
Trichlorofluoromethane	75-69-4	X	--	X	X	--	X
Trifluorobromomethane	75-63-8	--	--	--	--	--	--
Dioxin and Furan Compounds (PCDDs/PCDFs)							
1,2,3,4,6,7,8-Heptachlorodibenzo(p)dioxin	35822-46-9	X	--	X	X	--	X
1,2,3,4,6,7,8-Heptachlorodibenzofuran	67562-39-4	X	--	X	X	--	X
1,2,3,4,7,8,9-Heptachlorodibenzofuran	55673-89-7	X	--	X	X	--	X
1,2,3,4,7,8-Hexachlorodibenzo(p)dioxin	39227-28-6	X	--	X	X	--	X
1,2,3,4,7,8-Hexachlorodibenzofuran	70648-26-9	X	--	X	X	--	X
1,2,3,6,7,8-Hexachlorodibenzo(p)dioxin	57653-85-7	X	--	X	X	--	X
1,2,3,6,7,8-Hexachlorodibenzofuran	57117-44-9	X	--	X	X	--	X
1,2,3,7,8,9-Hexachlorodibenzo(p)dioxin	19408-74-3	X	--	X	X	--	X
1,2,3,7,8,9-Hexachlorodibenzofuran	72918-21-9	X	--	X	X	--	X
1,2,3,7,8-Pentachlorodibenzo(p)dioxin	40321-76-4	X	--	X	X	--	X
1,2,3,7,8-Pentachlorodibenzofuran	57117-41-6	X	--	X	X	--	X
2,3,4,6,7,8-Hexachlorodibenzofuran	60851-34-5	X	--	X	X	--	X
2,3,4,7,8-Pentachlorodibenzofuran	57117-31-4	X	--	X	X	--	X
2,3,7,8-Tetrachlorodibenzo(p)dioxin	1746-01-6	X	--	X	X	--	X
2,3,7,8-Tetrachlorodibenzofuran	51207-31-9	X	--	X	X	--	X
Dibenzofuran	132-64-9	--	--	X	--	--	X
Octachlorodibenzo(p)dioxin	3268-87-9	X	--	X	X	--	X
Octachlorodibenzofuran	39001-02-0	X	--	X	X	--	X
Polychlorinated Biphenyls (PCBs)							
2,2',3,3',4,4',5-Heptachlorobiphenyl	35065-30-6	--	--	--	--	--	--
2,2',3,4,4',5,5'-Heptachlorobiphenyl	35065-29-3	--	--	--	--	--	--
2,3,3',4,4',5,5'-Heptachlorobiphenyl	39635-31-9	X	--	X	X	--	X
2,3,3',4,4',5'-Hexachlorobiphenyl	69782-90-7	X	--	X	X	--	X
2,3,3',4,4',5-Hexachlorobiphenyl	38380-08-4	X	--	X	X	--	X
2,3,3',4,4'-Pentachlorobiphenyl	32598-14-4	X	--	X	X	--	X
2,3',4,4',5,5'-Hexachlorobiphenyl	52663-72-6	X	--	X	X	--	X
2,3,4,4',5-Pentachlorobiphenyl	74472-37-0	X	--	X	X	--	X
2',3,4,4',5-Pentachlorobiphenyl	65510-44-3	X	--	X	X	--	X
2,3',4,4',5-Pentachlorobiphenyl	31508-00-6	X	--	X	X	--	X
3,3',4,4',5,5'-Hexachlorobiphenyl	32774-16-6	X	--	X	X	--	X
3,3',4,4',5-Pentachlorobiphenyl	57465-28-8	X	--	X	X	--	X
3,3',4,4'-Tetrachlorobiphenyl	32598-13-3	X	--	X	X	--	X
3,4,4',5-Tetrachlorobiphenyl	70362-50-4	X	--	X	X	--	X
Polychlorinated biphenyls (PCBs)	1336-36-3	X	--	X	X	--	X
Phthalates							
Bis(2-ethylhexyl) phthalate (DEHP)	117-81-7	--	--	X	--	--	X

Table A-7 Constituents with Data Available to Estimate Human Cancer Risk and/or Noncancer Hazard: Hanford Site Industrial Worker[a]

Constituent of Potential Concern	CAS Registry Number	Exposure Media/Pathway					
		Direct Air Exposure		Direct Soil Exposure			Surface Water
		Inhalation	External Exposure	Ingestion	Inhalation	External Exposure	Ingestion
Butylbenzyl phthalate	85-68-7	--	--	X	--	--	X
Dibutyl phthalate	84-74-2	--	--	X	--	--	X
Diethyl phthalate	84-66-2	--	--	X	--	--	X
Dimethyl phthalate	131-11-3	--	--	--	--	--	--
n-Dioctyl phthalate	117-84-0	--	--	X	--	--	X
Light Polycyclic Aromatic Hydrocarbons (molecular weight <200 g/mole)							
2-Chloronaphthalene	91-58-7	--	--	X	--	--	X
2-Methyl naphthalene	91-57-6	X	--	X	X	--	X
5-Nitroacenaphthene	602-87-9	--	--	--	--	--	--
Acenaphthene	83-32-9	--	--	X	--	--	X
Acenaphthylene	208-96-8	--	--	--	--	--	--
Anthracene	120-12-7	--	--	X	--	--	X
Fluorene	86-73-7	--	--	X	--	--	X
Indene	95-13-6	--	--	--	--	--	--
Naphthalene	91-20-3	X	--	X	X	--	X
Phenanthrene	85-01-8	--	--	--	--	--	--
Pyrene	129-00-0	--	--	X	--	--	X
Heavy Polycyclic Aromatic Hydrocarbons (molecular weight >200 g/mole)							
3-Methylcholanthrene	56-49-5	--	--	--	--	--	--
5-Methylchrysene	3697-24-3	--	--	--	--	--	--
Benzo[a]anthracene	56-55-3	X	--	X	X	--	X
Benzo[a]pyrene	50-32-8	X	--	X	X	--	X
Benzo[a,i]pyrene	191-30-0	--	--	--	--	--	--
Benzo[b]fluoranthene	205-99-2	X	--	X	X	--	X
Benzo[e]pyrene	192-97-2	--	--	--	--	--	--
Benzo[g,h,i]perylene	191-24-2	--	--	--	--	--	--
Benzo[j]fluoranthene	205-82-3	--	--	--	--	--	--
Benzo[k]fluoranthene	207-08-9	X	--	X	X	--	X
Chrysene	218-01-9	X	--	X	X	--	X
Dibenz[a,h]acridine	226-36-8	--	--	--	--	--	--
Dibenz[a,h]anthracene	53-70-3	X	--	X	X	--	X
Dibenz[a,j]acridine	224-42-0	--	--	--	--	--	--
Dibenzo[a,e]fluoranthene	5385-75-1	--	--	--	--	--	--
Dibenzo[a,e]pyrene	192-65-4	--	--	--	--	--	--
Dibenzo[a,h]fluoranthene	No CAS #	--	--	--	--	--	--
Dibenzo[a,h]pyrene	189-64-0	--	--	--	--	--	--
Dibenzo[a,i]pyrene	189-55-9	--	--	--	--	--	--
Fluoranthene	206-44-0	--	--	X	--	--	X
Hexachloronaphthalene	1335-87-1	--	--	--	--	--	--
Indeno[1,2,3-cd]pyrene	193-39-5	X	--	X	X	--	X
Octachloronaphthalene	2234-13-1	--	--	--	--	--	--
Pentachloronaphthalene	1321-64-8	--	--	--	--	--	--
Tetrachloronaphthalene	1335-88-2	--	--	--	--	--	--
Trichloronaphthalene	1321-65-9	--	--	--	--	--	--
Light Substituted Benzene Compounds (molecular weight <200 g/mole)							
1,2,3-Trichlorobenzene	87-61-6	--	--	--	--	--	--
1,2,4-Trichlorobenzene	120-82-1	X	--	X	X	--	X
1,2,4-Trimethyl benzene	95-63-6	X	--	X	X	--	X
1,2-Dichlorobenzene	95-50-1	X	--	X	X	--	X
1,3,5-Trimethyl benzene	108-67-8	X	--	X	X	--	X
1,3-Dichlorobenzene	541-73-1	--	--	--	--	--	--
1,3-Dinitrobenzene	99-65-0	--	--	X	--	--	X
1,4-Dichlorobenzene	106-46-7	X	--	X	X	--	X
1,4-Dinitrobenzene	100-25-4	--	--	X	--	--	X
2,4,5-Trichlorophenol	95-95-4	--	--	X	--	--	X
2,4,6-Trichlorophenol	88-06-2	X	--	X	X	--	X
2,4-Dichlorophenol	120-83-2	--	--	X	--	--	X
2,4-Dimethylphenol	105-67-9	--	--	X	--	--	X
2,4-Dinitrophenol	51-28-5	--	--	X	--	--	X
2,4-Dinitrotoluene	121-14-2	--	--	X	--	--	X
2,6-Dinitrotoluene	606-20-2	--	--	X	--	--	X
2-Chlorophenol	95-57-8	--	--	X	--	--	X
2-Chlorotoluene	95-49-8	--	--	X	--	--	X

Table A-7 Constituents with Data Available to Estimate Human Cancer Risk and/or Noncancer Hazard: Hanford Site Industrial Worker[a]

Constituent of Potential Concern	CAS Registry Number	Exposure Media/Pathway					
		Direct Air Exposure		Direct Soil Exposure			Surface Water
		Inhalation	External Exposure	Ingestion	Inhalation	External Exposure	Ingestion
2-Nitrophenol	88-75-5	--	--	--	--	--	--
4,6-Dinitro-o-cresol	534-52-1	--	--	--	--	--	--
4-Chlorotoluene	106-43-4	--	--	--	--	--	--
4-Nitrophenol	100-02-7	--	--	--	--	--	--
alpha-Methylstyrene	98-83-9	--	--	X	--	--	X
Aniline	62-53-3	X	--	X	X	--	X
Benzotrichloride	98-07-7	--	--	X	--	--	X
Benzyl chloride	100-44-7	--	--	X	--	--	X
Bromobenzene	108-86-1	--	--	--	--	--	--
Chlorobenzene	108-90-7	X	--	X	X	--	X
Cumene	98-82-8	X	--	X	X	--	X
m-Cresol	108-39-4	--	--	X	--	--	X
n-Butyl benzene	104-51-8	--	--	--	--	--	--
Nitrobenzene	98-95-3	X	--	X	X	--	X
n-Propyl benzene	103-65-1	--	--	--	--	--	--
o-Cresol	95-48-7	--	--	X	--	--	X
o-Dinitrobenzene	528-29-0	--	--	X	--	--	X
o-Nitroaniline	88-74-4	X	--	--	X	--	--
o-Toluidine	95-53-4	--	--	X	--	--	X
p-Chloroaniline	106-47-8	--	--	X	--	--	X
p-Cresol	106-44-5	--	--	X	--	--	X
Phenol	108-95-2	--	--	X	--	--	X
p-Nitrochlorobenzene	100-00-5	--	--	--	--	--	--
p-Toluidine	106-49-0	--	--	X	--	--	X
sec-Butyl benzene	135-98-8	--	--	--	--	--	--
tert-Butyl benzene	98-06-6	--	--	--	--	--	--
Toluene-2,6-diamine	823-40-5	--	--	X	--	--	X
Trimethyl benzene	25551-13-7	--	--	--	--	--	--
Other Light Semivolatile Compounds (molecular weight <200 g/mole)							
1,1'-Biphenyl	92-52-4	--	--	X	--	--	X
1,1-Dimethylhydrazine	57-14-7	X	--	X	X	--	X
1,2-Dimethylhydrazine	540-73-8	X	--	X	X	--	X
1,2-Diphenylhydrazine	122-66-7	X	--	X	X	--	X
1,3-Propane sultone	1120-71-4	--	--	--	--	--	--
2,4-Toluene diisocyanate	584-84-9	--	--	--	--	--	--
2-Chloroacetophenone	532-27-4	X	--	--	X	--	--
2-Propenoic acid	79-10-7	X	--	X	X	--	X
4,4'-Methylenedianiline	101-77-9	--	--	--	--	--	--
Acetophenone	98-86-2	--	--	X	--	--	X
Benzoic acid	65-85-0	--	--	X	--	--	X
Bis(2-chloroethoxy)methane	111-91-1	--	--	--	--	--	--
Bis(2-chloroethyl) ether	111-44-4	X	--	X	X	--	X
Chlorocyclopentadiene	41851-50-7	--	--	--	--	--	--
Cyclohexanol	108-93-0	--	--	--	--	--	--
Dichloroisopropyl ether	108-60-1	X	--	X	X	--	X
Dichloromethyl ether	542-88-1	X	--	X	X	--	X
Dichloropentadiene	61626-71-9	--	--	--	--	--	--
Dimethyl sulfate	77-78-1	--	--	--	--	--	--
Dimethylaniline	121-69-7	--	--	X	--	--	X
di-n-Propylnitrosamine	621-64-7	--	--	X	--	--	X
Diphenyl ether	101-84-8	--	--	--	--	--	--
Epichlorohydrin	106-89-8	X	--	X	X	--	X
Ethyl carbamate (Urethane)	51-79-6	--	--	--	--	--	--
Ethyl methanesulfonate	62-50-0	--	--	--	--	--	--
Ethylene dibromide	106-93-4	X	--	X	X	--	X
Ethylene glycol	107-21-1	--	--	X	--	--	X
Ethylene glycol monobutyl ether	111-76-2	X	--	X	X	--	X
Ethylene glycol monoethyl ether acetate	111-15-9	--	--	X	--	--	X
Ethylene thiourea	96-45-7	--	--	X	--	--	X
Furfural	98-01-1	X	--	X	X	--	X
Maleic hydrazide	123-33-1	--	--	X	--	--	X
Malononitrile	109-77-3	--	--	X	--	--	X
Methyl styrene (mixed isomers)	25013-15-4	X	--	X	X	--	X

Table A-7 Constituents with Data Available to Estimate Human Cancer Risk and/or Noncancer Hazard: Hanford Site Industrial Worker[a]

Constituent of Potential Concern	CAS Registry Number	Exposure Media/Pathway					
		Direct Air Exposure		Direct Soil Exposure			Surface Water
		Inhalation	External Exposure	Ingestion	Inhalation	External Exposure	Ingestion
Methylhydrazine	60-34-4	X	--	X	X	--	X
N,N-Diphenylamine	122-39-4	--	--	X	--	--	X
Nitric acid, propyl ester	627-13-4	--	--	--	--	--	--
N-Nitrosodi-n-butylamine	924-16-3	X	--	X	X	--	X
N-Nitrosomorpholine	59-89-2	--	--	--	--	--	--
N-Nitroso-N,N-dimethylamine	62-75-9	X	--	X	X	--	X
o-Anisidine	90-04-0	--	--	--	--	--	--
Oxalic acid	144-62-7	--	--	--	--	--	--
Phthalic anhydride	85-44-9	X	--	X	X	--	X
p-Phthalic acid	100-21-0	--	--	X	--	--	X
Pyridine	110-86-1	--	--	X	--	--	X
Quinoline	91-22-5	--	--	X	--	--	X
Quinone	106-51-4	--	--	--	--	--	--
Safrole	94-59-7	--	--	--	--	--	--
Tetrahydrofuran	109-99-9	--	--	--	--	--	--
Other Heavy Semivolatile Compounds (molecular weight >200 g/mole)							
1,2,4,5-Tetrachlorobenzene	95-94-3	--	--	X	--	--	X
1,3,5-Trinitrobenzene	99-35-4	--	--	X	--	--	X
2,6-Bis(tert-butyl)-4-methylphenol	128-37-0	--	--	--	--	--	--
2-Cyclohexyl-4,6-dinitrophenol	131-89-5	--	--	X	--	--	X
2-sec-Butyl-4,6-dinitrophenol	88-85-7	--	--	X	--	--	X
3,3'-Dichlorobenzidine	91-94-1	--	--	X	--	--	X
3,3'-Dimethoxybenzidine	119-90-4	--	--	X	--	--	X
4-Bromophenylphenyl ether	101-55-3	--	--	--	--	--	--
Ammonium perfluorooctanoate	3825-26-1	--	--	--	--	--	--
Azobenzene	103-33-3	X	--	X	X	--	X
Bis(3-tert-butyl-4-hydroxy-6-methyl-phenyl)sulfide	96-69-5	--	--	--	--	--	--
Captan	133-06-2	--	--	X	--	--	X
Chlorobenzilate	510-15-6	X	--	X	X	--	X
Dibutylphosphate	107-66-4	--	--	--	--	--	--
Dimethyl aminoazobenzene	60-11-7	--	--	--	--	--	--
Hexachlorobenzene	118-74-1	X	--	X	X	--	X
Hexachlorobutadiene	87-68-3	X	--	X	X	--	X
Hexachlorocyclopentadiene	77-47-4	X	--	X	X	--	X
Hexachloroethane	67-72-1	X	--	X	X	--	X
Hexachlorophene	70-30-4	--	--	X	--	--	X
Hexamethylene-1,5-diisocyanate	822-06-0	X	--	--	X	--	--
Mirex	2385-85-5	X	--	X	X	--	X
Nitrofen	1836-75-5	--	--	--	--	--	--
Pentachlorobenzene	608-93-5	--	--	X	--	--	X
Pentachloronitrobenzene	82-68-8	--	--	X	--	--	X
Pentachlorophenol	87-86-5	--	--	X	--	--	X
Picric acid	88-89-1	--	--	--	--	--	--
Pronamide	23950-58-5	--	--	X	--	--	X
Strychnine	57-24-9	--	--	X	--	--	X
Terphenyls	26140-60-3	--	--	--	--	--	--
Tributyl phosphate	126-73-8	--	--	--	--	--	--
Trifluralin	1582-09-8	--	--	X	--	--	X
Triphenylamine	603-34-9	--	--	--	--	--	--
Herbicides and Organochlorinated Pesticides							
2,4,5-T	93-76-5	--	--	X	--	--	X
2,4-D and esters	94-75-7	--	--	X	--	--	X
4,4'-DDD	72-54-8	--	--	X	--	--	X
4,4'-DDE	72-55-9	--	--	X	--	--	X
4,4'-DDT	50-29-3	X	--	X	X	--	X
Aldrin	309-00-2	X	--	X	X	--	X
alpha-BHC	319-84-6	X	--	X	X	--	X
beta-BHC	319-85-7	X	--	X	X	--	X
Chlordane	57-74-9	X	--	X	X	--	X
delta-BHC	319-86-8	--	--	--	--	--	--
Dieldrin	60-57-1	X	--	X	X	--	X
Endothall	145-73-3	--	--	X	--	--	X
Endrin	72-20-8	--	--	X	--	--	X

Table A-7 Constituents with Data Available to Estimate Human Cancer Risk and/or Noncancer Hazard: Hanford Site Industrial Worker[a]

Constituent of Potential Concern	CAS Registry Number	Exposure Media/Pathway					
		Direct Air Exposure		Direct Soil Exposure			Surface Water
		Inhalation	External Exposure	Ingestion	Inhalation	External Exposure	Ingestion
gamma-BHC (Lindane)	58-89-9	--	--	X	--	--	X
Heptachlor	76-44-8	X	--	X	X	--	X
Isodrin	465-73-6	--	--	--	--	--	--
Methoxychlor	72-43-5	--	--	X	--	--	X
Silvex (2,4,5-TP)	93-72-1	--	--	X	--	--	X
Toxaphene	8001-35-2	X	--	X	X	--	X
Inorganic Chemicals and Compounds							
Metals							
Aluminum	7429-90-5	--	--	--	--	--	--
Antimony	7440-36-0	--	--	X	--	--	X
Arsenic	7440-38-2	X	--	X	X	--	X
Barium	7440-39-3	X	--	X	X	--	X
Beryllium	7440-41-7	X	--	X	X	--	X
Bismuth	7440-69-9	--	--	--	--	--	--
Boron	7440-42-8	X	--	X	X	--	X
Cadmium	7440-43-9	X	--	X	X	--	X
Calcium	7440-70-2	--	--	--	--	--	--
Chromium	18540-29-9	X	--	X	X	--	X
Cobalt	7440-48-4	--	--	--	--	--	--
Copper	7440-50-8	--	--	--	--	--	--
Iron	7439-89-6	--	--	--	--	--	--
Lead	7439-92-1	--	--	--	--	--	--
Lithium	7439-93-2	--	--	--	--	--	--
Magnesium	7439-95-4	--	--	--	--	--	--
Manganese	7439-96-5	X	--	X	X	--	X
Mercury	7439-97-6	X	--	--	--	--	--
Mercury - Hg+2	7487-94-7	--	--	X	--	--	X
Methylmercury	22967-92-6	--	--	X	--	--	X
Molybdenum	7439-98-7	--	--	X	--	--	X
Nickel	7440-02-0	X	--	X	X	--	X
Potassium	7440-09-7	--	--	--	--	--	--
Rhodium	7440-16-6	--	--	--	--	--	--
Selenium	7782-49-2	--	--	X	--	--	X
Silicon	7440-21-3	--	--	--	--	--	--
Silver	7440-22-4	--	--	X	--	--	X
Sodium	7440-23-5	--	--	--	--	--	--
Strontium	7440-24-6	--	--	X	--	--	X
Tantalum	7440-25-7	--	--	--	--	--	--
Thallium	7440-28-0	--	--	X	--	--	X
Tin	7440-31-5	--	--	X	--	--	X
Tungsten	7440-33-7	--	--	--	--	--	--
Uranium	7440-61-1	--	--	X	--	--	X
Vanadium	7440-62-2	--	--	X	--	--	X
Yttrium	7440-65-5	--	--	--	--	--	--
Zinc	7440-66-6	--	--	X	--	--	X
Zirconium	7440-67-7	--	--	--	--	--	--
Non-metals and Anions							
Ammonia/Ammonium	7664-41-7	X	--	--	X	--	--
Bromide	24959-67-9	--	--	--	--	--	--
Chloride	16887-00-6	--	--	--	--	--	--
Cyanide	57-12-5	--	--	X	--	--	X
Fluoride	16984-48-8	--	--	X	--	--	X
Hydroxide	14280-30-9	--	--	--	--	--	--
Iodine	7553-56-2	--	--	--	--	--	--
Nitrate	14797-55-8	--	--	X	--	--	X
Nitrite	14797-65-0	--	--	X	--	--	X
Phosphate	14265-44-2	--	--	--	--	--	--
Phosphorus	7723-14-0	--	--	--	--	--	--
Sulfate	14808-79-8	--	--	--	--	--	--
Total sulfur	63705-05-5	--	--	--	--	--	--
Criteria Pollutants							
Carbon monoxide	630-08-0	--	--	--	--	--	--

Table A-7 Constituents with Data Available to Estimate Human Cancer Risk and/or Noncancer Hazard: Hanford Site Industrial Worker[a]

Constituent of Potential Concern	CAS Registry Number	Exposure Media/Pathway					
		Direct Air Exposure		Direct Soil Exposure			Surface Water
		Inhalation	External Exposure	Ingestion	Inhalation	External Exposure	Ingestion
Nitrogen dioxide	10102-44-0	--	--	--	--	--	--
Ozone	10028-15-6	--	--	--	--	--	--
Particulate matter	No CAS #	--	--	--	--	--	--
Sulfur dioxide	7446-09-5	--	--	--	--	--	--
Radionuclides							
Actinium-227	14952-40-0	X	X	X	X	X	X
Americium-241	14596-10-2	X	X	X	X	X	X
Americium-243	14993-75-0	X	X	X	X	X	X
Antimony-125	14234-35-6	X	X	X	X	X	X
Cadmium-113m	14336-66-4	X	X	X	X	X	X
Carbon-14	14762-75-5	X	X	X	X	X	X
Cesium-134	13967-70-9	X	X	X	X	X	X
Cesium-137	10045-97-3	X	X	X	X	X	X
Barium-137m	13981-97-0	Risks from Barium-137 are included in slope factor for Cesium-137+D[b]					
Cobalt-60	10198-40-0	X	X	X	X	X	X
Curium-242	15510-73-3	X	X	X	X	X	X
Curium-243	15757-87-6	X	X	X	X	X	X
Curium-244	13981-15-2	X	X	X	X	X	X
Europium-152	14683-23-9	X	X	X	X	X	X
Europium-154	15585-10-1	X	X	X	X	X	X
Europium-155	14391-16-3	X	X	X	X	X	X
Iodine-129	15046-84-1	X	X	X	X	X	X
Neptunium-237	13994-20-2	X	X	X	X	X	X
Nickel-59	14336-70-0	X	X	X	X	X	X
Nickel-63	13981-37-8	X	X	X	X	X	X
Niobium-93m	7440-03-1	X	X	X	X	X	X
Plutonium-238	13981-16-3	X	X	X	X	X	X
Plutonium-239	15117-48-3	X	X	X	X	X	X
Plutonium-240	14119-33-6	X	X	X	X	X	X
Plutonium-241	14119-32-5	X	X	X	X	X	X
Plutonium-242	13982-10-0	X	X	X	X	X	X
Protactinium-231	14331-85-2	X	X	X	X	X	X
Radium-226	13982-63-3	X	X	X	X	X	X
Radium-228	15262-20-1	X	X	X	X	X	X
Ruthenium-106	13967-48-1	X	X	X	X	X	X
Samarium-151	15715-94-3	X	X	X	X	X	X
Selenium-79	15758-45-9	X	X	X	X	X	X
Strontium-90	10098-97-2	X	X	X	X	X	X
Yttrium-90	10098-91-6	Risks from Yttrium-90 are included in slope factor for Strontium-90+D[b]					
Technetium-99	14133-76-7	X	X	X	X	X	X
Thorium-229	15594-54-4	X	X	X	X	X	X
Thorium-232	7440-29-1	X	X	X	X	X	X
Tin-126	15832-50-5	X	X	X	X	X	X
Tritium	10028-17-8	X	X	X	X	X	X
Uranium-232	14158-29-3	X	X	X	X	X	X
Uranium-233	13968-55-3	X	X	X	X	X	X
Uranium-234	13966-29-5	X	X	X	X	X	X
Uranium-235	15117-96-1	X	X	X	X	X	X
Uranium-236	13982-70-2	X	X	X	X	X	X
Uranium-238	7440-61-1	X	X	X	X	X	X
Zirconium-93	15751-77-6	X	X	X	X	X	X

CAS = Chemical Abstracts Service.
PCDD = polychlorinated dibenzo-p-dioxin.
PCDF = polychlorinated dibenzofuran.

X = Constituent is quantitatively evaluated for this exposure medium and pathway.
-- = Constituent is qualitatively evaluated for this exposure medium and pathway.

[a]Worker exposure pathways apply to time spent at work. Worker is also an offsite resident; exposure pathways for residential portion of worker exposure are the same as those listed in Table A-8.

[b]+D slope factors include contributions from short-lived daughter products.

Table A-8 Constituents with Data Available to Estimate Human Cancer Risk and/or Noncancer Hazard: Resident Receptors

Constituent of Potential Concern	CAS Registry Number	Exposure Media/Pathway												
		Direct Air Exposure		Direct Soil Exposure			Ingestion of Foodstuffs						Surface Water	
		Inhalation	External Exposure	Ingestion	Inhalation	External Exposure	Produce	Poultry	Eggs	Pork	Beef	Dairy	Ingestion	Fish Ingestion
Organic Compounds														
Aromatic Halogenated Hydrocarbons														
2,3,4,6-Tetrachlorophenol	58-90-2	--	--	X	--	--	X	X	X	X	X	X	X	X
4-Chloro-3-methylphenol	59-50-7	--	--	--	--	--	--	--	--	--	--	--	--	--
Aromatic Nonhalogenated Hydrocarbons														
2-Nitrotoluene	88-72-2	--	--	X	--	--	X	X	X	X	X	X	X	X
4-Nitrobiphenyl	92-93-3	--	--	--	--	--	--	--	--	--	--	--	--	--
Benzaldehyde	100-52-7	--	--	X	--	--	X	X	X	X	X	X	X	X
Benzene	71-43-2	X	--	X	X	--	X	X	X	X	X	X	X	X
Benzyl alcohol	100-51-6	--	--	X	--	--	X	X	X	X	X	X	X	X
Ethyl benzene	100-41-4	X	--	X	X	--	X	X	X	X	X	X	X	X
m-Xylene	108-38-3	X	--	X	X	--	X	X	X	X	X	X	X	X
o-Xylene	95-47-6	X	--	X	X	--	X	X	X	X	X	X	X	X
p-Xylene	106-42-3	X	--	X	X	--	X	X	X	X	X	X	X	X
Styrene	100-42-5	X	--	X	X	--	X	X	X	X	X	X	X	X
Toluene	108-88-3	X	--	X	X	--	X	X	X	X	X	X	X	X
Non-aromatic Nonhalogenated Hydrocarbons														
1,2-Epoxybutane	106-88-7	X	--	--	X	--	--	--	--	--	--	--	--	--
1,3-Butadiene	106-99-0	X	--	--	X	--	--	--	--	--	--	--	--	--
1,4-Dioxane	123-91-1	X	--	X	X	--	X	X	X	X	X	X	X	X
1-Methylpropyl alcohol	78-92-2	X	--	--	X	--	--	--	--	--	--	--	--	--
1-Nitropropane	108-03-2	X	--	--	X	--	--	--	--	--	--	--	--	--
2,2,4-Trimethylpentane	540-84-1	X	--	--	X	--	--	--	--	--	--	--	--	--
2-Butanone	78-93-3	X	--	X	X	--	X	X	X	X	X	X	X	X
2-Butenaldehyde (2-Butenal)	4170-30-3	X	--	--	X	--	--	--	--	--	--	--	--	--
2-Ethoxyethanol	110-80-5	X	--	X	X	--	X	X	X	X	X	X	X	X
2-Heptanone	110-43-0	X	--	--	X	--	--	--	--	--	--	--	--	--
2-Hexanone	591-78-6	X	--	X	X	--	X	X	X	X	X	X	X	X
2-Methoxyethanol	109-86-4	X	--	X	X	--	X	X	X	X	X	X	X	X
2-Methyl-2-propanol	75-65-0	X	--	--	X	--	--	--	--	--	--	--	--	--
2-Methyl-2-propenenitrile	126-98-7	X	--	X	X	--	X	X	X	X	X	X	X	X
2-Methylaziridine	75-55-8	X	--	--	X	--	--	--	--	--	--	--	--	--
2-Methylpropyl alcohol	78-83-1	X	--	X	X	--	X	X	X	X	X	X	X	X
2-Pentanone	107-87-9	X	--	--	X	--	--	--	--	--	--	--	--	--
2-Propanone (Acetone)	67-64-1	X	--	X	X	--	X	X	X	X	X	X	X	X
2-Propene-1-ol	107-18-6	X	--	X	X	--	X	X	X	X	X	X	X	X
2-Propyl alcohol	67-63-0	X	--	--	X	--	--	--	--	--	--	--	--	--
3-Heptanone	106-35-4	X	--	--	X	--	--	--	--	--	--	--	--	--
3-Methyl-1-butanol	123-51-3	X	--	--	X	--	--	--	--	--	--	--	--	--
3-Methyl-2-butanone	563-80-4	X	--	--	X	--	--	--	--	--	--	--	--	--
3-Pentanone	96-22-0	X	--	--	X	--	--	--	--	--	--	--	--	--
4-Heptanone	123-19-3	X	--	--	X	--	--	--	--	--	--	--	--	--

Table A-8 Constituents with Data Available to Estimate Human Cancer Risk and/or Noncancer Hazard: Resident Receptors

Constituent of Potential Concern	CAS Registry Number	Exposure Media/Pathway												
		Direct Air Exposure		Direct Soil Exposure			Ingestion of Foodstuffs						Surface Water	
		Inhalation	External Exposure	Ingestion	Inhalation	External Exposure	Produce	Poultry	Eggs	Pork	Beef	Dairy	Ingestion	Fish Ingestion
4-Methyl-2-pentanone	108-10-1	X	--	X	X	--	X	X	X	X	X	X	X	X
4-Methyl-3-penten-2-one	141-79-7	X	--	--	X	--	--	--	--	--	--	--	--	--
5-Methyl-2-hexanone	110-12-3	X	--	--	X	--	--	--	--	--	--	--	--	--
Acetaldehyde	75-07-0	X	--	--	X	--	--	--	--	--	--	--	--	--
Acetamide	60-35-5	X	--	--	X	--	--	--	--	--	--	--	--	--
Acetic acid	64-19-7	X	--	--	X	--	--	--	--	--	--	--	--	--
Acetic acid ethyl ester	141-78-6	X	--	X	X	--	X	X	X	X	X	X	X	X
Acetic acid n-butyl ester	123-86-4	X	--	--	X	--	--	--	--	--	--	--	--	--
Acetonitrile	75-05-8	X	--	--	X	--	--	--	--	--	--	--	--	--
Acrolein	107-02-8	X	--	X	X	--	X	X	X	X	X	X	X	X
Acrylonitrile	107-13-1	X	--	X	X	--	X	X	X	X	X	X	X	X
Bis(isopropyl)ether	108-20-3	X	--	--	X	--	--	--	--	--	--	--	--	--
Butane	106-97-8	X	--	--	X	--	--	--	--	--	--	--	--	--
Carbon disulfide	75-15-0	X	--	X	X	--	X	X	X	X	X	X	X	X
Cyanogen	460-19-5	X	--	X	X	--	X	X	X	X	X	X	X	X
Cyclohexane	110-82-7	X	--	X	X	--	X	X	X	X	X	X	X	X
Cyclohexanone	108-94-1	X	--	X	X	--	X	X	X	X	X	X	X	X
Cyclohexene	110-83-8	X	--	--	X	--	--	--	--	--	--	--	--	--
Cyclopentane	287-92-3	X	--	--	X	--	--	--	--	--	--	--	--	--
Ethyl alcohol	64-17-5	X	--	--	X	--	--	--	--	--	--	--	--	--
Ethyl ether	60-29-7	X	--	X	X	--	X	X	X	X	X	X	X	X
Ethyl methacrylate	97-63-2	X	--	X	X	--	X	X	X	X	X	X	X	X
Formaldehyde	50-00-0	X	--	X	X	--	X	X	X	X	X	X	X	X
Formamide	75-12-7	X	--	--	X	--	--	--	--	--	--	--	--	--
Formic acid	64-18-6	X	--	X	X	--	X	X	X	X	X	X	X	X
Formic acid, methyl ester	107-31-3	X	--	--	X	--	--	--	--	--	--	--	--	--
Glycidylaldehyde	765-34-4	X	--	X	X	--	X	X	X	X	X	X	X	X
Methyl acetate	79-20-9	X	--	X	X	--	X	X	X	X	X	X	X	X
Methyl alcohol	67-56-1	X	--	X	X	--	X	X	X	X	X	X	X	X
Methyl isocyanate	624-83-9	X	--	--	X	--	--	--	--	--	--	--	--	--
Methyl methacrylate	80-62-6	X	--	X	X	--	X	X	X	X	X	X	X	X
Methyl tert-butyl ether	1634-04-4	X	--	--	X	--	--	--	--	--	--	--	--	--
Methylacetylene	74-99-7	X	--	--	X	--	--	--	--	--	--	--	--	--
Methylcyclohexane	108-87-2	X	--	--	X	--	--	--	--	--	--	--	--	--
N,N-Dimethylacetamide	127-19-5	X	--	--	X	--	--	--	--	--	--	--	--	--
n-Butyl alcohol	71-36-3	X	--	X	X	--	X	X	X	X	X	X	X	X
n-Heptane	142-82-5	X	--	--	X	--	--	--	--	--	--	--	--	--
n-Hexane	110-54-3	X	--	X	X	--	X	X	X	X	X	X	X	X
Nitromethane	75-52-5	X	--	--	X	--	--	--	--	--	--	--	--	--
n-Nonane	111-84-2	X	--	--	X	--	--	--	--	--	--	--	--	--
n-Octane	111-65-9	X	--	--	X	--	--	--	--	--	--	--	--	--
n-Pentane	109-66-0	X	--	--	X	--	--	--	--	--	--	--	--	--

Table A-8 Constituents with Data Available to Estimate Human Cancer Risk and/or Noncancer Hazard: Resident Receptors

Constituent of Potential Concern	CAS Registry Number	Exposure Media/Pathway												
		Direct Air Exposure		Direct Soil Exposure			Ingestion of Foodstuffs						Surface Water	
		Inhalation	External Exposure	Ingestion	Inhalation	External Exposure	Produce	Poultry	Eggs	Pork	Beef	Dairy	Ingestion	Fish Ingestion
n-Propionaldehyde	123-38-6	X	--	--	X	--	--	--	--	--	--	--	--	--
n-Propyl alcohol	71-23-8	X	--	--	X	--	--	--	--	--	--	--	--	--
n-Valeraldehyde	110-62-3	X	--	--	X	--	--	--	--	--	--	--	--	--
Oxirane	75-21-8	X	--	X	X	--	X	X	X	X	X	X	X	X
p-Cymene	99-87-6	X	--	--	X	--	--	--	--	--	--	--	--	--
Phosgene	75-44-5	X	--	--	X	--	--	--	--	--	--	--	--	--
Propargyl alcohol	107-19-7	X	--	X	X	--	X	X	X	X	X	X	X	X
Propionic acid	79-09-4	X	--	--	X	--	--	--	--	--	--	--	--	--
Propionitrile	107-12-0	X	--	--	X	--	--	--	--	--	--	--	--	--
Propylene glycol monomethyl ether	107-98-2	X	--	X	X	--	X	X	X	X	X	X	X	X
p-tert-Butyltoluene	98-51-1	X	--	--	X	--	--	--	--	--	--	--	--	--
Triethylamine	121-44-8	X	--	--	X	--	--	--	--	--	--	--	--	--
Trimethylamine	75-50-3	X	--	--	X	--	--	--	--	--	--	--	--	--
Vinyl acetate	108-05-4	X	--	X	X	--	X	X	X	X	X	X	X	X
Non-aromatic Halogenated Hydrocarbons														
1,1,1,2-Tetrachloro-2,2-difluoroethane	76-11-9	--	--	--	--	--	--	--	--	--	--	--	--	--
1,1,1,2-Tetrachloroethane	630-20-6	X	--	X	X	--	X	X	X	X	X	X	X	X
1,1,1-Trichloroethane	71-55-6	X	--	X	X	--	X	X	X	X	X	X	X	X
1,1,2,2-Tetrachloro-1,2-difluoroethane	76-12-0	--	--	--	--	--	--	--	--	--	--	--	--	--
1,1,2,2-Tetrachloroethane	79-34-5	X	--	X	X	--	X	X	X	X	X	X	X	X
1,1,2,2-Tetrachloroethene	127-18-4	X	--	X	X	--	X	X	X	X	X	X	X	X
1,1,2-Trichloroethane	79-00-5	X	--	X	X	--	X	X	X	X	X	X	X	X
1,1,2-Trichloroethylene	79-01-6	X	--	X	X	--	X	X	X	X	X	X	X	X
1,1-Dichloroethane	75-34-3	X	--	X	X	--	X	X	X	X	X	X	X	X
1,1-Dichloroethene	75-35-4	X	--	X	X	--	X	X	X	X	X	X	X	X
1,2,2-Trichloro-1,1,2-trifluoroethane	76-13-1	X	--	X	X	--	X	X	X	X	X	X	X	X
1,2,3-Trichloropropane	96-18-4	--	--	X	--	--	X	X	X	X	X	X	X	X
1,2-Dibromo-3-chloropropane	96-12-8	X	--	X	X	--	X	X	X	X	X	X	X	X
1,2-Dichloro-1,1,2,2-tetrafluoroethane	76-14-2	--	--	--	--	--	--	--	--	--	--	--	--	--
1,2-Dichloroethane	107-06-2	X	--	X	X	--	X	X	X	X	X	X	X	X
1,2-Dichloroethylene	540-59-0	--	--	X	--	--	X	X	X	X	X	X	X	X
1,2-Dichloropropane	78-87-5	X	--	X	X	--	X	X	X	X	X	X	X	X
1,3-Dichloropropene	542-75-6	X	--	X	X	--	X	X	X	X	X	X	X	X
1,4-Dichloro-2-butene	764-41-0	X	--	--	X	--	--	--	--	--	--	--	--	--
1-Chloroethene	75-01-4	X	--	X	X	--	X	X	X	X	X	X	X	X
2,2-Dichloropropionic acid	75-99-0	--	--	X	--	--	X	X	X	X	X	X	X	X
2-Chloropropane	75-29-6	X	--	--	X	--	--	--	--	--	--	--	--	--
3-Chloropropene (Allyl chloride)	107-05-1	X	--	--	X	--	--	--	--	--	--	--	--	--
Bromochloromethane	74-97-5	--	--	--	--	--	--	--	--	--	--	--	--	--
Bromodichloromethane	75-27-4	--	--	X	--	--	X	X	X	X	X	X	X	X
Bromoethene	593-60-2	X	--	--	X	--	--	--	--	--	--	--	--	--
Bromoform	75-25-2	X	--	X	X	--	X	X	X	X	X	X	X	X

Table A-8 Constituents with Data Available to Estimate Human Cancer Risk and/or Noncancer Hazard: Resident Receptors

Constituent of Potential Concern	CAS Registry Number	Exposure Media/Pathway												
		Direct Air Exposure		Direct Soil Exposure			Ingestion of Foodstuffs						Surface Water	
		Inhalation	External Exposure	Ingestion	Inhalation	External Exposure	Produce	Poultry	Eggs	Pork	Beef	Dairy	Ingestion	Fish Ingestion
Bromomethane	74-83-9	X	--	X	X	--	X	X	X	X	X	X	X	X
Carbon tetrachloride	56-23-5	X	--	X	X	--	X	X	X	X	X	X	X	X
Chlorodibromomethane	124-48-1	--	--	X	--	--	X	X	X	X	X	X	X	X
Chlorodifluoromethane	75-45-6	X	--	--	X	--	--	--	--	--	--	--	--	--
Chloroethane	75-00-3	X	--	--	X	--	--	--	--	--	--	--	--	--
Chloroform	67-66-3	X	--	X	X	--	X	X	X	X	X	X	X	X
Chloromethane	74-87-3	X	--	--	X	--	--	--	--	--	--	--	--	--
Chloropentafluoroethane	76-15-3	--	--	--	--	--	--	--	--	--	--	--	--	--
cis-1,2-Dichloroethene	156-59-2	--	--	X	--	--	X	X	X	X	X	X	X	X
cis-1,3-Dichloropropene	10061-01-5	--	--	--	--	--	--	--	--	--	--	--	--	--
Cyanogen bromide	506-68-3	--	--	X	--	--	X	X	X	X	X	X	X	X
Cyanogen chloride	506-77-4	--	--	X	--	--	X	X	X	X	X	X	X	X
Dichlorodifluoromethane	75-71-8	X	--	X	X	--	X	X	X	X	X	X	X	X
Dichlorofluoromethane	75-43-4	--	--	--	--	--	--	--	--	--	--	--	--	--
Dichloromethane	75-09-2	X	--	X	X	--	X	X	X	X	X	X	X	X
Difluorodibromomethane	75-61-6	--	--	--	--	--	--	--	--	--	--	--	--	--
Hexafluoroacetone	684-16-2	--	--	--	--	--	--	--	--	--	--	--	--	--
Iodomethane	74-88-4	--	--	--	--	--	--	--	--	--	--	--	--	--
Methylene bromide	74-95-3	--	--	X	--	--	X	X	X	X	X	X	X	X
Pentachloroethane	76-01-7	--	--	--	--	--	--	--	--	--	--	--	--	--
trans-1,2-Dichloroethylene	156-60-5	--	--	X	--	--	X	X	X	X	X	X	X	X
trans-1,3-Dichloropropene	10061-02-6	--	--	--	--	--	--	--	--	--	--	--	--	--
Trichloroacetic acid	76-03-9	--	--	--	--	--	--	--	--	--	--	--	--	--
Trichlorofluoroethane	27154-33-2	--	--	--	--	--	--	--	--	--	--	--	--	--
Trichlorofluoromethane	75-69-4	X	--	X	X	--	X	X	X	X	X	X	X	X
Trifluorobromomethane	75-63-8	--	--	--	--	--	--	--	--	--	--	--	--	--
Dioxin and Furan Compounds (PCDDs/PCDFs)														
1,2,3,4,6,7,8-Heptachlorodibenzo(p)dioxin	35822-46-9	X	--	X	X	--	X	X	X	X	X	X	X	X
1,2,3,4,6,7,8-Heptachlorodibenzofuran	67562-39-4	X	--	X	X	--	X	X	X	X	X	X	X	X
1,2,3,4,7,8,9-Heptachlorodibenzofuran	55673-89-7	X	--	X	X	--	X	X	X	X	X	X	X	X
1,2,3,4,7,8-Hexachlorodibenzo(p)dioxin	39227-28-6	X	--	X	X	--	X	X	X	X	X	X	X	X
1,2,3,4,7,8-Hexachlorodibenzofuran	70648-26-9	X	--	X	X	--	X	X	X	X	X	X	X	X
1,2,3,6,7,8-Hexachlorodibenzo(p)dioxin	57653-85-7	X	--	X	X	--	X	X	X	X	X	X	X	X
1,2,3,6,7,8-Hexachlorodibenzofuran	57117-44-9	X	--	X	X	--	X	X	X	X	X	X	X	X
1,2,3,7,8,9-Hexachlorodibenzo(p)dioxin	19408-74-3	X	--	X	X	--	X	X	X	X	X	X	X	X
1,2,3,7,8,9-Hexachlorodibenzofuran	72918-21-9	X	--	X	X	--	X	--	--	X	X	X	X	X
1,2,3,7,8-Pentachlorodibenzo(p)dioxin	40321-76-4	X	--	X	X	--	X	X	X	X	X	X	X	X
1,2,3,7,8-Pentachlorodibenzofuran	57117-41-6	X	--	X	X	--	X	X	X	X	X	X	X	X
2,3,4,6,7,8-Hexachlorodibenzofuran	60851-34-5	X	--	X	X	--	X	X	X	X	X	X	X	X
2,3,4,7,8-Pentachlorodibenzofuran	57117-31-4	X	--	X	X	--	X	X	X	X	X	X	X	X
2,3,7,8-Tetrachlorodibenzo(p)dioxin	1746-01-6	X	--	X	X	--	X	X	X	X	X	X	X	X
2,3,7,8-Tetrachlorodibenzofuran	51207-31-9	X	--	X	X	--	X	X	X	X	X	X	X	X

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Constituent of Potential Concern	CAS Registry Number	Exposure Media/Pathway												
		Direct Air Exposure		Direct Soil Exposure			Ingestion of Foodstuffs						Surface Water	
		Inhalation	External Exposure	Ingestion	Inhalation	External Exposure	Produce	Poultry	Eggs	Pork	Beef	Dairy	Ingestion	Fish Ingestion
Dibenzofuran	132-64-9	--	--	X	--	--	X	X	X	X	X	X	X	X
Octachlorodibenzo(p)dioxin	3268-87-9	X	--	X	X	--	X	X	X	X	X	X	X	X
Octachlorodibenzofuran	39001-02-0	X	--	X	X	--	X	X	X	X	X	X	X	X
Polychlorinated Biphenyls (PCBs)														
2,2',3,3',4,4',5-Heptachlorobiphenyl	35065-30-6	--	--	--	--	--	--	--	--	--	--	--	--	--
2,2',3,4,4',5,5'-Heptachlorobiphenyl	35065-29-3	--	--	--	--	--	--	--	--	--	--	--	--	--
2,3,3',4,4',5,5'-Heptachlorobiphenyl	39635-31-9	X	--	X	X	--	X	--	--	--	--	--	X	--
2,3,3',4,4',5'-Hexachlorobiphenyl	69782-90-7	X	--	X	X	--	X	--	--	--	--	--	X	--
2,3,3',4,4',5-Hexachlorobiphenyl	38380-08-4	X	--	X	X	--	X	--	--	--	--	--	X	--
2,3,3',4,4'-Pentachlorobiphenyl	32598-14-4	X	--	X	X	--	X	--	--	--	--	--	X	--
2,3',4,4',5,5'-Hexachlorobiphenyl	52663-72-6	X	--	X	X	--	X	--	--	--	--	--	X	--
2,3,4,4',5-Pentachlorobiphenyl	74472-37-0	X	--	X	X	--	X	--	--	--	--	--	X	--
2',3,4,4',5-Pentachlorobiphenyl	65510-44-3	X	--	X	X	--	X	--	--	--	--	--	X	--
2,3',4,4',5-Pentachlorobiphenyl	31508-00-6	X	--	X	X	--	X	X	X	X	X	X	X	X
3,3',4,4',5,5'-Hexachlorobiphenyl	32774-16-6	X	--	X	X	--	X	X	X	X	X	X	X	X
3,3',4,4',5-Pentachlorobiphenyl	57465-28-8	X	--	X	X	--	X	--	--	--	--	--	X	--
3,3',4,4'-Tetrachlorobiphenyl	32598-13-3	X	--	X	X	--	X	--	--	--	--	--	X	--
3,4,4',5-Tetrachlorobiphenyl	70362-50-4	X	--	X	X	--	X	--	--	--	--	--	X	--
Polychlorinated biphenyls (PCBs)	1336-36-3	X	--	X	X	--	X	X	X	X	X	X	X	X
Phthalates														
Bis(2-ethylhexyl) phthalate (DEHP)	117-81-7	--	--	X	--	--	X	X	X	X	X	X	X	X
Butylbenzyl phthalate	85-68-7	--	--	X	--	--	X	X	X	X	X	X	X	X
Dibutyl phthalate	84-74-2	--	--	X	--	--	X	X	X	X	X	X	X	X
Diethyl phthalate	84-66-2	--	--	X	--	--	X	X	X	X	X	X	X	X
Dimethyl phthalate	131-11-3	--	--	--	--	--	--	--	--	--	--	--	--	--
n-Dioctyl phthalate	117-84-0	--	--	X	--	--	X	X	X	X	X	X	X	X
Light Polycyclic Aromatic Hydrocarbons (molecular weight <200 g/mole)														
2-Chloronaphthalene	91-58-7	--	--	X	--	--	X	X	X	X	X	X	X	X
2-Methyl naphthalene	91-57-6	X	--	X	X	--	X	X	X	X	X	X	X	X
5-Nitroacenaphthene	602-87-9	--	--	--	--	--	--	--	--	--	--	--	--	--
Acenaphthene	83-32-9	--	--	X	--	--	X	X	X	X	X	X	X	X
Acenaphthylene	208-96-8	--	--	--	--	--	--	--	--	--	--	--	--	--
Anthracene	120-12-7	--	--	X	--	--	X	X	X	X	X	X	X	X
Fluorene	86-73-7	--	--	X	--	--	X	X	X	X	X	X	X	X
Indene	95-13-6	--	--	--	--	--	--	--	--	--	--	--	--	--
Naphthalene	91-20-3	X	--	X	X	--	X	X	X	X	X	X	X	X
Phenanthrene	85-01-8	--	--	--	--	--	--	--	--	--	--	--	--	--
Pyrene	129-00-0	--	--	X	--	--	X	X	X	X	X	X	X	X
Heavy Polycyclic Aromatic Hydrocarbons (molecular weight >200 g/mole)														
3-Methylcholanthrene	56-49-5	--	--	--	--	--	--	--	--	--	--	--	--	--
5-Methylchrysene	3697-24-3	--	--	--	--	--	--	--	--	--	--	--	--	--
Benzo[a]anthracene	56-55-3	X	--	X	X	--	X	X	X	X	X	X	X	X

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		Direct Air Exposure		Direct Soil Exposure			Ingestion of Foodstuffs						Surface Water	
		Inhalation	External Exposure	Ingestion	Inhalation	External Exposure	Produce	Poultry	Eggs	Pork	Beef	Dairy	Ingestion	Fish Ingestion
Benzo[a]pyrene	50-32-8	X	--	X	X	--	X	X	X	X	X	X	X	X
Benzo[a,i]pyrene	191-30-0	--	--	--	--	--	--	--	--	--	--	--	--	--
Benzo[b]fluoranthene	205-99-2	X	--	X	X	--	X	X	X	X	X	X	X	X
Benzo[e]pyrene	192-97-2	--	--	--	--	--	--	--	--	--	--	--	--	--
Benzo[g,h,i]perylene	191-24-2	--	--	--	--	--	--	--	--	--	--	--	--	--
Benzo[j]fluoranthene	205-82-3	--	--	--	--	--	--	--	--	--	--	--	--	--
Benzo[k]fluoranthene	207-08-9	X	--	X	X	--	X	X	X	X	X	X	X	X
Chrysene	218-01-9	X	--	X	X	--	X	X	X	X	X	X	X	X
Dibenz[a,h]acridine	226-36-8	--	--	--	--	--	--	--	--	--	--	--	--	--
Dibenz[a,h]anthracene	53-70-3	X	--	X	X	--	X	X	X	X	X	X	X	X
Dibenz[a,j]acridine	224-42-0	--	--	--	--	--	--	--	--	--	--	--	--	--
Dibenzo[a,e]fluoranthene	5385-75-1	--	--	--	--	--	--	--	--	--	--	--	--	--
Dibenzo[a,e]pyrene	192-65-4	--	--	--	--	--	--	--	--	--	--	--	--	--
Dibenzo[a,h]fluoranthene	No CAS #	--	--	--	--	--	--	--	--	--	--	--	--	--
Dibenzo[a,h]pyrene	189-64-0	--	--	--	--	--	--	--	--	--	--	--	--	--
Dibenzo[a,i]pyrene	189-55-9	--	--	--	--	--	--	--	--	--	--	--	--	--
Fluoranthene	206-44-0	--	--	X	--	--	X	X	X	X	X	X	X	X
Hexachloronaphthalene	1335-87-1	--	--	--	--	--	--	--	--	--	--	--	--	--
Indeno[1,2,3-cd]pyrene	193-39-5	X	--	X	X	--	X	X	X	X	X	X	X	X
Octachloronaphthalene	2234-13-1	--	--	--	--	--	--	--	--	--	--	--	--	--
Pentachloronaphthalene	1321-64-8	--	--	--	--	--	--	--	--	--	--	--	--	--
Tetrachloronaphthalene	1335-88-2	--	--	--	--	--	--	--	--	--	--	--	--	--
Trichloronaphthalene	1321-65-9	--	--	--	--	--	--	--	--	--	--	--	--	--
Light Substituted Benzene Compounds (molecular weight <200 g/mole)														
1,2,3-Trichlorobenzene	87-61-6	--	--	--	--	--	--	--	--	--	--	--	--	--
1,2,4-Trichlorobenzene	120-82-1	X	--	X	X	--	X	X	X	X	X	X	X	X
1,2,4-Trimethyl benzene	95-63-6	X	--	X	X	--	X	X	X	X	X	X	X	X
1,2-Dichlorobenzene	95-50-1	X	--	X	X	--	X	X	X	X	X	X	X	X
1,3,5-Trimethyl benzene	108-67-8	X	--	X	X	--	X	X	X	X	X	X	X	X
1,3-Dichlorobenzene	541-73-1	--	--	--	--	--	--	--	--	--	--	--	--	--
1,3-Dinitrobenzene	99-65-0	--	--	X	--	--	X	X	X	X	X	X	X	X
1,4-Dichlorobenzene	106-46-7	X	--	X	X	--	X	X	X	X	X	X	X	X
1,4-Dinitrobenzene	100-25-4	--	--	X	--	--	X	X	X	X	X	X	X	X
2,4,5-Trichlorophenol	95-95-4	--	--	X	--	--	X	X	X	X	X	X	X	X
2,4,6-Trichlorophenol	88-06-2	X	--	X	X	--	X	X	X	X	X	X	X	X
2,4-Dichlorophenol	120-83-2	--	--	X	--	--	X	X	X	X	X	X	X	X
2,4-Dimethylphenol	105-67-9	--	--	X	--	--	X	X	X	X	X	X	X	X
2,4-Dinitrophenol	51-28-5	--	--	X	--	--	X	X	X	X	X	X	X	X
2,4-Dinitrotoluene	121-14-2	--	--	X	--	--	X	X	X	X	X	X	X	X
2,6-Dinitrotoluene	606-20-2	--	--	X	--	--	X	X	X	X	X	X	X	X
2-Chlorophenol	95-57-8	--	--	X	--	--	X	X	X	X	X	X	X	X
2-Chlorotoluene	95-49-8	--	--	X	--	--	X	X	X	X	X	X	X	X

Table A-8 Constituents with Data Available to Estimate Human Cancer Risk and/or Noncancer Hazard: Resident Receptors

Constituent of Potential Concern	CAS Registry Number	Exposure Media/Pathway												
		Direct Air Exposure		Direct Soil Exposure			Ingestion of Foodstuffs						Surface Water	
		Inhalation	External Exposure	Ingestion	Inhalation	External Exposure	Produce	Poultry	Eggs	Pork	Beef	Dairy	Ingestion	Fish Ingestion
2-Nitrophenol	88-75-5	--	--	--	--	--	--	--	--	--	--	--	--	--
4,6-Dinitro-o-cresol	534-52-1	--	--	--	--	--	--	--	--	--	--	--	--	--
4-Chlorotoluene	106-43-4	--	--	--	--	--	--	--	--	--	--	--	--	--
4-Nitrophenol	100-02-7	--	--	--	--	--	--	--	--	--	--	--	--	--
alpha-Methylstyrene	98-83-9	--	--	X	--	--	X	X	X	X	X	X	X	X
Aniline	62-53-3	X	--	X	X	--	X	X	X	X	X	X	X	X
Benzotrichloride	98-07-7	--	--	X	--	--	X	X	X	X	X	X	X	X
Benzyl chloride	100-44-7	--	--	X	--	--	X	X	X	X	X	X	X	X
Bromobenzene	108-86-1	--	--	--	--	--	--	--	--	--	--	--	--	--
Chlorobenzene	108-90-7	X	--	X	X	--	X	X	X	X	X	X	X	X
Cumene	98-82-8	X	--	X	X	--	X	X	X	X	X	X	X	X
m-Cresol	108-39-4	--	--	X	--	--	X	X	X	X	X	X	X	X
n-Butyl benzene	104-51-8	--	--	--	--	--	--	--	--	--	--	--	--	--
Nitrobenzene	98-95-3	X	--	X	X	--	X	X	X	X	X	X	X	X
n-Propyl benzene	103-65-1	--	--	--	--	--	--	--	--	--	--	--	--	--
o-Cresol	95-48-7	--	--	X	--	--	X	X	X	X	X	X	X	X
o-Dinitrobenzene	528-29-0	--	--	X	--	--	X	X	X	X	X	X	X	X
o-Nitroaniline	88-74-4	X	--	--	X	--	--	--	--	--	--	--	--	--
o-Toluidine	95-53-4	--	--	X	--	--	X	X	X	X	X	X	X	X
p-Chloroaniline	106-47-8	--	--	X	--	--	X	X	X	X	X	X	X	X
p-Cresol	106-44-5	--	--	X	--	--	X	X	X	X	X	X	X	X
Phenol	108-95-2	--	--	X	--	--	X	X	X	X	X	X	X	X
p-Nitrochlorobenzene	100-00-5	--	--	--	--	--	--	--	--	--	--	--	--	--
p-Toluidine	106-49-0	--	--	X	--	--	X	X	X	X	X	X	X	X
sec-Butyl benzene	135-98-8	--	--	--	--	--	--	--	--	--	--	--	--	--
tert-Butyl benzene	98-06-6	--	--	--	--	--	--	--	--	--	--	--	--	--
Toluene-2,6-diamine	823-40-5	--	--	X	--	--	X	X	X	X	X	X	X	X
Trimethyl benzene	25551-13-7	--	--	--	--	--	--	--	--	--	--	--	--	--
Other Light Semivolatile Compounds (molecular weight <200 g/mole)														
1,1'-Biphenyl	92-52-4	--	--	X	--	--	X	X	X	X	X	X	X	X
1,1-Dimethylhydrazine	57-14-7	X	--	X	X	--	X	X	X	X	X	X	X	X
1,2-Dimethylhydrazine	540-73-8	X	--	X	X	--	X	X	X	X	X	X	X	X
1,2-Diphenylhydrazine	122-66-7	X	--	X	X	--	X	X	X	X	X	X	X	X
1,3-Propane sultone	1120-71-4	--	--	--	--	--	--	--	--	--	--	--	--	--
2,4-Toluene diisocyanate	584-84-9	--	--	--	--	--	--	--	--	--	--	--	--	--
2-Chloroacetophenone	532-27-4	X	--	--	X	--	--	--	--	--	--	--	--	--
2-Propenoic acid	79-10-7	X	--	X	X	--	X	X	X	X	X	X	X	X
4,4'-Methylenedianiline	101-77-9	--	--	--	--	--	--	--	--	--	--	--	--	--
Acetophenone	98-86-2	--	--	X	--	--	X	X	X	X	X	X	X	X
Benzoic acid	65-85-0	--	--	X	--	--	X	X	X	X	X	X	X	X
Bis(2-chloroethoxy)methane	111-91-1	--	--	--	--	--	--	--	--	--	--	--	--	--
Bis(2-chloroethyl) ether	111-44-4	X	--	X	X	--	X	X	X	X	X	X	X	X

Table A-8 Constituents with Data Available to Estimate Human Cancer Risk and/or Noncancer Hazard: Resident Receptors

Constituent of Potential Concern	CAS Registry Number	Exposure Media/Pathway												
		Direct Air Exposure		Direct Soil Exposure			Ingestion of Foodstuffs						Surface Water	
		Inhalation	External Exposure	Ingestion	Inhalation	External Exposure	Produce	Poultry	Eggs	Pork	Beef	Dairy	Ingestion	Fish Ingestion
Chlorocyclopentadiene	41851-50-7	--	--	--	--	--	--	--	--	--	--	--	--	--
Cyclohexanol	108-93-0	--	--	--	--	--	--	--	--	--	--	--	--	--
Dichloroisopropyl ether	108-60-1	X	--	X	X	--	X	X	X	X	X	X	X	X
Dichloromethyl ether	542-88-1	X	--	X	X	--	X	X	X	X	X	X	X	X
Dichloropentadiene	61626-71-9	--	--	--	--	--	--	--	--	--	--	--	--	--
Dimethyl sulfate	77-78-1	--	--	--	--	--	--	--	--	--	--	--	--	--
Dimethylaniline	121-69-7	--	--	X	--	--	X	X	X	X	X	X	X	X
di-n-Propylnitrosamine	621-64-7	--	--	X	--	--	X	X	X	X	X	X	X	X
Diphenyl ether	101-84-8	--	--	--	--	--	--	--	--	--	--	--	--	--
Epichlorohydrin	106-89-8	X	--	X	X	--	X	X	X	X	X	X	X	X
Ethyl carbamate (Urethane)	51-79-6	--	--	--	--	--	--	--	--	--	--	--	--	--
Ethyl methanesulfonate	62-50-0	--	--	--	--	--	--	--	--	--	--	--	--	--
Ethylene dibromide	106-93-4	X	--	X	X	--	X	X	X	X	X	X	X	X
Ethylene glycol	107-21-1	--	--	X	--	--	X	X	X	X	X	X	X	X
Ethylene glycol monobutyl ether	111-76-2	X	--	X	X	--	X	X	X	X	X	X	X	X
Ethylene glycol monoethyl ether acetate	111-15-9	--	--	X	--	--	X	X	X	X	X	X	X	X
Ethylene thiourea	96-45-7	--	--	X	--	--	X	X	X	X	X	X	X	X
Furfural	98-01-1	X	--	X	X	--	X	X	X	X	X	X	X	X
Maleic hydrazide	123-33-1	--	--	X	--	--	X	X	X	X	X	X	X	X
Malononitrile	109-77-3	--	--	X	--	--	X	X	X	X	X	X	X	X
Methyl styrene (mixed isomers)	25013-15-4	X	--	X	X	--	X	X	X	X	X	X	X	X
Methylhydrazine	60-34-4	X	--	X	X	--	X	X	X	X	X	X	X	X
N,N-Diphenylamine	122-39-4	--	--	X	--	--	X	X	X	X	X	X	X	X
Nitric acid, propyl ester	627-13-4	--	--	--	--	--	--	--	--	--	--	--	--	--
N-Nitrosodi-n-butylamine	924-16-3	X	--	X	X	--	X	X	X	X	X	X	X	X
N-Nitrosomorpholine	59-89-2	--	--	--	--	--	--	--	--	--	--	--	--	--
N-Nitroso-N,N-dimethylamine	62-75-9	X	--	X	X	--	X	X	X	X	X	X	X	X
o-Anisidine	90-04-0	--	--	--	--	--	--	--	--	--	--	--	--	--
Oxalic acid	144-62-7	--	--	--	--	--	--	--	--	--	--	--	--	--
Phthalic anhydride	85-44-9	X	--	X	X	--	X	X	X	X	X	X	X	X
p-Phthalic acid	100-21-0	--	--	X	--	--	X	X	X	X	X	X	X	X
Pyridine	110-86-1	--	--	X	--	--	X	X	X	X	X	X	X	X
Quinoline	91-22-5	--	--	X	--	--	X	X	X	X	X	X	X	X
Quinone	106-51-4	--	--	--	--	--	--	--	--	--	--	--	--	--
Safrole	94-59-7	--	--	--	--	--	--	--	--	--	--	--	--	--
Tetrahydrofuran	109-99-9	--	--	--	--	--	--	--	--	--	--	--	--	--
Other Heavy Semivolatile Compounds (molecular weight >200 g/mole)														
1,2,4,5-Tetrachlorobenzene	95-94-3	--	--	X	--	--	X	X	X	X	X	X	X	X
1,3,5-Trinitrobenzene	99-35-4	--	--	X	--	--	X	X	X	X	X	X	X	X
2,6-Bis(tert-butyl)-4-methylphenol	128-37-0	--	--	--	--	--	--	--	--	--	--	--	--	--
2-Cyclohexyl-4,6-dinitrophenol	131-89-5	--	--	X	--	--	X	X	X	X	X	X	X	X
2-sec-Butyl-4,6-dinitrophenol	88-85-7	--	--	X	--	--	X	X	X	X	X	X	X	X

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Constituent of Potential Concern	CAS Registry Number	Exposure Media/Pathway												
		Direct Air Exposure		Direct Soil Exposure			Ingestion of Foodstuffs						Surface Water	
		Inhalation	External Exposure	Ingestion	Inhalation	External Exposure	Produce	Poultry	Eggs	Pork	Beef	Dairy	Ingestion	Fish Ingestion
3,3'-Dichlorobenzidine	91-94-1	--	--	X	--	--	X	X	X	X	X	X	X	X
3,3'-Dimethoxybenzidine	119-90-4	--	--	X	--	--	X	X	X	X	X	X	X	X
4-Bromophenylphenyl ether	101-55-3	--	--	--	--	--	--	--	--	--	--	--	--	--
Ammonium perfluorooctanoate	3825-26-1	--	--	--	--	--	--	--	--	--	--	--	--	--
Azobenzene	103-33-3	X	--	X	X	--	X	X	X	X	X	X	X	X
Bis(3-tert-butyl-4-hydroxy-6-methyl-phenyl)sulfide	96-69-5	--	--	--	--	--	--	--	--	--	--	--	--	--
Captan	133-06-2	--	--	X	--	--	X	X	X	X	X	X	X	X
Chlorobenzilate	510-15-6	X	--	X	X	--	X	X	X	X	X	X	X	X
Dibutylphosphate	107-66-4	--	--	--	--	--	--	--	--	--	--	--	--	--
Dimethyl aminoazobenzene	60-11-7	--	--	--	--	--	--	--	--	--	--	--	--	--
Hexachlorobenzene	118-74-1	X	--	X	X	--	X	X	X	X	X	X	X	X
Hexachlorobutadiene	87-68-3	X	--	X	X	--	X	X	X	X	X	X	X	X
Hexachlorocyclopentadiene	77-47-4	X	--	X	X	--	X	X	X	X	X	X	X	X
Hexachloroethane	67-72-1	X	--	X	X	--	X	X	X	X	X	X	X	X
Hexachlorophene	70-30-4	--	--	X	--	--	X	X	X	X	X	X	X	X
Hexamethylene-1,5-diisocyanate	822-06-0	X	--	--	X	--	--	--	--	--	--	--	--	--
Mirex	2385-85-5	X	--	X	X	--	X	X	X	X	X	X	X	X
Nitrofen	1836-75-5	--	--	--	--	--	--	--	--	--	--	--	--	--
Pentachlorobenzene	608-93-5	--	--	X	--	--	X	X	X	X	X	X	X	X
Pentachloronitrobenzene	82-68-8	--	--	X	--	--	X	X	X	X	X	X	X	X
Pentachlorophenol	87-86-5	--	--	X	--	--	X	X	X	X	X	X	X	X
Picric acid	88-89-1	--	--	--	--	--	--	--	--	--	--	--	--	--
Pronamide	23950-58-5	--	--	X	--	--	X	X	X	X	X	X	X	X
Strychnine	57-24-9	--	--	X	--	--	X	X	X	X	X	X	X	X
Terphenyls	26140-60-3	--	--	--	--	--	--	--	--	--	--	--	--	--
Tributyl phosphate	126-73-8	--	--	--	--	--	--	--	--	--	--	--	--	--
Trifluralin	1582-09-8	--	--	X	--	--	X	X	X	X	X	X	X	X
Triphenylamine	603-34-9	--	--	--	--	--	--	--	--	--	--	--	--	--
Herbicides and Organochlorinated Pesticides														
2,4,5-T	93-76-5	--	--	X	--	--	X	X	X	X	X	X	X	X
2,4-D and esters	94-75-7	--	--	X	--	--	X	X	X	X	X	X	X	X
4,4'-DDD	72-54-8	--	--	X	--	--	X	X	X	X	X	X	X	X
4,4'-DDE	72-55-9	--	--	X	--	--	X	X	X	X	X	X	X	X
4,4'-DDT	50-29-3	X	--	X	X	--	X	X	X	X	X	X	X	X
Aldrin	309-00-2	X	--	X	X	--	X	X	X	X	X	X	X	X
alpha-BHC	319-84-6	X	--	X	X	--	X	X	X	X	X	X	X	X
beta-BHC	319-85-7	X	--	X	X	--	X	X	X	X	X	X	X	X
Chlordane	57-74-9	X	--	X	X	--	X	X	X	X	X	X	X	X
delta-BHC	319-86-8	--	--	--	--	--	--	--	--	--	--	--	--	--
Dieldrin	60-57-1	X	--	X	X	--	X	X	X	X	X	X	X	X
Endothall	145-73-3	--	--	X	--	--	X	X	X	X	X	X	X	X
Endrin	72-20-8	--	--	X	--	--	X	X	X	X	X	X	X	X

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		Direct Air Exposure		Direct Soil Exposure			Ingestion of Foodstuffs						Surface Water	
		Inhalation	External Exposure	Ingestion	Inhalation	External Exposure	Produce	Poultry	Eggs	Pork	Beef	Dairy	Ingestion	Fish Ingestion
gamma-BHC (Lindane)	58-89-9	--	--	X	--	--	X	X	X	X	X	X	X	X
Heptachlor	76-44-8	X	--	X	X	--	X	X	X	X	X	X	X	X
Isodrin	465-73-6	--	--	--	--	--	--	--	--	--	--	--	--	--
Methoxychlor	72-43-5	--	--	X	--	--	X	X	X	X	X	X	X	X
Silvex (2,4,5-TP)	93-72-1	--	--	X	--	--	X	X	X	X	X	X	X	X
Toxaphene	8001-35-2	X	--	X	X	--	X	X	X	X	X	X	X	X
Inorganic Chemicals and Compounds														
Metals														
Aluminum	7429-90-5	--	--	--	--	--	--	--	--	--	--	--	--	--
Antimony	7440-36-0	--	--	X	--	--	X	--	--	--	X	X	X	X
Arsenic	7440-38-2	X	--	X	X	--	X	--	--	--	X	X	X	X
Barium	7440-39-3	X	--	X	X	--	X	X	X	--	X	X	X	X
Beryllium	7440-41-7	X	--	X	X	--	X	--	--	--	X	X	X	X
Bismuth	7440-69-9	--	--	--	--	--	--	--	--	--	--	--	--	--
Boron	7440-42-8	X	--	X	X	--	X	--	--	--	X	X	X	--
Cadmium	7440-43-9	X	--	X	X	--	X	X	X	X	X	X	X	X
Calcium	7440-70-2	--	--	--	--	--	--	--	--	--	--	--	--	--
Chromium	18540-29-9	X	--	X	X	--	X	--	--	--	X	X	X	X
Cobalt	7440-48-4	--	--	--	--	--	--	--	--	--	--	--	--	--
Copper	7440-50-8	--	--	--	--	--	--	--	--	--	--	--	--	--
Iron	7439-89-6	--	--	--	--	--	--	--	--	--	--	--	--	--
Lead	7439-92-1	--	--	--	--	--	--	--	--	--	--	--	--	--
Lithium	7439-93-2	--	--	--	--	--	--	--	--	--	--	--	--	--
Magnesium	7439-95-4	--	--	--	--	--	--	--	--	--	--	--	--	--
Manganese	7439-96-5	X	--	X	X	--	X	X	X	X	X	X	X	--
Mercury	7439-97-6	X	--	--	--	--	--	--	--	--	--	--	--	--
Mercury - Hg+2	7487-94-7	--	--	X	--	--	X	X	X	X	X	X	X	--
Methylmercury	22967-92-6	--	--	X	--	--	X	X	X	X	X	X	X	X
Molybdenum	7439-98-7	--	--	X	--	--	X	X	X	--	X	X	X	--
Nickel	7440-02-0	X	--	X	X	--	X	--	--	--	X	X	X	X
Potassium	7440-09-7	--	--	--	--	--	--	--	--	--	--	--	--	--
Rhodium	7440-16-6	--	--	--	--	--	--	--	--	--	--	--	--	--
Selenium	7782-49-2	--	--	X	--	--	X	X	X	X	X	X	X	X
Silicon	7440-21-3	--	--	--	--	--	--	--	--	--	--	--	--	--
Silver	7440-22-4	--	--	X	--	--	X	--	--	--	X	X	X	X
Sodium	7440-23-5	--	--	--	--	--	--	--	--	--	--	--	--	--
Strontium	7440-24-6	--	--	X	--	--	X	--	--	--	X	X	X	X
Tantalum	7440-25-7	--	--	--	--	--	--	--	--	--	--	--	--	--
Thallium	7440-28-0	--	--	X	--	--	X	--	--	--	X	X	X	X
Tin	7440-31-5	--	--	X	--	--	X	--	--	--	X	X	X	--

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		Inhalation	External Exposure	Ingestion	Inhalation	External Exposure	Produce	Poultry	Eggs	Pork	Beef	Dairy	Ingestion	Fish Ingestion
Tungsten	7440-33-7	--	--	--	--	--	--	--	--	--	--	--	--	--
Uranium	7440-61-1	--	--	X	--	--	X	X	X	X	X	X	X	--
Vanadium	7440-62-2	--	--	X	--	--	X	--	--	--	X	X	X	--
Yttrium	7440-65-5	--	--	--	--	--	--	--	--	--	--	--	--	--
Zinc	7440-66-6	--	--	X	--	--	X	X	X	X	X	X	X	X
Zirconium	7440-67-7	--	--	--	--	--	--	--	--	--	--	--	--	--
Non-metals and Anions														
Ammonia/Ammonium	7664-41-7	X	--	--	X	--	--	--	--	--	--	--	--	--
Bromide	24959-67-9	--	--	--	--	--	--	--	--	--	--	--	--	--
Chloride	16887-00-6	--	--	--	--	--	--	--	--	--	--	--	--	--
Cyanide	57-12-5	--	--	X	--	--	--	--	--	--	X	X	X	X
Fluoride	16984-48-8	--	--	X	--	--	X	--	--	--	--	--	X	--
Hydroxide	14280-30-9	--	--	--	--	--	--	--	--	--	--	--	--	--
Iodine	7553-56-2	--	--	--	--	--	--	--	--	--	--	--	--	--
Nitrate	14797-55-8	--	--	X	--	--	X	--	--	--	--	--	X	--
Nitrite	14797-65-0	--	--	X	--	--	--	--	--	--	--	--	X	--
Phosphate	14265-44-2	--	--	--	--	--	--	--	--	--	--	--	--	--
Phosphorus	7723-14-0	--	--	--	--	--	--	--	--	--	--	--	--	--
Sulfate	14808-79-8	--	--	--	--	--	--	--	--	--	--	--	--	--
Total sulfur	63705-05-5	--	--	--	--	--	--	--	--	--	--	--	--	--
Criteria Pollutants														
Carbon monoxide	630-08-0	--	--	--	--	--	--	--	--	--	--	--	--	--
Nitrogen dioxide	10102-44-0	--	--	--	--	--	--	--	--	--	--	--	--	--
Ozone	10028-15-6	--	--	--	--	--	--	--	--	--	--	--	--	--
Particulate matter	No CAS #	--	--	--	--	--	--	--	--	--	--	--	--	--
Sulfur dioxide	7446-09-5	--	--	--	--	--	--	--	--	--	--	--	--	--
Radionuclides														
Actinium-227	14952-40-0	X	X	X	X	X	X	--	--	--	X	X	X	X
Americium-241	14596-10-2	X	X	X	X	X	X	--	--	--	X	X	X	X
Americium-243	14993-75-0	X	X	X	X	X	X	--	--	--	X	X	X	X
Antimony-125	14234-35-6	X	X	X	X	X	X	--	--	--	X	X	X	X
Cadmium-113m	14336-66-4	X	X	X	X	X	X	--	--	--	X	X	X	X
Carbon-14	14762-75-5	X	X	X	X	X	X	--	--	--	--	--	X	X
Cesium-134	13967-70-9	X	X	X	X	X	X	--	--	--	X	X	X	X
Cesium-137	10045-97-3	X	X	X	X	X	X	--	--	--	X	X	X	X
Barium-137m	13981-97-0	Risks from Barium-137 are included in slope factor for Cesium-137+D[a]												
Cobalt-60	10198-40-0	X	X	X	X	X	X	--	--	--	X	X	X	X
Curium-242	15510-73-3	X	X	X	X	X	X	--	--	--	X	X	X	X
Curium-243	15757-87-6	X	X	X	X	X	X	--	--	--	X	X	X	X
Curium-244	13981-15-2	X	X	X	X	X	X	--	--	--	X	X	X	X

Table A-8 Constituents with Data Available to Estimate Human Cancer Risk and/or Noncancer Hazard: Resident Receptors

Constituent of Potential Concern	CAS Registry Number	Exposure Media/Pathway												
		Direct Air Exposure		Direct Soil Exposure			Ingestion of Foodstuffs						Surface Water	
		Inhalation	External Exposure	Ingestion	Inhalation	External Exposure	Produce	Poultry	Eggs	Pork	Beef	Dairy	Ingestion	Fish Ingestion
Europium-152	14683-23-9	X	X	X	X	X	X	--	--	--	X	X	X	X
Europium-154	15585-10-1	X	X	X	X	X	X	--	--	--	X	X	X	X
Europium-155	14391-16-3	X	X	X	X	X	X	--	--	--	X	X	X	X
Iodine-129	15046-84-1	X	X	X	X	X	X	--	--	--	X	X	X	X
Neptunium-237	13994-20-2	X	X	X	X	X	X	--	--	--	X	X	X	X
Nickel-59	14336-70-0	X	X	X	X	X	X	--	--	--	X	X	X	X
Nickel-63	13981-37-8	X	X	X	X	X	X	--	--	--	X	X	X	X
Niobium-93m	7440-03-1	X	X	X	X	X	X	--	--	--	X	X	X	X
Plutonium-238	13981-16-3	X	X	X	X	X	X	--	--	--	X	X	X	X
Plutonium-239	15117-48-3	X	X	X	X	X	X	--	--	--	X	X	X	X
Plutonium-240	14119-33-6	X	X	X	X	X	X	--	--	--	X	X	X	X
Plutonium-241	14119-32-5	X	X	X	X	X	X	--	--	--	X	X	X	X
Plutonium-242	13982-10-0	X	X	X	X	X	X	--	--	--	X	X	X	X
Protactinium-231	14331-85-2	X	X	X	X	X	X	--	--	--	X	X	X	X
Radium-226	13982-63-3	X	X	X	X	X	X	--	--	--	X	X	X	X
Radium-228	15262-20-1	X	X	X	X	X	X	--	--	--	X	X	X	X
Ruthenium-106	13967-48-1	X	X	X	X	X	X	--	--	--	X	X	X	X
Samarium-151	15715-94-3	X	X	X	X	X	X	--	--	--	X	X	X	X
Selenium-79	15758-45-9	X	X	X	X	X	X	--	--	--	X	X	X	X
Strontium-90	10098-97-2	X	X	X	X	X	X	--	--	--	X	X	X	X
Yttrium-90	10098-91-6	Risks from Yttrium-90 are included in slope factor for Strontium-90+D[a]												
Technetium-99	14133-76-7	X	X	X	X	X	X	--	--	--	X	X	X	X
Thorium-229	15594-54-4	X	X	X	X	X	X	--	--	--	X	X	X	X
Thorium-232	7440-29-1	X	X	X	X	X	X	--	--	--	X	X	X	X
Tin-126	15832-50-5	X	X	X	X	X	X	--	--	--	X	X	X	X
Tritium	10028-17-8	X	X	X	X	X	X	--	--	--	--	X	X	X
Uranium-232	14158-29-3	X	X	X	X	X	X	--	--	--	X	X	X	X
Uranium-233	13968-55-3	X	X	X	X	X	X	--	--	--	X	X	X	X
Uranium-234	13966-29-5	X	X	X	X	X	X	--	--	--	X	X	X	X
Uranium-235	15117-96-1	X	X	X	X	X	X	--	--	--	X	X	X	X
Uranium-236	13982-70-2	X	X	X	X	X	X	--	--	--	X	X	X	X
Uranium-238	7440-61-1	X	X	X	X	X	X	--	--	--	X	X	X	X
Zirconium-93	15751-77-6	X	X	X	X	X	X	--	--	--	X	X	X	X

CAS = Chemical Abstracts Service.
PCDD = Polychlorinated dibenzo-p-dioxin.
PCDF = Polychlorinated dibenzofuran.

X = Constituent is quantitatively evaluated for this exposure medium and pathway.
-- = Constituent is qualitatively evaluated for this exposure medium and pathway.
[a] +D slope factors include contributions from short-lived daughter products.

Table A-9 Constituents with Data Available to Estimate Human Cancer Risk and/or Noncancer Hazard: Native American Subsistence Receptors

Constituent of Potential Concern	CAS Registry Number	Exposure Media/Pathway												
		Direct Air Exposure		Direct Soil Exposure			Ingestion of Foodstuffs				Surface Water			
												Sweat Lodge		Fish
		Inhalation	External Exposure	Ingestion	Inhalation	External Exposure	Wild Plants	Game	Wildfowl	Eggs	Ingestion	Dermal	Inhalation	Ingestion
Organic Compounds														
Aromatic Halogenated Hydrocarbons														
2,3,4,6-Tetrachlorophenol	58-90-2	--	--	X	--	--	X	X	X	X	X	X	--	X
4-Chloro-3-methylphenol	59-50-7	--	--	--	--	--	--	--	--	--	--	--	--	--
Aromatic Nonhalogenated Hydrocarbons														
2-Nitrotoluene	88-72-2	--	--	X	--	--	X	X	X	X	X	X	--	X
4-Nitrobiphenyl	92-93-3	--	--	--	--	--	--	--	--	--	--	--	--	--
Benzaldehyde	100-52-7	--	--	X	--	--	X	X	X	X	X	X	--	X
Benzene	71-43-2	X	--	X	X	--	X	X	X	X	X	X	X	X
Benzyl alcohol	100-51-6	--	--	X	--	--	X	X	X	X	X	X	--	X
Ethyl benzene	100-41-4	X	--	X	X	--	X	X	X	X	X	X	X	X
m-Xylene	108-38-3	X	--	X	X	--	X	X	X	X	X	X	X	X
o-Xylene	95-47-6	X	--	X	X	--	X	X	X	X	X	X	X	X
p-Xylene	106-42-3	X	--	X	X	--	X	X	X	X	X	X	X	X
Styrene	100-42-5	X	--	X	X	--	X	X	X	X	X	X	X	X
Toluene	108-88-3	X	--	X	X	--	X	X	X	X	X	X	X	X
Non-aromatic Nonhalogenated Hydrocarbons														
1,2-Epoxybutane	106-88-7	X	--	--	X	--	--	--	--	--	--	--	X	--
1,3-Butadiene	106-99-0	X	--	--	X	--	--	--	--	--	--	--	X	--
1,4-Dioxane	123-91-1	X	--	X	X	--	X	X	X	X	X	X	X	X
1-Methylpropyl alcohol	78-92-2	X	--	--	X	--	--	--	--	--	--	--	X	--
1-Nitropropane	108-03-2	X	--	--	X	--	--	--	--	--	--	--	X	--
2,2,4-Trimethylpentane	540-84-1	X	--	--	X	--	--	--	--	--	--	--	X	--
2-Butanone	78-93-3	X	--	X	X	--	X	X	X	X	X	X	X	X
2-Butenaldehyde (2-Butenal)	4170-30-3	X	--	--	X	--	--	--	--	--	--	--	X	--
2-Ethoxyethanol	110-80-5	X	--	X	X	--	X	X	X	X	X	X	X	X
2-Heptanone	110-43-0	X	--	--	X	--	--	--	--	--	--	--	X	--
2-Hexanone	591-78-6	X	--	X	X	--	X	X	X	X	X	X	X	X
2-Methoxyethanol	109-86-4	X	--	X	X	--	X	X	X	X	X	X	X	X
2-Methyl-2-propanol	75-65-0	X	--	--	X	--	--	--	--	--	--	--	X	--
2-Methyl-2-propenenitrile	126-98-7	X	--	X	X	--	X	X	X	X	X	X	X	X
2-Methylaziridine	75-55-8	X	--	--	X	--	--	--	--	--	--	--	X	--
2-Methylpropyl alcohol	78-83-1	X	--	X	X	--	X	X	X	X	X	X	X	X
2-Pentanone	107-87-9	X	--	--	X	--	--	--	--	--	--	--	X	--
2-Propanone (Acetone)	67-64-1	X	--	X	X	--	X	X	X	X	X	X	X	X
2-Propene-1-ol	107-18-6	X	--	X	X	--	X	X	X	X	X	X	X	X
2-Propyl alcohol	67-63-0	X	--	--	X	--	--	--	--	--	--	--	X	--
3-Heptanone	106-35-4	X	--	--	X	--	--	--	--	--	--	--	X	--
3-Methyl-1-butanol	123-51-3	X	--	--	X	--	--	--	--	--	--	--	X	--
3-Methyl-2-butanone	563-80-4	X	--	--	X	--	--	--	--	--	--	--	X	--
3-Pentanone	96-22-0	X	--	--	X	--	--	--	--	--	--	--	X	--
4-Heptanone	123-19-3	X	--	--	X	--	--	--	--	--	--	--	X	--

Table A-9 Constituents with Data Available to Estimate Human Cancer Risk and/or Noncancer Hazard: Native American Subsistence Receptors

Constituent of Potential Concern	CAS Registry Number	Exposure Media/Pathway												
		Direct Air Exposure		Direct Soil Exposure			Ingestion of Foodstuffs					Surface Water		
		Inhalation	External Exposure	Ingestion	Inhalation	External Exposure	Wild Plants	Game	Wildfowl	Eggs	Ingestion	Sweat Lodge Dermal	Sweat Lodge Inhalation	Fish Ingestion
4-Methyl-2-pentanone	108-10-1	X	--	X	X	--	X	X	X	X	X	X	X	X
4-Methyl-3-penten-2-one	141-79-7	X	--	--	X	--	--	--	--	--	--	--	X	--
5-Methyl-2-hexanone	110-12-3	X	--	--	X	--	--	--	--	--	--	--	X	--
Acetaldehyde	75-07-0	X	--	--	X	--	--	--	--	--	--	--	X	--
Acetamide	60-35-5	X	--	--	X	--	--	--	--	--	--	--	X	--
Acetic acid	64-19-7	X	--	--	X	--	--	--	--	--	--	--	X	--
Acetic acid ethyl ester	141-78-6	X	--	X	X	--	X	X	X	X	X	X	X	X
Acetic acid n-butyl ester	123-86-4	X	--	--	X	--	--	--	--	--	--	--	X	--
Acetonitrile	75-05-8	X	--	--	X	--	--	--	--	--	--	--	X	--
Acrolein	107-02-8	X	--	X	X	--	X	X	X	X	X	X	X	X
Acrylonitrile	107-13-1	X	--	X	X	--	X	X	X	X	X	X	X	X
Bis(isopropyl)ether	108-20-3	X	--	--	X	--	--	--	--	--	--	--	X	--
Butane	106-97-8	X	--	--	X	--	--	--	--	--	--	--	X	--
Carbon disulfide	75-15-0	X	--	X	X	--	X	X	X	X	X	X	X	X
Cyanogen	460-19-5	X	--	X	X	--	X	X	X	X	X	X	X	X
Cyclohexane	110-82-7	X	--	X	X	--	X	X	X	X	X	X	X	X
Cyclohexanone	108-94-1	X	--	X	X	--	X	X	X	X	X	X	X	X
Cyclohexene	110-83-8	X	--	--	X	--	--	--	--	--	--	--	X	--
Cyclopentane	287-92-3	X	--	--	X	--	--	--	--	--	--	--	X	--
Ethyl alcohol	64-17-5	X	--	--	X	--	--	--	--	--	--	--	X	--
Ethyl ether	60-29-7	X	--	X	X	--	X	X	X	X	X	X	X	X
Ethyl methacrylate	97-63-2	X	--	X	X	--	X	X	X	X	X	X	X	X
Formaldehyde	50-00-0	X	--	X	X	--	X	X	X	X	X	X	X	X
Formamide	75-12-7	X	--	--	X	--	--	--	--	--	--	--	X	--
Formic acid	64-18-6	X	--	X	X	--	X	X	X	X	X	X	X	X
Formic acid, methyl ester	107-31-3	X	--	--	X	--	--	--	--	--	--	--	X	--
Glycidylaldehyde	765-34-4	X	--	X	X	--	X	X	X	X	X	X	X	X
Methyl acetate	79-20-9	X	--	X	X	--	X	X	X	X	X	X	X	X
Methyl alcohol	67-56-1	X	--	X	X	--	X	X	X	X	X	X	X	X
Methyl isocyanate	624-83-9	X	--	--	X	--	--	--	--	--	--	--	X	--
Methyl methacrylate	80-62-6	X	--	X	X	--	X	X	X	X	X	X	X	X
Methyl tert-butyl ether	1634-04-4	X	--	--	X	--	--	--	--	--	--	--	X	--
Methylacetylene	74-99-7	X	--	--	X	--	--	--	--	--	--	--	X	--
Methylcyclohexane	108-87-2	X	--	--	X	--	--	--	--	--	--	--	X	--
N,N-Dimethylacetamide	127-19-5	X	--	--	X	--	--	--	--	--	--	--	X	--
n-Butyl alcohol	71-36-3	X	--	X	X	--	X	X	X	X	X	X	X	X
n-Heptane	142-82-5	X	--	--	X	--	--	--	--	--	--	--	X	--
n-Hexane	110-54-3	X	--	X	X	--	X	X	X	X	X	X	X	X
Nitromethane	75-52-5	X	--	--	X	--	--	--	--	--	--	--	X	--
n-Nonane	111-84-2	X	--	--	X	--	--	--	--	--	--	--	X	--
n-Octane	111-65-9	X	--	--	X	--	--	--	--	--	--	--	X	--
n-Pentane	109-66-0	X	--	--	X	--	--	--	--	--	--	--	X	--

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Constituent of Potential Concern	CAS Registry Number	Exposure Media/Pathway												
		Direct Air Exposure		Direct Soil Exposure			Ingestion of Foodstuffs					Surface Water		
		Inhalation	External Exposure	Ingestion	Inhalation	External Exposure	Wild Plants	Game	Wildfowl	Eggs	Ingestion	Sweat Lodge Dermal	Sweat Lodge Inhalation	Fish Ingestion
n-Propionaldehyde	123-38-6	X	--	--	X	--	--	--	--	--	--	--	X	--
n-Propyl alcohol	71-23-8	X	--	--	X	--	--	--	--	--	--	--	X	--
n-Valeraldehyde	110-62-3	X	--	--	X	--	--	--	--	--	--	--	X	--
Oxirane	75-21-8	X	--	X	X	--	X	X	X	X	X	X	X	X
p-Cymene	99-87-6	X	--	--	X	--	--	--	--	--	--	--	X	--
Phosgene	75-44-5	X	--	--	X	--	--	--	--	--	--	--	X	--
Propargyl alcohol	107-19-7	X	--	X	X	--	X	X	X	X	X	X	X	X
Propionic acid	79-09-4	X	--	--	X	--	--	--	--	--	--	--	X	--
Propionitrile	107-12-0	X	--	--	X	--	--	--	--	--	--	--	X	--
Propylene glycol monomethyl ether	107-98-2	X	--	X	X	--	X	X	X	X	X	X	X	X
p-tert-Butyltoluene	98-51-1	X	--	--	X	--	--	--	--	--	--	--	X	--
Triethylamine	121-44-8	X	--	--	X	--	--	--	--	--	--	--	X	--
Trimethylamine	75-50-3	X	--	--	X	--	--	--	--	--	--	--	X	--
Vinyl acetate	108-05-4	X	--	X	X	--	X	X	X	X	X	X	X	X
Non-aromatic Halogenated Hydrocarbons														
1,1,1,2-Tetrachloro-2,2-difluoroethane	76-11-9	--	--	--	--	--	--	--	--	--	--	--	--	--
1,1,1,2-Tetrachloroethane	630-20-6	X	--	X	X	--	X	X	X	X	X	X	X	X
1,1,1-Trichloroethane	71-55-6	X	--	X	X	--	X	X	X	X	X	X	X	X
1,1,2,2-Tetrachloro-1,2-difluoroethane	76-12-0	--	--	--	--	--	--	--	--	--	--	--	--	--
1,1,2,2-Tetrachloroethane	79-34-5	X	--	X	X	--	X	X	X	X	X	X	X	X
1,1,2,2-Tetrachloroethene	127-18-4	X	--	X	X	--	X	X	X	X	X	X	X	X
1,1,2-Trichloroethane	79-00-5	X	--	X	X	--	X	X	X	X	X	X	X	X
1,1,2-Trichloroethylene	79-01-6	X	--	X	X	--	X	X	X	X	X	X	X	X
1,1-Dichloroethane	75-34-3	X	--	X	X	--	X	X	X	X	X	X	X	X
1,1-Dichloroethene	75-35-4	X	--	X	X	--	X	X	X	X	X	X	X	X
1,2,2-Trichloro-1,1,2-trifluoroethane	76-13-1	X	--	X	X	--	X	X	X	X	X	X	X	X
1,2,3-Trichloropropane	96-18-4	--	--	X	--	--	X	X	X	X	X	X	--	X
1,2-Dibromo-3-chloropropane	96-12-8	X	--	X	X	--	X	X	X	X	X	X	X	X
1,2-Dichloro-1,1,2,2-tetrafluoroethane	76-14-2	--	--	--	--	--	--	--	--	--	--	--	--	--
1,2-Dichloroethane	107-06-2	X	--	X	X	--	X	X	X	X	X	X	X	X
1,2-Dichloroethylene	540-59-0	--	--	X	--	--	X	X	X	X	X	X	--	X
1,2-Dichloropropane	78-87-5	X	--	X	X	--	X	X	X	X	X	X	X	X
1,3-Dichloropropene	542-75-6	X	--	X	X	--	X	X	X	X	X	X	X	X
1,4-Dichloro-2-butene	764-41-0	X	--	--	X	--	--	--	--	--	--	--	X	--
1-Chloroethene	75-01-4	X	--	X	X	--	X	X	X	X	X	X	X	X
2,2-Dichloropropionic acid	75-99-0	--	--	X	--	--	X	X	X	X	X	X	--	X
2-Chloropropane	75-29-6	X	--	--	X	--	--	--	--	--	--	--	X	--
3-Chloropropene (Allyl chloride)	107-05-1	X	--	--	X	--	--	--	--	--	--	--	X	--
Bromochloromethane	74-97-5	--	--	--	--	--	--	--	--	--	--	--	--	--
Bromodichloromethane	75-27-4	--	--	X	--	--	X	X	X	X	X	X	--	X
Bromoethene	593-60-2	X	--	--	X	--	--	--	--	--	--	--	X	--
Bromoform	75-25-2	X	--	X	X	--	X	X	X	X	X	X	X	X

Table A-9 Constituents with Data Available to Estimate Human Cancer Risk and/or Noncancer Hazard: Native American Subsistence Receptors

Constituent of Potential Concern	CAS Registry Number	Exposure Media/Pathway												
		Direct Air Exposure		Direct Soil Exposure			Ingestion of Foodstuffs					Surface Water		
												Sweat Lodge		Fish
		Inhalation	External Exposure	Ingestion	Inhalation	External Exposure	Wild Plants	Game	Wildfowl	Eggs	Ingestion	Dermal	Inhalation	Ingestion
Bromomethane	74-83-9	X	--	X	X	--	X	X	X	X	X	X	X	X
Carbon tetrachloride	56-23-5	X	--	X	X	--	X	X	X	X	X	X	X	X
Chlorodibromomethane	124-48-1	--	--	X	--	--	X	X	X	X	X	X	--	X
Chlorodifluoromethane	75-45-6	X	--	--	X	--	--	--	--	--	--	--	X	--
Chloroethane	75-00-3	X	--	--	X	--	--	--	--	--	--	--	X	--
Chloroform	67-66-3	X	--	X	X	--	X	X	X	X	X	X	X	X
Chloromethane	74-87-3	X	--	--	X	--	--	--	--	--	--	--	X	--
Chloropentafluoroethane	76-15-3	--	--	--	--	--	--	--	--	--	--	--	--	--
cis-1,2-Dichloroethene	156-59-2	--	--	X	--	--	X	X	X	X	X	X	--	X
cis-1,3-Dichloropropene	10061-01-5	--	--	--	--	--	--	--	--	--	--	--	--	--
Cyanogen bromide	506-68-3	--	--	X	--	--	X	X	X	X	X	--	--	X
Cyanogen chloride	506-77-4	--	--	X	--	--	X	X	X	X	X	X	--	X
Dichlorodifluoromethane	75-71-8	X	--	X	X	--	X	X	X	X	X	X	X	X
Dichlorofluoromethane	75-43-4	--	--	--	--	--	--	--	--	--	--	--	--	--
Dichloromethane	75-09-2	X	--	X	X	--	X	X	X	X	X	X	X	X
Difluorodibromomethane	75-61-6	--	--	--	--	--	--	--	--	--	--	--	--	--
Hexafluoroacetone	684-16-2	--	--	--	--	--	--	--	--	--	--	--	--	--
Iodomethane	74-88-4	--	--	--	--	--	--	--	--	--	--	--	--	--
Methylene bromide	74-95-3	--	--	X	--	--	X	X	X	X	X	X	--	X
Pentachloroethane	76-01-7	--	--	--	--	--	--	--	--	--	--	--	--	--
trans-1,2-Dichloroethylene	156-60-5	--	--	X	--	--	X	X	X	X	X	X	--	X
trans-1,3-Dichloropropene	10061-02-6	--	--	--	--	--	--	--	--	--	--	--	--	--
Trichloroacetic acid	76-03-9	--	--	--	--	--	--	--	--	--	--	--	--	--
Trichlorofluoroethane	27154-33-2	--	--	--	--	--	--	--	--	--	--	--	--	--
Trichlorofluoromethane	75-69-4	X	--	X	X	--	X	X	X	X	X	X	X	X
Trifluorobromomethane	75-63-8	--	--	--	--	--	--	--	--	--	--	--	--	--
Dioxin and Furan Compounds (PCDDs/PCDFs)														
1,2,3,4,6,7,8-Heptachlorodibenzo(p)dioxin	35822-46-9	X	--	X	X	--	X	X	X	X	X	X	X	X
1,2,3,4,6,7,8-Heptachlorodibenzofuran	67562-39-4	X	--	X	X	--	X	X	X	X	X	X	X	X
1,2,3,4,7,8,9-Heptachlorodibenzofuran	55673-89-7	X	--	X	X	--	X	X	X	X	X	X	X	X
1,2,3,4,7,8-Hexachlorodibenzo(p)dioxin	39227-28-6	X	--	X	X	--	X	X	X	X	X	X	X	X
1,2,3,4,7,8-Hexachlorodibenzofuran	70648-26-9	X	--	X	X	--	X	X	X	X	X	X	X	X
1,2,3,6,7,8-Hexachlorodibenzo(p)dioxin	57653-85-7	X	--	X	X	--	X	X	X	X	X	X	X	X
1,2,3,6,7,8-Hexachlorodibenzofuran	57117-44-9	X	--	X	X	--	X	X	X	X	X	X	X	X
1,2,3,7,8,9-Hexachlorodibenzo(p)dioxin	19408-74-3	X	--	X	X	--	X	X	X	X	X	X	X	X
1,2,3,7,8,9-Hexachlorodibenzofuran	72918-21-9	X	--	X	X	--	X	X	--	--	X	X	X	X
1,2,3,7,8-Pentachlorodibenzo(p)dioxin	40321-76-4	X	--	X	X	--	X	X	X	X	X	X	X	X
1,2,3,7,8-Pentachlorodibenzofuran	57117-41-6	X	--	X	X	--	X	X	X	X	X	X	X	X
2,3,4,6,7,8-Hexachlorodibenzofuran	60851-34-5	X	--	X	X	--	X	X	X	X	X	X	X	X
2,3,4,7,8-Pentachlorodibenzofuran	57117-31-4	X	--	X	X	--	X	X	X	X	X	X	X	X
2,3,7,8-Tetrachlorodibenzo(p)dioxin	1746-01-6	X	--	X	X	--	X	X	X	X	X	X	X	X
2,3,7,8-Tetrachlorodibenzofuran	51207-31-9	X	--	X	X	--	X	X	X	X	X	X	X	X

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Constituent of Potential Concern	CAS Registry Number	Exposure Media/Pathway												
		Direct Air Exposure		Direct Soil Exposure			Ingestion of Foodstuffs				Surface Water			
		Inhalation	External Exposure	Ingestion	Inhalation	External Exposure	Wild Plants	Game	Wildfowl	Eggs	Ingestion	Sweat Lodge Dermal	Sweat Lodge Inhalation	Fish Ingestion
Dibenzofuran	132-64-9	--	--	X	--	--	X	X	X	X	X	X	--	X
Octachlorodibenzo(p)dioxin	3268-87-9	X	--	X	X	--	X	X	X	X	X	X	X	X
Octachlorodibenzofuran	39001-02-0	X	--	X	X	--	X	X	X	X	X	X	X	X
Polychlorinated Biphenyls (PCBs)														
2,2',3,3',4,4',5-Heptachlorobiphenyl	35065-30-6	--	--	--	--	--	--	--	--	--	--	--	--	--
2,2',3,4,4',5,5'-Heptachlorobiphenyl	35065-29-3	--	--	--	--	--	--	--	--	--	--	--	--	--
2,3,3',4,4',5,5'-Heptachlorobiphenyl	39635-31-9	X	--	X	X	--	X	--	--	--	X	--	X	--
2,3,3',4,4',5'-Hexachlorobiphenyl	69782-90-7	X	--	X	X	--	X	--	--	--	X	--	X	--
2,3,3',4,4',5-Hexachlorobiphenyl	38380-08-4	X	--	X	X	--	X	--	--	--	X	--	X	--
2,3,3',4,4'-Pentachlorobiphenyl	32598-14-4	X	--	X	X	--	X	--	--	--	X	--	X	--
2,3',4,4',5,5'-Hexachlorobiphenyl	52663-72-6	X	--	X	X	--	X	--	--	--	X	--	X	--
2,3,4,4',5-Pentachlorobiphenyl	74472-37-0	X	--	X	X	--	X	--	--	--	X	--	X	--
2',3,4,4',5-Pentachlorobiphenyl	65510-44-3	X	--	X	X	--	X	--	--	--	X	--	X	--
2,3',4,4',5-Pentachlorobiphenyl	31508-00-6	X	--	X	X	--	X	X	X	X	X	X	X	X
3,3',4,4',5,5'-Hexachlorobiphenyl	32774-16-6	X	--	X	X	--	X	X	X	X	X	X	X	X
3,3',4,4',5-Pentachlorobiphenyl	57465-28-8	X	--	X	X	--	X	--	--	--	X	--	X	--
3,3',4,4'-Tetrachlorobiphenyl	32598-13-3	X	--	X	X	--	X	--	--	--	X	--	X	--
3,4,4',5-Tetrachlorobiphenyl	70362-50-4	X	--	X	X	--	X	--	--	--	X	--	X	--
Polychlorinated biphenyls (PCBs)	1336-36-3	X	--	X	X	--	X	X	X	X	X	--	X	X
Phthalates														
Bis(2-ethylhexyl) phthalate (DEHP)	117-81-7	--	--	X	--	--	X	X	X	X	X	X	--	X
Butylbenzyl phthalate	85-68-7	--	--	X	--	--	X	X	X	X	X	X	--	X
Dibutyl phthalate	84-74-2	--	--	X	--	--	X	X	X	X	X	X	--	X
Diethyl phthalate	84-66-2	--	--	X	--	--	X	X	X	X	X	X	--	X
Dimethyl phthalate	131-11-3	--	--	--	--	--	--	--	--	--	--	--	--	--
n-Dioctyl phthalate	117-84-0	--	--	X	--	--	X	X	X	X	X	X	--	X
Light Polycyclic Aromatic Hydrocarbons (molecular weight <200 g/mole)														
2-Chloronaphthalene	91-58-7	--	--	X	--	--	X	X	X	X	X	X	--	X
2-Methyl naphthalene	91-57-6	X	--	X	X	--	X	X	X	X	X	X	X	X
5-Nitroacenaphthene	602-87-9	--	--	--	--	--	--	--	--	--	--	--	--	--
Acenaphthene	83-32-9	--	--	X	--	--	X	X	X	X	X	X	--	X
Acenaphthylene	208-96-8	--	--	--	--	--	--	--	--	--	--	--	--	--
Anthracene	120-12-7	--	--	X	--	--	X	X	X	X	X	X	--	X
Fluorene	86-73-7	--	--	X	--	--	X	X	X	X	X	X	--	X
Indene	95-13-6	--	--	--	--	--	--	--	--	--	--	--	--	--
Naphthalene	91-20-3	X	--	X	X	--	X	X	X	X	X	X	X	X
Phenanthrene	85-01-8	--	--	--	--	--	--	--	--	--	--	--	--	--
Pyrene	129-00-0	--	--	X	--	--	X	X	X	X	X	X	--	X
Heavy Polycyclic Aromatic Hydrocarbons (molecular weight >200 g/mole)														
3-Methylcholanthrene	56-49-5	--	--	--	--	--	--	--	--	--	--	--	--	--
5-Methylchrysene	3697-24-3	--	--	--	--	--	--	--	--	--	--	--	--	--
Benzo[a]anthracene	56-55-3	X	--	X	X	--	X	X	X	X	X	X	X	X

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Constituent of Potential Concern	CAS Registry Number	Exposure Media/Pathway												
		Direct Air Exposure		Direct Soil Exposure			Ingestion of Foodstuffs					Surface Water		
		Inhalation	External Exposure	Ingestion	Inhalation	External Exposure	Wild Plants	Game	Wildfowl	Eggs	Ingestion	Sweat Lodge Dermal	Sweat Lodge Inhalation	Fish Ingestion
Benzo[a]pyrene	50-32-8	X	--	X	X	--	X	X	X	X	X	X	X	X
Benzo[a,i]pyrene	191-30-0	--	--	--	--	--	--	--	--	--	--	--	--	--
Benzo[b]fluoranthene	205-99-2	X	--	X	X	--	X	X	X	X	X	X	X	X
Benzo[e]pyrene	192-97-2	--	--	--	--	--	--	--	--	--	--	--	--	--
Benzo[g,h,i]perylene	191-24-2	--	--	--	--	--	--	--	--	--	--	--	--	--
Benzo[j]fluoranthene	205-82-3	--	--	--	--	--	--	--	--	--	--	--	--	--
Benzo[k]fluoranthene	207-08-9	X	--	X	X	--	X	X	X	X	X	X	X	X
Chrysene	218-01-9	X	--	X	X	--	X	X	X	X	X	X	X	X
Dibenz[a,h]acridine	226-36-8	--	--	--	--	--	--	--	--	--	--	--	--	--
Dibenz[a,h]anthracene	53-70-3	X	--	X	X	--	X	X	X	X	X	X	X	X
Dibenz[a,j]acridine	224-42-0	--	--	--	--	--	--	--	--	--	--	--	--	--
Dibenzo[a,e]fluoranthene	5385-75-1	--	--	--	--	--	--	--	--	--	--	--	--	--
Dibenzo[a,e]pyrene	192-65-4	--	--	--	--	--	--	--	--	--	--	--	--	--
Dibenzo[a,h]fluoranthene	No CAS #	--	--	--	--	--	--	--	--	--	--	--	--	--
Dibenzo[a,h]pyrene	189-64-0	--	--	--	--	--	--	--	--	--	--	--	--	--
Dibenzo[a,i]pyrene	189-55-9	--	--	--	--	--	--	--	--	--	--	--	--	--
Fluoranthene	206-44-0	--	--	X	--	--	X	X	X	X	X	X	--	X
Hexachloronaphthalene	1335-87-1	--	--	--	--	--	--	--	--	--	--	--	--	--
Indeno[1,2,3-cd]pyrene	193-39-5	X	--	X	X	--	X	X	X	X	X	X	X	X
Octachloronaphthalene	2234-13-1	--	--	--	--	--	--	--	--	--	--	--	--	--
Pentachloronaphthalene	1321-64-8	--	--	--	--	--	--	--	--	--	--	--	--	--
Tetrachloronaphthalene	1335-88-2	--	--	--	--	--	--	--	--	--	--	--	--	--
Trichloronaphthalene	1321-65-9	--	--	--	--	--	--	--	--	--	--	--	--	--
Light Substituted Benzene Compounds (molecular weight <200 g/mole)														
1,2,3-Trichlorobenzene	87-61-6	--	--	--	--	--	--	--	--	--	--	--	--	--
1,2,4-Trichlorobenzene	120-82-1	X	--	X	X	--	X	X	X	X	X	X	X	X
1,2,4-Trimethyl benzene	95-63-6	X	--	X	X	--	X	X	X	X	X	X	X	X
1,2-Dichlorobenzene	95-50-1	X	--	X	X	--	X	X	X	X	X	X	X	X
1,3,5-Trimethyl benzene	108-67-8	X	--	X	X	--	X	X	X	X	X	X	X	X
1,3-Dichlorobenzene	541-73-1	--	--	--	--	--	--	--	--	--	--	--	--	--
1,3-Dinitrobenzene	99-65-0	--	--	X	--	--	X	X	X	X	X	X	--	X
1,4-Dichlorobenzene	106-46-7	X	--	X	X	--	X	X	X	X	X	X	X	X
1,4-Dinitrobenzene	100-25-4	--	--	X	--	--	X	X	X	X	X	X	--	X
2,4,5-Trichlorophenol	95-95-4	--	--	X	--	--	X	X	X	X	X	X	--	X
2,4,6-Trichlorophenol	88-06-2	X	--	X	X	--	X	X	X	X	X	X	X	X
2,4-Dichlorophenol	120-83-2	--	--	X	--	--	X	X	X	X	X	X	--	X
2,4-Dimethylphenol	105-67-9	--	--	X	--	--	X	X	X	X	X	X	--	X
2,4-Dinitrophenol	51-28-5	--	--	X	--	--	X	X	X	X	X	X	--	X
2,4-Dinitrotoluene	121-14-2	--	--	X	--	--	X	X	X	X	X	X	--	X
2,6-Dinitrotoluene	606-20-2	--	--	X	--	--	X	X	X	X	X	X	--	X
2-Chlorophenol	95-57-8	--	--	X	--	--	X	X	X	X	X	X	--	X
2-Chlorotoluene	95-49-8	--	--	X	--	--	X	X	X	X	X	X	--	X

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		Direct Air Exposure		Direct Soil Exposure			Ingestion of Foodstuffs					Surface Water		
												Sweat Lodge		Fish
		Inhalation	External Exposure	Ingestion	Inhalation	External Exposure	Wild Plants	Game	Wildfowl	Eggs	Ingestion	Dermal	Inhalation	Ingestion
2-Nitrophenol	88-75-5	--	--	--	--	--	--	--	--	--	--	--	--	--
4,6-Dinitro-o-cresol	534-52-1	--	--	--	--	--	--	--	--	--	--	--	--	--
4-Chlorotoluene	106-43-4	--	--	--	--	--	--	--	--	--	--	--	--	--
4-Nitrophenol	100-02-7	--	--	--	--	--	--	--	--	--	--	--	--	--
alpha-Methylstyrene	98-83-9	--	--	X	--	--	X	X	X	X	X	X	--	X
Aniline	62-53-3	X	--	X	X	--	X	X	X	X	X	X	X	X
Benzotrichloride	98-07-7	--	--	X	--	--	X	X	X	X	X	X	--	X
Benzyl chloride	100-44-7	--	--	X	--	--	X	X	X	X	X	X	--	X
Bromobenzene	108-86-1	--	--	--	--	--	--	--	--	--	--	--	--	--
Chlorobenzene	108-90-7	X	--	X	X	--	X	X	X	X	X	X	X	X
Cumene	98-82-8	X	--	X	X	--	X	X	X	X	X	X	X	X
m-Cresol	108-39-4	--	--	X	--	--	X	X	X	X	X	X	--	X
n-Butyl benzene	104-51-8	--	--	--	--	--	--	--	--	--	--	--	--	--
Nitrobenzene	98-95-3	X	--	X	X	--	X	X	X	X	X	X	X	X
n-Propyl benzene	103-65-1	--	--	--	--	--	--	--	--	--	--	--	--	--
o-Cresol	95-48-7	--	--	X	--	--	X	X	X	X	X	X	--	X
o-Dinitrobenzene	528-29-0	--	--	X	--	--	X	X	X	X	X	X	--	X
o-Nitroaniline	88-74-4	X	--	--	X	--	--	--	--	--	--	--	X	--
o-Toluidine	95-53-4	--	--	X	--	--	X	X	X	X	X	X	--	X
p-Chloroaniline	106-47-8	--	--	X	--	--	X	X	X	X	X	X	--	X
p-Cresol	106-44-5	--	--	X	--	--	X	X	X	X	X	X	--	X
Phenol	108-95-2	--	--	X	--	--	X	X	X	X	X	X	--	X
p-Nitrochlorobenzene	100-00-5	--	--	--	--	--	--	--	--	--	--	--	--	--
p-Toluidine	106-49-0	--	--	X	--	--	X	X	X	X	X	X	--	X
sec-Butyl benzene	135-98-8	--	--	--	--	--	--	--	--	--	--	--	--	--
tert-Butyl benzene	98-06-6	--	--	--	--	--	--	--	--	--	--	--	--	--
Toluene-2,6-diamine	823-40-5	--	--	X	--	--	X	X	X	X	X	X	--	X
Trimethyl benzene	25551-13-7	--	--	--	--	--	--	--	--	--	--	--	--	--
Other Light Semivolatile Compounds (molecular weight <200 g/mole)														
1,1'-Biphenyl	92-52-4	--	--	X	--	--	X	X	X	X	X	X	--	X
1,1-Dimethylhydrazine	57-14-7	X	--	X	X	--	X	X	X	X	X	X	X	X
1,2-Dimethylhydrazine	540-73-8	X	--	X	X	--	X	X	X	X	X	X	X	X
1,2-Diphenylhydrazine	122-66-7	X	--	X	X	--	X	X	X	X	X	X	X	X
1,3-Propane sultone	1120-71-4	--	--	--	--	--	--	--	--	--	--	--	--	--
2,4-Toluene diisocyanate	584-84-9	--	--	--	--	--	--	--	--	--	--	--	--	--
2-Chloroacetophenone	532-27-4	X	--	--	X	--	--	--	--	--	--	--	X	--
2-Propenoic acid	79-10-7	X	--	X	X	--	X	X	X	X	X	X	X	X
4,4'-Methylenedianiline	101-77-9	--	--	--	--	--	--	--	--	--	--	--	--	--
Acetophenone	98-86-2	--	--	X	--	--	X	X	X	X	X	X	--	X
Benzoic acid	65-85-0	--	--	X	--	--	X	X	X	X	X	X	--	X
Bis(2-chloroethoxy)methane	111-91-1	--	--	--	--	--	--	--	--	--	--	--	--	--
Bis(2-chloroethyl) ether	111-44-4	X	--	X	X	--	X	X	X	X	X	X	X	X

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		Direct Air Exposure		Direct Soil Exposure			Ingestion of Foodstuffs					Surface Water		
												Sweat Lodge		Fish
		Inhalation	External Exposure	Ingestion	Inhalation	External Exposure	Wild Plants	Game	Wildfowl	Eggs	Ingestion	Dermal	Inhalation	Ingestion
Chlorocyclopentadiene	41851-50-7	--	--	--	--	--	--	--	--	--	--	--	--	--
Cyclohexanol	108-93-0	--	--	--	--	--	--	--	--	--	--	--	--	--
Dichloroisopropyl ether	108-60-1	X	--	X	X	--	X	X	X	X	X	X	X	X
Dichloromethyl ether	542-88-1	X	--	X	X	--	X	X	X	X	X	X	X	X
Dichloropentadiene	61626-71-9	--	--	--	--	--	--	--	--	--	--	--	--	--
Dimethyl sulfate	77-78-1	--	--	--	--	--	--	--	--	--	--	--	--	--
Dimethylaniline	121-69-7	--	--	X	--	--	X	X	X	X	X	X	--	X
di-n-Propylnitrosamine	621-64-7	--	--	X	--	--	X	X	X	X	X	X	--	X
Diphenyl ether	101-84-8	--	--	--	--	--	--	--	--	--	--	--	--	--
Epichlorohydrin	106-89-8	X	--	X	X	--	X	X	X	X	X	X	X	X
Ethyl carbamate (Urethane)	51-79-6	--	--	--	--	--	--	--	--	--	--	--	--	--
Ethyl methanesulfonate	62-50-0	--	--	--	--	--	--	--	--	--	--	--	--	--
Ethylene dibromide	106-93-4	X	--	X	X	--	X	X	X	X	X	X	X	X
Ethylene glycol	107-21-1	--	--	X	--	--	X	X	X	X	X	X	--	X
Ethylene glycol monobutyl ether	111-76-2	X	--	X	X	--	X	X	X	X	X	X	X	X
Ethylene glycol monoethyl ether acetate	111-15-9	--	--	X	--	--	X	X	X	X	X	X	--	X
Ethylene thiourea	96-45-7	--	--	X	--	--	X	X	X	X	X	X	--	X
Furfural	98-01-1	X	--	X	X	--	X	X	X	X	X	X	X	X
Maleic hydrazide	123-33-1	--	--	X	--	--	X	X	X	X	X	X	--	X
Malononitrile	109-77-3	--	--	X	--	--	X	X	X	X	X	X	--	X
Methyl styrene (mixed isomers)	25013-15-4	X	--	X	X	--	X	X	X	X	X	X	X	X
Methylhydrazine	60-34-4	X	--	X	X	--	X	X	X	X	X	X	X	X
N,N-Diphenylamine	122-39-4	--	--	X	--	--	X	X	X	X	X	X	--	X
Nitric acid, propyl ester	627-13-4	--	--	--	--	--	--	--	--	--	--	--	--	--
N-Nitrosodi-n-butylamine	924-16-3	X	--	X	X	--	X	X	X	X	X	X	X	X
N-Nitrosomorpholine	59-89-2	--	--	--	--	--	--	--	--	--	--	--	--	--
N-Nitroso-N,N-dimethylamine	62-75-9	X	--	X	X	--	X	X	X	X	X	X	X	X
o-Anisidine	90-04-0	--	--	--	--	--	--	--	--	--	--	--	--	--
Oxalic acid	144-62-7	--	--	--	--	--	--	--	--	--	--	--	--	--
Phthalic anhydride	85-44-9	X	--	X	X	--	X	X	X	X	X	X	X	X
p-Phthalic acid	100-21-0	--	--	X	--	--	X	X	X	X	X	X	--	X
Pyridine	110-86-1	--	--	X	--	--	X	X	X	X	X	X	--	X
Quinoline	91-22-5	--	--	X	--	--	X	X	X	X	X	X	--	X
Quinone	106-51-4	--	--	--	--	--	--	--	--	--	--	--	--	--
Safrole	94-59-7	--	--	--	--	--	--	--	--	--	--	--	--	--
Tetrahydrofuran	109-99-9	--	--	--	--	--	--	--	--	--	--	--	--	--
Other Heavy Semivolatile Compounds (molecular weight >200 g/mole)														
1,2,4,5-Tetrachlorobenzene	95-94-3	--	--	X	--	--	X	X	X	X	X	X	--	X
1,3,5-Trinitrobenzene	99-35-4	--	--	X	--	--	X	X	X	X	X	X	--	X
2,6-Bis(tert-butyl)-4-methylphenol	128-37-0	--	--	--	--	--	--	--	--	--	--	--	--	--
2-Cyclohexyl-4,6-dinitrophenol	131-89-5	--	--	X	--	--	X	X	X	X	X	X	--	X
2-sec-Butyl-4,6-dinitrophenol	88-85-7	--	--	X	--	--	X	X	X	X	X	X	--	X

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		Direct Air Exposure		Direct Soil Exposure			Ingestion of Foodstuffs				Surface Water			
												Sweat Lodge		Fish
		Inhalation	External Exposure	Ingestion	Inhalation	External Exposure	Wild Plants	Game	Wildfowl	Eggs	Ingestion	Dermal	Inhalation	Ingestion
3,3'-Dichlorobenzidine	91-94-1	--	--	X	--	--	X	X	X	X	X	X	--	X
3,3'-Dimethoxybenzidine	119-90-4	--	--	X	--	--	X	X	X	X	X	X	--	X
4-Bromophenylphenyl ether	101-55-3	--	--	--	--	--	--	--	--	--	--	--	--	--
Ammonium perfluorooctanoate	3825-26-1	--	--	--	--	--	--	--	--	--	--	--	--	--
Azobenzene	103-33-3	X	--	X	X	--	X	X	X	X	X	X	X	X
Bis(3-tert-butyl-4-hydroxy-6-methyl-phenyl)sulfide	96-69-5	--	--	--	--	--	--	--	--	--	--	--	--	--
Captan	133-06-2	--	--	X	--	--	X	X	X	X	X	X	--	X
Chlorobenzilate	510-15-6	X	--	X	X	--	X	X	X	X	X	X	X	X
Dibutylphosphate	107-66-4	--	--	--	--	--	--	--	--	--	--	--	--	--
Dimethyl aminoazobenzene	60-11-7	--	--	--	--	--	--	--	--	--	--	--	--	--
Hexachlorobenzene	118-74-1	X	--	X	X	--	X	X	X	X	X	X	X	X
Hexachlorobutadiene	87-68-3	X	--	X	X	--	X	X	X	X	X	X	X	X
Hexachlorocyclopentadiene	77-47-4	X	--	X	X	--	X	X	X	X	X	X	X	X
Hexachloroethane	67-72-1	X	--	X	X	--	X	X	X	X	X	X	X	X
Hexachlorophene	70-30-4	--	--	X	--	--	X	X	X	X	X	X	--	X
Hexamethylene-1,5-diisocyanate	822-06-0	X	--	--	X	--	--	--	--	--	--	--	X	--
Mirex	2385-85-5	X	--	X	X	--	X	X	X	X	X	X	X	X
Nitrofen	1836-75-5	--	--	--	--	--	--	--	--	--	--	--	--	--
Pentachlorobenzene	608-93-5	--	--	X	--	--	X	X	X	X	X	X	--	X
Pentachloronitrobenzene	82-68-8	--	--	X	--	--	X	X	X	X	X	X	--	X
Pentachlorophenol	87-86-5	--	--	X	--	--	X	X	X	X	X	X	--	X
Picric acid	88-89-1	--	--	--	--	--	--	--	--	--	--	--	--	--
Pronamide	23950-58-5	--	--	X	--	--	X	X	X	X	X	X	--	X
Strychnine	57-24-9	--	--	X	--	--	X	X	X	X	X	X	--	X
Terphenyls	26140-60-3	--	--	--	--	--	--	--	--	--	--	--	--	--
Tributyl phosphate	126-73-8	--	--	--	--	--	--	--	--	--	--	--	--	--
Trifluralin	1582-09-8	--	--	X	--	--	X	X	X	X	X	X	--	X
Triphenylamine	603-34-9	--	--	--	--	--	--	--	--	--	--	--	--	--
Herbicides and Organochlorinated Pesticides														
2,4,5-T	93-76-5	--	--	X	--	--	X	X	X	X	X	X	--	X
2,4-D and esters	94-75-7	--	--	X	--	--	X	X	X	X	X	X	--	X
4,4'-DDD	72-54-8	--	--	X	--	--	X	X	X	X	X	X	--	X
4,4'-DDE	72-55-9	--	--	X	--	--	X	X	X	X	X	X	--	X
4,4'-DDT	50-29-3	X	--	X	X	--	X	X	X	X	X	X	X	X
Aldrin	309-00-2	X	--	X	X	--	X	X	X	X	X	X	X	X
alpha-BHC	319-84-6	X	--	X	X	--	X	X	X	X	X	X	X	X
beta-BHC	319-85-7	X	--	X	X	--	X	X	X	X	X	X	X	X
Chlordane	57-74-9	X	--	X	X	--	X	X	X	X	X	X	X	X
delta-BHC	319-86-8	--	--	--	--	--	--	--	--	--	--	--	--	--
Dieldrin	60-57-1	X	--	X	X	--	X	X	X	X	X	X	X	X
Endothall	145-73-3	--	--	X	--	--	X	X	X	X	X	X	--	X
Endrin	72-20-8	--	--	X	--	--	X	X	X	X	X	X	--	X

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		Direct Air Exposure		Direct Soil Exposure			Ingestion of Foodstuffs				Surface Water			
		Inhalation	External Exposure	Ingestion	Inhalation	External Exposure	Wild Plants	Game	Wildfowl	Eggs	Ingestion	Sweat Lodge Dermal	Sweat Lodge Inhalation	Fish Ingestion
gamma-BHC (Lindane)	58-89-9	--	--	X	--	--	X	X	X	X	X	X	--	X
Heptachlor	76-44-8	X	--	X	X	--	X	X	X	X	X	X	X	X
Isodrin	465-73-6	--	--	--	--	--	--	--	--	--	--	--	--	--
Methoxychlor	72-43-5	--	--	X	--	--	X	X	X	X	X	X	--	X
Silvex (2,4,5-TP)	93-72-1	--	--	X	--	--	X	X	X	X	X	X	--	X
Toxaphene	8001-35-2	X	--	X	X	--	X	X	X	X	X	X	X	X
Inorganic Chemicals and Compounds														
Metals														
Aluminum	7429-90-5	--	--	--	--	--	--	--	--	--	--	--	--	--
Antimony	7440-36-0	--	--	X	--	--	X	X	--	--	X	--	--	X
Arsenic	7440-38-2	X	--	X	X	--	X	X	--	--	X	--	X	X
Barium	7440-39-3	X	--	X	X	--	X	X	X	X	X	--	X	X
Beryllium	7440-41-7	X	--	X	X	--	X	X	--	--	X	--	X	X
Bismuth	7440-69-9	--	--	--	--	--	--	--	--	--	--	--	--	--
Boron	7440-42-8	X	--	X	X	--	X	X	--	--	X	--	X	--
Cadmium	7440-43-9	X	--	X	X	--	X	X	X	X	X	--	X	X
Calcium	7440-70-2	--	--	--	--	--	--	--	--	--	--	--	--	--
Chromium	18540-29-9	X	--	X	X	--	X	X	--	--	X	--	X	X
Cobalt	7440-48-4	--	--	--	--	--	--	--	--	--	--	--	--	--
Copper	7440-50-8	--	--	--	--	--	--	--	--	--	--	--	--	--
Iron	7439-89-6	--	--	--	--	--	--	--	--	--	--	--	--	--
Lead	7439-92-1	--	--	--	--	--	--	--	--	--	--	--	--	--
Lithium	7439-93-2	--	--	--	--	--	--	--	--	--	--	--	--	--
Magnesium	7439-95-4	--	--	--	--	--	--	--	--	--	--	--	--	--
Manganese	7439-96-5	X	--	X	X	--	X	X	X	X	X	--	X	--
Mercury	7439-97-6	X	--	--	--	--	--	--	--	--	--	--	--	--
Mercury - Hg+2	7487-94-7	--	--	X	--	--	X	X	X	X	X	--	--	--
Methylmercury	22967-92-6	--	--	X	--	--	X	X	X	X	X	--	--	X
Molybdenum	7439-98-7	--	--	X	--	--	X	X	X	X	X	--	--	--
Nickel	7440-02-0	X	--	X	X	--	X	X	--	--	X	--	X	X
Potassium	7440-09-7	--	--	--	--	--	--	--	--	--	--	--	--	--
Rhodium	7440-16-6	--	--	--	--	--	--	--	--	--	--	--	--	--
Selenium	7782-49-2	--	--	X	--	--	X	X	X	X	X	--	--	X
Silicon	7440-21-3	--	--	--	--	--	--	--	--	--	--	--	--	--
Silver	7440-22-4	--	--	X	--	--	X	X	--	--	X	--	--	X
Sodium	7440-23-5	--	--	--	--	--	--	--	--	--	--	--	--	--
Strontium	7440-24-6	--	--	X	--	--	X	X	--	--	X	--	--	X
Tantalum	7440-25-7	--	--	--	--	--	--	--	--	--	--	--	--	--
Thallium	7440-28-0	--	--	X	--	--	X	X	--	--	X	--	--	X
Tin	7440-31-5	--	--	X	--	--	X	X	--	--	X	--	--	--
Tungsten	7440-33-7	--	--	--	--	--	--	--	--	--	--	--	--	--

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		Direct Air Exposure		Direct Soil Exposure			Ingestion of Foodstuffs					Surface Water		
												Sweat Lodge		Fish
		Inhalation	External Exposure	Ingestion	Inhalation	External Exposure	Wild Plants	Game	Wildfowl	Eggs	Ingestion	Dermal	Inhalation	Ingestion
Uranium	7440-61-1	--	--	X	--	--	X	X	X	X	X	--	--	--
Vanadium	7440-62-2	--	--	X	--	--	X	X	--	--	X	--	--	--
Yttrium	7440-65-5	--	--	--	--	--	--	--	--	--	--	--	--	--
Zinc	7440-66-6	--	--	X	--	--	X	X	X	X	X	--	--	X
Zirconium	7440-67-7	--	--	--	--	--	--	--	--	--	--	--	--	--
Non-metals and Anions														
Ammonia/Ammonium	7664-41-7	X	--	--	X	--	--	--	--	--	--	--	X	--
Bromide	24959-67-9	--	--	--	--	--	--	--	--	--	--	--	--	--
Chloride	16887-00-6	--	--	--	--	--	--	--	--	--	--	--	--	--
Cyanide	57-12-5	--	--	X	--	--	--	X	--	--	X	--	--	X
Fluoride	16984-48-8	--	--	X	--	--	X	--	--	--	X	--	--	--
Hydroxide	14280-30-9	--	--	--	--	--	--	--	--	--	--	--	--	--
Iodine	7553-56-2	--	--	--	--	--	--	--	--	--	--	--	--	--
Nitrate	14797-55-8	--	--	X	--	--	X	--	--	--	X	--	--	--
Nitrite	14797-65-0	--	--	X	--	--	--	--	--	--	X	--	--	--
Phosphate	14265-44-2	--	--	--	--	--	--	--	--	--	--	--	--	--
Phosphorus	7723-14-0	--	--	--	--	--	--	--	--	--	--	--	--	--
Sulfate	14808-79-8	--	--	--	--	--	--	--	--	--	--	--	--	--
Total sulfur	63705-05-5	--	--	--	--	--	--	--	--	--	--	--	--	--
Criteria Pollutants														
Carbon monoxide	630-08-0	--	--	--	--	--	--	--	--	--	--	--	--	--
Nitrogen dioxide	10102-44-0	--	--	--	--	--	--	--	--	--	--	--	--	--
Ozone	10028-15-6	--	--	--	--	--	--	--	--	--	--	--	--	--
Particulate matter	No CAS #	--	--	--	--	--	--	--	--	--	--	--	--	--
Sulfur dioxide	7446-09-5	--	--	--	--	--	--	--	--	--	--	--	--	--
Radionuclides														
Actinium-227	14952-40-0	X	X	X	X	X	X	X	--	--	X	--	X	X
Americium-241	14596-10-2	X	X	X	X	X	X	X	--	--	X	--	X	X
Americium-243	14993-75-0	X	X	X	X	X	X	X	--	--	X	--	X	X
Antimony-125	14234-35-6	X	X	X	X	X	X	X	--	--	X	--	X	X
Cadmium-113m	14336-66-4	X	X	X	X	X	X	X	--	--	X	--	X	X
Carbon-14	14762-75-5	X	X	X	X	X	X	--	--	--	X	--	X	X
Cesium-134	13967-70-9	X	X	X	X	X	X	X	--	--	X	--	X	X
Cesium-137	10045-97-3	X	X	X	X	X	X	X	--	--	X	--	X	X
Barium-137m	13981-97-0	Risks from Barium-137 are included in slope factor for Cesium-137+D[a]												
Cobalt-60	10198-40-0	X	X	X	X	X	X	X	--	--	X	--	X	X
Curium-242	15510-73-3	X	X	X	X	X	X	X	--	--	X	--	X	X
Curium-243	15757-87-6	X	X	X	X	X	X	X	--	--	X	--	X	X
Curium-244	13981-15-2	X	X	X	X	X	X	X	--	--	X	--	X	X
Europium-152	14683-23-9	X	X	X	X	X	X	X	--	--	X	--	X	X
Europium-154	15585-10-1	X	X	X	X	X	X	X	--	--	X	--	X	X

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												Sweat Lodge		Fish
		Inhalation	External Exposure	Ingestion	Inhalation	External Exposure	Wild Plants	Game	Wildfowl	Eggs	Ingestion	Dermal	Inhalation	Ingestion
Europium-155	14391-16-3	X	X	X	X	X	X	X	--	--	X	--	X	X
Iodine-129	15046-84-1	X	X	X	X	X	X	X	--	--	X	--	X	X
Neptunium-237	13994-20-2	X	X	X	X	X	X	X	--	--	X	--	X	X
Nickel-59	14336-70-0	X	X	X	X	X	X	X	--	--	X	--	X	X
Nickel-63	13981-37-8	X	X	X	X	X	X	X	--	--	X	--	X	X
Niobium-93m	7440-03-1	X	X	X	X	X	X	X	--	--	X	--	X	X
Plutonium-238	13981-16-3	X	X	X	X	X	X	X	--	--	X	--	X	X
Plutonium-239	15117-48-3	X	X	X	X	X	X	X	--	--	X	--	X	X
Plutonium-240	14119-33-6	X	X	X	X	X	X	X	--	--	X	--	X	X
Plutonium-241	14119-32-5	X	X	X	X	X	X	X	--	--	X	--	X	X
Plutonium-242	13982-10-0	X	X	X	X	X	X	X	--	--	X	--	X	X
Protactinium-231	14331-85-2	X	X	X	X	X	X	X	--	--	X	--	X	X
Radium-226	13982-63-3	X	X	X	X	X	X	X	--	--	X	--	X	X
Radium-228	15262-20-1	X	X	X	X	X	X	X	--	--	X	--	X	X
Ruthenium-106	13967-48-1	X	X	X	X	X	X	X	--	--	X	--	X	X
Samarium-151	15715-94-3	X	X	X	X	X	X	X	--	--	X	--	X	X
Selenium-79	15758-45-9	X	X	X	X	X	X	X	--	--	X	--	X	X
Strontium-90	10098-97-2	X	X	X	X	X	X	X	--	--	X	--	X	X
Yttrium-90	10098-91-6	Risks from Yttrium-90 are included in slope factor for Strontium-90+D[a]												
Technetium-99	14133-76-7	X	X	X	X	X	X	X	--	--	X	--	X	X
Thorium-229	15594-54-4	X	X	X	X	X	X	X	--	--	X	--	X	X
Thorium-232	7440-29-1	X	X	X	X	X	X	X	--	--	X	--	X	X
Tin-126	15832-50-5	X	X	X	X	X	X	X	--	--	X	--	X	X
Tritium	10028-17-8	X	X	X	X	X	X	--	--	--	X	--	X	X
Uranium-232	14158-29-3	X	X	X	X	X	X	X	--	--	X	--	X	X
Uranium-233	13968-55-3	X	X	X	X	X	X	X	--	--	X	--	X	X
Uranium-234	13966-29-5	X	X	X	X	X	X	X	--	--	X	--	X	X
Uranium-235	15117-96-1	X	X	X	X	X	X	X	--	--	X	--	X	X
Uranium-236	13982-70-2	X	X	X	X	X	X	X	--	--	X	--	X	X
Uranium-238	7440-61-1	X	X	X	X	X	X	X	--	--	X	--	X	X
Zirconium-93	15751-77-6	X	X	X	X	X	X	X	--	--	X	--	X	X

CAS = Chemical Abstracts Service.
PCDD = Polychlorinated dibenzo-p-dioxin.
PCDF = Polychlorinated dibenzofuran.

X = Constituent is quantitatively evaluated for this exposure medium and pathway.
-- = Constituent is qualitatively evaluated for this exposure medium and pathway.
[a] +D slope factors include contributions from short-lived daughter products.

Table A-10 Constituents with Data Available to Quantify Human Infant Ingestion of Breast Milk

Constituent of Potential Concern	CAS Registry Number	Ingestion of Breastmilk
Organic Compounds		
Dioxin and Furan Compounds (PCDDs/PCDFs)		
1,2,3,4,6,7,8-Heptachlorodibenzo(p)dioxin	35822-46-9	X
1,2,3,4,6,7,8-Heptachlorodibenzofuran	67562-39-4	X
1,2,3,4,7,8,9-Heptachlorodibenzofuran	55673-89-7	X
1,2,3,4,7,8-Hexachlorodibenzo(p)dioxin	39227-28-6	X
1,2,3,4,7,8-Hexachlorodibenzofuran	70648-26-9	X
1,2,3,6,7,8-Hexachlorodibenzo(p)dioxin	57653-85-7	X
1,2,3,6,7,8-Hexachlorodibenzofuran	57117-44-9	X
1,2,3,7,8,9-Hexachlorodibenzo(p)dioxin	19408-74-3	X
1,2,3,7,8,9-Hexachlorodibenzofuran	72918-21-9	X
1,2,3,7,8-Pentachlorodibenzo(p)dioxin	40321-76-4	X
1,2,3,7,8-Pentachlorodibenzofuran	57117-41-6	X
2,3,4,6,7,8-Hexachlorodibenzofuran	60851-34-5	X
2,3,4,7,8-Pentachlorodibenzofuran	57117-31-4	X
2,3,7,8-Tetrachlorodibenzo(p)dioxin	1746-01-6	X
2,3,7,8-Tetrachlorodibenzofuran	51207-31-9	X
Dibenzofuran	132-64-9	--
Octachlorodibenzo(p)dioxin	3268-87-9	X
Octachlorodibenzofuran	39001-02-0	X
Polychlorinated Biphenyls (PCBs)		
2,2',3,3',4,4',5-Heptachlorobiphenyl	35065-30-6	X [a]
2,2',3,4,4',5,5'-Heptachlorobiphenyl	35065-29-3	X [a]
2,3,3',4,4',5,5'-Heptachlorobiphenyl	39635-31-9	X
2,3,3',4,4',5'-Hexachlorobiphenyl	69782-90-7	X
2,3,3',4,4',5-Hexachlorobiphenyl	38380-08-4	X
2,3,3',4,4'-Pentachlorobiphenyl	32598-14-4	X
2,3',4,4',5,5'-Hexachlorobiphenyl	52663-72-6	X
2,3,4,4',5-Pentachlorobiphenyl	74472-37-0	X
2',3,4,4',5-Pentachlorobiphenyl	65510-44-3	X
2,3',4,4',5-Pentachlorobiphenyl	31508-00-6	X
3,3',4,4',5,5'-Hexachlorobiphenyl	32774-16-6	X
3,3',4,4',5-Pentachlorobiphenyl	57465-28-8	X
3,3',4,4'-Tetrachlorobiphenyl	32598-13-3	X
3,4,4',5-Tetrachlorobiphenyl	70362-50-4	X
Polychlorinated biphenyls (PCBs)	1336-36-3	--
Inorganic Chemicals and Compounds		
No Inorganic Chemicals and Compounds were evaluated for Nursing Infant		
Radionuclides		
Cesium-134	13967-70-9	X
Cesium-137	10045-97-3	X
Iodine-129	15046-84-1	X
Strontium-90	10098-97-2	X

CAS = Chemical Abstracts Service.

PCDD = Polychlorinated dibenzo-p-dioxin.
PCDF = Polychlorinated dibenzofuran.

X = Constituent is quantitatively evaluated for the ingestion of breastmilk.
-- = Constituent is qualitatively evaluated for the ingestion of breastmilk.

[a] Infant intakes can be quantified for these congeners, but because toxicity equivalency factors are not available, these congeners are not included in the intake of Total Coplanar PCBs as 2,3,7,8-TCDD equivalents.

Table A-11 Constituents with Data Available to Estimate Potential for Acute Human Hazards from Emissions

Constituent of Potential Concern	CAS Registry Number	Acute Exposure
Organic Compounds		
Aromatic Halogenated Hydrocarbons		
2,3,4,6-Tetrachlorophenol	58-90-2	--
4-Chloro-3-methylphenol	59-50-7	X
Aromatic Nonhalogenated Hydrocarbons		
2-Nitrotoluene	88-72-2	X
4-Nitrobiphenyl	92-93-3	X
Benzaldehyde	100-52-7	X
Benzene	71-43-2	X
Benzyl alcohol	100-51-6	X
Ethyl benzene	100-41-4	X
m-Xylene	108-38-3	X
o-Xylene	95-47-6	X
p-Xylene	106-42-3	X
Styrene	100-42-5	X
Toluene	108-88-3	X
Non-aromatic Nonhalogenated Hydrocarbons		
1,2-Epoxybutane	106-88-7	X
1,3-Butadiene	106-99-0	X
1,4-Dioxane	123-91-1	X
1-Methylpropyl alcohol	78-92-2	X
1-Nitropropane	108-03-2	X
2,2,4-Trimethylpentane	540-84-1	X
2-Butanone	78-93-3	X
2-Butenaldehyde (2-Butenal)	4170-30-3	X
2-Ethoxyethanol	110-80-5	X
2-Heptanone	110-43-0	X
2-Hexanone	591-78-6	X
2-Methoxyethanol	109-86-4	X
2-Methyl-2-propanol	75-65-0	X
2-Methyl-2-propenenitrile	126-98-7	X
2-Methylaziridine	75-55-8	X
2-Methylpropyl alcohol	78-83-1	X
2-Pentanone	107-87-9	X
2-Propanone (Acetone)	67-64-1	X
2-Propene-1-ol	107-18-6	X
2-Propyl alcohol	67-63-0	X
3-Heptanone	106-35-4	X
3-Methyl-1-butanol	123-51-3	X
3-Methyl-2-butanone	563-80-4	X
3-Pentanone	96-22-0	--
4-Heptanone	123-19-3	X
4-Methyl-2-pentanone	108-10-1	X
4-Methyl-3-penten-2-one	141-79-7	X
5-Methyl-2-hexanone	110-12-3	X
Acetaldehyde	75-07-0	X
Acetamide	60-35-5	X
Acetic acid	64-19-7	X
Acetic acid ethyl ester	141-78-6	X
Acetic acid n-butyl ester	123-86-4	X
Acetonitrile	75-05-8	X
Acrolein	107-02-8	X
Acrylonitrile	107-13-1	X
Bis(isopropyl)ether	108-20-3	--
Butane	106-97-8	X
Carbon disulfide	75-15-0	X
Cyanogen	460-19-5	X
Cyclohexane	110-82-7	X
Cyclohexanone	108-94-1	X
Cyclohexene	110-83-8	X
Cyclopentane	287-92-3	X
Ethyl alcohol	64-17-5	X
Ethyl ether	60-29-7	X
Ethyl methacrylate	97-63-2	X

Table A-11 Constituents with Data Available to Estimate Potential for Acute Human Hazards from Emissions

Constituent of Potential Concern	CAS Registry Number	Acute Exposure
Formaldehyde	50-00-0	X
Formamide	75-12-7	X
Formic acid	64-18-6	X
Formic acid, methyl ester	107-31-3	X
Glycidylaldehyde	765-34-4	X
Methyl acetate	79-20-9	--
Methyl alcohol	67-56-1	X
Methyl isocyanate	624-83-9	X
Methyl methacrylate	80-62-6	X
Methyl tert-butyl ether	1634-04-4	X
Methylacetylene	74-99-7	X
Methylcyclohexane	108-87-2	X
N,N-Dimethylacetamide	127-19-5	X
n-Butyl alcohol	71-36-3	X
n-Heptane	142-82-5	X
n-Hexane	110-54-3	X
Nitromethane	75-52-5	X
n-Nonane	111-84-2	X
n-Octane	111-65-9	X
n-Pentane	109-66-0	X
n-Propionaldehyde	123-38-6	X
n-Propyl alcohol	71-23-8	X
n-Valeraldehyde	110-62-3	--
Oxirane	75-21-8	X
p-Cymene	99-87-6	--
Phosgene	75-44-5	X
Propargyl alcohol	107-19-7	X
Propionic acid	79-09-4	X
Propionitrile	107-12-0	X
Propylene glycol monomethyl ether	107-98-2	X
p-tert-Butyltoluene	98-51-1	--
Triethylamine	121-44-8	X
Trimethylamine	75-50-3	X
Vinyl acetate	108-05-4	X
Non-aromatic Halogenated Hydrocarbons		
1,1,1,2-Tetrachloro-2,2-difluoroethane	76-11-9	--
1,1,1,2-Tetrachloroethane	630-20-6	X
1,1,1-Trichloroethane	71-55-6	X
1,1,2,2-Tetrachloro-1,2-difluoroethane	76-12-0	--
1,1,2,2-Tetrachloroethane	79-34-5	X
1,1,2,2-Tetrachloroethene	127-18-4	X
1,1,2-Trichloroethane	79-00-5	X
1,1,2-Trichloroethylene	79-01-6	X
1,1-Dichloroethane	75-34-3	X
1,1-Dichloroethene	75-35-4	X
1,2,2-Trichloro-1,1,2-trifluoroethane	76-13-1	X
1,2,3-Trichloropropane	96-18-4	X
1,2-Dibromo-3-chloropropane	96-12-8	X
1,2-Dichloro-1,1,2,2-tetrafluoroethane	76-14-2	X
1,2-Dichloroethane	107-06-2	X
1,2-Dichloroethylene	540-59-0	X
1,2-Dichloropropane	78-87-5	X
1,3-Dichloropropene	542-75-6	X
1,4-Dichloro-2-butene	764-41-0	X
1-Chloroethene	75-01-4	X
2,2-Dichloropropionic acid	75-99-0	--
2-Chloropropane	75-29-6	X
3-Chloropropene (Allyl chloride)	107-05-1	X
Bromochloromethane	74-97-5	X
Bromodichloromethane	75-27-4	X
Bromoethene	593-60-2	X
Bromoform	75-25-2	X
Bromomethane	74-83-9	X
Carbon tetrachloride	56-23-5	X

Table A-11 Constituents with Data Available to Estimate Potential for Acute Human Hazards from Emissions

Constituent of Potential Concern	CAS Registry Number	Acute Exposure
Chlorodibromomethane	124-48-1	X
Chlorodifluoromethane	75-45-6	X
Chloroethane	75-00-3	X
Chloroform	67-66-3	X
Chloromethane	74-87-3	X
Chloropentafluoroethane	76-15-3	X
cis-1,2-Dichloroethene	156-59-2	X
cis-1,3-Dichloropropene	10061-01-5	X
Cyanogen bromide	506-68-3	X
Cyanogen chloride	506-77-4	X
Dichlorodifluoromethane	75-71-8	X
Dichlorofluoromethane	75-43-4	X
Dichloromethane	75-09-2	X
Difluorodibromomethane	75-61-6	--
Hexafluoroacetone	684-16-2	X
Iodomethane	74-88-4	X
Methylene bromide	74-95-3	X
Pentachloroethane	76-01-7	X
trans-1,2-Dichloroethylene	156-60-5	X
trans-1,3-Dichloropropene	10061-02-6	X
Trichloroacetic acid	76-03-9	X
Trichlorofluoroethane	27154-33-2	--
Trichlorofluoromethane	75-69-4	X
Trifluorobromomethane	75-63-8	X
Dioxin and Furan Compounds (PCDDs/PCDFs)		
1,2,3,4,6,7,8-Heptachlorodibenzo(p)dioxin	35822-46-9	X
1,2,3,4,6,7,8-Heptachlorodibenzofuran	67562-39-4	X
1,2,3,4,7,8,9-Heptachlorodibenzofuran	55673-89-7	X
1,2,3,4,7,8-Hexachlorodibenzo(p)dioxin	39227-28-6	X
1,2,3,4,7,8-Hexachlorodibenzofuran	70648-26-9	X
1,2,3,6,7,8-Hexachlorodibenzo(p)dioxin	57653-85-7	X
1,2,3,6,7,8-Hexachlorodibenzofuran	57117-44-9	X
1,2,3,7,8,9-Hexachlorodibenzo(p)dioxin	19408-74-3	X
1,2,3,7,8,9-Hexachlorodibenzofuran	72918-21-9	X
1,2,3,7,8-Pentachlorodibenzo(p)dioxin	40321-76-4	X
1,2,3,7,8-Pentachlorodibenzofuran	57117-41-6	X
2,3,4,6,7,8-Hexachlorodibenzofuran	60851-34-5	X
2,3,4,7,8-Pentachlorodibenzofuran	57117-31-4	X
2,3,7,8-Tetrachlorodibenzo(p)dioxin	1746-01-6	X
2,3,7,8-Tetrachlorodibenzofuran	51207-31-9	X
Dibenzofuran	132-64-9	X
Octachlorodibenzo(p)dioxin	3268-87-9	X
Octachlorodibenzofuran	39001-02-0	X
Polychlorinated Biphenyls (PCBs)		
2,2',3,3',4,4',5-Heptachlorobiphenyl	35065-30-6	--
2,2',3,4,4',5,5'-Heptachlorobiphenyl	35065-29-3	--
2,3,3',4,4',5,5'-Heptachlorobiphenyl	39635-31-9	--
2,3,3',4,4',5'-Hexachlorobiphenyl	69782-90-7	--
2,3,3',4,4',5-Hexachlorobiphenyl	38380-08-4	--
2,3,3',4,4'-Pentachlorobiphenyl	32598-14-4	--
2,3',4,4',5,5'-Hexachlorobiphenyl	52663-72-6	--
2,3,4,4',5-Pentachlorobiphenyl	74472-37-0	--
2',3,4,4',5-Pentachlorobiphenyl	65510-44-3	--
2,3',4,4',5-Pentachlorobiphenyl	31508-00-6	--
3,3',4,4',5,5'-Hexachlorobiphenyl	32774-16-6	--
3,3',4,4',5-Pentachlorobiphenyl	57465-28-8	--
3,3',4,4'-Tetrachlorobiphenyl	32598-13-3	--
3,4,4',5-Tetrachlorobiphenyl	70362-50-4	--
Polychlorinated biphenyls (PCBs)	1336-36-3	X
Phthalates		
Bis(2-ethylhexyl) phthalate (DEHP)	117-81-7	X
Butylbenzyl phthalate	85-68-7	X
Dibutyl phthalate	84-74-2	X
Diethyl phthalate	84-66-2	X

Table A-11 Constituents with Data Available to Estimate Potential for Acute Human Hazards from Emissions

Constituent of Potential Concern	CAS Registry Number	Acute Exposure
Dimethyl phthalate	131-11-3	X
n-Dioctyl phthalate	117-84-0	X
Light Polycyclic Aromatic Hydrocarbons (molecular weight <200 g/mole)		
2-Chloronaphthalene	91-58-7	X
2-Methyl naphthalene	91-57-6	X
5-Nitroacenaphthene	602-87-9	--
Acenaphthene	83-32-9	X
Acenaphthylene	208-96-8	X
Anthracene	120-12-7	X
Fluorene	86-73-7	X
Indene	95-13-6	X
Naphthalene	91-20-3	X
Phenanthrene	85-01-8	X
Pyrene	129-00-0	X
Heavy Polycyclic Aromatic Hydrocarbons (molecular weight >200 g/mole)		
3-Methylcholanthrene	56-49-5	X
5-Methylchrysene	3697-24-3	--
Benzo[a]anthracene	56-55-3	X
Benzo[a]pyrene	50-32-8	X
Benzo[a,i]pyrene	191-30-0	--
Benzo[b]fluoranthene	205-99-2	X
Benzo[e]pyrene	192-97-2	--
Benzo[g,h,i]perylene	191-24-2	X
Benzo[j]fluoranthene	205-82-3	--
Benzo[k]fluoranthene	207-08-9	X
Chrysene	218-01-9	X
Dibenz[a,h]acridine	226-36-8	--
Dibenz[a,h]anthracene	53-70-3	X
Dibenz[a,j]acridine	224-42-0	--
Dibenzo[a,e]fluoranthene	5385-75-1	--
Dibenzo[a,e]pyrene	192-65-4	X
Dibenzo[a,h]fluoranthene	No CAS #	--
Dibenzo[a,h]pyrene	189-64-0	--
Dibenzo[a,i]pyrene	189-55-9	--
Fluoranthene	206-44-0	X
Hexachloronaphthalene	1335-87-1	X
Indeno[1,2,3-cd]pyrene	193-39-5	X
Octachloronaphthalene	2234-13-1	X
Pentachloronaphthalene	1321-64-8	--
Tetrachloronaphthalene	1335-88-2	--
Trichloronaphthalene	1321-65-9	--
Light Substituted Benzene Compounds (molecular weight <200 g/mole)		
1,2,3-Trichlorobenzene	87-61-6	X
1,2,4-Trichlorobenzene	120-82-1	X
1,2,4-Trimethyl benzene	95-63-6	X
1,2-Dichlorobenzene	95-50-1	X
1,3,5-Trimethyl benzene	108-67-8	X
1,3-Dichlorobenzene	541-73-1	X
1,3-Dinitrobenzene	99-65-0	X
1,4-Dichlorobenzene	106-46-7	X
1,4-Dinitrobenzene	100-25-4	X
2,4,5-Trichlorophenol	95-95-4	X
2,4,6-Trichlorophenol	88-06-2	X
2,4-Dichlorophenol	120-83-2	X
2,4-Dimethylphenol	105-67-9	X
2,4-Dinitrophenol	51-28-5	X
2,4-Dinitrotoluene	121-14-2	X
2,6-Dinitrotoluene	606-20-2	X
2-Chlorophenol	95-57-8	X
2-Chlorotoluene	95-49-8	X
2-Nitrophenol	88-75-5	X
4,6-Dinitro-o-cresol	534-52-1	X
4-Chlorotoluene	106-43-4	X
4-Nitrophenol	100-02-7	X

Table A-11 Constituents with Data Available to Estimate Potential for Acute Human Hazards from Emissions

Constituent of Potential Concern	CAS Registry Number	Acute Exposure
alpha-Methylstyrene	98-83-9	--
Aniline	62-53-3	X
Benzotrichloride	98-07-7	X
Benzyl chloride	100-44-7	X
Bromobenzene	108-86-1	X
Chlorobenzene	108-90-7	X
Cumene	98-82-8	X
m-Cresol	108-39-4	X
n-Butyl benzene	104-51-8	X
Nitrobenzene	98-95-3	X
n-Propyl benzene	103-65-1	X
o-Cresol	95-48-7	X
o-Dinitrobenzene	528-29-0	X
o-Nitroaniline	88-74-4	X
o-Toluidine	95-53-4	X
p-Chloroaniline	106-47-8	X
p-Cresol	106-44-5	X
Phenol	108-95-2	X
p-Nitrochlorobenzene	100-00-5	X
p-Toluidine	106-49-0	X
sec-Butyl benzene	135-98-8	X
tert-Butyl benzene	98-06-6	X
Toluene-2,6-diamine	823-40-5	X
Trimethyl benzene	25551-13-7	--
Other Light Semivolatile Compounds (molecular weight <200 g/mole)		
1,1'-Biphenyl	92-52-4	X
1,1-Dimethylhydrazine	57-14-7	X
1,2-Dimethylhydrazine	540-73-8	X
1,2-Diphenylhydrazine	122-66-7	X
1,3-Propane sultone	1120-71-4	X
2,4-Toluene diisocyanate	584-84-9	X
2-Chloroacetophenone	532-27-4	--
2-Propenoic acid	79-10-7	X
4,4'-Methylenedianiline	101-77-9	X
Acetophenone	98-86-2	X
Benzoic acid	65-85-0	X
Bis(2-chloroethoxy)methane	111-91-1	X
Bis(2-chloroethyl) ether	111-44-4	X
Chlorocyclopentadiene	41851-50-7	--
Cyclohexanol	108-93-0	X
Dichloroisopropyl ether	108-60-1	X
Dichloromethyl ether	542-88-1	X
Dichloropentadiene	61626-71-9	--
Dimethyl sulfate	77-78-1	X
Dimethylaniline	121-69-7	X
di-n-Propylnitrosamine	621-64-7	X
Diphenyl ether	101-84-8	--
Epichlorohydrin	106-89-8	X
Ethyl carbamate (Urethane)	51-79-6	X
Ethyl methanesulfonate	62-50-0	X
Ethylene dibromide	106-93-4	X
Ethylene glycol	107-21-1	X
Ethylene glycol monobutyl ether	111-76-2	X
Ethylene glycol monoethyl ether acetate	111-15-9	X
Ethylene thiourea	96-45-7	X
Furfural	98-01-1	X
Maleic hydrazide	123-33-1	X
Malononitrile	109-77-3	X
Methyl styrene (mixed isomers)	25013-15-4	--
Methylhydrazine	60-34-4	X
N,N-Diphenylamine	122-39-4	X
Nitric acid, propyl ester	627-13-4	X
N-Nitrosodi-n-butylamine	924-16-3	--
N-Nitrosomorpholine	59-89-2	X

Table A-11 Constituents with Data Available to Estimate Potential for Acute Human Hazards from Emissions

Constituent of Potential Concern	CAS Registry Number	Acute Exposure
N-Nitroso-N,N-dimethylamine	62-75-9	X
o-Anisidine	90-04-0	X
Oxalic acid	144-62-7	X
Phthalic anhydride	85-44-9	X
p-Phthalic acid	100-21-0	--
Pyridine	110-86-1	X
Quinoline	91-22-5	X
Quinone	106-51-4	X
Safrole	94-59-7	X
Tetrahydrofuran	109-99-9	X
Other Heavy Semivolatile Compounds (molecular weight >200 g/mole)		
1,2,4,5-Tetrachlorobenzene	95-94-3	X
1,3,5-Trinitrobenzene	99-35-4	X
2,6-Bis(tert-butyl)-4-methylphenol	128-37-0	X
2-Cyclohexyl-4,6-dinitrophenol	131-89-5	--
2-sec-Butyl-4,6-dinitrophenol	88-85-7	X
3,3'-Dichlorobenzidine	91-94-1	X
3,3'-Dimethoxybenzidine	119-90-4	X
4-Bromophenylphenyl ether	101-55-3	X
Ammonium perfluorooctanoate	3825-26-1	--
Azobenzene	103-33-3	--
Bis(3-tert-butyl-4-hydroxy-6-methyl-phenyl)sulfide	96-69-5	X
Captan	133-06-2	X
Chlorobenzilate	510-15-6	X
Dibutylphosphate	107-66-4	X
Dimethyl aminoazobenzene	60-11-7	X
Hexachlorobenzene	118-74-1	X
Hexachlorobutadiene	87-68-3	X
Hexachlorocyclopentadiene	77-47-4	X
Hexachloroethane	67-72-1	X
Hexachlorophene	70-30-4	X
Hexamethylene-1,5-diisocyanate	822-06-0	X
Mirex	2385-85-5	X
Nitrofen	1836-75-5	--
Pentachlorobenzene	608-93-5	X
Pentachloronitrobenzene	82-68-8	X
Pentachlorophenol	87-86-5	X
Picric acid	88-89-1	X
Pronamide	23950-58-5	--
Strychnine	57-24-9	X
Terphenyls	26140-60-3	X
Tributyl phosphate	126-73-8	X
Trifluralin	1582-09-8	X
Triphenylamine	603-34-9	--
Herbicides and Organochlorinated Pesticides		
2,4,5-T	93-76-5	X
2,4-D and esters	94-75-7	X
4,4'-DDD	72-54-8	X
4,4'-DDE	72-55-9	X
4,4'-DDT	50-29-3	X
Aldrin	309-00-2	X
alpha-BHC	319-84-6	X
beta-BHC	319-85-7	X
Chlordane	57-74-9	X
delta-BHC	319-86-8	--
Dieldrin	60-57-1	X
Endothall	145-73-3	--
Endrin	72-20-8	X
gamma-BHC (Lindane)	58-89-9	X
Heptachlor	76-44-8	X
Isodrin	465-73-6	X
Methoxychlor	72-43-5	X
Silvex (2,4,5-TP)	93-72-1	X
Toxaphene	8001-35-2	X

Table A-11 Constituents with Data Available to Estimate Potential for Acute Human Hazards from Emissions

Constituent of Potential Concern	CAS Registry Number	Acute Exposure
Inorganic Chemicals and Compounds		
Metals		
Aluminum	7429-90-5	X
Antimony	7440-36-0	X
Arsenic	7440-38-2	X
Barium	7440-39-3	X
Beryllium	7440-41-7	X
Bismuth	7440-69-9	X
Boron	7440-42-8	X
Cadmium	7440-43-9	X
Calcium	7440-70-2	X
Chromium	18540-29-9	X
Cobalt	7440-48-4	X
Copper	7440-50-8	X
Iron	7439-89-6	X
Lead	7439-92-1	X
Lithium	7439-93-2	X
Magnesium	7439-95-4	X
Manganese	7439-96-5	X
Mercury	7439-97-6	X
Mercury - Hg+2	7487-94-7	--
Methylmercury	22967-92-6	--
Molybdenum	7439-98-7	X
Nickel	7440-02-0	X
Potassium	7440-09-7	X
Rhodium	7440-16-6	X
Selenium	7782-49-2	X
Silicon	7440-21-3	X
Silver	7440-22-4	X
Sodium	7440-23-5	X
Strontium	7440-24-6	X
Tantalum	7440-25-7	--
Thallium	7440-28-0	X
Tin	7440-31-5	X
Tungsten	7440-33-7	X
Uranium	7440-61-1	X
Vanadium	7440-62-2	X
Yttrium	7440-65-5	X
Zinc	7440-66-6	X
Zirconium	7440-67-7	X
Non-metals and Anions		
Ammonia/Ammonium	7664-41-7	X
Bromide	24959-67-9	--
Chloride	16887-00-6	--
Cyanide	57-12-5	X
Fluoride	16984-48-8	X
Hydroxide	14280-30-9	--
Iodine	7553-56-2	X
Nitrate	14797-55-8	X
Nitrite	14797-65-0	--
Phosphate	14265-44-2	--
Phosphorus	7723-14-0	X
Sulfate	14808-79-8	X
Total sulfur	63705-05-5	X
Criteria Pollutants		
Carbon monoxide	630-08-0	X
Nitrogen dioxide	10102-44-0	X
Ozone	10028-15-6	X
Particulate matter	No CAS #	X
Sulfur dioxide	7446-09-5	X
Radionuclides		
Actinium-227	14952-40-0	X

Table A-11 Constituents with Data Available to Estimate Potential for Acute Human Hazards from Emissions

Constituent of Potential Concern	CAS Registry Number	Acute Exposure
Americium-241	14596-10-2	X
Americium-243	14993-75-0	X
Antimony-125	14234-35-6	X
Cadmium-113m	14336-66-4	X
Carbon-14	14762-75-5	X
Cesium-134	13967-70-9	X
Cesium-137	10045-97-3	X
Barium-137m	13981-97-0	X[a]
Cobalt-60	10198-40-0	X
Curium-242	15510-73-3	X
Curium-243	15757-87-6	X
Curium-244	13981-15-2	X
Europium-152	14683-23-9	X
Europium-154	15585-10-1	X
Europium-155	14391-16-3	X
Iodine-129	15046-84-1	X
Neptunium-237	13994-20-2	X
Nickel-59	14336-70-0	X
Nickel-63	13981-37-8	X
Niobium-93m	7440-03-1	X
Plutonium-238	13981-16-3	X
Plutonium-239	15117-48-3	X
Plutonium-240	14119-33-6	X
Plutonium-241	14119-32-5	X
Plutonium-242	13982-10-0	X
Protactinium-231	14331-85-2	X
Radium-226	13982-63-3	X
Radium-228	15262-20-1	X
Ruthenium-106	13967-48-1	X
Samarium-151	15715-94-3	X
Selenium-79	15758-45-9	X
Strontium-90	10098-97-2	X
Yttrium-90	10098-91-6	X[b]
Technetium-99	14133-76-7	X
Thorium-229	15594-54-4	X
Thorium-232	7440-29-1	X
Tin-126	15832-50-5	X
Tritium	10028-17-8	X
Uranium-232	14158-29-3	X
Uranium-233	13968-55-3	X
Uranium-234	13966-29-5	X
Uranium-235	15117-96-1	X
Uranium-236	13982-70-2	X
Uranium-238	7440-61-1	X
Zirconium-93	15751-77-6	X

CAS = Chemical Abstracts Service.
PCDD = Polychlorinated dibenzo-p-dioxin.
PCDF = Polychlorinated dibenzofuran.

X = Constituent is quantitatively evaluated for acute exposure.
-- = Constituent is qualitatively evaluated for acute exposure.

[a] Risks from Barium-137 are included in slope factor for Cesium-137+D
[b] Risks from Yttrium-90 are included in slope factor for Strontium-90+D
+D slope factors include contributions from short-lived daughter products.

Table A-12 Constituents with Data Available to Estimate Potential for Hazards to Terrestrial Plants and Invertebrates from Emissions

Constituent of Potential Concern	CAS Registry Number	Terrestrial Plants	Terrestrial Invertebrates
Organic Compounds			
Aromatic Halogenated Hydrocarbons			
2,3,4,6-Tetrachlorophenol	58-90-2	--	--
4-Chloro-3-methylphenol	59-50-7	--	--
Aromatic Nonhalogenated Hydrocarbons			
2-Nitrotoluene	88-72-2	--	--
4-Nitrobiphenyl	92-93-3	--	--
Benzaldehyde	100-52-7	--	--
Benzene	71-43-2	--	--
Benzyl alcohol	100-51-6	--	--
Ethyl benzene	100-41-4	--	--
m-Xylene	108-38-3	--	--
o-Xylene	95-47-6	--	--
p-Xylene	106-42-3	--	--
Styrene	100-42-5	X	--
Toluene	108-88-3	X	--
Non-aromatic Nonhalogenated Hydrocarbons			
1,2-Epoxybutane	106-88-7	--	--
1,3-Butadiene	106-99-0	--	--
1,4-Dioxane	123-91-1	--	--
1-Methylpropyl alcohol	78-92-2	--	--
1-Nitropropane	108-03-2	--	--
2,2,4-Trimethylpentane	540-84-1	--	--
2-Butanone	78-93-3	--	--
2-Butenaldehyde (2-Butenal)	4170-30-3	--	--
2-Ethoxyethanol	110-80-5	--	--
2-Heptanone	110-43-0	--	--
2-Hexanone	591-78-6	--	--
2-Methoxyethanol	109-86-4	--	--
2-Methyl-2-propanol	75-65-0	--	--
2-Methyl-2-propenenitrile	126-98-7	--	--
2-Methylaziridine	75-55-8	--	--
2-Methylpropyl alcohol	78-83-1	--	--
2-Pentanone	107-87-9	--	--
2-Propanone (Acetone)	67-64-1	--	--
2-Propene-1-ol	107-18-6	--	--
2-Propyl alcohol	67-63-0	--	--
3-Heptanone	106-35-4	--	--
3-Methyl-1-butanol	123-51-3	--	--
3-Methyl-2-butanone	563-80-4	--	--
3-Pentanone	96-22-0	--	--
4-Heptanone	123-19-3	--	--
4-Methyl-2-pentanone	108-10-1	--	--
4-Methyl-3-penten-2-one	141-79-7	--	--
5-Methyl-2-hexanone	110-12-3	--	--
Acetaldehyde	75-07-0	--	--
Acetamide	60-35-5	--	--
Acetic acid	64-19-7	--	--
Acetic acid ethyl ester	141-78-6	--	--
Acetic acid n-butyl ester	123-86-4	--	--
Acetonitrile	75-05-8	--	--
Acrolein	107-02-8	--	--
Acrylonitrile	107-13-1	--	--
Bis(isopropyl)ether	108-20-3	--	--
Butane	106-97-8	--	--
Carbon disulfide	75-15-0	--	--
Cyanogen	460-19-5	--	--
Cyclohexane	110-82-7	--	--
Cyclohexanone	108-94-1	--	--
Cyclohexene	110-83-8	--	--
Cyclopentane	287-92-3	--	--
Ethyl alcohol	64-17-5	--	--
Ethyl ether	60-29-7	--	--

Table A-12 Constituents with Data Available to Estimate Potential for Hazards to Terrestrial Plants and Invertebrates from Emissions

Constituent of Potential Concern	CAS Registry Number	Terrestrial Plants	Terrestrial Invertebrates
Ethyl methacrylate	97-63-2	--	--
Formaldehyde	50-00-0	--	--
Formamide	75-12-7	--	--
Formic acid	64-18-6	--	--
Formic acid, methyl ester	107-31-3	--	--
Glycidylaldehyde	765-34-4	--	--
Methyl acetate	79-20-9	--	--
Methyl alcohol	67-56-1	--	--
Methyl isocyanate	624-83-9	--	--
Methyl methacrylate	80-62-6	--	--
Methyl tert-butyl ether	1634-04-4	--	--
Methylacetylene	74-99-7	--	--
Methylcyclohexane	108-87-2	--	--
N,N-Dimethylacetamide	127-19-5	--	--
n-Butyl alcohol	71-36-3	--	--
n-Heptane	142-82-5	X	--
n-Hexane	110-54-3	--	--
Nitromethane	75-52-5	--	--
n-Nonane	111-84-2	--	--
n-Octane	111-65-9	--	--
n-Pentane	109-66-0	--	--
n-Propionaldehyde	123-38-6	--	--
n-Propyl alcohol	71-23-8	--	--
n-Valeraldehyde	110-62-3	--	--
Oxirane	75-21-8	--	--
p-Cymene	99-87-6	--	--
Phosgene	75-44-5	--	--
Propargyl alcohol	107-19-7	--	--
Propionic acid	79-09-4	--	--
Propionitrile	107-12-0	--	--
Propylene glycol monomethyl ether	107-98-2	--	--
p-tert-Butyltoluene	98-51-1	--	--
Triethylamine	121-44-8	--	--
Trimethylamine	75-50-3	--	--
Vinyl acetate	108-05-4	--	--
Non-aromatic Halogenated Hydrocarbons			
1,1,1,2-Tetrachloro-2,2-difluoroethane	76-11-9	--	--
1,1,1,2-Tetrachloroethane	630-20-6	--	--
1,1,1-Trichloroethane	71-55-6	--	--
1,1,2,2-Tetrachloro-1,2-difluoroethane	76-12-0	--	--
1,1,2,2-Tetrachloroethane	79-34-5	--	--
1,1,2,2-Tetrachloroethene	127-18-4	--	--
1,1,2-Trichloroethane	79-00-5	--	--
1,1,2-Trichloroethylene	79-01-6	--	--
1,1-Dichloroethane	75-34-3	--	--
1,1-Dichloroethene	75-35-4	--	--
1,2,2-Trichloro-1,1,2-trifluoroethane	76-13-1	--	--
1,2,3-Trichloropropane	96-18-4	--	--
1,2-Dibromo-3-chloropropane	96-12-8	--	--
1,2-Dichloro-1,1,2,2-tetrafluoroethane	76-14-2	--	--
1,2-Dichloroethane	107-06-2	--	--
1,2-Dichloroethylene	540-59-0	--	--
1,2-Dichloropropane	78-87-5	--	X
1,3-Dichloropropene	542-75-6	--	--
1,4-Dichloro-2-butene	764-41-0	--	--
1-Chloroethene	75-01-4	--	--
2,2-Dichloropropionic acid	75-99-0	--	--
2-Chloropropane	75-29-6	--	--
3-Chloropropene (Allyl chloride)	107-05-1	--	--
Bromochloromethane	74-97-5	--	--
Bromodichloromethane	75-27-4	--	--
Bromoethene	593-60-2	--	--
Bromoform	75-25-2	--	--

Table A-12 Constituents with Data Available to Estimate Potential for Hazards to Terrestrial Plants and Invertebrates from Emissions

Constituent of Potential Concern	CAS Registry Number	Terrestrial Plants	Terrestrial Invertebrates
Bromomethane	74-83-9	--	--
Carbon tetrachloride	56-23-5	--	--
Chlorodibromomethane	124-48-1	--	--
Chlorodifluoromethane	75-45-6	--	--
Chloroethane	75-00-3	--	--
Chloroform	67-66-3	--	--
Chloromethane	74-87-3	--	--
Chloropentafluoroethane	76-15-3	--	--
cis-1,2-Dichloroethene	156-59-2	--	--
cis-1,3-Dichloropropene	10061-01-5	--	--
Cyanogen bromide	506-68-3	--	--
Cyanogen chloride	506-77-4	--	--
Dichlorodifluoromethane	75-71-8	--	--
Dichlorofluoromethane	75-43-4	--	--
Dichloromethane	75-09-2	--	--
Difluorodibromomethane	75-61-6	--	--
Hexafluoroacetone	684-16-2	--	--
Iodomethane	74-88-4	--	--
Methylene bromide	74-95-3	--	--
Pentachloroethane	76-01-7	--	--
trans-1,2-Dichloroethylene	156-60-5	--	--
trans-1,3-Dichloropropene	10061-02-6	--	--
Trichloroacetic acid	76-03-9	--	--
Trichlorofluoroethane	27154-33-2	--	--
Trichlorofluoromethane	75-69-4	--	--
Trifluorobromomethane	75-63-8	--	--
Dioxin and Furan Compounds (PCDDs/PCDFs)			
1,2,3,4,6,7,8-Heptachlorodibenzo(p)dioxin	35822-46-9	--	--
1,2,3,4,6,7,8-Heptachlorodibenzofuran	67562-39-4	--	--
1,2,3,4,7,8,9-Heptachlorodibenzofuran	55673-89-7	--	--
1,2,3,4,7,8-Hexachlorodibenzo(p)dioxin	39227-28-6	--	--
1,2,3,4,7,8-Hexachlorodibenzofuran	70648-26-9	--	--
1,2,3,6,7,8-Hexachlorodibenzo(p)dioxin	57653-85-7	--	--
1,2,3,6,7,8-Hexachlorodibenzofuran	57117-44-9	--	--
1,2,3,7,8,9-Hexachlorodibenzo(p)dioxin	19408-74-3	--	--
1,2,3,7,8,9-Hexachlorodibenzofuran	72918-21-9	--	--
1,2,3,7,8-Pentachlorodibenzo(p)dioxin	40321-76-4	--	--
1,2,3,7,8-Pentachlorodibenzofuran	57117-41-6	--	--
2,3,4,6,7,8-Hexachlorodibenzofuran	60851-34-5	--	--
2,3,4,7,8-Pentachlorodibenzofuran	57117-31-4	--	--
2,3,7,8-Tetrachlorodibenzo(p)dioxin	1746-01-6	--	X
2,3,7,8-Tetrachlorodibenzofuran	51207-31-9	--	--
Dibenzofuran	132-64-9	--	--
Octachlorodibenzo(p)dioxin	3268-87-9	--	--
Octachlorodibenzofuran	39001-02-0	--	--
Polychlorinated Biphenyls (PCBs)			
2,2',3,3',4,4',5-Heptachlorobiphenyl	35065-30-6	--	--
2,2',3,4,4',5,5'-Heptachlorobiphenyl	35065-29-3	--	--
2,3,3',4,4',5,5'-Heptachlorobiphenyl	39635-31-9	--	--
2,3,3',4,4',5'-Hexachlorobiphenyl	69782-90-7	--	--
2,3,3',4,4',5-Hexachlorobiphenyl	38380-08-4	--	--
2,3,3',4,4'-Pentachlorobiphenyl	32598-14-4	--	--
2,3',4,4',5,5'-Hexachlorobiphenyl	52663-72-6	--	--
2,3,4,4',5-Pentachlorobiphenyl	74472-37-0	--	--
2',3,4,4',5-Pentachlorobiphenyl	65510-44-3	--	--
2,3',4,4',5-Pentachlorobiphenyl	31508-00-6	--	--
3,3',4,4',5,5'-Hexachlorobiphenyl	32774-16-6	--	--
3,3',4,4',5-Pentachlorobiphenyl	57465-28-8	--	--
3,3',4,4'-Tetrachlorobiphenyl	32598-13-3	--	--
3,4,4',5-Tetrachlorobiphenyl	70362-50-4	--	--
Polychlorinated biphenyls (PCBs)	1336-36-3	X	X
Phthalates			
Bis(2-ethylhexyl) phthalate (DEHP)	117-81-7	--	--

Table A-12 Constituents with Data Available to Estimate Potential for Hazards to Terrestrial Plants and Invertebrates from Emissions

Constituent of Potential Concern	CAS Registry Number	Terrestrial Plants	Terrestrial Invertebrates
Butylbenzyl phthalate	85-68-7	--	--
Dibutyl phthalate	84-74-2	X	--
Diethyl phthalate	84-66-2	X	--
Dimethyl phthalate	131-11-3	--	X
n-Dioctyl phthalate	117-84-0	--	--
Light Polycyclic Aromatic Hydrocarbons (molecular weight <200 g/mole)			
2-Chloronaphthalene	91-58-7	--	--
2-Methyl naphthalene	91-57-6	--	--
5-Nitroacenaphthene	602-87-9	--	--
Acenaphthene	83-32-9	X	--
Acenaphthylene	208-96-8	--	--
Anthracene	120-12-7	--	--
Fluorene	86-73-7	--	X
Indene	95-13-6	--	--
Naphthalene	91-20-3	--	--
Phenanthrene	85-01-8	--	--
Pyrene	129-00-0	--	--
Heavy Polycyclic Aromatic Hydrocarbons (molecular weight >200 g/mole)			
3-Methylcholanthrene	56-49-5	--	--
5-Methylchrysene	3697-24-3	--	--
Benzo[a]anthracene	56-55-3	X	X
Benzo[a]pyrene	50-32-8	X	X
Benzo[a,i]pyrene	191-30-0	--	--
Benzo[b]fluoranthene	205-99-2	X	X
Benzo[e]pyrene	192-97-2	--	--
Benzo[g,h,i]perylene	191-24-2	--	--
Benzo[j]fluoranthene	205-82-3	--	--
Benzo[k]fluoranthene	207-08-9	X	X
Chrysene	218-01-9	X	X
Dibenz[a,h]acridine	226-36-8	--	--
Dibenz[a,h]anthracene	53-70-3	X	X
Dibenz[a,j]acridine	224-42-0	--	--
Dibenzo[a,e]fluoranthene	5385-75-1	--	--
Dibenzo[a,e]pyrene	192-65-4	--	--
Dibenzo[a,h]fluoranthene	No CAS #	--	--
Dibenzo[a,h]pyrene	189-64-0	--	--
Dibenzo[a,i]pyrene	189-55-9	--	--
Fluoranthene	206-44-0	--	--
Hexachloronaphthalene	1335-87-1	--	--
Indeno[1,2,3-cd]pyrene	193-39-5	X	X
Octachloronaphthalene	2234-13-1	--	--
Pentachloronaphthalene	1321-64-8	--	--
Tetrachloronaphthalene	1335-88-2	--	--
Trichloronaphthalene	1321-65-9	--	--
Light Substituted Benzene Compounds (molecular weight <200 g/mole)			
1,2,3-Trichlorobenzene	87-61-6	--	X
1,2,4-Trichlorobenzene	120-82-1	--	X
1,2,4-Trimethyl benzene	95-63-6	--	--
1,2-Dichlorobenzene	95-50-1	--	--
1,3,5-Trimethyl benzene	108-67-8	--	--
1,3-Dichlorobenzene	541-73-1	--	--
1,3-Dinitrobenzene	99-65-0	--	X
1,4-Dichlorobenzene	106-46-7	--	X
1,4-Dinitrobenzene	100-25-4	--	--
2,4,5-Trichlorophenol	95-95-4	X	X
2,4,6-Trichlorophenol	88-06-2	--	X
2,4-Dichlorophenol	120-83-2	--	--
2,4-Dimethylphenol	105-67-9	--	--
2,4-Dinitrophenol	51-28-5	X	--
2,4-Dinitrotoluene	121-14-2	--	--
2,6-Dinitrotoluene	606-20-2	--	--
2-Chlorophenol	95-57-8	--	--
2-Chlorotoluene	95-49-8	--	--

Table A-12 Constituents with Data Available to Estimate Potential for Hazards to Terrestrial Plants and Invertebrates from Emissions

Constituent of Potential Concern	CAS Registry Number	Terrestrial Plants	Terrestrial Invertebrates
2-Nitrophenol	88-75-5	--	--
4,6-Dinitro-o-cresol	534-52-1	--	--
4-Chlorotoluene	106-43-4	--	--
4-Nitrophenol	100-02-7	--	X
alpha-Methylstyrene	98-83-9	--	--
Aniline	62-53-3	--	--
Benzotrichloride	98-07-7	--	--
Benzyl chloride	100-44-7	--	--
Bromobenzene	108-86-1	--	--
Chlorobenzene	108-90-7	--	X
Cumene	98-82-8	--	--
m-Cresol	108-39-4	--	--
n-Butyl benzene	104-51-8	--	--
Nitrobenzene	98-95-3	--	X
n-Propyl benzene	103-65-1	--	--
o-Cresol	95-48-7	--	--
o-Dinitrobenzene	528-29-0	--	--
o-Nitroaniline	88-74-4	--	--
o-Toluidine	95-53-4	--	--
p-Chloroaniline	106-47-8	--	X
p-Cresol	106-44-5	--	--
Phenol	108-95-2	X	X
p-Nitrochlorobenzene	100-00-5	--	--
p-Toluidine	106-49-0	--	--
sec-Butyl benzene	135-98-8	--	--
tert-Butyl benzene	98-06-6	--	--
Toluene-2,6-diamine	823-40-5	--	--
Trimethyl benzene	25551-13-7	--	--
Other Light Semivolatile Compounds (molecular weight <200 g/mole)			
1,1'-Biphenyl	92-52-4	X	--
1,1-Dimethylhydrazine	57-14-7	--	--
1,2-Dimethylhydrazine	540-73-8	--	--
1,2-Diphenylhydrazine	122-66-7	--	--
1,3-Propane sultone	1120-71-4	--	--
2,4-Toluene diisocyanate	584-84-9	--	--
2-Chloroacetophenone	532-27-4	--	--
2-Propenoic acid	79-10-7	--	--
4,4'-Methylenedianiline	101-77-9	--	--
Acetophenone	98-86-2	--	--
Benzoic acid	65-85-0	--	--
Bis(2-chloroethoxy)methane	111-91-1	--	--
Bis(2-chloroethyl) ether	111-44-4	--	--
Chlorocyclopentadiene	41851-50-7	--	--
Cyclohexanol	108-93-0	--	--
Dichloroisopropyl ether	108-60-1	--	--
Dichloromethyl ether	542-88-1	--	--
Dichloropentadiene	61626-71-9	--	--
Dimethyl sulfate	77-78-1	--	--
Dimethylaniline	121-69-7	--	--
di-n-Propylnitrosamine	621-64-7	--	--
Diphenyl ether	101-84-8	--	--
Epichlorohydrin	106-89-8	--	--
Ethyl carbamate (Urethane)	51-79-6	--	--
Ethyl methanesulfonate	62-50-0	--	--
Ethylene dibromide	106-93-4	--	--
Ethylene glycol	107-21-1	--	--
Ethylene glycol monobutyl ether	111-76-2	--	--
Ethylene glycol monoethyl ether acetate	111-15-9	--	--
Ethylene thiourea	96-45-7	--	--
Furfural	98-01-1	--	--
Maleic hydrazide	123-33-1	--	--
Malononitrile	109-77-3	--	--
Methyl styrene (mixed isomers)	25013-15-4	--	--

Table A-12 Constituents with Data Available to Estimate Potential for Hazards to Terrestrial Plants and Invertebrates from Emissions

Constituent of Potential Concern	CAS Registry Number	Terrestrial Plants	Terrestrial Invertebrates
Methylhydrazine	60-34-4	--	--
N,N-Diphenylamine	122-39-4	--	--
Nitric acid, propyl ester	627-13-4	--	--
N-Nitrosodi-n-butylamine	924-16-3	--	--
N-Nitrosomorpholine	59-89-2	--	--
N-Nitroso-N,N-dimethylamine	62-75-9	--	--
o-Anisidine	90-04-0	--	--
Oxalic acid	144-62-7	--	--
Phthalic anhydride	85-44-9	--	--
p-Phthalic acid	100-21-0	--	--
Pyridine	110-86-1	--	--
Quinoline	91-22-5	--	--
Quinone	106-51-4	--	--
Safrole	94-59-7	--	--
Tetrahydrofuran	109-99-9	--	--
Other Heavy Semivolatile Compounds (molecular weight >200 g/mole)			
1,2,4,5-Tetrachlorobenzene	95-94-3	--	--
1,3,5-Trinitrobenzene	99-35-4	--	--
2,6-Bis(tert-butyl)-4-methylphenol	128-37-0	--	--
2-Cyclohexyl-4,6-dinitrophenol	131-89-5	--	--
2-sec-Butyl-4,6-dinitrophenol	88-85-7	--	--
3,3'-Dichlorobenzidine	91-94-1	--	--
3,3'-Dimethoxybenzidine	119-90-4	--	--
4-Bromophenylphenyl ether	101-55-3	--	--
Ammonium perfluorooctanoate	3825-26-1	--	--
Azobenzene	103-33-3	--	--
Bis(3-tert-butyl-4-hydroxy-6-methyl-phenyl)sulfide	96-69-5	--	--
Captan	133-06-2	--	--
Chlorobenzilate	510-15-6	--	--
Dibutylphosphate	107-66-4	--	--
Dimethyl aminoazobenzene	60-11-7	--	--
Hexachlorobenzene	118-74-1	--	--
Hexachlorobutadiene	87-68-3	--	--
Hexachlorocyclopentadiene	77-47-4	X	--
Hexachloroethane	67-72-1	--	--
Hexachlorophene	70-30-4	--	--
Hexamethylene-1,5-diisocyanate	822-06-0	--	--
Mirex	2385-85-5	--	--
Nitrofen	1836-75-5	--	--
Pentachlorobenzene	608-93-5	--	X
Pentachloronitrobenzene	82-68-8	--	--
Pentachlorophenol	87-86-5	X	X
Picric acid	88-89-1	--	--
Pronamide	23950-58-5	--	--
Strychnine	57-24-9	--	--
Terphenyls	26140-60-3	--	--
Tributyl phosphate	126-73-8	--	--
Trifluralin	1582-09-8	--	--
Triphenylamine	603-34-9	--	--
Herbicides and Organochlorinated Pesticides			
2,4,5-T	93-76-5	--	--
2,4-D and esters	94-75-7	--	--
4,4'-DDD	72-54-8	--	--
4,4'-DDE	72-55-9	--	--
4,4'-DDT	50-29-3	--	--
Aldrin	309-00-2	--	--
alpha-BHC	319-84-6	--	--
beta-BHC	319-85-7	--	--
Chlordane	57-74-9	--	--
delta-BHC	319-86-8	--	--
Dieldrin	60-57-1	--	--
Endothall	145-73-3	--	--
Endrin	72-20-8	--	--

Table A-12 Constituents with Data Available to Estimate Potential for Hazards to Terrestrial Plants and Invertebrates from Emissions

Constituent of Potential Concern	CAS Registry Number	Terrestrial Plants	Terrestrial Invertebrates
gamma-BHC (Lindane)	58-89-9	--	--
Heptachlor	76-44-8	X	--
Isodrin	465-73-6	--	--
Methoxychlor	72-43-5	--	--
Silvex (2,4,5-TP)	93-72-1	--	--
Toxaphene	8001-35-2	--	--
Inorganic Chemicals and Compounds			
Metals			
Aluminum	7429-90-5	X	--
Antimony	7440-36-0	X	--
Arsenic	7440-38-2	X	X
Barium	7440-39-3	X	--
Beryllium	7440-41-7	X	--
Bismuth	7440-69-9	--	--
Boron	7440-42-8	X	--
Cadmium	7440-43-9	X	X
Calcium	7440-70-2	--	--
Chromium	18540-29-9	X	X
Cobalt	7440-48-4	X	--
Copper	7440-50-8	X	X
Iron	7439-89-6	--	--
Lead	7439-92-1	X	X
Lithium	7439-93-2	X	--
Magnesium	7439-95-4	--	--
Manganese	7439-96-5	X	--
Mercury	7439-97-6	--	--
Mercury - Hg+2	7487-94-7	X	X
Methylmercury	22967-92-6	--	X
Molybdenum	7439-98-7	X	--
Nickel	7440-02-0	X	X
Potassium	7440-09-7	--	--
Rhodium	7440-16-6	--	--
Selenium	7782-49-2	X	X
Silicon	7440-21-3	--	--
Silver	7440-22-4	X	--
Sodium	7440-23-5	--	--
Strontium	7440-24-6	--	--
Tantalum	7440-25-7	--	--
Thallium	7440-28-0	X	--
Tin	7440-31-5	X	--
Tungsten	7440-33-7	--	--
Uranium	7440-61-1	X	--
Vanadium	7440-62-2	X	--
Yttrium	7440-65-5	--	--
Zinc	7440-66-6	X	X
Zirconium	7440-67-7	--	--
Non-metals and Anions			
Ammonia/Ammonium	7664-41-7	--	--
Bromide	24959-67-9	X	--
Chloride	16887-00-6	--	--
Cyanide	57-12-5	--	--
Fluoride	16984-48-8	X	--
Hydroxide	14280-30-9	--	--
Iodine	7553-56-2	X	--
Nitrate	14797-55-8	--	--
Nitrite	14797-65-0	--	--
Phosphate	14265-44-2	--	--
Phosphorus	7723-14-0	--	--
Sulfate	14808-79-8	--	--
Total sulfur	63705-05-5	--	--
Criteria Pollutants			
Carbon monoxide	630-08-0	--	--

Table A-12 Constituents with Data Available to Estimate Potential for Hazards to Terrestrial Plants and Invertebrates from Emissions

Constituent of Potential Concern	CAS Registry Number	Terrestrial Plants	Terrestrial Invertebrates
Nitrogen dioxide	10102-44-0	--	--
Ozone	10028-15-6	--	--
Particulate matter	No CAS #	--	--
Sulfur dioxide	7446-09-5	--	--
Radionuclides			
Actinium-227	14952-40-0	X	X
Americium-241	14596-10-2	X	X
Americium-243	14993-75-0	X	X
Antimony-125	14234-35-6	X	X
Cadmium-113m	14336-66-4	X	X
Carbon-14	14762-75-5	X	X
Cesium-134	13967-70-9	X	X
Cesium-137	10045-97-3	X	X
Cobalt-60	10198-40-0	X	X
Curium-242	15510-73-3	X	X
Curium-243	15757-87-6	X	X
Curium-244	13981-15-2	X	X
Europium-152	14683-23-9	X	X
Europium-154	15585-10-1	X	X
Europium-155	14391-16-3	X	X
Iodine-129	15046-84-1	X	X
Neptunium-237	13994-20-2	X	X
Nickel-59	14336-70-0	X	X
Nickel-63	13981-37-8	X	X
Niobium-93m	7440-03-1	X	X
Plutonium-238	13981-16-3	X	X
Plutonium-239	15117-48-3	X	X
Plutonium-240	14119-33-6	X	X
Plutonium-241	14119-32-5	X	X
Plutonium-242	13982-10-0	X	X
Protactinium-231	14331-85-2	X	X
Radium-226	13982-63-3	X	X
Radium-228	15262-20-1	X	X
Ruthenium-106	13967-48-1	X	X
Samarium-151	15715-94-3	X	X
Selenium-79	15758-45-9	X	X
Strontium-90	10098-97-2	X	X
Technetium-99	14133-76-7	X	X
Thorium-229	15594-54-4	X	X
Thorium-232	7440-29-1	X	X
Tin-126	15832-50-5	X	X
Tritium	10028-17-8	X	X
Uranium-232	14158-29-3	X	X
Uranium-233	13968-55-3	X	X
Uranium-234	13966-29-5	X	X
Uranium-235	15117-96-1	X	X
Uranium-236	13982-70-2	X	X
Uranium-238	7440-61-1	X	X
Zirconium-93	15751-77-6	X	X

CAS = Chemical Abstracts Service.
PCDD = Polychlorinated dibenzo-p-dioxin.
PCDF = Polychlorinated dibenzofuran.

X = Constituent is quantitatively evaluated for acute exposure.
-- = Constituent is qualitatively evaluated for acute exposure.

Table A-13 Constituents with Data Available to Estimate Potential for Hazards to Terrestrial Mammals and Birds from Emissions

Constituent of Potential Concern	CAS Registry Number	Terrestrial Mammals	Terrestrial Birds
Organic Compounds			
Aromatic Halogenated Hydrocarbons			
2,3,4,6-Tetrachlorophenol	58-90-2	X	--
4-Chloro-3-methylphenol	59-50-7	--	--
Aromatic Nonhalogenated Hydrocarbons			
2-Nitrotoluene	88-72-2	--	--
4-Nitrobiphenyl	92-93-3	--	--
Benzaldehyde	100-52-7	X	--
Benzene	71-43-2	X	--
Benzyl alcohol	100-51-6	--	--
Ethyl benzene	100-41-4	X	--
m-Xylene	108-38-3	--	--
o-Xylene	95-47-6	--	--
p-Xylene	106-42-3	--	--
Styrene	100-42-5	X	
Toluene	108-88-3	X	
Non-aromatic Nonhalogenated Hydrocarbons			
1,2-Epoxybutane	106-88-7	--	--
1,3-Butadiene	106-99-0	--	--
1,4-Dioxane	123-91-1	X	--
1-Methylpropyl alcohol	78-92-2	--	--
1-Nitropropane	108-03-2	--	--
2,2,4-Trimethylpentane	540-84-1	--	--
2-Butanone	78-93-3	X	--
2-Butenaldehyde (2-Butenal)	4170-30-3	X	--
2-Ethoxyethanol	110-80-5	--	--
2-Heptanone	110-43-0	--	--
2-Hexanone	591-78-6	--	--
2-Methoxyethanol	109-86-4	--	--
2-Methyl-2-propanol	75-65-0	--	--
2-Methyl-2-propenenitrile	126-98-7	X	--
2-Methylaziridine	75-55-8	--	--
2-Methylpropyl alcohol	78-83-1	X	--
2-Pentanone	107-87-9	--	--
2-Propanone (Acetone)	67-64-1	X	X
2-Propene-1-ol	107-18-6	X	--
2-Propyl alcohol	67-63-0	--	--
3-Heptanone	106-35-4	--	--
3-Methyl-1-butanol	123-51-3	--	--
3-Methyl-2-butanone	563-80-4	--	--
3-Pentanone	96-22-0	--	--
4-Heptanone	123-19-3	--	--
4-Methyl-2-pentanone	108-10-1	X	--
4-Methyl-3-penten-2-one	141-79-7	--	--
5-Methyl-2-hexanone	110-12-3	--	--
Acetaldehyde	75-07-0	--	--
Acetamide	60-35-5	--	--
Acetic acid	64-19-7	--	--
Acetic acid ethyl ester	141-78-6	X	--
Acetic acid n-butyl ester	123-86-4	--	--
Acetonitrile	75-05-8	--	--
Acrolein	107-02-8	--	--
Acrylonitrile	107-13-1	X	--
Bis(isopropyl)ether	108-20-3	--	--
Butane	106-97-8	--	--
Carbon disulfide	75-15-0	X	--
Cyanogen	460-19-5	--	--
Cyclohexane	110-82-7	--	--
Cyclohexanone	108-94-1	--	--
Cyclohexene	110-83-8	--	--
Cyclopentane	287-92-3	--	--
Ethyl alcohol	64-17-5	--	--

Table A-13 Constituents with Data Available to Estimate Potential for Hazards to Terrestrial Mammals and Birds from Emissions

Constituent of Potential Concern	CAS Registry Number	Terrestrial Mammals	Terrestrial Birds
Ethyl ether	60-29-7	X	--
Ethyl methacrylate	97-63-2	--	--
Formaldehyde	50-00-0	X	--
Formamide	75-12-7	--	--
Formic acid	64-18-6	--	--
Formic acid, methyl ester	107-31-3	--	--
Glycidylaldehyde	765-34-4	X	--
Methyl acetate	79-20-9	--	--
Methyl alcohol	67-56-1	X	--
Methyl isocyanate	624-83-9	--	--
Methyl methacrylate	80-62-6	X	--
Methyl tert-butyl ether	1634-04-4	--	--
Methylacetylene	74-99-7	--	--
Methylcyclohexane	108-87-2	--	--
N,N-Dimethylacetamide	127-19-5	--	--
n-Butyl alcohol	71-36-3	X	--
n-Heptane	142-82-5	--	--
n-Hexane	110-54-3	--	--
Nitromethane	75-52-5	--	--
n-Nonane	111-84-2	--	--
n-Octane	111-65-9	--	--
n-Pentane	109-66-0	--	--
n-Propionaldehyde	123-38-6	--	--
n-Propyl alcohol	71-23-8	--	--
n-Valeraldehyde	110-62-3	--	--
Oxirane	75-21-8	--	--
p-Cymene	99-87-6	--	--
Phosgene	75-44-5	--	--
Propargyl alcohol	107-19-7	X	--
Propionic acid	79-09-4	--	--
Propionitrile	107-12-0	--	--
Propylene glycol monomethyl ether	107-98-2	--	--
p-tert-Butyltoluene	98-51-1	--	--
Triethylamine	121-44-8	--	--
Trimethylamine	75-50-3	--	--
Vinyl acetate	108-05-4	--	--
Non-aromatic Halogenated Hydrocarbons			
1,1,1,2-Tetrachloro-2,2-difluoroethane	76-11-9	--	--
1,1,1,2-Tetrachloroethane	630-20-6	X	--
1,1,1-Trichloroethane	71-55-6	X	--
1,1,2,2-Tetrachloro-1,2-difluoroethane	76-12-0	--	--
1,1,2,2-Tetrachloroethane	79-34-5	--	--
1,1,2,2-Tetrachloroethene	127-18-4	X	--
1,1,2-Trichloroethane	79-00-5	--	--
1,1,2-Trichloroethylene	79-01-6	X	--
1,1-Dichloroethane	75-34-3	--	--
1,1-Dichloroethene	75-35-4	X	--
1,2,2-Trichloro-1,1,2-trifluoroethane	76-13-1	--	--
1,2,3-Trichloropropane	96-18-4	X	--
1,2-Dibromo-3-chloropropane	96-12-8	--	--
1,2-Dichloro-1,1,2,2-tetrafluoroethane	76-14-2	--	--
1,2-Dichloroethane	107-06-2	X	X
1,2-Dichloroethylene	540-59-0	X	--
1,2-Dichloropropane	78-87-5	--	--
1,3-Dichloropropene	542-75-6	X	--
1,4-Dichloro-2-butene	764-41-0	--	--
1-Chloroethene	75-01-4	X	--
2,2-Dichloropropionic acid	75-99-0	--	--
2-Chloropropane	75-29-6	--	--
3-Chloropropene (Allyl chloride)	107-05-1	--	--
Bromochloromethane	74-97-5	--	--
Bromodichloromethane	75-27-4	X	--

Table A-13 Constituents with Data Available to Estimate Potential for Hazards to Terrestrial Mammals and Birds from Emissions

Constituent of Potential Concern	CAS Registry Number	Terrestrial Mammals	Terrestrial Birds
Bromoethene	593-60-2	--	--
Bromoform	75-25-2	X	--
Bromomethane	74-83-9	X	--
Carbon tetrachloride	56-23-5	X	--
Chlorodibromomethane	124-48-1	X	--
Chlorodifluoromethane	75-45-6	--	--
Chloroethane	75-00-3	--	--
Chloroform	67-66-3	X	--
Chloromethane	74-87-3	--	--
Chloropentafluoroethane	76-15-3	--	--
cis-1,2-Dichloroethene	156-59-2	--	--
cis-1,3-Dichloropropene	10061-01-5	--	--
Cyanogen bromide	506-68-3	X	--
Cyanogen chloride	506-77-4	X	--
Dichlorodifluoromethane	75-71-8	X	--
Dichlorofluoromethane	75-43-4	--	--
Dichloromethane	75-09-2	X	--
Difluorodibromomethane	75-61-6	--	--
Hexafluoroacetone	684-16-2	--	--
Iodomethane	74-88-4	--	--
Methylene bromide	74-95-3	--	--
Pentachloroethane	76-01-7	--	--
trans-1,2-Dichloroethylene	156-60-5	X	--
trans-1,3-Dichloropropene	10061-02-6	--	--
Trichloroacetic acid	76-03-9	--	--
Trichlorofluoroethane	27154-33-2	--	--
Trichlorofluoromethane	75-69-4	X	--
Trifluorobromomethane	75-63-8	--	--
Dioxin and Furan Compounds (PCDDs/PCDFs)			
1,2,3,4,6,7,8-Heptachlorodibenzo(p)dioxin	35822-46-9	--	--
1,2,3,4,6,7,8-Heptachlorodibenzofuran	67562-39-4	--	--
1,2,3,4,7,8,9-Heptachlorodibenzofuran	55673-89-7	--	--
1,2,3,4,7,8-Hexachlorodibenzo(p)dioxin	39227-28-6	--	--
1,2,3,4,7,8-Hexachlorodibenzofuran	70648-26-9	--	--
1,2,3,6,7,8-Hexachlorodibenzo(p)dioxin	57653-85-7	--	--
1,2,3,6,7,8-Hexachlorodibenzofuran	57117-44-9	X	--
1,2,3,7,8,9-Hexachlorodibenzo(p)dioxin	19408-74-3	--	--
1,2,3,7,8,9-Hexachlorodibenzofuran	72918-21-9	--	--
1,2,3,7,8-Pentachlorodibenzo(p)dioxin	40321-76-4	--	--
1,2,3,7,8-Pentachlorodibenzofuran	57117-41-6	X	--
2,3,4,6,7,8-Hexachlorodibenzofuran	60851-34-5	--	--
2,3,4,7,8-Pentachlorodibenzofuran	57117-31-4	X	--
2,3,7,8-Tetrachlorodibenzo(p)dioxin	1746-01-6	X	X
2,3,7,8-Tetrachlorodibenzofuran	51207-31-9	--	X
Dibenzofuran	132-64-9	--	--
Octachlorodibenzo(p)dioxin	3268-87-9	--	--
Octachlorodibenzofuran	39001-02-0	--	--
Polychlorinated Biphenyls (PCBs)			
2,2',3,3',4,4',5-Heptachlorobiphenyl	35065-30-6	--	--
2,2',3,4,4',5,5'-Heptachlorobiphenyl	35065-29-3	--	--
2,3,3',4,4',5,5'-Heptachlorobiphenyl	39635-31-9	--	--
2,3,3',4,4',5'-Hexachlorobiphenyl	69782-90-7	--	--
2,3,3',4,4',5-Hexachlorobiphenyl	38380-08-4	--	--
2,3,3',4,4'-Pentachlorobiphenyl	32598-14-4	--	--
2,3',4,4',5,5'-Hexachlorobiphenyl	52663-72-6	--	--
2,3,4,4',5-Pentachlorobiphenyl	74472-37-0	--	--
2',3,4,4',5-Pentachlorobiphenyl	65510-44-3	--	--
2,3',4,4',5-Pentachlorobiphenyl	31508-00-6	--	--
3,3',4,4',5,5'-Hexachlorobiphenyl	32774-16-6	--	--
3,3',4,4',5-Pentachlorobiphenyl	57465-28-8	--	--
3,3',4,4'-Tetrachlorobiphenyl	32598-13-3	--	--
3,4,4',5-Tetrachlorobiphenyl	70362-50-4	--	--

Table A-13 Constituents with Data Available to Estimate Potential for Hazards to Terrestrial Mammals and Birds from Emissions

Constituent of Potential Concern	CAS Registry Number	Terrestrial Mammals	Terrestrial Birds
Polychlorinated biphenyls (PCBs)	1336-36-3	X	X
Phthalates			
Bis(2-ethylhexyl) phthalate (DEHP)	117-81-7	X	X
Butylbenzyl phthalate	85-68-7	--	--
Dibutyl phthalate	84-74-2	X	X
Diethyl phthalate	84-66-2	X	--
Dimethyl phthalate	131-11-3	--	--
n-Dioctyl phthalate	117-84-0	X	--
Light Polycyclic Aromatic Hydrocarbons (molecular weight <200 g/mole)			
2-Chloronaphthalene	91-58-7	X	--
2-Methyl naphthalene	91-57-6	--	--
5-Nitroacenaphthene	602-87-9	--	--
Acenaphthene	83-32-9	X	--
Acenaphthylene	208-96-8	--	--
Anthracene	120-12-7	X	--
Fluorene	86-73-7	X	--
Indene	95-13-6	--	--
Naphthalene	91-20-3	X	--
Phenanthrene	85-01-8	--	--
Pyrene	129-00-0	X	--
Heavy Polycyclic Aromatic Hydrocarbons (molecular weight >200 g/mole)			
3-Methylcholanthrene	56-49-5	--	--
5-Methylchrysene	3697-24-3	--	--
Benzo[a]anthracene	56-55-3	X	X
Benzo[a]pyrene	50-32-8	X	X
Benzo[a,i]pyrene	191-30-0	--	--
Benzo[b]fluoranthene	205-99-2	--	X
Benzo[e]pyrene	192-97-2	--	--
Benzo[g,h,i]perylene	191-24-2	--	--
Benzo[j]fluoranthene	205-82-3	--	--
Benzo[k]fluoranthene	207-08-9	--	X
Chrysene	218-01-9	--	X
Dibenz[a,h]acridine	226-36-8	--	--
Dibenz[a,h]anthracene	53-70-3	X	X
Dibenz[a,j]acridine	224-42-0	--	--
Dibenzo[a,e]fluoranthene	5385-75-1	--	--
Dibenzo[a,e]pyrene	192-65-4	--	--
Dibenzo[a,h]fluoranthene	No CAS #	--	--
Dibenzo[a,h]pyrene	189-64-0	--	--
Dibenzo[a,i]pyrene	189-55-9	--	--
Fluoranthene	206-44-0	X	--
Hexachloronaphthalene	1335-87-1	--	--
Indeno[1,2,3-cd]pyrene	193-39-5	--	X
Octachloronaphthalene	2234-13-1	--	--
Pentachloronaphthalene	1321-64-8	--	--
Tetrachloronaphthalene	1335-88-2	--	--
Trichloronaphthalene	1321-65-9	--	--
Light Substituted Benzene Compounds (molecular weight <200 g/mole)			
1,2,3-Trichlorobenzene	87-61-6	--	--
1,2,4-Trichlorobenzene	120-82-1	--	--
1,2,4-Trimethyl benzene	95-63-6	--	--
1,2-Dichlorobenzene	95-50-1	X	--
1,3,5-Trimethyl benzene	108-67-8	--	--
1,3-Dichlorobenzene	541-73-1	--	--
1,3-Dinitrobenzene	99-65-0	X	X
1,4-Dichlorobenzene	106-46-7	--	--
1,4-Dinitrobenzene	100-25-4	--	--
2,4,5-Trichlorophenol	95-95-4	X	--
2,4,6-Trichlorophenol	88-06-2	--	--
2,4-Dichlorophenol	120-83-2	X	--
2,4-Dimethylphenol	105-67-9	X	--
2,4-Dinitrophenol	51-28-5	X	--

Table A-13 Constituents with Data Available to Estimate Potential for Hazards to Terrestrial Mammals and Birds from Emissions

Constituent of Potential Concern	CAS Registry Number	Terrestrial Mammals	Terrestrial Birds
2,4-Dinitrotoluene	121-14-2	X	--
2,6-Dinitrotoluene	606-20-2	X	--
2-Chlorophenol	95-57-8	--	--
2-Chlorotoluene	95-49-8	X	--
2-Nitrophenol	88-75-5	--	--
4,6-Dinitro-o-cresol	534-52-1	--	--
4-Chlorotoluene	106-43-4	--	--
4-Nitrophenol	100-02-7	--	--
alpha-Methylstyrene	98-83-9	--	--
Aniline	62-53-3	--	--
Benzotrichloride	98-07-7	--	--
Benzyl chloride	100-44-7	--	--
Bromobenzene	108-86-1	--	--
Chlorobenzene	108-90-7	X	--
Cumene	98-82-8	X	--
m-Cresol	108-39-4	X	--
n-Butyl benzene	104-51-8	--	--
Nitrobenzene	98-95-3	X	--
n-Propyl benzene	103-65-1	--	--
o-Cresol	95-48-7	X	--
o-Dinitrobenzene	528-29-0	--	--
o-Nitroaniline	88-74-4	--	--
o-Toluidine	95-53-4	--	--
p-Chloroaniline	106-47-8	X	--
p-Cresol	106-44-5	--	--
Phenol	108-95-2	X	--
p-Nitrochlorobenzene	100-00-5	--	--
p-Toluidine	106-49-0	--	--
sec-Butyl benzene	135-98-8	--	--
tert-Butyl benzene	98-06-6	--	--
Toluene-2,6-diamine	823-40-5	--	--
Trimethyl benzene	25551-13-7	--	--
Other Light Semivolatile Compounds (molecular weight <200 g/mole)			
1,1'-Biphenyl	92-52-4	X	--
1,1-Dimethylhydrazine	57-14-7	--	--
1,2-Dimethylhydrazine	540-73-8	--	--
1,2-Diphenylhydrazine	122-66-7	--	--
1,3-Propane sultone	1120-71-4	--	--
2,4-Toluene diisocyanate	584-84-9	--	--
2-Chloroacetophenone	532-27-4	--	--
2-Propenoic acid	79-10-7	X	--
4,4'-Methylenedianiline	101-77-9	--	--
Acetophenone	98-86-2	X	--
Benzoic acid	65-85-0	X	--
Bis(2-chloroethoxy)methane	111-91-1	--	--
Bis(2-chloroethyl) ether	111-44-4	--	--
Chlorocyclopentadiene	41851-50-7	--	--
Cyclohexanol	108-93-0	--	--
Dichloroisopropyl ether	108-60-1	--	--
Dichloromethyl ether	542-88-1	--	--
Dichloropentadiene	61626-71-9	--	--
Dimethyl sulfate	77-78-1	--	--
Dimethylaniline	121-69-7	X	--
di-n-Propylnitrosamine	621-64-7	--	--
Diphenyl ether	101-84-8	--	--
Epichlorohydrin	106-89-8	--	--
Ethyl carbamate (Urethane)	51-79-6	--	--
Ethyl methanesulfonate	62-50-0	--	--
Ethylene dibromide	106-93-4	--	--
Ethylene glycol	107-21-1	X	--
Ethylene glycol monobutyl ether	111-76-2	X	--
Ethylene glycol monoethyl ether acetate	111-15-9	--	--

Table A-13 Constituents with Data Available to Estimate Potential for Hazards to Terrestrial Mammals and Birds from Emissions

Constituent of Potential Concern	CAS Registry Number	Terrestrial Mammals	Terrestrial Birds
Ethylene thiourea	96-45-7	X	--
Furfural	98-01-1	X	--
Maleic hydrazide	123-33-1	X	--
Malononitrile	109-77-3	--	--
Methyl styrene (mixed isomers)	25013-15-4	--	--
Methylhydrazine	60-34-4	--	--
N,N-Diphenylamine	122-39-4	X	--
Nitric acid, propyl ester	627-13-4	--	--
N-Nitrosodi-n-butylamine	924-16-3	--	--
N-Nitrosomorpholine	59-89-2	--	--
N-Nitroso-N,N-dimethylamine	62-75-9	--	--
o-Anisidine	90-04-0	--	--
Oxalic acid	144-62-7	--	--
Phthalic anhydride	85-44-9	X	--
p-Phthalic acid	100-21-0	--	--
Pyridine	110-86-1	X	--
Quinoline	91-22-5	--	--
Quinone	106-51-4	--	--
Safrole	94-59-7	--	--
Tetrahydrofuran	109-99-9	--	--
Other Heavy Semivolatile Compounds (molecular weight >200 g/mole)			
1,2,4,5-Tetrachlorobenzene	95-94-3	X	--
1,3,5-Trinitrobenzene	99-35-4	X	--
2,6-Bis(tert-butyl)-4-methylphenol	128-37-0	--	--
2-Cyclohexyl-4,6-dinitrophenol	131-89-5	X	--
2-sec-Butyl-4,6-dinitrophenol	88-85-7	--	--
3,3'-Dichlorobenzidine	91-94-1	--	--
3,3'-Dimethoxybenzidine	119-90-4	--	--
4-Bromophenylphenyl ether	101-55-3	--	--
Ammonium perfluorooctanoate	3825-26-1	--	--
Azobenzene	103-33-3	--	--
Bis(3-tert-butyl-4-hydroxy-6-methyl-phenyl)sulfide	96-69-5	--	--
Captan	133-06-2	--	--
Chlorobenzilate	510-15-6	--	--
Dibutylphosphate	107-66-4	--	--
Dimethyl aminoazobenzene	60-11-7	--	--
Hexachlorobenzene	118-74-1	X	X
Hexachlorobutadiene	87-68-3	X	X
Hexachlorocyclopentadiene	77-47-4	X	--
Hexachloroethane	67-72-1	X	--
Hexachlorophene	70-30-4	X	X
Hexamethylene-1,5-diisocyanate	822-06-0	--	--
Mirex	2385-85-5	X	--
Nitrofen	1836-75-5	--	--
Pentachlorobenzene	608-93-5	X	--
Pentachloronitrobenzene	82-68-8	X	X
Pentachlorophenol	87-86-5	X	X
Picric acid	88-89-1	--	--
Pronamide	23950-58-5	X	--
Strychnine	57-24-9	X	--
Terphenyls	26140-60-3	--	--
Tributyl phosphate	126-73-8	--	--
Trifluralin	1582-09-8	X	--
Triphenylamine	603-34-9	--	--
Herbicides and Organochlorinated Pesticides			
2,4,5-T	93-76-5	X	--
2,4-D and esters	94-75-7	--	--
4,4'-DDD	72-54-8	--	--
4,4'-DDE	72-55-9	X	X
4,4'-DDT	50-29-3	X	X
Aldrin	309-00-2	X	--
alpha-BHC	319-84-6	--	--

Table A-13 Constituents with Data Available to Estimate Potential for Hazards to Terrestrial Mammals and Birds from Emissions

Constituent of Potential Concern	CAS Registry Number	Terrestrial Mammals	Terrestrial Birds
beta-BHC	319-85-7	X	--
Chlordane	57-74-9	X	X
delta-BHC	319-86-8	--	--
Dieldrin	60-57-1	X	X
Endothall	145-73-3	X	--
Endrin	72-20-8	X	X
gamma-BHC (Lindane)	58-89-9	X	X
Heptachlor	76-44-8	X	X
Isodrin	465-73-6	--	--
Methoxychlor	72-43-5	X	--
Silvex (2,4,5-TP)	93-72-1	X	--
Toxaphene	8001-35-2	X	--
Inorganic Chemicals and Compounds			
Metals			
Aluminum	7429-90-5	X	X
Antimony	7440-36-0	X	--
Arsenic	7440-38-2	X	X
Barium	7440-39-3	X	X
Beryllium	7440-41-7	X	--
Bismuth	7440-69-9	--	--
Boron	7440-42-8	X	X
Cadmium	7440-43-9	X	X
Calcium	7440-70-2	--	--
Chromium	18540-29-9	X	X
Cobalt	7440-48-4	X	--
Copper	7440-50-8	X	X
Iron	7439-89-6	--	--
Lead	7439-92-1	X	X
Lithium	7439-93-2	X	--
Magnesium	7439-95-4	--	--
Manganese	7439-96-5	X	X
Mercury	7439-97-6	--	--
Mercury - Hg+2	7487-94-7	X	X
Methylmercury	22967-92-6	X	X
Molybdenum	7439-98-7	X	X
Nickel	7440-02-0	X	X
Potassium	7440-09-7	--	--
Rhodium	7440-16-6	--	--
Selenium	7782-49-2	X	X
Silicon	7440-21-3	--	--
Silver	7440-22-4	X	X
Sodium	7440-23-5	--	--
Strontium	7440-24-6	X	--
Tantalum	7440-25-7	--	--
Thallium	7440-28-0	X	X
Tin	7440-31-5	--	--
Tungsten	7440-33-7	--	--
Uranium	7440-61-1	X	X
Vanadium	7440-62-2	X	X
Yttrium	7440-65-5	--	--
Zinc	7440-66-6	X	X
Zirconium	7440-67-7	X	--
Non-metals and Anions			
Ammonia/Ammonium	7664-41-7	--	--
Bromide	24959-67-9	--	--
Chloride	16887-00-6	--	--
Cyanide	57-12-5	X	X
Fluoride	16984-48-8	X	X
Hydroxide	14280-30-9	--	--
Iodine	7553-56-2	--	--
Nitrate	14797-55-8	--	--

Table A-13 Constituents with Data Available to Estimate Potential for Hazards to Terrestrial Mammals and Birds from Emissions

Constituent of Potential Concern	CAS Registry Number	Terrestrial Mammals	Terrestrial Birds
Nitrite	14797-65-0	--	--
Phosphate	14265-44-2	--	--
Phosphorus	7723-14-0	--	--
Sulfate	14808-79-8	--	--
Total sulfur	63705-05-5	--	--
Criteria Pollutants			
Carbon monoxide	630-08-0	--	--
Nitrogen dioxide	10102-44-0	--	--
Ozone	10028-15-6	--	--
Particulate matter	No CAS #	--	--
Sulfur dioxide	7446-09-5	--	--
Radionuclides			
Actinium-227	14952-40-0	X	X
Americium-241	14596-10-2	X	X
Americium-243	14993-75-0	X	X
Antimony-125	14234-35-6	X	X
Cadmium-113m	14336-66-4	X	X
Carbon-14	14762-75-5	X	X
Cesium-134	13967-70-9	X	X
Cesium-137	10045-97-3	X	X
Cobalt-60	10198-40-0	X	X
Curium-242	15510-73-3	X	X
Curium-243	15757-87-6	X	X
Curium-244	13981-15-2	X	X
Europium-152	14683-23-9	X	X
Europium-154	15585-10-1	X	X
Europium-155	14391-16-3	X	X
Iodine-129	15046-84-1	X	X
Neptunium-237	13994-20-2	X	X
Nickel-59	14336-70-0	X	X
Nickel-63	13981-37-8	X	X
Niobium-93m	7440-03-1	X	X
Plutonium-238	13981-16-3	X	X
Plutonium-239	15117-48-3	X	X
Plutonium-240	14119-33-6	X	X
Plutonium-241	14119-32-5	X	X
Plutonium-242	13982-10-0	X	X
Protactinium-231	14331-85-2	X	X
Radium-226	13982-63-3	X	X
Radium-228	15262-20-1	X	X
Ruthenium-106	13967-48-1	X	X
Samarium-151	15715-94-3	X	X
Selenium-79	15758-45-9	X	X
Strontium-90	10098-97-2	X	X
Technetium-99	14133-76-7	X	X
Thorium-229	15594-54-4	X	X
Thorium-232	7440-29-1	X	X
Tin-126	15832-50-5	X	X
Tritium	10028-17-8	X	X
Uranium-232	14158-29-3	X	X
Uranium-233	13968-55-3	X	X
Uranium-234	13966-29-5	X	X
Uranium-235	15117-96-1	X	X
Uranium-236	13982-70-2	X	X
Uranium-238	7440-61-1	X	X
Zirconium-93	15751-77-6	X	X

CAS = Chemical Abstracts Service.
PCDD = Polychlorinated dibenzo-p-dioxin.
PCDF = Polychlorinated dibenzofuran.

X = Constituent is quantitatively evaluated for acute exposure.
-- = Constituent is qualitatively evaluated for acute exposure.

Table A-14 Constituents with Data Available to Estimate Potential for Hazards to Aquatic Biota, Salmonids, and Benthic Invertebrates from Emissions

Constituent of Potential Concern	CAS Registry Number	Aquatic Biota	Chinook Salmon and Other Salmonids	Benthic Invertebrates
Organic Compounds				
Aromatic Halogenated Hydrocarbons				
2,3,4,6-Tetrachlorophenol	58-90-2	--	--	--
4-Chloro-3-methylphenol	59-50-7	X	X	X
Aromatic Nonhalogenated Hydrocarbons				
2-Nitrotoluene	88-72-2	--	--	--
4-Nitrobiphenyl	92-93-3	--	--	--
Benzaldehyde	100-52-7	--	--	--
Benzene	71-43-2	X	X	X
Benzyl alcohol	100-51-6	X	X	X
Ethyl benzene	100-41-4	X	X	X
m-Xylene	108-38-3	X	X	X
o-Xylene	95-47-6	--	--	--
p-Xylene	106-42-3	--	--	--
Styrene	100-42-5	--	--	--
Toluene	108-88-3	X	X	X
Non-aromatic Nonhalogenated Hydrocarbons				
1,2-Epoxybutane	106-88-7	--	--	--
1,3-Butadiene	106-99-0	--	--	--
1,4-Dioxane	123-91-1	X	X	X
1-Methylpropyl alcohol	78-92-2	--	--	--
1-Nitropropane	108-03-2	--	--	--
2,2,4-Trimethylpentane	540-84-1	--	--	--
2-Butanone	78-93-3	X	X	X
2-Butenaldehyde (2-Butenal)	4170-30-3	X	X	--
2-Ethoxyethanol	110-80-5	--	--	--
2-Heptanone	110-43-0	--	--	--
2-Hexanone	591-78-6	X	X	X
2-Methoxyethanol	109-86-4	--	--	--
2-Methyl-2-propanol	75-65-0	--	--	--
2-Methyl-2-propenenitrile	126-98-7	--	--	--
2-Methylaziridine	75-55-8	--	--	--
2-Methylpropyl alcohol	78-83-1	--	--	--
2-Pentanone	107-87-9	--	--	--
2-Propanone (Acetone)	67-64-1	X	X	X
2-Propene-1-ol	107-18-6	--	--	--
2-Propyl alcohol	67-63-0	X	X	--
3-Heptanone	106-35-4	--	--	--
3-Methyl-1-butanol	123-51-3	--	--	--
3-Methyl-2-butanone	563-80-4	--	--	--
3-Pentanone	96-22-0	--	--	--
4-Heptanone	123-19-3	--	--	--
4-Methyl-2-pentanone	108-10-1	X	X	X
4-Methyl-3-penten-2-one	141-79-7	--	--	--
5-Methyl-2-hexanone	110-12-3	--	--	--
Acetaldehyde	75-07-0	--	--	--
Acetamide	60-35-5	--	--	--
Acetic acid	64-19-7	--	--	--
Acetic acid ethyl ester	141-78-6	--	--	--
Acetic acid n-butyl ester	123-86-4	--	--	--
Acetonitrile	75-05-8	--	--	--
Acrolein	107-02-8	X	X	X
Acrylonitrile	107-13-1	X	X	X
Bis(isopropyl)ether	108-20-3	--	--	--
Butane	106-97-8	--	--	--
Carbon disulfide	75-15-0	X	X	X
Cyanogen	460-19-5	--	--	--

Table A-14 Constituents with Data Available to Estimate Potential for Hazards to Aquatic Biota, Salmonids, and Benthic Invertebrates from Emissions

Constituent of Potential Concern	CAS Registry Number	Aquatic Biota	Chinook Salmon and Other Salmonids	Benthic Invertebrates
Cyclohexane	110-82-7	--	--	--
Cyclohexanone	108-94-1	--	--	--
Cyclohexene	110-83-8	--	--	--
Cyclopentane	287-92-3	--	--	--
Ethyl alcohol	64-17-5	--	--	--
Ethyl ether	60-29-7	--	--	--
Ethyl methacrylate	97-63-2	--	--	--
Formaldehyde	50-00-0	X	X	X
Formamide	75-12-7	--	--	--
Formic acid	64-18-6	--	--	--
Formic acid, methyl ester	107-31-3	--	--	--
Glycidylaldehyde	765-34-4	--	--	--
Methyl acetate	79-20-9	--	--	--
Methyl alcohol	67-56-1	--	--	--
Methyl isocyanate	624-83-9	--	--	--
Methyl methacrylate	80-62-6	--	--	--
Methyl tert-butyl ether	1634-04-4	--	--	--
Methylacetylene	74-99-7	--	--	--
Methylcyclohexane	108-87-2	--	--	--
N,N-Dimethylacetamide	127-19-5	--	--	--
n-Butyl alcohol	71-36-3	--	--	--
n-Heptane	142-82-5	--	--	--
n-Hexane	110-54-3	X	X	--
Nitromethane	75-52-5	--	--	--
n-Nonane	111-84-2	--	--	--
n-Octane	111-65-9	--	--	--
n-Pentane	109-66-0	--	--	--
n-Propionaldehyde	123-38-6	--	--	--
n-Propyl alcohol	71-23-8	--	--	--
n-Valeraldehyde	110-62-3	--	--	--
Oxirane	75-21-8	--	--	--
p-Cymene	99-87-6	--	--	--
Phosgene	75-44-5	--	--	--
Propargyl alcohol	107-19-7	--	--	--
Propionic acid	79-09-4	--	--	--
Propionitrile	107-12-0	--	--	--
Propylene glycol monomethyl ether	107-98-2	--	--	--
p-tert-Butyltoluene	98-51-1	--	--	--
Triethylamine	121-44-8	--	--	--
Trimethylamine	75-50-3	--	--	--
Vinyl acetate	108-05-4	X	X	X
Non-aromatic Halogenated Hydrocarbons				
1,1,1,2-Tetrachloro-2,2-difluoroethane	76-11-9	--	--	--
1,1,1,2-Tetrachloroethane	630-20-6	--	--	--
1,1,1-Trichloroethane	71-55-6	X	X	X
1,1,2,2-Tetrachloro-1,2-difluoroethane	76-12-0	--	--	--
1,1,2,2-Tetrachloroethane	79-34-5	X	X	X
1,1,2,2-Tetrachloroethene	127-18-4	X	X	X
1,1,2-Trichloroethane	79-00-5	X	X	X
1,1,2-Trichloroethylene	79-01-6	X	X	X
1,1-Dichloroethane	75-34-3	X	X	X
1,1-Dichloroethene	75-35-4	X	X	X
1,2,2-Trichloro-1,1,2-trifluoroethane	76-13-1	--	--	--
1,2,3-Trichloropropane	96-18-4	--	--	--
1,2-Dibromo-3-chloropropane	96-12-8	--	--	--
1,2-Dichloro-1,1,2,2-tetrafluoroethane	76-14-2	--	--	--
1,2-Dichloroethane	107-06-2	X	X	X

Table A-14 Constituents with Data Available to Estimate Potential for Hazards to Aquatic Biota, Salmonids, and Benthic Invertebrates from Emissions

Constituent of Potential Concern	CAS Registry Number	Aquatic Biota	Chinook Salmon and Other Salmonids	Benthic Invertebrates
1,2-Dichloroethylene	540-59-0	X	X	X
1,2-Dichloropropane	78-87-5	--	--	--
1,3-Dichloropropene	542-75-6	X	X	X
1,4-Dichloro-2-butene	764-41-0	--	--	--
1-Chloroethene	75-01-4	X	X	X
2,2-Dichloropropionic acid	75-99-0	--	--	--
2-Chloropropane	75-29-6	--	--	--
3-Chloropropene (Allyl chloride)	107-05-1	--	--	--
Bromochloromethane	74-97-5	--	--	--
Bromodichloromethane	75-27-4	--	--	--
Bromoethene	593-60-2	--	--	--
Bromoform	75-25-2	--	--	--
Bromomethane	74-83-9	--	--	--
Carbon tetrachloride	56-23-5	X	X	X
Chlorodibromomethane	124-48-1	--	--	--
Chlorodifluoromethane	75-45-6	--	--	--
Chloroethane	75-00-3	--	--	--
Chloroform	67-66-3	X	X	X
Chloromethane	74-87-3	--	--	--
Chloropentafluoroethane	76-15-3	--	--	--
cis-1,2-Dichloroethene	156-59-2	--	--	--
cis-1,3-Dichloropropene	10061-01-5	--	--	--
Cyanogen bromide	506-68-3	--	--	--
Cyanogen chloride	506-77-4	--	--	--
Dichlorodifluoromethane	75-71-8	--	--	--
Dichlorofluoromethane	75-43-4	--	--	--
Dichloromethane	75-09-2	X	X	X
Difluorodibromomethane	75-61-6	--	--	--
Hexafluoroacetone	684-16-2	--	--	--
Iodomethane	74-88-4	--	--	--
Methylene bromide	74-95-3	--	--	--
Pentachloroethane	76-01-7	X	X	--
trans-1,2-Dichloroethylene	156-60-5	--	--	--
trans-1,3-Dichloropropene	10061-02-6	--	--	--
Trichloroacetic acid	76-03-9	--	--	--
Trichlorofluoroethane	27154-33-2	--	--	--
Trichlorofluoromethane	75-69-4	--	--	--
Trifluorobromomethane	75-63-8	--	--	--
Dioxin and Furan Compounds (PCDDs/PCDFs)				
1,2,3,4,6,7,8-Heptachlorodibenzo(p)dioxin	35822-46-9	--	--	--
1,2,3,4,6,7,8-Heptachlorodibenzofuran	67562-39-4	--	--	--
1,2,3,4,7,8,9-Heptachlorodibenzofuran	55673-89-7	--	--	--
1,2,3,4,7,8-Hexachlorodibenzo(p)dioxin	39227-28-6	--	--	--
1,2,3,4,7,8-Hexachlorodibenzofuran	70648-26-9	--	--	--
1,2,3,6,7,8-Hexachlorodibenzo(p)dioxin	57653-85-7	--	--	--
1,2,3,6,7,8-Hexachlorodibenzofuran	57117-44-9	--	--	--
1,2,3,7,8,9-Hexachlorodibenzo(p)dioxin	19408-74-3	--	--	--
1,2,3,7,8,9-Hexachlorodibenzofuran	72918-21-9	--	--	--
1,2,3,7,8-Pentachlorodibenzo(p)dioxin	40321-76-4	--	--	--
1,2,3,7,8-Pentachlorodibenzofuran	57117-41-6	--	--	--
2,3,4,6,7,8-Hexachlorodibenzofuran	60851-34-5	--	--	--
2,3,4,7,8-Pentachlorodibenzofuran	57117-31-4	--	--	--
2,3,7,8-Tetrachlorodibenzo(p)dioxin	1746-01-6	X	X	X
2,3,7,8-Tetrachlorodibenzofuran	51207-31-9	--	--	--
Dibenzofuran	132-64-9	X	X	X
Octachlorodibenzo(p)dioxin	3268-87-9	--	--	--
Octachlorodibenzofuran	39001-02-0	--	--	--

Table A-14 Constituents with Data Available to Estimate Potential for Hazards to Aquatic Biota, Salmonids, and Benthic Invertebrates from Emissions

Constituent of Potential Concern	CAS Registry Number	Aquatic Biota	Chinook Salmon and Other Salmonids	Benthic Invertebrates
Polychlorinated Biphenyls (PCBs)				
2,2',3,3',4,4',5-Heptachlorobiphenyl	35065-30-6	--	--	--
2,2',3,4,4',5,5'-Heptachlorobiphenyl	35065-29-3	--	--	--
2,3,3',4,4',5,5'-Heptachlorobiphenyl	39635-31-9	--	--	--
2,3,3',4,4',5'-Hexachlorobiphenyl	69782-90-7	--	--	--
2,3,3',4,4',5-Hexachlorobiphenyl	38380-08-4	--	--	--
2,3,3',4,4'-Pentachlorobiphenyl	32598-14-4	--	--	--
2,3',4,4',5,5'-Hexachlorobiphenyl	52663-72-6	--	--	--
2,3,4,4',5-Pentachlorobiphenyl	74472-37-0	--	--	--
2',3,4,4',5-Pentachlorobiphenyl	65510-44-3	--	--	--
2,3',4,4',5-Pentachlorobiphenyl	31508-00-6	--	--	--
3,3',4,4',5,5'-Hexachlorobiphenyl	32774-16-6	--	--	--
3,3',4,4',5-Pentachlorobiphenyl	57465-28-8	--	--	--
3,3',4,4'-Tetrachlorobiphenyl	32598-13-3	--	--	--
3,4,4',5-Tetrachlorobiphenyl	70362-50-4	--	--	--
Polychlorinated biphenyls (PCBs)	1336-36-3	X	X	X
Phthalates				
Bis(2-ethylhexyl) phthalate (DEHP)	117-81-7	X	X	X
Butylbenzyl phthalate	85-68-7	X	X	X
Dibutyl phthalate	84-74-2	X	X	X
Diethyl phthalate	84-66-2	X	X	X
Dimethyl phthalate	131-11-3	--	X	--
n-Dioctyl phthalate	117-84-0	X	X	X
Light Polycyclic Aromatic Hydrocarbons (molecular weight <200 g/mole)				
2-Chloronaphthalene	91-58-7	--	--	--
2-Methyl naphthalene	91-57-6	--	--	X
5-Nitroacenaphthene	602-87-9	--	--	--
Acenaphthene	83-32-9	X	X	X
Acenaphthylene	208-96-8	--	--	X
Anthracene	120-12-7	X	X	X
Fluorene	86-73-7	X	X	X
Indene	95-13-6	--	--	--
Naphthalene	91-20-3	X	X	X
Phenanthrene	85-01-8	X	X	X
Pyrene	129-00-0	--	--	X
Heavy Polycyclic Aromatic Hydrocarbons (molecular weight >200 g/mole)				
3-Methylcholanthrene	56-49-5	--	--	--
5-Methylchrysene	3697-24-3	--	--	--
Benzo[a]anthracene	56-55-3	X	X	X
Benzo[a]pyrene	50-32-8	X	X	X
Benzo[a,i]pyrene	191-30-0	--	--	--
Benzo[b]fluoranthene	205-99-2	X	X	X
Benzo[e]pyrene	192-97-2	--	--	--
Benzo[g,h,i]perylene	191-24-2	--	--	X
Benzo[j]fluoranthene	205-82-3	--	--	--
Benzo[k]fluoranthene	207-08-9	X	X	X
Chrysene	218-01-9	X	X	X
Dibenz[a,h]acridine	226-36-8	--	--	--
Dibenz[a,h]anthracene	53-70-3	X	X	X
Dibenz[a,j]acridine	224-42-0	--	--	--
Dibenzo[a,e]fluoranthene	5385-75-1	--	--	--
Dibenzo[a,e]pyrene	192-65-4	--	--	--
Dibenzo[a,h]fluoranthene	No CAS #	--	--	--
Dibenzo[a,h]pyrene	189-64-0	--	--	--
Dibenzo[a,i]pyrene	189-55-9	--	--	--
Fluoranthene	206-44-0	X	X	X
Hexachloronaphthalene	1335-87-1	--	--	--

Table A-14 Constituents with Data Available to Estimate Potential for Hazards to Aquatic Biota, Salmonids, and Benthic Invertebrates from Emissions

Constituent of Potential Concern	CAS Registry Number	Aquatic Biota	Chinook Salmon and Other Salmonids	Benthic Invertebrates
Indeno[1,2,3-cd]pyrene	193-39-5	X	X	X
Octachloronaphthalene	2234-13-1	--	--	--
Pentachloronaphthalene	1321-64-8	--	--	--
Tetrachloronaphthalene	1335-88-2	--	--	--
Trichloronaphthalene	1321-65-9	--	--	--
Light Substituted Benzene Compounds (molecular weight <200 g/mole)				
1,2,3-Trichlorobenzene	87-61-6	--	--	--
1,2,4-Trichlorobenzene	120-82-1	X	X	X
1,2,4-Trimethyl benzene	95-63-6	--	--	--
1,2-Dichlorobenzene	95-50-1	X	X	X
1,3,5-Trimethyl benzene	108-67-8	--	--	--
1,3-Dichlorobenzene	541-73-1	X	X	X
1,3-Dinitrobenzene	99-65-0	X	X	X
1,4-Dichlorobenzene	106-46-7	X	X	X
1,4-Dinitrobenzene	100-25-4	--	--	--
2,4,5-Trichlorophenol	95-95-4	--	--	--
2,4,6-Trichlorophenol	88-06-2	X	X	--
2,4-Dichlorophenol	120-83-2	X	X	--
2,4-Dimethylphenol	105-67-9	X	X	--
2,4-Dinitrophenol	51-28-5	--	--	--
2,4-Dinitrotoluene	121-14-2	X	X	X
2,6-Dinitrotoluene	606-20-2	X	X	X
2-Chlorophenol	95-57-8	--	--	--
2-Chlorotoluene	95-49-8	--	--	--
2-Nitrophenol	88-75-5	--	--	--
4,6-Dinitro-o-cresol	534-52-1	--	--	--
4-Chlorotoluene	106-43-4	--	--	--
4-Nitrophenol	100-02-7	X	X	X
alpha-Methylstyrene	98-83-9	--	--	--
Aniline	62-53-3	--	--	--
Benzotrichloride	98-07-7	--	--	--
Benzyl chloride	100-44-7	--	--	--
Bromobenzene	108-86-1	--	--	--
Chlorobenzene	108-90-7	X	X	X
Cumene	98-82-8	--	--	--
m-Cresol	108-39-4	--	--	--
n-Butyl benzene	104-51-8	--	--	--
Nitrobenzene	98-95-3	X	X	X
n-Propyl benzene	103-65-1	--	--	--
o-Cresol	95-48-7	X	X	X
o-Dinitrobenzene	528-29-0	--	--	--
o-Nitroaniline	88-74-4	--	--	--
o-Toluidine	95-53-4	--	--	--
p-Chloroaniline	106-47-8	--	--	--
p-Cresol	106-44-5	--	--	--
Phenol	108-95-2	X	X	X
p-Nitrochlorobenzene	100-00-5	--	--	--
p-Toluidine	106-49-0	--	--	--
sec-Butyl benzene	135-98-8	--	--	--
tert-Butyl benzene	98-06-6	--	--	--
Toluene-2,6-diamine	823-40-5	--	--	--
Trimethyl benzene	25551-13-7	--	--	--
Other Light Semivolatile Compounds (molecular weight <200 g/mole)				
1,1'-Biphenyl	92-52-4	X	X	--
1,1-Dimethylhydrazine	57-14-7	--	--	--
1,2-Dimethylhydrazine	540-73-8	--	--	--
1,2-Diphenylhydrazine	122-66-7	X	X	--

Table A-14 Constituents with Data Available to Estimate Potential for Hazards to Aquatic Biota, Salmonids, and Benthic Invertebrates from Emissions

Constituent of Potential Concern	CAS Registry Number	Aquatic Biota	Chinook Salmon and Other Salmonids	Benthic Invertebrates
1,3-Propane sultone	1120-71-4	--	--	--
2,4-Toluene diisocyanate	584-84-9	--	--	--
2-Chloroacetophenone	532-27-4	--	--	--
2-Propenoic acid	79-10-7	--	--	--
4,4'-Methylenedianiline	101-77-9	--	--	--
Acetophenone	98-86-2	--	--	--
Benzoic acid	65-85-0	X	X	--
Bis(2-chloroethoxy)methane	111-91-1	--	--	--
Bis(2-chloroethyl) ether	111-44-4	--	--	--
Chlorocyclopentadiene	41851-50-7	--	--	--
Cyclohexanol	108-93-0	--	--	--
Dichloroisopropyl ether	108-60-1	--	--	--
Dichloromethyl ether	542-88-1	--	--	--
Dichloropentadiene	61626-71-9	--	--	--
Dimethyl sulfate	77-78-1	--	--	--
Dimethylaniline	121-69-7	--	--	--
di-n-Propylnitrosamine	621-64-7	--	--	--
Diphenyl ether	101-84-8	--	--	--
Epichlorohydrin	106-89-8	--	--	--
Ethyl carbamate (Urethane)	51-79-6	--	--	--
Ethyl methanesulfonate	62-50-0	--	--	--
Ethylene dibromide	106-93-4	--	--	--
Ethylene glycol	107-21-1	--	--	--
Ethylene glycol monobutyl ether	111-76-2	--	--	--
Ethylene glycol monoethyl ether acetate	111-15-9	--	--	--
Ethylene thiourea	96-45-7	--	--	--
Furfural	98-01-1	--	--	--
Maleic hydrazide	123-33-1	--	--	--
Malononitrile	109-77-3	--	--	--
Methyl styrene (mixed isomers)	25013-15-4	--	--	--
Methylhydrazine	60-34-4	--	--	--
N,N-Diphenylamine	122-39-4	--	--	--
Nitric acid, propyl ester	627-13-4	--	--	--
N-Nitrosodi-n-butylamine	924-16-3	--	--	--
N-Nitrosomorpholine	59-89-2	--	--	--
N-Nitroso-N,N-dimethylamine	62-75-9	--	--	--
o-Anisidine	90-04-0	--	--	--
Oxalic acid	144-62-7	--	--	--
Phthalic anhydride	85-44-9	--	--	--
p-Phthalic acid	100-21-0	--	--	--
Pyridine	110-86-1	--	--	--
Quinoline	91-22-5	--	--	--
Quinone	106-51-4	--	--	--
Safrole	94-59-7	--	--	--
Tetrahydrofuran	109-99-9	--	--	--
Other Heavy Semivolatile Compounds (molecular weight >200 g/mole)				
1,2,4,5-Tetrachlorobenzene	95-94-3	--	--	--
1,3,5-Trinitrobenzene	99-35-4	--	X	--
2,6-Bis(tert-butyl)-4-methylphenol	128-37-0	--	--	--
2-Cyclohexyl-4,6-dinitrophenol	131-89-5	--	--	--
2-sec-Butyl-4,6-dinitrophenol	88-85-7	--	X	--
3,3'-Dichlorobenzidine	91-94-1	--	--	--
3,3'-Dimethoxybenzidine	119-90-4	--	--	--
4-Bromophenylphenyl ether	101-55-3	X	X	--
Ammonium perfluorooctanoate	3825-26-1	--	--	--
Azobenzene	103-33-3	--	--	--
Bis(3-tert-butyl-4-hydroxy-6-methyl-phenyl)sulfide	96-69-5	--	--	--

Table A-14 Constituents with Data Available to Estimate Potential for Hazards to Aquatic Biota, Salmonids, and Benthic Invertebrates from Emissions

Constituent of Potential Concern	CAS Registry Number	Aquatic Biota	Chinook Salmon and Other Salmonids	Benthic Invertebrates
Captan	133-06-2	--	--	--
Chlorobenzilate	510-15-6	--	--	--
Dibutylphosphate	107-66-4	--	--	--
Dimethyl aminoazobenzene	60-11-7	--	--	--
Hexachlorobenzene	118-74-1	X	X	X
Hexachlorobutadiene	87-68-3	X	X	X
Hexachlorocyclopentadiene	77-47-4	X	X	X
Hexachloroethane	67-72-1	X	X	X
Hexachlorophene	70-30-4	X	X	X
Hexamethylene-1,5-diisocyanate	822-06-0	--	--	--
Mirex	2385-85-5	X	X	X
Nitrofen	1836-75-5	--	--	--
Pentachlorobenzene	608-93-5	X	X	X
Pentachloronitrobenzene	82-68-8	X	X	X
Pentachlorophenol	87-86-5	X	X	X
Picric acid	88-89-1	--	--	--
Pronamide	23950-58-5	--	--	--
Strychnine	57-24-9	--	--	--
Terphenyls	26140-60-3	--	--	--
Tributyl phosphate	126-73-8	--	--	--
Trifluralin	1582-09-8	--	--	--
Triphenylamine	603-34-9	--	--	--
Herbicides and Organochlorinated Pesticides				
2,4,5-T	93-76-5	--	--	--
2,4-D and esters	94-75-7	--	--	--
4,4'-DDD	72-54-8	X	X	X
4,4'-DDE	72-55-9	X	X	X
4,4'-DDT	50-29-3	X	X	X
Aldrin	309-00-2	X	X	X
alpha-BHC	319-84-6	X	X	X
beta-BHC	319-85-7	X	X	X
Chlordane	57-74-9	X	X	X
delta-BHC	319-86-8	X	X	X
Dieldrin	60-57-1	X	X	X
Endothall	145-73-3	--	--	--
Endrin	72-20-8	X	X	X
gamma-BHC (Lindane)	58-89-9	X	X	X
Heptachlor	76-44-8	X	X	X
Isodrin	465-73-6	--	--	--
Methoxychlor	72-43-5	X	X	X
Silvex (2,4,5-TP)	93-72-1	--	--	--
Toxaphene	8001-35-2	X	X	X
Inorganic Chemicals and Compounds				
Metals				
Aluminum	7429-90-5	X	X	X
Antimony	7440-36-0	X	X	X
Arsenic	7440-38-2	X	X	X
Barium	7440-39-3	X	X	X
Beryllium	7440-41-7	X	X	--
Bismuth	7440-69-9	--	--	--
Boron	7440-42-8	X	X	--
Cadmium	7440-43-9	X	X	X
Calcium	7440-70-2	--	--	--
Chromium	18540-29-9	X	X	X
Cobalt	7440-48-4	X	X	--
Copper	7440-50-8	X	X	X
Iron	7439-89-6	X	X	X

Table A-14 Constituents with Data Available to Estimate Potential for Hazards to Aquatic Biota, Salmonids, and Benthic Invertebrates from Emissions

Constituent of Potential Concern	CAS Registry Number	Aquatic Biota	Chinook Salmon and Other Salmonids	Benthic Invertebrates
Lead	7439-92-1	X	X	X
Lithium	7439-93-2	X	X	--
Magnesium	7439-95-4	--	--	--
Manganese	7439-96-5	X	X	X
Mercury	7439-97-6	--	--	--
Mercury - Hg+2	7487-94-7	X	X	X
Methylmercury	22967-92-6	X	X	X
Molybdenum	7439-98-7	X	X	--
Nickel	7440-02-0	X	X	X
Potassium	7440-09-7	--	--	--
Rhodium	7440-16-6	--	--	--
Selenium	7782-49-2	X	X	X
Silicon	7440-21-3	--	--	--
Silver	7440-22-4	X	X	X
Sodium	7440-23-5	--	--	--
Strontium	7440-24-6	X	X	--
Tantalum	7440-25-7	--	--	--
Thallium	7440-28-0	X	X	--
Tin	7440-31-5	X	X	--
Tungsten	7440-33-7	--	--	--
Uranium	7440-61-1	X	X	--
Vanadium	7440-62-2	X	X	--
Yttrium	7440-65-5	--	--	--
Zinc	7440-66-6	X	X	X
Zirconium	7440-67-7	X	X	--
Non-metals and Anions				
Ammonia/Ammonium	7664-41-7	--	X	X
Bromide	24959-67-9	--	--	--
Chloride	16887-00-6	--	--	--
Cyanide	57-12-5	X	X	X
Fluoride	16984-48-8	--	--	--
Hydroxide	14280-30-9	--	--	--
Iodine	7553-56-2	--	--	--
Nitrate	14797-55-8	--	--	--
Nitrite	14797-65-0	--	--	--
Phosphate	14265-44-2	--	--	--
Phosphorus	7723-14-0	--	--	--
Sulfate	14808-79-8	--	--	--
Total sulfur	63705-05-5	--	--	--
Criteria Pollutants				
Carbon monoxide	630-08-0	--	--	--
Nitrogen dioxide	10102-44-0	--	--	--
Ozone	10028-15-6	--	--	--
Particulate matter	No CAS #	--	--	--
Sulfur dioxide	7446-09-5	--	--	--
Radionuclides				
Actinium-227	14952-40-0	X	X	X
Americium-241	14596-10-2	X	X	X
Americium-243	14993-75-0	X	X	X
Antimony-125	14234-35-6	X	X	X
Cadmium-113m	14336-66-4	X	X	X
Carbon-14	14762-75-5	X	X	X
Cesium-134	13967-70-9	X	X	X
Cesium-137	10045-97-3	X	X	X
Cobalt-60	10198-40-0	X	X	X
Curium-242	15510-73-3	X	X	X

Table A-14 Constituents with Data Available to Estimate Potential for Hazards to Aquatic Biota, Salmonids, and Benthic Invertebrates from Emissions

Constituent of Potential Concern	CAS Registry Number	Aquatic Biota	Chinook Salmon and Other Salmonids	Benthic Invertebrates
Curium-243	15757-87-6	X	X	X
Curium-244	13981-15-2	X	X	X
Europium-152	14683-23-9	X	X	X
Europium-154	15585-10-1	X	X	X
Europium-155	14391-16-3	X	X	X
Iodine-129	15046-84-1	X	X	X
Neptunium-237	13994-20-2	X	X	X
Nickel-59	14336-70-0	X	X	X
Nickel-63	13981-37-8	X	X	X
Niobium-93m	7440-03-1	X	X	X
Plutonium-238	13981-16-3	X	X	X
Plutonium-239	15117-48-3	X	X	X
Plutonium-240	14119-33-6	X	X	X
Plutonium-241	14119-32-5	X	X	X
Plutonium-242	13982-10-0	X	X	X
Protactinium-231	14331-85-2	X	X	X
Radium-226	13982-63-3	X	X	X
Radium-228	15262-20-1	X	X	X
Ruthenium-106	13967-48-1	X	X	X
Samarium-151	15715-94-3	X	X	X
Selenium-79	15758-45-9	X	X	X
Strontium-90	10098-97-2	X	X	X
Technetium-99	14133-76-7	X	X	X
Thorium-229	15594-54-4	X	X	X
Thorium-232	7440-29-1	X	X	X
Tin-126	15832-50-5	X	X	X
Tritium	10028-17-8	X	X	X
Uranium-232	14158-29-3	X	X	X
Uranium-233	13968-55-3	X	X	X
Uranium-234	13966-29-5	X	X	X
Uranium-235	15117-96-1	X	X	X
Uranium-236	13982-70-2	X	X	X
Uranium-238	7440-61-1	X	X	X
Zirconium-93	15751-77-6	X	X	X

CAS = Chemical Abstracts Service.
PCDD = Polychlorinated dibenzo-p-dioxin.
PCDF = Polychlorinated dibenzofuran.

X = Constituent is quantitatively evaluated for acute exposure.
-- = Constituent is qualitatively evaluated for acute exposure.

Appendix B

Modeling Parameters and Human Health Risk Assessment

Appendix B
Modeling Parameters and Human Health Risk Assessment

Contents

Appendix B-1 Constituent of Potential Concern-Specific Parameters B1-i

Appendix B-2 Supporting Equations for Soil, Surface Water, and Sediment Accumulation Modeling B2-i

Appendix B-3 Radiological Risk Assessment Issues B3-i

Appendix B-4 Information Regarding Human Health Risk Parameters for the Native American Receptors B4-i

Appendix B-1

Constituent of Potential Concern-Specific Parameters

Appendix B-1
Constituent of Potential Concern-Specific Parameters

Contents

References for Appendix B-1 ..... B1-iii
- **Project Documents B1-iii**
- **Codes and Standards B1-iii**
- **Other Documents B1-iii**

Overview of Database B1-1

Tables

Table B1-1 Chemical-Specific Parameters for Organic COPCs B1-3
Table B1-2 Chemical-Specific Parameters for Inorganic COPCs B1-116
Table B1-3 Isotope-Specific Parameters for ROPCs B1-131

References for Appendix B-1

Project Documents

24590-WTP-RPT-PO-03-008, Rev 0, *Integrated Emissions Baseline Report for the Hanford Tank Waste Treatment and Immobilization Plant.*

CCN 063817. Personal communication, e-mail from Marcia Bailey (US Environmental Protection Agency, Region 10) to Sharon Robers (SAIC), 30 October 2002.

Codes and Standards

None

Other Documents

Baes CF III, Sharp RD, Sjoreen AL, and Shor RW. 1984. *A Review and Analysis of Parameters for Assessing Transport of Environmentally Released Radionuclides Through Agriculture*, ORNL-5786, September 1984. Martin Marietta Energy Systems, Inc., Oak Ridge National Laboratory, Oak Ridge, Tennessee, USA

Binstein SJ, Devillers J, and Karcher W. 1993. "Nonlinear Dependence of Fish Bioconcentrations on n-Octanol/Water Partition Coefficients," SAR and QSAR, *Environ. Res.*, Volume 1, p 29–39.

CHEMFATE Chemical. 1999. Available at http://esc.syrres.com/efdb/Chemfate.htm.

Eckerman KF, Leggett RW, Nelson CB, Puskin JS, and Richardson ACB. 1999. *Cancer Risk Coefficients for Environmental Exposure to Radionuclides*, EPA 402-R-99-001, Federal Guidance Report No. 13, September 1999. Prepared by Oak Ridge National Laboratory, Oak Ridge, Tennessee, for the US Environmental Protection Agency, Office of Radiation and Indoor Air, Washington, DC, USA.

EPA. 1998. *Human Health Risk Assessment Protocol for Hazardous Waste Combustion Facilities*, Peer Review Draft, EPA/530/D-98/001B. US Environmental Protection Agency, Washington, DC, USA. Available at http://www.epa.gov/epaoswer/hazwaste/combust/risk.htm.

EPA. 1999a. *Screening-Level Ecological Risk Assessment Protocol for Hazardous Waste Combustion Facilities*, Peer Review Draft, EPA 530-D-99-001A. Office of Solid Waste and Emergency Response, US Environmental Protection Agency, Washington, DC, USA. Available at http://www.epa.gov/epaoswer/hazwaste/combust/ecorisk.htm.

EPA. 1999b. *Errata to Human Health Risk Assessment Protocol for Hazardous Waste Combustion Facilities*, Peer Review Draft, August 2. US Environmental Protection Agency, Washington, DC, USA.

EPA. 2001. *Health Effects Assessment Summary Tables (HEAST) 2001Update*. Office of Solid Waste and Emergency Response, US Environmental Protection Agency, Washington, DC, USA.

EPA. 2002a. Region 9: Superfund, *Preliminary Remediation Goals*, October 2002. Available at http://www.epa.gov/region09/waste/sfund/prg/index.htm.

EPA. 2002b. Exposure Assessment Tools and Models, EPI Suite™ v3.10 software. Accessed at http://www.epa.gov/oppt/exposure/docs/episuitedl.htm.

EPA. 2003. *Risk Assessment Guidance for Superfund, Volume I: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Interim.*

Hansch C, and Leo AJ. 1985. Medchem Project, Claremont, California: Pomona College, Issue No. 26.

Howard PH. 1989–1997. *Handbook of Environmental Fate and Exposure Data for Organic Chemicals, Volume I: Large Production and Priority Pollutants*; *Volume II: Solvents*; *Volume III: Pesticides*; *Volume IV: Solvents 2*; and *Volume V: Solvents 3*. Lewis Publishers, Chelsea, Michigan, USA.

Howard PH, Boethling RS, Jarvis WF, and Meylan WM. 1991. *Handbook of Environmental Degradation Rates*. Lewis Publishers, Chelsea, Michigan, USA.

Mackay D, and Shui WY. 1981. "A Critical Review of Henry's Law Constants for Chemicals of Environmental Interest," *J. Phys. Chem. Ref. Data*, Volume 10, Issue 4.

Mackay D, Shui WY, and Ma KC. 1991-1995. *Illustrated Handbook of Physical–Chemical Properties and Environmental Fate for Organic Chemicals. Volume I – Monoaromatic Hydrocarbons, Chloro-benzenes, and PCBs*; *Volume II – Polynuclear Aromatic Hydrocarbons, Polychlorinated Dioxins and Dibenzofurans*; *Volume III – Volatile Organic Chemicals*; and *Volume IV – Herbicides and Pesticides*. Lewis Publishers, Boca Raton, Florida, USA.

Ng CY, Colsher CS, and Thompson SE. 1982. *Transfer Coefficients for Assessing the Dose from Radionuclides in Meat and Eggs*. Lawrence Livermore National Laboratory, Livermore, California, USA.

NRC. 1992. *Residual Radioactive Contamination from Decommissioning, Technical Basis for Translating Contamination Levels to Annual Total Effective Dose Equivalent*, Final Report, NUREG/CR-5512, PNL-7794, Volume 1. US Nuclear Regulatory Commission, Washington, DC, USA.

RAIS (Risk Assessment Information System). 2002. Available at http://risk.lsd.ornl.gov/rap_hp.shtml.

Schwarzenbach RP, Gschwend PM, and Imboden DM. 1993. *Environmental Organic Chemistry*. John Wiley and Sons, Inc., New York, New York, USA.

Southworth GR, Beauchamp JJ, and Schmieder PK. 1978. "Bioaccumulation Potential of Polycyclic Aromatic Hydrocarbons in *Daphnia pulex*," *Water Res.*, Volume 12, p 973–977.

Spectrum. 1999. Index of Compounds, *Chemical Fact Sheet*. Spectrum Laboratories, Inc., Fort Lauderdale, Florida, and Savannah, Georgia, USA. Available at http://www.speclab.com/compound/.

Strenge DL, Peloquin RA, and Whelan G. 1986. *LADTAP II - Technical Reference and User Guide*. NUREG/CR-4013. US Nuclear Regulatory Commission, Office of Nuclear Reactor Regulation, Washington, DC, USA.

Overview of Database

A database has been developed in support of this risk assessment work plan to contain physical constituent-specific parameters that are used for various purposes, including modeling exposure point concentrations for the screening-level risk assessment. Values are presented for the chemicals of potential concern (COPCs) and radionuclides of potential concern (ROPCs), as identified in section 4 of this work plan, for the following parameters (shown in alphabetical order below, but shown in functional order on tables B1-1, B1-2, and B1-3):

Parameter	O[a]	I[a]	R[a]	Definition (Units)
Ba_{beef}	✓	✓	✓	Biotransfer factor for beef (mg constituent/kg FW tissue)/(mg constituent/day) OR (day/kg FW tissue)
$Ba_{chicken}$	✓	✓	✓	Biotransfer factor for chicken (mg constituent/kg FW tissue)/(mg constituent/day) OR (day/kg FW tissue)
Ba_{egg}	✓	✓	✓	Biotransfer factor for eggs (mg constituent/kg FW tissue)/(mg constituent/day) OR (day/kg FW tissue)
Ba_{milk}	✓	✓	✓	Biotransfer factor for milk (mg constituent/kg FW tissue)/(mg constituent/day) OR (day/kg FW tissue)
Ba_{pork}	✓	✓	✓	Biotransfer factor for pork (mg constituent/kg FW tissue)/(mg constituent/day) OR (day/kg FW tissue)
BAF_{fish}	✓	✓	✓	Bioaccumulation factor in fish (mg constituent/kg FW tissue)/(mg constituent/L total water column) OR (L water/kg FW tissue)
BCF_{fish}	✓	✓	✓	Bioconcentration factor in fish (L water/kg FW tissue)
Br_{ag}	✓	✓	✓	Plant-soil bioconcentration factor in aboveground produce as a weighted average of $Br_{ag(fruit)}$ and $Br_{ag(veg)}$ (µg constituent/g DW plant)/(µg constituent/g DW soil)
$Br_{ag(fruit)}$		✓	✓	Plant-soil bioconcentration factor in aboveground produce for fruit (µg constituent/g DW plant)/(µg constituent/g DW soil)
$Br_{ag(veg)}$		✓	✓	Plant-soil bioconcentration factor in aboveground produce for vegetables (µg constituent/g DW plant)/(µg constituent/g DW soil)
Br_{forage}	✓	✓	✓	Plant-soil bioconcentration factor in forage (µg constituent/g DW plant)/(µg constituent/g DW soil). Also used as plant-soil bioconcentration factor in silage.
Br_{grain}	✓	✓	✓	Plant-soil bioconcentration factor in grain (µg constituent/g DW grain)/(µg constituent/g DW soil)
$Br_{rootveg}$	✓	✓	✓	Plant-soil bioconcentration factor for belowground produce (µg constituent/g DW plant)/(µg constituent/g DW soil)
$BSAF_{fish}$	✓	✓	✓	Biota-sediment accumulation factor in fish (mg constituent/kg lipid tissue)/(mg constituent/kg sediment) OR (unitless)
Bv_{ag}	✓	✓		COPC air-to-plant biotransfer factor for aboveground produce (µg constituent/g DW plant)/(µg constituent/g air)

Parameter	O[a]	I[a]	R[a]	Definition (Units)
Bv_{forage}	✓	✓		COPC air-to-plant biotransfer factor for forage and silage (μg constituent/g DW plant)/(μg constituent/g air)
D_a	✓	✓	✓	Diffusivity of COPC or ROPC in air (cm^2/s)
D_w	✓	✓	✓	Diffusivity of COPC or ROPC in water (cm^2/s)
F_v	✓	✓	✓	Fraction of COPC or ROPC air concentration in vapor phase (unitless)
H	✓	✓		Henry's Law Constant (atmospheres × m^3/mol)
k_{decay}			✓	ROPC soil loss due to radiological decay ($year^{-1}$)
K_{oc}	✓			Soil organic carbon-water partitioning coefficient (mL water/g soil)
K_{ow}	✓			Octanol/water partitioning coefficient (unitless)
Kd_{bs}	✓	✓	✓	Bed sediment/sediment pore water partitioning coefficient (L constituent/kg bottom sediment) OR (cm^3 [or mL] constituent/g bottom sediment)
Kd_s	✓	✓	✓	Soil-water partitioning coefficient (cm^3 [or mL] water/g soil)
Kd_{sw}	✓	✓	✓	Suspended sediment/surface water partitioning coefficient (L water/kg suspended sediment) OR (cm^3 [or mL] water/g suspended sediment)
Kp	✓			COPC permeability constant (cm/hr)
ks_e	✓	✓	✓	COPC or ROPC soil loss due to soil erosion ($year^{-1}$)
ks_g	✓	✓		COPC soil loss due to biotic and abiotic degradation ($year^{-1}$)
ks_l	✓	✓	✓	COPC or ROPC soil loss due to leaching ($year^{-1}$)
ks_r	✓	✓	✓	COPC or ROPC soil loss due to surface runoff ($year^{-1}$)
ks_v	✓	✓	✓	COPC or ROPC soil loss due to volatilization ($year^{-1}$)
MW	✓	✓	✓	Molecular weight of COPC or ROPC (g/mole)
pH	✓	✓		Specific pH level used to obtain other parameter values (unitless). A neutral pH level (in the 6 to 8 range) is normal.
RCF	✓			Root concentration factor (μg constituent/g DW plant)/(μg constituent/mL soil water)
$t_{1/2}$	✓		✓	Half-time of COPC or ROPC in soil (days)

COPC = chemical of potential concern.

DW = dry weight.

FW = fresh weight.

ROPC = radionuclide of potential concern.

[a] Column is checked if relevant for organic compound (O), inorganic compound (I), or radionuclide (R) parameters in tables B1-1, B1-2, or B1-3.

Table B1-1 Chemical-Specific Parameters for Organic COPCs

Chemical of Potential Concern	CAS Registry Number	Fraction		MW (g/mol)	pH	Henry's Constant			Diffusivity			
		F_v (unitless)	Source			H-pub [x] (various units)	Source	H-used [x] (atm-m^3/mol)	D_a (cm^2/s)	Source	D_w (cm^2/s)	Source
Aromatic Halogenated Hydrocarbons												
2,3,4,6-Tetrachlorophenol	58-90-2	0 or 1	b	231.89	7	1.53E-05	c	1.53E-05	2.55E-02	c	5.78E-06	c
4-Chloro-3-methylphenol	59-50-7	0 or 1	b	142.58	NA	4.00E-07	h	4.00E-07	6.96E-02	c	8.06E-06	c
Aromatic Nonhalogenated Hydrocarbons												
2-Nitrotoluene	88-72-2	0 or 1	b	137.13	NA	5.81E+00	i	5.75E-05	4.75E-02	j	8.67E-06	j
4-Nitrobiphenyl	92-93-3	0 or 1	b	199.21	NA	1.45E-04	k	3.53E-06	5.57E-02	e	6.45E-06	e
Benzaldehyde	100-52-7	0 or 1	b	106.12	NA	4.18E-05	c	4.18E-05	7.07E-02	c	9.48E-06	c
Benzene	71-43-2	0 or 1	b	78.11	NA	5.49E-03	c	5.49E-03	1.17E-01	c	1.02E-05	c
Benzyl alcohol	100-51-6	0 or 1	b	108.13	NA	3.78E-07	c	3.78E-07	6.89E-02	c	9.38E-06	c
Ethyl benzene	100-41-4	0 or 1	b	106.16	NA	7.73E-03	c	7.73E-03	7.65E-02	c	8.49E-06	c
m-Xylene	108-38-3	0 or 1	b	106.16	NA	6.05E-03	h	6.05E-03	7.69E-02	c	8.49E-06	c
o-Xylene	95-47-6	0 or 1	b	106.16	NA	6.05E-03	h	6.05E-03	7.69E-02	c	8.44E-06	c
p-Xylene	106-42-3	0 or 1	b	106.16	NA	6.05E-03	h	6.05E-03	7.61E+02	c	8.50E-06	c
Styrene	100-42-5	0 or 1	b	104.14	NA	3.33E-03	c	3.33E-03	7.73E-02	c	8.77E-06	c
Toluene	108-88-3	0 or 1	b	92.13	NA	6.13E-03	c	6.13E-03	9.72E-02	c	9.23E-06	c
Non-aromatic Nonhalogenated Hydrocarbons												
1,2-Epoxybutane	106-88-7	0 or 1	b	72.12	NA	7.36E-03	m	1.79E-04	1.34E-01	j	1.03E-05	j
1,3-Butadiene	106-99-0	0 or 1	b	54.091	NA	7.46E+00	n	7.39E-02	1.33E-01	e	1.54E-05	e
1,4-Dioxane	123-91-1	0 or 1	b	88.1	NA	4.89E-06	c	4.89E-06	9.20E-02	c	1.05E-05	c
1-Methylpropyl alcohol	78-92-2	0 or 1	b	74.122	NA	1.03E+00	i	1.02E-05	1.08E-01	e	1.25E-05	e
1-Nitropropane	108-03-2	0 or 1	b	89.09	NA	3.56E-03	k	8.68E-05	9.53E-02	e	1.10E-05	e
2,2,4-Trimethylpentane	540-84-1	0 or 1	b	114.23	NA	3.05E+05	i	3.02E+00	8.07E-02	e	9.34E-06	e
2-Butanone	78-93-3	0 or 1	b	72.1	NA	3.61E-05	c	3.61E-05	1.35E-01	c	1.03E-05	c
2-Butenaldehyde (2-Butenal)	4170-30-3	0 or 1	b	70.091	NA	3.96E-04	k	9.66E-06	1.12E-01	e	1.29E-05	e
2-Ethoxyethanol	110-80-5	0 or 1	b	90.12	NA	5.13E-02	p	5.13E-02	9.32E-02	j	9.76E-06	j
2-Heptanone	110-43-0	0 or 1	b	114.19	NA	1.46E+01	i	1.45E-04	8.07E-02	e	9.35E-06	e
2-Hexanone	591-78-6	0 or 1	b	100.16	NA	9.70E+00	i	9.60E-05	8.81E-02	e	1.02E-05	e
2-Methoxyethanol	109-86-4	0 or 1	b	76	NA	1.35E-05	m	3.29E-07	1.29E-01	j	9.57E-06	j
2-Methyl-2-propanol	75-65-0	0 or 1	b	74.122	NA	1.21E+00	i	1.20E-05	1.08E-01	e	1.25E-05	e

Table B1-1 Chemical-Specific Parameters for Organic COPCs

Chemical of Potential Concern	CAS Registry Number	Octanol / Water Partitioning Coefficients						Partitioning Coefficients (Kd)			
		K_{oc}-pub [y] (various units)	Source	K_{oc}-used [z] (mL/g)	K_{ow}-pub [y] (various units)	Source	K_{ow}-used [z] (unitless)	Kd_{bs} (L/kg)	Source	Kd_s (mL/g)	Source
Aromatic Halogenated Hydrocarbons											
2,3,4,6-Tetrachlorophenol	58-90-2	2.49E+02	c	2.49E+02	2.00E+04	c	2.00E+04	9.97E+00	c	2.49E+00	c
4-Chloro-3-methylphenol	59-50-7	3.71E+02	h	3.71E+02	1.26E+03	c	1.26E+03	1.48E+01	h	3.71E+00	h
Aromatic Nonhalogenated Hydrocarbons											
2-Nitrotoluene	88-72-2	2.63E+00	i	4.27E+02	2.30E+00	i	2.00E+02	1.71E+01	e	4.27E+00	e
4-Nitrobiphenyl	92-93-3	NA	e	1.23E+03	3.77E+00	l	5.89E+03	4.94E+01	e	1.23E+01	e
Benzaldehyde	100-52-7	2.01E+01	h	2.01E+01	3.00E+01	c	3.00E+01	8.04E-01	c	2.01E-01	c
Benzene	71-43-2	6.20E+01	c	6.20E+01	1.37E+02	c	1.37E+02	2.48E+00	c	6.20E-01	c
Benzyl alcohol	100-51-6	1.02E+01	c	1.02E+01	1.26E+01	c	1.26E+01	4.09E-01	c	1.02E-01	c
Ethyl benzene	100-41-4	2.04E+02	c	2.04E+02	1.33E+03	c	1.33E+03	8.16E+00	c	2.04E+00	c
m-Xylene	108-38-3	1.96E+02	c	1.96E+02	1.59E+03	c	1.59E+03	7.84E+00	c	1.96E+00	c
o-Xylene	95-47-6	2.41E+02	c	2.41E+02	1.35E+03	c	1.35E+03	9.64E+00	c	2.41E+00	c
p-Xylene	106-42-3	3.11E+02	c	3.11E+02	1.48E+03	c	1.48E+03	1.24E+01	c	3.11E+00	c
Styrene	100-42-5	9.12E+02	c	9.12E+02	8.49E+02	c	8.49E+02	3.65E+01	c	9.12E+00	c
Toluene	108-88-3	1.40E+02	c	1.40E+02	4.65E+02	c	4.65E+02	5.60E+00	c	1.40E+00	c
Non-aromatic Nonhalogenated Hydrocarbons											
1,2-Epoxybutane	106-88-7	4.49E+00	m	4.49E+00	8.60E-01	m	7.24E+00	1.80E-01	e	4.49E-02	e
1,3-Butadiene	106-99-0	4.38E+01	m	4.38E+01	1.99E+00	m	9.77E+01	1.75E+00	e	4.38E-01	e
1,4-Dioxane	123-91-1	8.76E-01	c	8.76E-01	5.40E-01	c	5.40E-01	3.50E-02	c	8.76E-03	c
1-Methylpropyl alcohol	78-92-2	NA	e	4.23E+00	6.10E-01	i	4.07E+00	1.69E-01	e	4.23E-02	e
1-Nitropropane	108-03-2	NA	e	6.75E+00	8.70E-01	o	7.41E+00	2.70E-01	e	6.75E-02	e
2,2,4-Trimethylpentane	540-84-1	NA	e	1.17E+04	5.02E+00	i	1.05E+05	4.66E+02	e	1.17E+02	e
2-Butanone	78-93-3	2.34E+00	c	2.34E+00	1.91E+00	c	1.91E+00	9.36E-02	c	2.34E-02	c
2-Butenaldehyde (2-Butenal)	4170-30-3	NA	e	3.80E+00	5.50E-01	o	3.55E+00	1.52E-01	e	3.80E-02	e
2-Ethoxyethanol	110-80-5	1.32E+00	p	2.09E+01	-1.00E-01	p	7.94E-01	8.36E-01	e	2.09E-01	e
2-Heptanone	110-43-0	NA	e	4.96E+01	1.98E+00	i	9.55E+01	1.98E+00	e	4.96E-01	e
2-Hexanone	591-78-6	2.13E+00	i	1.34E+02	1.38E+00	i	2.40E+01	5.36E+00	e	1.34E+00	e
2-Methoxyethanol	109-86-4	1.00E+00	m	1.00E+00	-7.70E-01	m	1.70E-01	4.00E-02	e	1.00E-02	e
2-Methyl-2-propanol	75-65-0	1.57E+00	i	3.72E+01	3.50E-01	i	2.24E+00	1.49E+00	e	3.72E-01	e

Table B1-1 Chemical-Specific Parameters for Organic COPCs

Chemical of Potential Concern	CAS Registry Number	Kd		Plant Uptake Factors				
		Kd_{sw} (L/kg)	Source	Br_{ag} (µg/g DW plant)/ (µg/g soil)	Source	Br_{forage} (µg/g DW plant)/ (µg/g soil)	Source	Br_{grain} (µg/g DW plant)/ (µg/g soil) [a]
Aromatic Halogenated Hydrocarbons								
2,3,4,6-Tetrachlorophenol	58-90-2	1.87E+01	c	1.27E-01	c	1.27E-01	c	1.27E-01
4-Chloro-3-methylphenol	59-50-7	2.78E+01	h	6.25E-01	c	6.25E-01	c	6.25E-01
Aromatic Nonhalogenated Hydrocarbons								
2-Nitrotoluene	88-72-2	3.20E+01	e	1.81E+00	e	1.81E+00	e	1.81E+00
4-Nitrobiphenyl	92-93-3	9.26E+01	e	2.56E-01	e	2.56E-01	e	2.56E-01
Benzaldehyde	100-52-7	1.51E+00	c	5.42E+00	c	5.42E+00	c	5.42E+00
Benzene	71-43-2	4.65E+00	c	2.25E+00	c	2.25E+00	c	2.25E+00
Benzyl alcohol	100-51-6	7.66E-01	c	8.95E+00	c	8.95E+00	c	8.95E+00
Ethyl benzene	100-41-4	1.53E+01	c	6.07E-01	c	6.07E-01	c	6.07E-01
m-Xylene	108-38-3	1.47E+01	c	5.47E-01	c	5.47E-01	c	5.47E-01
o-Xylene	95-47-6	1.81E+01	c	6.01E-01	c	6.01E-01	c	6.01E-01
p-Xylene	106-42-3	2.33E+01	c	5.70E-01	c	5.70E-01	c	5.70E-01
Styrene	100-42-5	6.84E+01	c	7.85E-01	c	7.85E-01	c	7.85E-01
Toluene	108-88-3	1.05E+01	c	1.11E+00	c	1.11E+00	c	1.11E+00
Non-aromatic Nonhalogenated Hydrocarbons								
1,2-Epoxybutane	106-88-7	3.37E-01	e	1.23E+01	e	1.23E+01	e	1.23E+01
1,3-Butadiene	106-99-0	3.28E+00	e	2.74E+00	e	2.74E+00	e	2.74E+00
1,4-Dioxane	123-91-1	6.57E-02	c	5.53E+01	c	5.53E+01	c	5.53E+01
1-Methylpropyl alcohol	78-92-2	3.18E-01	e	1.72E+01	e	1.72E+01	e	1.72E+01
1-Nitropropane	108-03-2	5.07E-01	e	1.22E+01	e	1.22E+01	e	1.22E+01
2,2,4-Trimethylpentane	540-84-1	8.74E+02	e	4.86E-02	e	4.86E-02	e	4.86E-02
2-Butanone	78-93-3	1.76E-01	c	2.67E+01	c	2.67E+01	c	2.67E+01
2-Butenaldehyde (2-Butenal)	4170-30-3	2.85E-01	e	1.86E+01	e	1.86E+01	e	1.86E+01
2-Ethoxyethanol	110-80-5	1.57E+00	e	4.42E+01	e	4.42E+01	e	4.42E+01
2-Heptanone	110-43-0	3.72E+00	e	2.78E+00	e	2.78E+00	e	2.78E+00
2-Hexanone	591-78-6	1.00E+01	e	6.17E+00	e	6.17E+00	e	6.17E+00
2-Methoxyethanol	109-86-4	7.50E-02	e	1.08E+02	e	1.08E+02	e	1.08E+02
2-Methyl-2-propanol	75-65-0	2.79E+00	e	2.43E+01	e	2.43E+01	e	2.43E+01

Table B1-1 Chemical-Specific Parameters for Organic COPCs

Chemical of Potential Concern	CAS Registry Number	Plant Uptake Factors							
		$Br_{rootveg}$ (µg/g DW plant)/ (µg/g soil)	Source	Bv_{ag} (µg/g DW plant)/ (µg/g air)	Source	Bv_{forage} (µg/g DW plant)/ (µg/g air)	Source	RCF (µg/g DW plant)/ (µg/mL soil water)	Source
Aromatic Halogenated Hydrocarbons									
2,3,4,6-Tetrachlorophenol	58-90-2	1.94E+02	c	1.39E+02	c	1.39E+02	c	4.83E+02	c
4-Chloro-3-methylphenol	59-50-7	1.70E+01	h	2.80E+02	h	2.80E+02	h	6.30E+01	c
Aromatic Nonhalogenated Hydrocarbons									
2-Nitrotoluene	88-72-2	4.69E+00	e	2.74E-01	e	2.74E-01	e	2.00E+01	e
4-Nitrobiphenyl	92-93-3	1.56E+01	e	1.64E+02	e	1.64E+02	e	1.92E+02	e
Benzaldehyde	100-52-7	4.72E+01	c	5.00E-02	c	5.00E-02	c	9.50E+00	c
Benzene	71-43-2	2.67E+01	c	1.92E-03	c	1.92E-03	c	1.66E+01	c
Benzyl alcohol	100-51-6	7.77E+01	c	2.19E+00	c	2.19E+00	c	7.94E+00	c
Ethyl benzene	100-41-4	3.20E+01	c	1.53E-02	c	1.53E-02	c	6.52E+01	c
m-Xylene	108-38-3	3.78E+01	c	2.37E-02	h	2.37E-02	h	7.41E+01	c
o-Xylene	95-47-6	2.74E+01	c	1.99E-02	h	1.99E-02	h	6.61E+01	c
p-Xylene	106-42-3	2.27E+01	c	2.20E-02	h	2.20E-02	h	7.05E+01	c
Styrene	100-42-5	5.28E+00	c	2.21E-02	c	2.21E-02	c	4.81E+01	c
Toluene	108-88-3	2.33E+01	c	6.33E-03	c	6.33E-03	c	3.26E+01	c
Non-aromatic Nonhalogenated Hydrocarbons									
1,2-Epoxybutane	106-88-7	1.64E+02	e	2.57E-03	e	2.57E-03	e	7.37E+00	e
1,3-Butadiene	106-99-0	3.25E+01	e	9.99E-05	e	9.99E-05	e	1.42E+01	e
1,4-Dioxane	123-91-1	7.37E+02	c	5.93E-03	c	5.93E-03	c	6.45E+00	c
1-Methylpropyl alcohol	78-92-2	1.65E+02	e	2.45E-02	e	2.45E-02	e	6.99E+00	e
1-Nitropropane	108-03-2	1.09E+02	e	5.45E-03	e	5.45E-03	e	7.39E+00	e
2,2,4-Trimethylpentane	540-84-1	1.47E+01	e	4.12E-03	e	4.12E-03	e	1.71E+03	e
2-Butanone	78-93-3	2.86E+02	c	3.08E-03	c	3.08E-03	c	6.69E+00	c
2-Butenaldehyde (2-Butenal)	4170-30-3	1.82E+02	e	2.24E-02	e	2.24E-02	e	6.92E+00	e
2-Ethoxyethanol	110-80-5	3.11E+01	e	8.55E-07	e	8.55E-07	e	6.50E+00	e
2-Heptanone	110-43-0	2.84E+01	e	4.98E-02	e	4.98E-02	e	1.41E+01	e
2-Hexanone	591-78-6	6.71E+00	e	1.72E-02	e	1.72E-02	e	8.99E+00	e
2-Methoxyethanol	109-86-4	6.37E+02	e	2.58E-02	e	2.58E-02	e	6.37E+00	e
2-Methyl-2-propanol	75-65-0	1.81E+01	e	1.10E-02	e	1.10E-02	e	6.74E+00	e

Table B1-1 Chemical-Specific Parameters for Organic COPCs

Chemical of Potential Concern	CAS Registry Number	Bioconcentration/Bioaccumulation Factors									
		Ba_{beef} (day/kg FW)	Source	$Ba_{chicken}$ (day/kg FW)	Source	Ba_{egg} (day/kg FW)	Source	Ba_{milk} (day/kg FW)	Source	Ba_{pork} (day/kg FW)	Source
Aromatic Halogenated Hydrocarbons											
2,3,4,6-Tetrachlorophenol	58-90-2	5.02E-04	c	3.97E-04	c	1.59E-01	c	1.59E-04	c	6.08E-04	c
4-Chloro-3-methylphenol	59-50-7	3.16E-05	c	2.50E-05	c	1.00E-02	c	1.00E-05	c	3.83E-05	c
Aromatic Nonhalogenated Hydrocarbons											
2-Nitrotoluene	88-72-2	5.01E-06	e	3.96E-06	e	1.58E-03	e	1.58E-06	e	6.07E-06	e
4-Nitrobiphenyl	92-93-3	1.48E-04	e	1.17E-04	e	4.68E-02	e	4.68E-05	e	1.79E-04	e
Benzaldehyde	100-52-7	7.54E-07	c	5.95E-07	c	2.38E-04	c	2.38E-07	c	9.12E-07	c
Benzene	71-43-2	3.44E-06	c	2.72E-06	c	1.09E-03	c	1.09E-06	c	4.17E-06	c
Benzyl alcohol	100-51-6	3.16E-07	c	2.50E-07	c	1.00E-04	c	1.00E-07	c	3.83E-07	c
Ethyl benzene	100-41-4	3.33E-05	c	2.63E-05	c	1.05E-02	c	1.05E-05	c	4.03E-05	c
m-Xylene	108-38-3	3.99E-05	c	3.15E-05	c	1.26E-02	c	1.26E-05	c	4.83E-05	c
o-Xylene	95-47-6	3.39E-05	c	2.68E-05	c	1.07E-02	c	1.07E-05	c	4.10E-05	c
p-Xylene	106-42-3	3.72E-05	c	2.93E-05	c	1.18E-02	c	1.18E-05	c	4.50E-05	c
Styrene	100-42-5	2.13E-05	c	1.68E-05	c	6.74E-03	c	6.74E-06	c	2.58E-05	c
Toluene	108-88-3	1.17E-05	c	9.22E-06	c	3.69E-03	c	3.69E-06	c	1.41E-05	c
Non-aromatic Nonhalogenated Hydrocarbons											
1,2-Epoxybutane	106-88-7	1.82E-07	e	1.44E-07	e	5.75E-05	e	5.75E-08	e	2.20E-07	e
1,3-Butadiene	106-99-0	2.45E-06	e	1.94E-06	e	7.76E-04	e	7.76E-07	e	2.97E-06	e
1,4-Dioxane	123-91-1	1.36E-08	c	1.07E-08	c	4.29E-06	c	4.29E-09	c	1.64E-08	c
1-Methylpropyl alcohol	78-92-2	1.02E-07	e	8.08E-08	e	3.24E-05	e	3.24E-08	e	1.24E-07	e
1-Nitropropane	108-03-2	1.86E-07	e	1.47E-07	e	5.89E-05	e	5.89E-08	e	2.25E-07	e
2,2,4-Trimethylpentane	540-84-1	2.63E-03	e	2.08E-03	e	8.32E-01	e	8.32E-04	e	3.18E-03	e
2-Butanone	78-93-3	4.79E-08	c	3.78E-08	c	1.51E-05	c	1.51E-08	c	5.79E-08	c
2-Butenaldehyde (2-Butenal)	4170-30-3	8.91E-08	e	7.04E-08	e	2.82E-05	e	2.82E-08	e	1.08E-07	e
2-Ethoxyethanol	110-80-5	2.00E-08	e	1.58E-08	e	6.31E-06	e	6.31E-09	e	2.42E-08	e
2-Heptanone	110-43-0	2.40E-06	e	1.89E-06	e	7.59E-04	e	7.59E-07	e	2.90E-06	e
2-Hexanone	591-78-6	6.03E-07	e	4.76E-07	e	1.91E-04	e	1.91E-07	e	7.29E-07	e
2-Methoxyethanol	109-86-4	4.27E-09	e	3.37E-09	e	1.35E-06	e	1.35E-09	e	5.16E-09	e
2-Methyl-2-propanol	75-65-0	5.62E-08	e	4.44E-08	e	1.78E-05	e	1.78E-08	e	6.81E-08	e

Table B1-1 Chemical-Specific Parameters for Organic COPCs

Chemical of Potential Concern	CAS Registry Number	Bioconcentration/Bioaccumulation Factors						Half-life	
		BAF_{fish} (L/kg FW)	Source	BCF_{fish} (L/kg FW)	Source	$BSAF_{fish}$ (unitless)	Source	$t_{1/2}$ (days)	Source
Aromatic Halogenated Hydrocarbons									
2,3,4,6-Tetrachlorophenol	58-90-2	1.63E+03	c	NA	NA	NA	NA	1.80E+02	d
4-Chloro-3-methylphenol	59-50-7	NA	NA	1.34E+02	c	NA	NA	NA	NA
Aromatic Nonhalogenated Hydrocarbons									
2-Nitrotoluene	88-72-2	NA	NA	3.30E+01	e	NA	NA	NA	NA
4-Nitrobiphenyl	92-93-3	NA	NA	4.32E+02	e	NA	NA	2.80E+01	d
Benzaldehyde	100-52-7	NA	NA	7.81E+00	c	NA	NA	NA	NA
Benzene	71-43-2	NA	NA	2.48E+01	c	NA	NA	1.60E+01	d
Benzyl alcohol	100-51-6	NA	NA	4.04E+00	c	NA	NA	NA	NA
Ethyl benzene	100-41-4	NA	NA	1.39E+02	c	NA	NA	1.00E+01	d
m-Xylene	108-38-3	NA	NA	1.60E+02	c	NA	NA	2.80E+01	d
o-Xylene	95-47-6	NA	NA	1.41E+02	c	NA	NA	2.80E+01	d
p-Xylene	106-42-3	NA	NA	1.51E+02	c	NA	NA	2.80E+01	d
Styrene	100-42-5	NA	NA	9.91E+01	c	NA	NA	2.80E+01	d
Toluene	108-88-3	NA	NA	6.27E+01	c	NA	NA	NA	NA
Non-aromatic Nonhalogenated Hydrocarbons									
1,2-Epoxybutane	106-88-7	NA	NA	2.65E+00	e	NA	NA	1.29E+01	d
1,3-Butadiene	106-99-0	NA	NA	1.92E+01	e	NA	NA	2.80E+01	d
1,4-Dioxane	123-91-1	NA	NA	3.69E-01	c	NA	NA	NA	NA
1-Methylpropyl alcohol	78-92-2	NA	NA	1.71E+00	e	NA	NA	7.00E+00	d
1-Nitropropane	108-03-2	NA	NA	2.70E+00	e	NA	NA	NA	NA
2,2,4-Trimethylpentane	540-84-1	NA	NA	NA	NA	NA	NA	NA	NA
2-Butanone	78-93-3	NA	NA	9.61E-01	c	NA	NA	NA	NA
2-Butenaldehyde (2-Butenal)	4170-30-3	NA	NA	1.54E+00	e	NA	NA	NA	NA
2-Ethoxyethanol	110-80-5	NA	NA	4.94E-01	e	NA	NA	2.80E+01	d
2-Heptanone	110-43-0	NA	NA	1.88E+01	e	NA	NA	NA	NA
2-Hexanone	591-78-6	NA	NA	6.59E+00	e	NA	NA	NA	NA
2-Methoxyethanol	109-86-4	NA	NA	1.53E-01	e	NA	NA	2.80E+01	d
2-Methyl-2-propanol	75-65-0	NA	NA	1.09E+00	e	NA	NA	2.00E+02	d

Table B1-1 Chemical-Specific Parameters for Organic COPCs

Chemical of Potential Concern	CAS Registry Number	Soil Loss Mechanisms [g]											
		k_{decay} $(year)^{-1}$	Source	ks_e $(year)^{-1}$			Source	ks_g $(year)^{-1}$	Source	ks_l $(year)^{-1}$			Source
				1 cm	15 cm	20 cm				1 cm	15 cm	20 cm	
Aromatic Halogenated Hydrocarbons													
2,3,4,6-Tetrachlorophenol	58-90-2	0.0E+00	NA	4.98E-03	3.32E-04	2.49E-04	e	1.41E+00	c	1.22E+00	8.12E-02	6.09E-02	e
4-Chloro-3-methylphenol	59-50-7	0.0E+00	NA	5.07E-03	3.38E-04	2.54E-04	e	1.10E+01	c	8.33E-01	5.56E-02	4.17E-02	e
Aromatic Nonhalogenated Hydrocarbons													
2-Nitrotoluene	88-72-2	0.0E+00	NA	5.10E-03	3.40E-04	2.55E-04	e	0.0E+00	NA	7.29E-01	4.86E-02	3.64E-02	e
4-Nitrobiphenyl	92-93-3	0.0E+00	NA	5.22E-03	3.48E-04	2.61E-04	e	9.03E+00	e	2.58E-01	1.72E-02	1.29E-02	e
Benzaldehyde	100-52-7	0.0E+00	NA	2.99E-03	2.00E-04	1.50E-04	e	0.0E+00	NA	9.08E+00	6.05E-01	4.54E-01	e
Benzene	71-43-2	0.0E+00	NA	4.23E-03	2.82E-04	2.12E-04	e	3.89E+00	c	4.16E+00	2.77E-01	2.08E-01	e
Benzyl alcohol	100-51-6	0.0E+00	NA	2.11E-03	1.40E-04	1.05E-04	e	0.0E+00	NA	1.26E+01	8.39E-01	6.29E-01	e
Ethyl benzene	100-41-4	0.0E+00	NA	4.91E-03	3.28E-04	2.46E-04	e	2.53E+01	c	1.47E+00	9.79E-02	7.34E-02	e
m-Xylene	108-38-3	0.0E+00	NA	4.90E-03	3.27E-04	2.45E-04	e	9.03E+00	c	1.52E+00	1.02E-01	7.62E-02	e
o-Xylene	95-47-6	0.0E+00	NA	4.97E-03	3.31E-04	2.48E-04	e	9.03E+00	c	1.26E+00	8.37E-02	6.28E-02	e
p-Xylene	106-42-3	0.0E+00	NA	5.04E-03	3.36E-04	2.52E-04	e	9.03E+00	c	9.87E-01	6.58E-02	4.93E-02	e
Styrene	100-42-5	0.0E+00	NA	5.20E-03	3.46E-04	2.60E-04	e	9.03E+00	c	3.47E-01	2.31E-02	1.74E-02	e
Toluene	108-88-3	0.0E+00	NA	4.76E-03	3.17E-04	2.38E-04	e	1.15E+01	c	2.07E+00	1.38E-01	1.04E-01	e
Non-aromatic Nonhalogenated Hydrocarbons													
1,2-Epoxybutane	106-88-7	0.0E+00	NA	1.19E-03	7.96E-05	5.97E-05	e	1.96E+01	e	1.62E+01	1.08E+00	8.10E-01	e
1,3-Butadiene	106-99-0	0.0E+00	NA	3.91E-03	2.61E-04	1.96E-04	e	9.03E+00	e	5.44E+00	3.63E-01	2.72E-01	e
1,4-Dioxane	123-91-1	0.0E+00	NA	2.85E-04	1.90E-05	1.42E-05	e	1.41E+00	c	1.98E+01	1.32E+00	9.90E-01	e
1-Methylpropyl alcohol	78-92-2	0.0E+00	NA	1.14E-03	7.60E-05	5.70E-05	e	3.61E+01	e	1.64E+01	1.09E+00	8.21E-01	e
1-Nitropropane	108-03-2	0.0E+00	NA	1.61E-03	1.07E-04	8.06E-05	e	0.0E+00	NA	1.45E+01	9.70E-01	7.27E-01	e
2,2,4-Trimethylpentane	540-84-1	0.0E+00	NA	5.28E-03	3.52E-04	2.64E-04	e	0.0E+00	NA	2.76E-02	1.84E-03	1.38E-03	e
2-Butanone	78-93-3	0.0E+00	NA	6.98E-04	4.65E-05	3.49E-05	e	3.61E+01	c	1.82E+01	1.21E+00	9.08E-01	e
2-Butenaldehyde (2-Butenal)	4170-30-3	0.0E+00	NA	1.05E-03	6.98E-05	5.24E-05	e	0.0E+00	NA	1.68E+01	1.12E+00	8.39E-01	e
2-Ethoxyethanol	110-80-5	0.0E+00	NA	3.04E-03	2.03E-04	1.52E-04	e	9.03E+00	e	8.88E+00	5.92E-01	4.44E-01	e
2-Heptanone	110-43-0	0.0E+00	NA	4.03E-03	2.69E-04	2.02E-04	e	0.0E+00	NA	4.96E+00	3.30E-01	2.48E-01	e
2-Hexanone	591-78-6	0.0E+00	NA	4.74E-03	3.16E-04	2.37E-04	e	0.0E+00	NA	2.16E+00	1.44E-01	1.08E-01	e
2-Methoxyethanol	109-86-4	0.0E+00	NA	3.23E-04	2.15E-05	1.61E-05	e	9.03E+00	e	1.97E+01	1.31E+00	9.83E-01	e
2-Methyl-2-propanol	75-65-0	0.0E+00	NA	3.74E-03	2.49E-04	1.87E-04	e	1.26E+00	e	6.13E+00	4.09E-01	3.06E-01	e

Table B1-1 Chemical-Specific Parameters for Organic COPCs

Chemical of Potential Concern	CAS Registry Number	Soil Loss Mechanisms [g]								Kp (cm/hr)	Source
		ks_r $(year)^{-1}$			Source	ks_v $(year)^{-1}$			Source		
		1 cm	15 cm	20 cm		1 cm	15 cm	20 cm			
Aromatic Halogenated Hydrocarbons											
2,3,4,6-Tetrachlorophenol	58-90-2	7.27E-01	4.85E-02	3.64E-02	e	4.81E+01	2.14E-01	1.20E-01	f	6.07E-02	aa
4-Chloro-3-methylphenol	59-50-7	4.98E-01	3.32E-02	2.49E-02	e	2.30E+00	1.02E-02	5.76E-03	f	2.90E-02	ab
Aromatic Nonhalogenated Hydrocarbons											
2-Nitrotoluene	88-72-2	4.35E-01	2.90E-02	2.18E-02	e	1.97E+02	8.74E-01	4.92E-01	f	9.40E-03	aa
4-Nitrobiphenyl	92-93-3	1.54E-01	1.03E-02	7.69E-03	e	4.89E+00	2.17E-02	1.22E-02	f	3.80E-02	ab
Benzaldehyde	100-52-7	5.42E+00	3.61E-01	2.71E-01	e	4.51E+03	2.01E+01	1.13E+01	f	3.94E-03	aa
Benzene	71-43-2	2.49E+00	1.66E-01	1.24E-01	e	3.18E+05	1.41E+03	7.95E+02	f	1.50E-02	ab
Benzyl alcohol	100-51-6	7.52E+00	5.01E-01	3.76E-01	e	7.84E+01	3.48E-01	1.96E-01	f	2.15E-03	aa
Ethyl benzene	100-41-4	8.77E-01	5.84E-02	4.38E-02	e	8.90E+04	3.95E+02	2.22E+02	f	4.90E-02	ab
m-Xylene	108-38-3	9.10E-01	6.07E-02	4.55E-02	e	7.28E+04	3.24E+02	1.82E+02	f	5.30E-02	ab
o-Xylene	95-47-6	7.50E-01	5.00E-02	3.75E-02	e	5.92E+04	2.63E+02	1.48E+02	f	5.04E-02	aa
p-Xylene	106-42-3	5.89E-01	3.93E-02	2.95E-02	e	4.54E+08	2.02E+06	1.14E+06	f	5.37E-02	aa
Styrene	100-42-5	2.07E-01	1.38E-02	1.04E-02	e	8.66E+03	3.85E+01	2.17E+01	f	3.70E-02	ab
Toluene	108-88-3	1.24E+00	8.25E-02	6.19E-02	e	1.31E+05	5.81E+02	3.27E+02	f	3.10E-02	ab
Non-aromatic Nonhalogenated Hydrocarbons											
1,2-Epoxybutane	106-88-7	9.68E+00	6.45E-01	4.84E-01	e	1.65E+05	7.32E+02	4.12E+02	f	2.36E-03	aa
1,3-Butadiene	106-99-0	3.25E+00	2.17E-01	1.62E-01	e	6.88E+06	3.06E+04	1.72E+04	f	1.60E-02	ab
1,4-Dioxane	123-91-1	1.18E+01	7.88E-01	5.91E-01	e	1.58E+04	7.00E+01	3.94E+01	f	3.30E-04	ab
1-Methylpropyl alcohol	78-92-2	9.80E+00	6.53E-01	4.90E-01	e	7.98E+03	3.55E+01	2.00E+01	f	1.56E-03	aa
1-Nitropropane	108-03-2	8.69E+00	5.79E-01	4.34E-01	e	3.76E+04	1.67E+02	9.40E+01	f	1.92E-03	aa
2,2,4-Trimethylpentane	540-84-1	1.65E-02	1.10E-03	8.24E-04	e	6.42E+05	2.85E+03	1.60E+03	f	8.39E-01	aa
2-Butanone	78-93-3	1.08E+01	7.23E-01	5.42E-01	e	6.39E+04	2.84E+02	1.60E+02	f	9.60E-04	ab
2-Butenaldehyde (2-Butenal)	4170-30-3	1.00E+01	6.68E-01	5.01E-01	e	8.72E+03	3.87E+01	2.18E+01	f	1.50E-03	aa
2-Ethoxyethanol	110-80-5	5.30E+00	3.53E-01	2.65E-01	e	7.02E+06	3.12E+04	1.76E+04	f	3.00E-04	ab
2-Heptanone	110-43-0	2.96E+00	1.97E-01	1.48E-01	e	7.22E+03	3.21E+01	1.81E+01	f	7.71E-03	aa
2-Hexanone	591-78-6	1.29E+00	8.58E-02	6.44E-02	e	1.94E+03	8.61E+00	4.84E+00	f	3.66E-03	aa
2-Methoxyethanol	109-86-4	1.17E+01	7.82E-01	5.87E-01	e	1.30E+03	5.79E+00	3.26E+00	f	1.80E-04	ab
2-Methyl-2-propanol	75-65-0	3.66E+00	2.44E-01	1.83E-01	e	1.07E+03	4.75E+00	2.67E+00	f	1.05E-03	aa

Table B1-1 Chemical-Specific Parameters for Organic COPCs

Chemical of Potential Concern	CAS Registry Number	Fraction		MW	pH	Henry's Constant			Diffusivity			
		F_v (unitless)	Source	(g/mol)		H-pub [x] (various units)	Source	H-used [x] (atm-m^3/mol)	D_a (cm^2/s)	Source	D_w (cm^2/s)	Source
2-Methyl-2-propenenitrile	126-98-7	0 or 1	b	67.09	NA	2.39E-04	c	2.39E-04	1.15E-01	c	1.33E-05	c
2-Methylaziridine	75-55-8	0 or 1	b	57.1	NA	3.45E-04	k	8.40E-06	1.28E-01	e	1.48E-05	e
2-Methylpropyl alcohol	78-83-1	0 or 1	b	74.12	NA	1.21E+00	i	1.20E-05	8.60E-02	j	9.30E-06	j
2-Pentanone	107-87-9	0 or 1	b	86.133	NA	6.52E+00	i	6.46E-05	9.74E-02	e	1.13E-05	e
2-Propanone (Acetone)	67-64-1	0 or 1	b	58.08	NA	2.88E-05	c	2.88E-05	1.87E-01	c	1.15E-05	c
2-Propene-1-ol	107-18-6	0 or 1	b	58.08	NA	5.06E-01	i	5.01E-06	1.14E-01	j	1.14E-05	j
2-Propyl alcohol	67-63-0	0 or 1	b	60.096	NA	8.20E-01	i	8.12E-06	1.24E-01	e	1.43E-05	e
3-Heptanone	106-35-4	0 or 1	b	114.19	NA	3.72E-03	k	9.06E-05	8.07E-02	e	9.35E-06	e
3-Methyl-1-butanol	123-51-3	0 or 1	b	88.15	NA	5.77E-04	k	1.41E-05	9.59E-02	e	1.11E-05	e
3-Methyl-2-butanone	563-80-4	0 or 1	b	86.133	NA	3.98E-03	k	9.71E-05	9.74E-02	e	1.13E-05	e
3-Pentanone	96-22-0	0 or 1	b	86.133	NA	8.13E+00	i	8.05E-05	9.74E-02	e	1.13E-05	e
4-Heptanone	123-19-3	0 or 1	b	114.19	NA	2.25E-03	k	5.48E-05	8.07E-02	e	9.35E-06	e
4-Methyl-2-pentanone	108-10-1	0 or 1	b	100.16	NA	1.25E-04	c	1.25E-04	8.59E-02	c	8.36E-06	c
4-Methyl-3-penten-2-one	141-79-7	0 or 1	b	98.14	NA	1.50E-03	k	3.66E-05	8.93E-02	e	1.03E-05	e
5-Methyl-2-hexanone	110-12-3	0 or 1	b	114.19	NA	6.55E-03	k	1.60E-04	8.07E-02	e	9.35E-06	e
Acetaldehyde	75-07-0	0 or 1	b	44.05	NA	7.89E-05	l	7.89E-05	2.72E-01	c	1.33E-05	c
Acetamide	60-35-5	0 or 1	b	59.07	NA	3.53E-04	i	3.50E-09	1.25E-01	e	1.45E-05	e
Acetic acid	64-19-7	0 or 1	b	60.052	NA	3.05E-02	i	3.02E-07	1.24E-01	e	1.43E-05	e
Acetic acid ethyl ester	141-78-6	0 or 1	b	88.1	NA	1.36E+01	i	1.35E-04	7.32E-02	j	9.66E-06	j
Acetic acid n-butyl ester	123-86-4	0 or 1	b	116.16	NA	3.34E+01	i	3.31E-04	7.98E-02	e	9.24E-06	e
Acetonitrile	75-05-8	0 or 1	b	41.05	NA	6.57E-05	h	6.57E-05	3.14E-01	c	1.40E-05	c
Acrolein	107-02-8	0 or 1	b	56.06	NA	9.34E-05	c	9.34E-05	1.92E-01	c	1.22E-05	c
Acrylonitrile	107-13-1	0 or 1	b	53.06	NA	9.90E-05	c	9.90E-05	2.11E-01	c	1.23E-05	c
Bis(isopropyl)ether	108-20-3	0 or 1	b	102.18	NA	9.33E-02	k	2.28E-03	8.69E-02	e	1.01E-05	e
Butane	106-97-8	0 or 1	b	58.123	NA	9.59E+01	n	9.50E-01	1.27E-01	e	1.47E-05	e
Carbon disulfide	75-15-0	0 or 1	b	76.14	NA	1.27E-02	c	1.27E-02	1.04E-01	c	1.29E-05	c
Cyanogen	460-19-5	0 or 1	b	52.04	NA	1.41E-02	m	3.44E-04	2.04E-01	j	1.37E-05	j
Cyclohexane	110-82-7	0 or 1	b	84.161	NA	1.97E+04	i	1.95E-01	9.89E-02	e	1.15E-05	e
Cyclohexanone	108-94-1	0 or 1	b	98.2	NA	1.22E+00	i	1.20E-05	7.84E-02	j	8.62E-06	j

Table B1-1 Chemical-Specific Parameters for Organic COPCs

Chemical of Potential Concern	CAS Registry Number	Octanol / Water Partitioning Coefficients						Partitioning Coefficients (Kd)			
		K_{oc}-pub [y] (various units)	Source	K_{oc}-used [z] (mL/g)	K_{ow}-pub [y] (various units)	Source	K_{ow}-used [z] (unitless)	Kd_{bs} (L/kg)	Source	Kd_s (mL/g)	Source
2-Methyl-2-propenenitrile	126-98-7	3.74E+00	c	3.74E+00	3.47E+00	c	3.47E+00	1.49E-01	c	3.74E-02	c
2-Methylaziridine	75-55-8	NA	e	4.79E-01	-6.03E-01	l	2.49E-01	1.92E-02	e	4.79E-03	e
2-Methylpropyl alcohol	78-83-1	NA	e	5.54E+00	7.60E-01	i	5.75E+00	2.22E-01	e	5.54E-02	e
2-Pentanone	107-87-9	1.87E+00	i	7.40E+01	9.10E-01	i	8.13E+00	2.96E+00	e	7.40E-01	e
2-Propanone (Acetone)	67-64-1	9.51E-01	c	9.51E-01	6.00E-01	c	6.00E-01	3.80E-02	c	9.51E-03	c
2-Propene-1-ol	107-18-6	NA	e	1.92E+00	1.70E-01	i	1.48E+00	7.69E-02	e	1.92E-02	e
2-Propyl alcohol	67-63-0	NA	e	1.55E+00	5.00E-02	i	1.12E+00	6.20E-02	e	1.55E-02	e
3-Heptanone	106-35-4	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
3-Methyl-1-butanol	123-51-3	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
3-Methyl-2-butanone	563-80-4	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
3-Pentanone	96-22-0	1.08E+00	i	1.20E+01	9.90E-01	i	9.77E+00	4.81E-01	e	1.20E-01	e
4-Heptanone	123-19-3	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Methyl-2-pentanone	108-10-1	1.20E+01	c	1.20E+01	1.55E+01	c	1.55E+01	4.80E-01	c	1.20E-01	c
4-Methyl-3-penten-2-one	141-79-7	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
5-Methyl-2-hexanone	110-12-3	3.90E+01	p	3.90E+01	1.72E+00	p	5.25E+01	1.56E+00	e	3.90E-01	e
Acetaldehyde	75-07-0	9.53E-01	c	9.53E-01	6.02E-01	c	6.02E-01	3.81E-02	c	9.53E-03	c
Acetamide	60-35-5	-1.55E+00	i	2.82E-02	-1.26E+00	i	5.50E-02	1.13E-03	e	2.82E-04	e
Acetic acid	64-19-7	0.00E+00	i	1.00E+00	-1.70E-01	i	6.76E-01	4.00E-02	e	1.00E-02	e
Acetic acid ethyl ester	141-78-6	3.61E-01	i	2.30E+00	7.30E-01	i	5.37E+00	9.18E-02	e	2.30E-02	e
Acetic acid n-butyl ester	123-86-4	NA	e	3.17E+01	1.73E+00	i	5.37E+01	1.27E+00	e	3.17E-01	e
Acetonitrile	75-05-8	7.69E-01	c	7.69E-01	4.57E-01	c	4.57E-01	3.07E-02	c	7.69E-03	c
Acrolein	107-02-8	1.39E+00	c	1.39E+00	9.80E-01	c	9.80E-01	5.57E-02	c	1.39E-02	c
Acrylonitrile	107-13-1	2.22E+00	c	2.22E+00	1.78E+00	c	1.78E+00	8.88E-02	c	2.22E-02	c
Bis(isopropyl)ether	108-20-3	1.68E+02	p	1.68E+02	1.56E+00	p	3.63E+01	6.72E+00	e	1.68E+00	e
Butane	106-97-8	NA	e	2.54E+02	2.89E+00	q	7.76E+02	1.02E+01	e	2.54E+00	e
Carbon disulfide	75-15-0	5.14E+01	c	5.14E+01	1.00E+02	c	1.00E+02	2.06E+00	c	5.14E-01	c
Cyanogen	460-19-5	8.30E+00	m	8.30E+00	7.00E-02	m	1.17E+00	3.32E-01	e	8.30E-02	e
Cyclohexane	110-82-7	2.68E+00	i	4.79E+02	3.44E+00	i	2.75E+03	1.91E+01	e	4.79E+00	e
Cyclohexanone	108-94-1	NA	e	6.06E+00	8.10E-01	i	6.46E+00	2.43E-01	e	6.06E-02	e

Table B1-1 Chemical-Specific Parameters for Organic COPCs

Chemical of Potential Concern	CAS Registry Number	Kd		Plant Uptake Factors				
		Kd_{sw} (L/kg)	Source	Br_{ag} (µg/g DW plant)/ (µg/g soil)	Source	Br_{forage} (µg/g DW plant)/ (µg/g soil)	Source	Br_{grain} (µg/g DW plant)/ (µg/g soil) [a]
2-Methyl-2-propenenitrile	126-98-7	2.80E-01	c	1.89E+01	c	1.89E+01	c	1.89E+01
2-Methylaziridine	75-55-8	3.60E-02	e	8.64E+01	e	8.64E+01	e	8.64E+01
2-Methylpropyl alcohol	78-83-1	4.16E-01	e	1.41E+01	e	1.41E+01	e	1.41E+01
2-Pentanone	107-87-9	5.55E+00	e	1.15E+01	e	1.15E+01	e	1.15E+01
2-Propanone (Acetone)	67-64-1	7.13E-02	c	5.20E+01	c	5.20E+01	c	5.20E+01
2-Propene-1-ol	107-18-6	1.44E-01	e	3.09E+01	e	3.09E+01	e	3.09E+01
2-Propyl alcohol	67-63-0	1.16E-01	e	3.62E+01	e	3.62E+01	e	3.62E+01
3-Heptanone	106-35-4	NA	NA	NA	NA	NA	NA	NA
3-Methyl-1-butanol	123-51-3	NA	NA	NA	NA	NA	NA	NA
3-Methyl-2-butanone	563-80-4	NA	NA	NA	NA	NA	NA	NA
3-Pentanone	96-22-0	9.02E-01	e	1.04E+01	e	1.04E+01	e	1.04E+01
4-Heptanone	123-19-3	NA	NA	NA	NA	NA	NA	NA
4-Methyl-2-pentanone	108-10-1	9.00E-01	c	7.95E+00	c	7.95E+00	c	7.95E+00
4-Methyl-3-penten-2-one	141-79-7	NA	NA	NA	NA	NA	NA	NA
5-Methyl-2-hexanone	110-12-3	2.93E+00	e	3.93E+00	e	3.93E+00	e	3.93E+00
Acetaldehyde	75-07-0	7.15E-02	c	5.19E+01	c	5.19E+01	c	5.19E+01
Acetamide	60-35-5	2.11E-03	e	2.07E+02	e	2.07E+02	e	2.07E+02
Acetic acid	64-19-7	7.50E-02	e	4.86E+01	e	4.86E+01	e	4.86E+01
Acetic acid ethyl ester	141-78-6	1.72E-01	e	1.47E+01	e	1.47E+01	e	1.47E+01
Acetic acid n-butyl ester	123-86-4	2.37E+00	e	3.87E+00	e	3.87E+00	e	3.87E+00
Acetonitrile	75-05-8	5.76E-02	c	6.09E+01	c	6.09E+01	c	6.09E+01
Acrolein	107-02-8	1.05E-01	c	3.92E+01	c	3.92E+01	c	3.92E+01
Acrylonitrile	107-13-1	1.66E-01	c	2.77E+01	c	2.77E+01	c	2.77E+01
Bis(isopropyl)ether	108-20-3	1.26E+01	e	4.86E+00	e	4.86E+00	e	4.86E+00
Butane	106-97-8	1.91E+01	e	8.27E-01	e	8.27E-01	e	8.27E-01
Carbon disulfide	75-15-0	3.86E+00	c	2.70E+00	c	2.70E+00	c	2.70E+00
Cyanogen	460-19-5	6.23E-01	e	3.53E+01	e	3.53E+01	e	3.53E+01
Cyclohexane	110-82-7	3.59E+01	e	3.98E-01	e	3.98E-01	e	3.98E-01
Cyclohexanone	108-94-1	4.55E-01	e	1.32E+01	e	1.32E+01	e	1.32E+01

Table B1-1 Chemical-Specific Parameters for Organic COPCs

Chemical of Potential Concern	CAS Registry Number	Plant Uptake Factors							
		$Br_{rootveg}$ (µg/g DW plant)/ (µg/g soil)	Source	Bv_{ag} (µg/g DW plant)/ (µg/g air)	Source	Bv_{forage} (µg/g DW plant)/ (µg/g air)	Source	RCF (µg/g DW plant)/ (µg/mL soil water)	Source
2-Methyl-2-propenenitrile	126-98-7	1.85E+02	c	8.81E-04	c	8.81E-04	c	6.91E+00	c
2-Methylaziridine	75-55-8	1.33E+03	e	1.52E-03	e	1.52E-03	e	6.39E+00	e
2-Methylpropyl alcohol	78-83-1	1.30E+02	e	3.01E-02	e	3.01E-02	e	7.20E+00	e
2-Pentanone	107-87-9	1.01E+01	e	8.09E-03	e	8.09E-03	e	7.47E+00	e
2-Propanone (Acetone)	67-64-1	6.80E+02	c	1.13E-03	c	1.13E-03	c	6.46E+00	c
2-Propene-1-ol	107-18-6	3.45E+02	e	1.70E-02	e	1.70E-02	e	6.62E+00	e
2-Propyl alcohol	67-63-0	4.24E+02	e	7.80E-03	e	7.80E-03	e	6.56E+00	e
3-Heptanone	106-35-4	NA	NA	NA	NA	NA	NA	NA	NA
3-Methyl-1-butanol	123-51-3	NA	NA	NA	NA	NA	NA	NA	NA
3-Methyl-2-butanone	563-80-4	NA	NA	NA	NA	NA	NA	NA	NA
3-Pentanone	96-22-0	6.36E+01	e	7.89E-03	e	7.89E-03	e	7.65E+00	e
4-Heptanone	123-19-3	NA	NA	NA	NA	NA	NA	NA	NA
4-Methyl-2-pentanone	108-10-1	6.85E+01	c	8.26E-03	c	8.26E-03	c	8.22E+00	c
4-Methyl-3-penten-2-one	141-79-7	NA	NA	NA	NA	NA	NA	NA	NA
5-Methyl-2-hexanone	110-12-3	2.87E+01	e	2.38E-02	e	2.38E-02	e	1.12E+01	e
Acetaldehyde	75-07-0	6.78E+02	c	4.14E-04	e	4.14E-04	e	6.46E+00	c
Acetamide	60-35-5	2.25E+04	e	7.30E-01	e	7.30E-01	e	6.33E+00	e
Acetic acid	64-19-7	6.48E+02	e	1.22E-01	e	1.22E-01	e	6.48E+00	e
Acetic acid ethyl ester	141-78-6	3.12E+02	e	2.49E-03	e	2.49E-03	e	7.16E+00	e
Acetic acid n-butyl ester	123-86-4	3.57E+01	e	1.18E-02	e	1.18E-02	e	1.13E+01	e
Acetonitrile	75-05-8	8.37E+02	c	3.70E-04	h	3.70E-04	h	6.43E+00	c
Acrolein	107-02-8	4.69E+02	c	5.86E-04	c	5.86E-04	c	6.54E+00	c
Acrylonitrile	107-13-1	3.00E+02	c	1.04E-03	c	1.04E-03	c	6.67E+00	c
Bis(isopropyl)ether	108-20-3	5.95E+00	e	1.13E-03	e	1.13E-03	e	1.00E+01	e
Butane	106-97-8	1.78E+01	e	7.06E-05	e	7.06E-05	e	4.53E+01	e
Carbon disulfide	75-15-0	2.79E+01	c	5.92E-04	c	5.92E-04	c	1.44E+01	c
Cyanogen	460-19-5	7.92E+01	e	1.93E-04	e	1.93E-04	e	6.57E+00	e
Cyclohexane	110-82-7	2.29E+01	e	1.33E-03	e	1.33E-03	e	1.10E+02	e
Cyclohexanone	108-94-1	1.20E+02	e	3.39E-02	e	3.39E-02	e	7.28E+00	e

Table B1-1 Chemical-Specific Parameters for Organic COPCs

Chemical of Potential Concern	CAS Registry Number	Bioconcentration/Bioaccumulation Factors									
		Ba_{beef} (day/kg FW)	Source	$Ba_{chicken}$ (day/kg FW)	Source	Ba_{egg} (day/kg FW)	Source	Ba_{milk} (day/kg FW)	Source	Ba_{pork} (day/kg FW)	Source
2-Methyl-2-propenenitrile	126-98-7	8.72E-08	c	6.88E-08	c	2.76E-05	c	2.76E-08	c	1.06E-07	c
2-Methylaziridine	75-55-8	6.27E-09	e	4.95E-09	e	1.98E-06	e	1.98E-09	e	7.59E-09	e
2-Methylpropyl alcohol	78-83-1	1.45E-07	e	1.14E-07	e	4.57E-05	e	4.57E-08	e	1.75E-07	e
2-Pentanone	107-87-9	2.04E-07	e	1.61E-07	e	6.46E-05	e	6.46E-08	e	2.47E-07	e
2-Propanone (Acetone)	67-64-1	1.15E-08	c	1.19E-08	c	4.77E-06	c	4.77E-09	c	1.82E-08	c
2-Propene-1-ol	107-18-6	3.72E-08	e	2.93E-08	e	1.17E-05	e	1.17E-08	e	4.50E-08	e
2-Propyl alcohol	67-63-0	2.82E-08	e	2.23E-08	e	8.91E-06	e	8.91E-09	e	3.41E-08	e
3-Heptanone	106-35-4	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
3-Methyl-1-butanol	123-51-3	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
3-Methyl-2-butanone	563-80-4	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
3-Pentanone	96-22-0	2.45E-07	e	1.94E-07	e	7.76E-05	e	7.76E-08	e	2.97E-07	e
4-Heptanone	123-19-3	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Methyl-2-pentanone	108-10-1	3.89E-07	c	3.07E-07	c	1.23E-04	c	1.23E-07	c	4.71E-07	c
4-Methyl-3-penten-2-one	141-79-7	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
5-Methyl-2-hexanone	110-12-3	1.32E-06	e	1.04E-06	e	4.17E-04	e	4.17E-07	e	1.60E-06	e
Acetaldehyde	75-07-0	1.51E-08	c	1.19E-08	c	4.78E-06	c	4.78E+09	c	1.83E-08	c
Acetamide	60-35-5	1.38E-09	e	1.09E-09	e	4.37E-07	e	4.37E-10	e	1.67E-09	e
Acetic acid	64-19-7	1.70E-08	e	1.34E-08	e	5.37E-06	e	5.37E-09	e	2.06E-08	e
Acetic acid ethyl ester	141-78-6	1.35E-07	e	1.06E-07	e	4.27E-05	e	4.27E-08	e	1.63E-07	e
Acetic acid n-butyl ester	123-86-4	1.35E-06	e	1.06E-06	e	4.27E-04	e	4.27E-07	e	1.63E-06	e
Acetonitrile	75-05-8	1.15E-08	c	9.06E-09	c	3.63E-06	c	3.63E-09	c	1.39E-08	c
Acrolein	107-02-8	2.46E-08	c	1.94E-08	c	7.78E-06	c	7.78E-09	c	2.98E-08	c
Acrylonitrile	107-13-1	4.47E-08	c	3.53E-08	c	1.41E-05	c	1.41E-08	c	5.41E-08	c
Bis(isopropyl)ether	108-20-3	9.12E-07	e	7.20E-07	e	2.88E-04	e	2.88E-07	e	1.10E-06	e
Butane	106-97-8	1.95E-05	e	1.54E-05	e	6.17E-03	e	6.17E-06	e	2.36E-05	e
Carbon disulfide	75-15-0	2.51E-06	c	1.98E-06	c	7.94E-04	c	7.94E-07	c	3.04E-06	c
Cyanogen	460-19-5	2.95E-08	e	2.33E-08	e	9.33E-06	e	9.33E-09	e	3.57E-08	e
Cyclohexane	110-82-7	6.92E-05	e	5.46E-05	e	2.19E-02	e	2.19E-05	e	8.37E-05	e
Cyclohexanone	108-94-1	1.62E-07	e	1.28E-07	e	5.13E-05	e	5.13E-08	e	1.96E-07	e

Table B1-1 Chemical-Specific Parameters for Organic COPCs

Chemical of Potential Concern	CAS Registry Number	Bioconcentration/Bioaccumulation Factors						Half-life	
		BAF_{fish} (L/kg FW)	Source	BCF_{fish} (L/kg FW)	Source	$BSAF_{fish}$ (unitless)	Source	$t_{1/2}$ (days)	Source
2-Methyl-2-propenenitrile	126-98-7	NA	NA	1.52E+00	c	NA	NA	NA	NA
2-Methylaziridine	75-55-8	NA	NA	2.05E-01	e	NA	NA	3.63E+01	d
2-Methylpropyl alcohol	78-83-1	NA	NA	2.23E+00	e	NA	NA	7.21E+00	d
2-Pentanone	107-87-9	NA	NA	2.89E+00	e	NA	NA	NA	NA
2-Propanone (Acetone)	67-64-1	NA	NA	1.03E-01	s	NA	NA	NA	NA
2-Propene-1-ol	107-18-6	NA	NA	7.93E-01	e	NA	NA	7.00E+00	d
2-Propyl alcohol	67-63-0	NA	NA	6.43E-01	e	NA	NA	7.00E+00	d
3-Heptanone	106-35-4	NA	NA	NA	NA	NA	NA	NA	NA
3-Methyl-1-butanol	123-51-3	NA	NA	NA	NA	NA	NA	NA	NA
3-Methyl-2-butanone	563-80-4	NA	NA	NA	NA	NA	NA	NA	NA
3-Pentanone	96-22-0	NA	NA	3.33E+00	e	NA	NA	NA	NA
4-Heptanone	123-19-3	NA	NA	NA	NA	NA	NA	NA	NA
4-Methyl-2-pentanone	108-10-1	NA	NA	4.73E+00	c	NA	NA	NA	NA
4-Methyl-3-penten-2-one	141-79-7	NA	NA	NA	NA	NA	NA	NA	NA
5-Methyl-2-hexanone	110-12-3	NA	NA	1.19E+01	e	NA	NA	NA	NA
Acetaldehyde	75-07-0	NA	NA	4.00E-01	c	NA	NA	NA	NA
Acetamide	60-35-5	NA	NA	6.49E-02	e	NA	NA	7.00E+00	d
Acetic acid	64-19-7	NA	NA	4.37E-01	e	NA	NA	NA	NA
Acetic acid ethyl ester	141-78-6	NA	NA	2.11E+00	e	NA	NA	7.00E+00	d
Acetic acid n-butyl ester	123-86-4	NA	NA	1.22E+01	e	NA	NA	NA	NA
Acetonitrile	75-05-8	NA	NA	3.25E-01	c	NA	NA	NA	NA
Acrolein	107-02-8	NA	NA	5.80E-01	c	NA	NA	NA	NA
Acrylonitrile	107-13-1	NA	NA	4.80E+01	c	NA	NA	NA	NA
Bis(isopropyl)ether	108-20-3	NA	NA	9.03E+00	e	NA	NA	NA	NA
Butane	106-97-8	NA	NA	9.26E+01	e	NA	NA	NA	NA
Carbon disulfide	75-15-0	NA	NA	1.95E+01	c	NA	NA	NA	NA
Cyanogen	460-19-5	NA	NA	6.66E-01	e	NA	NA	NA	NA
Cyclohexane	110-82-7	NA	NA	2.42E+02	e	NA	NA	1.80E+02	d
Cyclohexanone	108-94-1	NA	NA	2.43E+00	e	NA	NA	NA	NA

Table B1-1 Chemical-Specific Parameters for Organic COPCs

Chemical of Potential Concern	CAS Registry Number	Soil Loss Mechanisms [g]											
		k_{decay} $(year)^{-1}$	Source	ks_e $(year)^{-1}$			Source	ks_g $(year)^{-1}$	Source	ks_l $(year)^{-1}$			Source
				1 cm	15 cm	20 cm				1 cm	15 cm	20 cm	
2-Methyl-2-propenenitrile	126-98-7	0.0E+00	NA	1.03E-03	6.89E-05	5.17E-05	e	0.0E+00	NA	1.68E+01	1.12E+00	8.42E-01	e
2-Methylaziridine	75-55-8	0.0E+00	NA	1.60E-04	1.06E-05	7.98E-06	e	6.98E+00	e	2.03E+01	1.35E+00	1.01E+00	e
2-Methylpropyl alcohol	78-83-1	0.0E+00	NA	1.40E-03	9.33E-05	7.00E-05	e	3.51E+01	e	1.54E+01	1.03E+00	7.69E-01	e
2-Pentanone	107-87-9	0.0E+00	NA	4.37E-03	2.92E-04	2.19E-04	e	0.0E+00	NA	3.60E+00	2.40E-01	1.80E-01	e
2-Propanone (Acetone)	67-64-1	0.0E+00	NA	3.08E-04	2.05E-05	1.54E-05	e	3.61E+01	c	1.97E+01	1.31E+00	9.86E-01	e
2-Propene-1-ol	107-18-6	0.0E+00	NA	5.87E-04	3.91E-05	2.93E-05	e	3.61E+01	e	1.86E+01	1.24E+00	9.30E-01	e
2-Propyl alcohol	67-63-0	0.0E+00	NA	4.83E-04	3.22E-05	2.42E-05	e	3.61E+01	e	1.90E+01	1.27E+00	9.51E-01	e
3-Heptanone	106-35-4	0.0E+00	NA	0.0E+00	0.0E+00	0.0E+00	NA	0.0E+00	NA	0.0E+00	0.0E+00	0.0E+00	NA
3-Methyl-1-butanol	123-51-3	0.0E+00	NA	0.0E+00	0.0E+00	0.0E+00	NA	0.0E+00	NA	0.0E+00	0.0E+00	0.0E+00	NA
3-Methyl-2-butanone	563-80-4	0.0E+00	NA	0.0E+00	0.0E+00	0.0E+00	NA	0.0E+00	NA	0.0E+00	0.0E+00	0.0E+00	NA
3-Pentanone	96-22-0	0.0E+00	NA	2.32E-03	1.55E-04	1.16E-04	e	0.0E+00	NA	1.17E+01	7.83E-01	5.87E-01	e
4-Heptanone	123-19-3	0.0E+00	NA	0.0E+00	0.0E+00	0.0E+00	NA	0.0E+00	NA	0.0E+00	0.0E+00	0.0E+00	NA
4-Methyl-2-pentanone	108-10-1	0.0E+00	NA	2.32E-03	1.54E-04	1.16E-04	e	3.61E+01	c	1.18E+01	7.84E-01	5.88E-01	e
4-Methyl-3-penten-2-one	141-79-7	0.0E+00	NA	0.0E+00	0.0E+00	0.0E+00	NA	0.0E+00	NA	0.0E+00	0.0E+00	0.0E+00	NA
5-Methyl-2-hexanone	110-12-3	0.0E+00	NA	3.79E-03	2.53E-04	1.89E-04	e	0.0E+00	NA	5.92E+00	3.95E-01	2.96E-01	e
Acetaldehyde	75-07-0	0.0E+00	NA	3.08E-04	2.05E-05	1.54E-05	e	0.0E+00	NA	1.97E+01	1.31E+00	9.86E-01	e
Acetamide	60-35-5	0.0E+00	NA	9.66E-06	6.44E-07	4.83E-07	e	3.61E+01	e	2.09E+01	1.39E+00	1.04E+00	e
Acetic acid	64-19-7	0.0E+00	NA	3.23E-04	2.15E-05	1.61E-05	e	0.0E+00	NA	1.97E+01	1.31E+00	9.83E-01	e
Acetic acid ethyl ester	141-78-6	0.0E+00	NA	6.86E-04	4.58E-05	3.43E-05	e	3.61E+01	e	1.82E+01	1.21E+00	9.11E-01	e
Acetic acid n-butyl ester	123-86-4	0.0E+00	NA	3.56E-03	2.37E-04	1.78E-04	e	0.0E+00	NA	6.85E+00	4.56E-01	3.42E-01	e
Acetonitrile	75-05-8	0.0E+00	NA	2.52E-04	1.68E-05	1.26E-05	e	9.03E+00	c	1.99E+01	1.33E+00	9.97E-01	e
Acrolein	107-02-8	0.0E+00	NA	4.38E-04	2.92E-05	2.19E-05	e	9.03E+00	c	1.92E+01	1.28E+00	9.60E-01	e
Acrylonitrile	107-13-1	0.0E+00	NA	6.66E-04	4.44E-05	3.33E-05	e	1.10E+01	c	1.83E+01	1.22E+00	9.15E-01	e
Bis(isopropyl)ether	108-20-3	0.0E+00	NA	4.84E-03	3.23E-04	2.42E-04	e	0.0E+00	NA	1.76E+00	1.17E-01	8.78E-02	e
Butane	106-97-8	0.0E+00	NA	4.98E-03	3.32E-04	2.49E-04	e	0.0E+00	NA	1.19E+00	7.96E-02	5.97E-02	e
Carbon disulfide	75-15-0	0.0E+00	NA	4.07E-03	2.71E-04	2.03E-04	e	0.0E+00	NA	4.82E+00	3.21E-01	2.41E-01	e
Cyanogen	460-19-5	0.0E+00	NA	1.85E-03	1.23E-04	9.26E-05	e	0.0E+00	NA	1.36E+01	9.06E-01	6.80E-01	e
Cyclohexane	110-82-7	0.0E+00	NA	5.12E-03	3.41E-04	2.56E-04	e	1.41E+00	e	6.52E-01	4.35E-02	3.26E-02	e
Cyclohexanone	108-94-1	0.0E+00	NA	1.49E-03	9.96E-05	7.47E-05	e	0.0E+00	NA	1.50E+01	1.00E+00	7.51E-01	e

Table B1-1 Chemical-Specific Parameters for Organic COPCs

Chemical of Potential Concern	CAS Registry Number	Soil Loss Mechanisms [g]								Kp (cm/hr)	Source
		ks_r $(year)^{-1}$			Source	ks_v $(year)^{-1}$			Source		
		1 cm	15 cm	20 cm		1 cm	15 cm	20 cm			
2-Methyl-2-propenenitrile	126-98-7	1.01E+01	6.70E-01	5.03E-01	e	2.26E+05	1.00E+03	5.64E+02	f	1.54E-03	aa
2-Methylaziridine	75-55-8	1.21E+01	8.08E-01	6.06E-01	e	6.89E+04	3.06E+02	1.72E+02	f	3.00E-04	ab
2-Methylpropyl alcohol	78-83-1	9.19E+00	6.13E-01	4.59E-01	e	5.72E+03	2.54E+01	1.43E+01	f	1.97E-03	aa
2-Pentanone	107-87-9	2.15E+00	1.43E-01	1.08E-01	e	2.61E+03	1.16E+01	6.52E+00	f	2.12E-03	aa
2-Propanone (Acetone)	67-64-1	1.18E+01	7.85E-01	5.89E-01	e	1.74E+05	7.72E+02	4.34E+02	f	5.32E-04	aa
2-Propene-1-ol	107-18-6	1.11E+01	7.41E-01	5.56E-01	e	9.12E+03	4.05E+01	2.28E+01	f	9.74E-04	aa
2-Propyl alcohol	67-63-0	1.14E+01	7.57E-01	5.68E-01	e	1.99E+04	8.85E+01	4.98E+01	f	7.89E-04	aa
3-Heptanone	106-35-4	0.0E+00	0.0E+00	0.0E+00	NA	0.0E+00	0.0E+00	0.0E+00	NA	NA	NA
3-Methyl-1-butanol	123-51-3	0.0E+00	0.0E+00	0.0E+00	NA	0.0E+00	0.0E+00	0.0E+00	NA	NA	NA
3-Methyl-2-butanone	563-80-4	0.0E+00	0.0E+00	0.0E+00	NA	0.0E+00	0.0E+00	0.0E+00	NA	NA	NA
3-Pentanone	96-22-0	7.02E+00	4.68E-01	3.51E-01	e	2.00E+04	8.90E+01	5.01E+01	f	2.40E-03	aa
4-Heptanone	123-19-3	0.0E+00	0.0E+00	0.0E+00	NA	0.0E+00	0.0E+00	0.0E+00	NA	NA	NA
4-Methyl-2-pentanone	108-10-1	7.02E+00	4.68E-01	3.51E-01	e	2.75E+04	1.22E+02	6.87E+01	f	2.70E-03	ab
4-Methyl-3-penten-2-one	141-79-7	0.0E+00	0.0E+00	0.0E+00	NA	0.0E+00	0.0E+00	0.0E+00	NA	NA	NA
5-Methyl-2-hexanone	110-12-3	3.54E+00	2.36E-01	1.77E-01	e	1.01E+04	4.51E+01	2.54E+01	f	5.16E-03	aa
Acetaldehyde	75-07-0	1.18E+01	7.85E-01	5.89E-01	e	6.91E+05	3.07E+03	1.73E+03	f	6.30E-04	ab
Acetamide	60-35-5	1.25E+01	8.32E-01	6.24E-01	e	4.77E+02	2.12E+00	1.19E+00	f	1.10E-04	ab
Acetic acid	64-19-7	1.17E+01	7.82E-01	5.87E-01	e	1.15E+03	5.10E+00	2.87E+00	f	5.62E-04	aa
Acetic acid ethyl ester	141-78-6	1.09E+01	7.25E-01	5.44E-01	e	1.32E+05	5.86E+02	3.30E+02	f	1.57E-03	aa
Acetic acid n-butyl ester	123-86-4	4.09E+00	2.73E-01	2.04E-01	e	2.56E+04	1.14E+02	6.41E+01	f	5.11E-03	aa
Acetonitrile	75-05-8	1.19E+01	7.94E-01	5.95E-01	e	8.23E+05	3.66E+03	2.06E+03	f	5.52E-04	aa
Acrolein	107-02-8	1.15E+01	7.64E-01	5.73E-01	e	3.96E+05	1.76E+03	9.90E+02	f	6.50E-04	ab
Acrylonitrile	107-13-1	1.09E+01	7.28E-01	5.46E-01	e	2.89E+05	1.28E+03	7.22E+02	f	1.20E-03	ab
Bis(isopropyl)ether	108-20-3	1.05E+00	6.99E-02	5.24E-02	e	3.61E+04	1.61E+02	9.03E+01	f	4.71E-03	aa
Butane	106-97-8	7.13E-01	4.76E-02	3.57E-02	e	1.45E+07	6.45E+04	3.63E+04	f	6.47E-02	aa
Carbon disulfide	75-15-0	2.88E+00	1.92E-01	1.44E-01	e	7.89E+05	3.50E+03	1.97E+03	f	1.70E-02	ab
Cyanogen	460-19-5	8.12E+00	5.41E-01	4.06E-01	e	2.59E+05	1.15E+03	6.47E+02	f	9.03E-04	aa
Cyclohexane	110-82-7	3.89E-01	2.60E-02	1.95E-02	e	1.24E+06	5.50E+03	3.09E+03	f	1.08E-01	aa
Cyclohexanone	108-94-1	8.97E+00	5.98E-01	4.48E-01	e	4.78E+03	2.12E+01	1.19E+01	f	1.56E-03	aa

Table B1-1 Chemical-Specific Parameters for Organic COPCs

Chemical of Potential Concern	CAS Registry Number	Fraction		MW	pH	Henry's Constant			Diffusivity			
		F_v (unitless)	Source	(g/mol)		H-pub [x] (various units)	Source	H-used [x] (atm-m^3/mol)	D_a (cm^2/s)	Source	D_w (cm^2/s)	Source
Cyclohexene	110-83-8	0 or 1	b	82.145	NA	4.02E+03	i	3.98E-02	1.01E-01	e	1.16E-05	e
Cyclopentane	287-92-3	0 or 1	b	70.134	NA	1.88E+04	i	1.86E-01	1.12E-01	e	1.29E-05	e
Ethyl alcohol	64-17-5	0 or 1	b	46.069	NA	6.29E-06	p	6.29E-06	1.48E-01	e	1.71E-05	e
Ethyl ether	60-29-7	0 or 1	b	74.12	NA	1.30E+02	i	1.29E-03	7.40E-02	j	9.30E-06	j
Ethyl methacrylate	97-63-2	0 or 1	b	114.14	NA	1.38E-04	c	1.38E-04	8.07E-02	c	9.35E-06	c
Formaldehyde	50-00-0	0 or 1	b	30.03	NA	2.78E-04	c	2.78E-04	5.00E-01	c	1.74E-05	c
Formamide	75-12-7	0 or 1	b	45.04	NA	5.69E-08	k	1.39E-09	1.50E-01	e	1.74E-05	e
Formic acid	64-18-6	0 or 1	b	46.03	NA	2.49E-06	c	2.49E-06	2.22E-01	c	1.71E-05	c
Formic acid, methyl ester	107-31-3	0 or 1	b	60.05	NA	9.13E-03	k	2.23E-04	1.24E-01	e	1.43E-05	e
Glycidylaldehyde	765-34-4	0 or 1	b	72.07	NA	3.21E-05	m	7.82E-07	1.10E-01	e	1.27E-05	e
Methyl acetate	79-20-9	0 or 1	b	74.08	NA	8.64E-05	c	8.64E-05	1.23E-01	c	1.10E-05	c
Methyl alcohol	67-56-1	0 or 1	b	32.04	NA	1.44E-04	c	1.44E-04	4.58E-01	c	1.64E-05	c
Methyl isocyanate	624-83-9	0 or 1	b	57.052	NA	3.79E-02	k	9.24E-04	1.28E-01	e	1.48E-05	e
Methyl methacrylate	80-62-6	0 or 1	b	100.13	NA	3.21E+01	i	3.18E-04	7.70E-02	j	8.60E-06	j
Methyl tert-butyl ether	1634-04-4	0 or 1	b	88.15	NA	5.95E+01	i	5.89E-04	1.02E-01	j	1.05E-05	j
Methylacetylene	74-99-7	0 or 1	b	40.07	NA	4.51E-01	k	1.10E-02	1.62E-01	e	1.88E-05	e
Methylcyclohexane	108-87-2	0 or 1	b	98.188	NA	4.41E+04	i	4.36E-01	8.93E-02	e	1.03E-05	e
N,N-Dimethylacetamide	127-19-5	0 or 1	b	87.12	NA	5.36E-07	k	1.31E-08	9.67E-02	e	1.12E-05	e
n-Butyl alcohol	71-36-3	0 or 1	b	74.1	NA	8.60E-01	i	8.51E-06	8.00E-02	j	9.30E-06	j
n-Heptane	142-82-5	0 or 1	b	100.2	NA	2.30E+05	i	2.28E+00	8.81E-02	e	1.02E-05	e
n-Hexane	110-54-3	0 or 1	b	86.177	NA	1.84E+05	i	1.82E+00	9.74E-02	e	1.13E-05	e
Nitromethane	75-52-5	0 or 1	b	61.04	NA	1.17E-03	k	2.85E-05	1.23E-01	e	1.42E-05	e
n-Nonane	111-84-2	0 or 1	b	128.26	NA	5.00E+05	i	4.95E+00	7.47E-02	e	8.65E-06	e
n-Octane	111-65-9	0 or 1	b	114.23	NA	3.27E+05	i	3.24E+00	8.07E-02	e	9.34E-06	e
n-Pentane	109-66-0	0 or 1	b	72.15	NA	1.27E+05	i	1.26E+00	1.10E-01	e	1.27E-05	e
n-Propionaldehyde	123-38-6	0 or 1	b	58.08	NA	7.49E+00	i	7.41E-05	1.27E-01	e	1.47E-05	e
n-Propyl alcohol	71-23-8	0 or 1	b	60.096	NA	3.03E-04	k	7.40E-06	1.24E-01	e	1.43E-05	e
n-Valeraldehyde	110-62-3	0 or 1	b	86.13	NA	6.02E-03	k	1.47E-04	9.74E-02	e	1.13E-05	e
Oxirane	75-21-8	0 or 1	b	44.05	NA	1.67E-04	c	1.67E-04	2.71E-01	c	1.44E-05	c

Table B1-1 Chemical-Specific Parameters for Organic COPCs

Chemical of Potential Concern	CAS Registry Number	Octanol / Water Partitioning Coefficients						Partitioning Coefficients (Kd)			
		K_{oc}-pub [y] (various units)	Source	K_{oc}-used [z] (mL/g)	K_{ow}-pub [y] (various units)	Source	K_{ow}-used [z] (unitless)	Kd_{bs} (L/kg)	Source	Kd_s (mL/g)	Source
Cyclohexene	110-83-8	NA	e	2.41E+02	2.86E+00	i	7.24E+02	9.64E+00	e	2.41E+00	e
Cyclopentane	287-92-3	NA	e	3.10E+02	3.00E+00	i	1.00E+03	1.24E+01	e	3.10E+00	e
Ethyl alcohol	64-17-5	NA	e	8.11E-01	-3.10E-01	p	4.90E-01	3.25E-02	e	8.11E-03	e
Ethyl ether	60-29-7	NA	e	7.00E+00	8.90E-01	i	7.76E+00	2.80E-01	e	7.00E-02	e
Ethyl methacrylate	97-63-2	2.46E+01	c	2.46E+01	3.89E+01	c	3.89E+01	9.80E-01	c	2.46E-01	c
Formaldehyde	50-00-0	2.62E+00	c	2.62E+00	2.20E+00	c	2.20E+00	1.05E-01	c	2.62E-02	c
Formamide	75-12-7	NA	e	9.40E-02	-1.51E+00	l	3.09E-02	3.76E-03	e	9.40E-04	e
Formic acid	64-18-6	5.39E-01	h	5.39E-01	2.90E-01	c	2.90E-01	2.16E-02	h	5.39E-03	h
Formic acid, methyl ester	107-31-3	NA	e	8.81E-01	2.64E-01	l	5.45E-01	3.52E-02	e	8.81E-03	e
Glycidylaldehyde	765-34-4	1.00E+00	m	1.00E+00	-1.20E-01	m	7.59E-01	4.00E-02	e	1.00E-02	e
Methyl acetate	79-20-9	3.25E+00	c	3.25E+00	2.90E+00	c	2.90E+00	1.30E-01	c	3.25E-02	c
Methyl alcohol	67-56-1	3.96E-01	c	3.96E-01	1.95E-01	c	1.95E-01	1.58E-02	c	3.96E-03	c
Methyl isocyanate	624-83-9	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Methyl methacrylate	80-62-6	1.80E+00	i	6.31E+01	7.90E-01	i	6.17E+00	2.52E+00	e	6.31E-01	e
Methyl tert-butyl ether	1634-04-4	NA	e	7.66E+00	9.40E-01	i	8.71E+00	3.06E-01	e	7.66E-02	e
Methylacetylene	74-99-7	NA	e	7.66E+00	9.40E-01	l	8.71E+00	3.06E-01	e	7.66E-02	e
Methylcyclohexane	108-87-2	NA	e	2.23E+03	4.10E+00	i	1.26E+04	8.93E+01	e	2.23E+01	e
N,N-Dimethylacetamide	127-19-5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
n-Butyl alcohol	71-36-3	NA	e	6.88E+00	8.80E-01	i	7.59E+00	2.75E-01	e	6.88E-02	e
n-Heptane	142-82-5	NA	e	6.11E+03	4.66E+00	i	4.57E+04	2.44E+02	e	6.11E+01	e
n-Hexane	110-54-3	NA	e	2.27E+03	4.11E+00	i	1.29E+04	9.10E+01	e	2.27E+01	e
Nitromethane	75-52-5	NA	e	7.55E-01	-3.50E-01	o	4.47E-01	3.02E-02	e	7.55E-03	e
n-Nonane	111-84-2	NA	e	3.61E+04	5.65E+00	i	4.47E+05	1.45E+03	e	3.61E+02	e
n-Octane	111-65-9	NA	e	1.87E+03	4.00E+00	i	1.00E+04	7.47E+01	e	1.87E+01	e
n-Pentane	109-66-0	NA	e	4.52E+02	3.21E+00	i	1.62E+03	1.81E+01	e	4.52E+00	e
n-Propionaldehyde	123-38-6	NA	e	4.09E+00	5.90E-01	i	3.89E+00	1.63E-01	e	4.09E-02	e
n-Propyl alcohol	71-23-8	NA	e	2.22E+00	2.50E-01	l	1.78E+00	8.87E-02	e	2.22E-02	e
n-Valeraldehyde	110-62-3	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Oxirane	75-21-8	8.26E-01	c	8.26E-01	5.01E-01	c	5.01E-01	3.30E-02	c	8.26E-03	c

Table B1-1 Chemical-Specific Parameters for Organic COPCs

Chemical of Potential Concern	CAS Registry Number	Kd		Plant Uptake Factors				
		Kd_{sw} (L/kg)	Source	Br_{ag} (µg/g DW plant)/ (µg/g soil)	Source	Br_{forage} (µg/g DW plant)/ (µg/g soil)	Source	Br_{grain} (µg/g DW plant)/ (µg/g soil) [a]
Cyclohexene	110-83-8	1.81E+01	e	8.61E-01	e	8.61E-01	e	8.61E-01
Cyclopentane	287-92-3	2.32E+01	e	7.14E-01	e	7.14E-01	e	7.14E-01
Ethyl alcohol	64-17-5	6.09E-02	e	5.85E+01	e	5.85E+01	e	5.85E+01
Ethyl ether	60-29-7	5.25E-01	e	1.18E+01	e	1.18E+01	e	1.18E+01
Ethyl methacrylate	97-63-2	1.85E+00	c	4.67E+00	c	4.67E+00	c	4.67E+00
Formaldehyde	50-00-0	1.96E-01	c	2.46E+01	c	2.46E+01	c	2.46E+01
Formamide	75-12-7	7.05E-03	e	2.89E+02	e	2.89E+02	e	2.89E+02
Formic acid	64-18-6	4.04E-02	h	7.92E+01	c	7.92E+01	c	7.92E+01
Formic acid, methyl ester	107-31-3	6.61E-02	e	5.50E+01	e	5.50E+01	e	5.50E+01
Glycidylaldehyde	765-34-4	7.50E-02	e	4.54E+01	e	4.54E+01	e	4.54E+01
Methyl acetate	79-20-9	2.44E-01	c	2.09E+01	c	2.09E+01	c	2.09E+01
Methyl alcohol	67-56-1	2.97E-02	c	9.96E+01	c	9.96E+01	c	9.96E+01
Methyl isocyanate	624-83-9	NA	NA	NA	NA	NA	NA	NA
Methyl methacrylate	80-62-6	4.73E+00	e	1.35E+01	e	1.35E+01	e	1.35E+01
Methyl tert-butyl ether	1634-04-4	5.74E-01	e	1.11E+01	e	1.11E+01	e	1.11E+01
Methylacetylene	74-99-7	5.74E-01	e	1.11E+01	e	1.11E+01	e	1.11E+01
Methylcyclohexane	108-87-2	1.68E+02	e	1.65E-01	e	1.65E-01	e	1.65E-01
N,N-Dimethylacetamide	127-19-5	NA	NA	NA	NA	NA	NA	NA
n-Butyl alcohol	71-36-3	5.16E-01	e	1.20E+01	e	1.20E+01	e	1.20E+01
n-Heptane	142-82-5	4.58E+02	e	7.84E-02	e	7.84E-02	e	7.84E-02
n-Hexane	110-54-3	1.71E+02	e	1.63E-01	e	1.63E-01	e	1.63E-01
Nitromethane	75-52-5	5.66E-02	e	6.17E+01	e	6.17E+01	e	6.17E+01
n-Nonane	111-84-2	2.71E+03	e	2.10E-02	e	2.10E-02	e	2.10E-02
n-Octane	111-65-9	1.40E+02	e	1.89E-01	e	1.89E-01	e	1.89E-01
n-Pentane	109-66-0	3.39E+01	e	5.40E-01	e	5.40E-01	e	5.40E-01
n-Propionaldehyde	123-38-6	3.06E-01	e	1.77E+01	e	1.77E+01	e	1.77E+01
n-Propyl alcohol	71-23-8	1.66E-01	e	2.78E+01	e	2.78E+01	e	2.78E+01
n-Valeraldehyde	110-62-3	NA	NA	NA	NA	NA	NA	NA
Oxirane	75-21-8	6.19E-02	c	5.77E+01	c	5.77E+01	c	5.77E+01

Table B1-1 Chemical-Specific Parameters for Organic COPCs

Chemical of Potential Concern	CAS Registry Number	Plant Uptake Factors							
		$Br_{rootveg}$ (µg/g DW plant)/ (µg/g soil)	Source	Bv_{ag} (µg/g DW plant)/ (µg/g air)	Source	Bv_{forage} (µg/g DW plant)/ (µg/g air)	Source	RCF (µg/g DW plant)/ (µg/mL soil water)	Source
Cyclohexene	110-83-8	1.80E+01	e	1.57E-03	e	1.57E-03	e	4.33E+01	e
Cyclopentane	287-92-3	1.73E+01	e	4.72E-04	e	4.72E-04	e	5.37E+01	e
Ethyl alcohol	64-17-5	7.94E+02	e	4.17E-03	e	4.17E-03	e	6.44E+00	e
Ethyl ether	60-29-7	1.06E+02	e	3.86E-04	e	3.86E-04	e	7.43E+00	e
Ethyl methacrylate	97-63-2	4.14E+01	c	2.00E-02	c	2.00E-02	c	1.02E+01	c
Formaldehyde	50-00-0	2.57E+02	c	4.65E-04	c	4.65E-04	c	6.73E+00	c
Formamide	75-12-7	6.73E+03	e	9.96E-01	e	9.96E-01	e	6.32E+00	e
Formic acid	64-18-6	1.19E+03	h	6.02E-03	c	6.02E-03	c	6.40E+00	c
Formic acid, methyl ester	107-31-3	7.32E+02	e	1.32E-04	e	1.32E-04	e	6.45E+00	e
Glycidylaldehyde	765-34-4	6.50E+02	e	5.34E-02	e	5.34E-02	e	6.50E+00	e
Methyl acetate	79-20-9	2.10E+02	c	2.01E-03	c	2.01E-03	c	6.84E+00	c
Methyl alcohol	67-56-1	1.61E+03	c	6.82E-05	c	6.82E-05	c	6.37E+00	c
Methyl isocyanate	624-83-9	NA	NA	NA	NA	NA	NA	NA	NA
Methyl methacrylate	80-62-6	1.15E+01	e	1.22E-03	e	1.22E-03	e	7.25E+00	e
Methyl tert-butyl ether	1634-04-4	9.84E+01	e	9.55E-04	e	9.55E-04	e	7.54E+00	e
Methylacetylene	74-99-7	9.84E+01	e	5.11E-05	e	5.11E-05	e	7.54E+00	e
Methylcyclohexane	108-87-2	1.52E+01	e	2.99E-03	e	2.99E-03	e	3.40E+02	e
N,N-Dimethylacetamide	127-19-5	NA	NA	NA	NA	NA	NA	NA	NA
n-Butyl alcohol	71-36-3	1.08E+02	e	5.70E-02	e	5.70E-02	e	7.41E+00	e
n-Heptane	142-82-5	1.48E+01	e	2.26E-03	e	2.26E-03	e	9.06E+02	e
n-Hexane	110-54-3	1.52E+01	e	7.35E-04	e	7.35E-04	e	3.46E+02	e
Nitromethane	75-52-5	8.52E+02	e	8.32E-04	e	8.32E-04	e	6.43E+00	e
n-Nonane	111-84-2	1.44E+01	e	1.18E-02	e	1.18E-02	e	5.21E+03	e
n-Octane	111-65-9	1.53E+01	e	3.15E-04	e	3.15E-04	e	2.86E+02	e
n-Pentane	109-66-0	1.66E+01	e	1.17E-04	e	1.17E-04	e	7.51E+01	e
n-Propionaldehyde	123-38-6	1.71E+02	e	3.21E-03	e	3.21E-03	e	6.97E+00	e
n-Propyl alcohol	71-23-8	3.01E+02	e	1.40E-02	e	1.40E-02	e	6.67E+00	e
n-Valeraldehyde	110-62-3	NA	NA	NA	NA	NA	NA	NA	NA
Oxirane	75-21-8	7.80E+02	c	1.60E-04	c	1.60E-04	c	6.44E+00	c

Table B1-1 Chemical-Specific Parameters for Organic COPCs

Chemical of Potential Concern	CAS Registry Number	Bioconcentration/Bioaccumulation Factors									
		Ba_{beef} (day/kg FW)	Source	$Ba_{chicken}$ (day/kg FW)	Source	Ba_{egg} (day/kg FW)	Source	Ba_{milk} (day/kg FW)	Source	Ba_{pork} (day/kg FW)	Source
Cyclohexene	110-83-8	1.82E-05	e	1.44E-05	e	5.75E-03	e	5.75E-06	e	2.20E-05	e
Cyclopentane	287-92-3	2.51E-05	e	1.98E-05	e	7.94E-03	e	7.94E-06	e	3.04E-05	e
Ethyl alcohol	64-17-5	1.23E-08	e	9.71E-09	e	3.89E-06	e	3.89E-09	e	1.49E-08	e
Ethyl ether	60-29-7	1.95E-07	e	1.54E-07	e	6.17E-05	e	6.17E-08	e	2.36E-07	e
Ethyl methacrylate	97-63-2	9.77E-07	c	7.71E-07	c	3.09E-04	c	3.09E-07	c	1.18E-06	c
Formaldehyde	50-00-0	5.53E-08	c	4.36E-08	c	1.75E-05	c	1.75E-08	c	6.69E-08	c
Formamide	75-12-7	7.76E-10	e	6.13E-10	e	2.45E-07	e	2.45E-10	e	9.40E-10	e
Formic acid	64-18-6	7.28E-09	c	5.75E-09	c	2.30E-06	c	2.30E-09	c	8.82E-09	c
Formic acid, methyl ester	107-31-3	1.37E-08	e	1.08E-08	e	4.33E-06	e	4.33E-09	e	1.66E-08	e
Glycidylaldehyde	765-34-4	1.91E-08	e	1.50E-08	e	6.03E-06	e	6.03E-09	e	2.31E-08	e
Methyl acetate	79-20-9	7.28E-08	c	5.75E-08	c	2.30E-05	c	2.30E-08	c	8.82E-08	c
Methyl alcohol	67-56-1	4.30E-09	c	3.39E-09	c	1.55E-06	c	1.30E-09	c	5.21E-09	c
Methyl isocyanate	624-83-9	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Methyl methacrylate	80-62-6	1.55E-07	e	1.22E-07	e	4.90E-05	e	4.90E-08	e	1.87E-07	e
Methyl tert-butyl ether	1634-04-4	2.19E-07	e	1.73E-07	e	6.92E-05	e	6.92E-08	e	2.65E-07	e
Methylacetylene	74-99-7	2.19E-07	e	1.73E-07	e	6.92E-05	e	6.92E-08	e	2.65E-07	e
Methylcyclohexane	108-87-2	3.16E-04	e	2.50E-04	e	1.00E-01	e	1.00E-04	e	3.83E-04	e
N,N-Dimethylacetamide	127-19-5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
n-Butyl alcohol	71-36-3	1.91E-07	e	1.50E-07	e	6.03E-05	e	6.03E-08	e	2.31E-07	e
n-Heptane	142-82-5	1.15E-03	e	9.06E-04	e	3.63E-01	e	3.63E-04	e	1.39E-03	e
n-Hexane	110-54-3	3.24E-04	e	2.55E-04	e	1.02E-01	e	1.02E-04	e	3.92E-04	e
Nitromethane	75-52-5	1.12E-08	e	8.86E-09	e	3.55E-06	e	3.55E-09	e	1.36E-08	e
n-Nonane	111-84-2	1.12E-02	e	8.86E-03	e	3.55E+00	e	3.55E-03	e	1.36E-02	e
n-Octane	111-65-9	2.51E-04	e	1.98E-04	e	7.94E-02	e	7.94E-05	e	3.04E-04	e
n-Pentane	109-66-0	4.07E-05	e	3.22E-05	e	1.29E-02	e	1.29E-05	e	4.93E-05	e
n-Propionaldehyde	123-38-6	9.77E-08	e	7.72E-08	e	3.09E-05	e	3.09E-08	e	1.18E-07	e
n-Propyl alcohol	71-23-8	4.47E-08	e	3.53E-08	e	1.41E-05	e	1.41E-08	e	5.41E-08	e
n-Valeraldehyde	110-62-3	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Oxirane	75-21-8	1.26E-08	c	9.94E-09	c	3.98E-06	c	3.98E-09	c	1.52E-08	c

Table B1-1 Chemical-Specific Parameters for Organic COPCs

Chemical of Potential Concern	CAS Registry Number	Bioconcentration/Bioaccumulation Factors						Half-life	
		BAF_{fish} (L/kg FW)	Source	BCF_{fish} (L/kg FW)	Source	$BSAF_{fish}$ (unitless)	Source	$t_{1/2}$ (days)	Source
Cyclohexene	110-83-8	NA	NA	8.78E+01	e	NA	NA	NA	NA
Cyclopentane	287-92-3	NA	NA	1.12E+02	e	NA	NA	NA	NA
Ethyl alcohol	64-17-5	NA	NA	3.42E-01	e	NA	NA	1.00E+00	d
Ethyl ether	60-29-7	NA	NA	2.80E+00	e	NA	NA	NA	NA
Ethyl methacrylate	97-63-2	NA	NA	9.51E+00	c	NA	NA	NA	NA
Formaldehyde	50-00-0	NA	NA	3.35E-01	s	NA	NA	NA	NA
Formamide	75-12-7	NA	NA	4.19E-02	e	NA	NA	NA	NA
Formic acid	64-18-6	NA	NA	2.30E-01	c	NA	NA	NA	NA
Formic acid, methyl ester	107-31-3	NA	NA	3.71E-01	e	NA	NA	NA	NA
Glycidylaldehyde	765-34-4	NA	NA	4.77E-01	e	NA	NA	2.80E+01	d
Methyl acetate	79-20-9	NA	NA	1.32E+00	c	NA	NA	NA	NA
Methyl alcohol	67-56-1	NA	NA	1.70E-01	c	NA	NA	NA	NA
Methyl isocyanate	624-83-9	NA	NA	NA	NA	NA	NA	1.36E-02	d
Methyl methacrylate	80-62-6	NA	NA	2.35E+00	e	NA	NA	2.80E+01	d
Methyl tert-butyl ether	1634-04-4	NA	NA	3.05E+00	e	NA	NA	1.80E+02	d
Methylacetylene	74-99-7	NA	NA	3.05E+00	e	NA	NA	NA	NA
Methylcyclohexane	108-87-2	1.20E+02	m	NA	NA	NA	NA	NA	NA
N,N-Dimethylacetamide	127-19-5	NA	NA	NA	NA	NA	NA	NA	NA
n-Butyl alcohol	71-36-3	NA	NA	2.75E+00	e	NA	NA	7.00E+00	d
n-Heptane	142-82-5	7.73E+02	m	NA	NA	NA	NA	NA	NA
n-Hexane	110-54-3	1.15E+03	r	NA	NA	NA	NA	NA	NA
Nitromethane	75-52-5	NA	NA	3.19E-01	e	NA	NA	NA	NA
n-Nonane	111-84-2	NA	NA	NA	NA	NA	NA	NA	NA
n-Octane	111-65-9	NA	NA	6.46E+02	e	NA	NA	NA	NA
n-Pentane	109-66-0	NA	NA	1.62E+02	e	NA	NA	NA	NA
n-Propionaldehyde	123-38-6	NA	NA	1.65E+00	e	NA	NA	7.00E+00	d
n-Propyl alcohol	71-23-8	NA	NA	9.12E-01	e	NA	NA	NA	NA
n-Valeraldehyde	110-62-3	NA	NA	NA	NA	NA	NA	NA	NA
Oxirane	75-21-8	NA	NA	3.48E-01	c	NA	NA	NA	NA

Table B1-1 Chemical-Specific Parameters for Organic COPCs

Chemical of Potential Concern	CAS Registry Number	Soil Loss Mechanisms [g]											
		k_{decay} $(year)^{-1}$	Source	ks_e $(year)^{-1}$			Source	ks_g $(year)^{-1}$	Source	ks_l $(year)^{-1}$			Source
				1 cm	15 cm	20 cm				1 cm	15 cm	20 cm	
Cyclohexene	110-83-8	0.0E+00	NA	4.97E-03	3.31E-04	2.48E-04	e	0.0E+00	NA	1.26E+00	8.38E-02	6.28E-02	e
Cyclopentane	287-92-3	0.0E+00	NA	5.03E-03	3.36E-04	2.52E-04	e	0E+00	NA	9.90E-01	6.60E-02	4.95E-02	e
Ethyl alcohol	64-17-5	0.0E+00	NA	2.65E-04	1.76E-05	1.32E-05	e	2.53E+02	e	1.99E+01	1.33E+00	9.94E-01	e
Ethyl ether	60-29-7	0.0E+00	NA	1.65E-03	1.10E-04	8.26E-05	e	0.0E+00	NA	1.44E+01	9.59E-01	7.19E-01	e
Ethyl methacrylate	97-63-2	0.0E+00	NA	3.25E-03	2.17E-04	1.63E-04	e	0.0E+00	NA	8.05E+00	5.37E-01	4.03E-01	e
Formaldehyde	50-00-0	0.0E+00	NA	7.69E-04	5.13E-05	3.84E-05	e	3.61E+01	c	1.79E+01	1.19E+00	8.94E-01	e
Formamide	75-12-7	0.0E+00	NA	3.21E-05	2.14E-06	1.60E-06	e	0.0E+00	NA	2.08E+01	1.39E+00	1.04E+00	e
Formic acid	64-18-6	0.0E+00	NA	1.79E-04	1.19E-05	8.94E-06	e	3.61E+01	c	2.02E+01	1.35E+00	1.01E+00	e
Formic acid, methyl ester	107-31-3	0.0E+00	NA	2.86E-04	1.91E-05	1.43E-05	e	0.0E+00	NA	1.98E+01	1.32E+00	9.90E-01	e
Glycidylaldehyde	765-34-4	0.0E+00	NA	3.23E-04	2.15E-05	1.61E-05	e	9.03E+00	e	1.97E+01	1.31E+00	9.83E-01	e
Methyl acetate	79-20-9	0.0E+00	NA	9.22E-04	6.14E-05	4.61E-05	e	0.0E+00	NA	1.73E+01	1.15E+00	8.64E-01	e
Methyl alcohol	67-56-1	0.0E+00	NA	1.33E-04	8.84E-06	6.63E-06	e	3.61E+01	c	2.04E+01	1.36E+00	1.02E+00	e
Methyl isocyanate	624-83-9	0.0E+00	NA	0.0E+00	0.0E+00	0.0E+00	NA	1.9E+04	e	0.0E+00	0.0E+00	0.0E+00	NA
Methyl methacrylate	80-62-6	0.0E+00	NA	4.25E-03	2.83E-04	2.12E-04	e	9.03E+00	e	4.10E+00	2.74E-01	2.05E-01	e
Methyl tert-butyl ether	1634-04-4	0.0E+00	NA	1.76E-03	1.17E-04	8.78E-05	e	1.41E+00	e	1.40E+01	9.32E-01	6.99E-01	e
Methylacetylene	74-99-7	0.0E+00	NA	1.76E-03	1.17E-04	8.78E-05	e	0.0E+00	NA	1.40E+01	9.32E-01	6.99E-01	e
Methylcyclohexane	108-87-2	0.0E+00	NA	5.25E-03	3.50E-04	2.62E-04	e	0.0E+00	NA	1.43E-01	9.55E-03	7.16E-03	e
N,N-Dimethylacetamide	127-19-5	0.0E+00	NA	0.0E+00	0.0E+00	0.0E+00	NA	0.0E+00	NA	0.0E+00	0.0E+00	0.0E+00	NA
n-Butyl alcohol	71-36-3	0.0E+00	NA	1.63E-03	1.09E-04	8.16E-05	e	3.61E+01	e	1.45E+01	9.64E-01	7.23E-01	e
n-Heptane	142-82-5	0.0E+00	NA	5.27E-03	3.51E-04	2.64E-04	e	0.0E+00	NA	5.26E-02	3.51E-03	2.63E-03	e
n-Hexane	110-54-3	0.0E+00	NA	5.25E-03	3.50E-04	2.62E-04	e	0.0E+00	NA	1.41E-01	9.38E-03	7.03E-03	e
Nitromethane	75-52-5	0.0E+00	NA	2.47E-04	1.65E-05	1.24E-05	e	0.0E+00	NA	2.00E+01	1.33E+00	9.98E-01	e
n-Nonane	111-84-2	0.0E+00	NA	5.28E-03	3.52E-04	2.64E-04	e	0.0E+00	NA	8.91E-03	5.94E-04	4.45E-04	e
n-Octane	111-65-9	0.0E+00	NA	5.24E-03	3.49E-04	2.62E-04	e	0.0E+00	NA	1.71E-01	1.14E-02	8.56E-03	e
n-Pentane	109-66-0	0.0E+00	NA	5.11E-03	3.41E-04	2.56E-04	e	0.0E+00	NA	6.90E-01	4.60E-02	3.45E-02	e
n-Propionaldehyde	123-38-6	0.0E+00	NA	1.11E-03	7.39E-05	5.54E-05	e	3.61E+01	e	1.65E+01	1.10E+00	8.27E-01	e
n-Propyl alcohol	71-23-8	0.0E+00	NA	6.66E-04	4.44E-05	3.33E-05	e	0.0E+00	NA	1.83E+01	1.22E+00	9.15E-01	e
n-Valeraldehyde	110-62-3	0.0E+00	NA	0.0E+00	0.0E+00	0.0E+00	NA	0.0E+00	NA	0.0E+00	0.0E+00	0.0E+00	NA
Oxirane	75-21-8	0.0E+00	NA	2.69E-04	1.80E-05	1.35E-05	e	2.13E+01	c	1.99E+01	1.32E+00	9.93E-01	e

Table B1-1 Chemical-Specific Parameters for Organic COPCs

Chemical of Potential Concern	CAS Registry Number	Soil Loss Mechanisms [g]								Kp (cm/hr)	Source
		ks_r $(year)^{-1}$			Source	ks_v $(year)^{-1}$			Source		
		1 cm	15 cm	20 cm		1 cm	15 cm	20 cm			
Cyclohexene	110-83-8	7.50E-01	5.00E-02	3.75E-02	e	5.10E+05	2.27E+03	1.27E+03	f	4.53E-02	aa
Cyclopentane	287-92-3	5.91E-01	3.94E-02	2.96E-02	e	2.06E+06	9.16E+03	5.15E+03	f	6.57E-02	aa
Ethyl alcohol	64-17-5	1.19E+01	7.92E-01	5.94E-01	e	3.52E+04	1.56E+02	8.79E+01	f	5.40E-04	ab
Ethyl ether	60-29-7	8.59E+00	5.73E-01	4.30E-01	e	4.18E+05	1.86E+03	1.04E+03	f	2.30E-03	ab
Ethyl methacrylate	97-63-2	4.81E+00	3.21E-01	2.40E-01	e	1.39E+04	6.17E+01	3.47E+01	f	4.23E-03	aa
Formaldehyde	50-00-0	1.07E+01	7.12E-01	5.34E-01	e	1.63E+06	7.24E+03	4.07E+03	f	1.80E-03	ab
Formamide	75-12-7	1.24E+01	8.28E-01	6.21E-01	e	6.80E+01	3.02E-01	1.70E-01	f	8.63E-05	aa
Formic acid	64-18-6	1.21E+01	8.05E-01	6.04E-01	e	3.15E+04	1.40E+02	7.87E+01	f	3.82E-04	aa
Formic acid, methyl ester	107-31-3	1.18E+01	7.88E-01	5.91E-01	e	9.60E+05	4.27E+03	2.40E+03	f	4.86E-04	aa
Glycidylaldehyde	765-34-4	1.17E+01	7.82E-01	5.87E-01	e	2.63E+03	1.17E+01	6.58E+00	f	5.20E-04	aa
Methyl acetate	79-20-9	1.03E+01	6.88E-01	5.16E-01	e	1.00E+05	4.46E+02	2.51E+02	f	1.24E-03	aa
Methyl alcohol	67-56-1	1.22E+01	8.12E-01	6.09E-01	e	5.11E+06	2.27E+04	1.28E+04	f	3.20E-04	ab
Methyl isocyanate	624-83-9	0.0E+00	0E+00	0E+00	NA	0E+00	0E+00	0E+00	NA	NA	NA
Methyl methacrylate	80-62-6	2.45E+00	1.63E-01	1.23E-01	e	1.19E+04	5.29E+01	2.97E+01	f	1.47E-03	aa
Methyl tert-butyl ether	1634-04-4	8.35E+00	5.56E-01	4.17E-01	e	2.42E+05	1.07E+03	6.04E+02	f	2.17E-03	aa
Methylacetylene	74-99-7	8.35E+00	5.56E-01	4.17E-01	e	7.14E+06	3.18E+04	1.79E+04	f	4.03E-03	aa
Methylcyclohexane	108-87-2	8.55E-02	5.70E-03	4.28E-03	e	5.35E+05	2.38E+03	1.34E+03	f	2.50E-01	aa
N,N-Dimethylacetamide	127-19-5	0.0E+00	0E+00	0E+00	NA	0E+00	0E+00	0E+00	NA	NA	NA
n-Butyl alcohol	71-36-3	8.64E+00	5.76E-01	4.32E-01	e	3.04E+03	1.35E+01	7.60E+00	f	2.30E-03	ab
n-Heptane	142-82-5	3.14E-02	2.09E-03	1.57E-03	e	1.01E+06	4.48E+03	2.52E+03	f	5.77E-01	aa
n-Hexane	110-54-3	8.40E-02	5.60E-03	4.20E-03	e	2.39E+06	1.06E+04	5.98E+03	f	2.96E-01	aa
Nitromethane	75-52-5	1.19E+01	7.94E-01	5.96E-01	e	1.42E+05	6.32E+02	3.55E+02	f	4.20E-04	aa
n-Nonane	111-84-2	5.32E-03	3.55E-04	2.66E-04	e	3.14E+05	1.40E+03	7.85E+02	f	1.85E+00	aa
n-Octane	111-65-9	1.02E-01	6.81E-03	5.11E-03	e	4.29E+06	1.91E+04	1.07E+04	f	1.74E-01	aa
n-Pentane	109-66-0	4.12E-01	2.75E-02	2.06E-02	e	9.37E+06	4.16E+04	2.34E+04	f	8.84E-02	aa
n-Propionaldehyde	123-38-6	9.88E+00	6.58E-01	4.94E-01	e	7.05E+04	3.14E+02	1.76E+02	f	1.86E-03	aa
n-Propyl alcohol	71-23-8	1.09E+01	7.28E-01	5.46E-01	e	1.27E+04	5.63E+01	3.17E+01	f	1.10E-03	ab
n-Valeraldehyde	110-62-3	0.0E+00	0.0E+00	0.0E+00	NA	0.0E+00	0.0E+00	0.0E+00	NA	NA	NA
Oxirane	75-21-8	1.19E+01	7.91E-01	5.93E-01	e	1.68E+06	7.47E+03	4.20E+03	f	5.60E-04	ab

Table B1-1 Chemical-Specific Parameters for Organic COPCs

Chemical of Potential Concern	CAS Registry Number	Fraction		MW	pH	Henry's Constant			Diffusivity			
		F_v (unitless)	Source	(g/mol)		H-pub [x] (various units)	Source	H-used [x] (atm-m^3/mol)	D_a (cm^2/s)	Source	D_w (cm^2/s)	Source
p-Cymene	99-87-6	0 or 1	b	134.22	NA	8.00E-01	n	7.92E-03	7.25E-02	e	8.39E-06	e
Phosgene	75-44-5	0 or 1	b	98.916	NA	NA	NA	NA	8.88E-02	e	1.03E-05	e
Propargyl alcohol	107-19-7	0 or 1	b	56.06	NA	4.70E-05	m	1.15E-06	1.81E-01	j	1.33E-05	j
Propionic acid	79-09-4	0 or 1	b	74.08	NA	4.50E-02	i	4.46E-07	1.08E-01	e	1.25E-05	e
Propionitrile	107-12-0	0 or 1	b	55.079	NA	3.75E+00	i	3.71E-05	1.31E-01	e	1.52E-05	e
Propylene glycol monomethyl ether	107-98-2	0 or 1	b	90	NA	3.76E-05	m	9.17E-07	7.17E-02	j	9.73E-06	j
p-tert-Butyltoluene	98-51-1	0 or 1	b	148.25	NA	6.28E-01	k	1.53E-02	6.78E-02	e	7.85E-06	e
Triethylamine	121-44-8	0 or 1	b	101.19	NA	NA	e	7.45E+01	8.81E-02	j	7.88E-06	j
Trimethylamine	75-50-3	0 or 1	b	59.11	NA	1.05E+01	i	1.04E-04	1.25E-01	e	1.45E-05	e
Vinyl acetate	108-05-4	0 or 1	b	86.09	NA	5.50E-04	c	5.50E-04	9.94E-02	c	1.00E-05	c
Non-aromatic Halogenated Hydrocarbons												
1,1,1,2-Tetrachloro-2,2-difluoroethane	76-11-9	0 or 1	b	203.83	NA	6.02E+00	k	1.47E-01	5.49E-02	e	6.35E-06	e
1,1,1,2-Tetrachloroethane	630-20-6	0 or 1	b	167.85	NA	2.44E-03	c	2.44E-03	3.15E-02	c	9.30E-06	c
1,1,1-Trichloroethane	71-55-6	0 or 1	b	133.42	NA	1.86E-02	c	1.86E-02	4.66E-02	s	9.56E-06	c
1,1,2,2-Tetrachloro-1,2-difluoroethane	76-12-0	0 or 1	b	203.83	NA	9.87E+03	i	9.77E-02	5.49E-02	e	6.35E-06	e
1,1,2,2-Tetrachloroethane	79-34-5	0 or 1	b	167.86	NA	3.72E-04	c	3.72E-04	3.16E-02	c	9.26E-06	c
1,1,2,2-Tetrachloroethene	127-18-4	0 or 1	b	165.85	NA	1.73E-02	c	1.73E-02	7.20E-02	c	8.20E-06	c
1,1,2-Trichloroethane	79-00-5	0 or 1	b	133.42	NA	1.00E-03	c	1.00E-03	4.51E-02	c	1.00E-05	c
1,1,2-Trichloroethylene	79-01-6	0 or 1	b	131.4	NA	1.06E-02	c	1.06E-02	4.65E-02	c	9.94E-06	c
1,1-Dichloroethane	75-34-3	0 or 1	b	98.97	NA	5.75E-03	c	5.75E-03	7.42E-02	c	1.05E-05	c
1,1-Dichloroethene	75-35-4	0 or 1	b	96.95	NA	2.55E-02	c	2.55E-02	7.53E-02	c	1.09E-05	c
1,2,2-Trichloro-1,1,2-trifluoroethane	76-13-1	0 or 1	b	187.38	NA	5.33E+04	i	5.28E-01	2.88E-02	j	8.07E-06	j
1,2,3-Trichloropropane	96-18-4	0 or 1	b	147.43	NA	3.80E-04	c	3.80E-04	3.99E-02	c	9.24E-06	c
1,2-Dibromo-3-chloropropane	96-12-8	0 or 1	b	236.36	NA	1.97E-04	c	1.97E-04	1.79E-02	c	8.79E-06	c
1,2-Dichloro-1,1,2,2-tetrafluoroethane	76-14-2	0 or 1	b	170.92	NA	1.15E+02	k	2.79E+00	6.17E-02	e	7.14E-06	e
1,2-Dichloroethane	107-06-2	0 or 1	b	98.96	NA	1.27E-03	c	1.27E-03	7.19E-02	c	1.10E-05	c
1,2-Dichloroethylene	540-59-0	0 or 1	b	96.94	NA	7.61E-01	n	7.53E-03	9.00E-02	e	1.04E-05	e
1,2-Dichloropropane	78-87-5	0 or 1	b	112.99	NA	2.81E-03	c	2.81E-03	6.21E-02	c	9.71E-06	c
1,3-Dichloropropene	542-75-6	0 or 1	b	110.98	NA	2.94E-03	c	2.94E-03	6.26E-02	c	1.00E-05	c

Table B1-1 Chemical-Specific Parameters for Organic COPCs

Chemical of Potential Concern	CAS Registry Number	Octanol / Water Partitioning Coefficients						Partitioning Coefficients (Kd)			
		K_{oc}-pub [y] (various units)	Source	K_{oc}-used [z] (mL/g)	K_{ow}-pub [y] (various units)	Source	K_{ow}-used [z] (unitless)	Kd_{bs} (L/kg)	Source	Kd_s (mL/g)	Source
p-Cymene	99-87-6	NA	e	2.23E+03	4.10E+00	l	1.26E+04	8.93E+01	e	2.23E+01	e
Phosgene	75-44-5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Propargyl alcohol	107-19-7	1.33E+00	m	1.33E+00	-3.80E-01	m	4.17E-01	5.30E-02	e	1.33E-02	e
Propionic acid	79-09-4	NA	e	2.56E+00	3.30E-01	i	2.14E+00	1.02E-01	e	2.56E-02	e
Propionitrile	107-12-0	NA	e	1.89E+00	1.60E-01	i	1.45E+00	7.55E-02	e	1.89E-02	e
Propylene glycol monomethyl ether	107-98-2	1.00E+00	m	1.00E+00	-4.90E-01	m	3.24E-01	4.00E-02	e	1.00E-02	e
p-tert-Butyltoluene	98-51-1	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Triethylamine	121-44-8	1.07E+02	m	1.07E+02	1.45E+00	m	2.82E+01	4.29E+00	e	1.07E+00	e
Trimethylamine	75-50-3	6.02E-01	i	4.00E+00	1.60E-01	i	1.45E+00	1.60E-01	e	4.00E-02	e
Vinyl acetate	108-05-4	4.97E+00	c	4.97E+00	5.00E+00	c	5.00E+00	1.99E-01	c	4.97E-02	c
Non-aromatic Halogenated Hydrocarbons											
1,1,1,2-Tetrachloro-2,2-difluoroethane	76-11-9	3.47E+02	p	3.47E+02	3.41E+00	p	2.57E+03	1.39E+01	e	3.47E+00	e
1,1,1,2-Tetrachloroethane	630-20-6	1.59E+02	c	1.59E+02	4.27E+02	c	4.27E+02	6.37E+00	c	1.59E+00	c
1,1,1-Trichloroethane	71-55-6	1.35E+05	c	1.35E+05	2.64E+02	c	2.64E+02	5.40E+03	c	1.35E+03	c
1,1,2,2-Tetrachloro-1,2-difluoroethane	76-12-0	2.50E+00	i	3.16E+02	3.73E+00	i	5.37E+03	1.26E+01	e	3.16E+00	e
1,1,2,2-Tetrachloroethane	79-34-5	7.90E+01	c	7.90E+01	4.40E+04	c	4.40E+04	3.16E+00	c	7.90E-01	c
1,1,2,2-Tetrachloroethene	127-18-4	2.65E+02	c	2.65E+02	3.51E+02	c	3.51E+02	1.06E+01	c	2.65E+00	c
1,1,2-Trichloroethane	79-00-5	7.50E+01	c	7.50E+01	1.25E+02	c	1.25E+02	3.00E+00	c	7.50E-01	c
1,1,2-Trichloroethylene	79-01-6	9.40E+01	c	9.40E+01	2.71E+02	c	2.71E+02	3.76E+00	c	9.40E-01	c
1,1-Dichloroethane	75-34-3	5.30E+01	c	5.30E+01	6.20E+01	c	6.20E+01	2.12E+00	c	5.30E-01	c
1,1-Dichloroethene	75-35-4	6.50E+01	c	6.50E+01	1.32E+02	c	1.32E+02	2.60E+00	c	6.50E-01	c
1,2,2-Trichloro-1,1,2-trifluoroethane	76-13-1	2.41E+00	i	2.57E+02	3.16E+00	i	1.45E+03	1.03E+01	e	2.57E+00	e
1,2,3-Trichloropropane	96-18-4	8.05E+01	c	8.05E+01	1.78E+02	c	1.78E+02	3.22E+00	c	8.10E-01	c
1,2-Dibromo-3-chloropropane	96-12-8	9.47E+01	c	9.47E+01	2.19E+02	c	2.19E+02	3.79E+00	c	9.47E-01	c
1,2-Dichloro-1,1,2,2-tetrafluoroethane	76-14-2	NA	e	2.24E+02	2.82E+00	l	6.61E+02	8.97E+00	e	2.24E+00	e
1,2-Dichloroethane	107-06-2	1.96E+01	c	1.96E+01	2.90E+01	c	2.90E+01	7.83E-01	c	1.96E-01	c
1,2-Dichloroethylene	540-59-0	4.38E+01	m	4.38E+01	2.09E+00	m	1.23E+02	1.75E+00	e	4.38E-01	e
1,2-Dichloropropane	78-87-5	4.70E+01	c	4.70E+01	1.78E+02	c	1.78E+02	1.88E+00	c	4.70E-01	c
1,3-Dichloropropene	542-75-6	2.70E+01	c	2.70E+01	5.60E+01	c	5.60E+01	1.08E+00	c	2.70E-01	c

Table B1-1 Chemical-Specific Parameters for Organic COPCs

Chemical of Potential Concern	CAS Registry Number	Kd		Plant Uptake Factors				
		Kd_{sw} (L/kg)	Source	Br_{ag} (µg/g DW plant)/ (µg/g soil)	Source	Br_{forage} (µg/g DW plant)/ (µg/g soil)	Source	Br_{grain} (µg/g DW plant)/ (µg/g soil) [a]
p-Cymene	99-87-6	1.68E+02	e	1.65E-01	e	1.65E-01	e	1.65E-01
Phosgene	75-44-5	NA	NA	NA	NA	NA	NA	NA
Propargyl alcohol	107-19-7	9.94E-02	e	6.42E+01	e	6.42E+01	e	6.42E+01
Propionic acid	79-09-4	1.92E-01	e	2.50E+01	e	2.50E+01	e	2.50E+01
Propionitrile	107-12-0	1.42E-01	e	3.13E+01	e	3.13E+01	e	3.13E+01
Propylene glycol monomethyl ether	107-98-2	7.50E-02	e	7.43E+01	e	7.43E+01	e	7.43E+01
p-tert-Butyltoluene	98-51-1	NA	NA	NA	NA	NA	NA	NA
Triethylamine	121-44-8	8.04E+00	e	5.62E+00	e	5.62E+00	e	5.62E+00
Trimethylamine	75-50-3	3.00E-01	e	3.13E+01	e	3.13E+01	e	3.13E+01
Vinyl acetate	108-05-4	3.73E-01	c	1.53E+01	c	1.53E+01	c	1.53E+01
Non-aromatic Halogenated Hydrocarbons								
1,1,1,2-Tetrachloro-2,2-difluoroethane	76-11-9	2.60E+01	e	4.14E-01	e	4.14E-01	e	4.14E-01
1,1,1,2-Tetrachloroethane	630-20-6	1.20E+01	c	1.17E+00	c	1.17E+00	c	1.17E+00
1,1,1-Trichloroethane	71-55-6	1.01E+04	c	1.54E+00	c	1.54E+00	c	1.54E+00
1,1,2,2-Tetrachloro-1,2-difluoroethane	76-12-0	2.37E+01	e	2.70E-01	e	2.70E-01	e	2.70E-01
1,1,2,2-Tetrachloroethane	79-34-5	5.93E+00	c	8.02E-02	c	8.02E-02	c	8.02E-02
1,1,2,2-Tetrachloroethene	127-18-4	1.99E+01	c	1.31E+00	c	1.31E+00	c	1.31E+00
1,1,2-Trichloroethane	79-00-5	5.63E+00	c	2.38E+00	c	2.38E+00	c	2.38E+00
1,1,2-Trichloroethylene	79-01-6	7.05E+00	c	1.52E+00	c	1.52E+00	c	1.52E+00
1,1-Dichloroethane	75-34-3	3.98E+00	c	3.56E+00	c	3.56E+00	c	3.56E+00
1,1-Dichloroethene	75-35-4	4.88E+00	c	2.30E+00	c	2.30E+00	c	2.30E+00
1,2,2-Trichloro-1,1,2-trifluoroethane	76-13-1	1.93E+01	e	5.77E-01	e	5.77E-01	e	5.77E-01
1,2,3-Trichloropropane	96-18-4	6.04E+00	c	1.94E+00	c	1.94E+00	c	1.94E+00
1,2-Dibromo-3-chloropropane	96-12-8	7.10E+00	c	1.72E+00	c	1.72E+00	c	1.72E+00
1,2-Dichloro-1,1,2,2-tetrafluoroethane	76-14-2	1.68E+01	e	9.08E-01	e	9.08E-01	e	9.08E-01
1,2-Dichloroethane	107-06-2	1.47E+00	c	5.53E+00	c	5.53E+00	c	5.53E+00
1,2-Dichloroethylene	540-59-0	3.28E+00	e	2.40E+00	e	2.40E+00	e	2.40E+00
1,2-Dichloropropane	78-87-5	3.53E+00	c	1.94E+00	c	1.94E+00	c	1.94E+00
1,3-Dichloropropene	542-75-6	2.03E+00	c	3.78E+00	c	3.78E+00	c	3.78E+00

Table B1-1 Chemical-Specific Parameters for Organic COPCs

Chemical of Potential Concern	CAS Registry Number	Plant Uptake Factors							
		$Br_{rootveg}$ (µg/g DW plant)/ (µg/g soil)	Source	Bv_{ag} (µg/g DW plant)/ (µg/g air)	Source	Bv_{forage} (µg/g DW plant)/ (µg/g air)	Source	RCF (µg/g DW plant)/ (µg/mL soil water)	Source
p-Cymene	99-87-6	1.52E+01	e	1.65E-01	e	1.65E-01	e	3.40E+02	e
Phosgene	75-44-5	NA	NA	NA	NA	NA	NA	NA	NA
Propargyl alcohol	107-19-7	4.85E+02	e	1.93E-02	e	1.93E-02	e	6.43E+00	e
Propionic acid	79-09-4	2.63E+02	e	2.83E-01	e	2.83E-01	e	6.72E+00	e
Propionitrile	107-12-0	3.51E+02	e	2.23E-03	e	2.23E-03	e	6.62E+00	e
Propylene glycol monomethyl ether	107-98-2	6.41E+02	e	1.84E-02	e	1.84E-02	e	6.41E+00	e
p-tert-Butyltoluene	98-51-1	NA	NA	NA	NA	NA	NA	NA	NA
Triethylamine	121-44-8	8.72E+00	e	2.63E-08	e	2.63E-08	e	9.35E+00	e
Trimethylamine	75-50-3	1.65E+02	e	7.95E-04	e	7.95E-04	e	6.62E+00	e
Vinyl acetate	108-05-4	1.43E+02	c	5.65E-04	c	5.65E-04	c	7.11E+00	c
Non-aromatic Halogenated Hydrocarbons									
1,1,1,2-Tetrachloro-2,2-difluoroethane	76-11-9	3.01E+01	e	1.64E-03	e	1.64E-03	e	1.04E+02	e
1,1,1,2-Tetrachloroethane	630-20-6	1.94E+01	c	1.45E-02	c	1.45E-02	c	3.09E+01	c
1,1,1-Trichloroethane	71-55-6	1.73E-02	c	1.14E-03	c	1.14E-03	c	2.33E+01	c
1,1,2,2-Tetrachloro-1,2-difluoroethane	76-12-0	5.67E+01	e	5.38E-03	e	5.38E-03	e	1.79E+02	e
1,1,2,2-Tetrachloroethane	79-34-5	1.11E+03	c	1.33E+01	c	1.33E+01	c	8.80E+02	c
1,1,2,2-Tetrachloroethene	127-18-4	1.04E+01	h	1.66E-03	c	1.66E-03	c	2.75E+01	c
1,1,2-Trichloroethane	79-00-5	2.12E+01	c	9.53E-03	c	9.53E-03	c	1.59E+01	c
1,1,2-Trichloroethylene	79-01-6	2.12E+01	c	2.07E-03	c	2.07E-03	c	2.37E+01	c
1,1-Dichloroethane	75-34-3	2.24E+01	c	7.88E-04	c	7.88E-04	c	1.19E+01	c
1,1-Dichloroethene	75-35-4	2.50E+01	c	3.98E-04	c	3.98E-04	c	1.63E+01	c
1,2,2-Trichloro-1,1,2-trifluoroethane	76-13-1	2.70E+01	e	2.46E-04	e	2.46E-04	e	6.93E+01	e
1,2,3-Trichloropropane	96-18-4	2.34E+01	c	3.66E-02	c	3.66E-02	c	1.89E+01	c
1,2-Dibromo-3-chloropropane	96-12-8	2.22E+01	c	8.81E-02	c	8.81E-02	c	2.10E+01	c
1,2-Dichloro-1,1,2,2-tetrafluoroethane	76-14-2	1.82E+01	e	2.02E-05	e	2.02E-05	e	4.08E+01	e
1,2-Dichloroethane	107-06-2	4.81E+01	c	1.58E-03	c	1.58E-03	c	9.41E+00	c
1,2-Dichloroethylene	540-59-0	3.60E+01	e	1.25E-03	e	1.25E-03	e	1.58E+01	e
1,2-Dichloropropane	78-87-5	4.01E+01	c	4.96E-03	c	4.96E-03	c	1.89E+01	c
1,3-Dichloropropene	542-75-6	4.25E+01	c	1.38E-03	c	1.38E-03	c	1.15E+01	c

Table B1-1 Chemical-Specific Parameters for Organic COPCs

Chemical of Potential Concern	CAS Registry Number	Bioconcentration/Bioaccumulation Factors									
		Ba_{beef} (day/kg FW)	Source	$Ba_{chicken}$ (day/kg FW)	Source	Ba_{egg} (day/kg FW)	Source	Ba_{milk} (day/kg FW)	Source	Ba_{pork} (day/kg FW)	Source
p-Cymene	99-87-6	3.16E-04	e	2.50E-04	e	1.00E-01	e	1.00E-04	e	3.83E-04	e
Phosgene	75-44-5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Propargyl alcohol	107-19-7	1.05E-08	e	8.27E-09	e	3.31E-06	e	3.31E-09	e	1.27E-08	e
Propionic acid	79-09-4	5.37E-08	e	4.24E-08	e	1.70E-05	e	1.70E-08	e	6.50E-08	e
Propionitrile	107-12-0	3.63E-08	e	2.87E-08	e	1.15E-05	e	1.15E-08	e	4.40E-08	e
Propylene glycol monomethyl ether	107-98-2	8.13E-09	e	6.42E-09	e	2.57E-06	e	2.57E-09	e	9.84E-09	e
p-tert-Butyltoluene	98-51-1	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Triethylamine	121-44-8	7.08E-07	e	5.59E-07	e	2.24E-04	e	2.24E-07	e	8.57E-07	e
Trimethylamine	75-50-3	3.63E-08	e	2.87E-08	e	1.15E-05	e	1.15E-08	e	4.40E-08	e
Vinyl acetate	108-05-4	1.26E-07	c	9.92E-08	c	3.97E-05	c	3.97E-08	c	1.52E-07	c
Non-aromatic Halogenated Hydrocarbons											
1,1,1,2-Tetrachloro-2,2-difluoroethane	76-11-9	6.46E-05	e	5.10E-05	e	2.04E-02	e	2.04E-05	e	7.82E-05	e
1,1,1,2-Tetrachloroethane	630-20-6	1.07E-05	c	8.46E-06	c	3.39E-03	c	3.39E-06	c	1.30E-05	c
1,1,1-Trichloroethane	71-55-6	6.63E-06	c	5.24E-06	c	2.10E-03	c	2.10E-06	c	8.03E-06	c
1,1,2,2-Tetrachloro-1,2-difluoroethane	76-12-0	1.35E-04	e	1.06E-04	e	4.27E-02	e	4.27E-05	e	1.63E-04	e
1,1,2,2-Tetrachloroethane	79-34-5	1.11E-03	c	8.73E-04	c	3.50E-01	c	3.50E-04	c	1.34E-03	c
1,1,2,2-Tetrachloroethene	127-18-4	8.82E-06	c	6.96E-06	c	2.79E-03	c	2.79E-06	c	1.07E-05	c
1,1,2-Trichloroethane	79-00-5	3.14E-06	c	2.48E-06	c	9.93E-04	c	9.93E-07	c	3.80E-06	c
1,1,2-Trichloroethylene	79-01-6	6.81E-06	c	5.37E-06	c	2.15E-03	c	2.15E-06	c	8.24E-06	c
1,1-Dichloroethane	75-34-3	1.56E-06	c	1.23E-06	c	4.92E-04	c	4.93E-07	c	1.89E-06	c
1,1-Dichloroethene	75-35-4	3.32E-06	c	2.62E-06	c	1.05E-03	c	1.05E-06	c	4.01E-06	c
1,2,2-Trichloro-1,1,2-trifluoroethane	76-13-1	3.63E-05	e	2.87E-05	e	1.15E-02	e	1.15E-05	e	4.40E-05	e
1,2,3-Trichloropropane	96-18-4	4.47E-06	c	3.53E-06	c	1.41E-03	c	1.41E-06	c	5.41E-06	c
1,2-Dibromo-3-chloropropane	96-12-8	5.50E-06	c	4.34E-06	c	1.74E-03	c	1.74E-06	c	6.65E-06	c
1,2-Dichloro-1,1,2,2-tetrafluoroethane	76-14-2	1.66E-05	e	1.31E-05	e	5.25E-03	e	5.25E-06	e	2.01E-05	e
1,2-Dichloroethane	107-06-2	7.28E-07	c	5.75E-07	c	2.30E-04	c	2.30E-07	c	8.82E-07	c
1,2-Dichloroethylene	540-59-0	3.09E-06	e	2.44E-06	e	9.77E-04	e	9.77E-07	e	3.74E-06	e
1,2-Dichloropropane	78-87-5	4.47E-06	c	3.53E-06	c	1.41E-03	c	1.41E-06	c	5.41E-06	c
1,3-Dichloropropene	542-75-6	1.41E-06	c	1.11E-06	c	4.45E-04	c	4.45E-07	c	1.70E-06	c

Table B1-1 Chemical-Specific Parameters for Organic COPCs

Chemical of Potential Concern	CAS Registry Number	Bioconcentration/Bioaccumulation Factors						Half-life	
		BAF_{fish} (L/kg FW)	Source	BCF_{fish} (L/kg FW)	Source	$BSAF_{fish}$ (unitless)	Source	$t_{1/2}$ (days)	Source
p-Cymene	99-87-6	NA	NA	NA	NA	NA	NA	NA	NA
Phosgene	75-44-5	NA	NA	NA	NA	NA	NA	4.17E-02	d
Propargyl alcohol	107-19-7	NA	NA	3.03E-01	e	NA	NA	NA	NA
Propionic acid	79-09-4	NA	NA	1.05E+00	e	NA	NA	NA	NA
Propionitrile	107-12-0	NA	NA	7.79E-01	e	NA	NA	NA	NA
Propylene glycol monomethyl ether	107-98-2	NA	NA	2.50E-01	e	NA	NA	2.80E+01	d
p-tert-Butyltoluene	98-51-1	NA	NA	NA	NA	NA	NA	NA	NA
Triethylamine	121-44-8	NA	NA	7.45E+00	e	NA	NA	NA	NA
Trimethylamine	75-50-3	NA	NA	7.79E-01	e	NA	NA	NA	NA
Vinyl acetate	108-05-4	NA	NA	2.00E+00	c	NA	NA	NA	NA
Non-aromatic Halogenated Hydrocarbons									
1,1,1,2-Tetrachloro-2,2-difluoroethane	76-11-9	NA	NA	2.30E+02	e	NA	NA	NA	NA
1,1,1,2-Tetrachloroethane	630-20-6	NA	NA	5.87E+01	c	NA	NA	NA	NA
1,1,1-Trichloroethane	71-55-6	NA	NA	4.08E+01	c	NA	NA	NA	NA
1,1,2,2-Tetrachloro-1,2-difluoroethane	76-12-0	NA	NA	4.03E+02	e	NA	NA	NA	NA
1,1,2,2-Tetrachloroethane	79-34-5	4.33E+03	c	NA	NA	NA	NA	NA	NA
1,1,2,2-Tetrachloroethene	127-18-4	NA	NA	5.06E+01	c	NA	NA	NA	NA
1,1,2-Trichloroethane	79-00-5	NA	NA	2.31E+01	c	NA	NA	NA	NA
1,1,2-Trichloroethylene	79-01-6	NA	NA	4.16E+01	c	NA	NA	NA	NA
1,1-Dichloroethane	75-34-3	NA	NA	1.36E+01	c	NA	NA	NA	NA
1,1-Dichloroethene	75-35-4	NA	NA	2.41E+01	c	NA	NA	NA	NA
1,2,2-Trichloro-1,1,2-trifluoroethane	76-13-1	NA	NA	1.48E+02	e	NA	NA	3.60E+02	d
1,2,3-Trichloropropane	96-18-4	NA	NA	3.02E+01	c	NA	NA	NA	NA
1,2-Dibromo-3-chloropropane	96-12-8	NA	NA	3.54E+01	c	NA	NA	NA	NA
1,2-Dichloro-1,1,2,2-tetrafluoroethane	76-14-2	NA	NA	8.19E+01	e	NA	NA	NA	NA
1,2-Dichloroethane	107-06-2	NA	NA	7.61E+00	c	NA	NA	NA	NA
1,2-Dichloroethylene	540-59-0	NA	NA	2.28E+01	e	NA	NA	1.80E+02	d
1,2-Dichloropropane	78-87-5	NA	NA	3.02E+01	c	NA	NA	NA	NA
1,3-Dichloropropene	542-75-6	NA	NA	1.25E+01	c	NA	NA	NA	NA

Table B1-1 Chemical-Specific Parameters for Organic COPCs

Chemical of Potential Concern	CAS Registry Number	Soil Loss Mechanisms [g]											
		k_{decay} $(year)^{-1}$	Source	ks_e $(year)^{-1}$			Source	ks_g $(year)^{-1}$	Source	ks_l $(year)^{-1}$			Source
				1 cm	15 cm	20 cm				1 cm	15 cm	20 cm	
p-Cymene	99-87-6	0.0E+00	NA	5.25E-03	3.50E-04	2.62E-04	e	0.0E+00	NA	1.43E-01	9.55E-03	7.16E-03	e
Phosgene	75-44-5	0.0E+00	NA	0.0E+00	0.0E+00	0.0E+00	NA	6.07E+03	e	0.00E+00	0.00E+00	0.00E+00	NA
Propargyl alcohol	107-19-7	0.0E+00	NA	4.19E-04	2.79E-05	2.10E-05	e	0.0E+00	NA	1.93E+01	1.28E+00	9.64E-01	e
Propionic acid	79-09-4	0.0E+00	NA	7.54E-04	5.03E-05	3.77E-05	e	0.0E+00	NA	1.79E+01	1.20E+00	8.97E-01	e
Propionitrile	107-12-0	0.0E+00	NA	5.77E-04	3.85E-05	2.89E-05	e	0.0E+00	NA	1.86E+01	1.24E+00	9.32E-01	e
Propylene glycol monomethyl ether	107-98-2	0.0E+00	NA	3.23E-04	2.15E-05	1.61E-05	e	9.03E+00	e	1.97E+01	1.31E+00	9.83E-01	e
p-tert-Butyltoluene	98-51-1	0.0E+00	NA	0.0E+00	0.0E+00	0.0E+00	NA	0.0E+00	NA	0.0E+00	0.0E+00	0.0E+00	NA
Triethylamine	121-44-8	0.0E+00	NA	4.62E-03	3.08E-04	2.31E-04	e	0.0E+00	NA	2.63E+00	1.75E-01	1.31E-01	e
Trimethylamine	75-50-3	0.0E+00	NA	1.09E-03	7.27E-05	5.45E-05	e	0.0E+00	NA	1.66E+01	1.11E+00	8.31E-01	e
Vinyl acetate	108-05-4	0.0E+00	NA	1.29E-03	8.60E-05	6.45E-05	e	0.0E+00	NA	1.58E+01	1.05E+00	7.91E-01	e
Non-aromatic Halogenated Hydrocarbons													
1,1,1,2-Tetrachloro-2,2-difluoroethane	76-11-9	0.0E+00	NA	5.06E-03	3.37E-04	2.53E-04	e	0.0E+00	NA	8.89E-01	5.92E-02	4.44E-02	e
1,1,1,2-Tetrachloroethane	630-20-6	0.0E+00	NA	4.82E-03	3.21E-04	2.41E-04	e	5.75E+00	c	1.85E+00	1.23E-01	9.23E-02	e
1,1,1-Trichloroethane	71-55-6	0.0E+00	NA	5.28E-03	3.52E-04	2.64E-04	e	9.26E-01	c	2.39E-03	1.59E-04	1.19E-04	e
1,1,2,2-Tetrachloro-1,2-difluoroethane	76-12-0	0.0E+00	NA	5.04E-03	3.36E-04	2.52E-04	e	0.0E+00	NA	9.71E-01	6.47E-02	4.86E-02	e
1,1,2,2-Tetrachloroethane	79-34-5	0.0E+00	NA	4.42E-03	2.95E-04	2.21E-04	e	5.75E+00	c	3.41E+00	2.27E-01	1.71E-01	e
1,1,2,2-Tetrachloroethene	127-18-4	0.0E+00	NA	4.99E-03	3.33E-04	2.50E-04	e	7.03E-01	c	1.15E+00	7.66E-02	5.74E-02	e
1,1,2-Trichloroethane	79-00-5	0.0E+00	NA	4.38E-03	2.92E-04	2.19E-04	e	6.93E-01	c	3.56E+00	2.38E-01	1.78E-01	e
1,1,2-Trichloroethylene	79-01-6	0.0E+00	NA	4.54E-03	3.03E-04	2.27E-04	e	7.03E-01	c	2.94E+00	1.96E-01	1.47E-01	e
1,1-Dichloroethane	75-34-3	0.0E+00	NA	4.10E-03	2.73E-04	2.05E-04	e	1.64E+00	c	4.71E+00	3.14E-01	2.35E-01	e
1,1-Dichloroethene	75-35-4	0.0E+00	NA	4.27E-03	2.85E-04	2.14E-04	e	1.41E+00	c	4.01E+00	2.67E-01	2.00E-01	e
1,2,2-Trichloro-1,1,2-trifluoroethane	76-13-1	0.0E+00	NA	4.99E-03	3.32E-04	2.49E-04	e	7.03E-01	e	1.18E+00	7.88E-02	5.91E-02	e
1,2,3-Trichloropropane	96-18-4	0.0E+00	NA	4.44E-03	2.96E-04	2.22E-04	e	7.03E-01	c	3.34E+00	2.23E-01	1.67E-01	e
1,2-Dibromo-3-chloropropane	96-12-8	0.0E+00	NA	4.55E-03	3.03E-04	2.27E-04	e	1.41E+00	c	2.93E+00	1.95E-01	1.46E-01	e
1,2-Dichloro-1,1,2,2-tetrafluoroethane	76-14-2	0.0E+00	NA	4.95E-03	3.30E-04	2.47E-04	e	0.0E+00	NA	1.34E+00	8.96E-02	6.72E-02	e
1,2-Dichloroethane	107-06-2	0.0E+00	NA	2.96E-03	1.97E-04	1.48E-04	e	1.41E+00	c	9.20E+00	6.14E-01	4.60E-01	e
1,2-Dichloroethylene	540-59-0	0.0E+00	NA	3.91E-03	2.61E-04	1.96E-04	e	1.41E+00	e	5.44E+00	3.63E-01	2.72E-01	e
1,2-Dichloropropane	78-87-5	0.0E+00	NA	3.98E-03	2.65E-04	1.99E-04	e	1.96E-01	c	5.16E+00	3.44E-01	2.58E-01	e
1,3-Dichloropropene	542-75-6	0.0E+00	NA	3.37E-03	2.24E-04	1.68E-04	e	2.24E+01	c	7.60E+00	5.07E-01	3.80E-01	e

Table B1-1 Chemical-Specific Parameters for Organic COPCs

Chemical of Potential Concern	CAS Registry Number	Soil Loss Mechanisms [g]								Kp (cm/hr)	Source
		ks_r $(year)^{-1}$			Source	ks_v $(year)^{-1}$			Source		
		1 cm	15 cm	20 cm		1 cm	15 cm	20 cm			
p-Cymene	99-87-6	8.55E-02	5.70E-03	4.28E-03	e	7.89E+03	3.51E+01	1.97E+01	f	1.57E-01	aa
Phosgene	75-44-5	0.0E+00	0.0E+00	0.0E+00	NA	0.0E+00	0.0E+00	0.0E+00	NA	NA	NA
Propargyl alcohol	107-19-7	1.15E+01	7.67E-01	5.75E-01	e	4.80E+03	2.14E+01	1.20E+01	f	4.28E-04	aa
Propionic acid	79-09-4	1.07E+01	7.14E-01	5.36E-01	e	5.75E+02	2.56E+00	1.44E+00	f	1.01E-03	aa
Propionitrile	107-12-0	1.11E+01	7.42E-01	5.57E-01	e	7.93E+04	3.52E+02	1.98E+02	f	9.97E-04	aa
Propylene glycol monomethyl ether	107-98-2	1.17E+01	7.82E-01	5.87E-01	e	2.02E+03	8.98E+00	5.05E+00	f	3.70E-04	ab
p-tert-Butyltoluene	98-51-1	0.0E+00	0.0E+00	0.0E+00	NA	0.0E+00	0.0E+00	0.0E+00	NA	NA	NA
Triethylamine	121-44-8	1.57E+00	1.05E-01	7.84E-02	e	1.88E+09	8.35E+06	4.70E+06	f	4.03E-03	aa
Trimethylamine	75-50-3	9.92E+00	6.61E-01	4.96E-01	e	1.00E+05	4.46E+02	2.51E+02	f	9.47E-04	aa
Vinyl acetate	108-05-4	9.45E+00	6.30E-01	4.72E-01	e	3.38E+05	1.50E+03	8.44E+02	f	1.54E-03	aa
Non-aromatic Halogenated Hydrocarbons											
1,1,1,2-Tetrachloro-2,2-difluoroethane	76-11-9	5.31E-01	3.54E-02	2.65E-02	e	7.12E+05	3.16E+03	1.78E+03	f	2.20E-02	aa
1,1,1,2-Tetrachloroethane	630-20-6	1.10E+00	7.35E-02	5.51E-02	e	1.48E+04	6.59E+01	3.71E+01	f	1.05E-02	aa
1,1,1-Trichloroethane	71-55-6	1.42E-03	9.50E-05	7.12E-05	e	1.97E+02	8.76E-01	4.93E-01	f	1.30E-02	ab
1,1,2,2-Tetrachloro-1,2-difluoroethane	76-12-0	5.80E-01	3.87E-02	2.90E-02	e	5.20E+05	2.31E+03	1.30E+03	f	3.61E-02	aa
1,1,2,2-Tetrachloroethane	79-34-5	2.04E+00	1.36E-01	1.02E-01	e	4.57E+03	2.03E+01	1.14E+01	f	6.90E-03	ab
1,1,2,2-Tetrachloroethene	127-18-4	6.86E-01	4.57E-02	3.43E-02	e	1.44E+05	6.41E+02	3.61E+02	f	3.30E-02	ab
1,1,2-Trichloroethane	79-00-5	2.13E+00	1.42E-01	1.06E-01	e	1.85E+04	8.20E+01	4.61E+01	f	6.40E-03	ab
1,1,2-Trichloroethylene	79-01-6	1.76E+00	1.17E-01	8.79E-02	e	1.61E+05	7.15E+02	4.02E+02	f	1.20E-02	ab
1,1-Dichloroethane	75-34-3	2.81E+00	1.87E-01	1.41E-01	e	2.47E+05	1.10E+03	6.18E+02	f	6.70E-03	ab
1,1-Dichloroethene	75-35-4	2.39E+00	1.59E-01	1.20E-01	e	9.07E+05	4.03E+03	2.27E+03	f	1.20E-02	ab
1,2,2-Trichloro-1,1,2-trifluoroethane	76-13-1	7.06E-01	4.71E-02	3.53E-02	e	1.81E+06	8.06E+03	4.54E+03	f	1.85E-02	aa
1,2,3-Trichloropropane	96-18-4	2.00E+00	1.33E-01	9.98E-02	e	5.74E+03	2.55E+01	1.44E+01	f	7.62E-03	aa
1,2-Dibromo-3-chloropropane	96-12-8	1.75E+00	1.16E-01	8.73E-02	e	1.14E+03	5.08E+00	2.86E+00	f	2.78E-03	aa
1,2-Dichloro-1,1,2,2-tetrafluoroethane	76-14-2	8.03E-01	5.35E-02	4.01E-02	e	2.36E+07	1.05E+05	5.90E+04	f	1.36E-02	aa
1,2-Dichloroethane	107-06-2	5.50E+00	3.66E-01	2.75E-01	e	1.43E+05	6.35E+02	3.57E+02	f	4.20E-03	ab
1,2-Dichloroethylene	540-59-0	3.25E+00	2.17E-01	1.62E-01	e	4.75E+05	2.11E+03	1.19E+03	f	1.14E-02	aa
1,2-Dichloropropane	78-87-5	3.08E+00	2.06E-01	1.54E-01	e	1.14E+05	5.06E+02	2.85E+02	f	7.80E-03	ab
1,3-Dichloropropene	542-75-6	4.54E+00	3.02E-01	2.27E-01	e	2.09E+05	9.30E+02	5.23E+02	f	4.30E-03	ab

Table B1-1 Chemical-Specific Parameters for Organic COPCs

Chemical of Potential Concern	CAS Registry Number	Fraction		MW	pH	Henry's Constant			Diffusivity			
		F_v (unitless)	Source	(g/mol)		H-pub [x] (various units)	Source	H-used [x] (atm-m^3/mol)	D_a (cm^2/s)	Source	D_w (cm^2/s)	Source
1,4-Dichloro-2-butene	764-41-0	0 or 1	b	125	NA	3.48E-01	m	8.49E-03	7.60E-02	e	8.80E-06	e
1-Chloroethene	75-01-4	0 or 1	b	62.5	NA	3.15E-01	c	3.15E-01	1.58E-01	c	1.19E-05	c
2,2-Dichloropropionic acid	75-99-0	0 or 1	b	142.97	NA	6.43E-08	l	6.43E-08	6.95E-02	e	8.05E-06	e
2-Chloropropane	75-29-6	0 or 1	b	78.541	NA	1.65E+03	i	1.64E-02	1.04E-01	e	1.20E-05	e
3-Chloropropene (Allyl chloride)	107-05-1	0 or 1	b	76.526	NA	1.10E+00	n	1.09E-02	1.05E-01	e	1.22E-05	e
Bromochloromethane	74-97-5	0 or 1	b	129.39	NA	5.97E-02	m	1.46E-03	4.74E-02	j	1.00E-05	j
Bromodichloromethane	75-27-4	0 or 1	b	163.83	NA	3.17E-03	c	3.17E-03	2.98E-02	c	1.06E-05	c
Bromoethene	593-60-2	0 or 1	b	106.95	NA	5.03E-01	m	1.23E-02	8.43E-02	e	9.76E-06	e
Bromoform	75-25-2	0 or 1	b	252.77	NA	6.16E-04	c	6.16E-04	1.41E-02	c	1.03E-05	c
Bromomethane	74-83-9	0 or 1	b	94.95	NA	1.41E-02	c	1.41E-02	7.28E-02	c	1.21E-05	c
Carbon tetrachloride	56-23-5	0 or 1	b	153.84	NA	2.87E-02	c	2.87E-02	3.56E-02	c	9.77E-06	c
Chlorodibromomethane	124-48-1	0 or 1	b	208.3	NA	1.21E-03	c	1.21E-03	1.96E-02	c	1.05E-05	c
Chlorodifluoromethane	75-45-6	0 or 1	b	86.47	NA	1.68E-01	c	1.68E-01	9.72E-02	c	1.13E-05	c
Chloroethane	75-00-3	0 or 1	b	64.52	NA	1.80E+00	c	1.80E+00	1.27E-01	c	1.53E-06	c
Chloroform	67-66-3	0 or 1	b	119.39	NA	4.03E-03	c	4.03E-03	5.17E-02	c	1.09E-05	c
Chloromethane	74-87-3	0 or 1	b	50.49	NA	4.52E-02	c	4.52E-02	2.13E-01	c	1.39E-05	c
Chloropentafluoroethane	76-15-3	0 or 1	b	154.47	NA	2.28E+02	k	5.57E+00	6.60E-02	e	7.64E-06	e
cis-1,2-Dichloroethene	156-59-2	0 or 1	b	96.94	NA	4.51E-03	c	4.51E-03	7.36E-02	c	1.13E-05	c
cis-1,3-Dichloropropene	10061-01-5	0 or 1	b	110.97	NA	1.11E-01	k	2.70E-03	8.23E-02	e	9.53E-06	e
Cyanogen bromide	506-68-3	0 or 1	b	105.92	NA	1.00E+00	m	2.44E-02	8.49E-02	e	9.83E-06	e
Cyanogen chloride	506-77-4	0 or 1	b	61.471	NA	1.00E+00	m	2.44E-02	1.22E-01	e	1.41E-05	e
Dichlorodifluoromethane	75-71-8	0 or 1	b	120.92	NA	2.58E+00	c	2.58E+00	7.77E-02	c	9.00E-06	c
Dichlorofluoromethane	75-43-4	0 or 1	b	102.92	NA	4.42E-01	k	1.08E-02	8.65E-02	e	1.00E-05	e
Dichloromethane	75-09-2	0 or 1	b	84.94	NA	2.38E-03	c	2.38E-03	8.69E-02	c	1.25E-05	c
Difluorodibromomethane	75-61-6	0 or 1	b	209.82	NA	1.26E+00	k	3.07E-02	5.38E-02	e	6.23E-06	e
Hexafluoroacetone	684-16-2	0 or 1	b	166.02	NA	1.26E-01	k	3.06E-03	6.29E-02	e	7.28E-06	e
Iodomethane	74-88-4	0 or 1	b	141.939	NA	5.55E+02	i	5.49E-03	6.98E-02	e	8.09E-06	e
Methylene bromide	74-95-3	0 or 1	b	173.86	NA	2.64E-02	c	2.64E-02	6.10E-02	c	7.06E-06	c
Pentachloroethane	76-01-7	0 or 1	b	202.29	NA	2.48E+02	i	2.45E-03	5.51E-02	e	6.38E-06	e

Table B1-1 Chemical-Specific Parameters for Organic COPCs

Chemical of Potential Concern	CAS Registry Number	Octanol / Water Partitioning Coefficients						Partitioning Coefficients (Kd)			
		K_{oc}-pub [y] (various units)	Source	K_{oc}-used [z] (mL/g)	K_{ow}-pub [y] (various units)	Source	K_{ow}-used [z] (unitless)	Kd_{bs} (L/kg)	Source	Kd_s (mL/g)	Source
1,4-Dichloro-2-butene	764-41-0	1.49E+02	m	1.49E+02	2.60E+00	m	3.98E+02	5.96E+00	e	1.49E+00	e
1-Chloroethene	75-01-4	1.11E+01	h	1.11E+01	1.40E+01	c	1.40E+01	4.44E-01	c	1.11E-01	c
2,2-Dichloropropionic acid	75-99-0	2.74E+00	m	2.74E+00	1.68E+00	m	4.79E+01	1.10E-01	e	2.74E-02	e
2-Chloropropane	75-29-6	NA	e	4.30E+01	1.90E+00	i	7.94E+01	1.72E+00	e	4.30E-01	e
3-Chloropropene (Allyl chloride)	107-05-1	4.38E+01	m	4.38E+01	1.93E+00	m	8.51E+01	1.75E+00	e	4.38E-01	e
Bromochloromethane	74-97-5	NA	e	1.78E+01	1.41E+00	i	2.57E+01	7.13E-01	e	1.78E-01	e
Bromodichloromethane	75-27-4	5.38E+01	c	5.38E+01	1.06E+02	c	1.06E+02	2.15E+00	c	5.38E-01	c
Bromoethene	593-60-2	2.37E+01	m	2.37E+01	1.57E+00	m	3.72E+01	9.50E-01	e	2.37E-01	e
Bromoform	75-25-2	1.26E+02	c	1.26E+02	2.24E+02	c	2.24E+02	5.04E+00	c	1.26E+00	c
Bromomethane	74-83-9	9.00E+00	c	9.00E+00	1.30E+01	c	1.30E+01	3.60E-01	c	9.00E-02	c
Carbon tetrachloride	56-23-5	1.52E+02	c	1.52E+02	5.21E+02	c	5.21E+02	6.08E+00	c	1.52E+00	c
Chlorodibromomethane	124-48-1	7.05E+01	c	7.05E+01	1.50E+02	c	1.50E+02	2.82E+00	c	7.05E-01	c
Chlorodifluoromethane	75-45-6	9.83E+00	c	9.83E+00	1.20E+01	c	1.20E+01	3.93E-01	c	9.83E-02	c
Chloroethane	75-00-3	3.71E+02	c	3.71E+02	1.26E+03	c	1.26E+03	1.48E+01	c	3.71E+00	c
Chloroform	67-66-3	5.30E+01	c	5.30E+01	8.90E+01	c	8.90E+01	2.12E+00	c	5.30E-01	c
Chloromethane	74-87-3	6.00E+00	c	6.00E+00	8.00E+00	c	8.00E+00	2.40E-01	c	6.00E-02	c
Chloropentafluoroethane	76-15-3	7.08E+02	p	7.08E+02	2.10E+00	p	1.26E+02	2.83E+01	e	7.08E+00	e
cis-1,2-Dichloroethene	156-59-2	4.98E+01	h	4.98E+01	9.60E+01	c	9.60E+01	1.99E+00	h	4.98E-01	h
cis-1,3-Dichloropropene	10061-01-5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Cyanogen bromide	506-68-3	NA	e	8.41E-01	-2.90E-01	m	5.13E-01	3.36E-02	e	8.41E-03	e
Cyanogen chloride	506-77-4	4.50E+00	m	4.50E+00	-3.80E-01	m	4.17E-01	1.80E-01	e	4.50E-02	e
Dichlorodifluoromethane	75-71-8	6.85E+00	c	6.85E+00	1.44E+02	c	1.44E+02	2.74E+00	c	6.85E-01	c
Dichlorofluoromethane	75-43-4	3.50E+01	p	3.50E+01	1.55E+00	p	3.55E+01	1.40E+00	e	3.50E-01	e
Dichloromethane	75-09-2	1.00E+01	c	1.00E+01	1.80E+01	c	1.80E+01	4.00E-01	c	1.00E-01	c
Difluorodibromomethane	75-61-6	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Hexafluoroacetone	684-16-2	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Iodomethane	74-88-4	NA	e	2.95E+01	1.69E+00	i	4.90E+01	1.18E+00	e	2.95E-01	e
Methylene bromide	74-95-3	2.60E+01	h	2.60E+01	4.17E+01	c	4.17E+01	1.04E+00	c	2.60E-01	c
Pentachloroethane	76-01-7	NA	e	3.39E+02	3.05E+00	i	1.12E+03	1.36E+01	e	3.39E+00	e

Table B1-1 Chemical-Specific Parameters for Organic COPCs

Chemical of Potential Concern	CAS Registry Number	Kd		Plant Uptake Factors				
		Kd_{sw} (L/kg)	Source	Br_{ag} (µg/g DW plant)/ (µg/g soil)	Source	Br_{forage} (µg/g DW plant)/ (µg/g soil)	Source	Br_{grain} (µg/g DW plant)/ (µg/g soil) [a]
1,4-Dichloro-2-butene	764-41-0	1.12E+01	e	1.22E+00	e	1.22E+00	e	1.22E+00
1-Chloroethene	75-01-4	8.32E-01	c	8.42E+00	c	8.42E+00	c	8.42E+00
2,2-Dichloropropionic acid	75-99-0	2.05E-01	e	4.14E+00	e	4.14E+00	e	4.14E+00
2-Chloropropane	75-29-6	3.22E+00	e	3.09E+00	e	3.09E+00	e	3.09E+00
3-Chloropropene (Allyl chloride)	107-05-1	3.28E+00	e	2.97E+00	e	2.97E+00	e	2.97E+00
Bromochloromethane	74-97-5	1.34E+00	e	5.93E+00	e	5.93E+00	e	5.93E+00
Bromodichloromethane	75-27-4	4.03E+00	c	2.61E+00	c	2.61E+00	c	2.61E+00
Bromoethene	593-60-2	1.78E+00	e	4.79E+00	e	4.79E+00	e	4.79E+00
Bromoform	75-25-2	9.45E+00	c	1.70E+00	c	1.70E+00	c	1.70E+00
Bromomethane	74-83-9	6.75E-01	c	8.79E+00	c	8.79E+00	c	8.79E+00
Carbon tetrachloride	56-23-5	1.14E+01	c	1.04E+00	c	1.04E+00	c	1.04E+00
Chlorodibromomethane	124-48-1	5.29E+00	c	2.14E+00	c	2.14E+00	c	2.14E+00
Chlorodifluoromethane	75-45-6	7.38E-01	h	9.21E+00	c	9.21E+00	c	9.21E+00
Chloroethane	75-00-3	2.78E+01	c	6.25E-01	c	6.25E-01	c	6.25E-01
Chloroform	67-66-3	3.98E+00	c	2.89E+00	c	2.89E+00	c	2.89E+00
Chloromethane	74-87-3	4.50E-01	c	1.16E+01	c	1.16E+01	c	1.16E+01
Chloropentafluoroethane	76-15-3	5.31E+01	e	2.37E+00	e	2.37E+00	e	2.37E+00
cis-1,2-Dichloroethene	156-59-2	3.73E+00	h	2.77E+00	c	2.77E+00	c	2.77E+00
cis-1,3-Dichloropropene	10061-01-5	NA	NA	NA	NA	NA	NA	NA
Cyanogen bromide	506-68-3	6.31E-02	e	5.70E+01	e	5.70E+01	e	5.70E+01
Cyanogen chloride	506-77-4	3.38E-01	e	6.42E+01	e	6.42E+01	e	6.42E+01
Dichlorodifluoromethane	75-71-8	5.14E+00	c	2.19E+00	c	2.19E+00	c	2.19E+00
Dichlorofluoromethane	75-43-4	2.63E+00	e	4.92E+00	e	4.92E+00	e	4.92E+00
Dichloromethane	75-09-2	7.50E-01	c	7.29E+00	c	7.29E+00	c	7.29E+00
Difluorodibromomethane	75-61-6	NA	NA	NA	NA	NA	NA	NA
Hexafluoroacetone	684-16-2	NA	NA	NA	NA	NA	NA	NA
Iodomethane	74-88-4	2.21E+00	e	4.08E+00	e	4.08E+00	e	4.08E+00
Methylene bromide	74-95-3	1.95E+00	c	4.48E+00	c	4.48E+00	c	4.48E+00
Pentachloroethane	76-01-7	2.54E+01	e	6.68E-01	e	6.68E-01	e	6.68E-01

Table B1-1 Chemical-Specific Parameters for Organic COPCs

Chemical of Potential Concern	CAS Registry Number	Plant Uptake Factors							
		$Br_{rootveg}$ (µg/g DW plant)/ (µg/g soil)	Source	Bv_{ag} (µg/g DW plant)/ (µg/g air)	Source	Bv_{forage} (µg/g DW plant)/ (µg/g air)	Source	RCF (µg/g DW plant)/ (µg/mL soil water)	Source
1,4-Dichloro-2-butene	764-41-0	1.99E+01	e	3.88E-03	e	3.88E-03	e	2.96E+01	e
1-Chloroethene	75-01-4	7.29E+01	c	2.95E-06	c	2.95E-06	c	8.08E+00	c
2,2-Dichloropropionic acid	75-99-0	3.97E+02	e	5.37E+01	e	5.37E+01	e	1.09E+01	e
2-Chloropropane	75-29-6	3.04E+01	e	3.62E-04	e	3.62E-04	e	1.31E+01	e
3-Chloropropene (Allyl chloride)	107-05-1	3.07E+01	e	5.85E-04	e	5.85E-04	e	1.34E+01	e
Bromochloromethane	74-97-5	5.13E+01	e	1.22E-03	e	1.22E-03	e	9.14E+00	e
Bromodichloromethane	75-27-4	2.74E+01	c	2.53E-03	c	2.53E-03	c	1.47E+01	c
Bromoethene	593-60-2	4.24E+01	e	2.15E-04	e	2.15E-04	e	1.01E+01	e
Bromoform	75-25-2	1.69E+01	c	2.89E-02	c	2.89E-02	c	2.13E+01	c
Bromomethane	74-83-9	8.87E+01	c	6.07E-05	c	6.07E-05	c	7.98E+00	c
Carbon tetrachloride	56-23-5	2.30E+01	c	1.52E-03	c	1.52E-03	c	3.50E+01	c
Chlorodibromomethane	124-48-1	2.45E+01	c	9.59E-03	c	9.59E-03	c	1.73E+01	c
Chlorodifluoromethane	75-45-6	8.01E+01	c	4.69E-06	c	4.69E-06	c	7.88E+00	c
Chloroethane	75-00-3	1.70E+01	c	6.05E-05	c	6.05E-05	c	6.30E+01	c
Chloroform	67-66-3	2.58E+01	c	1.65E-03	c	1.65E-03	c	1.37E+01	c
Chloromethane	74-87-3	1.24E+02	c	1.13E-05	c	1.13E-05	c	7.46E+00	c
Chloropentafluoroethane	76-15-3	2.25E+00	e	1.73E-06	e	1.73E-06	e	1.59E+01	e
cis-1,2-Dichloroethene	156-59-2	2.83E+01	h	1.60E-03	c	1.60E-03	c	1.41E+01	c
cis-1,3-Dichloropropene	10061-01-5	NA	NA	NA	NA	NA	NA	NA	NA
Cyanogen bromide	506-68-3	7.67E+02	e	1.13E-06	e	1.13E-06	e	6.45E+00	e
Cyanogen chloride	506-77-4	1.43E+02	e	9.04E-07	e	9.04E-07	e	6.43E+00	e
Dichlorodifluoromethane	75-71-8	2.48E+01	c	4.33E-06	c	4.33E-06	c	1.70E+01	c
Dichlorofluoromethane	75-43-4	2.84E+01	e	2.33E-04	e	2.33E-04	e	9.93E+00	e
Dichloromethane	75-09-2	8.46E+01	c	5.11E-04	c	5.11E-04	c	8.46E+00	c
Difluorodibromomethane	75-61-6	NA	NA	NA	NA	NA	NA	NA	NA
Hexafluoroacetone	684-16-2	NA	NA	NA	NA	NA	NA	NA	NA
Iodomethane	74-88-4	3.72E+01	e	6.44E-04	e	6.44E-04	e	1.10E+01	e
Methylene bromide	74-95-3	4.01E+01	c	1.13E-04	c	1.13E-04	c	1.04E+01	c
Pentachloroethane	76-01-7	1.72E+01	e	4.04E-02	e	4.04E-02	e	5.81E+01	e

Table B1-1 Chemical-Specific Parameters for Organic COPCs

Chemical of Potential Concern	CAS Registry Number	Bioconcentration/Bioaccumulation Factors									
		Ba_{beef} (day/kg FW)	Source	$Ba_{chicken}$ (day/kg FW)	Source	Ba_{egg} (day/kg FW)	Source	Ba_{milk} (day/kg FW)	Source	Ba_{pork} (day/kg FW)	Source
1,4-Dichloro-2-butene	764-41-0	1.00E-05	e	7.89E-06	e	3.16E-03	e	3.16E-06	e	1.21E-05	e
1-Chloroethene	75-01-4	3.52E-07	c	2.78E-07	c	1.11E-04	c	1.11E-07	c	4.26E-07	c
2,2-Dichloropropionic acid	75-99-0	1.20E-06	e	9.49E-07	e	3.80E-04	e	3.80E-07	e	1.46E-06	e
2-Chloropropane	75-29-6	2.00E-06	e	1.58E-06	e	6.31E-04	e	6.31E-07	e	2.42E-06	e
3-Chloropropene (Allyl chloride)	107-05-1	2.14E-06	e	1.69E-06	e	6.76E-04	e	6.76E-07	e	2.59E-06	e
Bromochloromethane	74-97-5	6.46E-07	e	5.10E-07	e	2.04E-04	e	2.04E-07	e	7.82E-07	e
Bromodichloromethane	75-27-4	2.66E-06	c	2.10E-06	c	8.42E-04	c	8.42E-07	c	3.22E-06	c
Bromoethene	593-60-2	9.33E-07	e	7.37E-07	e	2.95E-04	e	2.95E-07	e	1.13E-06	e
Bromoform	75-25-2	5.63E-06	c	4.44E-06	c	1.78E-03	c	1.78E-06	c	6.81E-06	c
Bromomethane	74-83-9	3.27E-07	c	2.58E-07	c	1.03E-04	c	1.03E-07	c	3.95E-07	c
Carbon tetrachloride	56-23-5	1.30E-05	c	1.05E-05	c	4.14E-03	c	4.14E-06	c	1.58E-05	c
Chlorodibromomethane	124-48-1	3.77E-06	c	2.97E-06	c	1.19E-03	c	1.19E-06	c	4.56E-06	c
Chlorodifluoromethane	75-45-6	3.01E-07	c	2.38E-07	c	9.53E-05	c	9.53E-08	c	3.65E-07	c
Chloroethane	75-00-3	3.16E-05	c	2.50E-05	c	1.00E-02	c	1.00E-05	c	3.83E-05	c
Chloroform	67-66-3	2.23E-06	c	1.76E-06	c	7.07E-04	c	7.07E-07	c	2.71E-06	c
Chloromethane	74-87-3	2.01E-07	c	1.59E-07	c	6.35E-05	c	6.36E-08	c	2.43E-07	c
Chloropentafluoroethane	76-15-3	3.16E-06	e	2.50E-06	e	1.00E-03	e	1.00E-06	e	3.83E-06	e
cis-1,2-Dichloroethene	156-59-2	2.41E-06	c	1.90E-06	c	7.63E-04	c	7.63E-07	c	2.92E-06	c
cis-1,3-Dichloropropene	10061-01-5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Cyanogen bromide	506-68-3	1.29E-08	e	1.02E-08	e	4.07E-06	e	4.07E-09	e	1.56E-08	e
Cyanogen chloride	506-77-4	1.05E-08	e	8.27E-09	e	3.31E-06	e	3.31E-09	e	1.27E-08	e
Dichlorodifluoromethane	75-71-8	3.63E-06	c	2.87E-06	c	1.15E-03	c	1.15E-06	c	4.40E-06	c
Dichlorofluoromethane	75-43-4	8.91E-07	e	7.04E-07	e	2.82E-04	e	2.82E-07	e	1.08E-06	e
Dichloromethane	75-09-2	4.52E-07	c	3.57E-07	c	1.43E-04	c	1.43E-07	c	5.47E-07	c
Difluorodibromomethane	75-61-6	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Hexafluoroacetone	684-16-2	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Iodomethane	74-88-4	1.23E-06	e	9.71E-07	e	3.89E-04	e	3.89E-07	e	1.49E-06	e
Methylene bromide	74-95-3	1.05E-06	c	8.27E-07	c	3.31E-04	c	3.31E-07	c	1.27E-06	c
Pentachloroethane	76-01-7	2.82E-05	e	2.23E-05	e	8.91E-03	e	8.91E-06	e	3.41E-05	e

Table B1-1 Chemical-Specific Parameters for Organic COPCs

Chemical of Potential Concern	CAS Registry Number	Bioconcentration/Bioaccumulation Factors						Half-life	
		BAF_{fish} (L/kg FW)	Source	BCF_{fish} (L/kg FW)	Source	$BSAF_{fish}$ (unitless)	Source	$t_{1/2}$ (days)	Source
1,4-Dichloro-2-butene	764-41-0	NA	NA	5.57E+01	e	NA	NA	NA	NA
1-Chloroethene	75-01-4	NA	NA	1.81E+00	s	NA	NA	NA	NA
2,2-Dichloropropionic acid	75-99-0	NA	NA	1.11E+01	e	NA	NA	6.00E+01	d
2-Chloropropane	75-29-6	NA	NA	1.64E+01	e	NA	NA	NA	NA
3-Chloropropene (Allyl chloride)	107-05-1	NA	NA	1.73E+01	e	NA	NA	1.40E+01	d
Bromochloromethane	74-97-5	NA	NA	6.94E+00	e	NA	NA	NA	NA
Bromodichloromethane	75-27-4	NA	NA	2.04E+01	c	NA	NA	NA	NA
Bromoethene	593-60-2	NA	NA	9.19E+00	e	NA	NA	1.80E+02	d
Bromoform	75-25-2	NA	NA	3.60E+01	c	NA	NA	NA	NA
Bromomethane	74-83-9	NA	NA	4.14E+00	c	NA	NA	NA	NA
Carbon tetrachloride	56-23-5	NA	NA	3.00E+01	c	NA	NA	NA	NA
Chlorodibromomethane	124-48-1	NA	NA	2.65E+01	c	NA	NA	NA	NA
Chlorodifluoromethane	75-45-6	NA	NA	3.89E+00	c	NA	NA	NA	NA
Chloroethane	75-00-3	NA	NA	1.34E+02	c	NA	NA	NA	NA
Chloroform	67-66-3	NA	NA	3.59E+00	c	NA	NA	NA	NA
Chloromethane	74-87-3	NA	NA	2.86E+00	c	NA	NA	NA	NA
Chloropentafluoroethane	76-15-3	NA	NA	2.32E+01	e	NA	NA	NA	NA
cis-1,2-Dichloroethene	156-59-2	NA	NA	1.89E+01	c	NA	NA	NA	NA
cis-1,3-Dichloropropene	10061-01-5	NA	NA	NA	NA	NA	NA	NA	NA
Cyanogen bromide	506-68-3	NA	NA	3.54E-01	e	NA	NA	NA	NA
Cyanogen chloride	506-77-4	NA	NA	3.03E-01	e	NA	NA	NA	NA
Dichlorodifluoromethane	75-71-8	NA	NA	2.58E+01	c	NA	NA	NA	NA
Dichlorofluoromethane	75-43-4	NA	NA	8.87E+00	e	NA	NA	NA	NA
Dichloromethane	75-09-2	NA	NA	5.30E+00	c	NA	NA	NA	NA
Difluorodibromomethane	75-61-6	NA	NA	NA	NA	NA	NA	NA	NA
Hexafluoroacetone	684-16-2	NA	NA	NA	NA	NA	NA	NA	NA
Iodomethane	74-88-4	NA	NA	1.13E+01	e	NA	NA	2.80E+01	d
Methylene bromide	74-95-3	NA	NA	1.00E+01	c	NA	NA	NA	NA
Pentachloroethane	76-01-7	NA	NA	1.22E+02	e	NA	NA	NA	NA

Table B1-1 Chemical-Specific Parameters for Organic COPCs

Chemical of Potential Concern	CAS Registry Number	Soil Loss Mechanisms [g]											
		k_{decay} $(year)^{-1}$	Source	ks_e $(year)^{-1}$			Source	ks_g $(year)^{-1}$	Source	ks_l $(year)^{-1}$			Source
				1 cm	15 cm	20 cm				1 cm	15 cm	20 cm	
1,4-Dichloro-2-butene	764-41-0	0.0E+00	NA	4.79E-03	3.19E-04	2.39E-04	e	0.0E+00	NA	1.96E+00	1.31E-01	9.80E-02	e
1-Chloroethene	75-01-4	0.0E+00	NA	2.21E-03	1.48E-04	1.11E-04	e	1.41E+00	c	1.22E+01	8.11E-01	6.08E-01	e
2,2-Dichloropropionic acid	75-99-0	0.0E+00	NA	7.98E-04	5.32E-05	3.99E-05	e	4.22E+00	e	1.78E+01	1.18E+00	8.88E-01	e
2-Chloropropane	75-29-6	0.0E+00	NA	3.89E-03	2.59E-04	1.95E-04	e	0.0E+00	NA	5.52E+00	3.68E-01	2.76E-01	e
3-Chloropropene (Allyl chloride)	107-05-1	0.0E+00	NA	3.91E-03	2.61E-04	1.96E-04	e	1.81E+01	e	5.44E+00	3.63E-01	2.72E-01	e
Bromochloromethane	74-97-5	0.0E+00	NA	2.84E-03	1.89E-04	1.42E-04	e	0.0E+00	NA	9.70E+00	6.47E-01	4.85E-01	e
Bromodichloromethane	75-27-4	0.0E+00	NA	4.11E-03	2.74E-04	2.05E-04	e	0.0E+00	NA	4.65E+00	3.10E-01	2.33E-01	e
Bromoethene	593-60-2	0.0E+00	NA	3.21E-03	2.14E-04	1.60E-04	e	1.41E+00	e	8.23E+00	5.49E-01	4.12E-01	e
Bromoform	75-25-2	0.0E+00	NA	4.71E-03	3.14E-04	2.35E-04	e	1.41E+00	c	2.28E+00	1.52E-01	1.14E-01	e
Bromomethane	74-83-9	0.0E+00	NA	1.95E-03	1.30E-04	9.75E-05	e	9.03E+00	c	1.32E+01	8.80E-01	6.60E-01	e
Carbon tetrachloride	56-23-5	0.0E+00	NA	4.80E-03	3.20E-04	2.40E-04	e	7.03E-01	c	1.92E+00	1.28E-01	9.62E-02	e
Chlorodibromomethane	124-48-1	0.0E+00	NA	4.34E-03	2.89E-04	2.17E-04	e	1.41E+00	c	3.75E+00	2.50E-01	1.87E-01	e
Chlorodifluoromethane	75-45-6	0.0E+00	NA	2.06E-03	1.37E-04	1.03E-04	e	0.0E+00	NA	1.28E+01	8.51E-01	6.39E-01	e
Chloroethane	75-00-3	0.0E+00	NA	5.07E-03	3.38E-04	2.54E-04	e	6.72E+02	c	8.33E-01	5.56E-02	4.17E-02	e
Chloroform	67-66-3	0.0E+00	NA	4.10E-03	2.73E-04	2.05E-04	e	1.41E+00	c	4.71E+00	3.14E-01	2.35E-01	e
Chloromethane	74-87-3	0.0E+00	NA	1.48E-03	9.88E-05	7.41E-05	e	9.03E+00	c	1.51E+01	1.00E+00	7.53E-01	e
Chloropentafluoroethane	76-15-3	0.0E+00	NA	5.17E-03	3.45E-04	2.59E-04	e	0.0E+00	NA	4.45E-01	2.97E-02	2.23E-02	e
cis-1,2-Dichloroethene	156-59-2	0.0E+00	NA	4.04E-03	2.69E-04	2.02E-04	e	1.41E+00	c	4.94E+00	3.29E-01	2.47E-01	e
cis-1,3-Dichloropropene	10061-01-5	0.0E+00	NA	0.0E+00	0.0E+00	0.0E+00	NA	0.0E+00	NA	0.0E+00	0.0E+00	0.0E+00	NA
Cyanogen bromide	506-68-3	0.0E+00	NA	2.74E-04	1.83E-05	1.37E-05	e	0.0E+00	NA	1.98E+01	1.32E+00	9.92E-01	e
Cyanogen chloride	506-77-4	0.0E+00	NA	1.20E-03	7.97E-05	5.98E-05	e	0.0E+00	NA	1.62E+01	1.08E+00	8.10E-01	e
Dichlorodifluoromethane	75-71-8	0.0E+00	NA	4.32E-03	2.88E-04	2.16E-04	e	1.41E+00	c	3.84E+00	2.56E-01	1.92E-01	e
Dichlorofluoromethane	75-43-4	0.0E+00	NA	3.67E-03	2.45E-04	1.84E-04	e	0.0E+00	NA	6.39E+00	4.26E-01	3.20E-01	e
Dichloromethane	75-09-2	0.0E+00	NA	2.08E-03	1.39E-04	1.04E-04	e	9.03E+00	c	1.27E+01	8.46E-01	6.34E-01	e
Difluorodibromomethane	75-61-6	0.0E+00	NA	0.0E+00	0.0E+00	0.0E+00	NA	0.0E+00	NA	0.0E+00	0.0E+00	0.0E+00	NA
Hexafluoroacetone	684-16-2	0.0E+00	NA	0.0E+00	0.0E+00	0.0E+00	NA	0.0E+00	NA	0.0E+00	0.0E+00	0.0E+00	NA
Iodomethane	74-88-4	0.0E+00	NA	3.47E-03	2.31E-04	1.74E-04	e	9.03E+00	e	7.18E+00	4.79E-01	3.59E-01	e
Methylene bromide	74-95-3	0.0E+00	NA	3.32E-03	2.21E-04	1.66E-04	e	9.03E+00	c	7.78E+00	5.19E-01	3.89E-01	e
Pentachloroethane	76-01-7	0.0E+00	NA	5.05E-03	3.37E-04	2.53E-04	e	0.0E+00	NA	9.09E-01	6.06E-02	4.55E-02	e

Table B1-1 Chemical-Specific Parameters for Organic COPCs

Chemical of Potential Concern	CAS Registry Number	Soil Loss Mechanisms [g]								Kp (cm/hr)	Source
		ks_r $(year)^{-1}$			Source	ks_v $(year)^{-1}$			Source		
		1 cm	15 cm	20 cm		1 cm	15 cm	20 cm			
1,4-Dichloro-2-butene	764-41-0	1.17E+00	7.80E-02	5.85E-02	e	1.33E+05	5.90E+02	3.32E+02	f	1.75E-02	aa
1-Chloroethene	75-01-4	7.26E+00	4.84E-01	3.63E-01	e	1.38E+08	6.12E+05	3.44E+05	f	5.60E-03	ab
2,2-Dichloropropionic acid	75-99-0	1.06E+01	7.07E-01	5.31E-01	e	5.01E+01	2.23E-01	1.25E-01	f	3.35E-03	aa
2-Chloropropane	75-29-6	3.30E+00	2.20E-01	1.65E-01	e	1.21E+06	5.38E+03	3.03E+03	f	1.08E-02	aa
3-Chloropropene (Allyl chloride)	107-05-1	3.25E+00	2.17E-01	1.62E-01	e	8.05E+05	3.58E+03	2.01E+03	f	5.40E-03	ab
Bromochloromethane	74-97-5	5.79E+00	3.86E-01	2.90E-01	e	1.19E+05	5.28E+02	2.97E+02	f	2.63E-03	aa
Bromodichloromethane	75-27-4	2.78E+00	1.85E-01	1.39E-01	e	5.39E+04	2.39E+02	1.35E+02	f	4.60E-03	ab
Bromoethene	593-60-2	4.92E+00	3.28E-01	2.46E-01	e	1.34E+06	5.94E+03	3.34E+03	f	4.30E-03	ab
Bromoform	75-25-2	1.36E+00	9.07E-02	6.80E-02	e	2.12E+03	9.40E+00	5.29E+00	f	2.20E-03	ab
Bromomethane	74-83-9	7.89E+00	5.26E-01	3.94E-01	e	3.50E+06	1.56E+04	8.75E+03	f	2.80E-03	ab
Carbon tetrachloride	56-23-5	1.15E+00	7.66E-02	5.74E-02	e	2.06E+05	9.17E+02	5.16E+02	f	1.60E-02	ab
Chlorodibromomethane	124-48-1	2.24E+00	1.49E-01	1.12E-01	e	1.03E+04	4.59E+01	2.58E+01	f	3.20E-03	ab
Chlorodifluoromethane	75-45-6	7.63E+00	5.08E-01	3.81E-01	e	5.10E+07	2.27E+05	1.27E+05	f	2.75E-03	aa
Chloroethane	75-00-3	4.98E-01	3.32E-02	2.49E-02	e	1.89E+07	8.40E+04	4.73E+04	f	6.10E-03	ab
Chloroform	67-66-3	2.81E+00	1.87E-01	1.41E-01	e	1.21E+05	5.36E+02	3.02E+02	f	6.80E-03	ab
Chloromethane	74-87-3	8.99E+00	6.00E-01	4.50E-01	e	4.92E+07	2.19E+05	1.23E+05	f	3.30E-03	ab
Chloropentafluoroethane	76-15-3	2.66E-01	1.77E-02	1.33E-02	e	1.59E+07	7.08E+04	3.98E+04	f	5.52E-03	aa
cis-1,2-Dichloroethene	156-59-2	2.95E+00	1.97E-01	1.48E-01	e	2.05E+05	9.09E+02	5.11E+02	f	9.67E-03	aa
cis-1,3-Dichloropropene	10061-01-5	0.0E+00	0.0E+00	0.0E+00	NA	0.0E+00	0.0E+00	0.0E+00	NA	NA	NA
Cyanogen bromide	506-68-3	1.19E+01	7.90E-01	5.93E-01	e	7.57E+07	3.36E+05	1.89E+05	f	2.59E-04	aa
Cyanogen chloride	506-77-4	9.67E+00	6.45E-01	4.84E-01	e	2.03E+07	9.03E+04	5.08E+04	f	3.99E-04	aa
Dichlorodifluoromethane	75-71-8	2.29E+00	1.53E-01	1.15E-01	e	8.98E+07	3.99E+05	2.25E+05	f	9.00E-03	ab
Dichlorofluoromethane	75-43-4	3.82E+00	2.54E-01	1.91E-01	e	8.18E+05	3.63E+03	2.04E+03	f	4.59E-03	aa
Dichloromethane	75-09-2	7.58E+00	5.05E-01	3.79E-01	e	6.35E+05	2.82E+03	1.59E+03	f	3.50E-03	ab
Difluorodibromomethane	75-61-6	0.0E+00	0.0E+00	0.0E+00	NA	0.0E+00	0.0E+00	0.0E+00	NA	NA	NA
Hexafluoroacetone	684-16-2	0.0E+00	0.0E+00	0.0E+00	NA	0.0E+00	0.0E+00	0.0E+00	NA	NA	NA
Iodomethane	74-88-4	4.29E+00	2.86E-01	2.14E-01	e	4.00E+05	1.78E+03	9.99E+02	f	2.50E-03	ab
Methylene bromide	74-95-3	4.65E+00	3.10E-01	2.32E-01	e	1.90E+06	8.45E+03	4.75E+03	f	2.05E-03	aa
Pentachloroethane	76-01-7	5.43E-01	3.62E-02	2.71E-02	e	1.23E+04	5.45E+01	3.06E+01	f	1.29E-02	aa

Table B1-1 Chemical-Specific Parameters for Organic COPCs

Chemical of Potential Concern	CAS Registry Number	Fraction		MW (g/mol)	pH	Henry's Constant			Diffusivity			
		F_v (unitless)	Source			H-pub [x] (various units)	Source	H-used [x] (atm-m^3/mol)	D_a (cm^2/s)	Source	D_w (cm^2/s)	Source
trans-1,2-Dichloroethylene	156-60-5	0 or 1	b	96.95	NA	7.44E-03	c	7.44E-03	8.16E-02	c	9.75E-06	c
trans-1,3-Dichloropropene	10061-02-6	0 or 1	b	110.97	NA	3.56E-02	k	8.69E-04	8.23E-02	e	9.53E-06	e
Trichloroacetic acid	76-03-9	0 or 1	b	163.39	NA	NA	e	1.80E-07	6.36E-02	e	7.36E-06	e
Trichlorofluoroethane	27154-33-2	0 or 1	b	151.4	NA	5.10E+00	k	1.24E-01	6.69E-02	e	7.74E-06	e
Trichlorofluoromethane	75-69-4	0 or 1	b	137.38	NA	1.37E-01	c	1.37E-01	4.27E-02	c	1.00E-05	c
Trifluorobromomethane	75-63-8	0 or 1	b	148.91	NA	2.04E+01	k	4.98E-01	6.76E-02	e	7.83E-06	e
Dioxin and Furan Compounds (PCDDs/PCDFs)												
1,2,3,4,6,7,8-Heptachlorodibenzo(p)dioxin	35822-46-9	0 or 1	b	425.31	NA	7.50E-06	c	7.50E-06	1.11E-02	c	3.89E-06	c
1,2,3,4,6,7,8-Heptachlorodibenzofuran	67562-39-4	0 or 1	b	409.31	NA	5.30E-05	c	5.30E-05	1.55E-02	c	3.99E-06	c
1,2,3,4,7,8,9-Heptachlorodibenzofuran	55673-89-7	0 or 1	b	409.31	NA	5.30E-05	c	5.30E-05	1.55E-02	c	3.99E-06	c
1,2,3,4,7,8-Hexachlorodibenzo(p)dioxin	39227-28-6	0 or 1	b	390.87	NA	1.20E-05	c	1.20E-05	1.15E-02	c	4.12E-06	c
1,2,3,4,7,8-Hexachlorodibenzofuran	70648-26-9	0 or 1	b	374.87	NA	1.40E-05	c	1.40E-05	1.62E-02	c	4.23E-06	c
1,2,3,6,7,8-Hexachlorodibenzo(p)dioxin	57653-85-7	0 or 1	b	390.87	NA	1.20E-05	c	1.20E-05	1.15E-02	c	4.12E-06	c
1,2,3,6,7,8-Hexachlorodibenzofuran	57117-44-9	0 or 1	b	374.87	NA	6.10E-06	c	6.10E-06	1.62E-02	c	4.23E-06	c
1,2,3,7,8,9-Hexachlorodibenzo(p)dioxin	19408-74-3	0 or 1	b	390.87	NA	1.20E-05	c	1.20E-05	1.15E-02	c	4.12E-06	c
1,2,3,7,8,9-Hexachlorodibenzofuran	72918-21-9	0 or 1	b	374.87	NA	1.00E-05	c	1.00E-05	1.62E-02	c	4.23E-06	c
1,2,3,7,8-Pentachlorodibenzo(p)dioxin	40321-76-4	0 or 1	b	356.42	NA	2.60E-06	c	2.60E-06	1.21E-02	c	4.38E-06	c
1,2,3,7,8-Pentachlorodibenzofuran	57117-41-6	0 or 1	b	340.42	NA	6.20E-06	c	6.20E-06	1.70E-02	c	4.51E-06	c
2,3,4,6,7,8-Hexachlorodibenzofuran	60851-34-5	0 or 1	b	374.87	NA	1.00E-05	c	1.00E-05	1.62E-02	c	4.23E-06	c
2,3,4,7,8-Pentachlorodibenzofuran	57117-31-4	0 or 1	b	340.42	NA	6.20E-06	c	6.20E-06	1.70E-02	c	4.51E-06	c
2,3,7,8-Tetrachlorodibenzo(p)dioxin	1746-01-6	0 or 1	b	321.98	NA	1.60E-05	c	1.60E-05	1.27E-02	c	6.81E-06	c
2,3,7,8-Tetrachlorodibenzofuran	51207-31-9	0 or 1	b	305.98	NA	8.60E-06	c	8.60E-06	1.79E-02	c	4.85E-06	c
Dibenzofuran	132-64-9	0 or 1	b	168.19	NA	1.30E-05	u	1.30E-05	6.24E-02	e	7.22E-06	e
Octachlorodibenzo(p)dioxin	3268-87-9	0 or 1	b	459.75	NA	7.00E-09	c	7.00E-09	1.06E-02	c	3.69E-07	c
Octachlorodibenzofuran	39001-02-0	0 or 1	b	444.76	NA	1.90E-06	c	1.90E-06	1.48E-02	c	3.78E-06	c
Polychlorinated Biphenyls (PCBs)												
2,2',3,3',4,4',5-Heptachlorobiphenyl	35065-30-6	0 or 1	b	395.33	NA	1.93E+01	i	1.91E-04	3.53E-02	e	4.08E-06	e
2,2',3,4,4',5,5'-Heptachlorobiphenyl	35065-29-3	0 or 1	b	395.33	NA	3.04E+01	i	3.01E-04	3.53E-02	e	4.08E-06	e
2,3,3',4,4',5,5'-Heptachlorobiphenyl	39635-31-9	0 or 1	b	395.33	NA	3.68E-04	k	8.98E-06	3.53E-02	e	4.08E-06	e

Table B1-1 Chemical-Specific Parameters for Organic COPCs

Chemical of Potential Concern	CAS Registry Number	Octanol / Water Partitioning Coefficients						Partitioning Coefficients (Kd)			
		K_{oc}-pub [y] (various units)	Source	K_{oc}-used [z] (mL/g)	K_{ow}-pub [y] (various units)	Source	K_{ow}-used [z] (unitless)	Kd_{bs} (L/kg)	Source	Kd_s (mL/g)	Source
trans-1,2-Dichloroethylene	156-60-5	3.80E+01	c	3.80E+01	9.60E+01	c	9.60E+01	1.52E+00	c	3.80E-01	c
trans-1,3-Dichloropropene	10061-02-6	NA	e	5.73E+01	2.06E+00	t	1.15E+02	2.29E+00	e	5.73E-01	e
Trichloroacetic acid	76-03-9	NA	e	1.54E+01	1.33E+00	i	2.14E+01	6.17E-01	e	1.54E-01	e
Trichlorofluoroethane	27154-33-2	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Trichlorofluoromethane	75-69-4	1.34E+02	c	1.34E+02	3.40E+02	c	3.40E+02	5.34E+00	c	1.34E+00	c
Trifluorobromomethane	75-63-8	NA	e	4.00E+01	1.86E+00	o	7.24E+01	1.60E+00	e	4.00E-01	e
Dioxin and Furan Compounds (PCDDs/PCDFs)											
1,2,3,4,6,7,8-Heptachlorodibenzo(p)dioxin	35822-46-9	9.77E+07	c	9.77E+07	1.58E+08	c	1.58E+08	3.91E+06	c	9.77E+05	c
1,2,3,4,6,7,8-Heptachlorodibenzofuran	67562-39-4	5.13E+07	c	5.13E+07	8.32E+07	c	8.32E+07	2.05E+06	c	5.13E+05	c
1,2,3,4,7,8,9-Heptachlorodibenzofuran	55673-89-7	5.13E+07	c	5.13E+07	8.32E+07	c	8.32E+07	2.05E+06	c	5.13E+05	c
1,2,3,4,7,8-Hexachlorodibenzo(p)dioxin	39227-28-6	3.80E+07	c	3.80E+07	6.17E+07	c	6.17E+07	1.52E+06	c	3.80E+05	c
1,2,3,4,7,8-Hexachlorodibenzofuran	70648-26-9	1.10E+07	c	1.10E+07	1.78E+07	c	1.78E+07	4.39E+05	c	1.10E+05	c
1,2,3,6,7,8-Hexachlorodibenzo(p)dioxin	57653-85-7	1.10E+07	c	1.10E+07	1.78E+07	c	1.78E+07	4.39E+05	c	1.10E+05	c
1,2,3,6,7,8-Hexachlorodibenzofuran	57117-44-9	1.10E+07	c	1.10E+07	1.78E+07	c	1.78E+07	4.39E+05	c	1.10E+05	c
1,2,3,7,8,9-Hexachlorodibenzo(p)dioxin	19408-74-3	1.10E+07	c	1.10E+07	1.78E+07	c	1.78E+07	4.39E+05	c	1.10E+05	c
1,2,3,7,8,9-Hexachlorodibenzofuran	72918-21-9	1.10E+07	c	1.10E+07	1.78E+07	c	1.78E+07	4.39E+05	c	1.10E+05	c
1,2,3,7,8-Pentachlorodibenzo(p)dioxin	40321-76-4	2.69E+06	c	2.69E+06	4.37E+06	c	4.37E+06	1.08E+05	c	2.69E+04	c
1,2,3,7,8-Pentachlorodibenzofuran	57117-41-6	3.80E+06	c	3.80E+06	6.17E+06	c	6.17E+06	1.52E+05	c	3.80E+04	c
2,3,4,6,7,8-Hexachlorodibenzofuran	60851-34-5	1.10E+07	c	1.10E+07	1.78E+07	c	1.78E+07	4.39E+05	c	1.10E+05	c
2,3,4,7,8-Pentachlorodibenzofuran	57117-31-4	5.13E+06	c	5.13E+06	8.32E+06	c	8.32E+06	2.05E+05	c	5.13E+04	c
2,3,7,8-Tetrachlorodibenzo(p)dioxin	1746-01-6	2.69E+06	s	2.69E+06	4.37E+06	c	4.37E+06	1.08E+05	c	2.69E+04	c
2,3,7,8-Tetrachlorodibenzofuran	51207-31-9	2.09E+06	c	2.09E+06	3.39E+06	c	3.39E+06	8.36E+04	c	2.09E+04	c
Dibenzofuran	132-64-9	NA	e	1.32E+04	4.33E+00	i	2.14E+04	5.27E+02	e	1.32E+02	e
Octachlorodibenzo(p)dioxin	3268-87-9	2.40E+07	c	2.40E+07	3.89E+07	c	3.89E+07	9.60E+05	c	2.40E+05	c
Octachlorodibenzofuran	39001-02-0	3.72E+08	c	3.72E+08	6.03E+08	c	6.03E+08	1.49E+07	c	3.72E+06	c
Polychlorinated Biphenyls (PCBs)											
2,2',3,3',4,4',5-Heptachlorobiphenyl	35065-30-6	6.85E+00	i	7.08E+06	7.08E+00	i	1.20E+07	2.83E+05	e	7.08E+04	e
2,2',3,4,4',5,5'-Heptachlorobiphenyl	35065-29-3	6.92E+00	i	8.32E+06	7.12E+00	i	1.32E+07	3.33E+05	e	8.32E+04	e
2,3,3',4,4',5,5'-Heptachlorobiphenyl	39635-31-9	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Table B1-1 Chemical-Specific Parameters for Organic COPCs

Chemical of Potential Concern	CAS Registry Number	Kd		Plant Uptake Factors				
		Kd_{sw} (L/kg)	Source	Br_{ag} (µg/g DW plant)/ (µg/g soil)	Source	Br_{forage} (µg/g DW plant)/ (µg/g soil)	Source	Br_{grain} (µg/g DW plant)/ (µg/g soil) [a]
trans-1,2-Dichloroethylene	156-60-5	2.85E+00	c	2.77E+00	c	2.77E+00	c	2.77E+00
trans-1,3-Dichloropropene	10061-02-6	4.29E+00	e	2.50E+00	e	2.50E+00	e	2.50E+00
Trichloroacetic acid	76-03-9	1.16E+00	e	6.60E+00	e	6.60E+00	e	6.60E+00
Trichlorofluoroethane	27154-33-2	NA	NA	NA	NA	NA	NA	NA
Trichlorofluoromethane	75-69-4	1.00E+01	c	1.33E+00	c	1.33E+00	c	1.33E+00
Trifluorobromomethane	75-63-8	3.00E+00	e	3.26E+00	e	3.26E+00	e	3.26E+00
Dioxin and Furan Compounds (PCDDs/PCDFs)								
1,2,3,4,6,7,8-Heptachlorodibenzo(p)dioxin	35822-46-9	7.33E+06	c	7.05E-04	c	7.05E-04	c	7.05E-04
1,2,3,4,6,7,8-Heptachlorodibenzofuran	67562-39-4	3.85E+06	c	1.02E-03	c	1.02E-03	c	1.02E-03
1,2,3,4,7,8,9-Heptachlorodibenzofuran	55673-89-7	3.85E+06	c	1.02E-03	c	1.02E-03	c	1.02E-03
1,2,3,4,7,8-Hexachlorodibenzo(p)dioxin	39227-28-6	2.85E+06	c	1.22E-03	c	1.22E-03	c	1.22E-03
1,2,3,4,7,8-Hexachlorodibenzofuran	70648-26-9	8.22E+05	c	2.50E-03	c	2.50E-03	c	2.50E-03
1,2,3,6,7,8-Hexachlorodibenzo(p)dioxin	57653-85-7	8.22E+05	c	2.50E-03	c	2.50E-03	c	2.50E-03
1,2,3,6,7,8-Hexachlorodibenzofuran	57117-44-9	8.22E+05	c	2.50E-03	c	2.50E-03	c	2.50E-03
1,2,3,7,8,9-Hexachlorodibenzo(p)dioxin	19408-74-3	8.22E+05	c	2.50E-03	c	2.50E-03	c	2.50E-03
1,2,3,7,8,9-Hexachlorodibenzofuran	72918-21-9	8.22E+05	c	2.50E-03	c	2.50E-03	c	2.50E-03
1,2,3,7,8-Pentachlorodibenzo(p)dioxin	40321-76-4	2.02E+05	c	5.62E-03	c	5.62E-03	c	5.62E-03
1,2,3,7,8-Pentachlorodibenzofuran	57117-41-6	2.85E+05	c	4.61E-03	c	4.61E-03	c	4.61E-03
2,3,4,6,7,8-Hexachlorodibenzofuran	60851-34-5	8.22E+05	c	2.50E-03	c	2.50E-03	c	2.50E-03
2,3,4,7,8-Pentachlorodibenzofuran	57117-31-4	3.85E+05	c	3.87E-03	c	3.87E-03	c	3.87E-03
2,3,7,8-Tetrachlorodibenzo(p)dioxin	1746-01-6	2.02E+05	c	5.62E-03	c	5.62E-03	c	5.62E-03
2,3,7,8-Tetrachlorodibenzofuran	51207-31-9	1.57E+05	c	6.51E-03	c	6.51E-03	c	6.51E-03
Dibenzofuran	132-64-9	9.89E+02	e	1.22E-01	e	1.22E-01	e	1.22E-01
Octachlorodibenzo(p)dioxin	3268-87-9	1.80E+06	c	1.59E-03	c	1.59E-03	c	1.59E-03
Octachlorodibenzofuran	39001-02-0	2.79E+07	c	3.26E-04	c	3.26E-04	c	3.26E-04
Polychlorinated Biphenyls (PCBs)								
2,2',3,3',4,4',5-Heptachlorobiphenyl	35065-30-6	5.31E+05	e	3.13E-03	e	3.13E-03	e	3.13E-03
2,2',3,4,4',5,5'-Heptachlorobiphenyl	35065-29-3	6.24E+05	e	2.97E-03	e	2.97E-03	e	2.97E-03
2,3,3',4,4',5,5'-Heptachlorobiphenyl	39635-31-9	NA	NA	NA	NA	NA	NA	NA

Table B1-1 Chemical-Specific Parameters for Organic COPCs

Chemical of Potential Concern	CAS Registry Number	Plant Uptake Factors							
		$Br_{rootveg}$ (µg/g DW plant)/ (µg/g soil)	Source	Bv_{ag} (µg/g DW plant)/ (µg/g air)	Source	Bv_{forage} (µg/g DW plant)/ (µg/g air)	Source	RCF (µg/g DW plant)/ (µg/mL soil water)	Source
trans-1,2-Dichloroethylene	156-60-5	3.71E+01	c	9.70E-04	c	9.70E-04	c	1.41E+01	c
trans-1,3-Dichloropropene	10061-02-6	2.67E+01	e	1.01E-02	e	1.01E-02	e	1.53E+01	e
Trichloroacetic acid	76-03-9	5.68E+01	e	8.14E+00	e	8.14E+00	e	8.76E+00	e
Trichlorofluoroethane	27154-33-2	NA	NA	NA	NA	NA	NA	NA	NA
Trichlorofluoromethane	75-69-4	2.02E+00	c	2.02E-04	c	2.02E-04	c	2.70E+01	c
Trifluorobromomethane	75-63-8	3.15E+01	e	1.08E-05	e	1.08E-05	e	1.26E+01	e
Dioxin and Furan Compounds (PCDDs/PCDFs)									
1,2,3,4,6,7,8-Heptachlorodibenzo(p)dioxin	35822-46-9	4.90E-01	c	9.10E+05	s	3.50E+05	s	4.79E+05	c
1,2,3,4,6,7,8-Heptachlorodibenzofuran	67562-39-4	5.68E-01	c	8.30E+05	s	8.30E+05	s	2.91E+05	c
1,2,3,4,7,8,9-Heptachlorodibenzofuran	55673-89-7	5.68E-01	c	8.30E+05	s	8.30E+05	s	2.91E+05	c
1,2,3,4,7,8-Hexachlorodibenzo(p)dioxin	39227-28-6	6.09E-01	c	5.20E+05	s	5.20E+05	s	2.31E+05	c
1,2,3,4,7,8-Hexachlorodibenzofuran	70648-26-9	8.10E-01	c	1.62E+05	s	1.62E+05	s	8.88E+04	c
1,2,3,6,7,8-Hexachlorodibenzo(p)dioxin	57653-85-7	8.10E-01	c	5.20E+05	s	5.20E+05	s	8.88E+04	c
1,2,3,6,7,8-Hexachlorodibenzofuran	57117-44-9	8.10E-01	c	1.62E+05	s	1.62E+05	s	8.88E+04	c
1,2,3,7,8,9-Hexachlorodibenzo(p)dioxin	19408-74-3	8.10E-01	c	5.20E+05	s	5.20E+05	s	8.88E+04	c
1,2,3,7,8,9-Hexachlorodibenzofuran	72918-21-9	8.10E-01	c	1.62E+05	s	1.62E+05	s	8.88E+04	c
1,2,3,7,8-Pentachlorodibenzo(p)dioxin	40321-76-4	1.12E+00	c	2.39E+05	s	2.39E+05	s	3.01E+04	c
1,2,3,7,8-Pentachlorodibenzofuran	57117-41-6	1.03E+00	c	9.75E+04	s	9.75E+04	s	3.93E+04	c
2,3,4,6,7,8-Hexachlorodibenzofuran	60851-34-5	8.10E-01	c	1.62E+05	s	1.62E+05	s	8.88E+04	c
2,3,4,7,8-Pentachlorodibenzofuran	57117-31-4	9.65E-01	c	9.75E+04	s	9.75E+04	s	4.95E+04	c
2,3,7,8-Tetrachlorodibenzo(p)dioxin	1746-01-6	1.12E+00	c	6.55E+04	s	6.55E+04	s	3.01E+04	c
2,3,7,8-Tetrachlorodibenzofuran	51207-31-9	1.19E+00	c	4.57E+04	s	4.57E+04	s	2.48E+04	c
Dibenzofuran	132-64-9	3.85E+00	e	1.76E+02	e	1.76E+02	e	5.08E+02	e
Octachlorodibenzo(p)dioxin	3268-87-9	6.77E-01	c	2.36E+06	s	2.36E+06	s	1.62E+05	c
Octachlorodibenzofuran	39001-02-0	3.60E-01	c	2.28E+06	s	2.28E+06	s	1.34E+06	c
Polychlorinated Biphenyls (PCBs)									
2,2',3,3',4,4',5-Heptachlorobiphenyl	35065-30-6	9.28E-01	e	1.02E+04	e	1.02E+04	e	6.57E+04	e
2,2',3,4,4',5,5'-Heptachlorobiphenyl	35065-29-3	8.48E-01	e	7.13E+03	e	7.13E+03	e	7.05E+04	e
2,3,3',4,4',5,5'-Heptachlorobiphenyl	39635-31-9	NA	NA	NA	NA	NA	NA	NA	NA

Table B1-1 Chemical-Specific Parameters for Organic COPCs

Chemical of Potential Concern	CAS Registry Number	Bioconcentration/Bioaccumulation Factors									
		Ba_{beef} (day/kg FW)	Source	$Ba_{chicken}$ (day/kg FW)	Source	Ba_{egg} (day/kg FW)	Source	Ba_{milk} (day/kg FW)	Source	Ba_{pork} (day/kg FW)	Source
trans-1,2-Dichloroethylene	156-60-5	2.41E-06	c	1.90E-06	c	7.63E-04	c	7.63E-07	c	2.92E-06	c
trans-1,3-Dichloropropene	10061-02-6	2.88E-06	e	2.28E-06	e	9.12E-04	e	9.12E-07	e	3.49E-06	e
Trichloroacetic acid	76-03-9	5.37E-07	e	4.24E-07	e	1.70E-04	e	1.70E-07	e	6.50E-07	e
Trichlorofluoroethane	27154-33-2	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Trichlorofluoromethane	75-69-4	8.54E-06	c	6.74E-06	c	2.70E-03	c	2.70E-06	c	1.03E-05	c
Trifluorobromomethane	75-63-8	1.82E-06	e	1.44E-06	e	5.75E-04	e	5.75E-07	e	2.20E-06	e
Dioxin and Furan Compounds (PCDDs/PCDFs)											
1,2,3,4,6,7,8-Heptachlorodibenzo(p)dioxin	35822-46-9	5.40E-03	c	1.20E+00	s	5.05E+00	s	1.00E-03	c	6.57E-03	c
1,2,3,4,6,7,8-Heptachlorodibenzofuran	67562-39-4	5.43E-03	c	9.00E-01	s	3.30E+00	s	1.00E-03	c	6.57E-03	c
1,2,3,4,7,8,9-Heptachlorodibenzofuran	55673-89-7	1.63E-02	c	8.00E-01	s	2.40E+00	s	3.00E-03	c	1.97E-02	c
1,2,3,4,7,8-Hexachlorodibenzo(p)dioxin	39227-28-6	3.26E-02	c	3.35E+00	s	6.65E+00	s	6.00E-03	c	3.94E-02	c
1,2,3,4,7,8-Hexachlorodibenzofuran	70648-26-9	3.80E-02	c	4.30E+00	s	8.35E+00	s	7.00E-03	c	4.60E-02	c
1,2,3,6,7,8-Hexachlorodibenzo(p)dioxin	57653-85-7	2.71E-02	c	5.05E+00	s	9.75E+00	s	5.00E-03	c	3.29E-02	c
1,2,3,6,7,8-Hexachlorodibenzofuran	57117-44-9	3.26E-02	c	4.65E+00	s	8.65E+00	s	6.00E-03	c	3.94E-02	c
1,2,3,7,8,9-Hexachlorodibenzo(p)dioxin	19408-74-3	2.71E-02	c	2.20E+00	s	4.95E+00	s	5.00E-03	c	3.29E-02	c
1,2,3,7,8,9-Hexachlorodibenzofuran	72918-21-9	3.26E-02	c	NA	NA	NA	NA	6.00E-03	c	3.94E-02	c
1,2,3,7,8-Pentachlorodibenzo(p)dioxin	40321-76-4	5.43E-02	c	6.05E+00	s	6.30E+00	s	1.00E-02	c	6.57E-02	c
1,2,3,7,8-Pentachlorodibenzofuran	57117-41-6	1.09E-02	c	1.65E+01	s	2.24E+01	s	2.00E-03	c	1.31E-02	c
2,3,4,6,7,8-Hexachlorodibenzofuran	60851-34-5	2.71E-02	c	1.90E+00	s	2.90E+00	s	5.00E-03	c	3.29E-02	c
2,3,4,7,8-Pentachlorodibenzofuran	57117-31-4	4.89E-02	c	6.60E+00	s	9.60E+00	s	9.00E-03	c	5.91E-02	c
2,3,7,8-Tetrachlorodibenzo(p)dioxin	1746-01-6	5.43E-02	c	1.66E+01	s	1.36E+01	s	1.00E-02	c	6.57E-02	c
2,3,7,8-Tetrachlorodibenzofuran	51207-31-9	1.63E-02	c	3.05E+00	s	2.55E+00	s	3.00E-03	c	1.97E-02	c
Dibenzofuran	132-64-9	5.37E-04	e	4.24E-04	e	1.70E-01	e	1.70E-04	e	1.12E-03	e
Octachlorodibenzo(p)dioxin	3268-87-9	5.43E-03	c	2.50E-01	s	4.00E+00	s	1.00E-03	c	6.57E-03	c
Octachlorodibenzofuran	39001-02-0	5.43E-03	c	3.00E-01	s	1.45E+00	s	1.00E-03	c	6.57E-03	c
Polychlorinated Biphenyls (PCBs)											
2,2',3,3',4,4',5-Heptachlorobiphenyl	35065-30-6	3.02E-01	e	2.38E-01	e	9.55E+01	e	9.55E-02	e	3.66E-01	e
2,2',3,4,4',5,5'-Heptachlorobiphenyl	35065-29-3	3.31E-01	e	2.61E-01	e	1.05E+02	e	1.05E-01	e	4.01E-01	e
2,3,3',4,4',5,5'-Heptachlorobiphenyl	39635-31-9	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Table B1-1 Chemical-Specific Parameters for Organic COPCs

Chemical of Potential Concern	CAS Registry Number	Bioconcentration/Bioaccumulation Factors						Half-life	
		BAF_{fish} (L/kg FW)	Source	BCF_{fish} (L/kg FW)	Source	$BSAF_{fish}$ (unitless)	Source	$t_{1/2}$ (days)	Source
trans-1,2-Dichloroethylene	156-60-5	NA	NA	1.89E+01	c	NA	NA	NA	NA
trans-1,3-Dichloropropene	10061-02-6	NA	NA	2.17E+01	e	NA	NA	NA	NA
Trichloroacetic acid	76-03-9	NA	NA	6.04E+00	e	NA	NA	NA	NA
Trichlorofluoroethane	27154-33-2	NA	NA	NA	NA	NA	NA	NA	NA
Trichlorofluoromethane	75-69-4	NA	NA	4.94E+01	c	NA	NA	NA	NA
Trifluorobromomethane	75-63-8	NA	NA	1.53E+01	e	NA	NA	NA	NA
Dioxin and Furan Compounds (PCDDs/PCDFs)									
1,2,3,4,6,7,8-Heptachlorodibenzo(p)dioxin	35822-46-9	NA	NA	NA	NA	5.00E-03	c	NA	NA
1,2,3,4,6,7,8-Heptachlorodibenzofuran	67562-39-4	NA	NA	NA	NA	5.00E-03	c	NA	NA
1,2,3,4,7,8,9-Heptachlorodibenzofuran	55673-89-7	NA	NA	NA	NA	5.00E-03	c	NA	NA
1,2,3,4,7,8-Hexachlorodibenzo(p)dioxin	39227-28-6	NA	NA	NA	NA	4.00E-02	c	NA	NA
1,2,3,4,7,8-Hexachlorodibenzofuran	70648-26-9	NA	NA	NA	NA	4.00E-02	c	NA	NA
1,2,3,6,7,8-Hexachlorodibenzo(p)dioxin	57653-85-7	NA	NA	NA	NA	4.00E-02	c	NA	NA
1,2,3,6,7,8-Hexachlorodibenzofuran	57117-44-9	NA	NA	NA	NA	4.00E-02	c	NA	NA
1,2,3,7,8,9-Hexachlorodibenzo(p)dioxin	19408-74-3	NA	NA	NA	NA	4.00E-02	c	NA	NA
1,2,3,7,8,9-Hexachlorodibenzofuran	72918-21-9	NA	NA	NA	NA	4.00E-02	c	NA	NA
1,2,3,7,8-Pentachlorodibenzo(p)dioxin	40321-76-4	NA	NA	NA	NA	9.00E-02	c	NA	NA
1,2,3,7,8-Pentachlorodibenzofuran	57117-41-6	NA	NA	NA	NA	9.00E-02	c	NA	NA
2,3,4,6,7,8-Hexachlorodibenzofuran	60851-34-5	NA	NA	NA	NA	4.00E-02	c	NA	NA
2,3,4,7,8-Pentachlorodibenzofuran	57117-31-4	NA	NA	NA	NA	9.00E-02	c	NA	NA
2,3,7,8-Tetrachlorodibenzo(p)dioxin	1746-01-6	NA	NA	NA	NA	9.00E-02	c	NA	NA
2,3,7,8-Tetrachlorodibenzofuran	51207-31-9	NA	NA	NA	NA	9.00E-02	c	NA	NA
Dibenzofuran	132-64-9	NA	NA	NA	NA	2.51E+02	v	2.80E+01	d
Octachlorodibenzo(p)dioxin	3268-87-9	NA	NA	NA	NA	1.00E-04	c	NA	NA
Octachlorodibenzofuran	39001-02-0	NA	NA	NA	NA	1.00E-04	c	NA	NA
Polychlorinated Biphenyls (PCBs)									
2,2',3,3',4,4',5-Heptachlorobiphenyl	35065-30-6	NA	NA	NA	NA	NA	NA	NA	NA
2,2',3,4,4',5,5'-Heptachlorobiphenyl	35065-29-3	NA	NA	NA	NA	NA	NA	NA	NA
2,3,3',4,4',5,5'-Heptachlorobiphenyl	39635-31-9	NA	NA	NA	NA	NA	NA	NA	NA

Table B1-1 Chemical-Specific Parameters for Organic COPCs

Chemical of Potential Concern	CAS Registry Number	Soil Loss Mechanisms [g]											
		k_{decay} (year)$^{-1}$	Source	ks_e (year)$^{-1}$			Source	ks_g (year)$^{-1}$	Source	ks_l (year)$^{-1}$			Source
				1 cm	15 cm	20 cm				1 cm	15 cm	20 cm	
trans-1,2-Dichloroethylene	156-60-5	0.0E+00	NA	3.76E-03	2.51E-04	1.88E-04	e	1.41E+00	c	6.03E+00	4.02E-01	3.02E-01	e
trans-1,3-Dichloropropene	10061-02-6	0.0E+00	NA	4.17E-03	2.78E-04	2.08E-04	e	0.0E+00	NA	4.43E+00	2.96E-01	2.22E-01	e
Trichloroacetic acid	76-03-9	0.0E+00	NA	2.65E-03	1.76E-04	1.32E-04	e	0.0E+00	NA	1.05E+01	6.97E-01	5.23E-01	e
Trichlorofluoroethane	27154-33-2	0.0E+00	NA	0.0E+00	0.0E+00	0.0E+00	NA	0.0E+00	NA	0.0E+00	0.0E+00	0.0E+00	NA
Trichlorofluoromethane	75-69-4	0.0E+00	NA	4.74E-03	3.16E-04	2.37E-04	e	7.03E-01	c	2.16E+00	1.44E-01	1.08E-01	e
Trifluorobromomethane	75-63-8	0.0E+00	NA	3.82E-03	2.54E-04	1.91E-04	e	0.00E+00	NA	5.82E+00	3.88E-01	2.91E-01	e
Dioxin and Furan Compounds (PCDDs/PCDFs)													
1,2,3,4,6,7,8-Heptachlorodibenzo(p)dioxin	35822-46-9	0.0E+00	NA	5.28E-03	3.52E-04	2.64E-04	e	6.93E-02	s	3.30E-06	2.20E-07	1.65E-07	e
1,2,3,4,6,7,8-Heptachlorodibenzofuran	67562-39-4	0.0E+00	NA	5.28E-03	3.52E-04	2.64E-04	e	6.93E-02	s	6.28E-06	4.18E-07	3.14E-07	e
1,2,3,4,7,8,9-Heptachlorodibenzofuran	55673-89-7	0.0E+00	NA	5.28E-03	3.52E-04	2.64E-04	e	6.93E-02	s	6.28E-06	4.18E-07	3.14E-07	e
1,2,3,4,7,8-Hexachlorodibenzo(p)dioxin	39227-28-6	0.0E+00	NA	5.28E-03	3.52E-04	2.64E-04	e	6.93E-02	s	8.47E-06	5.65E-07	4.24E-07	e
1,2,3,4,7,8-Hexachlorodibenzofuran	70648-26-9	0.0E+00	NA	5.28E-03	3.52E-04	2.64E-04	e	6.93E-02	s	2.93E-05	1.95E-06	1.46E-06	e
1,2,3,6,7,8-Hexachlorodibenzo(p)dioxin	57653-85-7	0.0E+00	NA	5.28E-03	3.52E-04	2.64E-04	e	6.93E-02	s	2.93E-05	1.95E-06	1.46E-06	e
1,2,3,6,7,8-Hexachlorodibenzofuran	57117-44-9	0.0E+00	NA	5.28E-03	3.52E-04	2.64E-04	e	6.93E-02	s	2.93E-05	1.95E-06	1.46E-06	e
1,2,3,7,8,9-Hexachlorodibenzo(p)dioxin	19408-74-3	0.0E+00	NA	5.28E-03	3.52E-04	2.64E-04	e	6.93E-02	s	2.93E-05	1.95E-06	1.46E-06	e
1,2,3,7,8,9-Hexachlorodibenzofuran	72918-21-9	0.0E+00	NA	5.28E-03	3.52E-04	2.64E-04	e	6.93E-02	s	2.93E-05	1.95E-06	1.46E-06	e
1,2,3,7,8-Pentachlorodibenzo(p)dioxin	40321-76-4	0.0E+00	NA	5.28E-03	3.52E-04	2.64E-04	e	6.93E-02	s	1.20E-04	7.98E-06	5.99E-06	e
1,2,3,7,8-Pentachlorodibenzofuran	57117-41-6	0.0E+00	NA	5.28E-03	3.52E-04	2.64E-04	e	6.93E-02	s	8.47E-05	5.65E-06	4.24E-06	e
2,3,4,6,7,8-Hexachlorodibenzofuran	60851-34-5	0.0E+00	NA	5.28E-03	3.52E-04	2.64E-04	e	6.93E-02	s	2.93E-05	1.95E-06	1.46E-06	e
2,3,4,7,8-Pentachlorodibenzofuran	57117-31-4	0.0E+00	NA	5.28E-03	3.52E-04	2.64E-04	e	6.93E-02	s	6.28E-05	4.18E-06	3.14E-06	e
2,3,7,8-Tetrachlorodibenzo(p)dioxin	1746-01-6	0.0E+00	NA	5.28E-03	3.52E-04	2.64E-04	e	6.93E-02	s	1.20E-04	7.98E-06	5.99E-06	e
2,3,7,8-Tetrachlorodibenzofuran	51207-31-9	0.0E+00	NA	5.28E-03	3.52E-04	2.64E-04	e	6.93E-02	s	1.54E-04	1.03E-05	7.70E-06	e
Dibenzofuran	132-64-9	0.0E+00	NA	5.28E-03	3.52E-04	2.64E-04	e	9.03E+00	e	2.44E-02	1.63E-03	1.22E-03	e
Octachlorodibenzo(p)dioxin	3268-87-9	0.0E+00	NA	5.28E-03	3.52E-04	2.64E-04	e	6.93E-02	s	1.34E-05	8.95E-07	6.71E-07	e
Octachlorodibenzofuran	39001-02-0	0.0E+00	NA	5.28E-03	3.52E-04	2.64E-04	e	6.93E-02	s	8.66E-07	5.77E-08	4.33E-08	e
Polychlorinated Biphenyls (PCBs)													
2,2',3,3',4,4',5-Heptachlorobiphenyl	35065-30-6	0.0E+00	NA	5.28E-03	3.52E-04	2.64E-04	e	0.0E+00	NA	4.55E-05	3.03E-06	2.27E-06	e
2,2',3,4,4',5,5'-Heptachlorobiphenyl	35065-29-3	0.0E+00	NA	5.28E-03	3.52E-04	2.64E-04	e	0.0E+00	NA	3.87E-05	2.58E-06	1.94E-06	e
2,3,3',4,4',5,5'-Heptachlorobiphenyl	39635-31-9	0.0E+00	NA	0.0E+00	0.0E+00	0.0E+00	NA	0.0E+00	NA	0.0E+00	0.0E+00	0.0E+00	NA

Table B1-1 Chemical-Specific Parameters for Organic COPCs

Chemical of Potential Concern	CAS Registry Number	Soil Loss Mechanisms [g]								Kp (cm/hr)	Source
		ks_r $(year)^{-1}$			Source	ks_v $(year)^{-1}$			Source		
		1 cm	15 cm	20 cm		1 cm	15 cm	20 cm			
trans-1,2-Dichloroethylene	156-60-5	3.60E+00	2.40E-01	1.80E-01	e	4.90E+05	2.18E+03	1.23E+03	f	7.70E-03	ab
trans-1,3-Dichloropropene	10061-02-6	2.65E+00	1.76E-01	1.32E-01	e	3.83E+04	1.70E+02	9.59E+01	f	9.09E-03	aa
Trichloroacetic acid	76-03-9	6.24E+00	4.16E-01	3.12E-01	e	2.27E+01	1.01E-01	5.68E-02	f	1.50E-03	aa
Trichlorofluoroethane	27154-33-2	0.0E+00	0.0E+00	0.0E+00	NA	0.0E+00	0.0E+00	0.0E+00	NA	NA	NA
Trichlorofluoromethane	75-69-4	1.29E+00	8.58E-02	6.44E-02	e	1.34E+06	5.95E+03	3.35E+03	f	1.30E-02	ab
Trifluorobromomethane	75-63-8	3.47E+00	2.32E-01	1.74E-01	e	2.59E+07	1.15E+05	6.46E+04	f	4.10E-03	aa
Dioxin and Furan Compounds (PCDDs/PCDFs)											
1,2,3,4,6,7,8-Heptachlorodibenzo(p)dioxin	35822-46-9	1.97E-06	1.31E-07	9.84E-08	e	2.62E-05	1.16E-07	6.54E-08	f	2.05E+00	aa
1,2,3,4,6,7,8-Heptachlorodibenzofuran	67562-39-4	3.75E-06	2.50E-07	1.87E-07	e	4.91E-04	2.18E-06	1.23E-06	f	1.64E+00	aa
1,2,3,4,7,8,9-Heptachlorodibenzofuran	55673-89-7	3.75E-06	2.50E-07	1.87E-07	e	4.91E-04	2.18E-06	1.23E-06	f	1.64E+00	aa
1,2,3,4,7,8-Hexachlorodibenzo(p)dioxin	39227-28-6	5.06E-06	3.37E-07	2.53E-07	e	1.11E-04	4.95E-07	2.79E-07	f	1.70E+00	aa
1,2,3,4,7,8-Hexachlorodibenzofuran	70648-26-9	1.75E-05	1.17E-06	8.74E-07	e	6.33E-04	2.81E-06	1.58E-06	f	9.09E-01	aa
1,2,3,6,7,8-Hexachlorodibenzo(p)dioxin	57653-85-7	1.75E-05	1.17E-06	8.74E-07	e	3.85E-04	1.71E-06	9.63E-07	f	7.39E-01	aa
1,2,3,6,7,8-Hexachlorodibenzofuran	57117-44-9	1.75E-05	1.17E-06	8.74E-07	e	2.76E-04	1.23E-06	6.89E-07	f	9.09E-01	aa
1,2,3,7,8,9-Hexachlorodibenzo(p)dioxin	19408-74-3	1.75E-05	1.17E-06	8.74E-07	e	3.85E-04	1.71E-06	9.63E-07	f	7.39E-01	aa
1,2,3,7,8,9-Hexachlorodibenzofuran	72918-21-9	1.75E-05	1.17E-06	8.74E-07	e	4.52E-04	2.01E-06	1.13E-06	f	9.09E-01	aa
1,2,3,7,8-Pentachlorodibenzo(p)dioxin	40321-76-4	7.15E-05	4.77E-06	3.57E-06	e	3.59E-04	1.60E-06	8.97E-07	f	4.50E-01	aa
1,2,3,7,8-Pentachlorodibenzofuran	57117-41-6	5.06E-05	3.37E-06	2.53E-06	e	8.51E-04	3.78E-06	2.13E-06	f	6.97E-01	aa
2,3,4,6,7,8-Hexachlorodibenzofuran	60851-34-5	1.75E-05	1.17E-06	8.74E-07	e	4.52E-04	2.01E-06	1.13E-06	f	9.09E-01	aa
2,3,4,7,8-Pentachlorodibenzofuran	57117-31-4	3.75E-05	2.50E-06	1.87E-06	e	6.31E-04	2.80E-06	1.58E-06	f	8.51E-01	aa
2,3,7,8-Tetrachlorodibenzo(p)dioxin	1746-01-6	7.15E-05	4.77E-06	3.57E-06	e	2.32E-03	1.03E-05	5.80E-06	f	8.10E-01	ab
2,3,7,8-Tetrachlorodibenzofuran	51207-31-9	9.20E-05	6.13E-06	4.60E-06	e	2.26E-03	1.00E-05	5.65E-06	f	7.27E-01	aa
Dibenzofuran	132-64-9	1.46E-02	9.71E-04	7.29E-04	e	1.89E+00	8.39E-03	4.72E-03	f	1.44E-01	aa
Octachlorodibenzo(p)dioxin	3268-87-9	8.01E-06	5.34E-07	4.01E-07	e	9.49E-08	4.22E-10	2.37E-10	f	5.14E-01	aa
Octachlorodibenzofuran	39001-02-0	5.17E-07	3.45E-08	2.58E-08	e	2.32E-06	1.03E-08	5.80E-09	f	3.91E+00	aa
Polychlorinated Biphenyls (PCBs)											
2,2',3,3',4,4',5-Heptachlorobiphenyl	35065-30-6	2.72E-05	1.81E-06	1.36E-06	e	2.91E-02	1.30E-04	7.29E-05	f	5.37E-01	aa
2,2',3,4,4',5,5'-Heptachlorobiphenyl	35065-29-3	2.31E-05	1.54E-06	1.16E-06	e	3.92E-02	1.74E-04	9.79E-05	f	5.71E-01	aa
2,3,3',4,4',5,5'-Heptachlorobiphenyl	39635-31-9	0.0E+00	0.0E+00	0.0E+00	NA	0.0E+00	0.0E+00	0.0E+00	NA	NA	NA

Table B1-1 Chemical-Specific Parameters for Organic COPCs

Chemical of Potential Concern	CAS Registry Number	Fraction		MW (g/mol)	pH	Henry's Constant			Diffusivity			
		F_v (unitless)	Source			H-pub [x] (various units)	Source	H-used [x] (atm-m^3/mol)	D_a (cm^2/s)	Source	D_w (cm^2/s)	Source
2,3,3',4,4',5'-Hexachlorobiphenyl	69782-90-7	0 or 1	b	360.88	NA	2.80E-03	k	6.84E-05	3.75E-02	e	4.34E-06	e
2,3,3',4,4',5-Hexachlorobiphenyl	38380-08-4	0 or 1	b	360.88	NA	5.85E-03	k	1.43E-04	3.75E-02	e	4.34E-06	e
2,3,3',4,4'-Pentachlorobiphenyl	32598-14-4	0 or 1	b	326.44	NA	3.38E-02	k	8.23E-04	4.01E-02	e	4.64E-06	e
2,3',4,4',5,5'-Hexachlorobiphenyl	52663-72-6	0 or 1	b	360.88	NA	2.80E-03	k	6.84E-05	3.75E-02	e	4.34E-06	e
2,3,4,4',5-Pentachlorobiphenyl	74472-37-0	0 or 1	b	326.44	NA	1.18E-02	k	2.87E-04	4.01E-02	e	4.64E-06	e
2',3,4,4',5-Pentachlorobiphenyl	65510-44-3	0 or 1	b	326.44	NA	1.18E-02	k	2.87E-04	4.01E-02	e	4.64E-06	e
2,3',4,4',5-Pentachlorobiphenyl	31508-00-6	0 or 1	b	326.44	NA	1.18E-02	k	2.87E-04	4.01E-02	e	4.64E-06	e
3,3',4,4',5,5'-Hexachlorobiphenyl	32774-16-6	0 or 1	b	360.88	NA	5.98E+00	i	5.92E-05	3.75E-02	e	4.34E-06	e
3,3',4,4',5-Pentachlorobiphenyl	57465-28-8	0 or 1	b	326.44	NA	1.18E-02	k	2.87E-04	4.01E-02	e	4.64E-06	e
3,3',4,4'-Tetrachlorobiphenyl	32598-13-3	0 or 1	b	291.99	NA	3.85E-04	k	9.38E-06	4.32E-02	e	5.00E-06	e
3,4,4',5-Tetrachlorobiphenyl	70362-50-4	0 or 1	b	291.99	NA	3.85E-04	k	9.38E-06	4.32E-02	e	5.00E-06	e
Polychlorinated biphenyls (PCBs)	1336-36-3	0 or 1	b	NA	NA	1.40E-02	m	3.42E-04	1.75E-02	j	8.00E-06	j
Phthalates												
Bis(2-ethylhexyl) phthalate (DEHP)	117-81-7	0 or 1	b	390.54	NA	8.37E-06	h	8.37E-06	1.32E-02	c	4.22E-06	c
Butylbenzyl phthalate	85-68-7	0 or 1	b	312.39	NA	1.91E-06	c	1.91E-06	1.65E-02	c	5.17E-06	c
Dibutyl phthalate	84-74-2	0 or 1	b	278.34	NA	1.43E-06	c	1.43E-06	4.38E-02	c	7.86E-06	c
Diethyl phthalate	84-66-2	0 or 1	b	222.24	NA	5.48E-07	c	5.48E-07	2.56E-02	c	6.35E-06	c
Dimethyl phthalate	131-11-3	0 or 1	b	194.19	NA	1.01E-07	c	1.01E-07	2.96E-02	c	7.13E-06	c
n-Dioctyl phthalate	117-84-0	0 or 1	b	390.56	NA	7.65E-07	h	7.65E-07	1.32E-02	c	4.20E-06	c
Light Polycyclic Aromatic Hydrocarbons (MW<200 g/mole)												
2-Chloronaphthalene	91-58-7	0 or 1	b	162.61	NA	1.43E-04	c	1.43E-04	3.64E-02	c	8.24E-06	c
2-Methyl naphthalene	91-57-6	0 or 1	b	142.2	NA	4.05E+01	i	4.01E-04	6.97E-02	e	8.08E-06	e
5-Nitroacenaphthene	602-87-9	0 or 1	b	199.21	NA	4.54E-05	k	1.11E-06	5.57E-02	e	6.45E-06	e
Acenaphthene	83-32-9	0 or 1	b	154.21	NA	1.84E-04	h	1.84E-04	4.21E-02	c	7.19E-06	c
Acenaphthylene	208-96-8	0 or 1	b	152.21	NA	1.19E+01	i	1.18E-04	4.39E-02	j	7.53E-06	j
Anthracene	120-12-7	0 or 1	b	178.22	NA	1.11E-04	c	1.11E-04	3.24E-02	c	7.74E-06	c
Fluorene	86-73-7	0 or 1	b	166.22	NA	7.30E-05	h	7.30E-05	3.63E-02	c	7.88E-06	c
Indene	95-13-6	0 or 1	b	116.16	NA	6.51E-02	k	1.59E-03	7.98E-02	e	9.24E-06	e
Naphthalene	91-20-3	0 or 1	b	128.16	NA	4.82E-04	c	4.82E-04	5.26E-02	c	8.92E-06	c

Table B1-1 Chemical-Specific Parameters for Organic COPCs

Chemical of Potential Concern	CAS Registry Number	Octanol / Water Partitioning Coefficients						Partitioning Coefficients (Kd)			
		K_{oc}-pub [y] (various units)	Source	K_{oc}-used [z] (mL/g)	K_{ow}-pub [y] (various units)	Source	K_{ow}-used [z] (unitless)	Kd_{bs} (L/kg)	Source	Kd_s (mL/g)	Source
2,3,3',4,4',5'-Hexachlorobiphenyl	69782-90-7	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,3,3',4,4',5-Hexachlorobiphenyl	38380-08-4	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,3,3',4,4'-Pentachlorobiphenyl	32598-14-4	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,3',4,4',5,5'-Hexachlorobiphenyl	52663-72-6	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,3,4,4',5-Pentachlorobiphenyl	74472-37-0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2',3,4,4',5-Pentachlorobiphenyl	65510-44-3	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,3',4,4',5-Pentachlorobiphenyl	31508-00-6	NA	e	9.98E+06	7.12E+00	l	1.32E+07	3.99E+05	e	9.98E+04	e
3,3',4,4',5,5'-Hexachlorobiphenyl	32774-16-6	6.60E+00	i	3.98E+06	7.41E+00	i	2.56E+07	1.59E+05	e	3.98E+04	e
3,3',4,4',5-Pentachlorobiphenyl	57465-28-8	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
3,3',4,4'-Tetrachlorobiphenyl	32598-13-3	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
3,4,4',5-Tetrachlorobiphenyl	70362-50-4	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Polychlorinated biphenyls (PCBs)	1336-36-3	4.48E+04	m	4.48E+04	6.29E+00	m	1.95E+06	1.79E+03	e	4.48E+02	e
Phthalates											
Bis(2-ethylhexyl) phthalate (DEHP)	117-81-7	1.11E+05	h	1.11E+05	1.60E+05	c	1.60E+05	4.44E+03	c	1.11E+03	c
Butylbenzyl phthalate	85-68-7	1.37E+04	c	1.37E+04	2.59E+04	c	2.59E+04	5.50E+02	c	1.37E+02	c
Dibutyl phthalate	84-74-2	1.57E+03	c	1.57E+03	5.25E+04	c	5.25E+04	6.27E+01	c	1.57E+01	c
Diethyl phthalate	84-66-2	8.20E+01	c	8.20E+01	2.73E+04	c	2.73E+04	3.28E+00	c	8.20E-01	c
Dimethyl phthalate	131-11-3	3.09E+01	h	3.09E+01	4.30E+01	c	4.30E+01	1.06E+01	c	3.09E-01	h
n-Dioctyl phthalate	117-84-0	9.03E+08	c	9.03E+08	2.14E+09	c	2.14E+09	3.61E+07	c	9.03E+06	c
Light Polycyclic Aromatic Hydrocarbons (MW<200 g/mole)											
2-Chloronaphthalene	91-58-7	7.14E+03	c	7.14E+03	1.17E+04	c	1.17E+04	2.86E+02	c	7.14E+01	c
2-Methyl naphthalene	91-57-6	NA	e	4.47E+03	3.86E+00	i	7.24E+03	1.79E+02	e	4.47E+01	e
5-Nitroacenaphthene	602-87-9	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Acenaphthene	83-32-9	4.90E+03	c	4.90E+03	9.22E+03	c	9.22E+03	1.96E+02	c	4.90E+01	c
Acenaphthylene	208-96-8	3.83E+00	i	6.76E+03	4.07E+00	i	1.17E+04	2.70E+02	e	6.76E+01	e
Anthracene	120-12-7	2.35E+04	c	2.35E+04	2.95E+04	c	2.95E+04	9.40E+02	c	2.35E+02	c
Fluorene	86-73-7	7.71E+03	c	7.71E+03	1.47E+04	c	1.47E+04	3.08E+02	c	7.71E+01	c
Indene	95-13-6	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Naphthalene	91-20-3	1.19E+03	c	1.19E+03	2.36E+03	c	2.36E+03	4.76E+01	c	1.19E+01	c

Table B1-1 Chemical-Specific Parameters for Organic COPCs

Chemical of Potential Concern	CAS Registry Number	Kd		Plant Uptake Factors				
		Kd_{sw} (L/kg)	Source	Br_{ag} (µg/g DW plant)/ (µg/g soil)	Source	Br_{forage} (µg/g DW plant)/ (µg/g soil)	Source	Br_{grain} (µg/g DW plant)/ (µg/g soil) [a]
2,3,3',4,4',5'-Hexachlorobiphenyl	69782-90-7	NA	NA	NA	NA	NA	NA	NA
2,3,3',4,4',5-Hexachlorobiphenyl	38380-08-4	NA	NA	NA	NA	NA	NA	NA
2,3,3',4,4'-Pentachlorobiphenyl	32598-14-4	NA	NA	NA	NA	NA	NA	NA
2,3',4,4',5,5'-Hexachlorobiphenyl	52663-72-6	NA	NA	NA	NA	NA	NA	NA
2,3,4,4',5-Pentachlorobiphenyl	74472-37-0	NA	NA	NA	NA	NA	NA	NA
2',3,4,4',5-Pentachlorobiphenyl	65510-44-3	NA	NA	NA	NA	NA	NA	NA
2,3',4,4',5-Pentachlorobiphenyl	31508-00-6	7.49E+05	e	2.97E-03	e	2.97E-03	e	2.97E-03
3,3',4,4',5,5'-Hexachlorobiphenyl	32774-16-6	2.99E+05	e	2.02E-03	e	2.02E-03	e	2.02E-03
3,3',4,4',5-Pentachlorobiphenyl	57465-28-8	NA	NA	NA	NA	NA	NA	NA
3,3',4,4'-Tetrachlorobiphenyl	32598-13-3	NA	NA	NA	NA	NA	NA	NA
3,4,4',5-Tetrachlorobiphenyl	70362-50-4	NA	NA	NA	NA	NA	NA	NA
Polychlorinated biphenyls (PCBs)	1336-36-3	3.36E+03	e	8.96E-03	e	8.96E-03	e	8.96E-03
Phthalates								
Bis(2-ethylhexyl) phthalate (DEHP)	117-81-7	8.33E+03	c	3.80E-02	c	3.80E-02	c	3.80E-02
Butylbenzyl phthalate	85-68-7	1.03E+03	c	1.09E-01	c	1.09E-01	c	1.09E-01
Dibutyl phthalate	84-74-2	1.18E+02	c	7.24E-02	c	7.24E-02	c	7.24E-02
Diethyl phthalate	84-66-2	6.15E+00	c	1.06E-01	c	1.06E-01	c	1.06E-01
Dimethyl phthalate	131-11-3	2.00E+01	c	4.40E+00	c	4.40E+00	c	4.40E+00
n-Dioctyl phthalate	117-84-0	6.78E+07	c	1.57E-04	c	1.57E-04	c	1.57E-04
Light Polycyclic Aromatic Hydrocarbons (MW<200 g/mole)								
2-Chloronaphthalene	91-58-7	5.36E+02	c	1.72E-01	c	1.72E-01	c	1.72E-01
2-Methyl naphthalene	91-57-6	3.35E+02	e	2.27E-01	e	2.27E-01	e	2.27E-01
5-Nitroacenaphthene	602-87-9	NA	NA	NA	NA	NA	NA	NA
Acenaphthene	83-32-9	3.67E+02	c	1.98E-01	c	1.98E-01	c	1.98E-01
Acenaphthylene	208-96-8	5.07E+02	e	1.72E-01	e	1.72E-01	e	1.72E-01
Anthracene	120-12-7	1.76E+03	c	1.01E-01	c	1.01E-01	c	1.01E-01
Fluorene	86-73-7	5.78E+02	c	1.51E-01	c	1.51E-01	c	1.51E-01
Indene	95-13-6	NA	NA	NA	NA	NA	NA	NA
Naphthalene	91-20-3	8.93E+01	c	4.35E-01	c	4.35E-01	c	4.35E-01

Table B1-1 Chemical-Specific Parameters for Organic COPCs

Chemical of Potential Concern	CAS Registry Number	Plant Uptake Factors							
		$Br_{rootveg}$ (µg/g DW plant)/ (µg/g soil)	Source	Bv_{ag} (µg/g DW plant)/ (µg/g air)	Source	Bv_{forage} (µg/g DW plant)/ (µg/g air)	Source	RCF (µg/g DW plant)/ (µg/mL soil water)	Source
2,3,3',4,4',5'-Hexachlorobiphenyl	69782-90-7	NA	NA	NA	NA	NA	NA	NA	NA
2,3,3',4,4',5-Hexachlorobiphenyl	38380-08-4	NA	NA	NA	NA	NA	NA	NA	NA
2,3,3',4,4'-Pentachlorobiphenyl	32598-14-4	NA	NA	NA	NA	NA	NA	NA	NA
2,3',4,4',5,5'-Hexachlorobiphenyl	52663-72-6	NA	NA	NA	NA	NA	NA	NA	NA
2,3,4,4',5-Pentachlorobiphenyl	74472-37-0	NA	NA	NA	NA	NA	NA	NA	NA
2',3,4,4',5-Pentachlorobiphenyl	65510-44-3	NA	NA	NA	NA	NA	NA	NA	NA
2,3',4,4',5-Pentachlorobiphenyl	31508-00-6	7.07E-01	e	7.46E+03	e	7.46E+03	e	7.05E+04	e
3,3',4,4',5,5'-Hexachlorobiphenyl	32774-16-6	2.95E+00	e	7.34E+04	e	7.34E+04	e	1.18E+05	e
3,3',4,4',5-Pentachlorobiphenyl	57465-28-8	NA	NA	NA	NA	NA	NA	NA	NA
3,3',4,4'-Tetrachlorobiphenyl	32598-13-3	NA	NA	NA	NA	NA	NA	NA	NA
3,4,4',5-Tetrachlorobiphenyl	70362-50-4	NA	NA	NA	NA	NA	NA	NA	NA
Polychlorinated biphenyls (PCBs)	1336-36-3	3.61E+01	e	8.19E+02	e	8.19E+02	e	1.62E+04	e
Phthalates									
Bis(2-ethylhexyl) phthalate (DEHP)	117-81-7	2.13E+00	c	2.33E+03	h	2.33E+03	h	2.37E+03	c
Butylbenzyl phthalate	85-68-7	4.27E+00	c	1.46E+03	c	1.46E+03	c	5.87E+02	c
Dibutyl phthalate	84-74-2	6.43E+01	c	4.16E+03	c	4.16E+03	c	1.01E+03	c
Diethyl phthalate	84-66-2	7.46E+02	c	5.42E+03	c	5.42E+03	c	6.12E+02	c
Dimethyl phthalate	131-11-3	3.40E+01	h	3.05E+01	c	3.05E+01	c	1.05E+01	c
n-Dioctyl phthalate	117-84-0	3.93E-01	c	6.30E+08	h	6.30E+08	h	3.55E+06	c
Light Polycyclic Aromatic Hydrocarbons (MW<200 g/mole)									
2-Chloronaphthalene	91-58-7	4.51E+00	c	8.46E+00	c	8.46E+00	c	3.23E+02	c
2-Methyl naphthalene	91-57-6	5.02E+00	e	1.80E+00	e	1.80E+00	e	2.24E+02	e
5-Nitroacenaphthene	602-87-9	NA	NA	NA	NA	NA	NA	NA	NA
Acenaphthene	83-32-9	5.48E+00	c	5.07E+00	h	5.07E+00	h	2.69E+02	c
Acenaphthylene	208-96-8	4.77E+00	e	1.03E+01	e	1.03E+01	e	3.23E+02	e
Anthracene	120-12-7	2.76E+00	c	2.90E+01	c	2.90E+01	c	6.49E+02	c
Fluorene	86-73-7	4.96E+00	c	2.10E+01	h	2.10E+01	h	3.83E+02	c
Indene	95-13-6	NA	NA	NA	NA	NA	NA	NA	NA
Naphthalene	91-20-3	8.23E+00	c	4.52E-01	c	4.52E-01	c	9.81E+01	c

Table B1-1 Chemical-Specific Parameters for Organic COPCs

Chemical of Potential Concern	CAS Registry Number	Bioconcentration/Bioaccumulation Factors									
		Ba_{beef} (day/kg FW)	Source	$Ba_{chicken}$ (day/kg FW)	Source	Ba_{egg} (day/kg FW)	Source	Ba_{milk} (day/kg FW)	Source	Ba_{pork} (day/kg FW)	Source
2,3,3',4,4',5'-Hexachlorobiphenyl	69782-90-7	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,3,3',4,4',5-Hexachlorobiphenyl	38380-08-4	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,3,3',4,4'-Pentachlorobiphenyl	32598-14-4	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,3',4,4',5,5'-Hexachlorobiphenyl	52663-72-6	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,3,4,4',5-Pentachlorobiphenyl	74472-37-0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2',3,4,4',5-Pentachlorobiphenyl	65510-44-3	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,3',4,4',5-Pentachlorobiphenyl	31508-00-6	3.31E-01	e	2.61E-01	e	1.05E+02	e	1.05E-01	e	4.01E-01	e
3,3',4,4',5,5'-Hexachlorobiphenyl	32774-16-6	6.43E-01	e	5.07E-01	e	2.03E+02	e	2.03E-01	e	7.78E-01	e
3,3',4,4',5-Pentachlorobiphenyl	57465-28-8	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
3,3',4,4'-Tetrachlorobiphenyl	32598-13-3	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
3,4,4',5-Tetrachlorobiphenyl	70362-50-4	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Polychlorinated biphenyls (PCBs)	1336-36-3	4.90E-02	e	3.87E-02	e	1.55E+01	e	1.55E-02	e	5.93E-02	e
Phthalates											
Bis(2-ethylhexyl) phthalate (DEHP)	117-81-7	4.03E-03	c	3.18E-03	c	1.27E+00	c	1.27E-03	c	4.88E-03	c
Butylbenzyl phthalate	85-68-7	6.50E-04	c	5.13E-04	c	2.06E-01	c	2.06E-04	c	7.87E-04	c
Dibutyl phthalate	84-74-2	1.32E-03	c	1.04E-03	c	4.17E-01	c	4.17E-04	c	1.60E-03	c
Diethyl phthalate	84-66-2	6.87E-04	c	5.42E-04	c	2.17E-01	c	2.17E-04	c	8.31E-04	c
Dimethyl phthalate	131-11-3	1.08E-06	c	8.53E-07	c	3.42E-04	c	3.42E-07	c	1.31E-06	c
n-Dioctyl phthalate	117-84-0	5.37E+01	c	4.24E+01	c	1.70E+04	c	1.70E+01	c	6.50E+01	c
Light Polycyclic Aromatic Hydrocarbons (MW<200 g/mole)											
2-Chloronaphthalene	91-58-7	2.95E-04	c	2.33E-04	c	9.33E-02	c	9.33E-05	c	3.57E-04	c
2-Methyl naphthalene	91-57-6	1.82E-04	e	1.44E-04	e	5.75E-02	e	5.75E-05	e	2.20E-04	e
5-Nitroacenaphthene	602-87-9	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Acenaphthene	83-32-9	2.31E-04	c	1.83E-04	c	7.32E-02	c	7.32E-05	c	2.80E-04	c
Acenaphthylene	208-96-8	2.95E-04	e	2.33E-04	e	9.33E-02	e	9.33E-05	e	3.57E-04	e
Anthracene	120-12-7	7.41E-04	c	5.85E-04	c	2.34E-01	c	2.34E-04	c	8.98E-04	c
Fluorene	86-73-7	3.70E-04	c	2.92E-04	c	1.17E-01	c	1.17E-04	c	4.48E-04	c
Indene	95-13-6	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Naphthalene	91-20-3	5.92E-05	c	4.67E-05	c	1.87E-02	c	1.87E-05	c	7.16E-05	c

Table B1-1 Chemical-Specific Parameters for Organic COPCs

Chemical of Potential Concern	CAS Registry Number	Bioconcentration/Bioaccumulation Factors						Half-life	
		BAF_{fish} (L/kg FW)	Source	BCF_{fish} (L/kg FW)	Source	$BSAF_{fish}$ (unitless)	Source	$t_{1/2}$ (days)	Source
2,3,3',4,4',5'-Hexachlorobiphenyl	69782-90-7	NA	NA	NA	NA	NA	NA	NA	NA
2,3,3',4,4',5-Hexachlorobiphenyl	38380-08-4	NA	NA	NA	NA	NA	NA	NA	NA
2,3,3',4,4'-Pentachlorobiphenyl	32598-14-4	NA	NA	NA	NA	NA	NA	NA	NA
2,3',4,4',5,5'-Hexachlorobiphenyl	52663-72-6	NA	NA	NA	NA	NA	NA	NA	NA
2,3,4,4',5-Pentachlorobiphenyl	74472-37-0	NA	NA	NA	NA	NA	NA	NA	NA
2',3,4,4',5-Pentachlorobiphenyl	65510-44-3	NA	NA	NA	NA	NA	NA	NA	NA
2,3',4,4',5-Pentachlorobiphenyl	31508-00-6	NA	NA	NA	NA	4.84E+04	v	NA	NA
3,3',4,4',5,5'-Hexachlorobiphenyl	32774-16-6	NA	NA	NA	NA	8.34E+04	v	NA	NA
3,3',4,4',5-Pentachlorobiphenyl	57465-28-8	NA	NA	NA	NA	NA	NA	NA	NA
3,3',4,4'-Tetrachlorobiphenyl	32598-13-3	NA	NA	NA	NA	NA	NA	NA	NA
3,4,4',5-Tetrachlorobiphenyl	70362-50-4	NA	NA	NA	NA	NA	NA	NA	NA
Polychlorinated biphenyls (PCBs)	1336-36-3	NA	NA	NA	NA	5.30E-01	w	NA	NA
Phthalates									
Bis(2-ethylhexyl) phthalate (DEHP)	117-81-7	3.36E+02	s	NA	NA	NA	NA	NA	NA
Butylbenzyl phthalate	85-68-7	2.35E+03	c	NA	NA	NA	NA	NA	NA
Dibutyl phthalate	84-74-2	5.58E+03	c	NA	NA	NA	NA	NA	NA
Diethyl phthalate	84-66-2	2.45E+03	c	NA	NA	NA	NA	NA	NA
Dimethyl phthalate	131-11-3	NA	NA	1.03E+01	c	NA	NA	NA	NA
n-Dioctyl phthalate	117-84-0	1.40E+04	s	NA	NA	NA	NA	NA	NA
Light Polycyclic Aromatic Hydrocarbons (MW<200 g/mole)									
2-Chloronaphthalene	91-58-7	9.60E+02	c	NA	NA	NA	NA	NA	NA
2-Methyl naphthalene	91-57-6	NA	NA	5.05E+02	e	NA	NA	NA	NA
5-Nitroacenaphthene	602-87-9	NA	NA	NA	NA	NA	NA	NA	NA
Acenaphthene	83-32-9	NA	NA	6.07E+02	c	NA	NA	NA	NA
Acenaphthylene	208-96-8	2.16E+02	m	NA	NA	NA	NA	6.00E+01	d
Anthracene	120-12-7	2.60E+03	c	NA	NA	NA	NA	NA	NA
Fluorene	86-73-7	1.20E+03	c	NA	NA	NA	NA	6.00E+01	d
Indene	95-13-6	NA	NA	NA	NA	NA	NA	NA	NA
Naphthalene	91-20-3	NA	NA	2.15E+02	c	NA	NA	NA	NA

Table B1-1 Chemical-Specific Parameters for Organic COPCs

Chemical of Potential Concern	CAS Registry Number	Soil Loss Mechanisms [g]											
		k_{decay} $(year)^{-1}$	Source	ks_e $(year)^{-1}$			Source	ks_g $(year)^{-1}$	Source	ks_l $(year)^{-1}$			Source
				1 cm	15 cm	20 cm				1 cm	15 cm	20 cm	
2,3,3',4,4',5'-Hexachlorobiphenyl	69782-90-7	0.0E+00	NA	0.0E+00	0.0E+00	0.0E+00	NA	0.0E+00	NA	0.0E+00	0.0E+00	0.0E+00	NA
2,3,3',4,4',5-Hexachlorobiphenyl	38380-08-4	0.0E+00	NA	0.0E+00	0.0E+00	0.0E+00	NA	0.0E+00	NA	0.0E+00	0.0E+00	0.0E+00	NA
2,3,3',4,4'-Pentachlorobiphenyl	32598-14-4	0.0E+00	NA	0.0E+00	0.0E+00	0.0E+00	NA	0.0E+00	NA	0.0E+00	0.0E+00	0.0E+00	NA
2,3',4,4',5,5'-Hexachlorobiphenyl	52663-72-6	0.0E+00	NA	0.0E+00	0.0E+00	0.0E+00	NA	0.0E+00	NA	0.0E+00	0.0E+00	0.0E+00	NA
2,3,4,4',5-Pentachlorobiphenyl	74472-37-0	0.0E+00	NA	0.0E+00	0.0E+00	0.0E+00	NA	0.0E+00	NA	0.0E+00	0.0E+00	0.0E+00	NA
2',3,4,4',5-Pentachlorobiphenyl	65510-44-3	0.0E+00	NA	0.0E+00	0.0E+00	0.0E+00	NA	0.0E+00	NA	0.0E+00	0.0E+00	0.0E+00	NA
2,3',4,4',5-Pentachlorobiphenyl	31508-00-6	0.0E+00	NA	5.28E-03	3.52E-04	2.64E-04	e	0.0E+00	NA	3.23E-05	2.15E-06	1.61E-06	e
3,3',4,4',5,5'-Hexachlorobiphenyl	32774-16-6	0.0E+00	NA	5.28E-03	3.52E-04	2.64E-04	e	0.0E+00	NA	8.09E-05	5.39E-06	4.04E-06	e
3,3',4,4',5-Pentachlorobiphenyl	57465-28-8	0.0E+00	NA	0.0E+00	0.0E+00	0.0E+00	NA	0.0E+00	NA	0.0E+00	0.0E+00	0.0E+00	NA
3,3',4,4'-Tetrachlorobiphenyl	32598-13-3	0.0E+00	NA	0.0E+00	0.0E+00	0.0E+00	NA	0.0E+00	NA	0.0E+00	0.0E+00	0.0E+00	NA
3,4,4',5-Tetrachlorobiphenyl	70362-50-4	0.0E+00	NA	0.0E+00	0.0E+00	0.0E+00	NA	0.0E+00	NA	0.0E+00	0.0E+00	0.0E+00	NA
Polychlorinated biphenyls (PCBs)	1336-36-3	0.0E+00	NA	5.28E-03	3.52E-04	2.64E-04	e	0.0E+00	NA	7.18E-03	4.79E-04	3.59E-04	e
Phthalates													
Bis(2-ethylhexyl) phthalate (DEHP)	117-81-7	0.0E+00	NA	5.28E-03	3.52E-04	2.64E-04	e	1.10E+01	c	2.90E-03	1.93E-04	1.45E-04	e
Butylbenzyl phthalate	85-68-7	0.0E+00	NA	5.28E-03	3.52E-04	2.64E-04	e	3.61E+01	c	2.35E-02	1.57E-03	1.17E-03	e
Dibutyl phthalate	84-74-2	0.0E+00	NA	5.23E-03	3.49E-04	2.62E-04	e	1.11E+01	c	2.03E-01	1.35E-02	1.02E-02	e
Diethyl phthalate	84-66-2	0.0E+00	NA	4.45E-03	2.97E-04	2.22E-04	e	4.52E+00	c	3.31E+00	2.20E-01	1.65E-01	e
Dimethyl phthalate	131-11-3	0.0E+00	NA	3.53E-03	2.35E-04	1.76E-04	e	3.61E+01	c	6.96E+00	4.64E-01	3.48E-01	e
n-Dioctyl phthalate	117-84-0	0.0E+00	NA	5.28E-03	3.52E-04	2.64E-04	e	9.03E+00	c	3.57E-07	2.38E-08	1.78E-08	e
Light Polycyclic Aromatic Hydrocarbons (MW<200 g/mole)													
2-Chloronaphthalene	91-58-7	0.0E+00	NA	5.27E-03	3.52E-04	2.64E-04	e	0.0E+00	NA	4.50E-02	3.00E-03	2.25E-03	e
2-Methyl naphthalene	91-57-6	0.0E+00	NA	5.27E-03	3.51E-04	2.63E-04	e	0.0E+00	NA	7.18E-02	4.79E-03	3.59E-03	e
5-Nitroacenaphthene	602-87-9	0.0E+00	NA	0.0E+00	0.0E+00	0.0E+00	NA	0.0E+00	NA	0.0E+00	0.0E+00	0.0E+00	NA
Acenaphthene	83-32-9	0.0E+00	NA	5.27E-03	3.51E-04	2.63E-04	e	2.48E+00	c	6.55E-02	4.37E-03	3.28E-03	e
Acenaphthylene	208-96-8	0.0E+00	NA	5.27E-03	3.51E-04	2.64E-04	e	4.22E+00	e	4.75E-02	3.17E-03	2.38E-03	e
Anthracene	120-12-7	0.0E+00	NA	5.28E-03	3.52E-04	2.64E-04	e	5.50E-01	c	1.37E-02	9.13E-04	6.85E-04	e
Fluorene	86-73-7	0.0E+00	NA	5.27E-03	3.52E-04	2.64E-04	e	4.22E+00	c	4.17E-02	2.78E-03	2.08E-03	e
Indene	95-13-6	0.0E+00	NA	0.0E+00	0.0E+00	0.0E+00	NA	0.0E+00	NA	0.0E+00	0.0E+00	0.0E+00	NA
Naphthalene	91-20-3	0.0E+00	NA	5.22E-03	3.48E-04	2.61E-04	e	5.27E+00	c	2.67E-01	1.78E-02	1.34E-02	e

Table B1-1 Chemical-Specific Parameters for Organic COPCs

Chemical of Potential Concern	CAS Registry Number	Soil Loss Mechanisms [g]								Kp (cm/hr)	Source
		ks_r $(year)^{-1}$			Source	ks_v $(year)^{-1}$			Source		
		1 cm	15 cm	20 cm		1 cm	15 cm	20 cm			
2,3,3',4,4',5'-Hexachlorobiphenyl	69782-90-7	0.0E+00	0.0E+00	0.0E+00	NA	0.0E+00	0.0E+00	0.0E+00	NA	NA	NA
2,3,3',4,4',5-Hexachlorobiphenyl	38380-08-4	0.0E+00	0.0E+00	0.0E+00	NA	0.0E+00	0.0E+00	0.0E+00	NA	NA	NA
2,3,3',4,4'-Pentachlorobiphenyl	32598-14-4	0.0E+00	0.0E+00	0.0E+00	NA	0.0E+00	0.0E+00	0.0E+00	NA	NA	NA
2,3',4,4',5,5'-Hexachlorobiphenyl	52663-72-6	0.0E+00	0.0E+00	0.0E+00	NA	0.0E+00	0.0E+00	0.0E+00	NA	NA	NA
2,3,4,4',5-Pentachlorobiphenyl	74472-37-0	0.0E+00	0.0E+00	0.0E+00	NA	0.0E+00	0.0E+00	0.0E+00	NA	NA	NA
2',3,4,4',5-Pentachlorobiphenyl	65510-44-3	0.0E+00	0.0E+00	0.0E+00	NA	0.0E+00	0.0E+00	0.0E+00	NA	NA	NA
2,3',4,4',5-Pentachlorobiphenyl	31508-00-6	1.93E-05	1.28E-06	9.63E-07	e	3.54E-02	1.57E-04	8.86E-05	f	1.39E+00	aa
3,3',4,4',5,5'-Hexachlorobiphenyl	32774-16-6	4.83E-05	3.22E-06	2.42E-06	e	1.71E-02	7.60E-05	4.28E-05	f	1.39E+00	aa
3,3',4,4',5-Pentachlorobiphenyl	57465-28-8	0.0E+00	0.0E+00	0.0E+00	NA	0.0E+00	0.0E+00	0.0E+00	NA	NA	NA
3,3',4,4'-Tetrachlorobiphenyl	32598-13-3	0.0E+00	0.0E+00	0.0E+00	NA	0.0E+00	0.0E+00	0.0E+00	NA	NA	NA
3,4,4',5-Tetrachlorobiphenyl	70362-50-4	0.0E+00	0.0E+00	0.0E+00	NA	0.0E+00	0.0E+00	0.0E+00	NA	NA	NA
Polychlorinated biphenyls (PCBs)	1336-36-3	4.29E-03	2.86E-04	2.14E-04	e	4.10E+00	1.82E-02	1.02E-02	f	NA	NA
Phthalates											
Bis(2-ethylhexyl) phthalate (DEHP)	117-81-7	1.73E-03	1.15E-04	8.66E-05	e	3.05E-02	1.36E-04	7.64E-05	f	2.50E-02	ab
Butylbenzyl phthalate	85-68-7	1.40E-02	9.35E-04	7.01E-04	e	7.06E-02	3.14E-04	1.76E-04	f	2.56E-02	aa
Dibutyl phthalate	84-74-2	1.21E-01	8.09E-03	6.07E-03	e	1.22E+00	5.44E-03	3.06E-03	f	2.40E-02	ab
Diethyl phthalate	84-66-2	1.97E+00	1.32E-01	9.87E-02	e	5.25E+00	2.33E-02	1.31E-02	f	3.90E-03	ab
Dimethyl phthalate	131-11-3	4.15E+00	2.77E-01	2.08E-01	e	2.97E+00	1.32E-02	7.42E-03	f	1.40E-03	ab
n-Dioctyl phthalate	117-84-0	2.13E-07	1.42E-08	1.06E-08	e	3.43E-07	1.53E-09	8.58E-10	f	1.84E+01	aa
Light Polycyclic Aromatic Hydrocarbons (MW<200 g/mole)											
2-Chloronaphthalene	91-58-7	2.69E-02	1.79E-03	1.34E-03	e	2.24E+01	9.94E-02	5.59E-02	f	1.04E-01	aa
2-Methyl naphthalene	91-57-6	4.29E-02	2.86E-03	2.14E-03	e	1.92E+02	8.54E-01	4.80E-01	f	9.77E-02	aa
5-Nitroacenaphthene	602-87-9	0.0E+00	0.0E+00	0.0E+00	NA	0.0E+00	0.0E+00	0.0E+00	NA	NA	NA
Acenaphthene	83-32-9	3.91E-02	2.61E-03	1.96E-03	e	4.85E+01	2.16E-01	1.21E-01	f	9.84E-02	aa
Acenaphthylene	208-96-8	2.84E-02	1.89E-03	1.42E-03	e	2.35E+01	1.04E-01	5.87E-02	f	1.19E-01	aa
Anthracene	120-12-7	8.18E-03	5.45E-04	4.09E-04	e	4.70E+00	2.09E-02	1.17E-02	f	1.57E-01	aa
Fluorene	86-73-7	2.49E-02	1.66E-03	1.24E-03	e	1.05E+01	4.69E-02	2.64E-02	f	1.15E-01	aa
Indene	95-13-6	0.0E+00	0.0E+00	0.0E+00	NA	0.0E+00	0.0E+00	0.0E+00	NA	NA	NA
Naphthalene	91-20-3	1.60E-01	1.06E-02	7.98E-03	e	6.54E+02	2.91E+00	1.63E+00	f	4.70E-02	ab

Table B1-1 Chemical-Specific Parameters for Organic COPCs

Chemical of Potential Concern	CAS Registry Number	Fraction		MW (g/mol)	pH	Henry's Constant			Diffusivity			
		F_v (unitless)	Source			H-pub [x] (various units)	Source	H-used [x] (atm-m^3/mol)	D_a (cm^2/s)	Source	D_w (cm^2/s)	Source
Phenanthrene	85-01-8	0 or 1	b	178.22	NA	1.88E-01	c	1.88E-01	3.33E-02	c	7.47E-06	c
Pyrene	129-00-0	0 or 1	b	202.24	NA	8.25E-06	h	8.25E-06	2.72E-02	c	7.14E-06	c
Heavy Polycyclic Aromatic Hydrocarbons (MW>200 g/mole)												
3-Methylcholanthrene	56-49-5	0 or 1	b	268.36	NA	NA	e	1.24E-07	4.57E-02	e	5.29E-06	e
5-Methylchrysene	3697-24-3	0 or 1	b	242.32	NA	2.26E-04	k	5.52E-06	4.89E-02	e	5.66E-06	e
Benzo[a]anthracene	56-55-3	0 or 1	b	228.28	NA	3.62E-06	c	3.62E-06	2.47E-02	c	6.21E-06	c
Benzo[a]pyrene	50-32-8	0 or 1	b	252.3	NA	8.36E-07	c	8.36E-07	2.18E-02	c	5.85E-06	c
Benzo[a,i]pyrene	191-30-0	0 or 1	b	302.37	NA	5.77E-07	k	1.41E-08	4.22E-02	e	4.88E-06	e
Benzo[b]fluoranthene	205-99-2	0 or 1	b	252.32	NA	6.18E-06	c	6.18E-06	2.28E-02	c	5.49E-06	c
Benzo[e]pyrene	192-97-2	0 or 1	b	252.31	NA	NA	e	4.62E-07	4.76E-02	e	5.51E-06	e
Benzo[g,h,i]perylene	191-24-2	0 or 1	b	276.34	NA	7.09E-01	i	7.02E-06	4.48E-02	e	5.19E-06	e
Benzo[j]fluoranthene	205-82-3	0 or 1	b	252.31	NA	8.31E-06	k	2.03E-07	4.76E-02	e	5.51E-06	e
Benzo[k]fluoranthene	207-08-9	0 or 1	b	252.32	NA	4.15E-07	c	4.15E-07	2.28E-02	c	5.49E-06	c
Chrysene	218-01-9	0 or 1	b	228.28	NA	1.21E-06	c	1.21E-06	2.48E-02	c	6.21E-06	c
Dibenz[a,h]acridine	226-36-8	0 or 1	b	279.34	NA	7.78E-08	k	1.90E-09	4.45E-02	e	5.15E-06	e
Dibenz[a,h]anthracene	53-70-3	0 or 1	b	278.33	NA	1.12E-08	c	1.12E-08	1.80E-02	c	6.01E-06	c
Dibenz[a,j]acridine	224-42-0	0 or 1	b	279.34	NA	7.78E-08	k	1.90E-09	4.45E-02	e	5.15E-06	e
Dibenzo[a,e]fluoranthene	5385-75-1	0 or 1	b	302.37	NA	NA	NA	NA	4.22E-02	e	4.88E-06	e
Dibenzo[a,e]pyrene	192-65-4	0 or 1	b	302.37	NA	5.77E-07	k	1.41E-08	4.22E-02	e	4.88E-06	e
Dibenzo[a,h]fluoranthene	No CAS #	0 or 1	b	302.37	NA	NA	NA	NA	4.22E-02	e	4.88E-06	e
Dibenzo[a,h]pyrene	189-64-0	0 or 1	b	302.37	NA	5.77E-07	k	1.41E-08	4.22E-02	e	4.88E-06	e
Dibenzo[a,i]pyrene	189-55-9	0 or 1	b	302.37	NA	5.77E-07	k	1.41E-08	4.22E-02	e	4.88E-06	e
Fluoranthene	206-44-0	0 or 1	b	202.26	NA	9.33E-06	c	9.33E-06	2.75E-02	c	7.18E-06	c
Hexachloronaphthalene	1335-87-1	0 or 1	b	334.84	NA	3.56E-03	k	8.68E-05	3.94E-02	e	4.56E-06	e
Indeno[1,2,3-cd]pyrene	193-39-5	0 or 1	b	276.34	NA	4.86E-09	c	4.86E-09	1.90E-02	c	5.66E-06	c
Octachloronaphthalene	2234-13-1	0 or 1	b	403.73	NA	4.17E-03	k	1.02E-04	3.48E-02	e	4.03E-06	e
Pentachloronaphthalene	1321-64-8	0 or 1	b	300.4	NA	4.83E-03	k	1.18E-04	4.24E-02	e	4.90E-06	e
Tetrachloronaphthalene	1335-88-2	0 or 1	b	265.95	NA	6.51E-03	k	1.59E-04	4.59E-02	e	5.32E-06	e
Trichloronaphthalene	1321-65-9	0 or 1	b	231.51	NA	8.76E-03	k	2.14E-04	5.04E-02	e	5.84E-06	e

Table B1-1 Chemical-Specific Parameters for Organic COPCs

Chemical of Potential Concern	CAS Registry Number	Octanol / Water Partitioning Coefficients						Partitioning Coefficients (Kd)			
		K_{oc}-pub [y] (various units)	Source	K_{oc}-used [z] (mL/g)	K_{ow}-pub [y] (various units)	Source	K_{ow}-used [z] (unitless)	Kd_{bs} (L/kg)	Source	Kd_s (mL/g)	Source
Phenanthrene	85-01-8	2.09E+04	h	2.09E+04	3.55E+04	c	3.55E+04	8.35E+02	h	2.09E+02	h
Pyrene	129-00-0	6.80E+04	c	6.80E+04	1.00E+05	c	1.00E+05	2.72E+03	c	6.80E+02	c
Heavy Polycyclic Aromatic Hydrocarbons (MW>200 g/mole)											
3-Methylcholanthrene	56-49-5	6.18E+00	i	1.51E+06	7.11E+00	i	1.29E+07	6.05E+04	e	1.51E+04	e
5-Methylchrysene	3697-24-3	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzo[a]anthracene	56-55-3	2.60E+05	c	2.60E+05	4.77E+05	c	4.77E+05	1.04E+04	c	2.60E+03	c
Benzo[a]pyrene	50-32-8	9.69E+05	c	9.69E+05	1.35E+06	c	1.35E+06	3.87E+04	c	9.69E+03	c
Benzo[a,i]pyrene	191-30-0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzo[b]fluoranthene	205-99-2	8.36E+05	c	8.36E+05	1.59E+06	c	1.59E+06	3.34E+04	c	8.36E+03	c
Benzo[e]pyrene	192-97-2	7.20E+00	i	1.58E+07	7.40E+00	i	2.51E+07	6.34E+05	e	1.58E+05	e
Benzo[g,h,i]perylene	191-24-2	6.26E+00	i	1.82E+06	7.10E+00	i	1.26E+07	7.28E+04	e	1.82E+04	e
Benzo[j]fluoranthene	205-82-3	NA	e	1.42E+06	6.44E+00	i	2.75E+06	5.69E+04	e	1.42E+04	e
Benzo[k]fluoranthene	207-08-9	8.32E+05	h	8.32E+05	1.56E+06	c	1.56E+06	3.33E+04	c	8.32E+03	c
Chrysene	218-01-9	2.97E+05	c	2.97E+05	5.48E+05	c	5.48E+05	1.19E+04	c	2.97E+03	c
Dibenz[a,h]acridine	226-36-8	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dibenz[a,h]anthracene	53-70-3	1.79E+06	c	1.79E+06	3.53E+06	c	3.53E+06	7.16E+04	c	1.79E+04	c
Dibenz[a,j]acridine	224-42-0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dibenzo[a,e]fluoranthene	5385-75-1	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dibenzo[a,e]pyrene	192-65-4	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dibenzo[a,h]fluoranthene	No CAS #	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dibenzo[a,h]pyrene	189-64-0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dibenzo[a,i]pyrene	189-55-9	NA	e	9.49E+06	7.29E+00	l	1.95E+07	3.80E+05	e	9.49E+04	e
Fluoranthene	206-44-0	4.91E+04	c	4.91E+04	1.21E+05	c	1.21E+05	1.96E+03	c	4.91E+02	c
Hexachloronaphthalene	1335-87-1	NA	e	1.85E+07	7.59E+00	l	3.89E+07	7.42E+05	e	1.85E+05	e
Indeno[1,2,3-cd]pyrene	193-39-5	4.11E+06	c	4.11E+06	8.22E+06	c	8.22E+06	1.64E+05	c	4.11E+04	c
Octachloronaphthalene	2234-13-1	NA	e	1.36E+06	6.42E+00	l	2.63E+06	5.44E+04	e	1.36E+04	e
Pentachloronaphthalene	1321-64-8	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Tetrachloronaphthalene	1335-88-2	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Trichloronaphthalene	1321-65-9	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Table B1-1 Chemical-Specific Parameters for Organic COPCs

Chemical of Potential Concern	CAS Registry Number	Kd		Plant Uptake Factors				
		Kd_{sw} (L/kg)	Source	Br_{ag} (µg/g DW plant)/ (µg/g soil)	Source	Br_{forage} (µg/g DW plant)/ (µg/g soil)	Source	Br_{grain} (µg/g DW plant)/ (µg/g soil) [a]
Phenanthrene	85-01-8	1.57E+03	h	9.08E-02	c	9.08E-02	c	9.08E-02
Pyrene	129-00-0	5.10E+03	c	4.98E-02	c	4.98E-02	c	4.98E-02
Heavy Polycyclic Aromatic Hydrocarbons (MW>200 g/mole)								
3-Methylcholanthrene	56-49-5	1.14E+05	e	3.01E-03	e	3.01E-03	e	3.01E-03
5-Methylchrysene	3697-24-3	NA	NA	NA	NA	NA	NA	NA
Benzo[a]anthracene	56-55-3	1.95E+04	c	2.02E-02	c	2.02E-02	c	2.02E-02
Benzo[a]pyrene	50-32-8	7.27E+04	c	1.11E-02	c	1.11E-02	c	1.11E-02
Benzo[a,i]pyrene	191-30-0	NA	NA	NA	NA	NA	NA	NA
Benzo[b]fluoranthene	205-99-2	6.27E+04	c	1.01E-02	c	1.01E-02	c	1.01E-02
Benzo[e]pyrene	192-97-2	1.19E+06	e	2.05E-03	e	2.05E-03	e	2.05E-03
Benzo[g,h,i]perylene	191-24-2	1.36E+05	e	3.05E-03	e	3.05E-03	e	3.05E-03
Benzo[j]fluoranthene	205-82-3	1.07E+05	e	7.34E-03	e	7.34E-03	e	7.34E-03
Benzo[k]fluoranthene	207-08-9	6.24E+04	c	1.01E-02	c	1.01E-02	c	1.01E-02
Chrysene	218-01-9	2.23E+04	c	1.87E-02	c	1.87E-02	c	1.87E-02
Dibenz[a,h]acridine	226-36-8	NA	NA	NA	NA	NA	NA	NA
Dibenz[a,h]anthracene	53-70-3	1.34E+05	c	6.36E-03	c	6.36E-03	c	6.36E-03
Dibenz[a,j]acridine	224-42-0	NA	NA	NA	NA	NA	NA	NA
Dibenzo[a,e]fluoranthene	5385-75-1	NA	NA	NA	NA	NA	NA	NA
Dibenzo[a,e]pyrene	192-65-4	NA	NA	NA	NA	NA	NA	NA
Dibenzo[a,h]fluoranthene	No CAS #	NA	NA	NA	NA	NA	NA	NA
Dibenzo[a,h]pyrene	189-64-0	NA	NA	NA	NA	NA	NA	NA
Dibenzo[a,i]pyrene	189-55-9	7.12E+05	e	2.37E-03	e	2.37E-03	e	2.37E-03
Fluoranthene	206-44-0	3.68E+03	c	4.46E-02	c	4.46E-02	c	4.46E-02
Hexachloronaphthalene	1335-87-1	1.39E+06	e	1.59E-03	e	1.59E-03	e	1.59E-03
Indeno[1,2,3-cd]pyrene	193-39-5	3.08E+05	c	3.90E-03	c	3.90E-03	c	3.90E-03
Octachloronaphthalene	2234-13-1	1.02E+05	e	7.54E-03	e	7.54E-03	e	7.54E-03
Pentachloronaphthalene	1321-64-8	NA	NA	NA	NA	NA	NA	NA
Tetrachloronaphthalene	1335-88-2	NA	NA	NA	NA	NA	NA	NA
Trichloronaphthalene	1321-65-9	NA	NA	NA	NA	NA	NA	NA

Table B1-1 Chemical-Specific Parameters for Organic COPCs

Chemical of Potential Concern	CAS Registry Number	Plant Uptake Factors							
		$Br_{rootveg}$ (µg/g DW plant)/ (µg/g soil)	Source	Bv_{ag} (µg/g DW plant)/ (µg/g air)	Source	Bv_{forage} (µg/g DW plant)/ (µg/g air)	Source	RCF (µg/g DW plant)/ (µg/mL soil water)	Source
Phenanthrene	85-01-8	3.58E+00	h	2.08E-02	c	2.08E-02	c	7.47E+02	c
Pyrene	129-00-0	2.44E+00	c	1.44E+03	h	1.44E+03	h	1.66E+03	c
Heavy Polycyclic Aromatic Hydrocarbons (MW>200 g/mole)									
3-Methylcholanthrene	56-49-5	4.58E+00	e	1.68E+07	e	1.68E+07	e	6.93E+04	e
5-Methylchrysene	3697-24-3	NA	NA	NA	NA	NA	NA	NA	NA
Benzo[a]anthracene	56-55-3	2.11E+00	c	1.72E+04	c	1.72E+04	c	5.48E+03	c
Benzo[a]pyrene	50-32-8	1.26E+00	c	2.25E+05	c	2.25E+05	c	1.22E+04	c
Benzo[a,i]pyrene	191-30-0	NA	NA	NA	NA	NA	NA	NA	NA
Benzo[b]fluoranthene	205-99-2	1.66E+00	c	3.65E+04	c	3.65E+04	c	1.39E+04	c
Benzo[e]pyrene	192-97-2	7.31E-01	e	9.22E+06	e	9.22E+06	e	1.16E+05	e
Benzo[g,h,i]perylene	191-24-2	3.74E+00	e	2.91E+05	e	2.91E+05	e	6.81E+04	e
Benzo[j]fluoranthene	205-82-3	1.49E+00	e	2.00E+06	e	2.00E+06	e	2.11E+04	e
Benzo[k]fluoranthene	207-08-9	1.66E+00	c	5.40E+05	c	5.40E+05	c	1.38E+04	c
Chrysene	218-01-9	2.05E+00	c	5.97E+04	c	5.97E+04	c	6.10E+03	c
Dibenz[a,h]acridine	226-36-8	NA	NA	NA	NA	NA	NA	NA	NA
Dibenz[a,h]anthracene	53-70-3	1.43E+00	h	4.68E+07	c	4.68E+07	c	2.56E+04	c
Dibenz[a,j]acridine	224-42-0	NA	NA	NA	NA	NA	NA	NA	NA
Dibenzo[a,e]fluoranthene	5385-75-1	NA	NA	NA	NA	NA	NA	NA	NA
Dibenzo[a,e]pyrene	192-65-4	NA	NA	NA	NA	NA	NA	NA	NA
Dibenzo[a,h]fluoranthene	No CAS #	NA	NA	NA	NA	NA	NA	NA	NA
Dibenzo[a,h]pyrene	189-64-0	NA	NA	NA	NA	NA	NA	NA	NA
Dibenzo[a,i]pyrene	189-55-9	1.00E+00	e	2.31E+08	e	2.31E+08	e	9.54E+04	e
Fluoranthene	206-44-0	3.90E+00	c	1.56E+03	c	1.56E+03	c	1.92E+03	c
Hexachloronaphthalene	1335-87-1	8.75E-01	e	7.82E+04	e	7.82E+04	e	1.62E+05	e
Indeno[1,2,3-cd]pyrene	193-39-5	1.19E+00	c	2.67E+08	c	2.67E+08	c	4.91E+04	c
Octachloronaphthalene	2234-13-1	1.50E+00	e	3.79E+03	e	3.79E+03	e	2.04E+04	e
Pentachloronaphthalene	1321-64-8	NA	NA	NA	NA	NA	NA	NA	NA
Tetrachloronaphthalene	1335-88-2	NA	NA	NA	NA	NA	NA	NA	NA
Trichloronaphthalene	1321-65-9	NA	NA	NA	NA	NA	NA	NA	NA

Table B1-1 Chemical-Specific Parameters for Organic COPCs

Chemical of Potential Concern	CAS Registry Number	Bioconcentration/Bioaccumulation Factors									
		Ba_{beef} (day/kg FW)	Source	$Ba_{chicken}$ (day/kg FW)	Source	Ba_{egg} (day/kg FW)	Source	Ba_{milk} (day/kg FW)	Source	Ba_{pork} (day/kg FW)	Source
Phenanthrene	85-01-8	8.92E-04	c	7.04E-04	c	2.82E-01	c	2.82E-04	c	1.08E-03	c
Pyrene	129-00-0	2.52E-03	c	1.99E-03	c	7.98E-01	c	7.98E-04	c	3.06E-03	c
Heavy Polycyclic Aromatic Hydrocarbons (MW>200 g/mole)											
3-Methylcholanthrene	56-49-5	3.24E-01	e	2.55E-01	e	1.02E+02	e	1.02E-01	e	3.92E-01	e
5-Methylchrysene	3697-24-3	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzo[a]anthracene	56-55-3	1.20E-02	c	9.46E-03	c	3.79E+00	c	3.79E-03	c	1.45E-02	c
Benzo[a]pyrene	50-32-8	3.38E-02	c	2.67E-02	c	1.07E+01	c	1.07E-02	c	4.10E-02	c
Benzo[a,i]pyrene	191-30-0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzo[b]fluoranthene	205-99-2	4.00E-02	c	3.16E-02	c	1.27E+01	c	1.27E-02	c	4.84E-02	c
Benzo[e]pyrene	192-97-2	6.31E-01	e	4.98E-01	e	2.00E+02	e	2.00E-01	e	7.64E-01	e
Benzo[g,h,i]perylene	191-24-2	3.16E-01	e	2.50E-01	e	1.00E+02	e	1.00E-01	e	3.83E-01	e
Benzo[j]fluoranthene	205-82-3	6.92E-02	e	5.46E-02	e	2.19E+01	e	2.19E-02	e	8.37E-02	e
Benzo[k]fluoranthene	207-08-9	3.98E-02	c	3.14E-02	c	1.26E+01	c	1.26E-02	c	4.82E-02	c
Chrysene	218-01-9	1.38E-02	c	1.09E-02	c	4.35E+00	c	4.36E-03	c	1.67E-02	c
Dibenz[a,h]acridine	226-36-8	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dibenz[a,h]anthracene	53-70-3	8.86E-02	c	7.00E-02	c	2.80E+01	c	2.80E-02	c	1.07E-01	c
Dibenz[a,j]acridine	224-42-0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dibenzo[a,e]fluoranthene	5385-75-1	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dibenzo[a,e]pyrene	192-65-4	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dibenzo[a,h]fluoranthene	No CAS #	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dibenzo[a,h]pyrene	189-64-0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dibenzo[a,i]pyrene	189-55-9	4.90E-01	e	3.87E-01	e	1.55E+02	e	1.55E-01	e	5.93E-01	e
Fluoranthene	206-44-0	3.05E-03	c	2.41E-03	c	9.65E-01	c	9.65E-04	c	3.69E-03	c
Hexachloronaphthalene	1335-87-1	9.77E-01	e	7.72E-01	e	3.09E+02	e	3.09E-01	e	1.18E+00	e
Indeno[1,2,3-cd]pyrene	193-39-5	2.07E-01	c	1.63E-01	c	6.53E+01	c	6.53E-02	c	2.50E-01	c
Octachloronaphthalene	2234-13-1	6.61E-02	e	5.22E-02	e	2.09E+01	e	2.09E-02	e	8.00E-02	e
Pentachloronaphthalene	1321-64-8	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Tetrachloronaphthalene	1335-88-2	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Trichloronaphthalene	1321-65-9	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Table B1-1 Chemical-Specific Parameters for Organic COPCs

Chemical of Potential Concern	CAS Registry Number	Bioconcentration/Bioaccumulation Factors						Half-life	
		BAF_{fish} (L/kg FW)	Source	BCF_{fish} (L/kg FW)	Source	$BSAF_{fish}$ (unitless)	Source	$t_{1/2}$ (days)	Source
Phenanthrene	85-01-8	3.30E+03	c	NA	NA	NA	NA	NA	NA
Pyrene	129-00-0	1.19E+04	c	NA	NA	NA	NA	NA	NA
Heavy Polycyclic Aromatic Hydrocarbons (MW>200 g/mole)									
3-Methylcholanthrene	56-49-5	NA	NA	NA	NA	NA	NA	1.40E+03	d
5-Methylchrysene	3697-24-3	NA	NA	NA	NA	NA	NA	NA	NA
Benzo[a]anthracene	56-55-3	5.10E+03	c	NA	NA	NA	NA	NA	NA
Benzo[a]pyrene	50-32-8	9.95E+03	c	NA	NA	NA	NA	NA	NA
Benzo[a,i]pyrene	191-30-0	NA	NA	NA	NA	NA	NA	NA	NA
Benzo[b]fluoranthene	205-99-2	9.95E+03	c	NA	NA	NA	NA	NA	NA
Benzo[e]pyrene	192-97-2	NA	NA	NA	NA	NA	NA	NA	NA
Benzo[g,h,i]perylene	191-24-2	2.54E+04	m	NA	NA	NA	NA	6.50E+02	d
Benzo[j]fluoranthene	205-82-3	NA	NA	NA	NA	NA	NA	NA	NA
Benzo[k]fluoranthene	207-08-9	9.95E+03	c	NA	NA	NA	NA	NA	NA
Chrysene	218-01-9	6.03E+03	c	NA	NA	NA	NA	NA	NA
Dibenz[a,h]acridine	226-36-8	NA	NA	NA	NA	NA	NA	NA	NA
Dibenz[a,h]anthracene	53-70-3	1.28E+04	c	NA	NA	NA	NA	NA	NA
Dibenz[a,j]acridine	224-42-0	NA	NA	NA	NA	NA	NA	NA	NA
Dibenzo[a,e]fluoranthene	5385-75-1	NA	NA	NA	NA	NA	NA	NA	NA
Dibenzo[a,e]pyrene	192-65-4	NA	NA	NA	NA	NA	NA	NA	NA
Dibenzo[a,h]fluoranthene	No CAS #	NA	NA	NA	NA	NA	NA	NA	NA
Dibenzo[a,h]pyrene	189-64-0	NA	NA	NA	NA	NA	NA	NA	NA
Dibenzo[a,i]pyrene	189-55-9	NA	NA	NA	NA	NA	NA	3.61E+02	d
Fluoranthene	206-44-0	1.57E+04	c	NA	NA	NA	NA	NA	NA
Hexachloronaphthalene	1335-87-1	NA	NA	NA	NA	NA	NA	3.65E+02	d
Indeno[1,2,3-cd]pyrene	193-39-5	1.31E+04	c	NA	NA	NA	NA	NA	NA
Octachloronaphthalene	2234-13-1	NA	NA	NA	NA	NA	NA	3.65E+02	d
Pentachloronaphthalene	1321-64-8	NA	NA	NA	NA	NA	NA	NA	NA
Tetrachloronaphthalene	1335-88-2	NA	NA	NA	NA	NA	NA	NA	NA
Trichloronaphthalene	1321-65-9	NA	NA	NA	NA	NA	NA	NA	NA

Table B1-1 Chemical-Specific Parameters for Organic COPCs

Chemical of Potential Concern	CAS Registry Number	Soil Loss Mechanisms [g]											
		k_{decay} (year)$^{-1}$	Source	ks_e (year)$^{-1}$			Source	ks_g (year)$^{-1}$	Source	ks_l (year)$^{-1}$			Source
				1 cm	15 cm	20 cm				1 cm	15 cm	20 cm	
Phenanthrene	85-01-8	0.0E+00	NA	5.28E-03	3.52E-04	2.64E-04	e	1.26E+00	c	1.54E-02	1.03E-03	7.70E-04	e
Pyrene	129-00-0	0.0E+00	NA	5.28E-03	3.52E-04	2.64E-04	e	1.33E-01	c	4.73E-03	3.16E-04	2.37E-04	e
Heavy Polycyclic Aromatic Hydrocarbons (MW>200 g/mole)													
3-Methylcholanthrene	56-49-5	0.0E+00	NA	5.28E-03	3.52E-04	2.64E-04	e	1.81E-01	e	2.13E-04	1.42E-05	1.06E-05	e
5-Methylchrysene	3697-24-3	0.0E+00	NA	0.0E+00	0.0E+00	0.0E+00	NA	0.0E+00	NA	0.0E+00	0.0E+00	0.0E+00	NA
Benzo[a]anthracene	56-55-3	0.0E+00	NA	5.28E-03	3.52E-04	2.64E-04	e	3.72E-01	c	1.24E-03	8.26E-05	6.19E-05	e
Benzo[a]pyrene	50-32-8	0.0E+00	NA	5.28E-03	3.52E-04	2.64E-04	e	4.77E-01	c	3.32E-04	2.22E-05	1.66E-05	e
Benzo[a,i]pyrene	191-30-0	0.0E+00	NA	0.0E+00	0.0E+00	0.0E+00	NA	0.0E+00	NA	0.0E+00	0.0E+00	0.0E+00	NA
Benzo[b]fluoranthene	205-99-2	0.0E+00	NA	5.28E-03	3.52E-04	2.64E-04	e	4.15E-01	c	3.85E-04	2.57E-05	1.93E-05	e
Benzo[e]pyrene	192-97-2	0.0E+00	NA	5.28E-03	3.52E-04	2.64E-04	e	0.0E+00	NA	2.03E-05	1.35E-06	1.02E-06	e
Benzo[g,h,i]perylene	191-24-2	0.0E+00	NA	5.28E-03	3.52E-04	2.64E-04	e	3.89E-01	e	1.77E-04	1.18E-05	8.85E-06	e
Benzo[j]fluoranthene	205-82-3	0.0E+00	NA	5.28E-03	3.52E-04	2.64E-04	e	0.0E+00	NA	2.27E-04	1.51E-05	1.13E-05	e
Benzo[k]fluoranthene	207-08-9	0.0E+00	NA	5.28E-03	3.52E-04	2.64E-04	e	1.18E-01	c	3.87E-04	2.58E-05	1.94E-05	e
Chrysene	218-01-9	0.0E+00	NA	5.28E-03	3.52E-04	2.64E-04	e	2.53E-01	c	1.08E-03	7.23E-05	5.42E-05	e
Dibenz[a,h]acridine	226-36-8	0.0E+00	NA	0.0E+00	0.0E+00	0.0E+00	NA	0.0E+00	NA	0.0E+00	0.0E+00	0.0E+00	NA
Dibenz[a,h]anthracene	53-70-3	0.0E+00	NA	5.28E-03	3.52E-04	2.64E-04	e	2.69E-01	c	1.80E-04	1.20E-05	9.00E-06	e
Dibenz[a,j]acridine	224-42-0	0.0E+00	NA	0.0E+00	0.0E+00	0.0E+00	NA	0.0E+00	NA	0.0E+00	0.0E+00	0.0E+00	NA
Dibenzo[a,e]fluoranthene	5385-75-1	0.0E+00	NA	0.0E+00	0.0E+00	0.0E+00	NA	0.0E+00	NA	0.0E+00	0.0E+00	0.0E+00	NA
Dibenzo[a,e]pyrene	192-65-4	0.0E+00	NA	0.0E+00	0.0E+00	0.0E+00	NA	0.0E+00	NA	0.0E+00	0.0E+00	0.0E+00	NA
Dibenzo[a,h]fluoranthene	No CAS #	0.0E+00	NA	0.0E+00	0.0E+00	0.0E+00	NA	0.0E+00	NA	0.0E+00	0.0E+00	0.0E+00	NA
Dibenzo[a,h]pyrene	189-64-0	0.0E+00	NA	0.0E+00	0.0E+00	0.0E+00	NA	0.0E+00	NA	0.0E+00	0.0E+00	0.0E+00	NA
Dibenzo[a,i]pyrene	189-55-9	0.0E+00	NA	5.28E-03	3.52E-04	2.64E-04	e	7.01E-01	e	3.39E-05	2.26E-06	1.70E-06	e
Fluoranthene	206-44-0	0.0E+00	NA	5.28E-03	3.52E-04	2.64E-04	e	5.75E-01	c	6.56E-03	4.37E-04	3.28E-04	e
Hexachloronaphthalene	1335-87-1	0.0E+00	NA	5.28E-03	3.52E-04	2.64E-04	e	6.93E-01	e	1.74E-05	1.16E-06	8.68E-07	e
Indeno[1,2,3-cd]pyrene	193-39-5	0.0E+00	NA	5.28E-03	3.52E-04	2.64E-04	e	3.47E-01	c	7.84E-05	5.22E-06	3.92E-06	e
Octachloronaphthalene	2234-13-1	0.0E+00	NA	5.28E-03	3.52E-04	2.64E-04	e	6.93E-01	e	2.37E-04	1.58E-05	1.18E-05	e
Pentachloronaphthalene	1321-64-8	0.0E+00	NA	0.0E+00	0.0E+00	0.0E+00	NA	0.0E+00	NA	0.0E+00	0.0E+00	0.0E+00	NA
Tetrachloronaphthalene	1335-88-2	0.0E+00	NA	0.0E+00	0.0E+00	0.0E+00	NA	0.0E+00	NA	0.0E+00	0.0E+00	0.0E+00	NA
Trichloronaphthalene	1321-65-9	0.0E+00	NA	0.0E+00	0.0E+00	0.0E+00	NA	0.0E+00	NA	0.0E+00	0.0E+00	0.0E+00	NA

Table B1-1 Chemical-Specific Parameters for Organic COPCs

Chemical of Potential Concern	CAS Registry Number	Soil Loss Mechanisms [g]								Kp (cm/hr)	Source
		ks_r $(year)^{-1}$			Source	ks_v $(year)^{-1}$			Source		
		1 cm	15 cm	20 cm		1 cm	15 cm	20 cm			
Phenanthrene	85-01-8	9.19E-03	6.13E-04	4.60E-04	e	9.19E+03	4.09E+01	2.30E+01	f	1.40E-01	ab
Pyrene	129-00-0	2.83E-03	1.88E-04	1.41E-04	e	1.01E-01	4.50E-04	2.53E-04	f	2.61E-01	aa
Heavy Polycyclic Aromatic Hydrocarbons (MW>200 g/mole)											
3-Methylcholanthrene	56-49-5	1.27E-04	8.47E-06	6.35E-06	e	1.15E-04	5.12E-07	2.88E-07	f	2.89E+00	aa
5-Methylchrysene	3697-24-3	0.0E+00	0.0E+00	0.0E+00	NA	0.0E+00	0.0E+00	0.0E+00	NA	NA	NA
Benzo[a]anthracene	56-55-3	7.40E-04	4.93E-05	3.70E-05	e	1.06E-02	4.69E-05	2.64E-05	f	4.70E-01	ab
Benzo[a]pyrene	50-32-8	1.98E-04	1.32E-05	9.92E-06	e	5.77E-04	2.57E-06	1.44E-06	f	7.00E-01	ab
Benzo[a,i]pyrene	191-30-0	0.0E+00	0.0E+00	0.0E+00	NA	0.0E+00	0.0E+00	0.0E+00	NA	NA	NA
Benzo[b]fluoranthene	205-99-2	2.30E-04	1.53E-05	1.15E-05	e	5.17E-03	2.30E-05	1.29E-05	f	7.00E-01	ab
Benzo[e]pyrene	192-97-2	1.21E-05	8.09E-07	6.07E-07	e	4.26E-05	1.89E-07	1.06E-07	f	5.56E+00	aa
Benzo[g,h,i]perylene	191-24-2	1.06E-04	7.05E-06	5.28E-06	e	5.30E-03	2.36E-05	1.33E-05	f	2.57E+00	aa
Benzo[j]fluoranthene	205-82-3	1.35E-04	9.02E-06	6.76E-06	e	2.08E-04	9.25E-07	5.20E-07	f	1.26E+00	aa
Benzo[k]fluoranthene	207-08-9	2.31E-04	1.54E-05	1.16E-05	e	3.49E-04	1.55E-06	8.73E-07	f	8.64E-01	aa
Chrysene	218-01-9	6.47E-04	4.32E-05	3.24E-05	e	3.10E-03	1.38E-05	7.75E-06	f	4.70E-01	ab
Dibenz[a,h]acridine	226-36-8	0.0E+00	0.0E+00	0.0E+00	NA	0.0E+00	0.0E+00	0.0E+00	NA	NA	NA
Dibenz[a,h]anthracene	53-70-3	1.07E-04	7.16E-06	5.37E-06	e	3.46E-06	1.54E-08	8.64E-09	f	1.50E+00	ab
Dibenz[a,j]acridine	224-42-0	0.0E+00	0.0E+00	0.0E+00	NA	0.0E+00	0.0E+00	0.0E+00	NA	NA	NA
Dibenzo[a,e]fluoranthene	5385-75-1	0.0E+00	0.0E+00	0.0E+00	NA	0.0E+00	0.0E+00	0.0E+00	NA	NA	NA
Dibenzo[a,e]pyrene	192-65-4	0.0E+00	0.0E+00	0.0E+00	NA	0.0E+00	0.0E+00	0.0E+00	NA	NA	NA
Dibenzo[a,h]fluoranthene	No CAS #	0.0E+00	0.0E+00	0.0E+00	NA	0.0E+00	0.0E+00	0.0E+00	NA	NA	NA
Dibenzo[a,h]pyrene	189-64-0	0.0E+00	0.0E+00	0.0E+00	NA	0.0E+00	0.0E+00	0.0E+00	NA	NA	NA
Dibenzo[a,i]pyrene	189-55-9	2.03E-05	1.35E-06	1.01E-06	e	1.92E-06	8.53E-09	4.80E-09	f	2.46E+00	aa
Fluoranthene	206-44-0	3.92E-03	2.61E-04	1.96E-04	e	1.60E-01	7.13E-04	4.01E-04	f	2.20E-01	ab
Hexachloronaphthalene	1335-87-1	1.04E-05	6.91E-07	5.18E-07	e	5.66E-03	2.52E-05	1.42E-05	f	2.57E+00	aa
Indeno[1,2,3-cd]pyrene	193-39-5	4.68E-05	3.12E-06	2.34E-06	e	6.90E-07	3.06E-09	1.72E-09	f	1.00E+00	ab
Octachloronaphthalene	2234-13-1	1.41E-04	9.43E-06	7.07E-06	e	7.99E-02	3.55E-04	2.00E-04	f	1.74E-01	aa
Pentachloronaphthalene	1321-64-8	0.0E+00	0.0E+00	0.0E+00	NA	0.0E+00	0.0E+00	0.0E+00	NA	NA	NA
Tetrachloronaphthalene	1335-88-2	0.0E+00	0.0E+00	0.0E+00	NA	0.0E+00	0.0E+00	0.0E+00	NA	NA	NA
Trichloronaphthalene	1321-65-9	0.0E+00	0.0E+00	0.0E+00	NA	0.0E+00	0.0E+00	0.0E+00	NA	NA	NA

Table B1-1 Chemical-Specific Parameters for Organic COPCs

Chemical of Potential Concern	CAS Registry Number	Fraction		MW (g/mol)	pH	Henry's Constant			Diffusivity			
		F_v (unitless)	Source			H-pub [x] (various units)	Source	H-used [x] (atm-m^3/mol)	D_a (cm^2/s)	Source	D_w (cm^2/s)	Source
Light Substituted Benzene Compounds (MW<200 g/mole)												
1,2,3-Trichlorobenzene	87-61-6	0 or 1	b	181.46	NA	2.84E-03	c	2.84E-03	3.02E-02	c	8.15E-06	c
1,2,4-Trichlorobenzene	120-82-1	0 or 1	b	181.46	NA	2.61E-03	c	2.61E-03	3.00E-02	c	8.23E-06	c
1,2,4-Trimethyl benzene	95-63-6	0 or 1	b	120.19	NA	5.81E+02	i	5.75E-03	7.80E-02	e	9.03E-06	e
1,2-Dichlorobenzene	95-50-1	0 or 1	b	147.01	NA	2.11E-03	c	2.11E-03	4.11E-02	c	8.93E-06	c
1,3,5-Trimethyl benzene	108-67-8	0 or 1	b	120.19	NA	7.81E-03	c	7.81E-03	6.48E-02	c	7.86E-06	c
1,3-Dichlorobenzene	541-73-1	0 or 1	b	147.01	NA	1.11E+02	c	1.11E+02	4.14E-02	c	8.85E-06	c
1,3-Dinitrobenzene	99-65-0	0 or 1	b	168.11	NA	1.25E-07	c	1.25E-07	3.18E-02	c	9.15E-06	c
1,4-Dichlorobenzene	106-46-7	0 or 1	b	147.01	NA	2.80E-03	c	2.80E-03	4.14E-02	c	8.85E-06	c
1,4-Dinitrobenzene	100-25-4	0 or 1	b	168.11	NA	3.43E-06	k	8.37E-08	6.24E-02	e	7.22E-06	e
2,4,5-Trichlorophenol	95-95-4	0 or 1	b	197.46	7	5.64E-06	c	5.64E-06	2.91E-02	c	7.03E-06	c
2,4,6-Trichlorophenol	88-06-2	0 or 1	b	197.46	7	4.06E-06	c	4.06E-06	2.62E-02	c	8.08E-06	c
2,4-Dichlorophenol	120-83-2	0 or 1	b	163.01	7	2.38E-07	c	2.38E-07	2.69E-02	c	7.79E-06	c
2,4-Dimethylphenol	105-67-9	0 or 1	b	122.17	7	3.24E-06	h	3.24E-06	5.84E-02	c	8.69E-06	c
2,4-Dinitrophenol	51-28-5	0 or 1	b	184.11	7	4.82E-09	c	4.82E-09	2.73E-02	c	9.06E-06	c
2,4-Dinitrotoluene	121-14-2	0 or 1	b	182.14	NA	1.46E-07	c	1.46E-07	3.09E-02	c	7.86E-06	c
2,6-Dinitrotoluene	606-20-2	0 or 1	b	182.15	NA	1.30E-07	c	1.30E-07	3.11E-02	c	7.76E-06	c
2-Chlorophenol	95-57-8	0 or 1	b	128.56	NA	1.66E-05	c	1.66E-05	5.01E-02	c	9.46E-06	c
2-Chlorotoluene	95-49-8	0 or 1	b	126.59	NA	6.41E-02	n	6.35E-04	7.54E-02	e	8.73E-06	e
2-Nitrophenol	88-75-5	0 or 1	b	139.11	NA	1.46E-05	c	1.46E-05	4.44E-02	c	9.19E-06	c
4,6-Dinitro-o-cresol	534-52-1	0 or 1	b	198.13	NA	5.72E-05	m	1.40E-06	2.93E-02	j	6.91E-06	j
4-Chlorotoluene	106-43-4	0 or 1	b	126.59	NA	NA	NA	NA	7.54E-02	e	8.73E-06	e
4-Nitrophenol	100-02-7	0 or 1	b	139.11	NA	7.32E-09	c	7.32E-09	4.30E-02	c	9.61E-06	c
alpha-Methylstyrene	98-83-9	0 or 1	b	118.18	NA	1.04E-01	m	2.54E-03	2.64E-01	j	1.14E-05	j
Aniline	62-53-3	0 or 1	b	93.12	NA	2.28E-06	c	2.28E-06	8.56E-01	c	1.01E-05	c
Benzotrichloride	98-07-7	0 or 1	b	195.47	NA	1.06E-02	m	2.59E-04	2.75E-02	j	7.77E-06	j
Benzyl chloride	100-44-7	0 or 1	b	126.58	NA	4.13E-04	c	4.13E-04	5.43E-02	c	8.80E-06	c
Bromobenzene	108-86-1	0 or 1	b	157.01	NA	2.11E+02	i	2.09E-03	6.53E-02	e	7.56E-06	e
Chlorobenzene	108-90-7	0 or 1	b	112.56	NA	4.38E-03	c	4.38E-03	6.35E-02	c	9.49E-06	c

Table B1-1 Chemical-Specific Parameters for Organic COPCs

Chemical of Potential Concern	CAS Registry Number	Octanol / Water Partitioning Coefficients						Partitioning Coefficients (Kd)			
		K_{oc}-pub [y] (various units)	Source	K_{oc}-used [z] (mL/g)	K_{ow}-pub [y] (various units)	Source	K_{ow}-used [z] (unitless)	Kd_{bs} (L/kg)	Source	Kd_s (mL/g)	Source
Light Substituted Benzene Compounds (MW<200 g/mole)											
1,2,3-Trichlorobenzene	87-61-6	2.02E+03	h	2.02E+03	1.11E+04	c	1.11E+04	8.10E+01	h	2.02E+01	h
1,2,4-Trichlorobenzene	120-82-1	1.66E+03	c	1.66E+03	9.73E+03	c	9.73E+03	6.64E+01	c	1.66E+01	c
1,2,4-Trimethyl benzene	95-63-6	NA	e	9.95E+02	3.65E+00	i	4.47E+03	3.98E+01	e	9.95E+00	e
1,2-Dichlorobenzene	95-50-1	3.79E+02	c	3.79E+02	2.79E+03	c	2.79E+03	1.52E+01	c	3.79E+00	c
1,3,5-Trimethyl benzene	108-67-8	1.67E+03	c	1.67E+03	2.63E+03	c	2.63E+03	6.69E+01	c	1.67E+01	c
1,3-Dichlorobenzene	541-73-1	8.03E+02	h	8.03E+02	3.39E+03	c	3.39E+03	3.21E+01	h	8.03E+00	h
1,3-Dinitrobenzene	99-65-0	2.06E+01	c	2.06E+01	3.10E+01	c	3.10E+01	8.25E-01	c	2.06E-01	c
1,4-Dichlorobenzene	106-46-7	6.16E+02	c	6.16E+02	2.58E+03	c	2.58E+03	2.46E+01	c	6.16E+00	c
1,4-Dinitrobenzene	100-25-4	2.20E+02	m	2.20E+02	1.46E+00	m	2.88E+01	8.80E+00	e	2.20E+00	e
2,4,5-Trichlorophenol	95-95-4	1.13E+03	c	1.13E+03	7.41E+03	c	7.41E+03	4.51E+01	c	1.13E+01	c
2,4,6-Trichlorophenol	88-06-2	2.26E+02	c	2.26E+02	5.15E+03	c	5.15E+03	9.05E+00	c	2.26E+00	c
2,4-Dichlorophenol	120-83-2	1.39E+02	c	1.39E+02	1.09E+03	c	1.09E+03	5.58E+00	c	1.40E+00	c
2,4-Dimethylphenol	105-67-9	1.26E+02	c	1.26E+02	2.29E+02	c	2.29E+02	5.04E+00	c	1.26E+00	c
2,4-Dinitrophenol	51-28-5	1.00E-02	c	1.00E-02	3.30E+01	c	3.30E+01	4.00E-04	c	1.00E-04	c
2,4-Dinitrotoluene	121-14-2	5.10E+01	c	5.10E+01	9.90E+01	c	9.90E+01	2.04E+00	c	5.10E-01	c
2,6-Dinitrotoluene	606-20-2	4.19E+01	c	4.19E+01	7.70E+01	c	7.70E+01	1.68E+00	c	4.19E-01	c
2-Chlorophenol	95-57-8	3.87E+02	c	3.87E+02	1.45E+02	c	1.45E+02	1.55E+01	c	3.87E+00	c
2-Chlorotoluene	95-49-8	4.43E+02	m	4.43E+02	3.42E+00	m	2.63E+03	1.77E+01	e	4.43E+00	e
2-Nitrophenol	88-75-5	3.53E+01	h	3.53E+01	6.17E+01	c	6.17E+01	1.41E+00	h	3.53E-01	h
4,6-Dinitro-o-cresol	534-52-1	6.02E+02	m	6.02E+02	2.12E+00	m	1.32E+02	2.41E+01	e	6.02E+00	e
4-Chlorotoluene	106-43-4	NA	e	5.60E+02	3.33E+00	o	2.14E+03	2.24E+01	e	5.60E+00	e
4-Nitrophenol	100-02-7	4.37E+01	h	4.37E+01	8.13E+01	c	8.13E+01	1.75E+00	h	4.37E-01	h
alpha-Methylstyrene	98-83-9	8.17E+02	m	8.17E+02	3.48E+00	m	3.02E+03	3.27E+01	e	8.17E+00	e
Aniline	62-53-3	8.23E+00	c	8.23E+00	9.55E+00	c	9.55E+00	3.29E-01	c	8.23E-02	c
Benzotrichloride	98-07-7	1.18E+03	m	1.18E+03	2.92E+00	p	8.32E+02	4.72E+01	e	1.18E+01	e
Benzyl chloride	100-44-7	8.83E+01	h	8.83E+01	2.00E+02	h	2.00E+02	3.53E+00	h	8.83E-01	h
Bromobenzene	108-86-1	2.65E+00	i	4.47E+02	2.99E+00	i	9.77E+02	1.79E+01	e	4.47E+00	e
Chlorobenzene	108-90-7	2.24E+02	c	2.24E+02	6.16E+02	c	6.16E+02	8.96E+00	c	2.24E+00	c

Table B1-1 Chemical-Specific Parameters for Organic COPCs

Chemical of Potential Concern	CAS Registry Number	Kd		Plant Uptake Factors				
		Kd_{sw} (L/kg)	Source	Br_{ag} (µg/g DW plant)/ (µg/g soil)	Source	Br_{forage} (µg/g DW plant)/ (µg/g soil)	Source	Br_{grain} (µg/g DW plant)/ (µg/g soil) [a]
Light Substituted Benzene Compounds (MW<200 g/mole)								
1,2,3-Trichlorobenzene	87-61-6	1.52E+02	h	1.78E-01	c	1.78E-01	c	1.78E-01
1,2,4-Trichlorobenzene	120-82-1	1.24E+02	c	1.92E-01	c	1.92E-01	c	1.92E-01
1,2,4-Trimethyl benzene	95-63-6	7.47E+01	e	3.01E-01	e	3.01E-01	e	3.01E-01
1,2-Dichlorobenzene	95-50-1	2.84E+01	c	3.95E-01	c	3.95E-01	c	3.95E-01
1,3,5-Trimethyl benzene	108-67-8	1.25E+02	c	4.09E-01	c	4.09E-01	c	4.09E-01
1,3-Dichlorobenzene	541-73-1	6.02E+01	h	3.53E-01	c	3.53E-01	c	3.53E-01
1,3-Dinitrobenzene	99-65-0	1.55E+00	c	5.32E+00	c	5.32E+00	c	5.32E+00
1,4-Dichlorobenzene	106-46-7	4.62E+01	c	4.13E-01	c	4.13E-01	c	4.13E-01
1,4-Dinitrobenzene	100-25-4	1.65E+01	e	5.55E+00	e	5.55E+00	e	5.55E+00
2,4,5-Trichlorophenol	95-95-4	8.45E+01	c	2.24E-01	c	2.24E-01	c	2.24E-01
2,4,6-Trichlorophenol	88-06-2	1.70E+01	c	2.77E-01	c	2.77E-01	c	2.77E-01
2,4-Dichlorophenol	120-83-2	1.05E+01	c	6.82E-01	c	6.82E-01	c	6.82E-01
2,4-Dimethylphenol	105-67-9	9.44E+00	c	1.68E+00	c	1.68E+00	c	1.68E+00
2,4-Dinitrophenol	51-28-5	7.50E-04	c	5.13E+00	c	5.13E+00	c	5.13E+00
2,4-Dinitrotoluene	121-14-2	3.83E+00	c	2.72E+00	c	2.72E+00	c	2.72E+00
2,6-Dinitrotoluene	606-20-2	3.14E+00	c	3.15E+00	c	3.15E+00	c	3.15E+00
2-Chlorophenol	95-57-8	2.90E+01	c	2.18E+00	c	2.18E+00	c	2.18E+00
2-Chlorotoluene	95-49-8	3.32E+01	e	4.09E-01	e	4.09E-01	e	4.09E-01
2-Nitrophenol	88-75-5	2.65E+00	h	3.57E+00	c	3.57E+00	c	3.57E+00
4,6-Dinitro-o-cresol	534-52-1	4.51E+01	e	2.30E+00	e	2.30E+00	e	2.30E+00
4-Chlorotoluene	106-43-4	4.20E+01	e	4.61E-01	e	4.61E-01	e	4.61E-01
4-Nitrophenol	100-02-7	3.28E+00	h	3.05E+00	c	3.05E+00	c	3.05E+00
alpha-Methylstyrene	98-83-9	6.13E+01	e	3.77E-01	e	3.77E-01	e	3.77E-01
Aniline	62-53-3	6.17E-01	c	1.05E+01	c	1.05E+01	c	1.05E+01
Benzotrichloride	98-07-7	8.86E+01	e	7.95E-01	e	7.95E-01	e	7.95E-01
Benzyl chloride	100-44-7	6.62E+00	h	1.81E+00	h	1.81E+00	h	1.81E+00
Bromobenzene	108-86-1	3.35E+01	e	7.24E-01	e	7.24E-01	e	7.24E-01
Chlorobenzene	108-90-7	1.68E+01	c	9.45E-01	c	9.45E-01	c	9.45E-01

Table B1-1 Chemical-Specific Parameters for Organic COPCs

Chemical of Potential Concern	CAS Registry Number	Plant Uptake Factors							
		$Br_{rootveg}$ (µg/g DW plant)/ (µg/g soil)	Source	Bv_{ag} (µg/g DW plant)/ (µg/g air)	Source	Bv_{forage} (µg/g DW plant)/ (µg/g air)	Source	RCF (µg/g DW plant)/ (µg/mL soil water)	Source
Light Substituted Benzene Compounds (MW<200 g/mole)									
1,2,3-Trichlorobenzene	87-61-6	1.53E+01	h	4.01E-01	c	4.01E-01	c	3.09E+02	c
1,2,4-Trichlorobenzene	120-82-1	1.69E+01	c	3.78E-01	c	3.78E-01	c	2.80E+02	c
1,2,4-Trimethyl benzene	95-63-6	1.57E+01	e	7.52E-02	e	7.52E-02	e	1.56E+02	e
1,2-Dichlorobenzene	95-50-1	2.92E+01	c	1.24E-01	c	1.24E-01	c	1.11E+02	c
1,3,5-Trimethyl benzene	108-67-8	6.35E+00	c	3.14E-02	c	3.14E-02	c	1.06E+02	c
1,3-Dichlorobenzene	541-73-1	1.59E+01	h	8.02E-02	c	8.02E-02	c	1.28E+02	c
1,3-Dinitrobenzene	99-65-0	4.64E+01	c	1.74E+01	c	1.74E+01	c	9.58E+00	c
1,4-Dichlorobenzene	106-46-7	1.70E+01	c	8.60E-02	c	8.60E-02	c	1.05E+02	c
1,4-Dinitrobenzene	100-25-4	4.27E+00	e	2.40E+01	e	2.40E+01	e	9.40E+00	e
2,4,5-Trichlorophenol	95-95-4	2.02E+01	c	1.31E+02	c	1.31E+02	c	2.28E+02	c
2,4,6-Trichlorophenol	88-06-2	7.69E+01	c	1.23E+02	c	1.23E+02	c	1.74E+01	c
2,4-Dichlorophenol	120-83-2	4.07E+01	c	4.01E+02	c	4.01E+02	c	5.68E+01	c
2,4-Dimethylphenol	105-67-9	1.71E+01	c	5.62E+00	h	5.62E+00	h	2.16E+01	c
2,4-Dinitrophenol	51-28-5	9.74E+04	c	4.80E+02	c	4.80E+02	c	9.74E+00	c
2,4-Dinitrotoluene	121-14-2	2.80E+01	c	5.10E+01	c	5.10E+01	c	1.43E+01	c
2,6-Dinitrotoluene	606-20-2	3.08E+01	c	4.41E+01	c	4.41E+01	c	1.29E+01	c
2-Chlorophenol	95-57-8	4.40E+00	c	6.76E-01	c	6.76E-01	c	1.70E+01	c
2-Chlorotoluene	95-49-8	2.40E+01	e	3.88E-01	e	3.88E-01	e	1.06E+02	e
2-Nitrophenol	88-75-5	3.36E+01	h	3.08E-01	c	3.08E-01	c	1.19E+01	c
4,6-Dinitro-o-cresol	534-52-1	2.71E+00	e	7.27E+00	e	7.27E+00	e	1.63E+01	e
4-Chlorotoluene	106-43-4	1.63E+01	e	NA	NA	NA	NA	9.15E+01	e
4-Nitrophenol	100-02-7	3.01E+01	h	8.26E+02	c	8.26E+02	c	1.32E+01	c
alpha-Methylstyrene	98-83-9	1.44E+01	e	1.12E-01	e	1.12E-01	e	1.17E+02	e
Aniline	62-53-3	9.27E+01	c	2.72E-01	c	2.72E-01	c	7.63E+00	c
Benzotrichloride	98-07-7	4.02E+00	e	2.78E-01	e	2.78E-01	e	4.75E+01	e
Benzyl chloride	100-44-7	2.27E+01	h	3.82E-02	h	3.82E-02	h	2.00E+01	h
Bromobenzene	108-86-1	1.18E+01	e	4.10E-02	e	4.10E-02	e	5.29E+01	e
Chlorobenzene	108-90-7	1.74E+01	c	1.19E-02	c	1.19E-02	c	3.90E+01	c

Table B1-1 Chemical-Specific Parameters for Organic COPCs

Chemical of Potential Concern	CAS Registry Number	Bioconcentration/Bioaccumulation Factors									
		Ba_{beef} (day/kg FW)	Source	$Ba_{chicken}$ (day/kg FW)	Source	Ba_{egg} (day/kg FW)	Source	Ba_{milk} (day/kg FW)	Source	Ba_{pork} (day/kg FW)	Source
Light Substituted Benzene Compounds (MW<200 g/mole)											
1,2,3-Trichlorobenzene	87-61-6	2.79E-04	c	2.20E-04	c	8.82E-02	c	8.82E-05	c	3.38E-04	c
1,2,4-Trichlorobenzene	120-82-1	2.45E-04	c	1.93E-04	c	7.73E-02	c	7.73E-05	c	2.96E-04	c
1,2,4-Trimethyl benzene	95-63-6	1.12E-04	e	8.86E-05	e	3.55E-02	e	3.55E-05	e	1.36E-04	e
1,2-Dichlorobenzene	95-50-1	7.00E-05	c	5.53E-05	c	2.21E-02	c	2.21E-05	c	8.48E-05	c
1,3,5-Trimethyl benzene	108-67-8	6.61E-05	c	5.22E-05	c	2.09E-02	c	2.09E-05	c	8.00E-05	c
1,3-Dichlorobenzene	541-73-1	8.52E-05	c	6.72E-05	c	2.69E-02	c	2.69E-05	c	1.03E-04	c
1,3-Dinitrobenzene	99-65-0	7.79E-07	c	6.15E-07	c	2.46E-04	c	2.46E-07	c	9.43E-07	c
1,4-Dichlorobenzene	106-46-7	6.49E-05	c	5.12E-05	c	2.05E-02	c	2.05E-05	c	7.86E-05	c
1,4-Dinitrobenzene	100-25-4	7.24E-07	e	5.72E-07	e	2.29E-04	e	2.29E-07	e	8.77E-07	e
2,4,5-Trichlorophenol	95-95-4	1.86E-04	c	1.47E-04	c	5.89E-02	c	5.89E-05	c	2.25E-04	c
2,4,6-Trichlorophenol	88-06-2	1.29E-04	c	1.02E-04	c	4.09E-02	c	4.09E-05	c	1.57E-04	c
2,4-Dichlorophenol	120-83-2	2.73E-05	c	2.15E-05	c	8.62E-03	c	8.62E-06	c	3.30E-05	c
2,4-Dimethylphenol	105-67-9	5.75E-06	c	4.54E-06	c	1.82E-03	c	1.82E-06	c	6.96E-06	c
2,4-Dinitrophenol	51-28-5	8.29E-07	c	6.54E-07	c	2.62E-04	c	2.62E-07	c	1.00E-06	c
2,4-Dinitrotoluene	121-14-2	2.49E-06	c	1.96E-06	c	7.86E-04	c	7.86E-07	c	3.01E-06	c
2,6-Dinitrotoluene	606-20-2	1.93E-06	c	1.53E-06	c	6.12E-04	c	6.12E-07	c	2.34E-06	c
2-Chlorophenol	95-57-8	3.64E-06	c	2.88E-06	c	1.15E-03	c	1.15E-06	c	4.41E-06	c
2-Chlorotoluene	95-49-8	6.61E-05	e	5.22E-05	e	2.09E-02	e	2.09E-05	e	8.00E-05	e
2-Nitrophenol	88-75-5	1.55E-06	c	1.22E-06	c	4.90E-04	c	4.90E-07	c	1.88E-06	c
4,6-Dinitro-o-cresol	534-52-1	3.31E-06	e	2.61E-06	e	1.05E-03	e	1.05E-06	e	4.01E-06	e
4-Chlorotoluene	106-43-4	5.37E-05	e	4.24E-05	e	1.70E-02	e	1.70E-05	e	6.50E-05	e
4-Nitrophenol	100-02-7	2.04E-06	c	1.61E-06	c	6.46E-04	c	6.46E-07	c	2.47E-06	c
alpha-Methylstyrene	98-83-9	7.59E-05	e	5.99E-05	e	2.40E-02	e	2.40E-05	e	9.18E-05	e
Aniline	62-53-3	2.40E-07	c	1.89E-07	c	7.59E-05	c	7.59E-08	c	2.90E-07	c
Benzotrichloride	98-07-7	2.09E-05	e	1.65E-05	e	6.61E-03	e	6.61E-06	e	2.53E-05	e
Benzyl chloride	100-44-7	5.02E-06	h	4.02E-06	h	1.59E-03	h	1.59E-06	h	6.03E-06	h
Bromobenzene	108-86-1	2.45E-05	e	1.94E-05	e	7.76E-03	e	7.76E-06	e	2.97E-05	e
Chlorobenzene	108-90-7	1.55E-05	c	1.22E-05	c	4.89E-03	c	4.89E-06	c	1.87E-05	c

Table B1-1 Chemical-Specific Parameters for Organic COPCs

Chemical of Potential Concern	CAS Registry Number	Bioconcentration/Bioaccumulation Factors						Half-life	
		BAF_{fish} (L/kg FW)	Source	BCF_{fish} (L/kg FW)	Source	$BSAF_{fish}$ (unitless)	Source	$t_{1/2}$ (days)	Source
Light Substituted Benzene Compounds (MW<200 g/mole)									
1,2,3-Trichlorobenzene	87-61-6	8.76E+02	c	NA	NA	NA	NA	NA	NA
1,2,4-Trichlorobenzene	120-82-1	NA	NA	6.33E+02	c	NA	NA	NA	NA
1,2,4-Trimethyl benzene	95-63-6	NA	NA	3.50E+02	e	NA	NA	2.80E+01	d
1,2-Dichlorobenzene	95-50-1	NA	NA	2.45E+02	c	NA	NA	NA	NA
1,3,5-Trimethyl benzene	108-67-8	NA	NA	2.34E+02	c	NA	NA	NA	NA
1,3-Dichlorobenzene	541-73-1	NA	NA	2.84E+02	c	NA	NA	NA	NA
1,3-Dinitrobenzene	99-65-0	NA	NA	7.40E+01	c	NA	NA	NA	NA
1,4-Dichlorobenzene	106-46-7	NA	NA	2.31E+02	c	NA	NA	NA	NA
1,4-Dinitrobenzene	100-25-4	NA	NA	7.58E+00	e	NA	NA	NA	NA
2,4,5-Trichlorophenol	95-95-4	NA	NA	5.14E+02	c	NA	NA	NA	NA
2,4,6-Trichlorophenol	88-06-2	NA	NA	3.90E+02	c	NA	NA	NA	NA
2,4-Dichlorophenol	120-83-2	NA	NA	1.19E+02	c	NA	NA	NA	NA
2,4-Dimethylphenol	105-67-9	NA	NA	3.66E+01	c	NA	NA	NA	NA
2,4-Dinitrophenol	51-28-5	NA	NA	8.40E+00	c	NA	NA	NA	NA
2,4-Dinitrotoluene	121-14-2	NA	NA	5.92E+00	c	NA	NA	NA	NA
2,6-Dinitrotoluene	606-20-2	NA	NA	5.92E+00	c	NA	NA	NA	NA
2-Chlorophenol	95-57-8	NA	NA	2.59E+01	c	NA	NA	NA	NA
2-Chlorotoluene	95-49-8	NA	NA	2.34E+02	e	NA	NA	NA	NA
2-Nitrophenol	88-75-5	NA	NA	1.35E+01	c	NA	NA	NA	NA
4,6-Dinitro-o-cresol	534-52-1	NA	NA	2.41E+01	e	NA	NA	2.10E+01	d
4-Chlorotoluene	106-43-4	NA	NA	2.00E+02	e	NA	NA	NA	NA
4-Nitrophenol	100-02-7	NA	NA	1.67E+01	c	NA	NA	NA	NA
alpha-Methylstyrene	98-83-9	NA	NA	2.60E+02	e	NA	NA	NA	NA
Aniline	62-53-3	NA	NA	3.27E+00	c	NA	NA	NA	NA
Benzotrichloride	98-07-7	NA	NA	9.75E+01	e	NA	NA	2.08E-03	d
Benzyl chloride	100-44-7	NA	NA	3.30E+01	h	NA	NA	NA	NA
Bromobenzene	108-86-1	NA	NA	1.10E+02	e	NA	NA	NA	NA
Chlorobenzene	108-90-7	NA	NA	7.76E+01	c	NA	NA	NA	NA

Table B1-1 Chemical-Specific Parameters for Organic COPCs

Chemical of Potential Concern	CAS Registry Number	Soil Loss Mechanisms [g]											
		k_{decay} $(year)^{-1}$	Source	ks_e $(year)^{-1}$			Source	ks_g $(year)^{-1}$	Source	ks_l $(year)^{-1}$			Source
				1 cm	15 cm	20 cm				1 cm	15 cm	20 cm	
Light Substituted Benzene Compounds (MW<200 g/mole)													
1,2,3-Trichlorobenzene	87-61-6	0.0E+00	NA	5.24E-03	3.50E-04	2.62E-04	e	1.41E+00	c	1.58E-01	1.05E-02	7.91E-03	e
1,2,4-Trichlorobenzene	120-82-1	0.0E+00	NA	5.24E-03	3.49E-04	2.62E-04	e	1.41E+00	c	1.92E-01	1.28E-02	9.61E-03	e
1,2,4-Trimethyl benzene	95-63-6	0.0E+00	NA	5.20E-03	3.47E-04	2.60E-04	e	9.03E+00	e	3.19E-01	2.12E-02	1.59E-02	e
1,2-Dichlorobenzene	95-50-1	0.0E+00	NA	5.08E-03	3.39E-04	2.54E-04	e	1.41E+00	c	8.17E-01	5.44E-02	4.08E-02	e
1,3,5-Trimethyl benzene	108-67-8	0.0E+00	NA	5.24E-03	3.49E-04	2.62E-04	e	3.16E+01	c	1.91E-01	1.27E-02	9.55E-03	e
1,3-Dichlorobenzene	541-73-1	0.0E+00	NA	5.19E-03	3.46E-04	2.59E-04	e	1.41E+00	c	3.93E-01	2.62E-02	1.97E-02	e
1,3-Dinitrobenzene	99-65-0	0.0E+00	NA	3.03E-03	2.02E-04	1.51E-04	e	1.41E+00	c	8.95E+00	5.97E-01	4.47E-01	e
1,4-Dichlorobenzene	106-46-7	0.0E+00	NA	5.16E-03	3.44E-04	2.58E-04	e	1.41E+00	c	5.10E-01	3.40E-02	2.55E-02	e
1,4-Dinitrobenzene	100-25-4	0.0E+00	NA	4.94E-03	3.29E-04	2.47E-04	e	0.0E+00	NA	1.37E+00	9.12E-02	6.84E-02	e
2,4,5-Trichlorophenol	95-95-4	0.0E+00	NA	5.21E-03	3.48E-04	2.61E-04	e	3.67E-01	c	2.81E-01	1.87E-02	1.41E-02	e
2,4,6-Trichlorophenol	88-06-2	0.0E+00	NA	4.95E-03	3.30E-04	2.47E-04	e	3.61E+00	c	1.33E+00	8.89E-02	6.67E-02	e
2,4-Dichlorophenol	120-83-2	0.0E+00	NA	4.76E-03	3.17E-04	2.38E-04	e	3.61E+00	c	2.07E+00	1.38E-01	1.04E-01	e
2,4-Dimethylphenol	105-67-9	0.0E+00	NA	4.71E-03	3.14E-04	2.35E-04	e	3.61E+01	c	2.28E+00	1.52E-01	1.14E-01	e
2,4-Dinitrophenol	51-28-5	0.0E+00	NA	3.43E-06	2.29E-07	1.72E-07	e	9.62E-01	c	2.09E+01	1.39E+00	1.05E+00	e
2,4-Dinitrotoluene	121-14-2	0.0E+00	NA	4.06E-03	2.71E-04	2.03E-04	e	1.41E+00	c	4.85E+00	3.23E-01	2.43E-01	e
2,6-Dinitrotoluene	606-20-2	0.0E+00	NA	3.87E-03	2.58E-04	1.93E-04	e	1.41E+00	c	5.62E+00	3.75E-01	2.81E-01	e
2-Chlorophenol	95-57-8	0.0E+00	NA	5.08E-03	3.39E-04	2.54E-04	e	0.0E+00	NA	8.00E-01	5.34E-02	4.00E-02	e
2-Chlorotoluene	95-49-8	0.0E+00	NA	5.11E-03	3.40E-04	2.55E-04	e	0.0E+00	NA	7.02E-01	4.68E-02	3.51E-02	e
2-Nitrophenol	88-75-5	0.0E+00	NA	3.68E-03	2.45E-04	1.84E-04	e	9.03E+00	c	6.35E+00	4.24E-01	3.18E-01	e
4,6-Dinitro-o-cresol	534-52-1	0.0E+00	NA	5.15E-03	3.44E-04	2.58E-04	e	1.20E+01	e	5.22E-01	3.48E-02	2.61E-02	e
4-Chlorotoluene	106-43-4	0.0E+00	NA	5.14E-03	3.43E-04	2.57E-04	e	0.0E+00	NA	5.59E-01	3.73E-02	2.80E-02	e
4-Nitrophenol	100-02-7	0.0E+00	NA	3.91E-03	2.61E-04	1.95E-04	e	2.09E+02	c	5.45E+00	3.63E-01	2.73E-01	e
alpha-Methylstyrene	98-83-9	0.0E+00	NA	5.19E-03	3.46E-04	2.59E-04	e	0.0E+00	NA	3.87E-01	2.58E-02	1.93E-02	e
Aniline	62-53-3	0.0E+00	NA	1.84E-03	1.23E-04	9.21E-05	e	3.20E+01	c	1.36E+01	9.09E-01	6.82E-01	e
Benzotrichloride	98-07-7	0.0E+00	NA	5.22E-03	3.48E-04	2.61E-04	e	1.21E+05	e	2.69E-01	1.79E-02	1.35E-02	e
Benzyl chloride	100-44-7	0.0E+00	NA	4.50E-03	3.00E-04	2.25E-04	e	2.09E+01	c	3.11E+00	2.07E-01	1.55E-01	e
Bromobenzene	108-86-1	0.0E+00	NA	5.11E-03	3.41E-04	2.55E-04	e	0.0E+00	NA	6.97E-01	4.65E-02	3.48E-02	e
Chlorobenzene	108-90-7	0.0E+00	NA	4.94E-03	3.30E-04	2.47E-04	e	1.69E+00	c	1.35E+00	8.97E-02	6.73E-02	e

Table B1-1 Chemical-Specific Parameters for Organic COPCs

Chemical of Potential Concern	CAS Registry Number	Soil Loss Mechanisms [g]								Kp (cm/hr)	Source
		ks_r $(year)^{-1}$			Source	ks_v $(year)^{-1}$			Source		
		1 cm	15 cm	20 cm		1 cm	15 cm	20 cm			
Light Substituted Benzene Compounds (MW<200 g/mole)											
1,2,3-Trichlorobenzene	87-61-6	9.45E-02	6.30E-03	4.72E-03	e	1.30E+03	5.79E+00	3.26E+00	f	7.84E-02	aa
1,2,4-Trichlorobenzene	120-82-1	1.15E-01	7.65E-03	5.74E-03	e	1.45E+03	6.43E+00	3.62E+00	f	6.60E-02	ab
1,2,4-Trimethyl benzene	95-63-6	1.90E-01	1.27E-02	9.51E-03	e	1.38E+04	6.15E+01	3.46E+01	f	9.39E-02	aa
1,2-Dichlorobenzene	95-50-1	4.88E-01	3.25E-02	2.44E-02	e	7.02E+03	3.12E+01	1.76E+01	f	4.10E-02	ab
1,3,5-Trimethyl benzene	108-67-8	1.14E-01	7.61E-03	5.71E-03	e	9.30E+03	4.13E+01	2.33E+01	f	6.58E-02	aa
1,3-Dichlorobenzene	541-73-1	2.35E-01	1.57E-02	1.17E-02	e	1.76E+08	7.81E+05	4.39E+05	f	5.80E-02	ab
1,3-Dinitrobenzene	99-65-0	5.34E+00	3.56E-01	2.67E-01	e	5.92E+00	2.63E-02	1.48E-02	f	1.81E-03	aa
1,4-Dichlorobenzene	106-46-7	3.05E-01	2.03E-02	1.52E-02	e	5.78E+03	2.57E+01	1.44E+01	f	4.20E-02	ab
1,4-Dinitrobenzene	100-25-4	8.17E-01	5.44E-02	4.08E-02	e	7.28E-01	3.24E-03	1.82E-03	f	1.72E-03	aa
2,4,5-Trichlorophenol	95-95-4	1.68E-01	1.12E-02	8.39E-03	e	4.46E+00	1.98E-02	1.11E-02	f	4.86E-02	aa
2,4,6-Trichlorophenol	88-06-2	7.97E-01	5.31E-02	3.98E-02	e	1.44E+01	6.42E-02	3.61E-02	f	3.50E-02	ab
2,4-Dichlorophenol	120-83-2	1.24E+00	8.25E-02	6.19E-02	e	1.40E+00	6.24E-03	3.51E-03	f	2.10E-02	ab
2,4-Dimethylphenol	105-67-9	1.36E+00	9.07E-02	6.80E-02	e	4.61E+01	2.05E-01	1.15E-01	f	1.10E-02	ab
2,4-Dinitrophenol	51-28-5	1.25E+01	8.33E-01	6.25E-01	e	4.04E+02	1.79E+00	1.01E+00	f	1.50E-03	ab
2,4-Dinitrotoluene	121-14-2	2.90E+00	1.93E-01	1.45E-01	e	2.71E+00	1.21E-02	6.79E-03	f	3.10E-03	ab
2,6-Dinitrotoluene	606-20-2	3.36E+00	2.24E-01	1.68E-01	e	2.96E+00	1.32E-02	7.40E-03	f	2.10E-03	ab
2-Chlorophenol	95-57-8	4.78E-01	3.19E-02	2.39E-02	e	6.60E+01	2.93E-01	1.65E-01	f	8.00E-03	ab
2-Chlorotoluene	95-49-8	4.19E-01	2.80E-02	2.10E-02	e	3.31E+03	1.47E+01	8.28E+00	f	6.06E-02	aa
2-Nitrophenol	88-75-5	3.79E+00	2.53E-01	1.90E-01	e	5.64E+02	2.50E+00	1.41E+00	f	4.00E-03	ab
4,6-Dinitro-o-cresol	534-52-1	3.12E-01	2.08E-02	1.56E-02	e	2.09E+00	9.28E-03	5.22E-03	f	3.10E-03	ab
4-Chlorotoluene	106-43-4	3.34E-01	2.23E-02	1.67E-02	e	0.00E+00	0.00E+00	0.00E+00	NA	5.27E-02	aa
4-Nitrophenol	100-02-7	3.25E+00	2.17E-01	1.63E-01	e	2.21E-01	9.82E-04	5.53E-04	f	4.80E-03	ab
alpha-Methylstyrene	98-83-9	2.31E-01	1.54E-02	1.15E-02	e	2.52E+04	1.12E+02	6.30E+01	f	7.41E-02	aa
Aniline	62-53-3	8.14E+00	5.43E-01	4.07E-01	e	7.28E+03	3.23E+01	1.82E+01	f	1.90E-03	ab
Benzotrichloride	98-07-7	1.61E-01	1.07E-02	8.04E-03	e	1.85E+02	8.23E-01	4.63E-01	f	1.10E-02	ab
Benzyl chloride	100-44-7	1.85E+00	1.24E-01	9.27E-02	e	7.79E+03	3.46E+01	1.95E+01	f	1.00E-02	ab
Bromobenzene	108-86-1	4.16E-01	2.77E-02	2.08E-02	e	9.37E+03	4.16E+01	2.34E+01	f	2.11E-02	aa
Chlorobenzene	108-90-7	8.03E-01	5.36E-02	4.02E-02	e	3.81E+04	1.69E+02	9.53E+01	f	2.80E-02	ab

Table B1-1 Chemical-Specific Parameters for Organic COPCs

Chemical of Potential Concern	CAS Registry Number	Fraction		MW	pH	Henry's Constant			Diffusivity			
		F_v (unitless)	Source	(g/mol)		H-pub [x] (various units)	Source	H-used [x] (atm-m^3/mol)	D_a (cm^2/s)	Source	D_w (cm^2/s)	Source
Cumene	98-82-8	0 or 1	b	120.19	NA	1.29E-02	c	1.29E-02	6.50E-02	c	7.83E-06	c
m-Cresol	108-39-4	0 or 1	b	108.13	NA	8.93E-07	c	8.93E-07	6.93E-02	c	9.30E-06	c
n-Butyl benzene	104-51-8	0 or 1	b	134.22	NA	1.30E+03	i	1.29E-02	7.25E-02	e	8.39E-06	e
Nitrobenzene	98-95-3	0 or 1	b	123.11	NA	2.06E-05	c	2.06E-05	5.43E-02	c	9.43E-06	c
n-Propyl benzene	103-65-1	0 or 1	b	120.19	NA	1.11E+03	i	1.10E-02	7.80E-02	e	9.03E-06	e
o-Cresol	95-48-7	0 or 1	b	108.13	NA	1.62E-06	c	1.62E-06	6.88E-02	c	9.41E-06	c
o-Dinitrobenzene	528-29-0	0 or 1	b	168.11	NA	1.51E-05	m	3.69E-07	6.24E-02	e	7.22E-06	e
o-Nitroaniline	88-74-4	0 or 1	b	138.12	NA	1.17E-06	c	1.17E-06	4.29E-02	c	9.81E-06	c
o-Toluidine	95-53-4	0 or 1	b	107.15	NA	2.43E-06	c	2.43E-06	7.14E-02	c	9.12E-06	c
p-Chloroaniline	106-47-8	0 or 1	b	127.57	NA	1.17E-06	c	1.17E-06	4.80E-02	c	1.02E-05	c
p-Cresol	106-44-5	0 or 1	b	108.13	NA	7.99E-07	c	7.99E-07	6.93E-02	c	9.30E-06	c
Phenol	108-95-2	0 or 1	b	94.11	7	5.95E-07	c	5.95E-07	8.27E-02	c	1.03E-05	c
p-Nitrochlorobenzene	100-00-5	0 or 1	b	157.56	7	2.00E-04	k	4.88E-06	6.51E-02	e	7.54E-06	e
p-Toluidine	106-49-0	0 or 1	b	107.17	NA	6.56E-01	i	6.50E-06	6.98E-02	j	9.43E-06	j
sec-Butyl benzene	135-98-8	0 or 1	b	134.22	NA	1.40E+03	i	1.39E-02	7.25E-02	e	8.39E-06	e
tert-Butyl benzene	98-06-6	0 or 1	b	134.22	NA	1.20E+03	i	1.19E-02	7.25E-02	e	8.39E-06	e
Toluene-2,6-diamine	823-40-5	0 or 1	b	122.17	NA	3.89E-08	m	9.49E-10	5.59E-02	j	9.23E-06	j
Trimethyl benzene	25551-13-7	0 or 1	b	120.19	NA	2.96E-01	k	7.23E-03	7.80E-02	e	9.03E-06	e
Other Light Semivolatile Compounds (MW<200 g/mole)												
1,1'-Biphenyl	92-52-4	0 or 1	b	154.21	NA	2.80E+01	i	2.77E-04	6.61E-02	e	7.65E-06	e
1,1-Dimethylhydrazine	57-14-7	0 or 1	b	60.099	NA	2.84E-06	m	6.93E-08	1.06E-01	j	1.09E-05	j
1,2-Dimethylhydrazine	540-73-8	0 or 1	b	60.099	NA	2.84E-06	m	6.93E-08	1.24E-01	e	1.43E-05	e
1,2-Diphenylhydrazine	122-66-7	0 or 1	b	184.24	NA	1.28E-07	c	1.28E-07	2.95E-02	c	7.24E-06	c
1,3-Propane sultone	1120-71-4	0 or 1	b	122.1	NA	NA	NA	NA	7.72E-02	e	8.94E-06	e
2,4-Toluene diisocyanate	584-84-9	0 or 1	b	174.16	NA	NA	NA	NA	6.09E-02	e	7.05E-06	e
2-Chloroacetophenone	532-27-4	0 or 1	b	154.6	NA	1.41E-04	m	3.45E-06	3.83E-02	j	8.71E-06	j
2-Propenoic acid	79-10-7	0 or 1	b	72.06	NA	4.20E-02	i	4.16E-07	9.80E-02	j	1.06E-05	j
4,4'-Methylenedianiline	101-77-9	0 or 1	b	198.27	NA	6.46E-10	m	1.58E-11	3.56E-02	j	5.39E-06	j
Acetophenone	98-86-2	0 or 1	b	120.5	NA	1.03E-05	h	1.03E-05	6.00E-02	c	8.73E-06	c

Table B1-1 Chemical-Specific Parameters for Organic COPCs

Chemical of Potential Concern	CAS Registry Number	Octanol / Water Partitioning Coefficients						Partitioning Coefficients (Kd)			
		K_{oc}-pub [y] (various units)	Source	K_{oc}-used [z] (mL/g)	K_{ow}-pub [y] (various units)	Source	K_{ow}-used [z] (unitless)	Kd_{bs} (L/kg)	Source	Kd_s (mL/g)	Source
Cumene	98-82-8	9.31E+02	h	9.31E+02	4.10E+03	c	4.10E+03	3.72E+01	h	9.31E+00	h
m-Cresol	108-39-4	4.78E+01	c	4.78E+01	9.10E+01	c	9.10E+01	1.91E+00	c	4.78E-01	c
n-Butyl benzene	104-51-8	3.40E+00	i	2.51E+03	4.28E+00	i	1.91E+04	1.00E+02	e	2.51E+01	e
Nitrobenzene	98-95-3	1.19E+02	c	1.19E+02	6.80E+01	c	6.80E+01	4.76E+04	c	1.19E+00	c
n-Propyl benzene	103-65-1	2.86E+00	i	7.24E+02	3.69E+00	i	4.90E+03	2.90E+01	e	7.24E+00	e
o-Cresol	95-48-7	5.34E+01	c	5.34E+01	1.05E+02	c	1.05E+02	2.14E+00	c	5.34E-01	c
o-Dinitrobenzene	528-29-0	2.25E+02	m	2.25E+02	1.69E+00	m	4.90E+01	8.98E+00	e	2.25E+00	e
o-Nitroaniline	88-74-4	3.93E+01	h	3.93E+01	7.08E+01	c	7.08E+01	1.57E+00	h	3.93E-01	h
o-Toluidine	95-53-4	1.57E+01	c	1.57E+01	2.19E+01	c	2.19E+01	6.28E-01	c	1.57E-01	c
p-Chloroaniline	106-47-8	4.10E+01	c	4.10E+01	7.40E+01	c	7.40E+01	1.63E+00	c	4.06E-01	c
p-Cresol	106-44-5	4.61E+01	c	4.61E+01	8.70E+01	c	8.70E+01	1.84E+00	c	4.61E-01	c
Phenol	108-95-2	2.20E+01	c	2.20E+01	3.00E+01	c	3.00E+01	8.79E-01	c	2.20E-01	c
p-Nitrochlorobenzene	100-00-5	NA	e	1.04E+02	2.39E+00	l	2.45E+02	4.14E+00	e	1.04E+00	e
p-Toluidine	106-49-0	NA	e	1.75E+01	1.40E+00	i	2.51E+01	7.00E-01	e	1.75E-01	e
sec-Butyl benzene	135-98-8	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
tert-Butyl benzene	98-06-6	NA	e	2.27E+03	4.11E+00	i	1.29E+04	9.10E+01	e	2.27E+01	e
Toluene-2,6-diamine	823-40-5	1.22E+02	m	1.22E+02	1.60E-01	m	1.45E+00	4.90E+00	e	1.22E+00	e
Trimethyl benzene	25551-13-7	7.03E+02	m	7.03E+02	3.42E+00	m	2.63E+03	2.81E+01	e	7.03E+00	e
Other Light Semivolatile Compounds (MW<200 g/mole)											
1,1'-Biphenyl	92-52-4	3.40E+00	i	2.51E+03	3.90E+00	i	7.94E+03	1.00E+02	e	2.51E+01	e
1,1-Dimethylhydrazine	57-14-7	1.98E+01	m	1.98E+01	-1.19E+00	m	6.46E-02	7.91E-01	e	1.98E-01	e
1,2-Dimethylhydrazine	540-73-8	NA	e	1.21E-01	-1.37E+00	l	4.29E-02	4.85E-03	e	1.21E-03	e
1,2-Diphenylhydrazine	122-66-7	2.78E+02	c	2.78E+02	8.71E+02	c	8.71E+02	1.11E+01	c	2.78E+00	c
1,3-Propane sultone	1120-71-4	NA	e	5.53E-01	-5.23E-01	l	3.00E-01	2.21E-02	e	5.53E-03	e
2,4-Toluene diisocyanate	584-84-9	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Chloroacetophenone	532-27-4	8.93E+01	m	8.93E+01	1.93E+00	m	8.51E+01	3.57E+00	e	8.93E-01	e
2-Propenoic acid	79-10-7	NA	e	3.06E+00	4.30E-01	i	2.69E+00	1.23E-01	e	3.06E-02	e
4,4'-Methylenedianiline	101-77-9	4.95E+03	m	4.95E+03	1.59E+00	m	3.89E+01	1.98E+02	e	4.95E+01	e
Acetophenone	98-86-2	2.69E+01	c	2.69E+01	4.37E+01	c	4.37E+01	1.08E+00	c	2.69E-01	c

Table B1-1 Chemical-Specific Parameters for Organic COPCs

Chemical of Potential Concern	CAS Registry Number	Kd		Plant Uptake Factors				
		Kd_{sw} (L/kg)	Source	Br_{ag} (µg/g DW plant)/ (µg/g soil)	Source	Br_{forage} (µg/g DW plant)/ (µg/g soil)	Source	Br_{grain} (µg/g DW plant)/ (µg/g soil) [a]
Cumene	98-82-8	6.98E+01	h	3.16E-01	c	3.16E-01	c	3.16E-01
m-Cresol	108-39-4	3.58E+00	c	2.86E+00	c	2.86E+00	c	2.86E+00
n-Butyl benzene	104-51-8	1.88E+02	e	1.30E-01	e	1.30E-01	e	1.30E-01
Nitrobenzene	98-95-3	8.93E+00	c	3.38E+00	c	3.38E+00	c	3.38E+00
n-Propyl benzene	103-65-1	5.43E+01	e	2.85E-01	e	2.85E-01	e	2.85E-01
o-Cresol	95-48-7	4.00E+00	c	2.63E+00	c	2.63E+00	c	2.63E+00
o-Dinitrobenzene	528-29-0	1.68E+01	e	4.08E+00	e	4.08E+00	e	4.08E+00
o-Nitroaniline	88-74-4	2.95E+00	h	3.30E+00	c	3.30E+00	c	3.30E+00
o-Toluidine	95-53-4	1.18E+00	c	6.51E+00	c	6.51E+00	c	6.51E+00
p-Chloroaniline	106-47-8	3.05E+00	c	3.22E+00	c	3.22E+00	c	3.22E+00
p-Cresol	106-44-5	3.46E+00	c	2.93E+00	c	2.93E+00	c	2.93E+00
Phenol	108-95-2	1.65E+00	c	5.42E+00	c	5.42E+00	c	5.42E+00
p-Nitrochlorobenzene	100-00-5	7.77E+00	e	1.61E+00	e	1.61E+00	e	1.61E+00
p-Toluidine	106-49-0	1.31E+00	e	6.01E+00	e	6.01E+00	e	6.01E+00
sec-Butyl benzene	135-98-8	NA	NA	NA	NA	NA	NA	NA
tert-Butyl benzene	98-06-6	1.71E+02	e	1.63E-01	e	1.63E-01	e	1.63E-01
Toluene-2,6-diamine	823-40-5	9.18E+00	e	3.13E+01	e	3.13E+01	e	3.13E+01
Trimethyl benzene	25551-13-7	5.27E+01	e	4.09E-01	e	4.09E-01	e	4.09E-01
Other Light Semivolatile Compounds (MW<200 g/mole)								
1,1'-Biphenyl	92-52-4	1.88E+02	e	2.16E-01	e	2.16E-01	e	2.16E-01
1,1-Dimethylhydrazine	57-14-7	1.48E+00	e	1.89E+02	e	1.89E+02	e	1.89E+02
1,2-Dimethylhydrazine	540-73-8	9.10E-03	e	2.39E+02	e	2.39E+02	e	2.39E+02
1,2-Diphenylhydrazine	122-66-7	2.09E+01	c	7.74E-01	c	7.74E-01	c	7.74E-01
1,3-Propane sultone	1120-71-4	4.15E-02	e	7.77E+01	e	7.77E+01	e	7.77E+01
2,4-Toluene diisocyanate	584-84-9	NA	NA	NA	NA	NA	NA	NA
2-Chloroacetophenone	532-27-4	6.69E+00	e	2.97E+00	e	2.97E+00	e	2.97E+00
2-Propenoic acid	79-10-7	2.30E-01	e	2.19E+01	e	2.19E+01	e	2.19E+01
4,4'-Methylenedianiline	101-77-9	3.71E+02	e	4.67E+00	e	4.67E+00	e	4.67E+00
Acetophenone	98-86-2	2.02E+00	c	4.37E+00	c	4.37E+00	c	4.37E+00

Table B1-1 Chemical-Specific Parameters for Organic COPCs

Chemical of Potential Concern	CAS Registry Number	Plant Uptake Factors							
		$Br_{rootveg}$ (µg/g DW plant)/ (µg/g soil)	Source	Bv_{ag} (µg/g DW plant)/ (µg/g air)	Source	Bv_{forage} (µg/g DW plant)/ (µg/g air)	Source	RCF (µg/g DW plant)/ (µg/mL soil water)	Source
Cumene	98-82-8	1.58E+01	h	3.06E-02	c	3.06E-02	c	1.47E+02	c
m-Cresol	108-39-4	2.89E+01	c	7.64E+00	c	7.64E+00	c	1.38E+01	c
n-Butyl benzene	104-51-8	1.85E+01	e	1.57E-01	e	1.57E-01	e	4.65E+02	e
Nitrobenzene	98-95-3	1.03E+01	c	2.43E-01	c	2.43E-01	c	1.23E+01	c
n-Propyl benzene	103-65-1	2.31E+01	e	4.34E-02	e	4.34E-02	e	1.68E+02	e
o-Cresol	95-48-7	2.75E+01	c	4.89E+00	c	4.89E+00	c	1.47E+01	c
o-Dinitrobenzene	528-29-0	4.88E+00	e	9.58E+00	e	9.58E+00	e	1.10E+01	e
o-Nitroaniline	88-74-4	3.18E+01	h	4.47E+00	c	4.47E+00	c	1.25E+01	c
o-Toluidine	95-53-4	5.61E+01	c	6.16E-01	c	6.16E-01	c	8.81E+00	c
p-Chloroaniline	106-47-8	3.12E+01	c	4.66E+00	c	4.66E+00	c	1.27E+01	c
p-Cresol	106-44-5	2.94E+01	c	8.13E+00	c	8.13E+00	c	1.35E+01	c
Phenol	108-95-2	4.32E+01	c	3.52E+00	c	3.52E+00	c	9.50E+00	c
p-Nitrochlorobenzene	100-00-5	2.16E+01	e	4.03E+00	e	4.03E+00	e	2.24E+01	e
p-Toluidine	106-49-0	5.19E+01	e	2.67E-01	e	2.67E-01	e	9.09E+00	e
sec-Butyl benzene	135-98-8	NA	NA	NA	NA	NA	NA	NA	NA
tert-Butyl benzene	98-06-6	1.52E+01	e	1.12E-01	e	1.12E-01	e	3.46E+02	e
Toluene-2,6-diamine	823-40-5	5.41E+00	e	8.74E+01	e	8.74E+01	e	6.62E+00	e
Trimethyl benzene	25551-13-7	1.51E+01	e	3.40E-02	e	3.40E-02	e	1.06E+02	e
Other Light Semivolatile Compounds (MW<200 g/mole)									
1,1'-Biphenyl	92-52-4	9.56E+00	e	2.88E+00	e	2.88E+00	e	2.40E+02	e
1,1-Dimethylhydrazine	57-14-7	3.20E+01	e	4.37E-02	e	4.37E-02	e	6.34E+00	e
1,2-Dimethylhydrazine	540-73-8	5.22E+03	e	2.82E-02	e	2.82E-02	e	6.33E+00	e
1,2-Diphenylhydrazine	122-66-7	1.76E+01	c	5.89E+02	c	5.89E+02	c	4.90E+01	c
1,3-Propane sultone	1120-71-4	1.16E+03	e	NA	NA	NA	NA	6.40E+00	e
2,4-Toluene diisocyanate	584-84-9	NA	NA	NA	NA	NA	NA	NA	NA
2-Chloroacetophenone	532-27-4	1.50E+01	e	1.85E+00	e	1.85E+00	e	1.34E+01	e
2-Propenoic acid	79-10-7	2.22E+02	e	3.87E-01	e	3.87E-01	e	6.81E+00	e
4,4'-Methylenedianiline	101-77-9	2.06E-01	e	1.76E+05	e	1.76E+05	e	1.02E+01	e
Acetophenone	98-86-2	3.92E+01	c	3.04E-01	c	3.04E-01	c	1.06E+01	c

Table B1-1 Chemical-Specific Parameters for Organic COPCs

Chemical of Potential Concern	CAS Registry Number	Bioconcentration/Bioaccumulation Factors									
		Ba_{beef} (day/kg FW)	Source	$Ba_{chicken}$ (day/kg FW)	Source	Ba_{egg} (day/kg FW)	Source	Ba_{milk} (day/kg FW)	Source	Ba_{pork} (day/kg FW)	Source
Cumene	98-82-8	1.03E-04	c	8.13E-05	c	3.26E-02	c	3.26E-05	c	1.25E-04	c
m-Cresol	108-39-4	2.29E-06	c	1.86E-06	c	7.23E-04	c	7.23E-07	c	2.77E-06	c
n-Butyl benzene	104-51-8	4.79E-04	e	3.78E-04	e	1.51E-01	e	1.51E-04	e	5.79E-04	e
Nitrobenzene	98-95-3	1.71E-06	c	1.35E-06	c	5.40E-04	c	5.40E-07	c	2.07E-06	c
n-Propyl benzene	103-65-1	1.23E-04	e	9.71E-05	e	3.89E-02	e	3.89E-05	e	1.49E-04	e
o-Cresol	95-48-7	2.64E-06	c	2.08E-06	c	8.34E-04	c	8.34E-07	c	3.19E-06	c
o-Dinitrobenzene	528-29-0	1.23E-06	e	9.71E-07	e	3.89E-04	e	3.89E-07	e	1.49E-06	e
o-Nitroaniline	88-74-4	1.78E-06	c	1.40E-06	c	5.62E-04	c	5.62E-07	c	2.15E-06	c
o-Toluidine	95-53-4	5.50E-07	c	4.34E-07	c	1.74E-04	c	1.74E-07	c	6.65E-07	c
p-Chloroaniline	106-47-8	1.86E-06	c	1.47E-06	c	5.88E-04	c	5.88E-07	c	2.25E-06	c
p-Cresol	106-44-5	2.19E-06	c	1.73E-06	c	6.91E-04	c	6.91E-07	c	2.65E-06	c
Phenol	108-95-2	7.54E-07	c	5.95E-07	c	2.38E-04	c	2.38E-07	c	9.12E-07	c
p-Nitrochlorobenzene	100-00-5	6.17E-06	e	4.87E-06	e	1.95E-03	e	1.95E-06	e	7.46E-06	e
p-Toluidine	106-49-0	6.31E-07	e	4.98E-07	e	2.00E-04	e	2.00E-07	e	7.64E-07	e
sec-Butyl benzene	135-98-8	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
tert-Butyl benzene	98-06-6	3.24E-04	e	2.55E-04	e	1.02E-01	e	1.02E-04	e	3.92E-04	e
Toluene-2,6-diamine	823-40-5	3.63E-08	e	2.87E-08	e	1.15E-05	e	1.15E-08	e	4.40E-08	e
Trimethyl benzene	25551-13-7	6.61E-05	e	5.22E-05	e	2.09E-02	e	2.09E-05	e	8.00E-05	e
Other Light Semivolatile Compounds (MW<200 g/mole)											
1,1'-Biphenyl	92-52-4	2.00E-04	e	1.58E-04	e	6.31E-02	e	6.31E-05	e	2.42E-04	e
1,1-Dimethylhydrazine	57-14-7	1.62E-09	e	1.28E-09	e	5.13E-07	e	5.13E-10	e	1.96E-09	e
1,2-Dimethylhydrazine	540-73-8	1.08E-09	e	8.50E-10	e	3.40E-07	e	3.40E-10	e	1.30E-09	e
1,2-Diphenylhydrazine	122-66-7	2.19E-05	c	1.73E-05	c	6.92E-03	c	6.92E-06	c	2.65E-05	c
1,3-Propane sultone	1120-71-4	7.53E-09	e	5.95E-09	e	2.38E-06	e	2.38E-09	e	9.12E-09	e
2,4-Toluene diisocyanate	584-84-9	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Chloroacetophenone	532-27-4	2.14E-06	e	1.69E-06	e	6.76E-04	e	6.76E-07	e	2.59E-06	e
2-Propenoic acid	79-10-7	6.76E-08	e	5.34E-08	e	2.14E-05	e	2.14E-08	e	8.18E-08	e
4,4'-Methylenedianiline	101-77-9	9.77E-07	e	7.72E-07	e	3.09E-04	e	3.09E-07	e	1.18E-06	e
Acetophenone	98-86-2	1.10E-06	c	8.66E-07	c	3.47E-04	c	3.47E-07	c	1.33E-06	c

Table B1-1 Chemical-Specific Parameters for Organic COPCs

Chemical of Potential Concern	CAS Registry Number	Bioconcentration/Bioaccumulation Factors						Half-life	
		BAF_{fish} (L/kg FW)	Source	BCF_{fish} (L/kg FW)	Source	$BSAF_{fish}$ (unitless)	Source	$t_{1/2}$ (days)	Source
Cumene	98-82-8	NA	NA	3.28E+02	c	NA	NA	NA	NA
m-Cresol	108-39-4	NA	NA	1.81E+01	c	NA	NA	NA	NA
n-Butyl benzene	104-51-8	NA	NA	NA	NA	NA	NA	NA	NA
Nitrobenzene	98-95-3	NA	NA	5.92E+00	c	NA	NA	NA	NA
n-Propyl benzene	103-65-1	NA	NA	3.75E+02	e	NA	NA	NA	NA
o-Cresol	95-48-7	NA	NA	2.02E+01	c	NA	NA	NA	NA
o-Dinitrobenzene	528-29-0	NA	NA	1.13E+01	e	NA	NA	NA	NA
o-Nitroaniline	88-74-4	NA	NA	1.50E+01	c	NA	NA	NA	NA
o-Toluidine	95-53-4	NA	NA	6.14E+00	c	NA	NA	NA	NA
p-Chloroaniline	106-47-8	NA	NA	1.55E+01	c	NA	NA	NA	NA
p-Cresol	106-44-5	NA	NA	1.75E+01	c	NA	NA	NA	NA
Phenol	108-95-2	NA	NA	7.81E+00	c	NA	NA	NA	NA
p-Nitrochlorobenzene	100-00-5	NA	NA	3.86E+01	e	NA	NA	NA	NA
p-Toluidine	106-49-0	NA	NA	6.82E+00	e	NA	NA	NA	NA
sec-Butyl benzene	135-98-8	NA	NA	NA	NA	NA	NA	NA	NA
tert-Butyl benzene	98-06-6	NA	NA	NA	NA	NA	NA	NA	NA
Toluene-2,6-diamine	823-40-5	NA	NA	7.79E-01	e	NA	NA	NA	NA
Trimethyl benzene	25551-13-7	NA	NA	2.34E+02	e	NA	NA	NA	NA
Other Light Semivolatile Compounds (MW<200 g/mole)									
1,1'-Biphenyl	92-52-4	NA	NA	5.42E+02	e	NA	NA	7.00E+00	d
1,1-Dimethylhydrazine	57-14-7	NA	NA	7.34E-02	e	NA	NA	2.20E+01	d
1,2-Dimethylhydrazine	540-73-8	NA	NA	5.37E-02	e	NA	NA	2.80E+01	d
1,2-Diphenylhydrazine	122-66-7	NA	NA	1.01E+02	c	NA	NA	NA	NA
1,3-Propane sultone	1120-71-4	NA	NA	2.36E-01	e	NA	NA	2.80E+01	d
2,4-Toluene diisocyanate	584-84-9	NA	NA	NA	NA	NA	NA	NA	NA
2-Chloroacetophenone	532-27-4	NA	NA	1.73E+01	e	NA	NA	2.80E+01	d
2-Propenoic acid	79-10-7	NA	NA	1.25E+00	e	NA	NA	7.00E+00	d
4,4'-Methylenedianiline	101-77-9	NA	NA	9.51E+00	e	NA	NA	7.00E+00	d
Acetophenone	98-86-2	NA	NA	1.04E+01	c	NA	NA	NA	NA

Table B1-1 Chemical-Specific Parameters for Organic COPCs

Chemical of Potential Concern	CAS Registry Number	Soil Loss Mechanisms [g]											
		k_{decay} (year)$^{-1}$	Source	ks_e (year)$^{-1}$			Source	ks_g (year)$^{-1}$	Source	ks_l (year)$^{-1}$			Source
				1 cm	15 cm	20 cm				1 cm	15 cm	20 cm	
Cumene	98-82-8	0.0E+00	NA	5.20E-03	3.47E-04	2.60E-04	e	3.16E+01	c	3.40E-01	2.27E-02	1.70E-02	e
m-Cresol	108-39-4	0.0E+00	NA	4.00E-03	2.67E-04	2.00E-04	e	8.72E+00	c	5.10E+00	3.40E-01	2.55E-01	e
n-Butyl benzene	104-51-8	0.0E+00	NA	5.25E-03	3.50E-04	2.63E-04	e	0.0E+00	NA	1.27E-01	8.49E-03	6.37E-03	e
Nitrobenzene	98-95-3	0.0E+00	NA	4.68E-03	3.12E-04	2.34E-04	e	1.28E+00	c	2.40E+00	1.60E-01	1.20E-01	e
n-Propyl benzene	103-65-1	0.0E+00	NA	5.17E-03	3.45E-04	2.59E-04	e	0.0E+00	NA	4.35E-01	2.90E-02	2.18E-02	e
o-Cresol	95-48-7	0.0E+00	NA	4.10E-03	2.73E-04	2.05E-04	e	3.61E+01	c	4.68E+00	3.12E-01	2.34E-01	e
o-Dinitrobenzene	528-29-0	0.0E+00	NA	4.95E-03	3.30E-04	2.47E-04	e	0.0E+00	NA	1.34E+00	8.95E-02	6.71E-02	e
o-Nitroaniline	88-74-4	0.0E+00	NA	3.80E-03	2.53E-04	1.90E-04	e	0.0E+00	NA	5.89E+00	3.93E-01	2.94E-01	e
o-Toluidine	95-53-4	0.0E+00	NA	2.67E-03	1.78E-04	1.33E-04	e	3.61E+01	c	1.04E+01	6.91E-01	5.18E-01	e
p-Chloroaniline	106-47-8	0.0E+00	NA	3.83E-03	2.55E-04	1.92E-04	e	0.0E+00	NA	5.75E+00	3.83E-01	2.88E-01	e
p-Cresol	106-44-5	0.0E+00	NA	3.96E-03	2.64E-04	1.98E-04	e	3.79E+02	c	5.24E+00	3.49E-01	2.62E-01	e
Phenol	108-95-2	0.0E+00	NA	3.11E-03	2.07E-04	1.55E-04	e	2.53E+01	c	8.61E+00	5.74E-01	4.31E-01	e
p-Nitrochlorobenzene	100-00-5	0.0E+00	NA	4.60E-03	3.07E-04	2.30E-04	e	0.0E+00	NA	2.71E+00	1.80E-01	1.35E-01	e
p-Toluidine	106-49-0	0.0E+00	NA	2.81E-03	1.87E-04	1.41E-04	e	0.0E+00	NA	9.79E+00	6.53E-01	4.90E-01	e
sec-Butyl benzene	135-98-8	0.0E+00	NA	0.0E+00	0.0E+00	0.0E+00	NA	0.0E+00	NA	0.0E+00	0.0E+00	0.0E+00	NA
tert-Butyl benzene	98-06-6	0.0E+00	NA	5.25E-03	3.50E-04	2.62E-04	e	0.0E+00	NA	1.41E-01	9.38E-03	7.03E-03	e
Toluene-2,6-diamine	823-40-5	0.0E+00	NA	4.69E-03	3.13E-04	2.35E-04	e	0.0E+00	NA	2.34E+00	1.56E-01	1.17E-01	e
Trimethyl benzene	25551-13-7	0.0E+00	NA	5.17E-03	3.45E-04	2.59E-04	e	0.0E+00	NA	4.48E-01	2.99E-02	2.24E-02	e
Other Light Semivolatile Compounds (MW<200 g/mole)													
1,1'-Biphenyl	92-52-4	0.0E+00	NA	5.25E-03	3.50E-04	2.63E-04	e	3.61E+01	e	1.27E-01	8.49E-03	6.37E-03	e
1,1-Dimethylhydrazine	57-14-7	0.0E+00	NA	2.97E-03	1.98E-04	1.49E-04	e	1.15E+01	e	9.16E+00	6.11E-01	4.58E-01	e
1,2-Dimethylhydrazine	540-73-8	0.0E+00	NA	4.13E-05	2.76E-06	2.07E-06	e	9.03E+00	e	2.08E+01	1.38E+00	1.04E+00	e
1,2-Diphenylhydrazine	122-66-7	0.0E+00	NA	5.01E-03	3.34E-04	2.50E-04	e	1.41E+00	c	1.10E+00	7.32E-02	5.49E-02	e
1,3-Propane sultone	1120-71-4	0.0E+00	NA	1.83E-04	1.22E-05	9.17E-06	e	9.03E+00	e	2.02E+01	1.35E+00	1.01E+00	e
2,4-Toluene diisocyanate	584-84-9	0.0E+00	NA	0.0E+00	0.0E+00	0.0E+00	NA	0.0E+00	NA	0.0E+00	0.0E+00	0.0E+00	NA
2-Chloroacetophenone	532-27-4	0.0E+00	NA	4.51E-03	3.01E-04	2.25E-04	e	9.03E+00	e	3.08E+00	2.05E-01	1.54E-01	e
2-Propenoic acid	79-10-7	0.0E+00	NA	8.78E-04	5.85E-05	4.39E-05	e	3.61E+01	e	1.75E+01	1.16E+00	8.73E-01	e
4,4'-Methylenedianiline	101-77-9	0.0E+00	NA	5.27E-03	3.51E-04	2.63E-04	e	3.61E+01	e	6.49E-02	4.32E-03	3.24E-03	e
Acetophenone	98-86-2	0.0E+00	NA	3.36E-03	2.24E-04	1.68E-04	e	0.0E+00	NA	7.62E+00	5.08E-01	3.81E-01	e

Table B1-1 Chemical-Specific Parameters for Organic COPCs

Chemical of Potential Concern	CAS Registry Number	Soil Loss Mechanisms [g]								Kp (cm/hr)	Source
		ks_r $(year)^{-1}$			Source	ks_v $(year)^{-1}$			Source		
		1 cm	15 cm	20 cm		1 cm	15 cm	20 cm			
Cumene	98-82-8	2.03E-01	1.35E-02	1.02E-02	e	2.76E+04	1.23E+02	6.91E+01	f	8.86E-02	aa
m-Cresol	108-39-4	3.04E+00	2.03E-01	1.52E-01	e	3.97E+01	1.77E-01	9.93E-02	f	7.80E-03	ab
n-Butyl benzene	104-51-8	7.61E-02	5.07E-03	3.80E-03	e	1.14E+04	5.07E+01	2.85E+01	f	2.07E-01	aa
Nitrobenzene	98-95-3	1.43E+00	9.54E-02	7.16E-02	e	2.88E+02	1.28E+00	7.21E-01	f	5.47E-03	aa
n-Propyl benzene	103-65-1	2.60E-01	1.73E-02	1.30E-02	e	3.63E+04	1.61E+02	9.07E+01	f	9.98E-02	aa
o-Cresol	95-48-7	2.80E+00	1.86E-01	1.40E-01	e	6.41E+01	2.85E-01	1.60E-01	f	7.70E-03	ab
o-Dinitrobenzene	528-29-0	8.01E-01	5.34E-02	4.01E-02	e	3.14E+00	1.40E-02	7.86E-03	f	2.46E-03	aa
o-Nitroaniline	88-74-4	3.52E+00	2.34E-01	1.76E-01	e	3.92E+01	1.74E-01	9.80E-02	f	4.64E-03	aa
o-Toluidine	95-53-4	6.19E+00	4.12E-01	3.09E-01	e	3.39E+02	1.51E+00	8.48E-01	f	3.00E-03	ab
p-Chloroaniline	106-47-8	3.44E+00	2.29E-01	1.72E-01	e	4.25E+01	1.89E-01	1.06E-01	f	5.47E-03	aa
p-Cresol	106-44-5	3.13E+00	2.09E-01	1.56E-01	e	3.69E+01	1.64E-01	9.22E-02	f	7.70E-03	ab
Phenol	108-95-2	5.14E+00	3.43E-01	2.57E-01	e	6.86E+01	3.05E-01	1.72E-01	f	4.30E-03	ab
p-Nitrochlorobenzene	100-00-5	1.62E+00	1.08E-01	8.08E-02	e	9.42E+01	4.19E-01	2.36E-01	f	8.30E-03	aa
p-Toluidine	106-49-0	5.85E+00	3.90E-01	2.92E-01	e	7.95E+02	3.53E+00	1.99E+00	f	3.45E-03	aa
sec-Butyl benzene	135-98-8	0.0E+00	0.0E+00	0.0E+00	NA	0.0E+00	0.0E+00	0.0E+00	NA	NA	NA
tert-Butyl benzene	98-06-6	8.40E-02	5.60E-03	4.20E-03	e	1.16E+04	5.17E+01	2.91E+01	f	1.59E-01	aa
Toluene-2,6-diamine	823-40-5	1.40E+00	9.30E-02	6.98E-02	e	1.33E-02	5.91E-05	3.33E-05	f	4.20E-04	aa
Trimethyl benzene	25551-13-7	2.68E-01	1.78E-02	1.34E-02	e	2.46E+04	1.09E+02	6.15E+01	f	6.58E-02	aa
Other Light Semivolatile Compounds (MW<200 g/mole)											
1,1'-Biphenyl	92-52-4	7.61E-02	5.07E-03	3.80E-03	e	2.24E+02	9.95E-01	5.59E-01	f	8.90E-02	aa
1,1-Dimethylhydrazine	57-14-7	5.47E+00	3.65E-01	2.73E-01	e	1.14E+01	5.07E-02	2.85E-02	f	7.30E-05	ab
1,2-Dimethylhydrazine	540-73-8	1.24E+01	8.27E-01	6.20E-01	e	2.17E+03	9.65E+00	5.43E+00	f	8.85E-05	aa
1,2-Diphenylhydrazine	122-66-7	6.55E-01	4.37E-02	3.28E-02	e	4.17E-01	1.85E-03	1.04E-03	f	1.30E-02	ab
1,3-Propane sultone	1120-71-4	1.21E+01	8.04E-01	6.03E-01	e	0.0E+00	0.0E+00	0.0E+00	NA	1.46E-04	aa
2,4-Toluene diisocyanate	584-84-9	0.0E+00	0.0E+00	0.0E+00	NA	0.0E+00	0.0E+00	0.0E+00	NA	NA	NA
2-Chloroacetophenone	532-27-4	1.84E+00	1.23E-01	9.19E-02	e	4.54E+01	2.02E-01	1.14E-01	f	4.24E-03	aa
2-Propenoic acid	79-10-7	1.04E+01	6.95E-01	5.21E-01	e	4.08E+02	1.81E+00	1.02E+00	f	1.21E-03	aa
4,4'-Methylenedianiline	101-77-9	3.87E-02	2.58E-03	1.94E-03	e	3.48E-06	1.55E-08	8.69E-09	f	1.40E-03	ab
Acetophenone	98-86-2	4.55E+00	3.03E-01	2.27E-01	e	7.05E+02	3.13E+00	1.76E+00	f	4.21E-03	aa

Table B1-1 Chemical-Specific Parameters for Organic COPCs

Chemical of Potential Concern	CAS Registry Number	Fraction		MW	pH	Henry's Constant			Diffusivity			
		F_v (unitless)	Source	(g/mol)		H-pub [x] (various units)	Source	H-used [x] (atm-m^3/mol)	D_a (cm^2/s)	Source	D_w (cm^2/s)	Source
Benzoic acid	65-85-0	0 or 1	b	122.13	7	3.34E-07	h	3.34E-07	5.36E-02	j	7.97E-06	j
Bis(2-chloroethoxy)methane	111-91-1	0 or 1	b	173.04	NA	6.91E-06	m	1.69E-07	6.12E-02	e	7.08E-06	e
Bis(2-chloroethyl) ether	111-44-4	0 or 1	b	143.02	NA	2.13E-05	c	2.13E-05	4.40E-02	c	8.70E-06	c
Chlorocyclopentadiene	41851-50-7	0 or 1	b	100.55	NA	9.16E-01	m	2.23E-02	8.79E-02	e	1.02E-05	e
Cyclohexanol	108-93-0	0 or 1	b	100.16	NA	5.81E-01	i	5.75E-06	8.81E-02	e	1.02E-05	e
Dichloroisopropyl ether	108-60-1	0 or 1	b	171.07	NA	1.14E+01	i	1.13E-04	3.50E-02	j	7.36E-06	j
Dichloromethyl ether	542-88-1	0 or 1	b	114.96	NA	8.42E-03	m	2.05E-04	8.04E-02	e	9.31E-06	e
Dichloropentadiene	61626-71-9	0 or 1	b	137.01	NA	NA	NA	NA	7.15E-02	e	8.28E-06	e
Dimethyl sulfate	77-78-1	0 or 1	b	126.14	NA	1.64E-04	m	3.99E-06	5.14E-02	j	9.57E-06	j
Dimethylaniline	121-69-7	0 or 1	b	121.18	NA	2.32E-03	m	5.66E-05	1.53E-01	j	1.41E-05	j
di-n-Propylnitrosamine	621-64-7	0 or 1	b	130.19	NA	4.13E-05	h	4.13E-05	5.67E-02	c	7.75E-06	c
Diphenyl ether	101-84-8	0 or 1	b	170.21	NA	2.51E+01	i	2.49E-04	6.19E-02	e	7.16E-06	e
Epichlorohydrin	106-89-8	0 or 1	b	92.53	NA	3.08E-05	c	3.08E-05	8.13E-02	c	1.10E-05	c
Ethyl carbamate (Urethane)	51-79-6	0 or 1	b	89.094	NA	NA	NA	NA	9.52E-02	e	1.10E-05	e
Ethyl methanesulfonate	62-50-0	0 or 1	b	124.15	NA	8.87E-08	c	8.87E-08	7.63E-02	c	8.84E-06	c
Ethylene dibromide	106-93-4	0 or 1	b	187.88	NA	4.47E-04	c	4.47E-04	2.17E-02	c	1.19E-05	c
Ethylene glycol	107-21-1	0 or 1	b	62.08	NA	2.45E-06	m	5.98E-08	1.08E-01	j	1.22E-05	j
Ethylene glycol monobutyl ether	111-76-2	0 or 1	b	118	NA	6.54E-05	m	1.60E-06	6.51E-02	j	8.15E-06	j
Ethylene glycol monoethyl ether acetate	111-15-9	0 or 1	b	148.17	NA	1.31E-04	m	3.19E-06	4.58E-02	j	7.56E-06	j
Ethylene thiourea	96-45-7	0 or 1	b	102.17	NA	1.37E-05	m	3.35E-07	7.15E-02	j	1.02E-05	j
Furfural	98-01-1	0 or 1	b	96.08	NA	3.75E-01	i	3.71E-06	8.72E-02	j	1.04E-05	j
Maleic hydrazide	123-33-1	0 or 1	b	112.09	NA	1.08E-09	m	2.64E-11	8.17E-02	e	9.46E-06	e
Malononitrile	109-77-3	0 or 1	b	66.062	NA	5.19E-07	m	1.27E-08	1.16E-01	e	1.35E-05	e
Methyl styrene (mixed isomers)	25013-15-4	0 or 1	b	118.18	NA	3.21E-01	m	7.84E-03	5.46E-02	j	8.08E-06	j
Methylhydrazine	60-34-4	0 or 1	b	46.072	NA	1.24E-04	k	3.03E-06	1.48E-01	e	1.71E-05	e
N,N-Diphenylamine	122-39-4	0 or 1	b	169.23	NA	3.50E-02	i	3.47E-07	6.21E-02	e	7.19E-06	e
Nitric acid, propyl ester	627-13-4	0 or 1	b	105.09	NA	5.20E-02	k	1.27E-03	8.53E-02	e	9.88E-06	e
N-Nitrosodi-n-butylamine	924-16-3	0 or 1	b	158.2	NA	5.47E-05	c	5.47E-05	6.50E-02	c	7.52E-06	c
N-Nitrosomorpholine	59-89-2	0 or 1	b	116.12	NA	1.00E-06	k	2.45E-08	7.98E-02	e	9.24E-06	e

Table B1-1 Chemical-Specific Parameters for Organic COPCs

Chemical of Potential Concern	CAS Registry Number	Octanol / Water Partitioning Coefficients						Partitioning Coefficients (Kd)			
		K_{oc}-pub [y] (various units)	Source	K_{oc}-used [z] (mL/g)	K_{ow}-pub [y] (various units)	Source	K_{ow}-used [z] (unitless)	Kd_{bs} (L/kg)	Source	Kd_s (mL/g)	Source
Benzoic acid	65-85-0	5.50E-01	c	5.50E-01	1.87E+00	m	7.41E+01	2.20E-02	c	5.50E-03	c
Bis(2-chloroethoxy)methane	111-91-1	2.77E+00	m	2.77E+00	1.30E+00	m	2.00E+01	1.11E-01	e	2.77E-02	e
Bis(2-chloroethyl) ether	111-44-4	7.60E+01	c	7.60E+01	2.00E+01	c	2.00E+01	3.04E+00	c	7.60E-01	c
Chlorocyclopentadiene	41851-50-7	1.45E+02	m	1.45E+02	2.43E+00	m	2.69E+02	5.81E+00	e	1.45E+00	e
Cyclohexanol	108-93-0	1.11E+00	i	1.30E+01	1.23E+00	i	1.70E+01	5.20E-01	e	1.30E-01	e
Dichloroisopropyl ether	108-60-1	1.79E+00	i	6.10E+01	2.58E+00	i	3.80E+02	2.44E+00	e	6.10E-01	e
Dichloromethyl ether	542-88-1	4.40E+00	m	4.40E+00	5.80E-01	m	3.80E+00	1.76E-01	e	4.40E-02	e
Dichloropentadiene	61626-71-9	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dimethyl sulfate	77-78-1	2.42E+01	m	2.42E+01	1.60E-01	m	1.45E+00	9.67E-01	e	2.42E-01	e
Dimethylaniline	121-69-7	7.71E+01	m	7.71E+01	2.31E+00	m	2.04E+02	3.08E+00	e	7.71E-01	e
di-n-Propylnitrosamine	621-64-7	1.70E+01	c	1.70E+01	2.40E+01	c	2.40E+01	6.80E-01	c	1.70E-01	c
Diphenyl ether	101-84-8	NA	e	2.72E+03	4.21E+00	i	1.62E+04	1.09E+02	e	2.72E+01	e
Epichlorohydrin	106-89-8	2.22E+00	c	2.22E+00	1.78E+00	c	1.78E+00	8.88E-02	c	2.22E-02	c
Ethyl carbamate (Urethane)	51-79-6	NA	e	1.08E+00	-1.50E-01	l	7.08E-01	4.33E-02	e	1.08E-02	e
Ethyl methanesulfonate	62-50-0	1.55E+00	c	1.55E+00	1.12E+00	c	1.12E+00	6.19E-02	c	1.55E-02	c
Ethylene dibromide	106-93-4	3.28E+01	c	3.28E+01	5.62E+01	c	5.62E+01	1.31E+00	c	3.28E-01	c
Ethylene glycol	107-21-1	1.00E+00	m	1.00E+00	-1.36E+00	m	4.37E-02	4.00E-02	e	1.00E-02	e
Ethylene glycol monobutyl ether	111-76-2	1.00E+00	m	1.00E+00	8.30E-01	m	6.76E+00	4.00E-02	e	1.00E-02	e
Ethylene glycol monoethyl ether acetate	111-15-9	2.09E+00	m	2.09E+00	5.90E-01	m	3.89E+00	8.37E-02	e	2.09E-02	e
Ethylene thiourea	96-45-7	6.51E+00	m	6.51E+00	-6.60E-01	m	2.19E-01	2.60E-01	e	6.51E-02	e
Furfural	98-01-1	NA	e	7.94E+00	9.60E-01	i	9.12E+00	3.18E-01	e	7.94E-02	e
Maleic hydrazide	123-33-1	1.04E+01	m	1.04E+01	-8.40E-01	m	1.45E-01	4.14E-01	e	1.04E-01	e
Malononitrile	109-77-3	1.53E+01	m	1.53E+01	-6.00E-01	m	2.51E-01	6.12E-01	e	1.53E-01	e
Methyl styrene (mixed isomers)	25013-15-4	8.17E+02	m	8.17E+02	3.48E+00	m	3.02E+03	3.27E+01	e	8.17E+00	e
Methylhydrazine	60-34-4	NA	e	2.15E-01	-1.05E+00	l	8.91E-02	8.59E-03	e	2.15E-03	e
N,N-Diphenylamine	122-39-4	2.54E+00	i	3.47E+02	3.50E+00	i	3.16E+03	1.39E+01	e	3.47E+00	e
Nitric acid, propyl ester	627-13-4	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
N-Nitrosodi-n-butylamine	924-16-3	1.07E+02	c	1.07E+02	2.57E+02	c	2.57E+02	4.29E+00	c	1.07E+00	c
N-Nitrosomorpholine	59-89-2	NA	e	8.24E+00	-4.40E-01	l	9.56E+00	3.29E-01	e	8.24E-02	e

Table B1-1 Chemical-Specific Parameters for Organic COPCs

Chemical of Potential Concern	CAS Registry Number	Kd		Plant Uptake Factors				
		Kd_{sw} (L/kg)	Source	Br_{ag} (µg/g DW plant)/ (µg/g soil)	Source	Br_{forage} (µg/g DW plant)/ (µg/g soil)	Source	Br_{grain} (µg/g DW plant)/ (µg/g soil) [a]
Benzoic acid	65-85-0	4.13E-02	c	3.17E+00	c	3.17E+00	c	3.17E+00
Bis(2-chloroethoxy)methane	111-91-1	2.08E-01	e	6.86E+00	e	6.86E+00	e	6.86E+00
Bis(2-chloroethyl) ether	111-44-4	5.70E+00	c	6.85E+00	c	6.85E+00	c	6.85E+00
Chlorocyclopentadiene	41851-50-7	1.09E+01	e	1.53E+00	e	1.53E+00	e	1.53E+00
Cyclohexanol	108-93-0	9.75E-01	e	7.53E+00	e	7.53E+00	e	7.53E+00
Dichloroisopropyl ether	108-60-1	4.57E+00	e	1.25E+00	e	1.25E+00	e	1.25E+00
Dichloromethyl ether	542-88-1	3.30E-01	e	1.79E+01	e	1.79E+01	e	1.79E+01
Dichloropentadiene	61626-71-9	NA	NA	NA	NA	NA	NA	NA
Dimethyl sulfate	77-78-1	1.81E+00	e	3.13E+01	e	3.13E+01	e	3.13E+01
Dimethylaniline	121-69-7	5.78E+00	e	1.79E+00	e	1.79E+00	e	1.79E+00
di-n-Propylnitrosamine	621-64-7	1.28E+00	c	6.17E+00	c	6.17E+00	c	6.17E+00
Diphenyl ether	101-84-8	2.04E+02	e	1.43E-01	e	1.43E-01	e	1.43E-01
Epichlorohydrin	106-89-8	1.66E-01	c	2.77E+01	c	2.77E+01	c	2.77E+01
Ethyl carbamate (Urethane)	51-79-6	8.11E-02	e	4.73E+01	e	4.73E+01	e	4.73E+01
Ethyl methanesulfonate	62-50-0	1.16E-01	c	3.63E+01	c	3.63E+01	c	3.63E+01
Ethylene dibromide	106-93-4	2.46E+00	c	3.77E+00	c	3.77E+00	c	3.77E+00
Ethylene glycol	107-21-1	7.50E-02	e	2.37E+02	e	2.37E+02	e	2.37E+02
Ethylene glycol monobutyl ether	111-76-2	7.50E-02	e	1.28E+01	e	1.28E+01	e	1.28E+01
Ethylene glycol monoethyl ether acetate	111-15-9	1.57E-01	e	1.77E+01	e	1.77E+01	e	1.77E+01
Ethylene thiourea	96-45-7	4.88E-01	e	9.32E+01	e	9.32E+01	e	9.32E+01
Furfural	98-01-1	5.95E-01	e	1.08E+01	e	1.08E+01	e	1.08E+01
Maleic hydrazide	123-33-1	7.76E-01	e	1.18E+02	e	1.18E+02	e	1.18E+02
Malononitrile	109-77-3	1.15E+00	e	8.61E+01	e	8.61E+01	e	8.61E+01
Methyl styrene (mixed isomers)	25013-15-4	6.13E+01	e	3.77E-01	e	3.77E-01	e	3.77E-01
Methylhydrazine	60-34-4	1.61E-02	e	1.57E+02	e	1.57E+02	e	1.57E+02
N,N-Diphenylamine	122-39-4	2.60E+01	e	3.67E-01	e	3.67E-01	e	3.67E-01
Nitric acid, propyl ester	627-13-4	NA	NA	NA	NA	NA	NA	NA
N-Nitrosodi-n-butylamine	924-16-3	8.05E+00	c	1.57E+00	c	1.57E+00	c	1.57E+00
N-Nitrosomorpholine	59-89-2	6.18E-01	e	1.05E+01	e	1.05E+01	e	1.05E+01

Table B1-1 Chemical-Specific Parameters for Organic COPCs

Chemical of Potential Concern	CAS Registry Number	Plant Uptake Factors							
		$Br_{rootveg}$ (µg/g DW plant)/ (µg/g soil)	Source	Bv_{ag} (µg/g DW plant)/ (µg/g air)	Source	Bv_{forage} (µg/g DW plant)/ (µg/g air)	Source	RCF (µg/g DW plant)/ (µg/mL soil water)	Source
Benzoic acid	65-85-0	2.33E+03	c	1.68E+01	h	1.68E+01	h	1.28E+01	c
Bis(2-chloroethoxy)methane	111-91-1	3.12E+02	e	8.06E+00	e	8.06E+00	e	8.64E+00	e
Bis(2-chloroethyl) ether	111-44-4	1.14E+01	c	6.37E-02	c	6.37E-02	c	8.64E+00	c
Chlorocyclopentadiene	41851-50-7	1.62E+01	e	9.72E-04	e	9.72E-04	e	2.36E+01	e
Cyclohexanol	108-93-0	6.43E+01	e	1.99E-01	e	1.99E-01	e	8.36E+00	e
Dichloroisopropyl ether	108-60-1	4.73E+01	e	2.78E-01	e	2.78E-01	e	2.88E+01	e
Dichloromethyl ether	542-88-1	1.58E+02	e	1.13E-03	e	1.13E-03	e	6.96E+00	e
Dichloropentadiene	61626-71-9	NA	NA	NA	NA	NA	NA	NA	NA
Dimethyl sulfate	77-78-1	2.74E+01	e	2.08E-02	e	2.08E-02	e	6.62E+00	e
Dimethylaniline	121-69-7	2.63E+01	e	2.86E-01	e	2.86E-01	e	2.03E+01	e
di-n-Propylnitrosamine	621-64-7	5.29E+01	c	4.00E-02	h	4.00E-02	h	8.99E+00	c
Diphenyl ether	101-84-8	1.51E+01	e	6.87E+00	e	6.87E+00	e	4.12E+02	e
Epichlorohydrin	106-89-8	3.00E+02	c	3.35E-03	c	3.35E-03	c	6.67E+00	c
Ethyl carbamate (Urethane)	51-79-6	6.00E+02	e	NA	NA	NA	NA	6.49E+00	e
Ethyl methanesulfonate	62-50-0	4.24E+02	c	7.11E-01	c	7.11E-01	c	6.56E+00	c
Ethylene dibromide	106-93-4	3.50E+01	c	9.13E-03	c	9.13E-03	c	1.15E+01	c
Ethylene glycol	107-21-1	6.33E+02	e	3.34E-02	e	3.34E-02	e	6.33E+00	e
Ethylene glycol monobutyl ether	111-76-2	7.32E+02	e	2.69E-01	e	2.69E-01	e	7.32E+00	e
Ethylene glycol monoethyl ether acetate	111-15-9	3.33E+02	e	7.47E-02	e	7.47E-02	e	6.97E+00	e
Ethylene thiourea	96-45-7	9.80E+01	e	3.32E-02	e	3.32E-02	e	6.38E+00	e
Furfural	98-01-1	9.55E+01	e	1.59E-01	e	1.59E-01	e	7.58E+00	e
Maleic hydrazide	123-33-1	6.15E+01	e	2.70E+02	e	2.70E+02	e	6.36E+00	e
Malononitrile	109-77-3	4.17E+01	e	1.02E+00	e	1.02E+00	e	6.39E+00	e
Methyl styrene (mixed isomers)	25013-15-4	1.44E+01	e	3.64E-02	e	3.64E-02	e	1.17E+02	e
Methylhydrazine	60-34-4	2.95E+03	e	1.41E-03	e	1.41E-03	e	6.34E+00	e
N,N-Diphenylamine	122-39-4	3.50E+01	e	8.64E+02	e	8.64E+02	e	1.21E+02	e
Nitric acid, propyl ester	627-13-4	NA	NA	NA	NA	NA	NA	NA	NA
N-Nitrosodi-n-butylamine	924-16-3	2.14E+01	c	3.77E-01	c	3.77E-01	c	2.30E+01	c
N-Nitrosomorpholine	59-89-2	9.26E+01	e	2.54E+01	e	2.54E+01	e	7.63E+00	e

Table B1-1 Chemical-Specific Parameters for Organic COPCs

Chemical of Potential Concern	CAS Registry Number	Bioconcentration/Bioaccumulation Factors									
		Ba_{beef} (day/kg FW)	Source	$Ba_{chicken}$ (day/kg FW)	Source	Ba_{egg} (day/kg FW)	Source	Ba_{milk} (day/kg FW)	Source	Ba_{pork} (day/kg FW)	Source
Benzoic acid	65-85-0	1.91E-06	c	1.51E-06	c	6.04E-04	c	6.04E-07	c	2.31E-06	c
Bis(2-chloroethoxy)methane	111-91-1	5.01E-07	e	3.96E-07	e	1.58E-04	e	1.58E-07	e	6.07E-07	e
Bis(2-chloroethyl) ether	111-44-4	5.02E-07	c	3.97E-07	c	1.59E-04	c	1.59E-07	c	6.08E-07	c
Chlorocyclopentadiene	41851-50-7	6.76E-06	e	5.34E-06	e	2.14E-03	e	2.14E-06	e	8.18E-06	e
Cyclohexanol	108-93-0	4.27E-07	e	3.37E-07	e	1.35E-04	e	1.35E-07	e	5.16E-07	e
Dichloroisopropyl ether	108-60-1	9.55E-06	e	7.54E-06	e	3.02E-03	e	3.02E-06	e	1.16E-05	e
Dichloromethyl ether	542-88-1	9.55E-08	e	7.54E-08	e	3.02E-05	e	3.02E-08	e	1.16E-07	e
Dichloropentadiene	61626-71-9	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dimethyl sulfate	77-78-1	3.63E-08	e	2.87E-08	e	1.15E-05	e	1.15E-08	e	4.40E-08	e
Dimethylaniline	121-69-7	5.13E-06	e	4.05E-06	e	1.62E-03	e	1.62E-06	e	6.21E-06	e
di-n-Propylnitrosamine	621-64-7	6.03E-07	c	4.76E-07	c	1.91E-04	c	1.91E-07	c	7.30E-07	c
Diphenyl ether	101-84-8	4.07E-04	e	3.22E-04	e	1.29E-01	e	1.29E-04	e	4.93E-04	e
Epichlorohydrin	106-89-8	4.47E-08	c	3.53E-08	c	1.41E-05	c	1.41E-08	c	5.41E-08	c
Ethyl carbamate (Urethane)	51-79-6	1.78E-08	e	1.40E-08	e	5.62E-06	e	5.62E-09	e	2.15E-08	e
Ethyl methanesulfonate	62-50-0	2.81E-08	c	2.22E-08	c	8.90E-06	c	8.90E-09	c	3.41E-08	c
Ethylene dibromide	106-93-4	1.41E-06	c	1.12E-06	c	4.47E-04	c	4.47E-07	c	1.71E-06	c
Ethylene glycol	107-21-1	1.10E-09	e	8.66E-10	e	3.47E-07	e	3.47E-10	e	1.33E-09	e
Ethylene glycol monobutyl ether	111-76-2	1.70E-07	e	1.34E-07	e	5.37E-05	e	5.37E-08	e	2.06E-07	e
Ethylene glycol monoethyl ether acetate	111-15-9	9.77E-08	e	7.72E-08	e	3.09E-05	e	3.09E-08	e	1.18E-07	e
Ethylene thiourea	96-45-7	5.50E-09	e	4.34E-09	e	1.74E-06	e	1.74E-09	e	6.65E-09	e
Furfural	98-01-1	2.29E-07	e	1.81E-07	e	7.24E-05	e	7.24E-08	e	2.77E-07	e
Maleic hydrazide	123-33-1	3.63E-09	e	2.87E-09	e	1.15E-06	e	1.15E-09	e	4.40E-09	e
Malononitrile	109-77-3	6.31E-09	e	4.98E-09	e	2.00E-06	e	2.00E-09	e	7.64E-09	e
Methyl styrene (mixed isomers)	25013-15-4	7.59E-05	e	5.99E-05	e	2.40E-02	e	2.40E-05	e	9.18E-05	e
Methylhydrazine	60-34-4	2.24E-09	e	1.77E-09	e	7.08E-07	e	7.08E-10	e	2.71E-09	e
N,N-Diphenylamine	122-39-4	7.94E-05	e	6.27E-05	e	2.51E-02	e	2.51E-05	e	9.62E-05	e
Nitric acid, propyl ester	627-13-4	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
N-Nitrosodi-n-butylamine	924-16-3	6.46E-06	c	5.10E-06	c	2.04E-03	c	2.04E-06	c	7.82E-06	c
N-Nitrosomorpholine	59-89-2	2.40E-07	e	1.90E-07	e	7.59E-05	e	7.59E-08	e	2.91E-07	e

Table B1-1 Chemical-Specific Parameters for Organic COPCs

Chemical of Potential Concern	CAS Registry Number	Bioconcentration/Bioaccumulation Factors						Half-life	
		BAF_{fish} (L/kg FW)	Source	BCF_{fish} (L/kg FW)	Source	$BSAF_{fish}$ (unitless)	Source	$t_{1/2}$ (days)	Source
Benzoic acid	65-85-0	NA	NA	1.58E+01	c	NA	NA	NA	NA
Bis(2-chloroethoxy)methane	111-91-1	NA	NA	5.73E+00	e	NA	NA	NA	NA
Bis(2-chloroethyl) ether	111-44-4	NA	NA	5.74E+00	c	NA	NA	NA	NA
Chlorocyclopentadiene	41851-50-7	NA	NA	4.14E+01	e	NA	NA	NA	NA
Cyclohexanol	108-93-0	NA	NA	5.07E+00	e	NA	NA	NA	NA
Dichloroisopropyl ether	108-60-1	NA	NA	5.38E+01	e	NA	NA	1.80E+02	d
Dichloromethyl ether	542-88-1	3.16E+00	m	1.62E+00	e	NA	NA	4.42E-03	p
Dichloropentadiene	61626-71-9	NA	NA	NA	NA	NA	NA	NA	NA
Dimethyl sulfate	77-78-1	NA	NA	7.79E-01	e	NA	NA	5.00E-01	d
Dimethylaniline	121-69-7	NA	NA	3.35E+01	e	NA	NA	1.80E+02	d
di-n-Propylnitrosamine	621-64-7	NA	NA	6.59E+00	c	NA	NA	NA	NA
Diphenyl ether	101-84-8	NA	NA	NA	NA	NA	NA	NA	NA
Epichlorohydrin	106-89-8	NA	NA	9.13E-01	c	NA	NA	NA	NA
Ethyl carbamate (Urethane)	51-79-6	NA	NA	4.53E-01	e	NA	NA	7.00E+00	d
Ethyl methanesulfonate	62-50-0	NA	NA	6.42E-01	c	NA	NA	NA	NA
Ethylene dibromide	106-93-4	NA	NA	1.26E+01	c	NA	NA	NA	NA
Ethylene glycol	107-21-1	NA	NA	5.45E-02	e	NA	NA	1.20E+01	d
Ethylene glycol monobutyl ether	111-76-2	NA	NA	2.52E+00	e	NA	NA	2.80E+01	d
Ethylene glycol monoethyl ether acetate	111-15-9	NA	NA	1.65E+00	e	NA	NA	NA	NA
Ethylene thiourea	96-45-7	NA	NA	1.86E-01	e	NA	NA	2.80E+01	d
Furfural	98-01-1	NA	NA	3.16E+00	e	NA	NA	NA	NA
Maleic hydrazide	123-33-1	NA	NA	1.35E-01	e	NA	NA	NA	NA
Malononitrile	109-77-3	NA	NA	2.06E-01	e	NA	NA	NA	NA
Methyl styrene (mixed isomers)	25013-15-4	NA	NA	2.60E+02	e	NA	NA	NA	NA
Methylhydrazine	60-34-4	NA	NA	9.38E-02	e	NA	NA	2.40E+01	d
N,N-Diphenylamine	122-39-4	NA	NA	2.69E+02	e	NA	NA	2.80E+01	d
Nitric acid, propyl ester	627-13-4	NA	NA	NA	NA	NA	NA	NA	NA
N-Nitrosodi-n-butylamine	924-16-3	NA	NA	4.00E+01	c	NA	NA	NA	NA
N-Nitrosomorpholine	59-89-2	NA	NA	3.27E+00	e	NA	NA	1.80E+02	d

Table B1-1 Chemical-Specific Parameters for Organic COPCs

Chemical of Potential Concern	CAS Registry Number	Soil Loss Mechanisms [g]											
		k_{decay} $(year)^{-1}$	Source	ks_e $(year)^{-1}$			Source	ks_g $(year)^{-1}$	Source	ks_l $(year)^{-1}$			Source
				1 cm	15 cm	20 cm				1 cm	15 cm	20 cm	
Benzoic acid	65-85-0	0.0E+00	NA	1.82E-04	1.22E-05	9.12E-06	e	1.26E+02	c	2.02E+01	1.35E+00	1.01E+00	e
Bis(2-chloroethoxy)methane	111-91-1	0.0E+00	NA	8.06E-04	5.37E-05	4.03E-05	e	0.0E+00	NA	1.77E+01	1.18E+00	8.87E-01	e
Bis(2-chloroethyl) ether	111-44-4	0.0E+00	NA	4.39E-03	2.93E-04	2.20E-04	e	1.41E+00	c	3.52E+00	2.35E-01	1.76E-01	e
Chlorocyclopentadiene	41851-50-7	0.0E+00	NA	4.78E-03	3.19E-04	2.39E-04	e	0.0E+00	NA	2.00E+00	1.34E-01	1.00E-01	e
Cyclohexanol	108-93-0	0.0E+00	NA	2.42E-03	1.61E-04	1.21E-04	e	0.0E+00	NA	1.13E+01	7.56E-01	5.67E-01	e
Dichloroisopropyl ether	108-60-1	0.0E+00	NA	4.22E-03	2.81E-04	2.11E-04	e	1.41E+00	e	4.22E+00	2.81E-01	2.11E-01	e
Dichloromethyl ether	542-88-1	0.0E+00	NA	1.17E-03	7.83E-05	5.87E-05	e	5.73E+04	e	1.63E+01	1.09E+00	8.14E-01	e
Dichloropentadiene	61626-71-9	0.0E+00	NA	0.0E+00	0.0E+00	0.0E+00	NA	0.0E+00	NA	0.0E+00	0.0E+00	0.0E+00	NA
Dimethyl sulfate	77-78-1	0.0E+00	NA	3.23E-03	2.15E-04	1.61E-04	e	5.06E+02	e	8.14E+00	5.43E-01	4.07E-01	e
Dimethylaniline	121-69-7	0.0E+00	NA	4.41E-03	2.94E-04	2.20E-04	e	1.41E+00	e	3.48E+00	2.32E-01	1.74E-01	e
di-n-Propylnitrosamine	621-64-7	0.0E+00	NA	2.77E-03	1.85E-04	1.39E-04	e	1.41E+00	c	9.94E+00	6.63E-01	4.97E-01	e
Diphenyl ether	101-84-8	0.0E+00	NA	5.25E-03	3.50E-04	2.63E-04	e	0.0E+00	NA	1.18E-01	7.84E-03	5.88E-03	e
Epichlorohydrin	106-89-8	0.0E+00	NA	6.66E-04	4.44E-05	3.33E-05	e	9.03E+00	c	1.83E+01	1.22E+00	9.15E-01	e
Ethyl carbamate (Urethane)	51-79-6	0.0E+00	NA	3.47E-04	2.31E-05	1.74E-05	e	3.61E+01	e	1.96E+01	1.30E+00	9.78E-01	e
Ethyl methanesulfonate	62-50-0	0.0E+00	NA	4.84E-04	3.22E-05	2.42E-05	e	7.88E+01	c	1.90E+01	1.27E+00	9.51E-01	e
Ethylene dibromide	106-93-4	0.0E+00	NA	3.60E-03	2.40E-04	1.80E-04	e	1.41E+00	c	6.68E+00	4.46E-01	3.34E-01	e
Ethylene glycol	107-21-1	0.0E+00	NA	3.23E-04	2.15E-05	1.61E-05	e	2.11E+01	e	1.97E+01	1.31E+00	9.83E-01	e
Ethylene glycol monobutyl ether	111-76-2	0.0E+00	NA	3.23E-04	2.15E-05	1.61E-05	e	9.03E+00	e	1.97E+01	1.31E+00	9.83E-01	e
Ethylene glycol monoethyl ether acetate	111-15-9	0.0E+00	NA	6.33E-04	4.22E-05	3.16E-05	e	0.0E+00	NA	1.84E+01	1.23E+00	9.21E-01	e
Ethylene thiourea	96-45-7	0.0E+00	NA	1.57E-03	1.05E-04	7.86E-05	e	9.03E+00	e	1.47E+01	9.81E-01	7.35E-01	e
Furfural	98-01-1	0.0E+00	NA	1.80E-03	1.20E-04	8.99E-05	e	0.0E+00	NA	1.38E+01	9.20E-01	6.90E-01	e
Maleic hydrazide	123-33-1	0.0E+00	NA	2.13E-03	1.42E-04	1.06E-04	e	0.0E+00	NA	1.25E+01	8.34E-01	6.26E-01	e
Malononitrile	109-77-3	0.0E+00	NA	2.64E-03	1.76E-04	1.32E-04	e	0.0E+00	NA	1.05E+01	6.99E-01	5.25E-01	e
Methyl styrene (mixed isomers)	25013-15-4	0.0E+00	NA	5.19E-03	3.46E-04	2.59E-04	e	0.0E+00	NA	3.87E-01	2.58E-02	1.93E-02	e
Methylhydrazine	60-34-4	0.0E+00	NA	7.28E-05	4.85E-06	3.64E-06	e	1.05E+01	e	2.06E+01	1.38E+00	1.03E+00	e
N,N-Diphenylamine	122-39-4	0.0E+00	NA	5.06E-03	3.37E-04	2.53E-04	e	9.03E+00	e	8.89E-01	5.93E-02	4.45E-02	e
Nitric acid, propyl ester	627-13-4	0.0E+00	NA	0.0E+00	0.0E+00	0.0E+00	NA	0.0E+00	NA	0.0E+00	0.0E+00	0.0E+00	NA
N-Nitrosodi-n-butylamine	924-16-3	0.0E+00	NA	4.62E-03	3.08E-04	2.31E-04	e	7.44E+00	c	2.63E+00	1.75E-01	1.32E-01	e
N-Nitrosomorpholine	59-89-2	0.0E+00	NA	1.84E-03	1.23E-04	9.21E-05	e	1.41E+00	e	1.36E+01	9.09E-01	6.82E-01	e

Table B1-1 Chemical-Specific Parameters for Organic COPCs

Chemical of Potential Concern	CAS Registry Number	Soil Loss Mechanisms [g]								Kp (cm/hr)	Source
		ks_r $(year)^{-1}$			Source	ks_v $(year)^{-1}$			Source		
		1 cm	15 cm	20 cm		1 cm	15 cm	20 cm			
Benzoic acid	65-85-0	1.21E+01	8.05E-01	6.03E-01	e	9.99E+02	4.44E+00	2.50E+00	f	5.70E-03	ab
Bis(2-chloroethoxy)methane	111-91-1	1.06E+01	7.06E-01	5.30E-01	e	1.14E+02	5.08E-01	2.86E-01	f	1.26E-03	aa
Bis(2-chloroethyl) ether	111-44-4	2.10E+00	1.40E-01	1.05E-01	e	3.78E+02	1.68E+00	9.46E-01	f	1.80E-03	ab
Chlorocyclopentadiene	41851-50-7	1.20E+00	7.98E-02	5.98E-02	e	4.15E+05	1.84E+03	1.04E+03	f	1.84E-02	aa
Cyclohexanol	108-93-0	6.77E+00	4.52E-01	3.39E-01	e	1.20E+03	5.32E+00	2.99E+00	f	2.91E-03	aa
Dichloroisopropyl ether	108-60-1	2.52E+00	1.68E-01	1.26E-01	e	1.99E+03	8.83E+00	4.97E+00	f	9.35E-03	aa
Dichloromethyl ether	542-88-1	9.72E+00	6.48E-01	4.86E-01	e	1.15E+05	5.12E+02	2.88E+02	f	8.81E-04	aa
Dichloropentadiene	61626-71-9	0.0E+00	0.0E+00	0.0E+00	NA	0.0E+00	0.0E+00	0.0E+00	NA	NA	NA
Dimethyl sulfate	77-78-1	4.86E+00	3.24E-01	2.43E-01	e	2.60E+02	1.16E+00	6.51E-01	f	1.80E-03	ab
Dimethylaniline	121-69-7	2.08E+00	1.39E-01	1.04E-01	e	3.45E+03	1.53E+01	8.62E+00	f	1.17E-02	aa
di-n-Propylnitrosamine	621-64-7	5.94E+00	3.96E-01	2.97E-01	e	4.23E+03	1.88E+01	1.06E+01	f	2.30E-03	ab
Diphenyl ether	101-84-8	7.03E-02	4.68E-03	3.51E-03	e	1.73E+02	7.71E-01	4.33E-01	f	1.17E-01	aa
Epichlorohydrin	106-89-8	1.09E+01	7.28E-01	5.46E-01	e	3.46E+04	1.54E+02	8.65E+01	f	3.50E-04	ab
Ethyl carbamate (Urethane)	51-79-6	1.17E+01	7.79E-01	5.84E-01	e	0.0E+00	0.0E+00	0.0E+00	NA	3.90E-04	ab
Ethyl methanesulfonate	62-50-0	1.14E+01	7.57E-01	5.68E-01	e	1.34E+02	5.96E-01	3.35E-01	f	3.45E-04	aa
Ethylene dibromide	106-93-4	3.99E+00	2.66E-01	2.00E-01	e	9.08E+03	4.03E+01	2.27E+01	f	2.80E-03	ab
Ethylene glycol	107-21-1	1.17E+01	7.82E-01	5.87E-01	e	1.98E+02	8.81E-01	4.96E-01	f	8.73E-05	aa
Ethylene glycol monobutyl ether	111-76-2	1.17E+01	7.82E-01	5.87E-01	e	3.19E+03	1.42E+01	7.97E+00	f	1.20E-03	ab
Ethylene glycol monoethyl ether acetate	111-15-9	1.10E+01	7.34E-01	5.50E-01	e	2.14E+03	9.52E+00	5.36E+00	f	7.70E-04	ab
Ethylene thiourea	96-45-7	8.78E+00	5.86E-01	4.39E-01	e	1.13E+02	5.02E-01	2.82E-01	f	1.70E-04	ab
Furfural	98-01-1	8.24E+00	5.50E-01	4.12E-01	e	1.25E+03	5.56E+00	3.13E+00	f	2.02E-03	aa
Maleic hydrazide	123-33-1	7.47E+00	4.98E-01	3.74E-01	e	6.40E-03	2.85E-05	1.60E-05	f	1.02E-04	aa
Malononitrile	109-77-3	6.27E+00	4.18E-01	3.13E-01	e	2.95E+00	1.31E-02	7.38E-03	f	2.68E-04	aa
Methyl styrene (mixed isomers)	25013-15-4	2.31E-01	1.54E-02	1.15E-02	e	1.61E+04	7.14E+01	4.02E+01	f	7.41E-02	aa
Methylhydrazine	60-34-4	1.23E+01	8.22E-01	6.16E-01	e	6.39E+04	2.84E+02	1.60E+02	f	1.73E-04	aa
N,N-Diphenylamine	122-39-4	5.31E-01	3.54E-02	2.66E-02	e	1.90E+00	8.47E-03	4.76E-03	f	3.96E-02	aa
Nitric acid, propyl ester	627-13-4	0.0E+00	0.0E+00	0.0E+00	NA	0.0E+00	0.0E+00	0.0E+00	NA	NA	NA
N-Nitrosodi-n-butylamine	924-16-3	1.57E+00	1.05E-01	7.86E-02	e	1.02E+03	4.53E+00	2.55E+00	f	3.80E-03	ab
N-Nitrosomorpholine	59-89-2	8.14E+00	5.43E-01	4.07E-01	e	7.27E+00	3.23E-02	1.82E-02	f	1.80E-04	ab

Table B1-1 Chemical-Specific Parameters for Organic COPCs

Chemical of Potential Concern	CAS Registry Number	Fraction		MW (g/mol)	pH	Henry's Constant			Diffusivity			
		F_v (unitless)	Source			H-pub [x] (various units)	Source	H-used [x] (atm-m^3/mol)	D_a (cm^2/s)	Source	D_w (cm^2/s)	Source
N-Nitroso-N,N-dimethylamine	62-75-9	0 or 1	b	74.1	NA	7.44E-05	m	1.81E-06	1.13E-01	j	1.24E-05	j
o-Anisidine	90-04-0	0 or 1	b	123.15	NA	NA	NA	NA	7.68E-02	e	8.89E-06	e
Oxalic acid	144-62-7	0 or 1	b	90.035	NA	5.85E-09	k	1.43E-10	9.46E-02	e	1.10E-05	e
Phthalic anhydride	85-44-9	0 or 1	b	148.11	NA	6.28E-09	c	6.28E-09	4.04E-02	c	8.97E-06	c
p-Phthalic acid	100-21-0	0 or 1	b	166.13	NA	1.59E-11	m	3.87E-13	3.90E-02	j	7.14E-06	j
Pyridine	110-86-1	0 or 1	b	79.1	NA	6.86E-03	c	6.86E-03	1.10E-01	c	1.08E-05	c
Quinoline	91-22-5	0 or 1	b	129.16	NA	6.83E-05	m	1.67E-06	5.46E-02	j	8.31E-06	j
Quinone	106-51-4	0 or 1	b	108.1	NA	NA	NA	NA	8.37E-02	e	9.69E-06	e
Safrole	94-59-7	0 or 1	b	162.18	NA	1.19E-05	c	1.19E-05	4.06E-02	c	7.16E-06	c
Tetrahydrofuran	109-99-9	0 or 1	b	72.1	NA	1.54E-05	h	1.54E-05	1.31E-01	c	1.07E-05	c
Other Heavy Semivolatile Compounds (MW>200 g/mole)												
1,2,4,5-Tetrachlorobenzene	95-94-3	0 or 1	b	215.89	NA	1.18E-03	c	1.18E-03	2.11E-02	c	8.75E-06	c
1,3,5-Trinitrobenzene	99-35-4	0 or 1	b	213.11	NA	8.66E-08	c	8.66E-08	2.84E-02	c	6.08E-06	c
2,6-Bis(tert-butyl)-4-methylphenol	128-37-0	0 or 1	b	220.35	NA	1.69E-04	k	4.11E-06	5.21E-02	e	6.03E-06	e
2-Cyclohexyl-4,6-dinitrophenol	131-89-5	0 or 1	b	266.25	NA	1.38E-09	m	3.37E-11	4.59E-02	e	5.32E-06	e
2-sec-Butyl-4,6-dinitrophenol	88-85-7	0 or 1	b	240.22	NA	1.86E-05	m	4.55E-07	4.92E-02	e	5.69E-06	e
3,3'-Dichlorobenzidine	91-94-1	0 or 1	b	253.13	NA	2.08E-08	c	2.08E-08	2.28E-02	c	5.48E-06	c
3,3'-Dimethoxybenzidine	119-90-4	0 or 1	b	244.28	NA	3.36E-10	c	3.36E-10	2.38E-02	c	5.60E-06	c
4-Bromophenylphenyl ether	101-55-3	0 or 1	b	249.2	NA	4.78E-03	m	1.17E-04	1.98E-02	c	6.83E-06	c
Ammonium perfluorooctanoate	3825-26-1	0 or 1	b	431.1	NA	4.09E-03	k	9.98E-05	3.33E-02	e	3.86E-06	e
Azobenzene	103-33-3	0 or 1	b	182.22	NA	5.52E-04	m	1.35E-05	3.15E-02	j	7.45E-06	j
Bis(3-tert-butyl-4-hydroxy-6-methyl-phenyl)sulfide	96-69-5	0 or 1	b	358.54	NA	1.17E-01	k	2.86E-03	3.76E-02	e	4.36E-06	e
Captan	133-06-2	0 or 1	b	300.57	NA	6.00E-01	i	5.94E-06	1.81E-02	j	5.00E-06	j
Chlorobenzilate	510-15-6	0 or 1	b	325.2	NA	7.24E-08	c	7.24E-08	1.65E-02	c	4.72E-06	c
Dibutylphosphate	107-66-4	0 or 1	b	210.21	NA	1.74E-07	k	4.25E-09	5.37E-02	e	6.22E-06	e
Dimethyl aminoazobenzene	60-11-7	0 or 1	b	225.29	NA	NA	NA	NA	5.13E-02	e	5.94E-06	e
Hexachlorobenzene	118-74-1	0 or 1	b	284.8	NA	5.35E-04	c	5.35E-04	1.41E-02	c	7.84E-06	c
Hexachlorobutadiene	87-68-3	0 or 1	b	260.76	NA	2.39E-02	c	2.39E-02	1.73E-02	c	7.33E-06	c
Hexachlorocyclopentadiene	77-47-4	0 or 1	b	272.77	NA	1.72E-02	c	1.72E-02	1.61E-02	c	7.21E-06	c

Table B1-1 Chemical-Specific Parameters for Organic COPCs

Chemical of Potential Concern	CAS Registry Number	Octanol / Water Partitioning Coefficients						Partitioning Coefficients (Kd)			
		K_{oc}-pub [y] (various units)	Source	K_{oc}-used [z] (mL/g)	K_{ow}-pub [y] (various units)	Source	K_{ow}-used [z] (unitless)	Kd_{bs} (L/kg)	Source	Kd_s (mL/g)	Source
N-Nitroso-N,N-dimethylamine	62-75-9	3.82E+01	m	3.82E+01	-5.70E-01	m	2.69E-01	1.53E+00	e	3.82E-01	e
o-Anisidine	90-04-0	NA	e	1.18E+01	1.18E+00	l	1.51E+01	4.71E-01	e	1.18E-01	e
Oxalic acid	144-62-7	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Phthalic anhydride	85-44-9	2.10E-01	h	2.10E-01	2.50E-01	c	2.50E-01	8.40E-03	h	2.10E-03	h
p-Phthalic acid	100-21-0	7.16E+01	m	7.16E+01	2.00E+00	m	1.00E+02	2.86E+00	e	7.16E-01	e
Pyridine	110-86-1	4.72E+00	c	4.72E+00	4.68E+00	c	4.68E+00	1.89E-01	c	4.72E-02	c
Quinoline	91-22-5	1.84E+03	m	1.84E+03	2.03E+00	m	1.07E+02	7.35E+01	e	1.84E+01	e
Quinone	106-51-4	NA	e	2.03E+00	2.00E-01	l	1.58E+00	8.11E-02	e	2.03E-02	e
Safrole	94-59-7	1.68E+02	c	1.68E+02	4.57E+02	c	4.57E+02	6.73E+00	c	1.68E+00	c
Tetrahydrofuran	109-99-9	3.16E+00	c	3.16E+00	2.80E+00	c	2.80E+00	1.26E-01	c	3.16E-02	c
Other Heavy Semivolatile Compounds (MW>200 g/mole)											
1,2,4,5-Tetrachlorobenzene	95-94-3	5.89E+03	c	5.89E+03	4.36E+04	c	4.36E+04	2.36E+02	c	5.89E+01	c
1,3,5-Trinitrobenzene	99-35-4	1.18E+01	c	1.18E+01	1.51E+01	c	1.51E+01	4.72E-01	c	1.18E-01	c
2,6-Bis(tert-butyl)-4-methylphenol	128-37-0	NA	e	2.53E+03	4.17E+00	l	1.48E+04	1.01E+02	e	2.53E+01	e
2-Cyclohexyl-4,6-dinitrophenol	131-89-5	NA	e	4.92E+03	4.54E+00	p	3.47E+04	1.97E+02	e	4.92E+01	e
2-sec-Butyl-4,6-dinitrophenol	88-85-7	3.54E+03	m	3.54E+03	3.56E+00	m	3.63E+03	1.42E+02	e	3.54E+01	e
3,3'-Dichlorobenzidine	91-94-1	8.70E+02	c	8.70E+02	3.76E+03	c	3.76E+03	3.48E+01	c	8.70E+00	c
3,3'-Dimethoxybenzidine	119-90-4	3.65E+01	c	3.65E+01	6.46E+01	c	6.46E+01	1.46E+00	c	3.65E-01	c
4-Bromophenylphenyl ether	101-55-3	1.21E+04	h	1.21E+04	1.10E+05	c	1.10E+05	4.85E+02	h	1.21E+02	h
Ammonium perfluorooctanoate	3825-26-1	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Azobenzene	103-33-3	1.95E+03	m	1.95E+03	3.82E+00	m	6.61E+03	7.82E+01	e	1.95E+01	e
Bis(3-tert-butyl-4-hydroxy-6-methyl-phenyl)sulfide	96-69-5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Captan	133-06-2	2.30E+00	i	2.00E+02	2.35E+00	i	2.24E+02	7.98E+00	e	2.00E+00	e
Chlorobenzilate	510-15-6	3.69E+03	c	3.69E+03	2.40E+04	c	2.40E+04	1.48E+02	c	3.69E+01	c
Dibutylphosphate	107-66-4	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dimethyl aminoazobenzene	60-11-7	NA	e	5.29E+03	4.58E+00	l	3.80E+04	2.12E+02	e	5.29E+01	e
Hexachlorobenzene	118-74-1	8.00E+04	c	8.00E+04	3.18E+05	c	3.18E+05	3.20E+03	c	8.00E+02	c
Hexachlorobutadiene	87-68-3	6.94E+03	c	6.94E+03	5.38E+04	c	5.38E+04	2.77E+02	c	6.94E+01	c
Hexachlorocyclopentadiene	77-47-4	9.51E+03	c	9.51E+03	8.07E+04	h	8.07E+04	3.80E+02	c	9.51E+01	c

Table B1-1 Chemical-Specific Parameters for Organic COPCs

Chemical of Potential Concern	CAS Registry Number	Kd		Plant Uptake Factors				
		Kd_{sw} (L/kg)	Source	Br_{ag} (µg/g DW plant)/ (µg/g soil)	Source	Br_{forage} (µg/g DW plant)/ (µg/g soil)	Source	Br_{grain} (µg/g DW plant)/ (µg/g soil) [a]
N-Nitroso-N,N-dimethylamine	62-75-9	2.87E+00	e	8.27E+01	e	8.27E+01	e	8.27E+01
o-Anisidine	90-04-0	8.84E-01	e	8.05E+00	e	8.05E+00	e	8.05E+00
Oxalic acid	144-62-7	NA	NA	NA	NA	NA	NA	NA
Phthalic anhydride	85-44-9	1.57E-02	h	8.63E+01	c	8.63E+01	c	8.63E+01
p-Phthalic acid	100-21-0	5.37E+00	e	2.70E+00	e	2.70E+00	e	2.70E+00
Pyridine	110-86-1	3.54E-01	c	1.59E+01	c	1.59E+01	c	1.59E+01
Quinoline	91-22-5	1.38E+02	e	2.60E+00	e	2.60E+00	e	2.60E+00
Quinone	106-51-4	1.52E-01	e	2.97E+01	e	2.97E+01	e	2.97E+01
Safrole	94-59-7	1.26E+01	c	1.12E+00	c	1.12E+00	c	1.12E+00
Tetrahydrofuran	109-99-9	2.37E-01	c	2.14E+01	c	2.14E+01	c	2.14E+01
Other Heavy Semivolatile Compounds (MW>200 g/mole)								
1,2,4,5-Tetrachlorobenzene	95-94-3	4.42E+02	c	8.06E-02	c	8.06E-02	c	8.06E-02
1,3,5-Trinitrobenzene	99-35-4	8.84E-01	c	8.05E+00	c	8.05E+00	c	8.05E+00
2,6-Bis(tert-butyl)-4-methylphenol	128-37-0	1.90E+02	e	1.51E-01	e	1.51E-01	e	1.51E-01
2-Cyclohexyl-4,6-dinitrophenol	131-89-5	3.69E+02	e	9.20E-02	e	9.20E-02	e	9.20E-02
2-sec-Butyl-4,6-dinitrophenol	88-85-7	2.66E+02	e	3.39E-01	e	3.39E-01	e	3.39E-01
3,3'-Dichlorobenzidine	91-94-1	6.52E+01	c	3.32E-01	c	3.32E-01	c	3.32E-01
3,3'-Dimethoxybenzidine	119-90-4	2.74E+00	c	3.48E+00	c	3.48E+00	c	3.48E+00
4-Bromophenylphenyl ether	101-55-3	9.09E+02	h	4.72E-02	c	4.72E-02	c	4.72E-02
Ammonium perfluorooctanoate	3825-26-1	NA	NA	NA	NA	NA	NA	NA
Azobenzene	103-33-3	1.47E+02	e	2.40E-01	e	2.40E-01	e	2.40E-01
Bis(3-tert-butyl-4-hydroxy-6-methyl-phenyl)sulfide	96-69-5	NA	NA	NA	NA	NA	NA	NA
Captan	133-06-2	1.50E+01	e	1.70E+00	e	1.70E+00	e	1.70E+00
Chlorobenzilate	510-15-6	2.77E+02	c	1.14E-01	c	1.14E-01	c	1.14E-01
Dibutylphosphate	107-66-4	NA	NA	NA	NA	NA	NA	NA
Dimethyl aminoazobenzene	60-11-7	3.97E+02	e	8.72E-02	e	8.72E-02	e	8.72E-02
Hexachlorobenzene	118-74-1	6.00E+03	c	2.56E-02	c	2.56E-02	c	2.56E-02
Hexachlorobutadiene	87-68-3	5.20E+02	c	7.14E-02	c	7.14E-02	c	7.14E-02
Hexachlorocyclopentadiene	77-47-4	7.13E+02	c	5.65E-02	c	5.65E-02	c	5.65E-02

Table B1-1 Chemical-Specific Parameters for Organic COPCs

Chemical of Potential Concern	CAS Registry Number	Plant Uptake Factors							
		$Br_{rootveg}$ (µg/g DW plant)/ (µg/g soil)	Source	Bv_{ag} (µg/g DW plant)/ (µg/g air)	Source	Bv_{forage} (µg/g DW plant)/ (µg/g air)	Source	RCF (µg/g DW plant)/ (µg/mL soil water)	Source
N-Nitroso-N,N-dimethylamine	62-75-9	1.67E+01	e	7.63E-03	e	7.63E-03	e	6.39E+00	e
o-Anisidine	90-04-0	6.95E+01	e	NA	NA	NA	NA	8.19E+00	e
Oxalic acid	144-62-7	NA	NA	NA	NA	NA	NA	NA	NA
Phthalic anhydride	85-44-9	3.04E+03	h	2.03E+00	c	2.03E+00	c	6.39E+00	c
p-Phthalic acid	100-21-0	2.01E+01	e	1.95E+07	e	1.95E+07	e	1.44E+01	e
Pyridine	110-86-1	1.50E+02	c	4.22E-05	c	4.22E-05	c	7.07E+00	c
Quinoline	91-22-5	8.06E-01	e	4.89E+00	e	4.89E+00	e	1.48E+01	e
Quinone	106-51-4	3.27E+02	e	NA	NA	NA	NA	6.64E+00	e
Safrole	94-59-7	1.92E+01	c	3.20E+00	c	3.20E+00	c	3.23E+01	c
Tetrahydrofuran	109-99-9	2.16E+02	c	1.08E-02	h	1.08E-02	h	6.82E+00	c
Other Heavy Semivolatile Compounds (MW>200 g/mole)									
1,2,4,5-Tetrachlorobenzene	95-94-3	1.49E+01	c	4.14E+00	c	4.14E+00	c	8.75E+02	c
1,3,5-Trinitrobenzene	99-35-4	6.95E+01	c	1.17E+01	c	1.17E+01	c	8.19E+00	c
2,6-Bis(tert-butyl)-4-methylphenol	128-37-0	1.52E+01	e	3.76E+02	e	3.76E+02	e	3.84E+02	e
2-Cyclohexyl-4,6-dinitrophenol	131-89-5	1.49E+01	e	1.14E+08	e	1.14E+08	e	7.34E+02	e
2-sec-Butyl-4,6-dinitrophenol	88-85-7	3.79E+00	e	7.63E+02	e	7.63E+02	e	1.34E+02	e
3,3'-Dichlorobenzidine	91-94-1	1.58E+01	c	1.73E+04	c	1.73E+04	c	1.38E+02	c
3,3'-Dimethoxybenzidine	119-90-4	3.30E+01	c	1.41E+04	c	1.41E+04	c	1.21E+01	c
4-Bromophenylphenyl ether	101-55-3	1.47E+00	c	1.12E+02	e	1.12E+02	e	1.78E+03	c
Ammonium perfluorooctanoate	3825-26-1	NA	NA	NA	NA	NA	NA	NA	NA
Azobenzene	103-33-3	1.07E+01	e	4.87E+01	e	4.87E+01	e	2.09E+02	e
Bis(3-tert-butyl-4-hydroxy-6-methyl-phenyl)sulfide	96-69-5	NA	NA	NA	NA	NA	NA	NA	NA
Captan	133-06-2	1.07E+01	e	3.00E+00	e	3.00E+00	e	2.13E+01	e
Chlorobenzilate	510-15-6	1.50E+01	c	3.57E+04	c	3.57E+04	c	5.54E+02	c
Dibutylphosphate	107-66-4	NA	NA	NA	NA	NA	NA	NA	NA
Dimethyl aminoazobenzene	60-11-7	1.49E+01	e	NA	NA	NA	NA	7.87E+02	e
Hexachlorobenzene	118-74-1	5.02E+00	c	7.57E+01	c	7.57E+01	c	4.02E+03	c
Hexachlorobutadiene	87-68-3	1.48E+01	c	2.55E-01	c	2.55E-01	c	1.03E+03	c
Hexachlorocyclopentadiene	77-47-4	1.47E+01	c	5.47E-01	c	5.47E-01	c	1.40E+03	c

Table B1-1 Chemical-Specific Parameters for Organic COPCs

Chemical of Potential Concern	CAS Registry Number	Bioconcentration/Bioaccumulation Factors									
		Ba_{beef} (day/kg FW)	Source	$Ba_{chicken}$ (day/kg FW)	Source	Ba_{egg} (day/kg FW)	Source	Ba_{milk} (day/kg FW)	Source	Ba_{pork} (day/kg FW)	Source
N-Nitroso-N,N-dimethylamine	62-75-9	6.76E-09	e	5.34E-09	e	2.14E-06	e	2.14E-09	e	8.18E-09	e
o-Anisidine	90-04-0	3.80E-07	e	3.00E-07	e	1.20E-04	e	1.20E-07	e	4.60E-07	e
Oxalic acid	144-62-7	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Phthalic anhydride	85-44-9	6.28E-09	c	4.96E-09	c	1.99E-06	c	1.99E-09	c	7.60E-09	c
p-Phthalic acid	100-21-0	2.51E-06	e	1.98E-06	e	7.94E-04	e	7.94E-07	e	3.04E-06	e
Pyridine	110-86-1	1.18E-07	c	9.28E-08	c	3.72E-05	c	3.72E-08	c	1.42E-07	c
Quinoline	91-22-5	2.69E-06	e	2.12E-06	e	8.51E-04	e	8.51E-07	e	3.26E-06	e
Quinone	106-51-4	3.98E-08	e	3.14E-08	e	1.26E-05	e	1.26E-08	e	4.82E-08	e
Safrole	94-59-7	1.15E-05	c	9.06E-06	c	3.63E-03	c	3.63E-06	c	1.39E-05	c
Tetrahydrofuran	109-99-9	7.03E-08	c	5.55E-08	c	2.22E-05	c	2.22E-08	c	8.51E-08	c
Other Heavy Semivolatile Compounds (MW>200 g/mole)											
1,2,4,5-Tetrachlorobenzene	95-94-3	1.10E-03	c	8.66E-04	c	3.47E-01	c	3.47E-04	c	1.33E-03	c
1,3,5-Trinitrobenzene	99-35-4	3.80E-07	c	3.00E-07	c	1.20E-04	c	1.20E-07	c	4.60E-07	c
2,6-Bis(tert-butyl)-4-methylphenol	128-37-0	3.72E-04	e	2.93E-04	e	1.17E-01	e	1.17E-04	e	4.50E-04	e
2-Cyclohexyl-4,6-dinitrophenol	131-89-5	8.71E-04	e	6.88E-04	e	2.75E-01	e	2.75E-04	e	1.05E-03	e
2-sec-Butyl-4,6-dinitrophenol	88-85-7	9.12E-05	e	7.20E-05	e	2.88E-02	e	2.88E-05	e	1.10E-04	e
3,3'-Dichlorobenzidine	91-94-1	9.44E-05	c	7.45E-05	c	2.99E-02	c	2.99E-05	c	1.14E-04	c
3,3'-Dimethoxybenzidine	119-90-4	1.62E-06	c	1.28E-06	c	5.13E-04	c	5.13E-07	c	1.96E-06	c
4-Bromophenylphenyl ether	101-55-3	2.76E-03	c	2.18E-03	c	8.74E-01	c	8.74E-04	c	3.34E-03	c
Ammonium perfluorooctanoate	3825-26-1	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Azobenzene	103-33-3	1.66E-04	e	1.31E-04	e	5.25E-02	e	5.25E-05	e	2.01E-04	e
Bis(3-tert-butyl-4-hydroxy-6-methyl-phenyl)sulfide	96-69-5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Captan	133-06-2	5.62E-06	e	4.44E-06	e	1.78E-03	e	1.78E-06	e	6.81E-06	e
Chlorobenzilate	510-15-6	6.03E-04	c	4.76E-04	c	1.91E-01	c	1.91E-04	c	7.29E-04	c
Dibutylphosphate	107-66-4	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dimethyl aminoazobenzene	60-11-7	9.55E-04	e	7.54E-04	e	3.02E-01	e	3.02E-04	e	1.16E-03	e
Hexachlorobenzene	118-74-1	7.99E-03	c	6.31E-03	c	2.53E+00	c	2.53E-03	c	9.68E-03	c
Hexachlorobutadiene	87-68-3	1.35E-03	c	1.07E-03	c	4.27E-01	c	4.28E-04	c	1.64E-03	c
Hexachlorocyclopentadiene	77-47-4	2.03E-03	c	1.60E-03	c	6.41E-01	c	6.41E-04	c	2.45E-03	c

Table B1-1 Chemical-Specific Parameters for Organic COPCs

Chemical of Potential Concern	CAS Registry Number	Bioconcentration/Bioaccumulation Factors						Half-life	
		BAF_{fish} (L/kg FW)	Source	BCF_{fish} (L/kg FW)	Source	$BSAF_{fish}$ (unitless)	Source	$t_{1/2}$ (days)	Source
N-Nitroso-N,N-dimethylamine	62-75-9	NA	NA	2.17E-01	e	NA	NA	1.80E+02	d
o-Anisidine	90-04-0	NA	NA	4.64E+00	e	NA	NA	1.80E+02	d
Oxalic acid	144-62-7	NA	NA	NA	NA	NA	NA	NA	NA
Phthalic anhydride	85-44-9	NA	NA	2.05E-01	c	NA	NA	NA	NA
p-Phthalic acid	100-21-0	NA	NA	1.95E+01	e	NA	NA	7.00E+00	d
Pyridine	110-86-1	NA	NA	1.90E+00	c	NA	NA	NA	NA
Quinoline	91-22-5	NA	NA	2.05E+01	e	NA	NA	1.00E+01	d
Quinone	106-51-4	NA	NA	8.36E-01	e	NA	NA	5.00E+00	d
Safrole	94-59-7	NA	NA	6.19E+01	c	NA	NA	NA	NA
Tetrahydrofuran	109-99-9	NA	NA	1.29E+00	c	NA	NA	NA	NA
Other Heavy Semivolatile Compounds (MW>200 g/mole)									
1,2,4,5-Tetrachlorobenzene	95-94-3	4.30E+03	c	NA	NA	NA	NA	NA	NA
1,3,5-Trinitrobenzene	99-35-4	NA	NA	4.64E+00	c	NA	NA	NA	NA
2,6-Bis(tert-butyl)-4-methylphenol	128-37-0	NA	NA	NA	NA	NA	NA	NA	NA
2-Cyclohexyl-4,6-dinitrophenol	131-89-5	2.97E+02	m	NA	NA	NA	NA	NA	NA
2-sec-Butyl-4,6-dinitrophenol	88-85-7	NA	NA	2.99E+02	e	NA	NA	1.23E+02	d
3,3'-Dichlorobenzidine	91-94-1	NA	NA	3.07E+02	c	NA	NA	NA	NA
3,3'-Dimethoxybenzidine	119-90-4	NA	NA	1.40E+01	c	NA	NA	NA	NA
4-Bromophenylphenyl ether	101-55-3	1.46E+04	c	NA	NA	NA	NA	NA	NA
Ammonium perfluorooctanoate	3825-26-1	NA	NA	NA	NA	NA	NA	NA	NA
Azobenzene	103-33-3	NA	NA	4.71E+02	e	NA	NA	NA	NA
Bis(3-tert-butyl-4-hydroxy-6-methyl-phenyl)sulfide	96-69-5	NA	NA	NA	NA	NA	NA	NA	NA
Captan	133-06-2	NA	NA	3.60E+01	e	NA	NA	6.00E+01	d
Chlorobenzilate	510-15-6	2.03E+03	c	NA	NA	NA	NA	NA	NA
Dibutylphosphate	107-66-4	NA	NA	NA	NA	NA	NA	NA	NA
Dimethyl aminoazobenzene	60-11-7	NA	NA	NA	NA	NA	NA	2.80E+01	d
Hexachlorobenzene	118-74-1	2.16E+03	s	NA	NA	NA	NA	NA	NA
Hexachlorobutadiene	87-68-3	1.92E+03	s	NA	NA	NA	NA	NA	NA
Hexachlorocyclopentadiene	77-47-4	5.25E+02	c	NA	NA	NA	NA	NA	NA

Table B1-1 Chemical-Specific Parameters for Organic COPCs

Chemical of Potential Concern	CAS Registry Number	Soil Loss Mechanisms [g]											
		k_{decay} (year)$^{-1}$	Source	ks_e (year)$^{-1}$			Source	ks_g (year)$^{-1}$	Source	ks_l (year)$^{-1}$			Source
				1 cm	15 cm	20 cm				1 cm	15 cm	20 cm	
N-Nitroso-N,N-dimethylamine	62-75-9	0.0E+00	NA	3.77E-03	2.51E-04	1.88E-04	e	1.41E+00	e	6.01E+00	4.01E-01	3.00E-01	e
o-Anisidine	90-04-0	0.0E+00	NA	2.29E-03	1.53E-04	1.15E-04	e	1.41E+00	e	1.19E+01	7.90E-01	5.93E-01	e
Oxalic acid	144-62-7	0.0E+00	NA	0.0E+00	0.0E+00	0.0E+00	NA	0.0E+00	NA	0.0E+00	0.0E+00	0.0E+00	NA
Phthalic anhydride	85-44-9	0.0E+00	NA	7.12E-05	4.74E-06	3.56E-06	e	1.35E+04	c	2.07E+01	1.38E+00	1.03E+00	e
p-Phthalic acid	100-21-0	0.0E+00	NA	4.35E-03	2.90E-04	2.17E-04	e	3.61E+01	e	3.70E+00	2.47E-01	1.85E-01	e
Pyridine	110-86-1	0.0E+00	NA	1.24E-03	8.27E-05	6.20E-05	e	3.61E+01	c	1.60E+01	1.07E+00	8.01E-01	e
Quinoline	91-22-5	0.0E+00	NA	5.24E-03	3.49E-04	2.62E-04	e	2.53E+01	e	1.74E-01	1.16E-02	8.69E-03	e
Quinone	106-51-4	0.0E+00	NA	6.15E-04	4.10E-05	3.08E-05	e	5.06E+01	e	1.85E+01	1.23E+00	9.25E-01	e
Safrole	94-59-7	0.0E+00	NA	4.84E-03	3.23E-04	2.42E-04	e	9.03E+00	c	1.76E+00	1.17E-01	8.78E-02	e
Tetrahydrofuran	109-99-9	0.0E+00	NA	9.00E-04	6.00E-05	4.50E-05	e	4.43E+01	c	1.74E+01	1.16E+00	8.68E-01	e
Other Heavy Semivolatile Compounds (MW>200 g/mole)													
1,2,4,5-Tetrachlorobenzene	95-94-3	0.0E+00	NA	5.27E-03	3.51E-04	2.64E-04	e	1.41E+00	c	5.45E-02	3.64E-03	2.73E-03	e
1,3,5-Trinitrobenzene	99-35-4	0.0E+00	NA	2.29E-03	1.53E-04	1.15E-04	e	0.0E+00	NA	1.18E+01	7.90E-01	5.92E-01	e
2,6-Bis(tert-butyl)-4-methylphenol	128-37-0	0.0E+00	NA	5.25E-03	3.50E-04	2.63E-04	e	0.0E+00	NA	1.26E-01	8.43E-03	6.32E-03	e
2-Cyclohexyl-4,6-dinitrophenol	131-89-5	0.0E+00	NA	5.27E-03	3.51E-04	2.63E-04	e	0.0E+00	NA	6.52E-02	4.35E-03	3.26E-03	e
2-sec-Butyl-4,6-dinitrophenol	88-85-7	0.0E+00	NA	5.26E-03	3.51E-04	2.63E-04	e	2.06E+00	e	9.05E-02	6.03E-03	4.52E-03	e
3,3'-Dichlorobenzidine	91-94-1	0.0E+00	NA	5.19E-03	3.46E-04	2.60E-04	e	1.41E+00	c	3.64E-01	2.42E-02	1.82E-02	e
3,3'-Dimethoxybenzidine	119-90-4	0.0E+00	NA	3.72E-03	2.48E-04	1.86E-04	e	1.41E+00	c	6.21E+00	4.14E-01	3.10E-01	e
4-Bromophenylphenyl ether	101-55-3	0.0E+00	NA	5.28E-03	3.52E-04	2.64E-04	e	0.00E+00	NA	2.66E-02	1.77E-03	1.33E-03	e
Ammonium perfluorooctanoate	3825-26-1	0.0E+00	NA	0.0E+00	0.0E+00	0.0E+00	NA	0.00E+00	NA	0.0E+00	0.0E+00	0.0E+00	NA
Azobenzene	103-33-3	0.0E+00	NA	5.24E-03	3.50E-04	2.62E-04	e	0.00E+00	NA	1.64E-01	1.09E-02	8.18E-03	e
Bis(3-tert-butyl-4-hydroxy-6-methyl-phenyl)sulfide	96-69-5	0.0E+00	NA	0.0E+00	0.0E+00	0.0E+00	NA	0.00E+00	NA	0.0E+00	0.0E+00	0.0E+00	NA
Captan	133-06-2	0.0E+00	NA	4.91E-03	3.27E-04	2.45E-04	e	4.22E+00	e	1.50E+00	9.99E-02	7.49E-02	e
Chlorobenzilate	510-15-6	0.0E+00	NA	5.26E-03	3.51E-04	2.63E-04	e	7.23E+00	c	8.69E-02	5.79E-03	4.35E-03	e
Dibutylphosphate	107-66-4	0.0E+00	NA	0.0E+00	0.0E+00	0.0E+00	NA	0.00E+00	NA	0.0E+00	0.0E+00	0.0E+00	NA
Dimethyl aminoazobenzene	60-11-7	0.0E+00	NA	5.27E-03	3.51E-04	2.63E-04	e	9.03E+00	e	6.07E-02	4.05E-03	3.04E-03	e
Hexachlorobenzene	118-74-1	0.0E+00	NA	5.28E-03	3.52E-04	2.64E-04	e	1.21E-01	c	4.02E-03	2.68E-04	2.01E-04	e
Hexachlorobutadiene	87-68-3	0.0E+00	NA	5.27E-03	3.52E-04	2.64E-04	e	1.41E+00	c	4.63E-02	3.09E-03	2.31E-03	e
Hexachlorocyclopentadiene	77-47-4	0.0E+00	NA	5.28E-03	3.52E-04	2.64E-04	e	9.03E+00	c	3.38E-02	2.25E-03	1.69E-03	e

Table B1-1 Chemical-Specific Parameters for Organic COPCs

Chemical of Potential Concern	CAS Registry Number	Soil Loss Mechanisms [g]								Kp (cm/hr)	Source
		ks_r $(year)^{-1}$			Source	ks_v $(year)^{-1}$			Source		
		1 cm	15 cm	20 cm		1 cm	15 cm	20 cm			
N-Nitroso-N,N-dimethylamine	62-75-9	3.59E+00	2.39E-01	1.79E-01	e	1.64E+02	7.30E-01	4.10E-01	f	2.50E-04	ab
o-Anisidine	90-04-0	7.08E+00	4.72E-01	3.54E-01	e	0.00E+00	0.00E+00	0.00E+00	NA	1.50E-03	ab
Oxalic acid	144-62-7	0.0E+00	0.0E+00	0.0E+00	NA	0.0E+00	0.0E+00	0.0E+00	NA	NA	NA
Phthalic anhydride	85-44-9	1.23E+01	8.22E-01	6.17E-01	e	3.71E+01	1.65E-01	9.27E-02	f	9.27E-05	aa
p-Phthalic acid	100-21-0	2.21E+00	1.47E-01	1.11E-01	e	6.47E-06	2.88E-08	1.62E-08	f	4.07E-03	aa
Pyridine	110-86-1	9.57E+00	6.38E-01	4.78E-01	e	4.91E+06	2.18E+04	1.23E+04	f	1.61E-03	aa
Quinoline	91-22-5	1.04E-01	6.92E-03	5.19E-03	e	1.52E+00	6.75E-03	3.80E-03	f	6.87E-03	aa
Quinone	106-51-4	1.10E+01	7.36E-01	5.52E-01	e	0.0E+00	0.0E+00	0.0E+00	NA	5.35E-04	aa
Safrole	94-59-7	1.05E+00	6.99E-02	5.24E-02	e	8.83E+01	3.92E-01	2.21E-01	f	1.10E-02	ab
Tetrahydrofuran	109-99-9	1.04E+01	6.91E-01	5.19E-01	e	1.96E+04	8.71E+01	4.90E+01	f	1.20E-03	ab
Other Heavy Semivolatile Compounds (MW>200 g/mole)											
1,2,4,5-Tetrachlorobenzene	95-94-3	3.26E-02	2.17E-03	1.63E-03	e	1.30E+02	5.77E-01	3.24E-01	f	1.26E-01	aa
1,3,5-Trinitrobenzene	99-35-4	7.07E+00	4.72E-01	3.54E-01	e	6.40E+00	2.84E-02	1.60E-02	f	6.26E-04	aa
2,6-Bis(tert-butyl)-4-methylphenol	128-37-0	7.55E-02	5.03E-03	3.77E-03	e	2.60E+00	1.15E-02	6.49E-03	f	5.75E-02	aa
2-Cyclohexyl-4,6-dinitrophenol	131-89-5	3.89E-02	2.60E-03	1.95E-03	e	9.65E-06	4.29E-08	2.41E-08	f	5.63E-02	aa
2-sec-Butyl-4,6-dinitrophenol	88-85-7	5.40E-02	3.60E-03	2.70E-03	e	1.94E-01	8.60E-04	4.84E-04	f	1.74E-02	aa
3,3'-Dichlorobenzidine	91-94-1	2.17E-01	1.45E-02	1.09E-02	e	1.67E-02	7.44E-05	4.18E-05	f	1.30E-02	ab
3,3'-Dimethoxybenzidine	119-90-4	3.71E+00	2.47E-01	1.85E-01	e	6.72E-03	2.99E-05	1.68E-05	f	9.30E-04	ab
4-Bromophenylphenyl ether	101-55-3	1.59E-02	1.06E-03	7.94E-04	e	5.86E+00	2.60E-02	1.46E-02	f	1.52E-01	aa
Ammonium perfluorooctanoate	3825-26-1	0.0E+00	0.0E+00	0.0E+00	NA	0.0E+00	0.0E+00	0.0E+00	NA	NA	NA
Azobenzene	103-33-3	9.76E-02	6.51E-03	4.88E-03	e	6.65E+00	2.96E-02	1.66E-02	f	5.48E-02	aa
Bis(3-tert-butyl-4-hydroxy-6-methyl-phenyl)sulfide	96-69-5	0.0E+00	0.0E+00	0.0E+00	NA	0.0E+00	0.0E+00	0.0E+00	NA	NA	NA
Captan	133-06-2	8.95E-01	5.97E-02	4.47E-02	e	1.65E+01	7.35E-02	4.13E-02	f	1.20E-03	ab
Chlorobenzilate	510-15-6	5.19E-02	3.46E-03	2.59E-03	e	9.94E-03	4.42E-05	2.48E-05	f	2.06E-02	aa
Dibutylphosphate	107-66-4	0.0E+00	0.0E+00	0.0E+00	NA	0.0E+00	0.0E+00	0.0E+00	NA	NA	NA
Dimethyl aminoazobenzene	60-11-7	3.63E-02	2.42E-03	1.81E-03	e	0.0E+00	0.0E+00	0.0E+00	NA	9.50E-02	ab
Hexachlorobenzene	118-74-1	2.40E-03	1.60E-04	1.20E-04	e	2.89E+00	1.29E-02	7.23E-03	f	1.30E-01	ab
Hexachlorobutadiene	87-68-3	2.76E-02	1.84E-03	1.38E-03	e	1.83E+03	8.13E+00	4.57E+00	f	8.10E-02	ab
Hexachlorocyclopentadiene	77-47-4	2.02E-02	1.35E-03	1.01E-03	e	8.94E+02	3.97E+00	2.23E+00	f	9.12E-02	aa

Table B1-1 Chemical-Specific Parameters for Organic COPCs

Chemical of Potential Concern	CAS Registry Number	Fraction		MW	pH	Henry's Constant			Diffusivity			
		F_v (unitless)	Source	(g/mol)		H-pub [x] (various units)	Source	H-used [x] (atm-m^3/mol)	D_a (cm^2/s)	Source	D_w (cm^2/s)	Source
Hexachloroethane	67-72-1	0 or 1	b	236.74	NA	3.60E-03	c	3.60E-03	1.77E-02	c	8.88E-06	c
Hexachlorophene	70-30-4	0 or 1	b	406.92	NA	4.88E-10	c	4.88E-10	3.46E-02	c	4.01E-06	c
Hexamethylene-1,5-diisocyanate	822-06-0	0 or 1	b	168.22	NA	1.96E-03	m	4.79E-05	3.80E-02	j	7.17E-06	j
Mirex	2385-85-5	0 or 1	b	545.55	NA	5.32E+01	i	5.27E-04	2.85E-02	e	3.30E-06	e
Nitrofen	1836-75-5	0 or 1	b	284.1	NA	1.04E-05	k	2.55E-07	4.40E-02	e	5.09E-06	e
Pentachlorobenzene	608-93-5	0 or 1	b	250.34	NA	2.43E-02	c	2.43E-02	1.86E-02	c	7.34E-06	c
Pentachloronitrobenzene	82-68-8	0 or 1	b	295.36	NA	2.86E-02	c	2.86E-02	1.87E-02	c	5.00E-06	c
Pentachlorophenol	87-86-5	0 or 1	b	266.35	7	1.41E-05	c	1.41E-05	1.56E-02	c	8.01E-06	c
Picric acid	88-89-1	0 or 1	b	229.11	NA	3.79E-13	l	3.79E-13	5.07E-02	e	5.88E-06	e
Pronamide	23950-58-5	0 or 1	b	256.13	NA	9.05E-06	c	9.05E-06	4.71E-02	c	5.45E-06	c
Strychnine	57-24-9	0 or 1	b	334.4	NA	4.90E-13	c	4.90E-13	1.38E-02	c	5.58E-06	c
Terphenyls	26140-60-3	0 or 1	b	230.31	NA	1.30E-03	k	3.17E-05	5.06E-02	e	5.86E-06	e
Tributyl phosphate	126-73-8	0 or 1	b	266.32	NA	1.50E-07	l	1.50E-07	4.59E-02	e	5.31E-06	e
Trifluralin	1582-09-8	0 or 1	b	335.29	NA	4.03E+00	i	3.99E-05	1.49E-02	j	5.04E-06	j
Triphenylamine	603-34-9	0 or 1	b	245.32	NA	2.21E-04	k	5.40E-06	4.85E-02	e	5.61E-06	e
Herbicides and Organochlorinated Pesticides												
2,4,5-T	93-76-5	0 or 1	b	255.48	NA	8.79E-04	i	8.70E-09	1.92E-02	j	6.70E-06	j
2,4-D and esters	94-75-7	0 or 1	b	221.04	NA	1.38E-05	i	1.37E-10	2.31E-02	j	7.31E-06	j
4,4'-DDD	72-54-8	0 or 1	b	320.05	NA	4.98E-06	c	4.98E-06	1.69E-02	c	4.76E-06	c
4,4'-DDE	72-55-9	0 or 1	b	319.03	NA	1.24E-04	c	1.24E-04	1.70E-02	c	4.78E-06	c
4,4'-DDT	50-29-3	0 or 1	b	354.5	NA	5.37E-05	c	5.37E-05	1.48E-02	c	4.48E-06	c
Aldrin	309-00-2	0 or 1	b	364.93	NA	1.02E-04	h	1.02E-04	1.43E-02	c	4.40E-06	c
alpha-BHC	319-84-6	0 or 1	b	290	NA	6.78E-06	c	6.78E-06	1.91E-02	c	5.04E-06	c
beta-BHC	319-85-7	0 or 1	b	290.83	NA	3.46E-07	c	3.46E-07	1.90E-02	c	5.40E-06	c
Chlordane	57-74-9	0 or 1	b	409.8	NA	2.64E-05	c	2.64E-05	1.18E-02	c	4.37E-06	c
delta-BHC	319-86-8	0 or 1	b	290.85	NA	8.25E-02	i	8.17E-07	4.33E-02	e	5.01E-06	e
Dieldrin	60-57-1	0 or 1	b	380.93	NA	2.66E-06	h	2.66E-06	1.36E-02	c	4.29E-06	c
Endothall	145-73-3	0 or 1	b	186.16	NA	1.57E-14	m	3.84E-16	5.83E-02	e	6.75E-06	e
Endrin	72-20-8	0 or 1	b	380.93	NA	1.19E-06	c	1.19E-06	1.07E-02	c	5.76E-06	c

Table B1-1 Chemical-Specific Parameters for Organic COPCs

Chemical of Potential Concern	CAS Registry Number	Octanol / Water Partitioning Coefficients						Partitioning Coefficients (Kd)			
		K_{oc}-pub [y] (various units)	Source	K_{oc}-used [z] (mL/g)	K_{ow}-pub [y] (various units)	Source	K_{ow}-used [z] (unitless)	Kd_{bs} (L/kg)	Source	Kd_s (mL/g)	Source
Hexachloroethane	67-72-1	1.82E+03	h	1.82E+03	9.66E+03	c	9.66E+03	7.27E+01	c	1.82E+01	c
Hexachlorophene	70-30-4	1.08E+06	c	1.08E+06	3.47E+07	c	3.47E+07	4.31E+04	c	1.08E+04	c
Hexamethylene-1,5-diisocyanate	822-06-0	5.86E+03	m	5.86E+03	3.20E+00	m	1.58E+03	2.35E+02	e	5.86E+01	e
Mirex	2385-85-5	6.00E+00	i	1.00E+06	6.89E+00	i	7.76E+06	4.00E+04	e	1.00E+04	e
Nitrofen	1836-75-5	NA	e	2.91E+04	5.53E+00	l	3.39E+05	1.17E+03	e	2.91E+02	e
Pentachlorobenzene	608-93-5	3.21E+04	c	3.21E+04	1.22E+05	c	1.22E+05	1.29E+03	c	3.21E+02	c
Pentachloronitrobenzene	82-68-8	5.89E+03	c	5.89E+03	4.37E+04	c	4.37E+04	2.36E+02	c	5.89E+01	c
Pentachlorophenol	87-86-5	5.05E+02	c	5.05E+02	1.20E+05	c	1.20E+05	2.02E+01	c	5.05E+00	c
Picric acid	88-89-1	NA	e	5.43E+01	2.03E+00	l	1.07E+02	2.17E+00	e	5.43E-01	e
Pronamide	23950-58-5	7.74E+02	c	7.74E+02	3.24E+03	c	3.24E+03	3.10E+01	c	7.74E+00	c
Strychnine	57-24-9	4.53E+01	h	4.53E+01	8.51E+01	c	8.51E+01	1.81E+00	c	4.53E-01	c
Terphenyls	26140-60-3	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Tributyl phosphate	126-73-8	NA	e	1.87E+03	4.00E+00	l	1.00E+04	7.47E+01	e	1.87E+01	e
Trifluralin	1582-09-8	3.78E+00	i	6.03E+03	5.34E+00	i	2.19E+05	2.41E+02	e	6.03E+01	e
Triphenylamine	603-34-9	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Herbicides and Organochlorinated Pesticides											
2,4,5-T	93-76-5	1.72E+00	i	5.25E+01	3.36E+00	i	2.29E+03	2.10E+00	e	5.25E-01	e
2,4-D and esters	94-75-7	1.30E+00	i	2.00E+01	2.81E+00	i	6.46E+02	7.98E-01	e	2.00E-01	e
4,4'-DDD	72-54-8	4.58E+04	c	4.58E+04	1.32E+06	c	1.32E+06	1.83E+03	c	4.58E+02	c
4,4'-DDE	72-55-9	8.64E+04	s	8.64E+04	1.80E+06	c	1.80E+06	3.46E+03	c	8.64E+02	h
4,4'-DDT	50-29-3	6.78E+05	c	6.78E+05	1.17E+06	c	1.17E+06	2.71E+04	c	6.78E+03	c
Aldrin	309-00-2	4.87E+04	c	4.87E+04	1.51E+06	c	1.51E+06	1.95E+03	c	4.87E+02	c
alpha-BHC	319-84-6	1.76E+03	c	1.76E+03	6.30E+03	c	6.30E+03	7.05E+01	c	1.76E+01	c
beta-BHC	319-85-7	2.14E+03	c	2.14E+03	6.81E+03	c	6.81E+03	8.56E+01	c	2.14E+01	c
Chlordane	57-74-9	5.13E+04	c	5.13E+04	8.66E+05	c	8.66E+05	2.05E+03	c	5.13E+02	c
delta-BHC	319-86-8	2.82E+00	i	6.61E+02	4.14E+00	i	1.38E+04	2.64E+01	e	6.61E+00	e
Dieldrin	60-57-1	2.55E+04	c	2.55E+04	1.86E+05	c	1.86E+05	1.02E+03	c	2.55E+02	c
Endothall	145-73-3	NA	e	2.97E-01	-8.70E-01	p	1.35E-01	1.19E-02	e	2.97E-03	e
Endrin	72-20-8	1.08E+04	h	1.08E+04	7.79E+04	c	7.79E+04	4.32E+02	c	1.08E+02	c

Table B1-1 Chemical-Specific Parameters for Organic COPCs

Chemical of Potential Concern	CAS Registry Number	Kd		Plant Uptake Factors				
		Kd_{sw} (L/kg)	Source	Br_{ag} (µg/g DW plant)/ (µg/g soil)	Source	Br_{forage} (µg/g DW plant)/ (µg/g soil)	Source	Br_{grain} (µg/g DW plant)/ (µg/g soil) [a]
Hexachloroethane	67-72-1	1.36E+01	c	1.93E-01	c	1.93E-01	c	1.93E-01
Hexachlorophene	70-30-4	8.08E+04	c	1.70E-03	c	1.70E-03	c	1.70E-03
Hexamethylene-1,5-diisocyanate	822-06-0	4.40E+02	e	5.48E-01	e	5.48E-01	e	5.48E-01
Mirex	2385-85-5	7.50E+04	e	4.03E-03	e	4.03E-03	e	4.03E-03
Nitrofen	1836-75-5	2.19E+03	e	2.46E-02	e	2.46E-02	e	2.46E-02
Pentachlorobenzene	608-93-5	2.41E+03	c	4.44E-02	c	4.44E-02	c	4.44E-02
Pentachloronitrobenzene	82-68-8	4.42E+02	c	8.06E-02	c	8.06E-02	c	8.06E-02
Pentachlorophenol	87-86-5	3.79E+01	c	4.48E-02	c	4.48E-02	c	4.48E-02
Picric acid	88-89-1	4.07E+00	e	2.60E+00	e	2.60E+00	e	2.60E+00
Pronamide	23950-58-5	5.81E+01	c	3.62E-01	c	3.62E-01	c	3.62E-01
Strychnine	57-24-9	3.40E+00	c	2.97E+00	c	2.97E+00	c	2.97E+00
Terphenyls	26140-60-3	NA	NA	NA	NA	NA	NA	NA
Tributyl phosphate	126-73-8	1.40E+02	e	1.89E-01	e	1.89E-01	e	1.89E-01
Trifluralin	1582-09-8	4.52E+02	e	3.17E-02	e	3.17E-02	e	3.17E-02
Triphenylamine	603-34-9	NA	NA	NA	NA	NA	NA	NA
Herbicides and Organochlorinated Pesticides								
2,4,5-T	93-76-5	3.94E+00	e	4.43E-01	e	4.43E-01	e	4.43E-01
2,4-D and esters	94-75-7	1.50E+00	e	9.20E-01	e	9.20E-01	e	9.20E-01
4,4'-DDD	72-54-8	3.44E+03	c	1.12E-02	c	1.12E-02	c	1.12E-02
4,4'-DDE	72-55-9	6.48E+03	c	9.37E-03	c	9.37E-03	c	9.37E-03
4,4'-DDT	50-29-3	5.08E+04	c	1.20E-02	c	1.20E-02	c	1.20E-02
Aldrin	309-00-2	3.65E+03	c	1.04E-02	c	1.04E-02	c	1.04E-02
alpha-BHC	319-84-6	1.32E+02	c	2.47E-01	c	2.47E-01	c	2.47E-01
beta-BHC	319-85-7	1.60E+02	c	2.36E-01	c	2.36E-01	c	2.36E-01
Chlordane	57-74-9	3.85E+03	c	1.43E-02	c	1.43E-02	c	1.43E-02
delta-BHC	319-86-8	4.96E+01	e	1.57E-01	e	1.57E-01	e	1.57E-01
Dieldrin	60-57-1	1.91E+03	c	3.49E-02	c	3.49E-02	c	3.49E-02
Endothall	145-73-3	2.23E-02	e	1.23E+02	e	1.23E+02	e	1.23E+02
Endrin	72-20-8	8.11E+02	c	5.76E-02	c	5.76E-02	c	5.76E-02

Table B1-1 Chemical-Specific Parameters for Organic COPCs

Chemical of Potential Concern	CAS Registry Number	Plant Uptake Factors							
		$Br_{rootveg}$ (µg/g DW plant)/ (µg/g soil)	Source	Bv_{ag} (µg/g DW plant)/ (µg/g air)	Source	Bv_{forage} (µg/g DW plant)/ (µg/g air)	Source	RCF (µg/g DW plant)/ (µg/mL soil water)	Source
Hexachloroethane	67-72-1	1.53E+01	c	2.72E-01	c	2.72E-01	c	2.78E+02	c
Hexachlorophene	70-30-4	1.38E+00	c	1.23E+10	c	1.23E+10	c	1.49E+05	c
Hexamethylene-1,5-diisocyanate	822-06-0	1.26E+00	e	3.00E+00	e	3.00E+00	e	7.39E+01	e
Mirex	2385-85-5	4.69E+00	e	2.32E+03	e	2.32E+03	e	4.69E+04	e
Nitrofen	1836-75-5	1.45E+01	e	1.71E+05	e	1.71E+05	e	4.22E+03	e
Pentachlorobenzene	608-93-5	5.99E+00	c	6.04E-01	c	6.04E-01	c	1.93E+03	c
Pentachloronitrobenzene	82-68-8	1.49E+01	c	1.71E-01	c	1.71E-01	c	8.75E+02	c
Pentachlorophenol	87-86-5	3.77E+02	c	1.02E+03	c	1.02E+03	c	1.90E+03	c
Picric acid	88-89-1	2.73E+01	e	2.15E+07	e	2.15E+07	e	1.48E+01	e
Pronamide	23950-58-5	1.59E+01	c	3.38E+01	c	3.38E+01	c	1.23E+02	c
Strychnine	57-24-9	2.96E+01	c	1.29E+07	c	1.29E+07	c	1.34E+01	c
Terphenyls	26140-60-3	NA	NA	NA	NA	NA	NA	NA	NA
Tributyl phosphate	126-73-8	1.53E+01	e	6.80E+03	e	6.80E+03	e	2.86E+02	e
Trifluralin	1582-09-8	5.00E+01	e	6.84E+02	e	6.84E+02	e	3.01E+03	e
Triphenylamine	603-34-9	NA	NA	NA	NA	NA	NA	NA	NA
Herbicides and Organochlorinated Pesticides									
2,4,5-T	93-76-5	1.83E+02	e	2.44E+04	e	2.44E+04	e	9.61E+01	e
2,4-D and esters	94-75-7	2.01E+02	e	4.03E+05	e	4.03E+05	e	4.02E+01	e
4,4'-DDD	72-54-8	2.62E+01	c	3.70E+04	c	3.70E+04	c	1.20E+04	c
4,4'-DDE	72-55-9	1.77E+01	c	2.08E+03	c	2.08E+03	c	1.53E+04	c
4,4'-DDT	50-29-3	1.62E+00	c	3.03E+03	c	3.03E+03	c	1.10E+04	c
Aldrin	309-00-2	2.73E+01	c	2.08E+03	h	2.08E+03	h	1.33E+04	c
alpha-BHC	319-84-6	1.15E+01	c	9.17E+01	c	9.17E+01	c	2.02E+02	c
beta-BHC	319-85-7	1.00E+01	c	1.95E+03	c	1.95E+03	c	2.14E+02	c
Chlordane	57-74-9	1.69E+01	c	4.46E+03	c	4.46E+03	c	8.67E+03	c
delta-BHC	319-86-8	5.51E+01	e	1.76E+03	e	1.76E+03	e	3.64E+02	e
Dieldrin	60-57-1	1.04E+01	c	8.56E+03	h	8.56E+03	h	2.66E+03	c
Endothall	145-73-3	2.14E+03	e	1.73E+07	e	1.73E+07	e	6.36E+00	e
Endrin	72-20-8	1.26E+01	c	7.62E+03	c	7.62E+03	c	1.36E+03	c

Table B1-1 Chemical-Specific Parameters for Organic COPCs

Chemical of Potential Concern	CAS Registry Number	Bioconcentration/Bioaccumulation Factors									
		Ba_{beef} (day/kg FW)	Source	$Ba_{chicken}$ (day/kg FW)	Source	Ba_{egg} (day/kg FW)	Source	Ba_{milk} (day/kg FW)	Source	Ba_{pork} (day/kg FW)	Source
Hexachloroethane	67-72-1	2.43E-04	c	1.92E-04	c	7.67E-02	c	7.67E-05	c	2.94E-04	c
Hexachlorophene	70-30-4	8.71E-01	c	6.88E-01	c	2.75E+02	c	2.75E-01	c	1.05E+00	c
Hexamethylene-1,5-diisocyanate	822-06-0	3.98E-05	e	3.14E-05	e	1.26E-02	e	1.26E-05	e	4.82E-05	e
Mirex	2385-85-5	1.95E-01	e	1.54E-01	e	6.17E+01	e	6.17E-02	e	2.36E-01	e
Nitrofen	1836-75-5	8.51E-03	e	6.72E-03	e	2.69E+00	e	2.69E-03	e	1.03E-02	e
Pentachlorobenzene	608-93-5	3.07E-03	c	2.43E-03	c	9.72E-01	c	9.72E-04	c	3.72E-03	c
Pentachloronitrobenzene	82-68-8	1.10E-03	c	8.66E-04	c	3.47E-01	c	3.47E-04	c	1.33E-03	c
Pentachlorophenol	87-86-5	3.02E-03	c	2.39E-03	c	9.55E-01	c	9.55E-04	c	3.66E-03	c
Picric acid	88-89-1	2.69E-06	e	2.12E-06	e	8.51E-04	e	8.51E-07	e	3.26E-06	e
Pronamide	23950-58-5	8.13E-05	c	6.42E-05	c	2.57E-02	c	2.57E-05	c	9.84E-05	c
Strychnine	57-24-9	2.14E-06	c	1.69E-06	c	6.76E-04	c	6.76E-07	c	2.59E-06	c
Terphenyls	26140-60-3	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Tributyl phosphate	126-73-8	2.51E-04	e	1.98E-04	e	7.94E-02	e	7.94E-05	e	3.04E-04	e
Trifluralin	1582-09-8	5.50E-03	e	4.34E-03	e	1.74E+00	e	1.74E-03	e	6.65E-03	e
Triphenylamine	603-34-9	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Herbicides and Organochlorinated Pesticides											
2,4,5-T	93-76-5	5.75E-05	e	4.54E-05	e	1.82E-02	e	1.82E-05	e	6.97E-05	e
2,4-D and esters	94-75-7	1.62E-05	e	1.28E-05	e	5.13E-03	e	5.13E-06	e	1.96E-05	e
4,4'-DDD	72-54-8	3.31E-02	c	2.62E-02	c	1.05E+01	c	1.05E-02	c	4.01E-02	c
4,4'-DDE	72-55-9	4.53E-02	c	3.58E-02	c	1.43E+01	c	1.43E-02	c	5.49E-02	c
4,4'-DDT	50-29-3	2.95E-02	c	2.33E-02	c	9.33E+00	c	9.33E-03	c	3.57E-02	c
Aldrin	309-00-2	3.79E-02	c	2.99E-02	c	1.20E+01	c	1.20E-02	c	4.59E-02	c
alpha-BHC	319-84-6	1.58E-04	c	1.25E-04	c	5.00E-02	c	5.00E-05	c	1.92E-04	c
beta-BHC	319-85-7	1.71E-04	c	1.35E-04	c	5.41E-02	c	5.41E-05	c	2.07E-04	c
Chlordane	57-74-9	2.17E-02	c	1.72E-02	c	6.88E+00	c	6.88E-03	c	2.63E-02	c
delta-BHC	319-86-8	3.47E-04	e	2.74E-04	e	1.10E-01	e	1.10E-04	e	4.20E-04	e
Dieldrin	60-57-1	4.67E-03	c	3.68E-03	c	1.48E+00	c	1.48E-03	c	5.65E-03	c
Endothall	145-73-3	3.39E-09	e	2.68E-09	e	1.07E-06	e	1.07E-09	e	4.10E-09	e
Endrin	72-20-8	1.96E-03	c	1.55E-03	c	6.19E-01	c	6.19E-04	c	2.37E-03	c

Table B1-1 Chemical-Specific Parameters for Organic COPCs

Chemical of Potential Concern	CAS Registry Number	Bioconcentration/Bioaccumulation Factors						Half-life	
		BAF_{fish} (L/kg FW)	Source	BCF_{fish} (L/kg FW)	Source	$BSAF_{fish}$ (unitless)	Source	$t_{1/2}$ (days)	Source
Hexachloroethane	67-72-1	NA	NA	6.29E+02	c	NA	NA	NA	NA
Hexachlorophene	70-30-4	4.66E+03	c	NA	NA	NA	NA	NA	NA
Hexamethylene-1,5-diisocyanate	822-06-0	NA	NA	1.59E+02	e	NA	NA	NA	NA
Mirex	2385-85-5	2.19E+05	r	NA	NA	NA	NA	NA	NA
Nitrofen	1836-75-5	NA	NA	NA	NA	NA	NA	NA	NA
Pentachlorobenzene	608-93-5	4.62E+04	s	NA	NA	NA	NA	NA	NA
Pentachloronitrobenzene	82-68-8	4.65E+02	c	NA	NA	NA	NA	NA	NA
Pentachlorophenol	87-86-5	3.97E+02	c	NA	NA	NA	NA	NA	NA
Picric acid	88-89-1	NA	NA	2.05E+01	e	NA	NA	1.80E+02	d
Pronamide	23950-58-5	NA	NA	2.74E+02	c	NA	NA	NA	NA
Strychnine	57-24-9	NA	NA	1.72E+01	c	NA	NA	NA	NA
Terphenyls	26140-60-3	NA	NA	NA	NA	NA	NA	NA	NA
Tributyl phosphate	126-73-8	NA	NA	6.46E+02	e	NA	NA	NA	NA
Trifluralin	1582-09-8	4.32E+04	r	NA	NA	NA	NA	NA	NA
Triphenylamine	603-34-9	NA	NA	NA	NA	NA	NA	NA	NA
Herbicides and Organochlorinated Pesticides									
2,4,5-T	93-76-5	NA	NA	2.11E+02	e	NA	NA	2.00E+01	d
2,4-D and esters	94-75-7	NA	NA	8.05E+01	e	NA	NA	5.00E+01	d
4,4'-DDD	72-54-8	5.25E+05	c	NA	NA	NA	NA	5.83E+03	d
4,4'-DDE	72-55-9	5.53E+05	c	NA	NA	NA	NA	NA	NA
4,4'-DDT	50-29-3	4.30E+05	c	NA	NA	NA	NA	5.83E+03	d
Aldrin	309-00-2	5.82E+05	c	NA	NA	NA	NA	NA	NA
alpha-BHC	319-84-6	NA	NA	4.54E+02	c	NA	NA	NA	NA
beta-BHC	319-85-7	NA	NA	4.82E+02	c	NA	NA	NA	NA
Chlordane	57-74-9	3.07E+05	s	NA	NA	NA	NA	NA	NA
delta-BHC	319-86-8	3.08E+02	m	NA	NA	NA	NA	1.00E+02	d
Dieldrin	60-57-1	2.86E+04	c	NA	NA	NA	NA	NA	NA
Endothall	145-73-3	NA	NA	1.28E-01	e	NA	NA	NA	NA
Endrin	72-20-8	8.55E+03	c	NA	NA	NA	NA	NA	NA

Table B1-1 Chemical-Specific Parameters for Organic COPCs

Chemical of Potential Concern	CAS Registry Number	Soil Loss Mechanisms [g]											
		k_{decay} $(year)^{-1}$	Source	ks_e $(year)^{-1}$			Source	ks_g $(year)^{-1}$	Source	ks_l $(year)^{-1}$			Source
				1 cm	15 cm	20 cm				1 cm	15 cm	20 cm	
Hexachloroethane	67-72-1	0.0E+00	NA	5.24E-03	3.49E-04	2.62E-04	e	1.41E+00	c	1.75E-01	1.17E-02	8.77E-03	e
Hexachlorophene	70-30-4	0.0E+00	NA	5.28E-03	3.52E-04	2.64E-04	e	7.71E-01	c	2.98E-04	1.99E-05	1.49E-05	e
Hexamethylene-1,5-diisocyanate	822-06-0	0.0E+00	NA	5.27E-03	3.51E-04	2.64E-04	e	0.00E+00	NA	5.48E-02	3.65E-03	2.74E-03	e
Mirex	2385-85-5	0.0E+00	NA	5.28E-03	3.52E-04	2.64E-04	e	0.00E+00	NA	3.22E-04	2.15E-05	1.61E-05	e
Nitrofen	1836-75-5	0.0E+00	NA	5.28E-03	3.52E-04	2.64E-04	e	0.00E+00	NA	1.10E-02	7.37E-04	5.52E-04	e
Pentachlorobenzene	608-93-5	0.0E+00	NA	5.28E-03	3.52E-04	2.64E-04	e	7.33E-01	c	1.00E-02	6.68E-04	5.01E-04	e
Pentachloronitrobenzene	82-68-8	0.0E+00	NA	5.27E-03	3.51E-04	2.64E-04	e	3.62E-01	c	5.45E-02	3.64E-03	2.73E-03	e
Pentachlorophenol	87-86-5	0.0E+00	NA	5.13E-03	3.42E-04	2.56E-04	e	1.42E+00	c	6.19E-01	4.13E-02	3.09E-02	e
Picric acid	88-89-1	0.0E+00	NA	4.12E-03	2.74E-04	2.06E-04	e	1.41E+00	e	4.62E+00	3.08E-01	2.31E-01	e
Pronamide	23950-58-5	0.0E+00	NA	5.18E-03	3.45E-04	2.59E-04	e	0.00E+00	NA	4.08E-01	2.72E-02	2.04E-02	e
Strychnine	57-24-9	0.0E+00	NA	3.94E-03	2.63E-04	1.97E-04	e	9.03E+00	c	5.31E+00	3.54E-01	2.65E-01	e
Terphenyls	26140-60-3	0.0E+00	NA	0.0E+00	0.0E+00	0.0E+00	NA	0.00E+00	NA	0.0E+00	0.0E+00	0.0E+00	NA
Tributyl phosphate	126-73-8	0.0E+00	NA	5.24E-03	3.49E-04	2.62E-04	e	0.0E+00	NA	1.71E-01	1.14E-02	8.56E-03	e
Trifluralin	1582-09-8	0.0E+00	NA	5.27E-03	3.51E-04	2.64E-04	e	0.0E+00	NA	5.33E-02	3.55E-03	2.67E-03	e
Triphenylamine	603-34-9	0.0E+00	NA	0.0E+00	0.0E+00	0.0E+00	NA	0.0E+00	NA	0.0E+00	0.0E+00	0.0E+00	NA
Herbicides and Organochlorinated Pesticides													
2,4,5-T	93-76-5	0.0E+00	NA	4.09E-03	2.72E-04	2.04E-04	e	1.26E+01	e	4.75E+00	3.16E-01	2.37E-01	e
2,4-D and esters	94-75-7	0.0E+00	NA	2.98E-03	1.99E-04	1.49E-04	e	5.06E+00	e	9.11E+00	6.08E-01	4.56E-01	e
4,4'-DDD	72-54-8	0.0E+00	NA	5.28E-03	3.52E-04	2.64E-04	e	4.34E-02	c	7.03E-03	4.69E-04	3.51E-04	e
4,4'-DDE	72-55-9	0.0E+00	NA	5.28E-03	3.52E-04	2.64E-04	e	4.34E-02	c	3.73E-03	2.48E-04	1.86E-04	e
4,4'-DDT	50-29-3	0.0E+00	NA	5.28E-03	3.52E-04	2.64E-04	e	4.34E-02	c	4.75E-04	3.17E-05	2.37E-05	e
Aldrin	309-00-2	0.0E+00	NA	5.28E-03	3.52E-04	2.64E-04	e	4.28E-01	c	6.61E-03	4.41E-04	3.31E-04	e
alpha-BHC	319-84-6	0.0E+00	NA	5.24E-03	3.49E-04	2.62E-04	e	1.87E+00	c	1.81E-01	1.21E-02	9.07E-03	e
beta-BHC	319-85-7	0.0E+00	NA	5.25E-03	3.50E-04	2.62E-04	e	2.04E+00	c	1.49E-01	9.96E-03	7.47E-03	e
Chlordane	57-74-9	0.0E+00	NA	5.28E-03	3.52E-04	2.64E-04	e	1.83E-01	c	6.28E-03	4.18E-04	3.14E-04	e
delta-BHC	319-86-8	0.0E+00	NA	5.16E-03	3.44E-04	2.58E-04	e	2.53E+00	e	4.76E-01	3.18E-02	2.38E-02	e
Dieldrin	60-57-1	0.0E+00	NA	5.28E-03	3.52E-04	2.64E-04	e	2.34E+00	c	1.26E-02	8.41E-04	6.31E-04	e
Endothall	145-73-3	0.0E+00	NA	1.00E-04	6.67E-06	5.00E-06	e	0.0E+00	NA	2.05E+01	1.37E+00	1.03E+00	e
Endrin	72-20-8	0.0E+00	NA	5.28E-03	3.52E-04	2.64E-04	e	3.61E+04	c	2.98E-02	1.99E-03	1.49E-03	e

Table B1-1 Chemical-Specific Parameters for Organic COPCs

Chemical of Potential Concern	CAS Registry Number	Soil Loss Mechanisms [g]								Kp (cm/hr)	Source
		ks_r $(year)^{-1}$			Source	ks_v $(year)^{-1}$			Source		
		1 cm	15 cm	20 cm		1 cm	15 cm	20 cm			
Hexachloroethane	67-72-1	1.05E-01	6.99E-03	5.24E-03	e	1.07E+03	4.78E+00	2.69E+00	f	3.00E-02	ab
Hexachlorophene	70-30-4	1.78E-04	1.19E-05	8.90E-06	e	4.80E-07	2.13E-09	1.20E-09	f	9.40E-01	aa
Hexamethylene-1,5-diisocyanate	822-06-0	3.27E-02	2.18E-03	1.64E-03	e	9.52E+00	4.23E-02	2.38E-02	f	2.52E-02	aa
Mirex	2385-85-5	1.92E-04	1.28E-05	9.62E-06	e	4.60E-01	2.04E-03	1.15E-03	f	5.77E-02	aa
Nitrofen	1836-75-5	6.60E-03	4.40E-04	3.30E-04	e	1.18E-02	5.24E-05	2.95E-05	f	1.90E-01	ab
Pentachlorobenzene	608-93-5	5.99E-03	3.99E-04	2.99E-04	e	4.32E+02	1.92E+00	1.08E+00	f	1.61E-01	aa
Pentachloronitrobenzene	82-68-8	3.26E-02	2.17E-03	1.63E-03	e	2.79E+03	1.24E+01	6.97E+00	f	4.20E-02	ab
Pentachlorophenol	87-86-5	3.70E-01	2.46E-02	1.85E-02	e	1.34E+01	5.94E-02	3.34E-02	f	3.90E-01	ab
Picric acid	88-89-1	2.76E+00	1.84E-01	1.38E-01	e	1.09E-05	4.84E-08	2.72E-08	f	1.89E-03	aa
Pronamide	23950-58-5	2.44E-01	1.62E-02	1.22E-02	e	1.69E+01	7.51E-02	4.23E-02	f	1.31E-02	aa
Strychnine	57-24-9	3.17E+00	2.11E-01	1.58E-01	e	4.58E-06	2.04E-08	1.15E-08	f	4.17E-04	aa
Terphenyls	26140-60-3	0.0E+00	0.0E+00	0.0E+00	NA	0.0E+00	0.0E+00	0.0E+00	NA	NA	NA
Tributyl phosphate	126-73-8	1.02E-01	6.81E-03	5.11E-03	e	1.13E-01	5.03E-04	2.83E-04	f	2.45E-02	aa
Trifluralin	1582-09-8	3.18E-02	2.12E-03	1.59E-03	e	3.03E+00	1.35E-02	7.58E-03	f	7.95E-02	aa
Triphenylamine	603-34-9	0.00E+00	0.00E+00	0.0E+00	NA	0.0E+00	0.0E+00	0.0E+00	NA	NA	NA
Herbicides and Organochlorinated Pesticides											
2,4,5-T	93-76-5	2.83E+00	1.89E-01	1.42E-01	e	9.77E-02	4.34E-04	2.44E-04	f	1.05E-02	aa
2,4-D and esters	94-75-7	5.44E+00	3.63E-01	2.72E-01	e	4.85E-03	2.16E-05	1.21E-05	f	7.00E-03	aa
4,4'-DDD	72-54-8	4.20E-03	2.80E-04	2.10E-04	e	5.64E-02	2.51E-04	1.41E-04	f	1.80E-01	ab
4,4'-DDE	72-55-9	2.23E-03	1.48E-04	1.11E-04	e	7.49E-01	3.33E-03	1.87E-03	f	1.60E-01	ab
4,4'-DDT	50-29-3	2.84E-04	1.89E-05	1.42E-05	e	3.60E-02	1.60E-04	8.99E-05	f	2.70E-01	ab
Aldrin	309-00-2	3.95E-03	2.63E-04	1.97E-04	e	9.19E-01	4.09E-03	2.30E-03	f	1.40E-03	ab
alpha-BHC	319-84-6	1.08E-01	7.22E-03	5.42E-03	e	2.26E+00	1.00E-02	5.65E-03	f	1.32E-02	aa
beta-BHC	319-85-7	8.92E-02	5.95E-03	4.46E-03	e	9.43E-02	4.19E-04	2.36E-04	f	1.38E-02	aa
Chlordane	57-74-9	3.75E-03	2.50E-04	1.87E-04	e	1.86E-01	8.28E-04	4.66E-04	f	3.80E-02	ab
delta-BHC	319-86-8	2.84E-01	1.90E-02	1.42E-02	e	1.64E+00	7.30E-03	4.11E-03	f	2.21E-02	aa
Dieldrin	60-57-1	7.54E-03	5.02E-04	3.77E-04	e	4.35E-02	1.94E-04	1.09E-04	f	1.20E-02	ab
Endothall	145-73-3	1.23E+01	8.18E-01	6.13E-01	e	2.31E-06	1.03E-08	5.78E-09	f	3.75E-05	aa
Endrin	72-20-8	1.78E-02	1.19E-03	8.89E-04	e	3.62E-02	1.61E-04	9.05E-05	f	1.20E-02	ab

Table B1-1 Chemical-Specific Parameters for Organic COPCs

Chemical of Potential Concern	CAS Registry Number	Fraction		MW	pH	Henry's Constant			Diffusivity			
		F_v (unitless)	Source	(g/mol)		H-pub [x] (various units)	Source	H-used [x] (atm-m^3/mol)	D_a (cm^2/s)	Source	D_w (cm^2/s)	Source
gamma-BHC (Lindane)	58-89-9	0 or 1	b	290.83	NA	1.58E-01	i	1.56E-06	4.33E-02	e	5.01E-06	e
Heptachlor	76-44-8	0 or 1	b	373.35	NA	5.87E-06	c	5.87E-06	1.12E-02	c	5.69E-06	c
Isodrin	465-73-6	0 or 1	b	364.91	NA	1.58E-02	k	3.86E-04	3.72E-02	e	4.31E-06	e
Methoxychlor	72-43-5	0 or 1	b	345.65	NA	6.33E-06	c	6.33E-06	1.30E-02	c	5.59E-06	c
Silvex (2,4,5-TP)	93-72-1	0 or 1	b	269.51	NA	3.70E-07	m	9.03E-09	1.94E-02	j	5.83E-06	j
Toxaphene	8001-35-2	0 or 1	b	414	NA	4.56E+01	i	4.51E-04	1.16E-02	j	4.34E-06	j

Table B1-1 Chemical-Specific Parameters for Organic COPCs

Chemical of Potential Concern	CAS Registry Number	Octanol / Water Partitioning Coefficients						Partitioning Coefficients (Kd)			
		K_{oc}-pub [y] (various units)	Source	K_{oc}-used [z] (mL/g)	K_{ow}-pub [y] (various units)	Source	K_{ow}-used [z] (unitless)	Kd_{bs} (L/kg)	Source	Kd_s (mL/g)	Source
gamma-BHC (Lindane)	58-89-9	3.03E+00	i	1.07E+03	3.72E+00	i	5.25E+03	4.29E+01	e	1.07E+01	e
Heptachlor	76-44-8	9.53E+03	c	9.53E+03	1.04E+05	c	1.04E+05	3.81E+02	c	9.53E+01	c
Isodrin	465-73-6	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Methoxychlor	72-43-5	8.00E+04	c	8.00E+04	3.36E+04	c	3.36E+04	3.20E+03	c	8.00E+02	c
Silvex (2,4,5-TP)	93-72-1	8.04E+01	m	8.04E+01	3.80E+00	m	6.31E+03	3.22E+00	e	8.04E-01	e
Toxaphene	8001-35-2	5.00E+00	i	1.00E+05	5.50E+00	i	3.16E+05	4.00E+03	e	1.00E+03	e

Table B1-1 Chemical-Specific Parameters for Organic COPCs

Chemical of Potential Concern	CAS Registry Number	Kd		Plant Uptake Factors				
		Kd_{sw} (L/kg)	Source	Br_{ag} (µg/g DW plant)/ (µg/g soil)	Source	Br_{forage} (µg/g DW plant)/ (µg/g soil)	Source	Br_{grain} (µg/g DW plant)/ (µg/g soil) [a]
gamma-BHC (Lindane)	58-89-9	8.04E+01	e	2.74E-01	e	2.74E-01	e	2.74E-01
Heptachlor	76-44-8	7.15E+02	c	4.89E-02	c	4.89E-02	c	4.89E-02
Isodrin	465-73-6	NA	NA	NA	NA	NA	NA	NA
Methoxychlor	72-43-5	6.00E+03	c	9.38E-02	c	9.38E-02	c	9.38E-02
Silvex (2,4,5-TP)	93-72-1	6.03E+00	e	2.46E-01	e	2.46E-01	e	2.46E-01
Toxaphene	8001-35-2	7.50E+03	e	2.56E-02	e	2.56E-02	e	2.56E-02

Table B1-1 Chemical-Specific Parameters for Organic COPCs

Chemical of Potential Concern	CAS Registry Number	Plant Uptake Factors							
		$Br_{rootveg}$ (µg/g DW plant)/ (µg/g soil)	Source	Bv_{ag} (µg/g DW plant)/ (µg/g air)	Source	Bv_{forage} (µg/g DW plant)/ (µg/g air)	Source	RCF (µg/g DW plant)/ (µg/mL soil water)	Source
gamma-BHC (Lindane)	58-89-9	1.65E+01	e	3.28E+02	e	3.28E+02	e	1.76E+02	e
Heptachlor	76-44-8	1.78E+01	c	2.09E+03	c	2.09E+03	c	1.70E+03	c
Isodrin	465-73-6	NA	NA	NA	NA	NA	NA	NA	NA
Methoxychlor	72-43-5	8.95E-01	c	5.83E+02	c	5.83E+02	c	7.16E+02	c
Silvex (2,4,5-TP)	93-72-1	2.52E+02	e	6.91E+04	e	6.91E+04	e	2.02E+02	e
Toxaphene	8001-35-2	4.00E+00	e	8.94E+01	e	8.94E+01	e	4.00E+03	e

Table B1-1 Chemical-Specific Parameters for Organic COPCs

Chemical of Potential Concern	CAS Registry Number	Bioconcentration/Bioaccumulation Factors									
		Ba_{beef} (day/kg FW)	Source	$Ba_{chicken}$ (day/kg FW)	Source	Ba_{egg} (day/kg FW)	Source	Ba_{milk} (day/kg FW)	Source	Ba_{pork} (day/kg FW)	Source
gamma-BHC (Lindane)	58-89-9	1.32E-04	e	1.04E-04	e	4.17E-02	e	4.17E-05	e	1.60E-04	e
Heptachlor	76-44-8	2.60E-03	c	2.05E-03	c	8.22E-01	c	8.22E-04	c	3.15E-03	c
Isodrin	465-73-6	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Methoxychlor	72-43-5	8.43E-04	c	6.66E-04	c	2.67E-01	c	2.67E-04	c	1.02E-03	c
Silvex (2,4,5-TP)	93-72-1	1.58E-04	e	1.25E-04	e	5.01E-02	e	5.01E-05	e	1.92E-04	e
Toxaphene	8001-35-2	7.94E-03	e	6.27E-03	e	2.51E+00	e	2.51E-03	e	9.62E-03	e

Table B1-1 Chemical-Specific Parameters for Organic COPCs

Chemical of Potential Concern	CAS Registry Number	Bioconcentration/Bioaccumulation Factors						Half-life	
		BAF_{fish} (L/kg FW)	Source	BCF_{fish} (L/kg FW)	Source	$BSAF_{fish}$ (unitless)	Source	$t_{1/2}$ (days)	Source
gamma-BHC (Lindane)	58-89-9	NA	NA	3.96E+02	e	NA	NA	2.40E+02	d
Heptachlor	76-44-8	2.01E+04	s	NA	NA	NA	NA	NA	NA
Isodrin	465-73-6	NA	NA	NA	NA	NA	NA	NA	NA
Methoxychlor	72-43-5	3.16E+03	c	NA	NA	NA	NA	NA	NA
Silvex (2,4,5-TP)	93-72-1	6.06E+02	r	4.55E+02	e	NA	NA	NA	NA
Toxaphene	8001-35-2	8.00E+04	r	NA	NA	NA	NA	NA	NA

Table B1-1 Chemical-Specific Parameters for Organic COPCs

Chemical of Potential Concern	CAS Registry Number	Soil Loss Mechanisms [g]											
		k_{decay} $(year)^{-1}$	Source	ks_e $(year)^{-1}$			Source	ks_g $(year)^{-1}$	Source	ks_l $(year)^{-1}$			Source
				1 cm	15 cm	20 cm				1 cm	15 cm	20 cm	
gamma-BHC (Lindane)	58-89-9	0.0E+00	NA	5.21E-03	3.47E-04	2.60E-04	e	1.05E+00	e	2.96E-01	1.98E-02	1.48E-02	e
Heptachlor	76-44-8	0.0E+00	NA	5.28E-03	3.52E-04	2.64E-04	e	1.41E+00	c	3.37E-02	2.25E-03	1.69E-03	e
Isodrin	465-73-6	0.0E+00	NA	0.0E+00	0.0E+00	0.0E+00	NA	0.0E+00	NA	0.0E+00	0.0E+00	0.0E+00	NA
Methoxychlor	72-43-5	0.0E+00	NA	5.28E-03	3.52E-04	2.64E-04	e	6.93E-01	c	4.02E-03	2.68E-04	2.01E-04	e
Silvex (2,4,5-TP)	93-72-1	0.0E+00	NA	4.44E-03	2.96E-04	2.22E-04	e	0.0E+00	NA	3.36E+00	2.24E-01	1.68E-01	e
Toxaphene	8001-35-2	0.0E+00	NA	5.28E-03	3.52E-04	2.64E-04	e	0.0E+00	NA	3.22E-03	2.15E-04	1.61E-04	e

Table B1-1 Chemical-Specific Parameters for Organic COPCs

Chemical of Potential Concern	CAS Registry Number	Soil Loss Mechanisms [g]								Kp (cm/hr)	Source
		ks_r $(year)^{-1}$			Source	ks_v $(year)^{-1}$			Source		
		1 cm	15 cm	20 cm		1 cm	15 cm	20 cm			
gamma-BHC (Lindane)	58-89-9	1.77E-01	1.18E-02	8.85E-03	e	1.94E+00	8.62E-03	4.85E-03	f	1.10E-02	ab
Heptachlor	76-44-8	2.01E-02	1.34E-03	1.01E-03	e	2.12E-01	9.41E-04	5.29E-04	f	8.60E-03	ab
Isodrin	465-73-6	0.00E+00	0.00E+00	0.0E+00	NA	0.0E+00	0.0E+00	0.0E+00	NA	NA	NA
Methoxychlor	72-43-5	2.40E-03	1.60E-04	1.20E-04	e	3.16E-02	1.40E-04	7.89E-05	f	1.98E-02	aa
Silvex (2,4,5-TP)	93-72-1	2.01E+00	1.34E-01	1.00E-01	e	6.69E-02	2.97E-04	1.67E-04	f	1.72E-02	aa
Toxaphene	8001-35-2	1.92E-03	1.28E-04	9.61E-05	e	1.61E+00	7.14E-03	4.02E-03	f	1.20E-02	ab

Table B1-1 Chemical-Specific Parameters for Organic COPCs

CAS = Chemical Abstracts Service.
COPC = Chemical of Potential Concern.
DW = dry weight.
FW = fresh weight.

Notes/Sources

a Br_{forage} value is used as a surrogate value for Br_{grain} for organic COPCs.
b Value for Fv is based on phase type, which is shown in the emissions report (Attachment 1 of this work plan).
c Section 5 and/or Appendix A-3 of the *Human Health Risk Assessment Protocol* (HHRAP) (EPA 1998).
d Howard and others 1991.
e Calculated per Section 5 and/or Appendix A-3 of the HHRAP (EPA 1998).
f Calculated per Errata to HHRAP (EPA 1999b).
g Total soil loss (ks) is the sum of all appropriate soil loss mechanisms.
h Errata to HHRAP (EPA 1999b).
i Mackay and others 1991 - 1995.
j Risk Assessment Information System (RAIS); see http://risk.lsd.ornl.gov/rap_hp.shtml. Accessed in November 2002.
k 24590-WTP-RPT-PO-03-008.
l Chemfate; see http://esc.syrres.com/efdb/Chemfate.htm. Accessed in 1999.
m US Environmental Protection Agency (EPA) EPI software; see http://www.epa.gov/oppt/exposure/docs/episuitedl.htm. Accessed in November 2002.
n Mackay and Shui 1981.
o Hansch and Leo 1985.
p Howard 1989-1997.
q Schwarzenbach and others 1993.
r Calculated per Section C-1.5 in the *Screening-Level Ecological Risk Assessment Protocol* (SLERAP) (EPA 1999a) using Binstein and others 1993.
s CCN 063817.
t Spectrum Chemical Fact Sheet; see http://www.speclab.com/compound/. Accessed in 1999.
u EPA Region 9 Preliminary Remediation Goal (PRG) data set (EPA 2002a).
v Calculated per Section C-1.6 in the SLERAP (EPA 1999a) using Southworth and others 1978.
w SLERAP (EPA 1999a).
x H-pub = published Henry's Law Constant with various units; H-used = actual used Henry's Law Constant in atm-m^3/mol.
y K_{ow}-pub and K_{oc}-pub = published K_{ow} and K_{oc} values, respectively, with various units.
z K_{ow}-used and K_{oc}-used = actual used K_{ow} (unitless) and K_{oc} (mL/g) values, respectively.
aa Calculated per Risk Assessment Guidance for Superfund (RAGS) Part E (EPA 2003).
ab Value from RAGS Part E (EPA 2003).
NA Not Applicable.

Table B1-2 Chemical-Specific Parameters for Inorganic COPCs

Chemicals of Potential Concern	CAS Registry Number	Fraction		MW	pH	Henry's Constant			Diffusivity			
		F_v (unitless)	Source	(g/mol)		H-pub [m] (various units)	Source	H-used [m] (atm-m^3/mol)	D_a (cm^2/s)	Source	D_w (cm^2/s)	Source
Metals												
Aluminum	7429-90-5	0 or 1	b	26.982	NA	NA	NA	NA	NA	NA	NA	NA
Antimony	7440-36-0	0 or 1	b	121.75	6.8	NA	NA	NA	7.73E-02	f	8.96E-06	f
Arsenic	7440-38-2	0 or 1	b	74.92	6.8	NA	NA	NA	1.07E-01	f	1.24E-05	f
Barium	7440-39-3	0 or 1	b	137.33	6.8	NA	NA	NA	7.14E-02	f	8.26E-06	f
Beryllium	7440-41-7	0 or 1	b	9.01	6.8	NA	NA	NA	4.39E-01	f	5.08E-05	f
Bismuth	7440-69-9	0 or 1	b	208.98	NA	NA	NA	NA	NA	NA	NA	NA
Boron	7440-42-8	0 or 1	b	10.811	NA	NA	NA	NA	NA	NA	NA	NA
Cadmium	7440-43-9	0 or 1	b	112.41	6.8	NA	NA	NA	8.16E-02	f	9.45E-06	f
Calcium	7440-70-2	0 or 1	b	40.078	NA	NA	NA	NA	NA	NA	NA	NA
Chromium	18540-29-9	0 or 1	b	52	6.8	NA	NA	NA	1.36E-01	f	1.58E-05	f
Cobalt	7440-48-4	0 or 1	b	58.933	NA	NA	NA	NA	NA	NA	NA	NA
Copper	7440-50-8	0 or 1	b	63.546	NA	NA	NA	NA	NA	NA	NA	NA
Iron	7439-89-6	0 or 1	b	55.845	NA	NA	NA	NA	NA	NA	NA	NA
Lead	7439-92-1	0 or 1	b	207.2	NA	NA	NA	NA	5.43E-02	f	6.28E-06	f
Lithium	7439-93-2	0 or 1	b	6.941	NA	NA	NA	NA	NA	NA	NA	NA
Magnesium	7439-95-4	0 or 1	b	24.305	NA	NA	NA	NA	NA	NA	NA	NA
Manganese	7439-96-5	0 or 1	b	54.938	NA	NA	NA	NA	NA	NA	NA	NA
Mercury	7439-97-6	0.85	j	200.59	NA	7.10E-03	f	7.10E-03	1.09E-02	f	3.01E-05	f
Mercury - Hg+2	7487-94-7	0 or 1	b	271.52	NA	7.10E-10	f	7.10E-10	4.53E-02	f	5.25E-06	f
Methylmercury	22967-92-6	0 or 1	b	216	NA	4.70E-07	f	4.70E-07	5.28E-02	f	6.11E-06	f
Molybdenum	7439-98-7	0 or 1	b	95.94	NA	NA	NA	NA	NA	NA	NA	NA
Nickel	7440-02-0	0 or 1	b	58.69	6.8	NA	NA	NA	1.26E-01	f	1.46E-05	f
Potassium	7440-09-7	0 or 1	b	39.098	NA	NA	NA	NA	NA	NA	NA	NA
Rhodium	7440-16-6	0 or 1	b	102.906	NA	NA	NA	NA	NA	NA	NA	NA
Selenium	7782-49-2	0 or 1	b	78.96	6.8	NA	NA	NA	1.03E-01	f	1.20E-05	f
Silicon	7440-21-3	0 or 1	b	28.086	NA	NA	NA	NA	NA	NA	NA	NA
Silver	7440-22-4	0 or 1	b	107.87	6.8	NA	NA	NA	8.38E-02	f	9.71E-06	f
Sodium	7440-23-5	0 or 1	b	22.99	NA	NA	NA	NA	NA	NA	NA	NA

Table B1-2 Chemical-Specific Parameters for Inorganic COPCs

Chemicals of Potential Concern	CAS Registry Number	Partitioning Coefficients						Plant Uptake Factors			
		Kd_{bs} (L/kg)	Source	Kd_s (mL/g)	Source	Kd_{sw} (L/kg)	Source	Br_{ag} (µg/g DW plant)/ (µg/g soil) [a]	Source	$Br_{ag(fruit)}$ (µg/g DW plant)/ (µg/g soil)	Source
Metals											
Aluminum	7429-90-5	1.50E+03	c	1.50E+03	c	1.50E+03	c	1.08E-03	d	6.50E-04	c
Antimony	7440-36-0	4.50E+01	f	4.50E+01	f	4.50E+01	f	3.19E-02	f	3.00E-02	c
Arsenic	7440-38-2	2.90E+01	f	2.90E+01	f	2.90E+01	f	6.33E-03	f	NA	NA
Barium	7440-39-3	4.10E+01	f	4.10E+01	f	4.10E+01	f	3.22E-02	f	1.50E-02	c
Beryllium	7440-41-7	7.90E+02	f	7.90E+02	f	7.90E+02	f	2.58E-03	f	1.50E-03	c
Bismuth	7440-69-9	2.00E+02	c	2.00E+02	c	2.00E+02	c	8.81E-03	d	5.00E-03	c
Boron	7440-42-8	3.00E+00	c	3.00E+00	c	3.00E+00	c	2.25E+00	d	2.00E+00	c
Cadmium	7440-43-9	7.50E+01	f	7.50E+01	f	7.50E+01	f	1.25E-01	f	NA	NA
Calcium	7440-70-2	4.00E+00	c	4.00E+00	c	4.00E+00	c	7.50E-01	d	3.50E-01	c
Chromium	18540-29-9	1.90E+01	f	1.90E+01	f	1.90E+01	f	4.88E-03	f	4.50E-03	c
Cobalt	7440-48-4	4.50E+01	c	4.50E+01	c	4.50E+01	c	6.36E-02	d	7.00E-02	c
Copper	7440-50-8	3.50E+01	c	3.50E+01	c	3.50E+01	c	2.69E-01	d	2.50E-01	c
Iron	7439-89-6	2.50E+01	c	2.50E+01	c	2.50E+01	c	1.38E-03	d	1.00E-03	c
Lead	7439-92-1	9.00E+02	f	9.00E+02	f	9.00E+02	f	1.36E-02	f	9.00E-03	c
Lithium	7439-93-2	3.00E+02	c	3.00E+02	c	3.00E+02	c	6.67E-03	d	4.00E-03	c
Magnesium	7439-95-4	4.50E+00	c	4.50E+00	c	4.50E+00	c	6.07E-01	d	5.50E-01	c
Manganese	7439-96-5	6.50E+01	c	6.50E+01	c	6.50E+01	c	7.54E-02	d	5.00E-02	c
Mercury	7439-97-6	3.00E+03	f	1.00E+03	f	1.00E+03	f	2.89E-01	d	2.00E-01	c
Mercury - Hg+2	7487-94-7	5.00E+04	f	5.80E+04	f	1.00E+05	f	1.45E-02	f	NA	NA
Methylmercury	22967-92-6	3.00E+03	f	7.00E+03	f	1.00E+05	f	2.94E-02	f	NA	NA
Molybdenum	7439-98-7	2.00E+01	c	2.00E+01	c	2.00E+01	c	8.42E-02	d	6.00E-02	c
Nickel	7440-02-0	6.50E+01	f	6.50E+01	f	6.50E+01	f	9.31E-03	f	NA	NA
Potassium	7440-09-7	5.50E+00	c	5.50E+00	c	5.50E+00	c	6.07E-01	d	5.50E-01	c
Rhodium	7440-16-6	6.00E+01	c	6.00E+01	c	6.00E+01	c	5.40E-02	d	4.00E-02	c
Selenium	7782-49-2	5.00E+00	f	5.00E+00	f	5.00E+00	f	1.95E-02	f	NA	NA
Silicon	7440-21-3	3.00E+01	c	3.00E+01	c	3.00E+01	c	1.06E-01	d	7.00E-02	c
Silver	7440-22-4	8.30E+00	f	8.30E+00	f	8.30E+00	f	1.38E-01	f	1.00E-01	c
Sodium	7440-23-5	1.00E+02	c	1.00E+02	c	1.00E+02	c	5.75E-02	d	5.50E-02	c

Table B1-2 Chemical-Specific Parameters for Inorganic COPCs

Chemicals of Potential Concern	CAS Registry Number	Plant Uptake Factors							
		$Br_{ag(veg)}$ (µg/g DW plant)/ (µg/g soil)	Source	Br_{forage} (µg/g DW plant)/ (µg/g soil)	Source	Br_{grain} (µg/g DW plant)/ (µg/g soil)	Source	$Br_{rootveg}$ (µg/g DW plant)/ (µg/g soil)	Source
Metals									
Aluminum	7429-90-5	1.49E-03	d	4.00E-03	c	6.50E-04	c	6.50E-04	c
Antimony	7440-36-0	7.25E-02	d	2.00E-01	f	2.00E-01	f	3.00E-02	f
Arsenic	7440-38-2	NA	NA	3.60E-02	f	4.00E-03	f	8.00E-03	f
Barium	7440-39-3	4.88E-02	d	1.50E-01	f	1.50E-02	f	1.50E-02	f
Beryllium	7440-41-7	3.63E-03	d	1.00E-02	f	1.50E-03	f	1.50E-03	f
Bismuth	7440-69-9	1.25E-02	d	3.50E-02	c	5.00E-03	c	5.00E-03	c
Boron	7440-42-8	2.50E+00	d	4.00E+00	c	2.00E+00	c	2.00E+00	c
Cadmium	7440-43-9	NA	NA	3.64E-01	f	6.20E-02	f	6.40E-02	f
Calcium	7440-70-2	1.14E+00	d	3.50E+00	c	3.50E-01	c	3.50E-01	c
Chromium	18540-29-9	5.25E-03	d	7.50E-03	f	4.50E-03	f	4.50E-03	f
Cobalt	7440-48-4	5.75E-02	d	2.00E-02	c	7.00E-02	c	7.00E-02	c
Copper	7440-50-8	2.88E-01	d	4.00E-01	c	2.50E-01	c	2.50E-01	c
Iron	7439-89-6	1.75E-03	d	4.00E-03	c	1.00E-03	c	1.00E-03	c
Lead	7439-92-1	1.80E-02	d	4.50E-02	f	9.00E-03	f	9.00E-03	f
Lithium	7439-93-2	9.25E-03	d	2.50E-02	c	4.00E-03	c	4.00E-03	c
Magnesium	7439-95-4	6.63E-01	d	1.00E+00	c	5.50E-01	c	5.50E-01	c
Manganese	7439-96-5	1.00E-01	d	2.50E-01	c	5.00E-02	c	5.00E-02	c
Mercury	7439-97-6	3.75E-01	d	9.00E-01	c	2.00E-01	c	2.00E-01	c
Mercury - Hg+2	7487-94-7	NA	NA	NA	NA	NA	NA	3.60E-02	f
Methylmercury	22967-92-6	NA	NA	NA	NA	NA	NA	9.90E-02	f
Molybdenum	7439-98-7	1.08E-01	d	2.50E-01	c	6.00E-02	c	6.00E-02	c
Nickel	7440-02-0	NA	NA	3.20E-02	f	6.00E-03	f	8.00E-03	f
Potassium	7440-09-7	6.63E-01	d	1.00E+00	c	5.50E-01	c	5.50E-01	c
Rhodium	7440-16-6	6.75E-02	d	1.50E-01	c	4.00E-02	c	4.00E-02	c
Selenium	7782-49-2	NA	NA	1.60E-02	f	2.00E-03	f	2.20E-02	f
Silicon	7440-21-3	1.40E-01	d	3.50E-01	c	7.00E-02	c	7.00E-02	c
Silver	7440-22-4	1.75E-01	d	4.00E-01	f	1.00E-01	f	1.00E-01	f
Sodium	7440-23-5	6.00E-02	d	7.50E-02	c	5.50E-02	c	5.50E-02	c

Table B1-2 Chemical-Specific Parameters for Inorganic COPCs

Chemicals of Potential Concern	CAS Registry Number	Plant Uptake Factors				Bioconcentration/Bioaccumulation Factors					
		Bv_{ag} (µg/g DW plant)/ (µg/g air)	Source	Bv_{forage} (µg/g DW plant)/ (µg/g air)	Source	Ba_{beef} (day/kg FW)	Source	$Ba_{chicken}$ (day/kg FW)	Source	Ba_{egg} (day/kg FW)	Source
Metals											
Aluminum	7429-90-5	NA	NA	NA	NA	1.50E-03	c	NA	NA	NA	NA
Antimony	7440-36-0	NA	NA	NA	NA	1.00E-03	f	NA	NA	NA	NA
Arsenic	7440-38-2	NA	NA	NA	NA	2.00E-03	f	NA	NA	NA	NA
Barium	7440-39-3	NA	NA	NA	NA	1.50E-04	f	2.00E-02	h	9.00E-01	h
Beryllium	7440-41-7	NA	NA	NA	NA	1.00E-03	f	NA	NA	NA	NA
Bismuth	7440-69-9	NA	NA	NA	NA	4.00E-04	c	NA	NA	NA	NA
Boron	7440-42-8	NA	NA	NA	NA	8.00E-04	c	NA	NA	NA	NA
Cadmium	7440-43-9	NA	NA	NA	NA	1.20E-04	f	1.06E-01	f	2.50E-03	f
Calcium	7440-70-2	NA	NA	NA	NA	7.00E-04	c	4.40E-02	h	4.40E-02	h
Chromium	18540-29-9	NA	NA	NA	NA	5.50E-03	f	NA	NA	NA	NA
Cobalt	7440-48-4	NA	NA	NA	NA	2.00E-02	c	5.30E-01	h	2.00E-02	h
Copper	7440-50-8	NA	NA	NA	NA	1.00E-02	c	5.10E-01	h	4.90E-01	h
Iron	7439-89-6	NA	NA	NA	NA	2.00E-02	c	1.50E+00	h	1.30E+00	h
Lead	7439-92-1	NA	NA	NA	NA	3.00E-04	f	NA	NA	NA	NA
Lithium	7439-93-2	NA	NA	NA	NA	1.00E-02	c	NA	NA	NA	NA
Magnesium	7439-95-4	NA	NA	NA	NA	5.00E-03	c	NA	NA	1.60E+00	h
Manganese	7439-96-5	NA	NA	NA	NA	4.00E-04	c	5.10E-02	h	6.50E-02	h
Mercury	7439-97-6	1.80E+03	j	1.80E+03	j	2.50E-01	c	2.70E-02	h	NA	NA
Mercury - Hg+2	7487-94-7	1.80E+03	f	1.80E+03	f	5.22E-03	f	2.39E-02	f	2.39E-02	f
Methylmercury	22967-92-6	NA	NA	NA	NA	7.80E-04	f	3.58E-03	f	3.58E-03	f
Molybdenum	7439-98-7	NA	NA	NA	NA	6.00E-03	c	5.00E-02	h	5.00E-01	h
Nickel	7440-02-0	NA	NA	NA	NA	6.00E-03	f	NA	NA	NA	NA
Potassium	7440-09-7	NA	NA	NA	NA	2.00E-02	c	NA	NA	1.10E+00	h
Rhodium	7440-16-6	NA	NA	NA	NA	2.00E-03	c	NA	NA	NA	NA
Selenium	7782-49-2	NA	NA	NA	NA	2.27E-03	f	1.13E+00	f	1.13E+00	f
Silicon	7440-21-3	NA	NA	NA	NA	4.00E-05	c	NA	NA	NA	NA
Silver	7440-22-4	NA	NA	NA	NA	3.00E-03	f	NA	NA	NA	NA
Sodium	7440-23-5	NA	NA	NA	NA	5.50E-02	c	NA	NA	6.10E+00	h

Table B1-2 Chemical-Specific Parameters for Inorganic COPCs

Chemicals of Potential Concern	CAS Registry Number	Bioconcentration/Bioaccumulation Factors									
		Ba_{milk} (day/kg FW)	Source	Ba_{pork} (day/kg FW)	Source	BAF_{fish} (L/kg FW)	Source	BCF_{fish} (L/kg FW)	Source	$BSAF_{fish}$ (unitless)	Source
Metals											
Aluminum	7429-90-5	2.00E-04	c	NA	NA	NA	NA	NA	NA	NA	NA
Antimony	7440-36-0	1.00E-04	f	NA	NA	NA	NA	4.00E+01	f	NA	NA
Arsenic	7440-38-2	6.00E-05	g	NA	NA	NA	NA	1.14E+02	g	NA	NA
Barium	7440-39-3	3.50E-04	f	NA	NA	NA	NA	6.33E+02	g	NA	NA
Beryllium	7440-41-7	9.00E-07	f	NA	NA	NA	NA	6.20E+01	g	NA	NA
Bismuth	7440-69-9	5.00E-04	c	NA	NA	NA	NA	NA	NA	NA	NA
Boron	7440-42-8	1.50E-03	c	NA	NA	NA	NA	NA	NA	NA	NA
Cadmium	7440-43-9	6.50E-06	f	1.91E-04	f	NA	NA	9.07E+02	g	NA	NA
Calcium	7440-70-2	1.00E-02	c	NA	NA	NA	NA	NA	NA	NA	NA
Chromium	18540-29-9	1.50E-03	f	NA	NA	NA	NA	3.00E+00	f	NA	NA
Cobalt	7440-48-4	2.00E-03	c	1.70E-01	h	3.16E+00	i	NA	NA	NA	NA
Copper	7440-50-8	1.50E-03	c	2.20E-02	h	3.16E+00	i	NA	NA	NA	NA
Iron	7439-89-6	2.50E-04	c	2.60E-02	h	3.16E+00	i	NA	NA	NA	NA
Lead	7439-92-1	2.50E-04	f	NA	NA	8.00E+00	f	NA	NA	NA	NA
Lithium	7439-93-2	2.00E-02	c	NA	NA	NA	NA	NA	NA	NA	NA
Magnesium	7439-95-4	4.00E-03	c	NA	NA	NA	NA	NA	NA	NA	NA
Manganese	7439-96-5	3.50E-04	c	3.60E-03	h	NA	NA	NA	NA	NA	NA
Mercury	7439-97-6	4.50E-04	c	NA	NA	NA	NA	NA	NA	NA	NA
Mercury - Hg+2	7487-94-7	2.26E-03	f	3.39E-05	f	0.00E+00	g	NA	NA	NA	NA
Methylmercury	22967-92-6	3.38E-04	f	5.07E-06	f	6.80E+06	f	NA	NA	NA	NA
Molybdenum	7439-98-7	1.50E-03	c	NA	NA	NA	NA	NA	NA	NA	NA
Nickel	7440-02-0	1.00E-03	f	NA	NA	NA	NA	7.80E+01	g	NA	NA
Potassium	7440-09-7	7.00E-03	c	NA	NA	NA	NA	NA	NA	NA	NA
Rhodium	7440-16-6	1.00E-02	c	NA	NA	NA	NA	NA	NA	NA	NA
Selenium	7782-49-2	5.86E-03	f	1.88E-01	f	NA	NA	1.29E+02	f	NA	NA
Silicon	7440-21-3	2.00E-05	c	NA	NA	NA	NA	NA	NA	NA	NA
Silver	7440-22-4	2.00E-02	f	NA	NA	NA	NA	8.77E+01	g	NA	NA
Sodium	7440-23-5	3.50E-02	c	NA	NA	NA	NA	NA	NA	NA	NA

Table B1-2 Chemical-Specific Parameters for Inorganic COPCs

Chemicals of Potential Concern	CAS Registry Number	Soil Loss Mechanisms [e]											
		k_{decay} $(year)^{-1}$	Source	ks_e $(year)^{-1}$			Source	ks_g $(year)^{-1}$	Source	ks_l $(year)^{-1}$			Source
				1 cm	15 cm	20 cm				1 cm	15 cm	20 cm	
Metals													
Aluminum	7429-90-5	0.0E+00	NA	1.76E-03	1.17E-04	8.81E-05	d	0.0E+00	NA	2.15E-03	1.43E-04	1.07E-04	d
Antimony	7440-36-0	0.0E+00	NA	1.76E-03	1.17E-04	8.78E-05	d	0.0E+00	NA	7.13E-02	4.75E-03	3.57E-03	d
Arsenic	7440-38-2	0.0E+00	NA	1.75E-03	1.17E-04	8.76E-05	d	0.0E+00	NA	1.10E-01	7.36E-03	5.52E-03	d
Barium	7440-39-3	0.0E+00	NA	1.75E-03	1.17E-04	8.77E-05	d	0.0E+00	NA	7.83E-02	5.22E-03	3.91E-03	d
Beryllium	7440-41-7	0.0E+00	NA	1.76E-03	1.17E-04	8.81E-05	d	0.0E+00	NA	4.08E-03	2.72E-04	2.04E-04	d
Bismuth	7440-69-9	0.0E+00	NA	1.76E-03	1.17E-04	8.80E-05	d	0.0E+00	NA	1.61E-02	1.07E-03	8.04E-04	d
Boron	7440-42-8	0.0E+00	NA	1.68E-03	1.12E-04	8.38E-05	d	0.0E+00	NA	1.02E+00	6.81E-02	5.11E-02	d
Cadmium	7440-43-9	0.0E+00	NA	1.76E-03	1.17E-04	8.79E-05	d	0.0E+00	NA	4.28E-02	2.86E-03	2.14E-03	d
Calcium	7440-70-2	0.0E+00	NA	1.70E-03	1.13E-04	8.48E-05	d	0.0E+00	NA	7.75E-01	5.17E-02	3.88E-02	d
Chromium	18540-29-9	0.0E+00	NA	1.75E-03	1.16E-04	8.74E-05	d	0.0E+00	NA	1.68E-01	1.12E-02	8.41E-03	d
Cobalt	7440-48-4	0.0E+00	NA	1.76E-03	1.17E-04	8.78E-05	d	0.0E+00	NA	7.13E-02	4.75E-03	3.57E-03	d
Copper	7440-50-8	0.0E+00	NA	1.75E-03	1.17E-04	8.77E-05	d	0.0E+00	NA	9.16E-02	6.11E-03	4.58E-03	d
Iron	7439-89-6	0.0E+00	NA	1.75E-03	1.17E-04	8.75E-05	d	0.0E+00	NA	1.28E-01	8.53E-03	6.40E-03	d
Lead	7439-92-1	0.0E+00	NA	1.76E-03	1.17E-04	8.81E-05	d	0.0E+00	NA	3.58E-03	2.39E-04	1.79E-04	d
Lithium	7439-93-2	0.0E+00	NA	1.76E-03	1.17E-04	8.80E-05	d	0.0E+00	NA	1.07E-02	7.15E-04	5.36E-04	d
Magnesium	7439-95-4	0.0E+00	NA	1.70E-03	1.14E-04	8.52E-05	d	0.0E+00	NA	6.92E-01	4.61E-02	3.46E-02	d
Manganese	7439-96-5	0.0E+00	NA	1.76E-03	1.17E-04	8.79E-05	d	0.0E+00	NA	4.94E-02	3.30E-03	2.47E-03	d
Mercury	7439-97-6	0.0E+00	NA	1.76E-03	1.17E-04	8.81E-05	d	0.0E+00	NA	3.22E-03	2.15E-04	1.61E-04	d
Mercury - Hg+2	7487-94-7	0.0E+00	NA	1.76E-03	1.17E-04	8.81E-05	d	0.0E+00	NA	5.55E-05	3.70E-06	2.78E-06	d
Methylmercury	22967-92-6	0.0E+00	NA	1.76E-03	1.17E-04	8.81E-05	d	0.0E+00	NA	4.60E-04	3.07E-05	2.30E-05	d
Molybdenum	7439-98-7	0.0E+00	NA	1.75E-03	1.17E-04	8.74E-05	d	0.0E+00	NA	1.60E-01	1.07E-02	7.99E-03	d
Nickel	7440-02-0	0.0E+00	NA	1.76E-03	1.17E-04	8.79E-05	d	0.0E+00	NA	4.94E-02	3.30E-03	2.47E-03	d
Potassium	7440-09-7	0.0E+00	NA	1.71E-03	1.14E-04	8.57E-05	d	0.0E+00	NA	5.70E-01	3.80E-02	2.85E-02	d
Rhodium	7440-16-6	0.0E+00	NA	1.76E-03	1.17E-04	8.78E-05	d	0.0E+00	NA	5.35E-02	3.57E-03	2.68E-03	d
Selenium	7782-49-2	0.0E+00	NA	1.71E-03	1.14E-04	8.54E-05	d	0.0E+00	NA	6.25E-01	4.17E-02	3.12E-02	d
Silicon	7440-21-3	0.0E+00	NA	1.75E-03	1.17E-04	8.76E-05	d	0.0E+00	NA	1.07E-01	7.12E-03	5.34E-03	d
Silver	7440-22-4	0.0E+00	NA	1.73E-03	1.15E-04	8.65E-05	d	0.0E+00	NA	3.81E-01	2.54E-02	1.90E-02	d
Sodium	7440-23-5	0.0E+00	NA	1.76E-03	1.17E-04	8.79E-05	d	0.0E+00	NA	3.22E-02	2.14E-03	1.61E-03	d

Table B1-2 Chemical-Specific Parameters for Inorganic COPCs

Chemicals of Potential Concern	CAS Registry Number	Soil Loss Mechanisms [e]							
		ks_r $(year)^{-1}$			Source	ks_v $(year)^{-1}$			Source
		1 cm	15 cm	20 cm		1 cm	15 cm	20 cm	
Metals									
Aluminum	7429-90-5	1.28E-03	8.55E-05	6.41E-05	d	0.0E+00	0.0E+00	0.0E+00	NA
Antimony	7440-36-0	4.26E-02	2.84E-03	2.13E-03	d	0.0E+00	0.0E+00	0.0E+00	NA
Arsenic	7440-38-2	6.60E-02	4.40E-03	3.30E-03	d	0.0E+00	0.0E+00	0.0E+00	NA
Barium	7440-39-3	4.67E-02	3.12E-03	2.34E-03	d	0.0E+00	0.0E+00	0.0E+00	NA
Beryllium	7440-41-7	2.43E-03	1.62E-04	1.22E-04	d	0.0E+00	0.0E+00	0.0E+00	NA
Bismuth	7440-69-9	9.61E-03	6.41E-04	4.80E-04	d	0.0E+00	0.0E+00	0.0E+00	NA
Boron	7440-42-8	6.10E-01	4.07E-02	3.05E-02	d	0.0E+00	0.0E+00	0.0E+00	NA
Cadmium	7440-43-9	2.56E-02	1.71E-03	1.28E-03	d	0.0E+00	0.0E+00	0.0E+00	NA
Calcium	7440-70-2	4.63E-01	3.09E-02	2.31E-02	d	0.0E+00	0.0E+00	0.0E+00	NA
Chromium	18540-29-9	1.00E-01	6.69E-03	5.02E-03	d	0.0E+00	0.0E+00	0.0E+00	NA
Cobalt	7440-48-4	4.26E-02	2.84E-03	2.13E-03	d	0.0E+00	0.0E+00	0.0E+00	NA
Copper	7440-50-8	5.47E-02	3.65E-03	2.74E-03	d	0.0E+00	0.0E+00	0.0E+00	NA
Iron	7439-89-6	7.65E-02	5.10E-03	3.82E-03	d	0.0E+00	0.0E+00	0.0E+00	NA
Lead	7439-92-1	2.14E-03	1.42E-04	1.07E-04	d	0.0E+00	0.0E+00	0.0E+00	NA
Lithium	7439-93-2	6.41E-03	4.27E-04	3.20E-04	d	0.0E+00	0.0E+00	0.0E+00	NA
Magnesium	7439-95-4	4.13E-01	2.75E-02	2.07E-02	d	0.0E+00	0.0E+00	0.0E+00	NA
Manganese	7439-96-5	2.95E-02	1.97E-03	1.48E-03	d	0.0E+00	0.0E+00	0.0E+00	NA
Mercury	7439-97-6	1.92E-03	1.28E-04	9.61E-05	d	2.38E+01	1.06E-01	5.94E-02	k
Mercury - Hg+2	7487-94-7	3.32E-05	2.21E-06	1.66E-06	d	1.70E-07	7.56E-10	4.25E-10	k
Methylmercury	22967-92-6	2.75E-04	1.83E-05	1.37E-05	d	1.09E-03	4.84E-06	2.72E-06	k
Molybdenum	7439-98-7	9.54E-02	6.36E-03	4.77E-03	d	0.0E+00	0.0E+00	0.0E+00	NA
Nickel	7440-02-0	2.95E-02	1.97E-03	1.48E-03	d	0.0E+00	0.0E+00	0.0E+00	NA
Potassium	7440-09-7	3.40E-01	2.27E-02	1.70E-02	d	0.0E+00	0.0E+00	0.0E+00	NA
Rhodium	7440-16-6	3.20E-02	2.13E-03	1.60E-03	d	0.0E+00	0.0E+00	0.0E+00	NA
Selenium	7782-49-2	3.73E-01	2.49E-02	1.87E-02	d	0.0E+00	0.0E+00	0.0E+00	NA
Silicon	7440-21-3	6.38E-02	4.25E-03	3.19E-03	d	0.0E+00	0.0E+00	0.0E+00	NA
Silver	7440-22-4	2.27E-01	1.52E-02	1.14E-02	d	0.0E+00	0.0E+00	0.0E+00	NA
Sodium	7440-23-5	1.92E-02	1.28E-03	9.60E-04	d	0.0E+00	0.0E+00	0.0E+00	NA

Table B1-2 Chemical-Specific Parameters for Inorganic COPCs

Chemicals of Potential Concern	CAS Registry Number	Fraction		MW	pH	Henry's Constant			Diffusivity			
		F_v (unitless)	Source	(g/mol)		H-pub [m] (various units)	Source	H-used [m] (atm-m^3/mol)	D_a (cm^2/s)	Source	D_w (cm^2/s)	Source
Strontium	7440-24-6	0 or 1	b	87.62	NA	NA	NA	NA	NA	NA	NA	NA
Tantalum	7440-25-7	0 or 1	b	180.948	NA	NA	NA	NA	NA	NA	NA	NA
Thallium	7440-28-0	0 or 1	b	204.38	6.8	NA	NA	NA	5.48E-02	f	6.34E-06	f
Tin	7440-31-5	0 or 1	b	118.71	NA	NA	NA	NA	NA	NA	NA	NA
Tungsten	7440-33-7	0 or 1	b	183.84	NA	NA	NA	NA	NA	NA	NA	NA
Uranium	7440-61-1	0 or 1	b	238.029	NA	NA	NA	NA	NA	NA	NA	NA
Vanadium	7440-62-2	0 or 1	b	50.942	NA	NA	NA	NA	NA	NA	NA	NA
Yttrium	7440-65-5	0 or 1	b	88.906	NA	NA	NA	NA	NA	NA	NA	NA
Zinc	7440-66-6	0 or 1	b	65.38	6.8	NA	NA	NA	1.17E-01	f	1.36E-05	f
Zirconium	7440-67-7	0 or 1	b	91.224	NA	NA	NA	NA	NA	NA	NA	NA
Non-Metals and Anions												
Ammonia/Ammonium	7664-41-7	0 or 1	b	NA	NA	1.41E-04	i	3.44E-06	NA	NA	NA	NA
Bromide	24959-67-9	0 or 1	b	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chloride	16887-00-6	0 or 1	b	NA	NA	NA	NA	NA	NA	NA	NA	NA
Cyanide	57-12-5	0 or 1	b	26.017	NA	NA	NA	NA	5.48E-01	f	2.10E-05	f
Fluoride	16984-48-8	0 or 1	b	NA	NA	NA	NA	NA	NA	NA	NA	NA
Hydroxide	14280-30-9	0 or 1	b	NA	NA	NA	NA	NA	NA	NA	NA	NA
Iodine	7553-56-2	0 or 1	b	126.904	NA	NA	NA	NA	NA	NA	NA	NA
Nitrate	14797-55-8	0 or 1	b	NA	NA	NA	NA	NA	NA	NA	NA	NA
Nitrite	14797-65-0	0 or 1	b	NA	NA	NA	NA	NA	NA	NA	NA	NA
Phosphate	14265-44-2	0 or 1	b	NA	NA	NA	NA	NA	NA	NA	NA	NA
Phosphorus	7723-14-0	0 or 1	b	30.974	NA	NA	NA	NA	NA	NA	NA	NA
Sulfate	14808-79-8	0 or 1	b	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total sulfur	63705-05-5	0 or 1	b	32.064	NA	NA	NA	NA	NA	NA	NA	NA
Criteria Pollutants												
Carbon monoxide	630-08-0	0 or 1	b	NA	NA	NA	NA	NA	NA	NA	NA	NA
Nitrogen dioxide	10102-44-0	0 or 1	b	NA	NA	NA	NA	NA	NA	NA	NA	NA
Ozone	10028-15-6	0 or 1	b	NA	NA	NA	NA	NA	NA	NA	NA	NA
Particulate matter	No CAS #	0 or 1	b	NA	NA	NA	NA	NA	NA	NA	NA	NA
Sulfur dioxide	7446-09-5	0 or 1	b	NA	NA	NA	NA	NA	NA	NA	NA	NA

Table B1-2 Chemical-Specific Parameters for Inorganic COPCs

Chemicals of Potential Concern	CAS Registry Number	Partitioning Coefficients						Plant Uptake Factors			
		Kd_{bs} (L/kg)	Source	Kd_s (mL/g)	Source	Kd_{sw} (L/kg)	Source	Br_{ag} (µg/g DW plant)/ (µg/g soil) [a]	Source	$Br_{ag(fruit)}$ (µg/g DW plant)/ (µg/g soil)	Source
Strontium	7440-24-6	3.50E+01	c	3.50E+01	c	3.50E+01	c	5.36E-01	d	2.50E-01	c
Tantalum	7440-25-7	6.50E+02	c	6.50E+02	c	6.50E+02	c	3.45E-03	d	2.50E-03	c
Thallium	7440-28-0	7.10E+01	f	7.10E+01	f	7.10E+01	f	8.58E-04	f	4.00E-04	c
Tin	7440-31-5	2.50E+02	c	2.50E+02	c	2.50E+02	c	9.05E-03	d	6.00E-03	c
Tungsten	7440-33-7	1.50E+02	c	1.50E+02	c	1.50E+02	c	1.25E-02	d	1.00E-02	c
Uranium	7440-61-1	4.50E+02	c	4.50E+02	c	4.50E+02	c	4.57E-03	d	4.00E-03	c
Vanadium	7440-62-2	1.00E+03	c	1.00E+03	c	1.00E+03	c	3.32E-03	d	3.00E-03	c
Yttrium	7440-65-5	5.00E+02	c	5.00E+02	c	5.00E+02	c	7.14E-03	d	6.00E-03	c
Zinc	7440-66-6	6.20E+01	f	6.20E+01	f	6.20E+01	f	7.20E-02	g	4.60E-02	f
Zirconium	7440-67-7	3.00E+03	c	3.00E+03	c	3.00E+03	c	1.02E-01	d	5.00E-04	c
Non-Metals and Anions											
Ammonia/Ammonium	7664-41-7	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Bromide	24959-67-9	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chloride	16887-00-6	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Cyanide	57-12-5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Fluoride	16984-48-8	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Hydroxide	14280-30-9	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Iodine	7553-56-2	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Nitrate	14797-55-8	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Nitrite	14797-65-0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Phosphate	14265-44-2	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Phosphorus	7723-14-0	3.50E+00	c	3.50E+00	c	3.50E+00	c	3.50E+00	d	3.50E+00	c
Sulfate	14808-79-8	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total sulfur	63705-05-5	7.50E+00	c	7.50E+00	c	7.50E+00	c	1.50E+00	d	1.50E+00	c
Criteria Pollutants											
Carbon monoxide	630-08-0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Nitrogen dioxide	10102-44-0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Ozone	10028-15-6	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Particulate matter	No CAS #	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Sulfur dioxide	7446-09-5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Table B1-2 Chemical-Specific Parameters for Inorganic COPCs

Chemicals of Potential Concern	CAS Registry Number	Plant Uptake Factors							
		$Br_{ag(veg)}$ (µg/g DW plant)/ (µg/g soil)	Source	Br_{forage} (µg/g DW plant)/ (µg/g soil)	Source	Br_{grain} (µg/g DW plant)/ (µg/g soil)	Source	$Br_{rootveg}$ (µg/g DW plant)/ (µg/g soil)	Source
Strontium	7440-24-6	8.13E-01	d	2.50E+00	c	2.50E-01	c	2.50E-01	c
Tantalum	7440-25-7	4.38E-03	d	1.00E-02	c	2.50E-03	c	2.50E-03	c
Thallium	7440-28-0	1.30E-03	d	4.00E-03	f	4.00E-04	f	4.00E-04	f
Tin	7440-31-5	1.20E-02	d	3.00E-02	c	6.00E-03	c	6.00E-03	c
Tungsten	7440-33-7	1.88E-02	d	4.50E-02	c	1.00E-02	c	1.00E-02	c
Uranium	7440-61-1	5.13E-03	d	8.50E-03	c	4.00E-03	c	4.00E-03	c
Vanadium	7440-62-2	3.63E-03	d	5.50E-03	c	3.00E-03	c	3.00E-03	c
Yttrium	7440-65-5	8.25E-03	d	1.50E-02	c	6.00E-03	c	6.00E-03	c
Zinc	7440-66-6	9.70E-02	f	2.50E-01	f	5.40E-02	f	4.40E-02	f
Zirconium	7440-67-7	8.75E-04	d	2.00E-03	c	5.00E-04	c	5.00E-04	c
Non-Metals and Anions									
Ammonia/Ammonium	7664-41-7	NA	NA	NA	NA	NA	NA	NA	NA
Bromide	24959-67-9	NA	NA	NA	NA	NA	NA	NA	NA
Chloride	16887-00-6	NA	NA	NA	NA	NA	NA	NA	NA
Cyanide	57-12-5	NA	NA	NA	NA	NA	NA	NA	NA
Fluoride	16984-48-8	NA	NA	NA	NA	NA	NA	NA	NA
Hydroxide	14280-30-9	NA	NA	NA	NA	NA	NA	NA	NA
Iodine	7553-56-2	NA	NA	NA	NA	NA	NA	NA	NA
Nitrate	14797-55-8	NA	NA	NA	NA	NA	NA	NA	NA
Nitrite	14797-65-0	NA	NA	NA	NA	NA	NA	NA	NA
Phosphate	14265-44-2	NA	NA	NA	NA	NA	NA	NA	NA
Phosphorus	7723-14-0	3.50E+00	d	3.50E+00	c	3.50E+00	c	3.50E+00	c
Sulfate	14808-79-8	NA	NA	NA	NA	NA	NA	NA	NA
Total sulfur	63705-05-5	1.50E+00	d	1.50E+00	c	1.50E+00	c	1.50E+00	c
Criteria Pollutants									
Carbon monoxide	630-08-0	NA	NA	NA	NA	NA	NA	NA	NA
Nitrogen dioxide	10102-44-0	NA	NA	NA	NA	NA	NA	NA	NA
Ozone	10028-15-6	NA	NA	NA	NA	NA	NA	NA	NA
Particulate matter	No CAS #	NA	NA	NA	NA	NA	NA	NA	NA
Sulfur dioxide	7446-09-5	NA	NA	NA	NA	NA	NA	NA	NA

Table B1-2 Chemical-Specific Parameters for Inorganic COPCs

Chemicals of Potential Concern	CAS Registry Number	Plant Uptake Factors				Bioconcentration/Bioaccumulation Factors					
		Bv_{ag} (µg/g DW plant)/ (µg/g air)	Source	Bv_{forage} (µg/g DW plant)/ (µg/g air)	Source	Ba_{beef} (day/kg FW)	Source	$Ba_{chicken}$ (day/kg FW)	Source	Ba_{egg} (day/kg FW)	Source
Strontium	7440-24-6	NA	NA	NA	NA	3.00E-04	c	NA	NA	NA	NA
Tantalum	7440-25-7	NA	NA	NA	NA	6.00E-04	c	NA	NA	NA	NA
Thallium	7440-28-0	NA	NA	NA	NA	4.00E-02	f	NA	NA	NA	NA
Tin	7440-31-5	NA	NA	NA	NA	8.00E-02	c	NA	NA	NA	NA
Tungsten	7440-33-7	NA	NA	NA	NA	4.50E-02	c	NA	NA	NA	NA
Uranium	7440-61-1	NA	NA	NA	NA	2.00E-04	c	1.20E+00	h	9.90E-01	h
Vanadium	7440-62-2	NA	NA	NA	NA	2.50E-03	c	NA	NA	NA	NA
Yttrium	7440-65-5	NA	NA	NA	NA	3.00E-04	c	1.00E-02	h	2.00E-03	h
Zinc	7440-66-6	NA	NA	NA	NA	9.00E-05	f	8.75E-03	f	8.75E-03	f
Zirconium	7440-67-7	NA	NA	NA	NA	5.50E-03	c	NA	NA	NA	NA
Non-Metals and Anions											
Ammonia/Ammonium	7664-41-7	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Bromide	24959-67-9	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chloride	16887-00-6	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Cyanide	57-12-5	NA	NA	NA	NA	3.10E-07	l	NA	NA	NA	NA
Fluoride	16984-48-8	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Hydroxide	14280-30-9	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Iodine	7553-56-2	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Nitrate	14797-55-8	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Nitrite	14797-65-0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Phosphate	14265-44-2	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Phosphorus	7723-14-0	NA	NA	NA	NA	5.50E-02	c	NA	NA	NA	NA
Sulfate	14808-79-8	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total sulfur	63705-05-5	NA	NA	NA	NA	1.00E-01	c	NA	NA	NA	NA
Criteria Pollutants											
Carbon monoxide	630-08-0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Nitrogen dioxide	10102-44-0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Ozone	10028-15-6	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Particulate matter	No CAS #	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Sulfur dioxide	7446-09-5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Table B1-2 Chemical-Specific Parameters for Inorganic COPCs

Chemicals of Potential Concern	CAS Registry Number	Bioconcentration/Bioaccumulation Factors									
		Ba_{milk} (day/kg FW)	Source	Ba_{pork} (day/kg FW)	Source	BAF_{fish} (L/kg FW)	Source	BCF_{fish} (L/kg FW)	Source	$BSAF_{fish}$ (unitless)	Source
Strontium	7440-24-6	1.50E-03	c	NA	NA	3.16E+00	i	NA	NA	NA	NA
Tantalum	7440-25-7	3.00E-04	c	NA	NA	NA	NA	NA	NA	NA	NA
Thallium	7440-28-0	2.00E-03	f	NA	NA	NA	NA	1.00E+00	g	NA	NA
Tin	7440-31-5	1.00E-03	c	NA	NA	NA	NA	NA	NA	NA	NA
Tungsten	7440-33-7	3.00E-04	c	NA	NA	NA	NA	NA	NA	NA	NA
Uranium	7440-61-1	6.00E-04	c	4.00E-02	h	NA	NA	NA	NA	NA	NA
Vanadium	7440-62-2	2.00E-05	c	NA	NA	NA	NA	NA	NA	NA	NA
Yttrium	7440-65-5	2.00E-05	c	NA	NA	NA	NA	NA	NA	NA	NA
Zinc	7440-66-6	3.25E-05	f	1.28E-04	f	NA	NA	2.06E+03	g	NA	NA
Zirconium	7440-67-7	3.00E-05	c	NA	NA	NA	NA	NA	NA	NA	NA
Non-Metals and Anions											
Ammonia/Ammonium	7664-41-7	7.90E-09	l	NA	NA	NA	NA	NA	NA	NA	NA
Bromide	24959-67-9	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chloride	16887-00-6	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Cyanide	57-12-5	9.90E-08	l	NA	NA	NA	NA	6.33E+02	f	NA	NA
Fluoride	16984-48-8	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Hydroxide	14280-30-9	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Iodine	7553-56-2	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Nitrate	14797-55-8	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Nitrite	14797-65-0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Phosphate	14265-44-2	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Phosphorus	7723-14-0	1.50E-02	c	NA	NA	NA	NA	NA	NA	NA	NA
Sulfate	14808-79-8	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total sulfur	63705-05-5	1.50E-02	c	NA	NA	NA	NA	NA	NA	NA	NA
Criteria Pollutants											
Carbon monoxide	630-08-0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Nitrogen dioxide	10102-44-0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Ozone	10028-15-6	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Particulate matter	No CAS #	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Sulfur dioxide	7446-09-5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Table B1-2 Chemical-Specific Parameters for Inorganic COPCs

Chemicals of Potential Concern	CAS Registry Number	Soil Loss Mechanisms [e]											
		k_{decay} (year)$^{-1}$	Source	ks_e (year)$^{-1}$			Source	ks_g (year)$^{-1}$	Source	ks_l (year)$^{-1}$			Source
				1 cm	15 cm	20 cm				1 cm	15 cm	20 cm	
Strontium	7440-24-6	0.0E+00	NA	1.75E-03	1.17E-04	8.77E-05	d	0.0E+00	NA	9.16E-02	6.11E-03	4.58E-03	d
Tantalum	7440-25-7	0.0E+00	NA	1.76E-03	1.17E-04	8.81E-05	d	0.0E+00	NA	4.95E-03	3.30E-04	2.48E-04	d
Thallium	7440-28-0	0.0E+00	NA	1.76E-03	1.17E-04	8.79E-05	d	0.0E+00	NA	4.53E-02	3.02E-03	2.26E-03	d
Tin	7440-31-5	0.0E+00	NA	1.76E-03	1.17E-04	8.80E-05	d	0.0E+00	NA	1.29E-02	8.58E-04	6.44E-04	d
Tungsten	7440-33-7	0.0E+00	NA	1.76E-03	1.17E-04	8.80E-05	d	0.0E+00	NA	2.14E-02	1.43E-03	1.07E-03	d
Uranium	7440-61-1	0.0E+00	NA	1.76E-03	1.17E-04	8.80E-05	d	0.0E+00	NA	7.15E-03	4.77E-04	3.58E-04	d
Vanadium	7440-62-2	0.0E+00	NA	1.76E-03	1.17E-04	8.81E-05	d	0.0E+00	NA	3.22E-03	2.15E-04	1.61E-04	d
Yttrium	7440-65-5	0.0E+00	NA	1.76E-03	1.17E-04	8.80E-05	d	0.0E+00	NA	6.44E-03	4.29E-04	3.22E-04	d
Zinc	7440-66-6	0.0E+00	NA	1.76E-03	1.17E-04	8.79E-05	d	0.0E+00	NA	5.18E-02	3.45E-03	2.59E-03	d
Zirconium	7440-67-7	0.0E+00	NA	1.76E-03	1.17E-04	8.81E-05	d	0.0E+00	NA	1.07E-03	7.16E-05	5.37E-05	d
Non-Metals and Anions													
Ammonia/Ammonium	7664-41-7	0.0E+00	NA	0.0E+00	0.0E+00	0.0E+00	NA	0.0E+00	NA	0.0E+00	0.0E+00	0.0E+00	NA
Bromide	24959-67-9	0.0E+00	NA	0.0E+00	0.0E+00	0.0E+00	NA	0.0E+00	NA	0.0E+00	0.0E+00	0.0E+00	NA
Chloride	16887-00-6	0.0E+00	NA	0.0E+00	0.0E+00	0.0E+00	NA	0.0E+00	NA	0.0E+00	0.0E+00	0.0E+00	NA
Cyanide	57-12-5	0.0E+00	NA	0.0E+00	0.0E+00	0.0E+00	NA	0.0E+00	NA	0.0E+00	0.0E+00	0.0E+00	NA
Fluoride	16984-48-8	0.0E+00	NA	0.0E+00	0.0E+00	0.0E+00	NA	0.0E+00	NA	0.0E+00	0.0E+00	0.0E+00	NA
Hydroxide	14280-30-9	0.0E+00	NA	0.0E+00	0.0E+00	0.0E+00	NA	0.0E+00	NA	0.0E+00	0.0E+00	0.0E+00	NA
Iodine	7553-56-2	0.0E+00	NA	0.0E+00	0.0E+00	0.0E+00	NA	0.0E+00	NA	0.0E+00	0.0E+00	0.0E+00	NA
Nitrate	14797-55-8	0.0E+00	NA	0.0E+00	0.0E+00	0.0E+00	NA	0.0E+00	NA	0.0E+00	0.0E+00	0.0E+00	NA
Nitrite	14797-65-0	0.0E+00	NA	0.0E+00	0.0E+00	0.0E+00	NA	0.0E+00	NA	0.0E+00	0.0E+00	0.0E+00	NA
Phosphate	14265-44-2	0.0E+00	NA	0.0E+00	0.0E+00	0.0E+00	NA	0.0E+00	NA	0.0E+00	0.0E+00	0.0E+00	NA
Phosphorus	7723-14-0	0.0E+00	NA	1.69E-03	1.12E-04	8.44E-05	d	0.0E+00	NA	8.81E-01	5.88E-02	4.41E-02	d
Sulfate	14808-79-8	0.0E+00	NA	0.0E+00	0.0E+00	0.0E+00	NA	0.0E+00	NA	0.0E+00	0.0E+00	0.0E+00	NA
Total sulfur	63705-05-5	0.0E+00	NA	1.73E-03	1.15E-04	8.63E-05	d	0.0E+00	NA	4.21E-01	2.80E-02	2.10E-02	d
Criteria Pollutants													
Carbon monoxide	630-08-0	0.0E+00	NA	0.0E+00	0.0E+00	0.0E+00	NA	0.0E+00	NA	0.0E+00	0.0E+00	0.0E+00	NA
Nitrogen dioxide	10102-44-0	0.0E+00	NA	0.0E+00	0.0E+00	0.0E+00	NA	0.0E+00	NA	0.0E+00	0.0E+00	0.0E+00	NA
Ozone	10028-15-6	0.0E+00	NA	0.0E+00	0.0E+00	0.0E+00	NA	0.0E+00	NA	0.0E+00	0.0E+00	0.0E+00	NA
Particulate matter	No CAS #	0.0E+00	NA	0.0E+00	0.0E+00	0.0E+00	NA	0.0E+00	NA	0.0E+00	0.0E+00	0.0E+00	NA
Sulfur dioxide	7446-09-5	0.0E+00	NA	0.0E+00	0.0E+00	0.0E+00	NA	0.0E+00	NA	0.0E+00	0.0E+00	0.0E+00	NA

Table B1-2 Chemical-Specific Parameters for Inorganic COPCs

Chemicals of Potential Concern	CAS Registry Number	Soil Loss Mechanisms [e]							
		ks_r $(year)^{-1}$			Source	ks_v $(year)^{-1}$			Source
		1 cm	15 cm	20 cm		1 cm	15 cm	20 cm	
Strontium	7440-24-6	5.47E-02	3.65E-03	2.74E-03	d	0.0E+00	0.0E+00	0.0E+00	NA
Tantalum	7440-25-7	2.96E-03	1.97E-04	1.48E-04	d	0.0E+00	0.0E+00	0.0E+00	NA
Thallium	7440-28-0	2.70E-02	1.80E-03	1.35E-03	d	0.0E+00	0.0E+00	0.0E+00	NA
Tin	7440-31-5	7.69E-03	5.13E-04	3.84E-04	d	0.0E+00	0.0E+00	0.0E+00	NA
Tungsten	7440-33-7	1.28E-02	8.54E-04	6.40E-04	d	0.0E+00	0.0E+00	0.0E+00	NA
Uranium	7440-61-1	4.27E-03	2.85E-04	2.14E-04	d	0.0E+00	0.0E+00	0.0E+00	NA
Vanadium	7440-62-2	1.92E-03	1.28E-04	9.61E-05	d	0.0E+00	0.0E+00	0.0E+00	NA
Yttrium	7440-65-5	3.84E-03	2.56E-04	1.92E-04	d	0.0E+00	0.0E+00	0.0E+00	NA
Zinc	7440-66-6	3.09E-02	2.06E-03	1.55E-03	d	0.0E+00	0.0E+00	0.0E+00	NA
Zirconium	7440-67-7	6.41E-04	4.27E-05	3.20E-05	d	0.0E+00	0.0E+00	0.0E+00	NA
Non-Metals and Anions									
Ammonia/Ammonium	7664-41-7	0.0E+00	0.0E+00	0.0E+00	NA	0.0E+00	0.0E+00	0.0E+00	NA
Bromide	24959-67-9	0.0E+00	0.0E+00	0.0E+00	NA	0.0E+00	0.0E+00	0.0E+00	NA
Chloride	16887-00-6	0.0E+00	0.0E+00	0.0E+00	NA	0.0E+00	0.0E+00	0.0E+00	NA
Cyanide	57-12-5	0.0E+00	0.0E+00	0.0E+00	NA	0.0E+00	0.0E+00	0.0E+00	NA
Fluoride	16984-48-8	0.0E+00	0.0E+00	0.0E+00	NA	0.0E+00	0.0E+00	0.0E+00	NA
Hydroxide	14280-30-9	0.0E+00	0.0E+00	0.0E+00	NA	0.0E+00	0.0E+00	0.0E+00	NA
Iodine	7553-56-2	0.0E+00	0.0E+00	0.0E+00	NA	0.0E+00	0.0E+00	0.0E+00	NA
Nitrate	14797-55-8	0.0E+00	0.0E+00	0.0E+00	NA	0.0E+00	0.0E+00	0.0E+00	NA
Nitrite	14797-65-0	0.0E+00	0.0E+00	0.0E+00	NA	0.0E+00	0.0E+00	0.0E+00	NA
Phosphate	14265-44-2	0.0E+00	0.0E+00	0.0E+00	NA	0.0E+00	0.0E+00	0.0E+00	NA
Phosphorus	7723-14-0	5.26E-01	3.51E-02	2.63E-02	d	0.0E+00	0.0E+00	0.0E+00	NA
Sulfate	14808-79-8	0.0E+00	0.0E+00	0.0E+00	NA	0.0E+00	0.0E+00	0.0E+00	NA
Total sulfur	63705-05-5	2.51E-01	1.68E-02	1.26E-02	d	0.0E+00	0.0E+00	0.0E+00	NA
Criteria Pollutants									
Carbon monoxide	630-08-0	0.0E+00	0.0E+00	0.0E+00	NA	0.0E+00	0.0E+00	0.0E+00	NA
Nitrogen dioxide	10102-44-0	0.0E+00	0.0E+00	0.0E+00	NA	0.0E+00	0.0E+00	0.0E+00	NA
Ozone	10028-15-6	0.0E+00	0.0E+00	0.0E+00	NA	0.0E+00	0.0E+00	0.0E+00	NA
Particulate matter	No CAS #	0.0E+00	0.0E+00	0.0E+00	NA	0.0E+00	0.0E+00	0.0E+00	NA
Sulfur dioxide	7446-09-5	0.0E+00	0.0E+00	0.0E+00	NA	0.0E+00	0.0E+00	0.0E+00	NA

Table B1-2 Chemical-Specific Parameters for Inorganic COPCs

CAS = Chemical Abstracts Service.
COPC = Chemical of Potential Concern.
DW = dry weight.
FW = fresh weight.

Notes/Sources

a See Section 5 of the *Human Health Risk Assessment Protocol* (HHRAP) (EPA 1998), Br_{ag} = weighted average of $Br_{ag(fruit)}$ and $Br_{ag(veg)}$.
b Value for Fv is based on phase type, which is shown in the emissions report (Attachment 1 of this work plan).
c Baes and others 1984.
d Calculated per Section 5 and/or Appendix A-3 of the HHRAP (EPA 1998).
e Total soil loss (ks) is the sum of all appropriate soil loss mechanisms.
f Section 5 and/or Appendix A-3 of the HHRAP (EPA 1998).
g CCN 063817.
h Ng and others 1982.
i US Environmental Protection Agency (EPA) EPI software; see http://www.epa.gov/oppt/exposure/docs/episuitedl.htm. Accessed in November 2002.
j Appendix A-3 of the HHRAP (EPA 1998) using value from mercuric chloride.
k Calculated per Errata to HHRAP (EPA 1999b).
l Risk Assessment Information System (RAIS); see http://risk.lsd.ornl.gov/rap_hp.shtml. Accessed in November 2002.
m H-pub = published Henry's Law Constant with various units; H-used = actual used Henry's Law Constant in atm-m^3/mol.
NA Not Applicable.

Table B1-3 Isotope-Specific Parameters for ROPCs

Radionuclide of Potential Concern	CAS Registry Number	Fraction		MW	Diffusivity				Partitioning Coefficients					
		F_v (unitless)	Source	(g/mol)	D_a (cm^2/s)	Source	D_w (cm^2/s)	Source	Kd_{bs} (L/kg)	Source	Kd_s (mL/g)	Source	Kd_{sw} (L/kg)	Source
Actinium-227	14952-40-0	0 or 1	b	227	NA	NA	NA	NA	1.50E+03	c	1.50E+03	c	1.50E+03	c
Americium-241	14596-10-2	0 or 1	b	241	NA	NA	NA	NA	7.00E+02	c	7.00E+02	c	7.00E+02	c
Americium-243	14993-75-0	0 or 1	b	243	NA	NA	NA	NA	7.00E+02	c	7.00E+02	c	7.00E+02	c
Antimony-125	14234-35-6	0 or 1	b	125	NA	NA	NA	NA	4.50E+01	c	4.50E+01	c	4.50E+01	c
Barium-137m	13981-97-0	0 or 1	b	137	NA	NA	NA	NA	6.00E+01	c	6.00E+01	c	6.00E+01	c
Cadmium-113m	14336-66-4	0 or 1	b	113	NA	NA	NA	NA	6.50E+00	c	6.50E+00	c	6.50E+00	c
Carbon-14	14762-75-5	0 or 1	b	14	NA	NA	NA	NA	6.70E+00	i	6.70E+00	i	6.70E+00	i
Cesium-134	13967-70-9	0 or 1	b	134	NA	NA	NA	NA	1.00E+03	c	1.00E+03	c	1.00E+03	c
Cesium-137	10045-97-3	0 or 1	b	137	NA	NA	NA	NA	1.00E+03	c	1.00E+03	c	1.00E+03	c
Cobalt-60	10198-40-0	0 or 1	b	60	NA	NA	NA	NA	4.50E+01	c	4.50E+01	c	4.50E+01	c
Curium-242	15510-73-3	0 or 1	b	242	NA	NA	NA	NA	2.00E+03	c	2.00E+03	c	2.00E+03	c
Curium-243	15757-87-6	0 or 1	b	243	NA	NA	NA	NA	2.00E+03	c	2.00E+03	c	2.00E+03	c
Curium-244	13981-15-2	0 or 1	b	244	NA	NA	NA	NA	2.00E+03	c	2.00E+03	c	2.00E+03	c
Europium-152	14683-23-9	0 or 1	b	152	NA	NA	NA	NA	6.50E+02	c	6.50E+02	c	6.50E+02	c
Europium-154	15585-10-1	0 or 1	b	154	NA	NA	NA	NA	6.50E+02	c	6.50E+02	c	6.50E+02	c
Europium-155	14391-16-3	0 or 1	b	155	NA	NA	NA	NA	6.50E+02	c	6.50E+02	c	6.50E+02	c
Iodine-129	15046-84-1	0 or 1	b	129	NA	NA	NA	NA	6.00E+01	c	6.00E+01	c	6.00E+01	c
Neptunium-237	13994-20-2	0 or 1	b	237	NA	NA	NA	NA	3.00E+01	c	3.00E+01	c	3.00E+01	c
Nickel-59	14336-70-0	0 or 1	b	59	NA	NA	NA	NA	1.50E+02	c	1.50E+02	c	1.50E+02	c
Nickel-63	13981-37-8	0 or 1	b	63	NA	NA	NA	NA	1.50E+02	c	1.50E+02	c	1.50E+02	c
Niobium-93m	7440-03-1	0 or 1	b	93	NA	NA	NA	NA	3.50E+02	c	3.50E+02	c	3.50E+02	c
Plutonium-238	13981-16-3	0 or 1	b	238	NA	NA	NA	NA	4.50E+03	c	4.50E+03	c	4.50E+03	c
Plutonium-239	15117-48-3	0 or 1	b	239	NA	NA	NA	NA	4.50E+03	c	4.50E+03	c	4.50E+03	c
Plutonium-240	14119-33-6	0 or 1	b	240	NA	NA	NA	NA	4.50E+03	c	4.50E+03	c	4.50E+03	c
Plutonium-241	14119-32-5	0 or 1	b	241	NA	NA	NA	NA	4.50E+03	c	4.50E+03	c	4.50E+03	c
Plutonium-242	13982-10-0	0 or 1	b	242	NA	NA	NA	NA	4.50E+03	c	4.50E+03	c	4.50E+03	c
Protactinium-231	14331-85-2	0 or 1	b	231	NA	NA	NA	NA	2.50E+03	c	2.50E+03	c	2.50E+03	c
Radium-226	13982-63-3	0 or 1	b	226	NA	NA	NA	NA	4.50E+02	c	4.50E+02	c	4.50E+02	c
Radium-228	15262-20-1	0 or 1	b	228	NA	NA	NA	NA	4.50E+02	c	4.50E+02	c	4.50E+02	c
Ruthenium-106	13967-48-1	0 or 1	b	106	NA	NA	NA	NA	3.50E+02	c	3.50E+02	c	3.50E+02	c
Samarium-151	15715-94-3	0 or 1	b	151	NA	NA	NA	NA	6.50E+02	c	6.50E+02	c	6.50E+02	c

Table B1-3 Isotope-Specific Parameters for ROPCs

Radionuclide of Potential Concern	CAS Registry Number	Plant Uptake Factors							
		Br_{ag} (µg/g DW plant)/ (µg/g soil) [a]	Source	$Br_{ag(fruit)}$ (µg/g DW plant)/ (µg/g soil)	Source	$Br_{ag(veg)}$ (µg/g DW plant)/ (µg/g soil)	Source	Br_{forage} (µg/g DW plant)/ (µg/g soil)	Source
Actinium-227	14952-40-0	7.50E-04	e	3.50E-04	c	1.14E-03	e	3.50E-03	c
Americium-241	14596-10-2	9.17E-04	e	2.50E-04	c	1.56E-03	e	5.50E-03	c
Americium-243	14993-75-0	9.17E-04	e	2.50E-04	c	1.56E-03	e	5.50E-03	c
Antimony-125	14234-35-6	5.16E-02	e	3.00E-02	c	7.25E-02	e	2.00E-01	c
Barium-137m	13981-97-0	3.22E-02	e	1.50E-02	c	4.88E-02	e	1.50E-01	c
Cadmium-113m	14336-66-4	2.01E-01	e	1.50E-01	c	2.50E-01	e	5.50E-01	c
Carbon-14	14762-75-5	NA	NA	NA	NA	NA	NA	NA	NA
Cesium-134	13967-70-9	3.64E-02	e	3.00E-02	c	4.25E-02	e	8.00E-02	c
Cesium-137	10045-97-3	3.64E-02	e	3.00E-02	c	4.25E-02	e	8.00E-02	c
Cobalt-60	10198-40-0	8.65E-03	e	7.00E-03	c	1.03E-02	e	2.00E-02	c
Curium-242	15510-73-3	1.21E-04	e	1.50E-05	c	2.24E-04	e	8.50E-04	c
Curium-243	15757-87-6	1.21E-04	e	1.50E-05	c	2.24E-04	e	8.50E-04	c
Curium-244	13981-15-2	1.21E-04	e	1.50E-05	c	2.24E-04	e	8.50E-04	c
Europium-152	14683-23-9	4.76E-03	e	4.00E-03	c	5.50E-03	e	1.00E-02	c
Europium-154	15585-10-1	4.76E-03	e	4.00E-03	c	5.50E-03	e	1.00E-02	c
Europium-155	14391-16-3	4.76E-03	e	4.00E-03	c	5.50E-03	e	1.00E-02	c
Iodine-129	15046-84-1	6.27E-02	e	5.00E-02	c	7.50E-02	e	1.50E-01	c
Neptunium-237	13994-20-2	2.14E-02	e	1.00E-02	c	3.25E-02	e	1.00E-01	c
Nickel-59	14336-70-0	6.00E-02	e	6.00E-02	c	6.00E-02	e	6.00E-02	c
Nickel-63	13981-37-8	6.00E-02	e	6.00E-02	c	6.00E-02	e	6.00E-02	c
Niobium-93m	7440-03-1	6.91E-03	e	5.00E-03	c	8.75E-03	e	2.00E-02	c
Plutonium-238	13981-16-3	9.65E-05	e	4.50E-05	c	1.46E-04	e	4.50E-04	c
Plutonium-239	15117-48-3	9.65E-05	e	4.50E-05	c	1.46E-04	e	4.50E-04	c
Plutonium-240	14119-33-6	9.65E-05	e	4.50E-05	c	1.46E-04	e	4.50E-04	c
Plutonium-241	14119-32-5	9.65E-05	e	4.50E-05	c	1.46E-04	e	4.50E-04	c
Plutonium-242	13982-10-0	9.65E-05	e	4.50E-05	c	1.46E-04	e	4.50E-04	c
Protactinium-231	14331-85-2	5.36E-04	e	2.50E-04	c	8.13E-04	e	2.50E-03	c
Radium-226	13982-63-3	3.22E-03	e	1.50E-03	c	4.88E-03	e	1.50E-02	c
Radium-228	15262-20-1	3.22E-03	e	1.50E-03	c	4.88E-03	e	1.50E-02	c
Ruthenium-106	13967-48-1	2.70E-02	e	2.00E-02	c	3.38E-02	e	7.50E-02	c
Samarium-151	15715-94-3	4.76E-03	e	4.00E-03	c	5.50E-03	e	1.00E-02	c

Table B1-3 Isotope-Specific Parameters for ROPCs

Radionuclide of Potential Concern	CAS Registry Number	Plant Uptake Factors				Bioconcentration/Bioaccumulation Factors					
		Br_{grain} (µg/g DW plant)/ (µg/g soil)	Source	$Br_{rootveg}$ (µg/g DW plant)/ (µg/g soil)	Source	Ba_{beef} (day/kg FW)	Source	$Ba_{chicken}$ (day/kg FW)	Source	Ba_{egg} (day/kg FW)	Source
Actinium-227	14952-40-0	3.50E-04	c	3.50E-04	c	2.50E-05	c	NA	NA	NA	NA
Americium-241	14596-10-2	2.50E-04	c	2.50E-04	c	3.50E-06	c	NA	NA	NA	NA
Americium-243	14993-75-0	2.50E-04	c	2.50E-04	c	3.50E-06	c	NA	NA	NA	NA
Antimony-125	14234-35-6	3.00E-02	c	3.00E-02	c	1.00E-03	c	NA	NA	NA	NA
Barium-137m	13981-97-0	1.50E-02	c	1.50E-02	c	1.50E-04	c	NA	NA	NA	NA
Cadmium-113m	14336-66-4	1.50E-01	c	1.50E-01	c	5.50E-04	c	NA	NA	NA	NA
Carbon-14	14762-75-5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Cesium-134	13967-70-9	3.00E-02	c	3.00E-02	c	2.00E-02	c	NA	NA	NA	NA
Cesium-137	10045-97-3	3.00E-02	c	3.00E-02	c	2.00E-02	c	NA	NA	NA	NA
Cobalt-60	10198-40-0	7.00E-03	c	7.00E-03	c	2.00E-02	c	NA	NA	NA	NA
Curium-242	15510-73-3	1.50E-05	c	1.50E-05	c	3.50E-06	c	NA	NA	NA	NA
Curium-243	15757-87-6	1.50E-05	c	1.50E-05	c	3.50E-06	c	NA	NA	NA	NA
Curium-244	13981-15-2	1.50E-05	c	1.50E-05	c	3.50E-06	c	NA	NA	NA	NA
Europium-152	14683-23-9	4.00E-03	c	4.00E-03	c	5.00E-03	c	NA	NA	NA	NA
Europium-154	15585-10-1	4.00E-03	c	4.00E-03	c	5.00E-03	c	NA	NA	NA	NA
Europium-155	14391-16-3	4.00E-03	c	4.00E-03	c	5.00E-03	c	NA	NA	NA	NA
Iodine-129	15046-84-1	5.00E-02	c	5.00E-02	c	7.00E-03	c	NA	NA	NA	NA
Neptunium-237	13994-20-2	1.00E-02	c	1.00E-02	c	5.50E-05	c	NA	NA	NA	NA
Nickel-59	14336-70-0	6.00E-02	c	6.00E-02	c	6.00E-03	c	NA	NA	NA	NA
Nickel-63	13981-37-8	6.00E-02	c	6.00E-02	c	6.00E-03	c	NA	NA	NA	NA
Niobium-93m	7440-03-1	5.00E-03	c	5.00E-03	c	2.50E-01	c	NA	NA	NA	NA
Plutonium-238	13981-16-3	4.50E-05	c	4.50E-05	c	5.00E-07	c	NA	NA	NA	NA
Plutonium-239	15117-48-3	4.50E-05	c	4.50E-05	c	5.00E-07	c	NA	NA	NA	NA
Plutonium-240	14119-33-6	4.50E-05	c	4.50E-05	c	5.00E-07	c	NA	NA	NA	NA
Plutonium-241	14119-32-5	4.50E-05	c	4.50E-05	c	5.00E-07	c	NA	NA	NA	NA
Plutonium-242	13982-10-0	4.50E-05	c	4.50E-05	c	5.00E-07	c	NA	NA	NA	NA
Protactinium-231	14331-85-2	2.50E-04	c	2.50E-04	c	1.00E-05	c	NA	NA	NA	NA
Radium-226	13982-63-3	1.50E-03	c	1.50E-03	c	2.50E-04	c	NA	NA	NA	NA
Radium-228	15262-20-1	1.50E-03	c	1.50E-03	c	2.50E-04	c	NA	NA	NA	NA
Ruthenium-106	13967-48-1	2.00E-02	c	2.00E-02	c	2.00E-03	c	NA	NA	NA	NA
Samarium-151	15715-94-3	4.00E-03	c	4.00E-03	c	5.00E-03	c	NA	NA	NA	NA

Table B1-3 Isotope-Specific Parameters for ROPCs

Radionuclide of Potential Concern	CAS Registry Number	Bioconcentration/Bioaccumulation Factors										Half-life	
		Ba_{milk} (day/kg FW)	Source	Ba_{pork} (day/kg FW)	Source	BAF_{fish} (L/kg FW)	Source	BCF_{fish} (L/kg FW)	Source	$BSAF_{fish}$ (unitless)	Source	$t_{1/2}$ (days)	Source
Actinium-227	14952-40-0	2.00E-05	c	NA	NA	2.50E+01	f	NA	NA	NA	NA	7.96E+03	d
Americium-241	14596-10-2	4.00E-07	c	NA	NA	3.00E+01	f	NA	NA	NA	NA	1.58E+05	d
Americium-243	14993-75-0	4.00E-07	c	NA	NA	3.00E+01	f	NA	NA	NA	NA	2.69E+06	d
Antimony-125	14234-35-6	1.00E-04	c	NA	NA	1.00E-02	f	NA	NA	NA	NA	1.01E+03	d
Barium-137m	13981-97-0	3.50E-04	c	NA	NA	4.00E+00	f	NA	NA	NA	NA	1.77E-03	d
Cadmium-113m	14336-66-4	1.00E-03	c	NA	NA	2.00E+02	f	NA	NA	NA	NA	4.96E+03	d
Carbon-14	14762-75-5	NA	NA	NA	NA	NA	NA	4.60E+03	j	NA	NA	2.09E+06	d
Cesium-134	13967-70-9	7.00E-03	c	NA	NA	2.00E+03	f	NA	NA	NA	NA	7.52E+02	d
Cesium-137	10045-97-3	7.00E-03	c	NA	NA	2.00E+03	f	NA	NA	NA	NA	1.10E+04	d
Cobalt-60	10198-40-0	2.00E-03	c	NA	NA	3.00E+02	f	NA	NA	NA	NA	1.92E+03	d
Curium-242	15510-73-3	2.00E-03	c	NA	NA	3.00E+01	f	NA	NA	NA	NA	1.63E+02	d
Curium-243	15757-87-6	2.00E-03	c	NA	NA	3.00E+01	f	NA	NA	NA	NA	1.04E+04	d
Curium-244	13981-15-2	2.00E-03	c	NA	NA	3.00E+01	f	NA	NA	NA	NA	6.61E+03	d
Europium-152	14683-23-9	2.00E-05	c	NA	NA	5.00E+01	f	NA	NA	NA	NA	4.85E+03	d
Europium-154	15585-10-1	2.00E-05	c	NA	NA	5.00E+01	f	NA	NA	NA	NA	3.21E+03	d
Europium-155	14391-16-3	2.00E-05	c	NA	NA	5.00E+01	f	NA	NA	NA	NA	1.81E+03	d
Iodine-129	15046-84-1	1.00E-02	c	NA	NA	4.00E+01	f	NA	NA	NA	NA	5.73E+09	d
Neptunium-237	13994-20-2	5.00E-06	c	NA	NA	3.00E+01	f	NA	NA	NA	NA	7.81E+08	d
Nickel-59	14336-70-0	1.00E-03	c	NA	NA	1.00E+02	f	NA	NA	NA	NA	2.74E+07	d
Nickel-63	13981-37-8	1.00E-03	c	NA	NA	1.00E+02	f	NA	NA	NA	NA	3.51E+04	k
Niobium-93m	7440-03-1	2.00E-02	c	NA	NA	3.00E+02	f	NA	NA	NA	NA	4.97E+03	k
Plutonium-238	13981-16-3	1.00E-07	c	NA	NA	3.00E+01	f	NA	NA	NA	NA	3.20E+04	d
Plutonium-239	15117-48-3	1.00E-07	c	NA	NA	3.00E+01	f	NA	NA	NA	NA	8.80E+06	d
Plutonium-240	14119-33-6	1.00E-07	c	NA	NA	3.00E+01	f	NA	NA	NA	NA	2.39E+06	d
Plutonium-241	14119-32-5	1.00E-07	c	NA	NA	3.00E+01	f	NA	NA	NA	NA	5.26E+03	d
Plutonium-242	13982-10-0	1.00E-07	c	NA	NA	3.00E+01	f	NA	NA	NA	NA	1.37E+08	d
Protactinium-231	14331-85-2	5.00E-06	c	NA	NA	1.00E+01	f	NA	NA	NA	NA	1.20E+07	k
Radium-226	13982-63-3	4.50E-04	c	NA	NA	5.00E+01	f	NA	NA	NA	NA	5.84E+05	d
Radium-228	15262-20-1	4.50E-04	c	NA	NA	5.00E+01	f	NA	NA	NA	NA	2.10E+03	d
Ruthenium-106	13967-48-1	6.00E-07	c	NA	NA	1.00E+01	f	NA	NA	NA	NA	3.68E+02	d
Samarium-151	15715-94-3	2.00E-05	c	NA	NA	NA	NA	2.50E+01	i	NA	NA	3.29E+04	d

Table B1-3 Isotope-Specific Parameters for ROPCs

Radionuclide of Potential Concern	CAS Registry Number	Soil Loss Mechanisms [h]											
		k_{decay} $(year)^{-1}$	Source	ks_e $(year)^{-1}$			Source	ks_g $(year)^{-1}$	Source	ks_l $(year)^{-1}$			Source
				1 cm	15 cm	20 cm				1 cm	15 cm	20 cm	
Actinium-227	14952-40-0	3.18E-02	g	0.0E+00	0.0E+00	0.0E+00	NA	0.0E+00	NA	2.15E-03	1.43E-04	1.07E-04	e
Americium-241	14596-10-2	1.60E-03	g	0.0E+00	0.0E+00	0.0E+00	NA	0.0E+00	NA	4.60E-03	3.07E-04	2.30E-04	e
Americium-243	14993-75-0	9.39E-05	g	0.0E+00	0.0E+00	0.0E+00	NA	0.0E+00	NA	4.60E-03	3.07E-04	2.30E-04	e
Antimony-125	14234-35-6	2.50E-01	g	0.0E+00	0.0E+00	0.0E+00	NA	0.0E+00	NA	7.13E-02	4.75E-03	3.57E-03	e
Barium-137m	13981-97-0	1.43E+05	g	0.0E+00	0.0E+00	0.0E+00	NA	0.0E+00	NA	5.35E-02	3.57E-03	2.68E-03	e
Cadmium-113m	14336-66-4	5.10E-02	g	0.0E+00	0.0E+00	0.0E+00	NA	0.0E+00	NA	4.84E-01	3.23E-02	2.42E-02	e
Carbon-14	14762-75-5	1.21E-04	g	0.0E+00	0.0E+00	0.0E+00	NA	0.0E+00	NA	4.70E-01	3.13E-02	2.35E-02	e
Cesium-134	13967-70-9	3.36E-01	g	0.0E+00	0.0E+00	0.0E+00	NA	0.0E+00	NA	3.22E-03	2.15E-04	1.61E-04	e
Cesium-137	10045-97-3	2.31E-02	g	0.0E+00	0.0E+00	0.0E+00	NA	0.0E+00	NA	3.22E-03	2.15E-04	1.61E-04	e
Cobalt-60	10198-40-0	1.32E-01	g	0.0E+00	0.0E+00	0.0E+00	NA	0.0E+00	NA	7.13E-02	4.75E-03	3.57E-03	e
Curium-242	15510-73-3	1.55E+00	g	0.0E+00	0.0E+00	0.0E+00	NA	0.0E+00	NA	1.61E-03	1.07E-04	8.05E-05	e
Curium-243	15757-87-6	2.43E-02	g	0.0E+00	0.0E+00	0.0E+00	NA	0.0E+00	NA	1.61E-03	1.07E-04	8.05E-05	e
Curium-244	13981-15-2	3.83E-02	g	0.0E+00	0.0E+00	0.0E+00	NA	0.0E+00	NA	1.61E-03	1.07E-04	8.05E-05	e
Europium-152	14683-23-9	5.21E-02	g	0.0E+00	0.0E+00	0.0E+00	NA	0.0E+00	NA	4.95E-03	3.30E-04	2.48E-04	e
Europium-154	15585-10-1	7.88E-02	g	0.0E+00	0.0E+00	0.0E+00	NA	0.0E+00	NA	4.95E-03	3.30E-04	2.48E-04	e
Europium-155	14391-16-3	1.40E-01	g	0.0E+00	0.0E+00	0.0E+00	NA	0.0E+00	NA	4.95E-03	3.30E-04	2.48E-04	e
Iodine-129	15046-84-1	4.41E-08	g	0.0E+00	0.0E+00	0.0E+00	NA	0.0E+00	NA	5.35E-02	3.57E-03	2.68E-03	e
Neptunium-237	13994-20-2	3.24E-07	g	0.0E+00	0.0E+00	0.0E+00	NA	0.0E+00	NA	1.07E-01	7.12E-03	5.34E-03	e
Nickel-59	14336-70-0	9.24E-06	g	0.0E+00	0.0E+00	0.0E+00	NA	0.0E+00	NA	2.14E-02	1.43E-03	1.07E-03	e
Nickel-63	13981-37-8	7.21E-03	g	0.0E+00	0.0E+00	0.0E+00	NA	0.0E+00	NA	2.14E-02	1.43E-03	1.07E-03	e
Niobium-93m	7440-03-1	5.09E-02	g	0.0E+00	0.0E+00	0.0E+00	NA	0.0E+00	NA	9.20E-03	6.13E-04	4.60E-04	e
Plutonium-238	13981-16-3	7.90E-03	g	0.0E+00	0.0E+00	0.0E+00	NA	0.0E+00	NA	7.16E-04	4.77E-05	3.58E-05	e
Plutonium-239	15117-48-3	2.88E-05	g	0.0E+00	0.0E+00	0.0E+00	NA	0.0E+00	NA	7.16E-04	4.77E-05	3.58E-05	e
Plutonium-240	14119-33-6	1.06E-04	g	0.0E+00	0.0E+00	0.0E+00	NA	0.0E+00	NA	7.16E-04	4.77E-05	3.58E-05	e
Plutonium-241	14119-32-5	4.81E-02	g	0.0E+00	0.0E+00	0.0E+00	NA	0.0E+00	NA	7.16E-04	4.77E-05	3.58E-05	e
Plutonium-242	13982-10-0	1.84E-06	g	0.0E+00	0.0E+00	0.0E+00	NA	0.0E+00	NA	7.16E-04	4.77E-05	3.58E-05	e
Protactinium-231	14331-85-2	2.11E-05	g	0.0E+00	0.0E+00	0.0E+00	NA	0.0E+00	NA	1.29E-03	8.59E-05	6.44E-05	e
Radium-226	13982-63-3	4.33E-04	g	0.0E+00	0.0E+00	0.0E+00	NA	0.0E+00	NA	7.15E-03	4.77E-04	3.58E-04	e
Radium-228	15262-20-1	1.21E-01	g	0.0E+00	0.0E+00	0.0E+00	NA	0.0E+00	NA	7.15E-03	4.77E-04	3.58E-04	e
Ruthenium-106	13967-48-1	6.87E-01	g	0.0E+00	0.0E+00	0.0E+00	NA	0.0E+00	NA	9.20E-03	6.13E-04	4.60E-04	e
Samarium-151	15715-94-3	7.70E-03	g	0.0E+00	0.0E+00	0.0E+00	NA	0.0E+00	NA	4.95E-03	3.30E-04	2.48E-04	e

Table B1-3 Isotope-Specific Parameters for ROPCs

Radionuclide of Potential Concern	CAS Registry Number	Soil Loss Mechanisms [h]							
		ks_r (year)$^{-1}$			Source	ks_v (year)$^{-1}$			Source
		1 cm	15 cm	20 cm		1 cm	15 cm	20 cm	
Actinium-227	14952-40-0	1.28E-03	8.55E-05	6.41E-05	e	0.0E+00	0.0E+00	0.0E+00	NA
Americium-241	14596-10-2	2.75E-03	1.83E-04	1.37E-04	e	0.0E+00	0.0E+00	0.0E+00	NA
Americium-243	14993-75-0	2.75E-03	1.83E-04	1.37E-04	e	0.0E+00	0.0E+00	0.0E+00	NA
Antimony-125	14234-35-6	4.26E-02	2.84E-03	2.13E-03	e	0.0E+00	0.0E+00	0.0E+00	NA
Barium-137m	13981-97-0	3.20E-02	2.13E-03	1.60E-03	e	0.0E+00	0.0E+00	0.0E+00	NA
Cadmium-113m	14336-66-4	2.89E-01	1.93E-02	1.45E-02	e	0.0E+00	0.0E+00	0.0E+00	NA
Carbon-14	14762-75-5	2.81E-01	1.87E-02	1.40E-02	e	0.0E+00	0.0E+00	0.0E+00	NA
Cesium-134	13967-70-9	1.92E-03	1.28E-04	9.61E-05	e	0.0E+00	0.0E+00	0.0E+00	NA
Cesium-137	10045-97-3	1.92E-03	1.28E-04	9.61E-05	e	0.0E+00	0.0E+00	0.0E+00	NA
Cobalt-60	10198-40-0	4.26E-02	2.84E-03	2.13E-03	e	0.0E+00	0.0E+00	0.0E+00	NA
Curium-242	15510-73-3	9.61E-04	6.41E-05	4.81E-05	e	0.0E+00	0.0E+00	0.0E+00	NA
Curium-243	15757-87-6	9.61E-04	6.41E-05	4.81E-05	e	0.0E+00	0.0E+00	0.0E+00	NA
Curium-244	13981-15-2	9.61E-04	6.41E-05	4.81E-05	e	0.0E+00	0.0E+00	0.0E+00	NA
Europium-152	14683-23-9	2.96E-03	1.97E-04	1.48E-04	e	0.0E+00	0.0E+00	0.0E+00	NA
Europium-154	15585-10-1	2.96E-03	1.97E-04	1.48E-04	e	0.0E+00	0.0E+00	0.0E+00	NA
Europium-155	14391-16-3	2.96E-03	1.97E-04	1.48E-04	e	0.0E+00	0.0E+00	0.0E+00	NA
Iodine-129	15046-84-1	3.20E-02	2.13E-03	1.60E-03	e	0.0E+00	0.0E+00	0.0E+00	NA
Neptunium-237	13994-20-2	6.38E-02	4.25E-03	3.19E-03	e	0.0E+00	0.0E+00	0.0E+00	NA
Nickel-59	14336-70-0	1.28E-02	8.54E-04	6.40E-04	e	0.0E+00	0.0E+00	0.0E+00	NA
Nickel-63	13981-37-8	1.28E-02	8.54E-04	6.40E-04	e	0.0E+00	0.0E+00	0.0E+00	NA
Niobium-93m	7440-03-1	5.49E-03	3.66E-04	2.75E-04	e	0.0E+00	0.0E+00	0.0E+00	NA
Plutonium-238	13981-16-3	4.27E-04	2.85E-05	2.14E-05	e	0.0E+00	0.0E+00	0.0E+00	NA
Plutonium-239	15117-48-3	4.27E-04	2.85E-05	2.14E-05	e	0.0E+00	0.0E+00	0.0E+00	NA
Plutonium-240	14119-33-6	4.27E-04	2.85E-05	2.14E-05	e	0.0E+00	0.0E+00	0.0E+00	NA
Plutonium-241	14119-32-5	4.27E-04	2.85E-05	2.14E-05	e	0.0E+00	0.0E+00	0.0E+00	NA
Plutonium-242	13982-10-0	4.27E-04	2.85E-05	2.14E-05	e	0.0E+00	0.0E+00	0.0E+00	NA
Protactinium-231	14331-85-2	7.69E-04	5.13E-05	3.85E-05	e	0.0E+00	0.0E+00	0.0E+00	NA
Radium-226	13982-63-3	4.27E-03	2.85E-04	2.14E-04	e	0.0E+00	0.0E+00	0.0E+00	NA
Radium-228	15262-20-1	4.27E-03	2.85E-04	2.14E-04	e	0.0E+00	0.0E+00	0.0E+00	NA
Ruthenium-106	13967-48-1	5.49E-03	3.66E-04	2.75E-04	e	0.0E+00	0.0E+00	0.0E+00	NA
Samarium-151	15715-94-3	2.96E-03	1.97E-04	1.48E-04	e	0.0E+00	0.0E+00	0.0E+00	NA

Table B1-3 Isotope-Specific Parameters for ROPCs

Radionuclide of Potential Concern	CAS Registry Number	Fraction		MW	Diffusivity				Partitioning Coefficients					
		F_v (unitless)	Source	(g/mol)	D_a (cm^2/s)	Source	D_w (cm^2/s)	Source	Kd_{bs} (L/kg)	Source	Kd_s (mL/g)	Source	Kd_{sw} (L/kg)	Source
Selenium-79	15758-45-9	0 or 1	b	79	NA	NA	NA	NA	3.00E+02	c	3.00E+02	c	3.00E+02	c
Strontium-90	10098-97-2	0 or 1	b	90	NA	NA	NA	NA	3.50E+01	c	3.50E+01	c	3.50E+01	c
Technetium-99	14133-76-7	0 or 1	b	99	NA	NA	NA	NA	1.50E+00	c	1.50E+00	c	1.50E+00	c
Thorium-229	15594-54-4	0 or 1	b	229	NA	NA	NA	NA	1.50E+05	c	1.50E+05	c	1.50E+05	c
Thorium-232	7440-29-1	0 or 1	b	232	NA	NA	NA	NA	1.50E+05	c	1.50E+05	c	1.50E+05	c
Tin-126	15832-50-5	0 or 1	b	126	NA	NA	NA	NA	2.50E+02	c	2.50E+02	c	2.50E+02	c
Tritium	10028-17-8	0 or 1	b	3	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Uranium-232	14158-29-3	0 or 1	b	232	NA	NA	NA	NA	4.50E+02	c	4.50E+02	c	4.50E+02	c
Uranium-233	13968-55-3	0 or 1	b	233	NA	NA	NA	NA	4.50E+02	c	4.50E+02	c	4.50E+02	c
Uranium-234	13966-29-5	0 or 1	b	234	NA	NA	NA	NA	4.50E+02	c	4.50E+02	c	4.50E+02	c
Uranium-235	15117-96-1	0 or 1	b	235	NA	NA	NA	NA	4.50E+02	c	4.50E+02	c	4.50E+02	c
Uranium-236	13982-70-2	0 or 1	b	236	NA	NA	NA	NA	4.50E+02	c	4.50E+02	c	4.50E+02	c
Uranium-238	7440-61-1	0 or 1	b	238	NA	NA	NA	NA	4.50E+02	c	4.50E+02	c	4.50E+02	c
Yttrium-90	10098-91-6	0 or 1	b	90	NA	NA	NA	NA	5.00E+02	c	5.00E+02	c	5.00E+02	c
Zirconium-93	15751-77-6	0 or 1	b	93	NA	NA	NA	NA	3.00E+03	c	3.00E+03	c	3.00E+03	c

Table B1-3 Isotope-Specific Parameters for ROPCs

Radionuclide of Potential Concern	CAS Registry Number	Plant Uptake Factors							
		Br_{ag} (µg/g DW plant)/ (µg/g soil) [a]	Source	$Br_{ag(fruit)}$ (µg/g DW plant)/ (µg/g soil)	Source	$Br_{ag(veg)}$ (µg/g DW plant)/ (µg/g soil)	Source	Br_{forage} (µg/g DW plant)/ (µg/g soil)	Source
Selenium-79	15758-45-9	2.50E-02	e	2.50E-02	c	2.50E-02	e	2.50E-02	c
Strontium-90	10098-97-2	5.36E-01	e	2.50E-01	c	8.13E-01	e	2.50E+00	c
Technetium-99	14133-76-7	2.52E+00	e	1.50E+00	c	3.50E+00	e	9.50E+00	c
Thorium-229	15594-54-4	1.82E-04	e	8.50E-05	c	2.76E-04	e	8.50E-04	c
Thorium-232	7440-29-1	1.82E-04	e	8.50E-05	c	2.76E-04	e	8.50E-04	c
Tin-126	15832-50-5	9.05E-03	e	6.00E-03	c	1.20E-02	e	3.00E-02	c
Tritium	10028-17-8	NA	NA	NA	NA	NA	NA	NA	NA
Uranium-232	14158-29-3	4.57E-03	e	4.00E-03	c	5.13E-03	e	8.50E-03	c
Uranium-233	13968-55-3	4.57E-03	e	4.00E-03	c	5.13E-03	e	8.50E-03	c
Uranium-234	13966-29-5	4.57E-03	e	4.00E-03	c	5.13E-03	e	8.50E-03	c
Uranium-235	15117-96-1	4.57E-03	e	4.00E-03	c	5.13E-03	e	8.50E-03	c
Uranium-236	13982-70-2	4.57E-03	e	4.00E-03	c	5.13E-03	e	8.50E-03	c
Uranium-238	7440-61-1	4.57E-03	e	4.00E-03	c	5.13E-03	e	8.50E-03	c
Yttrium-90	10098-91-6	7.14E-03	e	6.00E-03	c	8.25E-03	e	1.50E-02	c
Zirconium-93	15751-77-6	6.91E-04	e	5.00E-04	c	8.75E-04	e	2.00E-03	c

Table B1-3 Isotope-Specific Parameters for ROPCs

Radionuclide of Potential Concern	CAS Registry Number	Plant Uptake Factors				Bioconcentration/Bioaccumulation Factors					
		Br_{grain} (µg/g DW plant)/ (µg/g soil)	Source	$Br_{rootveg}$ (µg/g DW plant)/ (µg/g soil)	Source	Ba_{beef} (day/kg FW)	Source	$Ba_{chicken}$ (day/kg FW)	Source	Ba_{egg} (day/kg FW)	Source
Selenium-79	15758-45-9	2.50E-02	c	2.50E-02	c	1.50E-02	c	NA	NA	NA	NA
Strontium-90	10098-97-2	2.50E-01	c	2.50E-01	c	3.00E-04	c	NA	NA	NA	NA
Technetium-99	14133-76-7	1.50E+00	c	1.50E+00	c	8.50E-03	c	NA	NA	NA	NA
Thorium-229	15594-54-4	8.50E-05	c	8.50E-05	c	6.00E-06	c	NA	NA	NA	NA
Thorium-232	7440-29-1	8.50E-05	c	8.50E-05	c	6.00E-06	c	NA	NA	NA	NA
Tin-126	15832-50-5	6.00E-03	c	6.00E-03	c	8.00E-02	c	NA	NA	NA	NA
Tritium	10028-17-8	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Uranium-232	14158-29-3	4.00E-03	c	4.00E-03	c	2.00E-04	c	NA	NA	NA	NA
Uranium-233	13968-55-3	4.00E-03	c	4.00E-03	c	2.00E-04	c	NA	NA	NA	NA
Uranium-234	13966-29-5	4.00E-03	c	4.00E-03	c	2.00E-04	c	NA	NA	NA	NA
Uranium-235	15117-96-1	4.00E-03	c	4.00E-03	c	2.00E-04	c	NA	NA	NA	NA
Uranium-236	13982-70-2	4.00E-03	c	4.00E-03	c	2.00E-04	c	NA	NA	NA	NA
Uranium-238	7440-61-1	4.00E-03	c	4.00E-03	c	2.00E-04	c	NA	NA	NA	NA
Yttrium-90	10098-91-6	6.00E-03	c	6.00E-03	c	3.00E-04	c	NA	NA	NA	NA
Zirconium-93	15751-77-6	5.00E-04	c	5.00E-04	c	5.50E-03	c	NA	NA	NA	NA

Table B1-3 Isotope-Specific Parameters for ROPCs

Radionuclide of Potential Concern	CAS Registry Number	Bioconcentration/Bioaccumulation Factors										Half-life	
		Ba_{milk} (day/kg FW)	Source	Ba_{pork} (day/kg FW)	Source	BAF_{fish} (L/kg FW)	Source	BCF_{fish} (L/kg FW)	Source	$BSAF_{fish}$ (unitless)	Source	$t_{1/2}$ (days)	Source
Selenium-79	15758-45-9	4.00E-03	c	NA	NA	5.70E+03	f	NA	NA	NA	NA	2.37E+07	d
Strontium-90	10098-97-2	1.50E-03	c	NA	NA	6.00E+01	f	NA	NA	NA	NA	1.06E+04	d
Technetium-99	14133-76-7	1.00E-02	c	NA	NA	2.00E+01	f	NA	NA	NA	NA	7.77E+07	d
Thorium-229	15594-54-4	5.00E-06	c	NA	NA	1.00E+02	f	NA	NA	NA	NA	2.68E+06	d
Thorium-232	7440-29-1	5.00E-06	c	NA	NA	1.00E+02	f	NA	NA	NA	NA	5.15E+12	d
Tin-126	15832-50-5	1.00E-03	c	NA	NA	3.00E+03	f	NA	NA	NA	NA	3.65E+07	d
Tritium	10028-17-8	1.50E-02	f	NA	NA	1.00E+00	f	NA	NA	NA	NA	4.53E+03	d
Uranium-232	14158-29-3	6.00E-04	c	NA	NA	1.00E+01	f	NA	NA	NA	NA	2.63E+04	d
Uranium-233	13968-55-3	6.00E-04	c	NA	NA	1.00E+01	f	NA	NA	NA	NA	5.80E+07	d
Uranium-234	13966-29-5	6.00E-04	c	NA	NA	1.00E+01	f	NA	NA	NA	NA	8.94E+07	d
Uranium-235	15117-96-1	6.00E-04	c	NA	NA	1.00E+01	f	NA	NA	NA	NA	2.57E+11	d
Uranium-236	13982-70-2	6.00E-04	c	NA	NA	1.00E+01	f	NA	NA	NA	NA	8.54E+09	d
Uranium-238	7440-61-1	6.00E-04	c	NA	NA	1.00E+01	f	NA	NA	NA	NA	1.63E+12	d
Yttrium-90	10098-91-6	2.00E-05	c	NA	NA	3.00E+01	f	NA	NA	NA	NA	2.67E+00	d
Zirconium-93	15751-77-6	3.00E-05	c	NA	NA	3.00E+02	f	NA	NA	NA	NA	5.58E+08	d

Table B1-3 Isotope-Specific Parameters for ROPCs

Radionuclide of Potential Concern	CAS Registry Number	Soil Loss Mechanisms [h]											
		k_{decay} (year)$^{-1}$	Source	ks_e (year)$^{-1}$			Source	ks_g (year)$^{-1}$	Source	ks_l (year)$^{-1}$			Source
				1 cm	15 cm	20 cm				1 cm	15 cm	20 cm	
Selenium-79	15758-45-9	1.07E-05	g	0.0E+00	0.0E+00	0.0E+00	NA	0.0E+00	NA	1.07E-02	7.15E-04	5.36E-04	e
Strontium-90	10098-97-2	2.38E-02	g	0.0E+00	0.0E+00	0.0E+00	NA	0.0E+00	NA	9.16E-02	6.11E-03	4.58E-03	e
Technetium-99	14133-76-7	3.25E-06	g	0.0E+00	0.0E+00	0.0E+00	NA	0.0E+00	NA	1.95E+00	1.30E-01	9.74E-02	e
Thorium-229	15594-54-4	9.44E-05	g	0.0E+00	0.0E+00	0.0E+00	NA	0.0E+00	NA	2.15E-05	1.43E-06	1.07E-06	e
Thorium-232	7440-29-1	4.92E-11	g	0.0E+00	0.0E+00	0.0E+00	NA	0.0E+00	NA	2.15E-05	1.43E-06	1.07E-06	e
Tin-126	15832-50-5	6.93E-06	g	0.0E+00	0.0E+00	0.0E+00	NA	0.0E+00	NA	1.29E-02	8.58E-04	6.44E-04	e
Tritium	10028-17-8	5.59E-02	g	0.0E+00	0.0E+00	0.0E+00	NA	0.0E+00	NA	0.0E+00	0.0E+00	0.0E+00	NA
Uranium-232	14158-29-3	9.63E-03	g	0.0E+00	0.0E+00	0.0E+00	NA	0.0E+00	NA	7.15E-03	4.77E-04	3.58E-04	e
Uranium-233	13968-55-3	4.36E-06	g	0.0E+00	0.0E+00	0.0E+00	NA	0.0E+00	NA	7.15E-03	4.77E-04	3.58E-04	e
Uranium-234	13966-29-5	2.83E-06	g	0.0E+00	0.0E+00	0.0E+00	NA	0.0E+00	NA	7.15E-03	4.77E-04	3.58E-04	e
Uranium-235	15117-96-1	9.85E-10	g	0.0E+00	0.0E+00	0.0E+00	NA	0.0E+00	NA	7.15E-03	4.77E-04	3.58E-04	e
Uranium-236	13982-70-2	2.96E-08	g	0.0E+00	0.0E+00	0.0E+00	NA	0.0E+00	NA	7.15E-03	4.77E-04	3.58E-04	e
Uranium-238	7440-61-1	1.55E-10	g	0.0E+00	0.0E+00	0.0E+00	NA	0.0E+00	NA	7.15E-03	4.77E-04	3.58E-04	e
Yttrium-90	10098-91-6	9.49E+01	g	0.0E+00	0.0E+00	0.0E+00	NA	0.0E+00	NA	6.44E-03	4.29E-04	3.22E-04	e
Zirconium-93	15751-77-6	4.53E-07	g	0.0E+00	0.0E+00	0.0E+00	NA	0.0E+00	NA	1.07E-03	7.16E-05	5.37E-05	e

Table B1-3 Isotope-Specific Parameters for ROPCs

Radionuclide of Potential Concern	CAS Registry Number	Soil Loss Mechanisms [h]							
		ks_r $(year)^{-1}$			Source	ks_v $(year)^{-1}$			Source
		1 cm	15 cm	20 cm		1 cm	15 cm	20 cm	
Selenium-79	15758-45-9	6.41E-03	4.27E-04	3.20E-04	e	0.0E+00	0.0E+00	0.0E+00	NA
Strontium-90	10098-97-2	5.47E-02	3.65E-03	2.74E-03	e	0.0E+00	0.0E+00	0.0E+00	NA
Technetium-99	14133-76-7	1.16E+00	7.75E-02	5.81E-02	e	0.0E+00	0.0E+00	0.0E+00	NA
Thorium-229	15594-54-4	1.28E-05	8.55E-07	6.41E-07	e	0.0E+00	0.0E+00	0.0E+00	NA
Thorium-232	7440-29-1	1.28E-05	8.55E-07	6.41E-07	e	0.0E+00	0.0E+00	0.0E+00	NA
Tin-126	15832-50-5	7.69E-03	5.13E-04	3.84E-04	e	0.0E+00	0.0E+00	0.0E+00	NA
Tritium	10028-17-8	0.0E+00	0.0E+00	0.0E+00	NA	0.0E+00	0.0E+00	0.0E+00	NA
Uranium-232	14158-29-3	4.27E-03	2.85E-04	2.14E-04	e	0.0E+00	0.0E+00	0.0E+00	NA
Uranium-233	13968-55-3	4.27E-03	2.85E-04	2.14E-04	e	0.0E+00	0.0E+00	0.0E+00	NA
Uranium-234	13966-29-5	4.27E-03	2.85E-04	2.14E-04	e	0.0E+00	0.0E+00	0.0E+00	NA
Uranium-235	15117-96-1	4.27E-03	2.85E-04	2.14E-04	e	0.0E+00	0.0E+00	0.0E+00	NA
Uranium-236	13982-70-2	4.27E-03	2.85E-04	2.14E-04	e	0.0E+00	0.0E+00	0.0E+00	NA
Uranium-238	7440-61-1	4.27E-03	2.85E-04	2.14E-04	e	0.0E+00	0.0E+00	0.0E+00	NA
Yttrium-90	10098-91-6	3.84E-03	2.56E-04	1.92E-04	e	0.0E+00	0.0E+00	0.0E+00	NA
Zirconium-93	15751-77-6	6.41E-04	4.27E-05	3.20E-05	e	0.0E+00	0.0E+00	0.0E+00	NA

Table B1-3 Isotope-Specific Parameters for ROPCs

CAS = Chemical Abstracts Service.
DW = dry weight.
FW = fresh weight.
ROPC = Radionuclide of Potential Concern.

Notes/Sources

a See Section 5 of the *Human Health Risk Assessment Protocol* (HHRAP) (EPA 1998), Br_{ag} = weighted average of $Br_{ag(fruit)}$ and $Br_{ag(veg)}$.
b Value for Fv is based on phase type, which is shown in the emissions report (Attachment 1 of this work plan).
c Baes and others 1984.
d Health Effects Assessment Summary Table (HEAST) (EPA 2001).
e Calculated per Section 5 and/or Appendix A-3 of the HHRAP (EPA 1998).
f Risk Assessment Information System (RAIS); see http://risk.lsd.ornl.gov/rap_hp.shtml. Accessed in November 2002.
g Calculated like ks_g per Section 5 of the HHRAP (EPA 1998).
h Total soil loss (ks) is the sum of all appropriate soil loss mechanisms.
i NRC 1992.
j Strenge and others 1986.
k Eckerman and others 1999.
NA Not Applicable.

Appendix B-2

Supporting Equations for Soil, Surface Water, and Sediment Accumulation Modeling

Appendix B-2
Supporting Equations for Soil, Surface Water, and Sediment Accumulation Modeling

Contents

References for Appendix B-2 ..... **B2-v**
- **Project Documents** **B2-v**
- **Codes and Standards** **B2-v**
- **Other Documents** **B2-v**

Introduction **B2-1**

Eq. B2-1 **Soil loss constant due to biotic and abiotic degradation (ks_g)** **B2-3**

Eq. B2-2 **Soil loss constant due to radiological decay (k_{decay})** **B2-4**

Eq. B2-3 **Soil loss constant due to leaching (ks_l)** **B2-5**

Eq. B2-4 **Soil loss constant due to surface runoff (ks_r)** **B2-6**

Eq. B2-5 **Soil loss constant due to volatilization (ks_v)** **B2-7**

Eq. B2-6 **Equilibrium coefficient (Ke)** **B2-8**

Eq. B2-7 **Gas-phase mass transfer coefficient (K_t)** **B2-9**

Eq. B2-8 **Soil void fraction (θ_v)** **B2-10**

Eq. B2-9 **Soil loss constant due to soil erosion (ks_e)** **B2-11**

Eq. B2-10 **Total soil loss constant due to biotic and abiotic degradation, radiological decay, leaching, surface runoff, volatilization, and erosion (ks)** **B2-12**

Eq. B2-11 **Soil deposition term for COPCs (Ds)** **B2-13**

Eq. B2-12 **Soil deposition term for ROPCs (Ds)** **B2-14**

Eq. B2-13 **Soil deposition term for total mercury (Ds_{Hg})** **B2-15**

Eq. B2-14 **Soil deposition term for divalent mercury (Ds_{Hg2+})** **B2-16**

Eq. B2-15 **Soil deposition term for methyl mercury (Ds_{MHg})** **B2-17**

Eq. B2-16 **Average load to the water body from direct deposition of wet and dry particles and wet and dry vapors onto the surface of the water body for all COPCs and ROPCs except total mercury, divalent mercury, and methyl mercury (L_{DEP})** **B2-18**

Eq. B2-17 **Average load to the water body from direct deposition of wet and dry particles and wet and dry vapors onto the surface of the water body for total mercury [$L_{DEP(Hg)}$]** **B2-19**

Eq. B2-18 Average load to the water body from direct deposition of wet and dry particles and wet and dry vapors onto the surface of the water body for divalent mercury [$L_{DEP(Hg2+)}$] B2-20

Eq. B2-19 Average load to the water body from direct deposition of wet and dry particles and wet and dry vapors onto the surface of the water body for methyl mercury [$L_{DEP(MHg)}$] B2-21

Eq. B2-20 Load to the water body due to dry vapor diffusion for all COPCs and ROPCs except total mercury, divalent mercury, and methyl mercury, when Henry's Law Constant is available (L_{DIF}) B2-22

Eq. B2-21 Load to the water body due to dry vapor diffusion for all COPCs and ROPCs except total mercury, divalent mercury, and methyl mercury, when Henry's Law Constant is not available (L_{DIF}) B2-23

Eq. B2-22 Load to the water body due to dry vapor diffusion for total mercury [$L_{DIF(Hg)}$] B2-24

Eq. B2-23 Load to the water body due to dry vapor diffusion for divalent mercury [$L_{DIF(Hg2+)}$] B2-25

Eq. B2-24 Load to the water body due to dry vapor diffusion for methyl mercury [$L_{DIF(MHg)}$] B2-26

Eq. B2-25 Average runoff load to the water body from impervious surfaces in the watershed from which runoff is conveyed directly to the water body for all COPCs and ROPCs except total mercury, divalent mercury, and methyl mercury (L_{RI}) B2-27

Eq. B2-26 Average runoff load to the water body from impervious surfaces in the watershed from which runoff is conveyed directly to the water body for total mercury [$L_{RI(Hg)}$] B2-28

Eq. B2-27 Average runoff load to the water body from impervious surfaces in the watershed from which runoff is conveyed directly to the water body for divalent mercury [$L_{RI(Hg2+)}$] B2-29

Eq. B2-28 Average runoff load to the water body from impervious surfaces in the watershed from which runoff is conveyed directly to the water body for methyl mercury [$L_{RI(MHg)}$] B2-30

Eq. B2-29 Average runoff load to the water body from pervious soil surfaces in the watershed for all COPCs (L_{RP}) B2-31

Eq. B2-30 Average runoff load to the water body from pervious soil surfaces in the watershed for all ROPCs (L_{RP}) B2-32

Eq. B2-31 Average load to the water body from soil erosion for all COPCs (L_E) B2-33

Eq. B2-32 Fraction of total water body COPC/ROPC concentration occurring in the water column (f_{wc}) B2-34

Eq. B2-33 Total water body depth (d_z) B2-35

Eq. B2-34 Overall total water body COPC/ROPC dissipation rate constant in surface water (k_{wt}) B2-36

Eq. B2-35 Water column volatilization rate constant (k_v) B2-37

Eq. B2-36 **Fraction of total water body COPC/ROPC concentration in the benthic sediment (f_{bs}) B2-38**

Eq. B2-37 **Water column loss constant due to burial in benthic sediment (k_b) B2-39**

Eq. B2-38 **Overall transfer rate of contaminants from the liquid and gas-phases (K_v)..... B2-40**

Eq. B2-39 **Soil loss rate from the watershed by using the universal soil loss equation (X_e) B2-41**

Eq. B2-40 **Sediment delivery ratio for the watershed (SD) B2-42**

Eq. B2-41 **Rate of contaminant transfer from the liquid phase for a flowing system (K_L) B2-43**

Eq. B2-42 **Rate of contaminant transfer from the gas phase for a flowing system (K_G) B2-44**

References for Appendix B-2

Project Documents

None

Codes and Standards

None

Other Documents

Columbia Basin Research. 1996. *Columbia River Salmon Passage Model CriSP.1.5 Theory, Calibration & Validation Manual, Copyright © 1996*. Available at http://www.cqs.washington.edu/crisp/models/crisp1manual/theory/theory.mif14.html. (Accessed in 2002.)

EPA. 1996. *Soil Screening Guidance: Technical Background Document*. Office of Solid Waste and Emergency Response, US Environmental Protection Agency, Washington, DC, USA.

EPA. 1998a. *Human Health Risk Assessment Protocol for Hazardous Waste Combustion Facilities, Peer Review Draft*, EPA/530/D-98/001B. US Environmental Protection Agency, Washington, DC, USA.

EPA. 1998b. *Methodology for Assessing Health Risks Associated with Multiple Pathways of Exposure to Combustor Emissions*, EPA 600/R-98/137. Update to EPA/600/6-90/003, *Methodology for Assessing Health Risks Associated with Indirect Exposure to Combustor Emissions*. National Center for Environmental Assessment, US Environmental Protection Agency, Cincinnati, Ohio, USA.

EPA. 1999. *Errata to Human Health Risk Assessment Protocol for Hazardous Waste Combustion Facilities (Peer Review Draft)*, 2 August 1999. US Environmental Protection Agency, Washington, DC, USA.

Halvorson JJ, McCool DK, King LG, and Gatto LW. 1998. *Ground Freezing Effects on Soil Erosion of Army Training Lands. Part 2. Overwinter Changes to Tracked-Vehicle Ruts, Yakima Training Center, Washington*, Special Report 98-8. Cold Regions Research and Engineering Laboratory, US Army Corps of Engineers.

National Environmental Research Park. 2002. Available at http://www.uga.edu/srel/ESSite/Hanford.html. (Accessed in August 2002.)

Western Regional Climate Center. 2002. *Washington Annual Precipitation Summary*. Available at http://www.wrcc.dri.edu/htmlfiles/wa/wa.ppt.ext.html. (Accessed in August 2002.)

Introduction

This appendix provides equations that supplement the equations provided in the text of section 6 (Environmental Modeling) of this work plan. Equations that support the soil, surface water, and sediment accumulation modeling and data are provided in this appendix. Equations shown in section 6 refer to the immediate supporting equations within Appendix B-2. Parameters that are functions of other parameters are presented only in Appendix B-2 (for example, the equation for the soil loss constant due to biotic and abiotic degradation, presented in Eq. B2-1, is referenced in the definition of parameters used to estimate the total soil loss constant, which is shown in Eq. B2-10, which is referenced in equations 6-1 through 6-4 in section 6.2). Section 6 presents only the "high-level" equations; all supporting equations (including supporting equations for parameters that appear in other supporting equations) are presented in this appendix. A description of how the parameters shown in this appendix link to the equations in section 6 is provided for each equation in this appendix.

Because many of the equations used in the soil modeling are functions of other equations, the intermediary calculations necessary to calculate the chemical of potential concern (COPC) or radionuclide of potential concern (ROPC) concentrations in soil should be performed in a logical order. The equations for these intermediary calculations can be found in this appendix; values for the contaminant-specific parameters are presented in Appendix B-1, tables B1-1 (for organic COPCs), B1-2 (inorganic COPCs), and B1-3 (ROPCs). The order for these intermediary calculations is as follows:

1. Individual COPC and ROPC soil loss mechanisms should be estimated first. These include soil loss constant due to biotic and abiotic degradation (see Eq. B2-1), soil loss constant due to radiological decay (Eq. B2-2), soil loss constant due to leaching (Eq. B2-3), soil loss constant due to surface runoff (Eq. B2-4), soil loss constant due to volatilization (Eq. B2-5), and soil loss constant due to soil erosion (Eq. B2-9). These soil loss mechanisms are estimated using methods provided in EPA 1998a, along with Hanford-specific parameter values (a site-specific parameter value unique to the Hanford Site), site-specific parameter values (a parameter unique to a site and independent of the constituent being evaluated; the actual value may be a default value and not specific to the Hanford Site), and contaminant-specific parameter values (a parameter unique to a contaminant and independent of the site being evaluated) where appropriate (see Table 6-1 for Hanford-specific and site-specific parameter values and Appendix B-1 for contaminant-specific parameter values).
2. Next, the total soil loss (summing across all available soil loss mechanisms) for each soil depth (untilled soil, root zone soil, and tilled soil) should be computed. See Eq. B2-10.
3. The deposition term (denoted by Ds) used to estimate the soil concentration should be calculated next (see Eq. B2-11 for COPCs and Eq. B2-12 for ROPCs). Note that for mercury, the deposition term to soil is modeled slightly differently from all other COPCs (as specified in EPA 1998a). Eq. B2-13 is used to estimate Ds for total mercury; Eq. B2-14 estimates Ds for divalent mercury; and Eq. B2-15 estimates Ds for methyl mercury. Note also because there are multiple flues from the facility, the deposition term to soil (Eq. B2-11 through Eq. B2-15) should be calculated for each individual flue before summing across flues to obtain a total deposition across all flues. The deposition term to soil is estimated using methods provided in EPA 1998a, along with site-specific parameter values where appropriate (see Appendix B-1 for details).

4 Finally, soil concentrations should be calculated (see Eq. 6-1 through Eq. 6-4 in section 6.2). The soil concentrations are estimated using methods provided in EPA 1998a, along with site-specific parameter values where appropriate (see Table 6-1 for a list of site-specific parameter values used in soil modeling).

The specific equations to support the soil, surface water, and sediment accumulation modeling follow.

Equation B2-1

Values for the soil loss constant due to biotic and abiotic degradation (ks_g) for inorganic and organic COPCs are found in the Human Health Risk Assessment Protocol (HHRAP) (EPA 1998a). In the event that values do not appear in the HHRAP, Eq. B2-1 (based on information in EPA 1998a) is used to calculate the soil loss constant due to biotic and abiotic degradation for organic COPCs (ks_g is not estimated for ROPCs). ks_g is used in the estimation of the total soil loss constant (see Eq. B2-10), which is used in the estimation of soil concentrations (see Eq. 6-1 through Eq. 6-4 in section 6.2). The equation to estimate ks_g for organic COPCs is:

$$ks_g = \frac{CF_1}{t_{1/2} \cdot CF_2} \qquad \text{(Eq. B2-1)}$$

where:

ks_g	=	COPC soil loss constant due to biotic and abiotic degradation (yr^{-1}). ks_g is COPC-specific. If no ks_g value exists for a constituent, the model uses $ks_g = 0\ yr^{-1}$. Values for ks_g are shown in Appendix B-1, tables B1-1 (organic COPCs) and B1-2 (inorganic COPCs).
CF_1	=	conversion factor of 0.693, equal to the natural logarithm of 2
$t_{1/2}$	=	half-life of the compound (days). The parameter $t_{1/2}$ is COPC-specific and is shown in Appendix B-1, Table B1-1, for organic COPCs.
CF_2	=	conversion factor of 1/365 (yr/d), used to convert half-life from units of days to years

Equation B2-2

Equation B2-2 (modified for ROPCs from Eq. B2-1) is used to calculate the soil loss constant due to radiological decay (k_{decay}) for ROPCs (k_{decay} is not estimated for COPCs). k_{decay} is used in the estimation of the total soil loss constant (see Eq. B2-10), which is used in the estimation of soil concentrations (see Eq. 6-1 through Eq. 6-4 in section 6.2). The equation to estimate k_{decay} for all ROPCs is:

$$k_{decay} = \frac{CF_1}{t_{1/2} \cdot CF_2} \qquad \text{(Eq. B2-2)}$$

where:

k_{decay}	=	ROPC soil loss constant due to radiological decay (yr^{-1}). k_{decay} is ROPC-specific. If no k_{decay} value exists for a constituent, the model uses $k_{decay} = 0\ yr^{-1}$. Values for k_{decay} are shown in Appendix B-1, Table B1-3.
CF_1	=	conversion factor of 0.693, equal to the natural logarithm of 2
$t_{1/2}$	=	half-life of the ROPC (days). The parameter $t_{1/2}$ is ROPC-specific and is shown in Appendix B-1, Table B1-3.
CF_2	=	conversion factor of 1/365 (yr/d), used to convert half-life from units of days to years

Equation B2-3

Soil loss due to leaching (ks_l) is a function of the amount of water available to generate leachate and soil properties such as bulk density, soil moisture, soil porosity, and soil sorption properties (EPA 1998a). Eq. B2-3 (Eq. 5-5A in EPA 1998a) is used to calculate the soil loss constant due to leaching for COPCs and ROPCs. ks_l is used in the estimation of the total soil loss constant (see Eq. B2-10), which is used in the estimation of soil concentrations (see Eq. 6-1 through Eq. 6-4 in section 6.2). The equation to estimate ks_l is:

$$ks_l = \frac{P + I - RO - E_v}{\theta_{sw} \cdot Z_s \cdot [1 + (Kd_s \cdot BD / \theta_{sw})]} \qquad \text{(Eq. B2-3)}$$

where:

ks_l	=	COPC or ROPC soil loss constant due to leaching (yr^{-1}). ks_l is COPC- and ROPC-specific and depth-specific. If no ks_l value exists for a constituent, the model uses ks_l = 0 yr^{-1}.
P	=	average annual precipitation (cm/yr). A value of 18.19 cm/yr (7.16 inches/yr for Richland, Washington; Western Regional Climate Center 2002) is used (see Table 6-1).
I	=	average annual irrigation (cm/yr). A value of 0 cm/yr is used (assumed value; see Table 6-1).
RO	=	average annual surface runoff from pervious areas (cm/yr). RO is site-specific. A value of 2.5 cm/yr (estimated value, assuming that the majority of rainfall recharges or evaporates) is used (see Table 6-1).
E_v	=	average annual evapotranspiration (cm/yr). E_v is site-specific. A value of 12.045 cm/yr (converted from 0.33 mm/day; National Environmental Research Park 2002) is used (see Table 6-1).
θ_{sw}	=	soil volumetric water content (mL water/cm^3 soil). θ_{sw} is site-specific. The recommended default value of 0.2 mL/cm^3 (EPA 1998a) is used (see Table 6-1).
Z_s	=	soil mixing zone depth (cm). Three different values (depths) are used for Z_s: untilled soil (1 cm), root-zone soil (15 cm), and tilled soil (20 cm) (see Table 6-1).
Kd_s	=	soil-water partition coefficient (mL water/g soil). Kd_s is COPC- and ROPC-specific and can be found in Appendix B-1, tables B1-1 (organic COPCs), B1-2 (inorganic COPCs), and B1-3 (ROPCs). If no Kd_s value exists for a constituent, the model uses Kd_s = 0 mL/g.
BD	=	soil bulk density (g soil/cm^3 soil). A site-specific value of 1.3 g/cm^3 (Halvorson and others 1998) is used (see Table 6-1).

Equation B2-4

Equation B2-4 (Eq. 5-4 in EPA 1998a) is used to calculate the soil loss constant due to surface runoff (ks_r) for COPCs and ROPCs. ks_r is used in the estimation of the total soil loss constant (see Eq. B2-10), which is used in the estimation of soil concentrations (see Eq. 6-1 through Eq. 6-4 in section 6.2). The equation to estimate ks_r is:

$$ks_r = \left(\frac{RO}{\theta_{sw} \cdot Z_s}\right) \cdot \left(\frac{1}{1 + (Kd_s \cdot BD / \theta_{sw})}\right) \qquad \text{(Eq. B2-4)}$$

where:

ks_r	=	COPC or ROPC soil loss constant due to surface runoff (yr^{-1}). ks_r is COPC- and ROPC-specific and depth-specific. If no ks_r value exists for a constituent, the model uses $ks_r = 0\ yr^{-1}$.
RO	=	average annual surface runoff from pervious areas (cm/yr). RO is site-specific. A value of 2.5 cm/yr (estimated value, assuming that the majority of rainfall recharges or evaporates) is used (see Table 6-1).
θ_{sw}	=	soil volumetric water content (mL water/cm^3 soil). θ_{sw} is site-specific. The recommended default value of 0.2 mL/cm^3 (EPA 1998a) is used (see Table 6-1).
Z_s	=	soil mixing zone depth (cm). Three different values (depths) are used for Z_s: untilled soil (1 cm), root-zone soil (15 cm), and tilled soil (20 cm) (see Table 6-1).
Kd_s	=	soil-water partition coefficient (mL water/g soil). Kd_s is COPC- and ROPC-specific and can be found in Appendix B-1, tables B1-1 (organic COPCs), B1-2 (inorganic COPCs), and B1-3 (ROPCs). If no Kd_s value exists for a constituent, then the soil loss due to surface runoff (ks_r) is assigned a value of 0 yr^{-1}.
BD	=	soil bulk density (g soil/cm^3 soil). A site-specific value of 1.3 g/cm^3 (Halvorson and others 1998) is used (see Table 6-1).

Equation B2-5

Volatile and semivolatile organic COPCs, as well as mercury, emitted in high concentrations may become adsorbed to soil particles and exhibit volatilization losses from soil (ks_v). This soil loss is a function of the rate of movement of the COPCs to the soil surface, the chemical vapor concentration at the soil surface, and the rate at which vapor is carried away by the atmosphere (EPA 1998a). Eq. B2-5 (Eq. 4-9 in EPA 1998b and recommended for use in EPA 1999) is used to calculate the soil loss constant due to volatilization for organic COPCs and mercury (ks_v is assumed to be zero for ROPCs and inorganic COPCs (except for mercury) since these constituents are not considered as being volatile). ks_v is used in the estimation of the total soil loss constant (see Eq. B2-10), which is used in the estimation of soil concentrations (see Eq. 6-1 through Eq. 6-4 in section 6.2). The equation to estimate ks_v is:

$$ks_v = Ke \cdot K_t \qquad \text{(Eq. B2-5)}$$

where:

ks_v = COPC soil loss constant due to volatilization (yr^{-1}). ks_v is COPC-specific and depth-specific. If no ks_v value can be calculated for a constituent, then the soil loss due to volatilization (ks_v) is assigned a value of 0 yr^{-1}.

Ke = equilibrium coefficient (s/yr-cm). Ke is COPC-specific, depth-specific, and calculated in Eq. B2-6. If Ke cannot be calculated, then the soil loss due to volatilization (ks_v) is assigned a value of 0 yr^{-1}.

K_t = gas-phase mass transfer coefficient (cm/s). K_t is COPC-specific, depth-specific, and calculated in Eq. B2-7. If K_t cannot be calculated, then the soil loss due to volatilization (ks_v) is assigned a value of 0 yr^{-1}.

Equation B2-6

Equation B2-6 calculates the equilibrium coefficient (Ke), which is used in the determination of the soil loss due to volatilization (ks_v) for organic COPCs and mercury. (Ke is not estimated for ROPCs and inorganic COPCs [except for mercury], based on the lack of Henry's Law Constants.) Note that ks_v is used in the estimation of the total soil loss constant (see Eq. B2-10), which is used in the estimation of soil concentrations (see Eq. 6-1 through Eq. 6-4 in section 6.2). The equation to estimate Ke (Eq. 4-10 in EPA 1998b and recommended for use in EPA 1999) is:

$$Ke = \frac{CF \cdot H}{Z_s \cdot Kd_s \cdot R \cdot T_{wk} \cdot BD} \qquad \text{(Eq. B2-6)}$$

where:

Ke	=	equilibrium coefficient (s/yr-cm). Ke is COPC-specific and depth-specific. If Ke cannot be calculated, then the soil loss due to volatilization (ks_v) is assigned a value of 0 yr^{-1}.
CF	=	units conversion factor of 3.1536E+07 (s/yr)
H	=	Henry's Law Constant (atm-m^3/mol). H is COPC-specific and is shown in Appendix B-1, Table B1-1, for organic COPCs and in Table B1-2 for mercury. If no value is available for H, then Ke is not calculated and the soil loss due to volatilization (ks_v) is assigned a value of 0 yr^{-1}.
Z_s	=	soil mixing zone depth (cm). Three different values (depths) are used for Z_s: untilled soil (1 cm), root-zone soil (15 cm), and tilled soil (20 cm) (see Table 6-1).
Kd_s	=	soil-water partition coefficient (mL water/g soil). Kd_s is COPC-specific and can be found in Appendix B-1, Table B1-1, for organic COPCs and in Table B1-2 for mercury. If no Kd_s value exists for a constituent, then Ke is not calculated and the soil loss due to volatilization (ks_v) is assigned a value of 0 yr^{-1}. Note that $Kd_s = K_{oc} \times f_{oc}$, where K_{oc} is the organic carbon partition coefficient for soil (mL water/g soil) and f_{oc} is the fraction of organic carbon in soil (unitless). K_{oc} is COPC-specific and can be found in Appendix B-1, Table B1-1, for organic COPCs, while the recommended default value of f_{oc} = 0.01 mL/g (EPA 1998a) can be used to estimate Kd_s for organic COPCs (see Table 6-1).
R	=	universal gas constant (atm-m^3/mol-°K). A value of R = 8.205×10^{-5} atm-m^3/mol-°K (EPA 1998a) is used (see Table 6-1).
T_{wk}	=	water body temperature (°K). T_{wk} is site-specific. The recommended default value of 298°K (EPA 1998a) is used (see Table 6-1).
BD	=	soil bulk density (g soil/cm^3 soil). A site-specific value of 1.3 g/cm^3 (Halvorson and others 1998) is used (see Table 6-1).

Equation B2-7

Equation B2-7 calculates the gas-phase mass transfer coefficient (K_t), which is used in the determination of the soil loss due to volatilization (ks_v) for organic COPCs and mercury. (K_t is not estimated for ROPCs and inorganic COPCs [except for mercury], based on the lack of diffusivity values.) Note that ks_v is used in the estimation of the total soil loss constant (see Eq. B2-10), which is used in the estimation of soil concentrations (see Eq. 6-1 through Eq. 6-4 in section 6.2). The equation to estimate K_t (Eq. 4-5 in EPA 1998b and recommended for use in EPA 1999) is:

$$K_t = \frac{D_a \cdot \theta_v}{Z_s} \qquad \text{(Eq. B2-7)}$$

where:

K_t	=	gas-phase mass transfer coefficient (cm/s). K_t is COPC-specific and depth-specific. If K_t cannot be calculated, then the soil loss due to volatilization (ks_v) is assigned a value of 0 yr^{-1}.
D_a	=	diffusion coefficient of contaminant in air (cm^2/s). D_a is COPC-specific and is shown in Appendix B-1, Table B1-1, for organic COPCs and Table B1-2 for mercury. If no value is available for D_a, then K_t is not calculated and the soil loss due to volatilization (ks_v) is assigned a value of 0 yr^{-1}.
θ_v	=	soil void fraction (cm^3/cm^3). θ_v is the volumetric fraction of a soil that does not contain solids or water and is calculated in Eq. B2-8.
Z_s	=	soil mixing zone depth (cm). Three different values (depths) are used for Z_s: untilled soil (1 cm), root-zone soil (15 cm), and tilled soil (20 cm) (see Table 6-1).

Equation B2-8

Equation B2-8 calculates the soil void fraction (θ_v), which is used in the determination of the soil loss due to volatilization (ks_v) for organic COPCs and mercury. (ks_v is assumed to be zero for ROPCs and inorganic COPCs [except for mercury] since these constituents are not considered as being volatile; thus, θ_v is not estimated for ROPCs and inorganic COPCs [except for mercury].) Note that ks_v is used in the estimation of the total soil loss constant (see Eq. B2-10), which is used in the estimation of soil concentrations (see Eq. 6-1 through Eq. 6-4 in section 6.2). The equation to estimate θ_v (Eq. 4-6 in EPA 1998b and recommended for use in EPA 1999) is:

$$\theta_v = 1 - \left(\frac{BD}{\rho_s}\right) - \theta_{sw} \qquad \text{(Eq. B2-8)}$$

where:

θ_v = soil void fraction (cm^3/cm^3). θ_v is the volumetric fraction of a soil that does not contain solids or water.

BD = soil bulk density (g soil/cm^3 soil). A site-specific value of 1.3 g/cm^3 (Halvorson and others 1998) is used (see Table 6-1).

ρ_s = solids particle density (g/cm^3). ρ_s is site-specific. A value of 2.65 g/cm^3 (the default value from EPA 1996) is used (see Table 6-1).

θ_{sw} = soil volumetric water content (mL water/cm^3 soil). θ_{sw} is site-specific. The recommended default value of 0.2 mL/cm^3 (EPA 1998a) is used (see Table 6-1).

Equation B2-9

Equation B2-9 is used to calculate the soil loss constant due to soil erosion (ks_e) for COPCs. (Since a soil enrichment ratio is not available for ROPCs, ks_e is not estimated for ROPCs.) ks_e is used in the estimation of the total soil loss constant (see Eq. B2-10), which is used in the estimation of soil concentrations (see Eq. 6-1 through Eq. 6-4 in section 6.2). The equation to estimate ks_e (Eq. 5-3 in EPA 1998a) is:

$$ks_e = \left(\frac{CF \cdot X_e \cdot SD \cdot ER}{BD \cdot Z_s}\right) \cdot \left(\frac{Kd_s \cdot BD}{\theta_{sw} + (Kd_s \cdot BD)}\right) \qquad \text{(Eq. B2-9)}$$

where:

ks_e	=	COPC soil loss constant due to soil erosion (yr^{-1}). ks_e is COPC-specific and depth-specific. If no ks_e value exists for a constituent, the model uses $ks_e = 0\ yr^{-1}$.
CF	=	units conversion factor of 0.1 ($g\text{-}m^2/kg\text{-}cm^2$)
X_e	=	unit soil loss ($kg/m^2\text{-}yr$). X_e is site-specific and calculated in Eq. B2-39.
SD	=	watershed sediment delivery ratio (unitless). SD is site-specific and is calculated in Eq. B2-40.
ER	=	soil enrichment ratio (unitless). ER is site-specific. The following recommended values (EPA 1998a) are used: 3 for organic COPCs and 1 for inorganic COPCs (see Table 6-1). No value is used for ROPCs and, thus, no soil loss due to soil erosion is quantified for ROPCs.
BD	=	soil bulk density (g soil/cm^3 soil). A site-specific value of 1.3 g/cm^3 (Halvorson and others 1998) is used (see Table 6-1).
Z_s	=	soil mixing zone depth (cm). Three different values (depths) are used for Z_s: untilled soil (1 cm), root-zone soil (15 cm), and tilled soil (20 cm) (see Table 6-1).
Kd_s	=	soil-water partition coefficient (mL water/g soil). Kd_s is COPC-specific and can be found in Appendix B-1, tables B1-1 (organic COPCs) and B1-2 (inorganic COPCs). If no Kd_s value exists for a constituent, the model assigns a value of 0 yr^{-1} for the soil loss due to soil erosion (ks_e).
θ_{sw}	=	soil volumetric water content (mL water/cm^3 soil). θ_{sw} is site-specific. The recommended default value of 0.2 mL/cm^3 (EPA 1998a) is used (see Table 6-1).

Equation B2-10

Equation B2-10 calculates the total soil loss constant (ks) due to biotic and abiotic degradation, radiological decay, leaching, surface runoff, volatilization, and erosion. ks is used in the estimation of soil concentrations (see Eq. 6-1 through Eq. 6-4 in section 6.2). The site-specific equation to estimate ks for all constituents (modified from Eq. 5-2A in EPA 1998a to include soil loss from radiological decay) is:

$$ks = ks_g + k_{decay} + ks_l + ks_r + ks_v + ks_e \qquad \text{(Eq. B2-10)}$$

where:

ks = total COPC or ROPC soil loss constant due to biotic and abiotic degradation, radiological decay, leaching, surface runoff, volatilization, and erosion (yr^{-1}). ks is COPC-specific, site-specific, and depth-specific. If no ks value exists for a constituent, the model uses ks = 0 yr^{-1}.

ks_g = COPC soil loss constant due to biotic and abiotic degradation (yr^{-1}). ks_g is COPC-specific, site-specific, and calculated in Eq. B2-1 for COPCs (but not for ROPCs). If no ks_g value exists for a constituent, the model uses ks_g = 0 yr^{-1}.

k_{decay} = ROPC radiological decay constant (yr^{-1}). k_{decay} is ROPC-specific, site-specific, and calculated in Eq. B2-2 for ROPCs (but not for COPCs). If no k_{decay} value exists for a constituent, the model uses k_{decay} = 0 yr^{-1}.

ks_l = COPC or ROPC soil loss constant due to leaching (yr^{-1}). ks_l is COPC- and ROPC-specific, site-specific, depth-specific, and is calculated in Eq. B2-3. If no ks_l value exists for a constituent, the model uses ks_l = 0 yr^{-1}.

ks_r = COPC or ROPC soil loss constant due to surface runoff (yr^{-1}). ks_r is COPC- and ROPC-specific, site-specific, depth-specific, and is calculated in Eq. B2-4. If no ks_r value exists for a constituent, the model uses ks_r = 0 yr^{-1}.

ks_v = COPC or ROPC soil loss constant due to volatilization (yr^{-1}). ks_v is COPC- and ROPC-specific, site-specific, depth-specific, and is calculated in Eq. B2-5. If no ks_v value exists for a constituent, the model uses ks_v = 0 yr^{-1}.

ks_e = COPC soil loss constant due to soil erosion (yr^{-1}). ks_e is COPC-specific, site-specific, depth-specific, and is calculated in Eq. B2-9 for COPCs (but not for ROPCs). If no ks_e value exists for a constituent, the model uses ks_e = 0 yr^{-1}.

Equation B2-11

Equation B2-11 calculates the soil deposition term used in soil modeling (Ds) for all COPCs except total mercury (see Eq. B2-13), divalent mercury (see Eq. B2-14), and methyl mercury (see Eq. B2-15). Ds is calculated for ROPCs using Eq. B2-12. Ds is used in the estimation of soil concentrations (see Eq. 6-1 through Eq. 6-4 in section 6.2). The equation to calculate Ds for COPCs (modified from Eq. 5-11 in EPA 1998a to incorporate dry deposition from vapor phase into the model) is:

$$Ds = \frac{Q \cdot CF_1 \cdot \left[F_v \cdot (Dywv + Dydv) + \left(1 - F_v\right) \cdot (Dydp + Dywp)\right]}{Z_S \cdot BD} \qquad \text{(Eq. B2-11)}$$

where:

Ds	=	deposition term to soil (mg/kg-yr). Ds is COPC-specific, site-specific, and depth-specific.
Q	=	COPC-specific emission rate (g/s). Q, obtained from calculations after the air dispersion modeling, is COPC-specific, site-specific, and flue-specific. If no Q value exists for a constituent, the model uses Q = 0 g/s.
CF_1	=	units conversion factor of 100 (mg-m^2/kg-cm^2)
F_v	=	fraction of COPC air concentration in vapor phase (unitless). F_v is COPC-specific, ranges from 0 to 1, and is shown in Appendix B-1, tables B1-1 (organic COPCs) and B1-2 (inorganic COPCs). The model uses F_v = 1 for constituents modeled as only vapor phase. Otherwise, the model uses F_v = 0.
Dywv	=	unitized yearly average wet deposition from vapor phase (s/m^2-yr). Dywv, from the air dispersion modeling, is site-specific and flue-specific. If no Dywv value exists for a constituent, the model uses Dywv = 0 s/m^2-yr.
Dydv	=	unitized yearly average dry deposition from vapor phase (s/m^2-yr). Dydv, from the air dispersion modeling, is site-specific and flue-specific. If no Dydv value exists for a constituent, the model uses Dydv = 0 s/m^2-yr.
Dydp	=	unitized yearly average dry deposition from particle phase (s/m^2-yr). Dydp, from the air dispersion modeling, is site-specific and flue-specific. If no Dydp value exists for a constituent, the model uses Dydp = 0 s/m^2-yr.
Dywp	=	unitized yearly average wet deposition from particle phase (s/m^2-yr). Dywp, from the air dispersion modeling, is site-specific and flue-specific. If no Dywp value exists for a constituent, the model uses Dywp = 0 s/m^2-yr.
Z_s	=	soil mixing zone depth (cm). Z_s is site-specific. Three different values (depths) are used for Z_s: untilled soil (1 cm), root-zone soil (15 cm), and tilled soil (20 cm) (see Table 6-1).
BD	=	soil bulk density (g/cm^3). A site-specific value of 1.3 g/cm^3 (Halvorson and others 1998) is used (see Table 6-1).

Equation B2-12

Equation B2-12 calculates the soil deposition term used in soil modeling (Ds) for all ROPCs (see equations B2-11, B2-13, B2-14, and B2-15 for COPCs). Ds is used in the estimation of soil concentrations (see Eq. 6-1 through Eq. 6-4 in section 6.2). The equation to estimate Ds for ROPCs (comparable to Eq. 5-11 for COPCs in EPA 1998a, incorporating dry deposition from vapor phase into the model) is:

$$Ds = \frac{Q \cdot CF_1 \cdot \left[F_v \cdot (Dywv + Dydv) + (1 - F_v) \cdot (Dydp + Dywp)\right]}{Z_S \cdot BD} \qquad \text{(Eq. B2-12)}$$

where:

Ds	=	deposition term to soil (pCi/g-yr). Ds is ROPC-specific, site-specific, and depth-specific.
Q	=	ROPC-specific emission rate (Ci/s). Q, obtained from calculations after the air dispersion modeling, is ROPC-specific, site-specific, and flue-specific. If no Q value exists for a constituent, the model uses Q = 0 Ci/s.
CF_1	=	units conversion factor of 1×10^8 (pCi-m^2/Ci-cm^2)
F_v	=	fraction of ROPC air concentration in vapor phase (unitless). F_v is ROPC-specific, ranges from 0 to 1, and is shown in Appendix B-1, Table B1-3. The model uses $F_v = 1$ for constituents modeled as only vapor phase. Otherwise, the model uses $F_v = 0$.
Dywv	=	unitized yearly average wet deposition from vapor phase (s/m^2-yr). Dywv, from the air dispersion modeling, is site-specific and flue-specific. If no Dywv value exists for a constituent, the model uses Dywv = 0 s/m^2-yr.
Dydv	=	unitized yearly average dry deposition from vapor phase (s/m^2-yr). Dydv, from the air dispersion modeling, is site-specific and flue-specific. If no Dydv value exists for a constituent, the model uses Dydv = 0 s/m^2-yr.
Dydp	=	unitized yearly average dry deposition from particle phase (s/m^2-yr). Dydp, from the air dispersion modeling, is site-specific and flue-specific. If no Dydp value exists for a constituent, the model uses Dydp = 0 s/m^2-yr.
Dywp	=	unitized yearly average wet deposition from particle phase (s/m^2-yr). Dywp, from the air dispersion modeling, is site-specific and flue-specific. If no Dywp value exists for a constituent, the model uses Dywp = 0 s/m^2-yr.
Z_s	=	soil mixing zone depth (cm). Z_s is site-specific. Three different values (depths) are used for Z_s: untilled soil (1 cm), root-zone soil (15 cm), and tilled soil (20 cm) (see Table 6-1).
BD	=	soil bulk density (g/cm^3). A site-specific value of 1.3 g/cm^3 (Halvorson and others 1998) is used (see Table 6-1).

Equation B2-13

Equation B2-13 calculates the soil deposition term used in soil modeling for total mercury [$Ds_{(Hg)}$]. $Ds_{(Hg)}$ is used in the estimation of soil concentrations (see Eq. 6-1 through Eq. 6-4 in section 6.2). The equation to estimate $Ds_{(Hg)}$ (modified from the equation for mercury modeling found in Table B-1-1 in EPA 1998a, incorporating dry deposition from vapor phase into the model) is:

$$Ds_{(Hg)} = \frac{0.48 \cdot Q \cdot CF_1 \cdot \left[F_v \cdot (Dywv + Dydv) + \left(1 - F_v\right) \cdot (Dydp + Dywp)\right]}{Z_S \cdot BD} \quad \text{(Eq. B2-13)}$$

where:

$Ds_{(Hg)}$	=	deposition term to soil for total mercury (mg/kg-yr). $Ds_{(Hg)}$ is COPC-specific, site-specific, and depth-specific.
Q	=	COPC-specific emission rate (g/s). Q, obtained from calculations after the air dispersion modeling, is COPC-specific, site-specific, and flue-specific. If no Q value exists for total mercury, the model uses Q = 0 g/s.
CF_1	=	units conversion factor of 100 (mg-m^2/kg-cm^2)
F_v	=	fraction of COPC air concentration in vapor phase (unitless). F_v is COPC-specific, ranges from 0 to 1, and is shown in Appendix B-1, Table B1-2. The model uses F_v = 0.85 (EPA 1998a) for total mercury; see Appendix B-1, Table B1-2.
Dywv	=	unitized yearly average wet deposition from vapor phase (s/m^2-yr). Dywv, from the air dispersion modeling, is site-specific and flue-specific. If no Dywv value exists for a constituent, the model uses Dywv = 0 s/m^2-yr.
Dydv	=	unitized yearly average dry deposition from vapor phase (s/m^2-yr). Dydv, from the air dispersion modeling, is site-specific and flue-specific. If no Dydv value exists for a constituent, the model uses Dydv = 0 s/m^2-yr.
Dydp	=	unitized yearly average dry deposition from particle phase (s/m^2-yr). Dydp, from the air dispersion modeling, is site-specific and flue-specific. If no Dydp value exists for a constituent, the model uses Dydp = 0 s/m^2-yr.
Dywp	=	unitized yearly average wet deposition from particle phase (s/m^2-yr). Dywp, from the air dispersion modeling, is site-specific and flue-specific. If no Dywp value exists for a constituent, the model uses Dywp = 0 s/m^2-yr.
Z_s	=	soil mixing zone depth (cm). Z_s is site-specific. Three different values (depths) are used for Z_s: untilled soil (1 cm), root-zone soil (15 cm), and tilled soil (20 cm) (see Table 6-1).
BD	=	soil bulk density (g/cm^3). A site-specific value of 1.3 g/cm^3 (Halvorson and others 1998) is used (see Table 6-1).

Equation B2-14

Equation B2-14 calculates the soil deposition term used in soil modeling for divalent mercury [$Ds_{(Hg2+)}$]. $Ds_{(Hg2+)}$ is used in the estimation of soil concentrations (see Eq. 6-1 through Eq. 6-4 in section 6.2). The equation to estimate $Ds_{(Hg2+)}$ (from the equations for mercury modeling found in Table B-1-1 in EPA 1998a) is:

$$Ds_{(Hg^{2+})} = 0.98 \cdot Ds_{(Hg)} \qquad \text{(Eq. B2-14)}$$

where:

$Ds_{(Hg2+)}$ = deposition term to soil for divalent mercury (mg/kg-yr). $Ds_{(Hg2+)}$ is COPC-specific, site-specific, and depth-specific.

$Ds_{(Hg)}$ = deposition term to soil for total mercury (mg/kg-yr). $Ds_{(Hg)}$ is COPC-specific, site-specific, depth-specific, and calculated in Eq. B2-13.

Equation B2-15

Equation B2-15 calculates the soil deposition term used in soil modeling for methyl mercury [$Ds_{(MHg)}$]. $Ds_{(MHg)}$ is used in the estimation of soil concentrations (see Eq. 6-1 through Eq. 6-4 in section 6.2). The equation to estimate $Ds_{(MHg)}$ (from the equations for mercury modeling found in Table B-1-1 in EPA 1998a) is:

$$Ds_{(MHg)} = 0.02 \cdot Ds_{(Hg)} \qquad \text{(Eq. B2-15)}$$

where:

$Ds_{(MHg)}$ = deposition term to soil for methyl mercury (mg/kg-yr). $Ds_{(MHg)}$ is COPC-specific, site-specific, and depth-specific.

$Ds_{(Hg)}$ = deposition term to soil for total mercury (mg/kg-yr). $Ds_{(Hg)}$ is COPC-specific, site-specific, depth-specific, and calculated in Eq. B2-13.

Equation B2-16

Equation B2-16 calculates the average load to the water body from direct deposition of wet and dry particles and wet and dry vapors onto the surface of the water body (L_{DEP}) for all constituents (ROPCs and COPCs) except total mercury (see Eq. B2-17), divalent mercury (see Eq. B2-18), and methyl mercury (see Eq. B2-19). L_{DEP} is used in the estimation of the total load to the surface water body (see Eq. 6-5 in section 6.3). The equation to estimate L_{DEP} (modified from Eq. 5-29 in EPA 1998a to incorporate dry deposition from vapor phase into the model) is:

$$L_{DEP} = Q \cdot \left[F_v \cdot \left(Dywwv + Dydv \right) + \left(1 - F_v \right) \cdot Dytwp \right] \cdot A_w \qquad \text{(Eq. B2-16)}$$

where:

L_{DEP}	=	total (wet and dry) particle-phase and total (wet and dry) vapor-phase direct deposition load to water body (g/yr for COPCs and Ci/yr for ROPCs). L_{DEP} is COPC- and ROPC-specific and site-specific.
Q	=	COPC or ROPC-specific emission rate (g/s for COPCs and Ci/s for ROPCs). Q, obtained from calculations after the air dispersion modeling, is COPC- and ROPC-specific, site-specific, and flue-specific. If no value exists for Q, a value of 0 g/s (for COPCs) or 0 Ci/s (for ROPCs) is used.
F_v	=	fraction of COPC or ROPC air concentration in vapor phase (unitless). F_v is COPC- and ROPC-specific, ranges from 0 to 1 and is shown in Appendix B-1, tables B1-1 (organic COPCs), B1-2 (inorganic COPCs), and B1-3 (ROPCs). The model uses $F_v = 1$ for constituents modeled in the vapor phase. Otherwise, the model uses $F_v = 0$.
Dywwv	=	unitized yearly average wet deposition from vapor phase over water body (s/m^2-yr). Dywwv, from the air dispersion modeling, is site-specific and flue-specific. If no Dywwv value exists for a constituent, the model uses Dywwv = 0 s/m^2-yr.
Dydv	=	unitized yearly average dry deposition from vapor phase (s/m^2-yr). Dydv, from the air dispersion modeling, is site-specific and flue-specific. If no Dydv value exists for a constituent, the model uses Dydv = 0 s/m^2-yr.
Dytwp	=	unitized yearly average total (wet and dry) deposition from particle phase over water body (s/m^2-yr). Dytwp, from the air dispersion modeling, is site-specific and flue-specific. If no Dytwp value exists for a constituent, the model uses Dytwp = 0 s/m^2-yr.
A_w	=	average annual water body surface area (m^2). A_w is site-specific. Based on estimates made from map measurements, a value of $A_w = 6 \times 10^6$ m^2 is used (see Table 6-2).

Equation B2-17

Equation B2-17 calculates the average load to the water body from direct deposition of wet and dry particles and wet and dry vapors onto the surface of the water body for total mercury [$L_{DEP(Hg)}$]. $L_{DEP(Hg)}$ is used in the estimation of the total load to the surface water body (see Eq. 6-5 in section 6.3). The equation to estimate $L_{DEP(Hg)}$ (modified from the equation for mercury modeling found in Table B-4-8 in EPA 1998a, incorporating dry deposition from vapor phase into the model) is:

$$L_{DEP\,(Hg)} = 0.48 \cdot Q \cdot \left[F_v \cdot \left(Dywwv + Dydv\right) + (1 - F_v) \cdot Dytwp\right] \cdot A_w \qquad \text{(Eq. B2-17)}$$

where:

$L_{DEP(Hg)}$	=	total (wet and dry) particle phase and total (wet and dry) vapor phase direct deposition load to water body for total mercury (g/yr). $L_{DEP(Hg)}$ is COPC-specific and site-specific.
Q	=	COPC-specific emission rate for total mercury (g/s). Q, obtained from calculations after the air dispersion modeling, is COPC-specific, site-specific and flue-specific. If no Q value exists for total mercury, the model uses Q = 0 g/s.
F_v	=	fraction of COPC air concentration in vapor phase for total mercury (unitless). F_v is COPC-specific. A value of 0.85 (EPA 1998a) is used for total mercury; see Appendix B-1, Table B1-2.
Dywwv	=	unitized yearly average wet deposition from vapor phase over water body for total mercury (s/m^2-yr). Dywwv, from the air dispersion modeling, is site-specific and flue-specific. If no Dywwv value exists for total mercury, the model uses Dywwv = 0 s/m^2-yr.
Dydv	=	unitized yearly average dry deposition from vapor phase over water body for total mercury (s/m^2-yr). Dydv, from the air dispersion modeling, is site-specific and flue-specific. If no Dydv value exists for total mercury, the model uses Dydv = 0 s/m^2-yr.
Dytwp	=	unitized yearly average total (wet and dry) deposition from particle phase over water body for total mercury (s/m^2-yr). Dytwp, from the air dispersion modeling, is site-specific and flue-specific. If no Dytwp value exists for total mercury, the model uses Dytwp = 0 s/m^2-yr.
A_w	=	average annual water body surface area (m^2). A_w is site-specific. Based on estimates made from map measurements, a value of $A_w = 6 \times 10^6$ m^2 is used (see Table 6-2).

Equation B2-18

Equation B2-18 calculates the average load to the water body from direct deposition of wet and dry particles and wet and dry vapors onto the surface of the water body for divalent mercury [$L_{DEP(Hg2+)}$]. $L_{DEP(Hg2+)}$ is used in the estimation of the total load to the surface water body (see Eq. 6-5 in section 6.3). The equation to estimate $L_{DEP(Hg2+)}$ (from the equations for mercury modeling found in Table B-4-8 in EPA 1998a) is:

$$L_{DEP_{(Hg^{2+})}} = 0.85 \cdot L_{DEP_{(Hg)}} \qquad \text{(Eq. B2-18)}$$

where:

$L_{DEP(Hg2+)}$ = total (wet and dry) particle phase and total (wet and dry) vapor phase direct deposition load to water body for divalent mercury (g/yr). $L_{DEP(Hg2+)}$ is COPC-specific and site-specific.

$L_{DEP(Hg)}$ = total (wet and dry) particle phase and total (wet and dry) vapor phase direct deposition load to water body for total mercury (g/yr). $L_{DEP(Hg)}$ is COPC-specific, site-specific, and calculated in Eq. B2-17.

Equation B2-19

Equation B2-19 calculates the average load to the water body from direct deposition of wet and dry particles and wet and dry vapors onto the surface of the water body for methyl mercury [$L_{DEP(MHg)}$]. $L_{DEP(MHg)}$ is used in the estimation of the total load to the surface water body (see Eq. 6-5 in section 6.3). The equation to estimate $L_{DEP(MHg)}$ (from the equations for mercury modeling found in Table B-4-8 in EPA 1998a) is:

$$L_{DEP_{(MHg)}} = 0.15 \cdot L_{DEP_{(Hg)}} \qquad \text{(Eq. B2-19)}$$

where:

$L_{DEP(MHg)}$ = total (wet and dry) particle phase and total (wet and dry) vapor phase direct deposition load to water body for methyl mercury (MHg) (g/yr). $L_{DEP(MHg)}$ is COPC-specific and site-specific.

$L_{DEP(Hg)}$ = total (wet and dry) particle phase and total (wet and dry) vapor phase direct deposition load to water body for total mercury (g/yr). $L_{DEP(Hg)}$ is COPC-specific, site-specific, and calculated in Eq. B2-17.

Equation B2-20

If a value exists for Henry's Law Constant (H) for a constituent, then Eq. B2-20 calculates the load to the water body due to dry vapor diffusion (L_{DIF}) for all constituents except total mercury (see Eq. B2-22), divalent mercury (see Eq. B2-23), and methyl mercury (see Eq. B2-24) (to estimate L_{DIF} for constituents that do not have a value for H, see Eq. B2-21). L_{DIF} is used in the estimation of the total load to the surface water body (see Eq. 6-5 in section 6.3). The equation to estimate L_{DIF} (Eq. 5-30 in EPA 1998a) is:

$$L_{DIF} = \frac{K_v \cdot Q \cdot F_v \cdot Cywv \cdot A_w \cdot CF \cdot R \cdot T_{wk}}{H} \qquad \text{(Eq. B2-20)}$$

where:

L_{DIF}	=	vapor phase COPC or ROPC dry deposition diffusion load to water body (g/yr for COPCs and Ci/yr for ROPCs). L_{DIF} is COPC- and ROPC-specific and site-specific.
K_v	=	overall transfer rate coefficient (m/yr). K_v is COPC- and ROPC-specific, site-specific, and is calculated in Eq. B2-38.
Q	=	COPC or ROPC-specific emission rate (g/s for COPCs and Ci/s for ROPCs). Q, obtained from calculations after the air dispersion modeling, is COPC- and ROPC-specific, site-specific, and flue-specific. If no value exists for Q, a value of 0 g/s (for COPCs) or 0 Ci/s (for ROPCs) is used.
F_v	=	fraction of COPC or ROPC air concentration in vapor phase (unitless). F_v is COPC-specific, ranges from 0 to 1, and shown in Appendix B-1, tables B1-1 (organic COPCs), B1-2 (inorganic COPCs), and B1-3 (ROPCs). The model uses $F_v = 1$ for constituents modeled in the vapor phase. Otherwise, the model uses $F_v = 0$.
Cywv	=	unitized yearly average air concentration from vapor phase over the water body (μg-s/g-m^3 for COPCs and μCi-s/Ci-m^3 for ROPCs). Cywv, from the air dispersion modeling, is site-specific and flue-specific. If no value exists for Cywv, the model uses Cywv = 0 μg-s/g-m^3 for COPCs and Cywv = 0 μCi-s/Ci-m^3 for ROPCs.
A_w	=	average annual water body surface area (m^2). A_w is site-specific. Based on estimates made from map measurements, a value of $A_w = 6 \times 10^6$ m^2 is used (see Table 6-2).
CF	=	units conversion factor of 1×10^{-6} (g/μg for COPCs and Ci/μCi for ROPCs)
H	=	Henry's Law Constant (atm-m^3/mol). H is COPC-specific and shown in Appendix B-1, tables B1-1 (organic COPCs) and B1-2 (inorganic COPCs). If no value is available for H (for example, for ROPCs), then Eq. B2-21 is used to calculate L_{DIF} for constituents other than total mercury, divalent mercury, and methyl mercury.
R	=	universal gas constant (atm-m^3/mol-°K). A value of $R = 8.205 \times 10^{-5}$ atm-m^3/mol °K (EPA 1998a) is used (see Table 6-2).
T_{wk}	=	water body temperature (°K). T_{wk} is site-specific. The recommended default value of 298 °K (EPA 1998a) is used (see Table 6-2).

Equation B2-21

If no value exists for Henry's Law Constant for a constituent, then Eq. B2-21 is used to estimate the load to the water body due to dry vapor diffusion (L_{DIF}) for all constituents except total mercury (see Eq. B2-22), divalent mercury (see Eq. B2-23), and methyl mercury (see Eq. B2-24). L_{DIF} is used in the estimation of the total load to the surface water body (see Eq. 6-5 in section 6.3). The limiting equation to estimate L_{DIF} (when no value is available for Henry's Law Constant, the equation is derived from Eq. 5-30 in EPA 1998a by using the relationships among the parameters involved; see also Eq. B2-38) is:

$$L_{DIF} = Q \cdot F_v \cdot Cywv \cdot A_w \cdot CF \cdot K_G \cdot \theta^{(T_{wk}-293)} \qquad \text{(Eq. B2-21)}$$

where:

L_{DIF}	=	vapor phase COPC or ROPC dry deposition diffusion load to water body (g/yr or Ci/yr). L_{DIF} is COPC- and ROPC-specific and site-specific.
Q	=	COPC or ROPC-specific emission rate (g/s for COPCs and Ci/s for ROPCs). Q, obtained from calculations after the air dispersion modeling, is COPC- and ROPC-specific, site-specific, and flue-specific. If no value exists for Q, a value of 0 g/s (for COPCs) or 0 Ci/s (for ROPCs) is used.
F_v	=	fraction of COPC or ROPC air concentration in vapor phase (unitless). F_v is COPC- and ROPC-specific, ranges from 0 to 1, and is shown in Appendix B-1, tables B1-1 (organic COPCs), B1-2 (inorganic COPCs), and B1-3 (ROPCs). The model uses $F_v = 1$ for constituents modeled in the vapor phase. Otherwise, the model uses $F_v = 0$.
Cywv	=	unitized yearly average air concentration from vapor phase over the water body (μg-s/g-m^3 for COPCs and μCi-s/Ci-m^3 for ROPCs). Cywv, from the air dispersion modeling, is site-specific and flue-specific. If no value exists for Cywv, the model uses Cywv = 0 μg-s/g-m^3 for COPCs and Cywv = 0 μCi-s/Ci-m^3 for ROPCs.
A_w	=	average annual water body surface area (m^2). A_w is site-specific. Based on estimates made from map measurements, a value of $A_w = 6 \times 10^6$ m^2 is used (see Table 6-2).
CF	=	units conversion factor of 1×10^{-6} (g/μg for COPCs and Ci/μCi for ROPCs)
K_G	=	gas-phase transfer coefficient (m/yr). K_G is site-specific and is shown in Eq. B2-42. The recommended default value of 36,500 m/yr for a flowing river (EPA 1998a) is used (see Table 6-2).
θ	=	temperature correction factor (unitless). θ is site-specific. The recommended default value of 1.026 (EPA 1998a) is used (see Table 6-2).
T_{wk}	=	water body temperature (°K). T_{wk} is site-specific. The recommended default value of 298 °K (EPA 1998a) is used (see Table 6-2).

Equation B2-22

Equation B2-22 calculates the load to the water body due to dry vapor diffusion for total mercury [$L_{DIF(Hg)}$]. $L_{DIF(Hg)}$ is used in the estimation of the total load to the surface water body (see Eq. 6-5 in section 6.3). The equation to estimate $L_{DIF(Hg)}$ (from the equation for mercury modeling found in Table B-4-12 in EPA 1998a) is:

$$L_{DIF_{(Hg)}} = \frac{K_v \cdot 0.48 \cdot Q \cdot F_v \cdot Cywv \cdot A_w \cdot CF \cdot R \cdot T_{wk}}{H} \qquad \text{(Eq. B2-22)}$$

where:

$L_{DIF(Hg)}$	=	vapor phase COPC dry deposition diffusion load to water body for total mercury (g/yr). $L_{DIF(Hg)}$ is COPC-specific and site-specific.
K_v	=	overall transfer rate coefficient for total mercury (m/yr). K_v is COPC-specific, site-specific, and is calculated in Eq. B2-38.
Q	=	COPC-specific emission rate for total mercury (g/s). Q, obtained from calculations after the air dispersion modeling, is COPC-specific, site-specific, and flue-specific. If no value exists for Q, a value of 0 g/s is used for total mercury.
F_v	=	fraction of COPC air concentration in vapor phase for total mercury (unitless). F_v is COPC-specific. A value of 0.85 (EPA 1998a) is used for total mercury; see Appendix B-1, Table B1-2.
Cywv	=	unitized yearly average air concentration from vapor phase over the water body (μg-s/g-m^3). Cywv, from the air dispersion modeling, is site-specific and flue-specific. If no Cywv value exists for total mercury, the model uses Cywv = 0 μg-s/g-m^3.
A_w	=	average annual water body surface area (m^2). A_w is site-specific. Based on estimates made from map measurements, a value of $A_w = 6 \times 10^6$ m^2 is used (see Table 6-2).
CF	=	units conversion factor of 1×10^{-6} (g/μg)
H	=	Henry's Law Constant for total mercury (atm-m^3/mol). H is shown in Appendix B-1, Table B1-2, for total mercury.
R	=	universal gas constant (atm-m^3/mol-°K). A value of $R = 8.205 \times 10^{-5}$ atm-m^3/mol-°K (EPA 1998a) is used (see Table 6-2).
T_{wk}	=	water body temperature (°K). T_{wk} is site-specific. The recommended default value of 298 °K (EPA 1998a) is used (see Table 6-2).

Equation B2-23

Equation B2-23 calculates the load to the water body due to dry vapor diffusion for divalent mercury [$L_{DIF(Hg2+)}$]. $L_{DIF(Hg2+)}$ is used in the estimation of the total load to the surface water body (see Eq. 6-5 in section 6.3). The equation to estimate $L_{DIF(Hg2+)}$ (from the equation for mercury modeling found in Table B-4-12 in EPA 1998a) is:

$$L_{DIF_{(Hg^{2+})}} = 0.85 \cdot L_{DIF(Hg)} \qquad \text{(Eq. B2-23)}$$

where:

$L_{DIF(Hg2+)}$ = vapor phase COPC dry deposition diffusion load to water body for divalent mercury (g/yr). $L_{DIF(Hg2+)}$ is COPC-specific and site-specific.

$L_{DIF(Hg)}$ = vapor phase COPC dry deposition diffusion load to water body for total mercury (g/yr). $L_{DIF(Hg)}$ is COPC-specific, site-specific, and calculated in Eq. B2-22.

Equation B2-24

Equation B2-24 calculates the load to the water body due to dry vapor diffusion for methyl mercury [$L_{DIF(MHg)}$]. $L_{DIF(MHg)}$ is used in the estimation of the total load to the surface water body (see Eq. 6-5 in section 6.3). The equation to estimate $L_{DIF(MHg)}$ (from the equation for mercury modeling found in Table B-4-12 in EPA 1998a) is:

$$L_{DIF_{(MHg)}} = 0.15 \cdot L_{DIF\ (Hg)} \qquad \text{(Eq. B2-24)}$$

where:

$L_{DIF(MHg)}$ = vapor phase COPC dry deposition diffusion load to water body for methyl mercury (g/yr). $L_{DIF(MHg)}$ is COPC-specific and site-specific.

$L_{DIF(Hg)}$ = vapor phase COPC dry deposition diffusion load to water body for total mercury (g/yr). $L_{DIF(Hg)}$ is COPC-specific, site-specific, and calculated in Eq. B2-22.

Equation B2-25

Equation B2-25 calculates the average runoff load to the water body from impervious surfaces in the watershed from which runoff is conveyed directly to the water body (L_{RI}), for all constituents except total mercury (see Eq. B2-26), divalent mercury (see Eq. B2-27), and methyl mercury (see Eq. B2-28). L_{RI} is used in the estimation of the total load to the surface water body (see Eq. 6-5 in section 6.3). The equation to estimate L_{RI} (modified from Eq. 5-31 in EPA 1998a, incorporating dry deposition from vapor phase into the model) is:

$$L_{RI} = Q \cdot \left[F_v \cdot \left(Dywwv + Dydv \right) + \left(1 - F_v \right) \cdot Dytwp \right] \cdot A_I \qquad \text{(Eq. B2-25)}$$

where:

L_{RI}	=	runoff load from impervious surfaces (g/yr for COPCs and Ci/yr for ROPCs). L_{RI} is COPC- and ROPC-specific and site-specific.
Q	=	COPC or ROPC-specific emission rate (g/s for COPCs and Ci/s for ROPCs). Q, obtained from calculations after the air dispersion modeling, is COPC- and ROPC-specific, site-specific, and flue-specific. If no value exists for Q, a value of 0 g/s (for COPCs) or 0 Ci/s (for ROPCs) is used.
F_v	=	fraction of COPC or ROPC air concentration in vapor phase (unitless). F_v is COPC- and ROPC-specific, ranges from 0 to 1, and is shown in Appendix B-1, tables B1-1 (organic COPCs), B1-2 (inorganic COPCs), and B1-3 (ROPCs). The model uses $F_v = 1$ for constituents modeled in the vapor phase. Otherwise, the model uses $F_v = 0$.
Dywwv	=	unitized yearly average wet deposition from vapor phase over water body (s/m^2-yr). Dywwv, from the air dispersion modeling, is site-specific and flue-specific. If no value exists for Dywwv, the model uses Dywwv = 0 s/m^2-yr.
Dydv	=	unitized yearly average dry deposition from vapor phase (s/m^2-yr). Dydv, from the air dispersion modeling, is site-specific and flue-specific. If no value exists for Dydv, the model uses Dydv = 0 s/m^2-yr.
Dytwp	=	unitized yearly average total (wet and dry) deposition from particle phase over water body (s/m^2-yr). Dytwp, from the air dispersion modeling, is site-specific and flue-specific. If no value exists for Dytwp, the model uses Dytwp = 0 s/m^2-yr.
A_I	=	impervious watershed area receiving COPC deposition (m^2). A_I is site-specific. The model uses $A_I = 0$ m^2 (see Table 6-2).

Equation B2-26

Equation B2-26 calculates the average runoff load to the water body from impervious surfaces in the watershed from which runoff is conveyed directly to the water body, for total mercury [$L_{RI(Hg)}$]. $L_{RI(Hg)}$ is used in the estimation of the total load to the surface water body (see Eq. 6-5 in section 6.3). The equation to estimate $L_{RI(Hg)}$ (modified from the equation for mercury modeling found in Table B-4-9 in EPA 1998a, incorporating dry deposition from vapor phase into the model) is:

$$L_{RI\,(Hg)} = 0.48 \cdot Q \cdot \left[F_v \cdot \left(Dywwv + Dydv\right) + (1 - F_v) \cdot Dytwp\right] \cdot A_I \qquad \text{(Eq. B2-26)}$$

where:

$L_{RI(Hg)}$	=	runoff load from impervious surfaces for total mercury (g/yr). $L_{RI(Hg)}$ is COPC-specific and site-specific.
Q	=	COPC-specific emission rate for total mercury (g/s). Q, obtained from calculations after the air dispersion modeling, is COPC-specific, site-specific, and flue-specific. If no value exists for Q, a value of 0 g/s is used for total mercury.
F_v	=	fraction of COPC air concentration in vapor phase for total mercury (unitless). F_v is COPC-specific. A value of 0.85 (EPA 1998a) is used for total mercury; see Appendix B-1, Table B1-2.
Dywwv	=	unitized yearly average wet deposition from vapor phase over water body for total mercury (s/m^2-yr). Dywwv, from the air dispersion modeling, is site-specific and flue-specific. If no Dywwv value exists for total mercury, the model uses Dywwv = 0 s/m^2-yr.
Dydv	=	unitized yearly average dry deposition from vapor phase over water body for total mercury (s/m^2-yr). Dydv, from the air dispersion modeling, is site-specific and flue-specific. If no Dydv value exists for total mercury, the model uses Dydv = 0 s/m^2-yr.
Dytwp	=	unitized yearly average total (wet and dry) deposition from particle phase over water body for total mercury (s/m^2-yr). Dytwp, from the air dispersion modeling, is site-specific and flue-specific. If no Dytwp value exists for total mercury, the model uses Dytwp = 0 s/m^2-yr.
A_I	=	impervious watershed area receiving COPC or ROPC deposition (m^2). A_I is site-specific. The model uses A_I = 0 m^2 (see Table 6-2).

Equation B2-27

Equation B2-27 calculates the average runoff load to the water body from impervious surfaces in the watershed from which runoff is conveyed directly to the water body, for divalent mercury [$L_{RI(Hg2+)}$]. $L_{RI(Hg2+)}$ is used in the estimation of the total load to the surface water body (see Eq. 6-5 in section 6.3). The equation to estimate $L_{RI(Hg2+)}$ (from the equations for mercury modeling found in Table B-4-9 in EPA 1998a) is:

$$L_{RI_{(Hg^{2+})}} = 0.85 \cdot L_{RI_{(Hg)}} \qquad \text{(Eq. B2-27)}$$

where:

$L_{RI(Hg2+)}$ = runoff load from impervious surfaces for divalent mercury (g/yr). $L_{RI(Hg2+)}$ is COPC-specific and site-specific.

$L_{RI(Hg)}$ = runoff load from impervious surfaces for total mercury (g/yr). $L_{RI(Hg)}$ is COPC-specific, site-specific, and calculated in Eq. B2-26.

Equation B2-28

Equation B2-28 calculates the average runoff load to the water body from impervious surfaces in the watershed from which runoff is conveyed directly to the water body, for methyl mercury ($L_{RI(MHg)}$). $L_{RI(MHg)}$ is used in the estimation of the total load to the surface water body (see Eq. 6-5 in section 6.3). The equation to estimate $L_{RI(MHg)}$ (from the equations for mercury modeling found in Table B-4-9 in EPA 1998a) is:

$$L_{RI_{(MHg)}} = 0.15 \cdot L_{RI_{(Hg)}} \qquad \text{(Eq. B2-28)}$$

where:

$L_{RI(MHg)}$ = runoff load from impervious surfaces for methyl mercury (g/yr). $L_{RI(MHg)}$ is COPC-specific and site-specific.

$L_{RI(Hg)}$ = runoff load from impervious surfaces for total mercury (g/yr). $L_{RI(Hg)}$ is COPC-specific, site-specific, and calculated in Eq. B2-26.

Equation B2-29

Equation B2-29 calculates the average runoff load to the water body from pervious soil surfaces in the watershed (L_{RP}) for all COPCs (see Eq. B2-30 to estimate L_{RP} for ROPCs). Note that the untilled soil concentration is used in this equation. L_{RP} is used in the estimation of the total load to the surface water body (see Eq. 6-5 in section 6.3). The equation to estimate L_{RP} for COPCs (Eq. 5-32 in EPA 1998a) is:

$$L_{RP} = RO \cdot \left(A_L - A_I\right) \cdot \left(\frac{Cs \cdot BD}{\theta_{sw} + Kd_s \cdot BD}\right) \cdot CF \qquad \text{(Eq. B2-29)}$$

where:

L_{RP}	=	runoff load from pervious surfaces (g/yr). L_{RP} is COPC-specific and site-specific.
RO	=	average annual surface runoff from pervious areas (cm/yr). RO is site-specific. A value of 2.5 cm/yr (estimated value, assuming that the majority of rainfall recharges or evaporates) is used (see Table 6-2).
A_L	=	total watershed area receiving COPC deposition (m^2). A_L is site-specific. The model uses $A_L = 4 \times 10^9$ m^2 (see Table 6-2).
A_I	=	impervious watershed area receiving COPC deposition (m^2). A_I is site-specific. The model uses $A_I = 0$ m^2 (see Table 6-2).
Cs	=	COPC concentration over the exposure duration in untilled soil (mg/kg). Cs is COPC-specific, site-specific, and is calculated in section 6.2, Eq. 6-1 through Eq. 6-4.
BD	=	soil bulk density (g soil/cm^3 soil). A site-specific value of 1.3 g/cm^3 (Halvorson and others 1998) is used (see Table 6-2).
CF	=	units conversion factor of 0.01 (kg-cm^2/mg-m^2)
θ_{sw}	=	soil volumetric water content (mL water/cm^3 soil). θ_{sw} is site-specific. The EPA-recommended default value of 0.2 mL/cm^3 (EPA 1998a) is used (see Table 6-2).
Kd_s	=	soil-water partition coefficient (mL/g). Kd_s is COPC-specific and shown in Appendix B-1, tables B1-1 (organic COPCs) and B1-2 (inorganic COPCs). If no Kd_s value exists for a constituent, the model uses $Kd_s = 0$ mL/g.

Equation B2-30

Equation B2-30 calculates the average runoff load to the water body from pervious soil surfaces in the watershed (L_{RP}) for all ROPCs (see Eq. B2-29 to estimate L_{RP} for COPCs). Note that the untilled soil concentration is used in this equation. L_{RP} is used in the estimation of the total load to the surface water body (see Eq. 6-5 in section 6.3). The equation to estimate L_{RP} for ROPCs (comparable to Eq. 5-32 for COPCs in EPA 1998a) is:

$$L_{RP} = RO \cdot \left(A_L - A_I\right) \cdot \left(\frac{Cs \cdot BD}{\theta_{sw} + Kd_s \cdot BD}\right) \cdot CF_1 \cdot CF_2 \qquad \text{(Eq. B2-30)}$$

where:

L_{RP}	=	runoff load from pervious surfaces (Ci/yr). L_{RP} is ROPC-specific and site-specific.
RO	=	average annual surface runoff from pervious areas (cm/yr). RO is site-specific. A value of 2.5 cm/yr (estimated value, assuming that the majority of rainfall recharges or evaporates) is used (see Table 6-2).
A_L	=	total watershed area receiving ROPC deposition (m^2). A_L is site-specific. The model uses $A_L = 4 \times 10^9$ m^2 (see Table 6-2).
A_I	=	impervious watershed area receiving ROPC deposition (m^2). A_I is site-specific. The model uses $A_I = 0$ m^2 (see Table 6-2).
Cs	=	ROPC concentration over the exposure duration in untilled soil (pCi/g). Cs is ROPC-specific, site-specific, and is calculated in section 6.2, Eq. 6-1 through Eq. 6-4.
BD	=	soil bulk density (g soil/cm^3 soil). A site-specific value of 1.3 g/cm^3 (Halvorson and others 1998) is used (see Table 6-2).
CF_1	=	units conversion factor of 1×10^4 (cm^2/m^2)
CF_2	=	units conversion factor of 1×10^{-12} (Ci/pCi)
θ_{sw}	=	soil volumetric water content (mL water/cm^3 soil). θ_{sw} is site-specific. The EPA-recommended default value of 0.2 mL/cm^3 (EPA 1998a) is used (see Table 6-2).
Kd_s	=	soil-water partition coefficient (mL/g). Kd_s is ROPC-specific and shown in Appendix B-1, Table B1-3. If no Kd_s value exists for a constituent, the model uses $Kd_s = 0$ mL/g.

Equation B2-31

Equation B2-31 calculates the average load to the water body from soil erosion (L_E). Since one of the parameters in the equation (ER) is not defined for ROPCs, L_E is only quantified for COPCs. Note that the untilled soil concentration is used in this equation. L_E is used in the estimation of the total load to the surface water body (see Eq. 6-5 in section 6.3). The equation to estimate L_E for all COPCs (Eq. 5-33 in EPA 1998a) is:

$$L_E = X_e \cdot \left(A_L - A_I\right) \cdot SD \cdot ER \cdot \left(\frac{Cs \cdot Kd_s \cdot BD}{\theta_{sw} + Kd_s \cdot BD}\right) \cdot CF \qquad \text{(Eq. B2-31)}$$

where:

L_E	=	soil erosion load to the water body (g/yr). L_E is COPC-specific and site-specific.
X_e	=	unit soil loss (kg/m^2-yr). X_e is site-specific and calculated in Eq. B2-39.
A_L	=	total watershed area receiving COPC deposition (m^2). A_L is site-specific. The model uses $A_L = 4 \times 10^9$ m^2 (see Table 6-2).
A_I	=	impervious watershed area receiving COPC deposition (m^2). A_I is site-specific. The model uses $A_I = 0$ m^2 (see Table 6-2).
SD	=	watershed sediment delivery ratio (unitless). SD is site-specific and is calculated in Eq. B2-40.
ER	=	soil enrichment ratio (unitless). ER is site-specific. The following recommended values (EPA 1998a) are used: 3 for organic COPCs and 1 for inorganic COPCs (see Table 6-1). No value is used for ROPCs and, thus, no soil erosion load to the water body is quantified for ROPCs.
Cs	=	COPC concentration in untilled soil (mg/kg). Cs is COPC-specific, site-specific, and is calculated in section 6.2, Eq. 6-1 through Eq. 6-4.
Kd_s	=	soil-water partition coefficient (L/kg or mL/g). Kd_s is COPC-specific and shown in Appendix B-1, tables B1-1 (organic COPCs) and B1-2 (inorganic COPCs). If no Kd_s value exists for a constituent, the model uses $Kd_s = 0$ mL/g.
BD	=	soil bulk density (g soil/cm^3 soil). A site-specific value of 1.3 g/cm^3 (Halvorson and others 1998) is used (see Table 6-2).
θ_{sw}	=	soil volumetric water content (mL water/cm^3 soil). θ_{sw} is site-specific. The EPA-recommended default value of 0.2 mL/cm^3 (EPA 1998a) is used (see Table 6-2).
CF	=	units conversion factor of 1×10^{-3} (g/mg)

Equation B2-32

Equation B2-32 calculates the fraction of total water body COPC or ROPC concentration occurring in the water column (f_{wc}). f_{wc} is used to estimate two other parameters: the overall total water body dissipation rate constant (see Eq. B2-34) and the fraction of the total water body concentration in the benthic sediment (see Eq. B2-36). f_{wc} is also used to estimate total water body concentration, including the water column and bed sediment (see Eq. 6-6 and Eq. 6-7 in section 6.3) and the total concentration in the water column (see Eq. 6-8 in section 6.3). The equation to estimate f_{wc} for all constituents (Eq. 5-36A in EPA 1998a) is:

$$f_{wc} = \frac{\left(1 + Kd_{sw} \cdot TSS \cdot CF\right) \cdot \frac{d_{wc}}{d_z}}{\left(1 + Kd_{sw} \cdot TSS \cdot CF\right) \cdot \frac{d_{wc}}{d_z} + \left(\theta_{bs} + Kd_{bs} \cdot C_{BS}\right) \cdot \frac{d_{bs}}{d_z}} \qquad \text{(Eq. B2-32)}$$

where:

f_{wc}	=	fraction of total water body COPC or ROPC concentration in the water column (unitless). f_{wc} is COPC- and ROPC-specific, site-specific, and ranges from 0 to 1.
Kd_{sw}	=	suspended sediments/surface water partition coefficient (L/kg). Kd_{sw} is COPC- and ROPC-specific and shown in Appendix B-1, tables B1-1 (organic COPCs), B1-2 (inorganic COPCs), and B1-3 (ROPCs). If no Kd_{sw} value exists for a constituent, the model uses Kd_{sw} = 0 L/kg.
TSS	=	total suspended solids concentration (mg/L). TSS is site-specific and ranges from 2 to 300 mg/L. The recommended default value of 10 mg/L (EPA 1998a) is used (see Table 6-2).
CF	=	units conversion factor of 1×10^{-6} (kg/mg)
d_{wc}	=	average annual depth of water column (m). d_{wc} is site-specific. The model uses an estimated value of d_{wc} = 7.5 m (see Table 6-2).
d_{bs}	=	depth of upper benthic sediment layer (m). d_{bs} is site-specific. The recommended default value of 0.03 m (EPA 1998a) is used (see Table 6-2).
d_z	=	total water body depth (m). d_z is site-specific and calculated in Eq. B2-33.
C_{BS}	=	bed sediment concentration (g/cm^3). C_{BS} is site-specific and ranges from 0.5 to 1.5 g/cm^3. The recommended default value of 1 g/cm^3 (EPA 1998a) is used (see Table 6-2).
θ_{bs}	=	bed sediment porosity ($L_{pore\ water}/L_{sediment}$). θ_{bs} is site-specific and ranges from 0.4 to 0.8 $L_{pore\ water}/L_{sediment}$. The recommended default value of 0.6 $L_{pore\ water}/L_{sediment}$ (EPA 1998a) is used (see Table 6-2).
Kd_{bs}	=	bed sediment/sediment pore water partition coefficient (L/kg). Kd_{bs} is COPC- and ROPC-specific and shown in Appendix B-1, tables B1-1 (organic COPCs), B1-2 (inorganic COPCs), and B1-3 (ROPCs). If no Kd_{bs} value exists for a constituent, the model uses Kd_{bs} = 0 L/kg.

Equation B2-33

Equation B2-33 calculates the total water body depth (d_z). d_z is used to estimate several other parameters, including the fraction of water body concentration in the water column (see Eq. B2-32), the water column volatilization rate constant (see Eq. B2-35), and the liquid-phase transfer coefficient (see Eq. B2-41). Note that the fraction of water body concentration in the water column is used in the estimation of the total water body concentration, including the water column and bed sediment (see Eq. 6-6 and Eq. 6-7 in section 6.3). The equation to estimate d_z for all constituents (see Table B-4-16 in EPA 1998a) is:

$$d_z = d_{wc} + d_{bs} \qquad \text{(Eq. B2-33)}$$

where:

d_z = total water body depth (m). d_z is site-specific.

d_{wc} = average annual depth of water column (m). d_{wc} is site-specific. The model uses an estimated value of d_{wc} = 7.5 m (see Table 6-2).

d_{bs} = depth of upper benthic sediment layer (m). d_{bs} is site-specific. The recommended default value of 0.03 m (EPA 1998a) is used (see Table 6-2).

Equation B2-34

Equation B2-34 calculates the overall total water body COPC or ROPC dissipation rate constant in surface water (k_{wt}). k_{wt} is used to estimate the total water body concentration, including the water column and bed sediment (see Eq. 6-6 and Eq. 6-7 in section 6.3). The equation to estimate k_{wt} for all constituents (Eq. 5-38 in EPA 1998a) is:

$$k_{wt} = f_{wc} \cdot k_v + f_{bs} \cdot k_b \qquad \text{(Eq. B2-34)}$$

where:

k_{wt} = overall total water body COPC or ROPC dissipation rate constant (yr^{-1}). k_{wt} is COPC- and ROPC-specific, and site-specific.

f_{wc} = fraction of total water body COPC or ROPC concentration in the water column (unitless). f_{wc} is COPC- and ROPC-specific, site-specific, ranges from 0 to 1, and is calculated in Eq. B2-32.

k_v = water column volatilization rate constant (yr^{-1}). k_v is COPC- and ROPC-specific, site-specific, and calculated in Eq. B2-35.

f_{bs} = fraction of total water body COPC or ROPC concentration in the benthic sediment (unitless). f_{bs} is COPC- and ROPC-specific, site-specific, ranges from 0 to 1, and is calculated in Eq. B2-36.

k_b = benthic burial rate constant (yr^{-1}). k_b is site-specific and calculated in Eq. B2-37.

Equation B2-35

Equation B2-35 calculates the water column volatilization rate constant (k_v). k_v is used to estimate the overall total water body dissipation rate constant (see Eq. B2-34), which is used to estimate the total water body concentration, including the water column and bed sediment (see Eq. 6-6 and Eq. 6-7 in section 6.3). The equation to estimate k_v for all constituents (Eq. 5-39 in EPA 1998a) is:

$$k_v = \frac{K_v}{d_z \cdot \left(1 + Kd_{sw} \cdot TSS \cdot CF\right)} \qquad \text{(Eq. B2-35)}$$

where:

k_v	=	water column volatilization rate constant (yr^{-1}). k_v is COPC- and ROPC-specific and site-specific.
K_v	=	overall transfer rate coefficient (m/yr). K_v is COPC- and ROPC-specific, site-specific, and is calculated in Eq. B2-38.
d_z	=	total water body depth (m). d_z is site-specific and calculated in Eq. B2-33.
Kd_{sw}	=	suspended sediments/surface water partition coefficient (L/kg). Kd_{sw} is COPC- and ROPC-specific and shown in Appendix B-1, tables B1-1 (organic COPCs), B1-2 (inorganic COPCs), and B1-3 (ROPCs). If no Kd_{sw} value exists for a constituent, the model uses Kd_{sw} = 0 L/kg.
TSS	=	total suspended solids concentration (mg/L). TSS is site-specific and ranges from 2 to 300 mg/L. The recommended default value of 10 mg/L (EPA 1998a) is used (see Table 6-2).
CF	=	units conversion factor of 1×10^{-6} (kg/mg)

Equation B2-36

Equation B2-36 calculates the fraction of total water body COPC or ROPC concentration in the benthic sediment (f_{bs}). f_{bs} is used to estimate the overall total water body dissipation rate constant (see Eq. B2-34), which is used to estimate the total water body concentration, including the water column and bed sediment (see Eq. 6-6 and Eq. 6-7 in section 6.3). f_{bs} is also used to estimate the bed sediment concentration (see Eq. 6-10 and Eq. 6-11 in section 6.4). The equation to estimate f_{bs} for all constituents (Eq. 5-36B in EPA 1998a) is:

$$f_{bs} = 1 - f_{wc} \qquad \text{(Eq. B2-36)}$$

where:

f_{bs} = fraction of total water body COPC or ROPC concentration in the benthic sediment (unitless). f_{bs} is COPC- and ROPC-specific, site-specific, and ranges from 0 to 1.

f_{wc} = fraction of total water body COPC or ROPC concentration in the water column (unitless). f_{wc} is COPC-specific, site-specific, ranges from 0 to 1, and is calculated in Eq. B2-32.

Equation B2-37

Equation B2-37 calculates the water column loss constant due to burial in benthic sediment (k_b). k_b is used to estimate the overall total water body dissipation rate constant (see Eq. B2-34), which is used to estimate the total water body concentration, including the water column and bed sediment (see Eq. 6-6 and Eq. 6-7 in section 6.3). The equation to estimate k_b for all constituents (Eq. 5-43 in EPA 1998a) is:

$$k_b = \left(\frac{X_e \cdot A_L \cdot SD \cdot CF_1 - Vf_x \cdot TSS}{A_w \cdot TSS} \right) \cdot \left(\frac{TSS \cdot CF_2}{C_{BS} \cdot d_{bs}} \right) \qquad \text{(Eq. B2-37)}$$

where:

k_b	=	benthic burial rate constant (1/yr). k_b is site-specific.
X_e	=	unit soil loss (kg/m^2-yr). X_e is site-specific and calculated in Eq. B2-39.
A_L	=	total watershed area receiving COPC or ROPC deposition (m^2). A_L is site-specific. The model uses $A_L = 4 \times 10^9$ m^2 (see Table 6-2).
SD	=	watershed sediment delivery ratio (unitless). SD is site-specific and is calculated in Eq. B2-40.
CF_1	=	units conversion factor of 1×10^3 (g/kg)
Vf_x	=	average annual volumetric flow rate through the water body (m^3/yr). Vf_x is site-specific. The model uses $Vf_x = 4 \times 10^{11}$ m^3/yr (see Table 6-2).
TSS	=	total suspended solids concentration (mg/L). TSS is site-specific and ranges from 2 to 300 mg/L. The recommended default value of 10 mg/L (EPA 1998a) is used (see Table 6-2).
A_w	=	average annual water body surface area (m^2). A_w is site-specific. Based on estimates made from map measurements, a value of $A_w = 6 \times 10^6$ m^2 is used (see Table 6-2).
CF_2	=	units conversion factor of 1×10^{-6} (kg/mg)
C_{BS}	=	bed sediment concentration (g/cm^3). C_{BS} is site-specific and ranges from 0.5 to 1.5 g/cm^3. The recommended default value of 1 g/cm^3 (EPA 1998a) is used (see Table 6-2).
d_{bs}	=	depth of upper benthic sediment layer (m). d_{bs} is site-specific. The recommended default value of 0.03 m (EPA 1998a) is used (see Table 6-2).

Equation B2-38

Equation B2-38 calculates the overall transfer rate of contaminants from the liquid and gas-phases in surface water (K_v). K_v is used to estimate the load to the water body due to dry vapor diffusion (see Eq. B2-20 and Eq. B2-22), which is used to estimate the total load to the water body (see Eq. 6-5 in section 6.3). K_v is also used to estimate the water column volatilization rate constant (see Eq. B2-35). The equation to estimate K_v for all constituents (Eq. 5-40 in EPA 1998a) is:

$$K_v = \frac{\theta^{(T_{wk}-293)}}{\frac{1}{K_L} + \frac{R \cdot T_{wk}}{H \cdot K_G}} \qquad \text{(Eq. B2-38)}$$

where:

K_v = overall transfer rate coefficient (m/yr). K_v is COPC- and ROPC-specific and site-specific.

θ = temperature correction factor (unitless). θ is site-specific. The recommended default value of 1.026 (EPA 1998a) is used (see Table 6-2).

T_{wk} = water body temperature (°K). T_{wk} is site-specific. The recommended default value of 298°K (EPA 1998a) is used (see Table 6-2).

K_L = liquid phase transfer coefficient (m/yr). K_L is COPC- and ROPC-specific, site-specific, and is calculated in Eq. B2-41.

R = universal gas constant (atm-m^3/mol-°K). A value of R = 8.205×10^{-5} atm-m^3/mol-°K (EPA 1998a) is used (see Table 6-2).

H = Henry's Law Constant (atm-m^3/mol). H is COPC-specific and shown in Appendix B-1, tables B1-1 (organic COPCs) and B1-2 (inorganic COPCs). If no H value exists for a constituent (for example, for ROPCs), the model sets the overall transfer rate coefficient (K_v) to 0 m/yr.

K_G = gas-phase transfer coefficient (m/yr). K_G is site-specific and is shown in Eq. B2-42. The recommended default value of 36,500 m/yr for a flowing river (EPA 1998a) is used (see Table 6-2).

Equation B2-39

Equation B2-39 calculates the soil loss rate from the watershed (X_e) by using the universal soil loss equation (USLE). X_e is used to estimate the soil loss due to soil erosion (see Eq. B2-9), the load to the water body from soil erosion (see Eq. B2-31), and the benthic burial rate constant (see Eq. B2-37). Note that the soil loss due to soil erosion is used to estimate the total soil loss constant (see Eq. B2-10), which is used to estimate soil concentrations (see Eq. 6-1 through Eq. 6-4 in section 6.2); the load to the water body from soil erosion is used to estimate the total load to the water body (see Eq. 6-5 in section 6.3); and the benthic burial rate constant is used to estimate the overall total water body dissipation rate constant (see Eq. B2-34), which is used to estimate the total water body concentration, including the water column and bed sediment (see Eq. 6-6 and Eq. 6-7 in section 6.3). The equation to estimate X_e for all constituents (Eq. 5-33A in EPA 1998a) is:

$$X_e = \frac{RF \cdot K \cdot LS \cdot C \cdot PF \cdot CF_1}{CF_2} \qquad \text{(Eq. B2-39)}$$

where:

X_e	=	unit soil loss (kg/m^2-yr). X_e is site-specific.
RF	=	USLE rainfall (or erosivity) factor (yr^{-1}). RF is site-specific and ranges from 50 to 300 yr^{-1}. The recommended default value of 50 yr^{-1} (EPA 1998a) is used (see Table 6-2).
K	=	USLE erodibility factor (ton/acre). K is site-specific. The recommended default value of 0.36 ton/acre (EPA 1998a) is used (see Table 6-2).
LS	=	USLE length-slope factor (unitless). LS is site-specific. The recommended default value of 1.5 (EPA 1998a) is used (see Table 6-2).
C	=	USLE cover management factor (unitless). C is site-specific. The recommended default value of 0.1 (EPA 1998a) is used (see Table 6-2).
PF	=	USLE supporting practice factor (unitless). PF is site-specific. The recommended default value of 1.0 (EPA 1998a) is used (see Table 6-2).
CF_1	=	units conversion factor of 907.18 (kg/ton)
CF_2	=	units conversion factor of 4047 (m^2/acre)

Equation B2-40

Equation B2-40 calculates the sediment delivery ratio (SD) for the watershed. SD is used to estimate several parameters, including the soil loss due to soil erosion (see Eq. B2-9), the load to the water body from soil erosion (see Eq. B2-31), and the benthic burial rate constant (see Eq. B2-37). Note that the soil loss due to soil erosion is used to estimate the total soil loss constant (see Eq. B2-10), which is used to estimate soil concentrations (see Eq. 6-1 through Eq. 6-4 in section 6.2); the load to the water body from soil erosion is used to estimate the total load to the water body (see Eq. 6-5 in section 6.3); and the benthic burial rate constant is used to estimate the overall total water body dissipation rate constant (see Eq. B2-34), which is used to estimate the total water body concentration, including the water column and bed sediment (see Eq. 6-6 and Eq. 6-7 in section 6.3). The equation to estimate SD for all constituents (Eq. 5-34 in EPA 1998a) is:

$$SD = a \cdot \left(A_L\right)^{-b} \qquad \text{(Eq. B2-40)}$$

where:

SD = watershed sediment delivery ratio (unitless). SD is site-specific.

a = empirical intercept coefficient (unitless). The parameter *a* is site-specific and is determined by the watershed area as follows (EPA 1998a):

Watershed Area (mile^2)	*a* (unitless)
area ≤ 0.1	2.1
0.1 < area ≤ 1	1.9
1 < area ≤ 10	1.4
10 < area ≤ 100	1.2
100 < area	0.6

Since the watershed area is > 100 mile^2, a site-specific value of a = 0.6 is used.

A_L = total watershed area receiving COPC or ROPC deposition (m^2). A_L is site-specific. An estimated value of 4.0E+09 m^2 (estimated as half of the study area) is used (see Table 6-2).

b = empirical slope coefficient (unitless). The recommended default value of 0.125 (EPA 1998a) is used (see Table 6-2).

Equation B2-41

Equation B2-41 calculates the rate of contaminant transfer from the liquid phase (K_L). The Columbia River is assumed to be a flowing river (as opposed to a quiescent lake or pond). Therefore, the equation to estimate K_L for flowing streams or rivers is used. K_L is used to estimate the overall transfer rate coefficient (see Eq. B2-38), which is used to estimate the water column volatilization rate constant (see Eq. B2-35), as well as the load to the water body due to dry vapor diffusion (see Eq. B2-20 and Eq. B2-22), which is used to estimate the total load to the water body (see Eq. 6-5 in section 6.3). The equation to estimate K_L for flowing streams or rivers for all constituents (Eq. 5-41A in EPA 1998a) is:

$$K_L = \sqrt{\frac{CF_1 \cdot D_w \cdot u}{d_z}} \cdot CF_2 \qquad \text{(Eq. B2-41)}$$

where:

K_L	=	liquid phase transfer coefficient (m/yr). K_L is COPC- and ROPC-specific and site-specific.
CF_1	=	units conversion factor of 1×10^{-4} (m^2/cm^2)
D_w	=	diffusivity of COPC or ROPC in water (cm^2/s). D_w is COPC- and ROPC-specific and shown in Appendix B-1, tables B1-1 (organic COPCs), B1-2 (inorganic COPCs), and B1-3 (ROPCs). If no D_w value exists for a constituent, the model uses $D_w = 0$ cm^2/s.
u	=	current velocity (m/s). u is site-specific. The model uses a value of $u = 1.5$ m/s, based on modeling data from Columbia Basin Research 1996 (see Table 6-2).
d_z	=	total water body depth (m). d_z is site-specific and calculated in Eq. B2-33.
CF_2	=	units conversion factor of 3.1536×10^7 (s/yr)

Equation B2-42

Equation B2-42 defines the rate of contaminant transfer from the gas phase (K_G) for a flowing system (as opposed to a quiescent system). Since the Columbia River is considered a flowing river as opposed to a quiescent lake or pond, parameter values for flowing streams are used for all constituents to estimate K_G. K_G is used to estimate the overall transfer rate coefficient (see Eq. B2-38) and the load to the water body due to dry vapor diffusion when Henry's Law Constant is not available (see Eq. B2-21). Note that the overall transfer rate coefficient is used to estimate the water column volatilization rate constant (see Eq. B2-35), as well as the load to the water body due to dry vapor diffusion (see Eq. B2-20 and Eq. B2-22), which is used to estimate the total load to the water body (see Eq. 6-5 in section 6.3). Note also that the load to the water body due to dry vapor diffusion is used to estimate the total load to the surface water body (see Eq. 6-5 in section 6.3). The equation for K_G for all constituents (Eq. 5-42A in EPA 1998a) is:

$$K_G = 36{,}500 \text{ m/yr} \qquad \text{(Eq. B2-42)}$$

where:

K_G = gas-phase transfer coefficient (m/yr). K_G is constant for flowing streams. The recommended default value of 36,500 m/yr for a flowing river (EPA 1998a) is used (see Table 6-2).

Appendix B-3

Radiological Risk Assessment Issues

Appendix B-3
Radiological Risk Assessment Issues

Contents

Tetra Tech EM Inc. Letter **B3-1**

Attachment **B3-3**

Appendix **B3-12**

019247

Tetra Tech EM Inc.

One Dallas Centre ◆ 350 N. St. Paul St. ◆ Dallas, TX 75201 ◆ (214) 754-8765 ◆ FAX (214) 922-9715

March 27, 2001

Mr. Jerry Yokel, Project Officer
Department of Ecology
Nuclear Waste Program
1315 W. 4th Street
Kennewick, Washington 99336-6018

Subject: Contract C0000084
Hanford River Protection Privatization Project
Screening Level Risk Assessment Work Plan
Radiological Risk Assessment Issues

Dear Mr. Yokel:

On November 2, 2000, the Washington State Department of Ecology (Ecology) and the U.S. Department of Energy (DOE) met to discuss the screening level risk assessment work plan for DOE's Hanford River Protection Privatization Project . During this meeting, Ecology asked Tetra Tech EM Inc., to evaluate several outstanding radiological risk assessment issues, as follows:

Issue 1: Prepare a brief report addressing the potential volatility of the radionuclides listed in RAWP-72 with respect to their becoming airborne in a sweat lodge (i.e., water containing these radionuclides splashed onto hot rocks to make steam).

Issue 2: Briefly review the list of 46 radionuclides and identify any other radionuclides, in addition to those listed in RAWP-72, that may become airborne and represent a potential inhalation exposure pathway in a sweat lodge.

Issue 3: Check if the HEAST slope factor for inhalation of tritiated water vapor includes uptake by dermal absorption.

Issue 4: Check to determine if dermal absorption of I-129 can be a significant contributor to risk relative to inhalation.

Issue 5: Check to determine if I-129 can represent an external exposure risk from plume immersion which may be significant relative to the risk it represents by inhalation.

Issue 6: Prepare a brief statement defining the level of exposure that may be considered a LOAEL for radionuclides (e.g., 1 to 5 rem).

Issue 7: Provide a brief report on the concentrations of naturally occurring and ubiquitous manmade radionuclides in mother's breast milk.

1

019247

Mr. Jerry Yokel
Washington State Department of Ecology
March 27, 2001
Page 2

The Attachment presents responses to each issue. The responses were prepared by Dr. John Mauro of Sandy Cohen & Associates. If you have any questions, please me at (214) 740-2022.

Sincerely,

William P. Desmond, Ph.D.
Senior Environmental Scientist

cc: J. Pankanin, Tetra Tech EM Inc.
J. Mauro, Sandy Cohen & Assoc.
file

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ATTACHMENT

This attachment discusses several issues raised during a meeting on November 2, 2000, between the Washington Department of Ecology and the U.S. Department of Energy (DOE). The purpose of the meeting was to discuss the draft screening level risk assessment work plan for DOE's Hanford River Protection Privatization Project.

Issue 1: Prepare a brief report addressing the potential volatility of the radionuclides listed in RAWP-72 with respect to their becoming airborne in a sweat lodge (i.e., water containing these radionuclides splashed onto hot rocks to make steam).

Issue 2: Briefly review the list of 46 radionuclides and identify any other radionuclides, in addition to those listed in RAWP-72, that may become airborne and represent a potential inhalation exposure pathway in a sweat lodge.

These two issues were formulated into the following question, which the discussion below attempts to answer:

> Assuming that radionuclides contaminate surfaces waters and these surface waters are used by native Americans in sweat lodges, what radioactivity exposure problems might result?

The Sweat Lodge

To prepare for a sweat lodge ceremony, igneous rocks such as lava are heated outside the lodge in a fire pit fueled with wood logs. (Lava tends to hold its heat well.) It takes several hours to heat the rocks, which may be about the size and shape of a man's head, to the required red heat. According to William Grosshandler, Acting Chief, Fire Sciences Division, National Institute for Science and Technology (301-971-2310), the temperature of the glowing coals in an intense wood fire is about 1700°C, while the flame temperature is about 1200°C. Rocks heated to a dull red heat will have a temperature of about 650°C. The sweat lodge generally consists of a frame of bent willow boughs covered with blankets and tarpaulins. The entrance to the sweat lodge is covered with blankets. A typical sweat lodge might be about 10 feet in diameter and roughly hemispherical in shape. When it is time for the ceremony to begin, a certain number of heated rocks are brought into the lodge one-by-one and placed in a central pit in a ritual manner. Depending on the particular ritual, this might involve twelve rocks. When the heated rocks are in place, the entrance is sealed, water is sprinkled onto the rocks, and prayers and meditation begin. Four such rounds of ritual comprise the ceremony. Each round is about 45 minutes.

Information presented above was obtained at the following Internet sites:

- http://www.ausbcomp.com/redman/sweat_lodge.htm
- http://www.crystalinks.com/sweatlodges.html
- http://www.welcomehome.org/rob/sweat/sweat.html

Aerosols in a Sweat Lodge

Emissions from the vitrification process are expected to be either gaseous species (e.g., CO_2, H_2O, I_2) or

019247

solid particulates (e.g., metal oxides and/or silicates).[1] Some fraction of the gaseous species will dissolve in surface waters on contact as H_2O, I^-, or CO_3^{-2}. Some fraction of the solid particulate emissions may also fall onto surface waters. Some of these particulates may settle to the bottom of the body of water, some may dissolve in the water, and some may remain suspended in the water as colloidal particles. Particles which settle out will not contribute to the types of exposures addressed here.

As noted above, water is sprinkled on the heated rocks in the sweat lodge to produce a steam-laden atmosphere. Any tritium, as tritiated water, would be vaporized in the sweat lodge. Similarly, any carbon-14 existing as dissolved carbonic acid would also be vaporized. Other dissolved radioactive species (e.g., metal ions and I-) would most likely remain on the igneous rocks as metal salts which might or might not subsequently evaporate depending on the chemical form of the resulting compounds. The melting and boiling points of some possible compounds are listed in Table 1 (Hdbk 1954).

It can be seen from Table 1 that if antimony chloride or antimony iodide is formed as a result of evaporation, these compounds could volatilize. Selenium, if present as the oxide, could also vaporize under expected sweat lodge conditions.

Ruthenium metal is quite stable and oxides slowly in air at temperatures above 800°C. The metal does not react with air at room temperature. The oxide, RuO_4, is highly volatile with a quoted boiling point of either 40°C or 130°C (**http://www.emsdiasum.com/ems/techdata/57.html).** However, this oxide can not be formed from the elements (http://www.britannica.com/bcom/eb/article/2/0,5716,119792+28+110614,00.html); rather, complex chemical synthesis techniques are required. Consequently, volatilization of ruthenium is not expected to represent a realistic exposure pathway.

Cesium metal boils at about 690°C. As a result, if the element is present in metallic form, perhaps due to decomposition of the oxide, it would not be vaporized in the sweat lodge. If the cesium salts, such as the chloride, iodide, or sulfate, reformed on the heated rocks after the steam had evaporated, none of these compounds would be expected to volatilize.

It is also possible that, instead of remaining as evaporative salts on the heated rocks, some of the dissolved species could be physically airborne as an aerosol mist if the boiling process is sufficiently violent. Whatever mechanism is responsible for the generation of aerosols (vaporization, mechanical entrainment, or volatilization), the quantities of such materials will likely be relatively small since only small quantities of water are used in the ceremonies. For example, consider a sweat lodge in the form of a hemisphere 10 feet in diameter. The lodge will contain about 262 cubic feet of air. Assuming that the lodge contains saturated air at a temperature of 100°F (38°C), then the air will contain 0.043 lb of water vapor per pound of dry air, and the saturated air will have a specific volume of 15.1 cubic feet per pound of dry air (Perry's 1984). Thus, there will be 0.74 lbs of water vapor in the lodge (261 ft^3 x 0.043 lb of H_2O/lb dry x lb dry air/15.1 ft^3). Since a gallon of water weighs 8.3 pounds, the amount of water required to saturate the air in the sweat lodge is about 0.1 gallons. Hence, the total amount of a contaminant airborne in the sweat lodge at any given time would not exceed the amount of the contaminant that is in about 0.1 gallon of water.

[1] Joule-heated ceramic melters used in the vitrification of HLW operate at about 1100°C in an oxidizing atmosphere. Thus, solid particulates are expected to be oxides or silicates.

019247

TABLE 1
MELTING POINTS AND BOILING POINTS OF SELECTED INORGANIC COMPOUNDS

Compound	Melting Point (°C)	Boiling Point (°C)
$SbCl_3$	74	234
SbI_3	167	401
Sb_2O_3	656	1550
$BaCl_2$	962	1560
BaI_2	740	NR
BaO	1923	NR
$BaSiO_3$	1604	NR
$BaSO_4$	1580	NR
$CdCl_2 \cdot 2.5H_2O$	568	960
CdI_2	NR	713
CdO	NR	900-1000 (d)
$CdSO_4$	NR	1000
CsCl	646	1290
CsI	621	1280
Cs_2O	360-400 (d)	NR
Cs_2SO_4	1010	NR
CoO	1800 (d)	NR
$CoSO_4$	989	NR
$EuCl_3$	623	NR
NiO	2090	NR
$RaCl_2$	1000	NR
$RuCl_3$	>500 (d)	NR
$SmCl_3$	678	NR
SmI_3	820	NR
SeO_2	NR	316
$SrCl_2$	873	NR

1

019247

Compound	Melting Point (°C)	Boiling Point (°C)
$Sr(OH)_2$	375	NR
SrO	2430	NR
$SrSO_4$	1580 (d)	NR
$SnCl_2$	246	**623**
SnO	700-950 (d)	NR
$ThCl_4$	720-750 (sub)	NR
YCl_3	680	NR

Notes:

Chemicals with boiler point values in **bold** would be expected to volatilize.

d Decomposes
sub Sublimes
NR Not reported

Recommendation:

Clearly, the quantity of radionuclides that may become airborne in this exposure scenario, and the potential significance of this scenario, will depend on many factors related to the chemical form of the radionuclides, the radionuclide concentration in the water, the temperature of the hot rocks, and the amount of water used in the ceremony. Given the many uncertainties, and the potential that aerosols may be generated by mechanical entrainment in addition to volatilization, it is recommended that a two-step process be employed for the assessment of this pathway. The first step would be a screening process, wherein it would be assumed that all of the radionuclides in the water used in the sweat lodge become airborne. If these levels result in potential risks exceeding 1E-6, a more refined analysis could then be initiated for the more limiting radionuclides.

Issue 3: Check if the HEAST slope factor for inhalation of tritiated water vapor includes uptake by dermal absorption.

The inhalation slope factor for tritiated water vapor reported in Table 4 of HEAST is 9.59 E-14 lifetime risk of cancer per pCi inhaled. This value includes both the risk contribution from the internal dose delivered by the tritium that is inhaled plus the tritium that is taken into the body by dermal absorption. This can be demonstrated by the following calculation:

The risk from inhalation of 1 pCi of tritiated water vapor, not including dermal absorption, is derived as follows:

1

019247

Dose = 1 pCi x .037 dis/sec-pCi x .0057 MeV/dis x 10 d/.693 x 86400 s/d
x 1.6E-06 erg/MeV x .01 rad-g/erg /70,000 g = 6.0E-11 rad/pCi inhaled

Risk = 6.0E-11 rad/pCi x 7.6E-4 risk/rad = 4.56E-14 risk/pCi inhaled

Other than physical constants, the key parameters in this equation are the effective half-life of tritiated water in the body of 10 days, the body weight of reference man of 70 kg, and the risk coefficient for uniform whole body exposure to ionizing radiation of 7.6E-4 lifetime risk per rad uniform whole body exposure.

As may be noted, the result of the above calculation is about one half the slope factor. Since, it is widely acknowledged that the internal dose from immersion in a plume of tritiated water vapor is about 50% from inhalation and 50% from dermal absorption[2], it is clear that the HEAST slope factor includes a factor of two to account for dermal absorption. A telephone conversation with Michael Boyd of the Office of Radiation and Indoor Air (11/3/00) confirmed this understanding.

Issue 4: Check to determine if dermal absorption of I-129 can be a significant contributor to risk relative to inhalation.

Guidance on the possible significance of dermal absorption, relative to inhalation, as a route of exposure to airborne toxicants is provided in "Dermal Exposure Assessment: Principles and Applications," EPA/600/8-91/001B, January 1992. As indicated on page 7-1, as a general rule, "many chemicals due to their low vapor pressure cannot achieve adequate vapor concentrations to pose a dermal hazard" and "for chemicals that can achieve adequate vapor concentrations, it has been assumed that they are primarily absorbed by the respiratory tract." In order to confirm this generalization, it is instructive to evaluate the permeability constant that an I-129 vapor must have in order for it to contribute significantly to uptake relative to inhalation.

Assuming a typical breathing rate of 8,000 m3/yr and an exposed skin surface area of 5,800 cm2[3], the permeability constant (Kp) for a vapor that would correspond to an uptake rate via dermal absorption that is comparable to the uptake by inhalation is derived as follows:

Kp (cm/hr) = (15.2 m3/day x 1E06 cm3/m3)/(5,200 cm2 x 24 hr/day) = 122 cm/hr

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[2] See Section 9.3.2 (page 9-4) of "Radiological Assessment - A Textbook on Environmental dose Analysis," Edited by John E. Till and H. Robert Meyer, NUREG/CR-3332, September 1983.

[3] These are the recommended adult long term inhalation value and the upper end exposed skin surface area value on pages 5-24 and 6-5 of "Exposure Factors Handbook," EPA/600/P-95/002Fa, August 1997.

019247

Therefore, the permeability constant for I-129 vapor would have to be 122 cm/hr in order for dermal absorption to contribute as much to I-129 uptake as does inhalation. The permeability constants reported in Table 7-1 in the above cited EPA guidance for a broad range of vapor phase organic compounds, which have a high potential for dermal absorption, range from .01 to 14.9 cm/hr. Clearly, dermal absorption of I-129 vapor cannot be a significant contributor to risk relative to inhalation of I-129 vapor.

019247

Issue 5: Check to determine if I-129 can represent an external exposure risk from plume immersion which may be significant relative to the risk it represents by inhalation.

I-129 is a pure beta emitter and will, therefore, not deliver a significant external effective whole body dose from plume immersion. As a result, the lifetime risk associated with immersion in an airborne plume of I-129 will essentially be entirely due to the I-129 taken up by inhalation, with a negligible contribution from dermal absorption and external exposure. For example, assuming an airborne plume of 1 pCi/m3 of I-129, and using the HEAST inhalation slope factors, the lifetime risk of cancer due to one year of inhalation exposure to the plume is estimated as follows:

R_{inh} = 1 pCi/m3 x 8000 m3/yr x 1.22E-10 risk per pCi inhaled = 9.76E-07 lifetime cancer risk of cancer from inhalation

Using the external risk conversion factors for I-129 in Federal Guidance Report No. 13, the lifetime risk from the external exposures from one year exposure to a plume containing 1 pCi/m3 of I-131 is estimated as follows:

R_{ext} = 1 pCi/m3 x 1.85E-17 risk per Bq per m3 per sec x 0.037 Bq/pCi x 3.15E7 sec/yr = 2.15E-11 lifetime risk of cancer from external exposure

Hence, the risk from external exposure is over four orders of magnitude smaller than the inhalation risk.

Issue 6: Prepare a brief statement defining the level of exposure that may be considered a LOAEL for radionuclides (e.g., 1 to 5 rem).

The Appendix presents a review of the literature which establishes the bases for defining LOAELs and NOAELs for radionuclides. Though the subject is complex, requiring a number of qualifying statements, in brief, the lowest levels of exposure where clinically significant non-stochastic effects (i.e., the acute effects of radiation) have been observed is about 10 rem. The lowest doses where a statistically significant increase in the incidence of stochastic effects (i.e., cancer) have been observed in an exposed population was about 1 rem uniform whole body exposure delivered over a short period of time to a large population.

Issue 7: Provide a brief report on the concentrations of naturally occurring and ubiquitous manmade radionuclides in mother's breast milk.

Available sources of information were searched, however no data on the natural background and ubiquitous manmade levels of radionuclides in human milk were located. The best evidence found were data on the radionuclide content in cow's milk and produce in the vicinity of Hanford. These data are included in an EXCEL spreadsheet (electronic copy transmitted with this memorandum). These data, which were kindly provided by Bruce Napier of Pacific Northwest National Laboratory, are the results of the 1999 environmental radiological surveillance program (Poston and others 1999). Dr. Napier explained

1

019247

that these annual reports can be obtained at **http://www.hanford.gov/doe/98annualrp/index.html.**

Human milk for women in the vicinity of Hanford would likely contain substantially lower levels of radionuclides than cow's milk since the amount of food and the radionuclide content of the cows' diet is likely to be considerably greater than that of a person. Nevertheless, the data in the spreadsheets represent a baseline that may be useful. In theory, the radionuclide content in human milk in the vicinity of Hanford can be estimated based on human dietary intake, along with the application of biokinetic models on the uptake and retention of radionuclides in human milk.

019247

REFERENCES

Hndbk. 1954. *Handbook of Chemistry and Physics*. 36th Edition. Chemical Rubber Publishing Co.

Perry, R.H., and D.W. Green, eds. 1984. *Perry's Chemical Engineers Handbook*. McGraw-Hill.

Poston, TM., R.W. Hanf, and R.L. Dirkes, 2000, "Hanford Site Environmental Report for 1999, PNNL-13230, Pacific Northwest National Laboratory, Richland WA.

019247

APPENDIX

LOAELs ASSOCIATED WITH RADIATION EXPOSURE

1.0 BACKGROUND INFORMATION

The concept of the "Lowest Observed Adverse Effect Level" (LOAEL) has been employed by public health professionals to assist their efforts to provide policies, guidance, and set regulatory limits in behalf of individuals exposed to radiation and radioactive materials. A LOAEL is the lowest dose in a given study that resulted in an observable harmful health effect. Radiation health effects are generally categorized as either deterministic or stochastic.

1.1 DETERMINISTIC HEALTH EFFECTS

Deterministic effects are those with a threshold dose and where the severity of the health effect(s) is largely defined by the total dose of radiation that is delivered to tissue(s), organ(s), or the whole body of the individual. These health effects are termed "acute radiation health effects" and are generally seen only for relatively large doses above the threshold level that are delivered within a short time period.

Modifying factors that affect the dose-response relationship are numerous and include (1) the rate at which the dose is delivered, (2) the type of radiation (alpha, beta, gamma, or neutron), (3) the exposure pathway (external versus internal exposure from ingestion or inhalation), and (4) age, sex, and health status of the individual.

1.2 STOCHASTIC HEALTH EFFECTS

In contrast to deterministic health effects, the severity of stochastic health effects is not affected by radiation dose. By definition, stochastic radiation effects are "probabilistic" health effects that include (1) cancer induction, (2) genetic effects, and (3) in-utero effects. Thus, the distinguishing feature of the dose-response relationship of a stochastic effect is that the severity is not dose dependent; rather the probability that a stochastic effect may occur is directly proportional to the dose of radiation. A second distinguishing feature of the dose-response relationship of a stochastic effect is that it is assumed to have no threshold. Thus, stochastic health effects associated with chronic low doses or low dose rates of radiation are assumed to represent a linear no-threshold (LNT) dose response. Thus, for even a very small dose of radiation, it is assumed that there is a small but finite risk of cancer, genetic, or in-utero effect.

A familiar example of a stochastic effect is that of smoking and lung cancer. Indisputably, cigarette smoking is a direct cause of human lung cancer, but not all smokers develop lung cancer. Moreover, lung cancer may also be observed in some non-smokers. It is important to note that the "severity" of a lung cancer is independent of whether the individual was a heavy smoker, light smoker, or non-smoker. Thus, the causal relationship of cigarette smoking and lung cancer was established when a higher incidence rate of lung cancer was observed among smokers than among non-smokers. The level of increase was found to be proportional to the amount and duration of cigarette smoking. While large differences in lung cancer rates were readily observable when heavy smokers were compared to non-smokers, these differences diminished to indistinguishable levels for very light smokers or individuals who had smoked only for a very short time.

A similar relationship exists between radiation exposure and several types of stochastic effects. For small

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019247

doses of radiation, the likelihood that even a single cell will undergo a selective alteration, which leads to a cancer or some other health effect, is extremely low. Furthermore, genetic effects, disturbances in growth and development of an embryo, and cancer can also be caused by chemical, physical, and biological agents, many of which exist naturally in the environment. Thus, even for large doses of radiation, stochastic health effects can be observed only as relatively small increases above the spontaneous incidence that is observable in the normal population.

It must also be acknowledged that the slope of the dose-response relationship for stochastic health effects is also modified by (1) the type of cancer, (2) sex and age at time of exposure, and (3) the type of radiation, pathway of exposure, etc. For example, for a given dose of radiation to the thyroid, the risk of thyroid cancer is highest when radiation is external and the exposed individual is a female child.

A quantitative assessment of the radiation dose-response relationship is further complicated by the fact that cancers (and other stochastic effects) induced by radiation are indistinguishable from those arising spontaneously or caused by other carcinogens. Physicians and pathologists cannot determine, based on tissue type, whether certain lung cancers, for example, are caused by radiation, cigarette smoking, air pollutants, chemicals, or other cancer-causing agents. The ability to detect the common cancers caused by any specific agent is, therefore, limited to statistical analyses. These statistical methods rely on the fact that the incidence of various cancers in a well-defined population can be predicted with reasonable accuracy. For a sufficiently large group of people who have received radiation exposure, an incidence of cancer above the expected level would suggest radiation was a possible cause of the excess number of cancers, but it would not identify radiation as the cause of cancer in any specific individual. Only epidemiologic studies of people exposed to relatively high doses of radiation (greater than 10,000 mrem or 10 rem) have shown such an excess of cancer and have, therefore, demonstrated a causal relationship.

In brief, there exists a voluminous body of data that describes the dose-response relationship and, while there is general consensus at the high end of the dose response, there remains uncertainty and controversy at the low end.

It is the combination of these factors that complicate a quantitative assessment of LOAELs associated with radiation exposure. A detailed and comprehensive discussion is, therefore, beyond the scope of this task. Presented below, however, are select citations of observed radiation health effects and their reported doses that provide useful reference values for LOAELs representing both deterministic and stochastic radiation health effects.

2.0 LOAELs FOR DETERMINISTIC OR ACUTE RADIATION HEALTH EFFECTS

Radiation affects the individual cells that are the building blocks of the tissues and organs of the body. Although all cells can be affected by radiation, some are more sensitive to radiation injury than others. In general, the degree of sensitivity depends on the rate of cell division and the degree of cell differentiation. Thus, the most sensitive cells are undifferentiated rapidly dividing cells that include somatic stem cells and precursor cells to male sperm. The key feature of deterministic effects is that they require a minimum dose that in turn induces cell death in a significant fraction of the exposed cell population that represents a particular tissue/organ.

Human exposure to a single whole-body dose of rapidly delivered radiation of 50 rem or more results in the development of a complex of clinical symptoms, signs, and laboratory findings, which are collectively termed the Acute Radiation Syndrome. In the acute radiation syndrome, the very radiosensitive

019247

hemopoietic system is the most prone to manifest evidence of injury. It is only when injury is more severe that gastrointestinal symptoms dominate the picture.

Presented below is a brief discussion of prominent features of the acute radiation syndrome in terms of time of onset and required radiation doses.

2.1 EARLY PRODROMAL SYMPTOMS

The first phase of the acute radiation syndrome is characterized by nausea, vomiting, and diarrhea. The best statistical information on the amount of radiation required to cause various levels of early acute radiation sickness (known clinically as prodromal gastro-intestinal distress) has been derived largely from an analysis of clinical data obtained from the histories of therapeutically and accidentally irradiated persons. The radiation exposures predicted to cause 50% probabilities of loss of appetite, nausea, vomiting, diarrhea and fatigue in such patients are listed in Table A-1.

2.2 HEMOPOIETIC SYNDROME

Clinical changes that develop in the blood following acute exposure often are referred to as the *hemopoietic syndrome*. The earliest change is a fall in the absolute peripheral lymphocyte count. This commences in the first few hours and continues for several days to levels commensurate with the amount of radiation exposure within certain limits. Reduced lymphocyte levels may persist for several weeks. There often is a prompt increase in the leukocyte count during the first few days, then a leveling off for a few more days, following which the granulocyte count will continue to fall with maximum leukopenia developing in two to five weeks. Large doses of radiation may result in severe granulocytopenia within the first seven to ten days, a poor prognostic indicator. Recovery may take several weeks to months. The platelet count usually begins to fall one to two weeks after exposure. Massive radiation exposure doses may cause severe thrombocytopenia to develop much earlier. It may take several months before the platelet counts return to normal. Usually there is a slow decline in the erythrocyte count associated

TABLE A-1
ESTIMATES OF SINGLE RADIATION EXPOSURES THAT WILL CAUSE 50% INCIDENCE OF PRODROMAL RESPONSES (EARLY SYMPTOMS) IN MAN[a]

Level of Radiation Sickness	Single Radiation Exposure (R[b])	95% Confidence Range (R)
Anorexia (loss of appetite for food)	180	150-210
Nausea	260	220-290
Fatigue	280	230-310
Vomiting	320	290-360
Diarrhea	360	310-410

[a] Source: *Radiobiological Factors in Manned Space Flight*, Edited by W. Langham, National Academy of Sciences Publication 1487, National Academy of Sciences, National Research Council, Washington, D.C., 1967.
[b] Measured in air.

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019247

with reticulocytopenia, the extent of which depends on the amount of radiation exposure and the severity of the acute radiation syndrome.

One difficulty for defining a LOAEL that involves a deterministic effect is the subjective interpretation for deciding when an "observed effect" is truly "adverse." Acute doses between 300 and 400 rem to hemopoietic tissue are generally regarded as mid-lethal doses, while doses below 100 rem are sub-lethal and result in cell depression that are transient and reversible. Wald and others (1962) provides the following doses-response relationship for each of the major blood-cell components:

Lymphocyte Count. The absence of any observable decrease has been equated with an exposure dose of less than 25 R; mild decrease and minor lymphopenia with less than a 100 R dose; a fall of greater than 50% and 90% with a dose of greater than 100 R. A pronounced fall has been taken to indicate a dose in the "dangerous range" from 300 to 1,000 rad. A lymphocyte count above 1,500/mm^3 has been considered to mean less than 200 R; less than 1,000/mm^3 to mean 200 to 400 or 500 R; less than 500/mm^3 to mean 400 or 500 to 900 R; and "virtually zero" to mean greater than 900 R.

Neutrophile Count. A depression count in the fourth and fifth week has been equated with a dose of less than 200 R; severe depression in 3 to 5 weeks with a dose of 200 to 400 or 500 R; and severe depression on days 10 to 20 with a dose of 400 or 500 to 900 R.

Platelet Count. A moderate depression of the platelet count during the fourth and fifth week has been associated with less than 200 R; severe depression in 3 to 5 weeks with 200 to 400 or 500 R; and sever depression on days 10 to 20 with 400 or 500 to 900 R.

Reticulocyte Count. An "unequivocal fall" in the reticulocyte count in five days has been equated with a dose or greater than 300 rad.

Mitotic Index. A progressive decrease has been equated with a dose in the 50 to 200 rad range. The absence of mitoses by the fourth day has been equated with a dose of 200 rad or more.

2.3 LOAELs ASSOCIATED WITH HUMAN GAMETES

Fertility. Radiation exposure of an individual's reproductive tissues may affect the production of mature male sperm or female egg cells. Reduced production of these cells may result in the temporary or permanent loss of ability to father or bear children. Sources of information about radiation effects on human fertility are limited to several studies involving medically exposed individuals (Rowley 1974; Upton 1974) and atomic bomb survivors (Blot 1977; Seigel 1966). Additionally, data from animal studies are generally thought to be applicable for estimating these effects on humans. Collectively, human and animal studies indicate that cells responsible for producing sperm in men and ova in women are among the more radiation-sensitive cells of the body. Nevertheless, radiation sensitivity differs between males and females with regard to reproductive fertility. These differences reflect the dynamics of sperm and egg production.

In the females, the ovary contains the complete inventory of about 2 million immature eggs (i.e., oocytes) at the time of birth. Following sexual maturation at puberty, monthly ovulation induces the production of a

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mature female egg. About 360 to 400 mature female oocytes are produced over her reproductive years. Immature preovulatory egg cells are relatively radioresistant, and following puberty, fertility is impaired only after moderately high doses of 300-400 rad (300,000-400,000 mrad) (NAS 1980). It is not surprising, therefore, that follow-up studies of female Japanese atomic bomb survivors have failed to demonstrate any long-term effects on female (and male) fertility (Blot 1977).

The male testes continuously produce reproductive sperm cells throughout life following sexual maturity. In this steady state of sperm cell renewal, cells are continuously produced to replace functional sperm cells that are expelled or leave the system. The production of mature sperm cells from testicular stem cells involves several cell divisions in which cells undergo dramatic changes. Radiation, which can profoundly impair cell division, is most detrimental in the early stages of sperm cell differentiation. Acute doses of a few rad can temporarily halt cell division at this stage and result in a transient reduction of sperm cell count (ICRP 1984). For increasing doses, the reduction in sperm cell count may lead to temporary or permanent male sterility. Sperm-count studies of males exposed to partial-body irradiation indicate that for gonadal doses of about one hundred to several hundred rad, sterility is temporary, and normal sperm counts resume within one to three years (Upton 1974). Thus, a dose that would permanently sterilize a man is thought to be greater than 500 rad (500,000 mrad) and would exceed the lethal whole body dose for acute radiation exposure (NAS 1980 (BEIR III)).

Among the 38,000 children born to parents irradiated at Hiroshima and Nagasaki with average doses between 31,000 and 39,000 mrem (31 and 39 rem), no statistically significant increase in genetic defects has been seen (Neel 1988; Schull 1981).

3.0 LOAELs ASSOCIATED WITH STOCHASTIC RADIATION HEALTH EFFECTS

Stochastic health effects may not appear for years or even decades after exposure to radiation. Such effects result from specific changes that occur in a few cells or a single cell. Although these selective cellular changes occur rarely, when they do, there is a probability that the altered cell may develop into cancer. If the altered cell is a reproductive cell, there is a possibility of transmitting genetic defects to the progeny of irradiated parents. Also, a developing embryo or fetus could possibly suffer injury if a pregnant woman is exposed to radiation. Thus, radiation-induced stochastic effects may exhibit long latency periods, are probabilistic, and involve biological end-points that occur relatively frequently among unexposed individuals. Because of these constraints, the most informative studies are those that involve (1) a large number of individuals, (2) large radiation doses, and (3) a follow-up period of several decades. These three parameters are frequently used to assess the strength of a study and are quantitatively expressed in person-rem-years.

Summarized in this section are epidemiologic studies grouped by the circumstances in which radiation was received. The categories include:

- Atomic Bomb Survivors
- Medical Exposures
- Fallout from Experimental Weapons Testing
- Occupational Exposures
- Others

3.1 CANCER

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019247

This section summarizes information concerning incidences of cancer related to radiation exposures.

3.1.1 Japanese A-Bomb Data

The most intensely studied human populations are the Japanese survivors of the 1945 atomic bombing of Hiroshima and Nagasaki. A-bomb survivors represent the largest group of humans exposed to radiation for whom estimates of individual doses are available. Survivors in the two cities were exposed to the immediate external radiation produced by bomb blasts and to a lesser extent subsequent internal/external exposure from fallout. Of the 75,991 survivors for whom doses were estimated, 34,272 were so far from the hypocenters that their radiation doses were considered negligible (less than 500 mrem or 0.5 rem); thus, they serve as a comparison or "control" group, leaving 41,719 whose doses are estimated at 500 mrem (0.5 rem) or greater. Table A-2 provides the dose distribution for this group of nearly 76,000 individuals.

TABLE A-2
DISTRIBUTION OF EXPOSURE AMONG A-BOMB SURVIVORS

Dose Range (Rad)	Number of Individuals
≈ 0	34,272
1 - 5	19,192
6-9	4,129
10 - 99	15,346
100 - 199	1,946
200 +	1,106

Data on cancer mortality among these 76,000 individuals have been collected and reported over the years. Relative to "controls" and adjusted for age and sex distribution, the number of observed cancer mortalities among the 76,000 A-bomb survivors has been compared to the number of expected mortalities if exposure to radiation had not occurred. The difference between the observed and expected numbers of cancer is assumed to be attributable to radiation exposure. The data in Table A-3 indicate that, of the 5,936 A-bomb survivors who died of cancer, about 340 of these cancers deaths are thought to have been the result of radiation exposure.

The data also define a dose-response in which increasing doses yield an increased percentage of excess cancers, especially for leukemia. However, some numerical estimates embody substantial statistical uncertainties as to the number of cancer deaths induced by radiation. Thus, for doses between 10,000 and 50,000 mrem (10-50 rem), the small number of excess cancers above normal expected levels is difficult to interpret and may reflect random fluctuations that are not linked to radiation exposure. When doses exceed 50,000 mrem (50 rem), the number of excess cancers is sufficient to support a causal link to human cancers.

TABLE A-3
OBSERVED CANCER DEATHS AND NUMBER OF EXPECTED CANCER DEATHS AMONG A-BOMB SURVIVORS

Dose (Rem)	Approx. No. of Survivors	Leukemia				Non-Leukemia			
		Observed	Expected	Excess No.	Excess %	Observed	Expected	Excess No.	Excess %
0	34,272	58	88	-	0	2443	2593	-	0
1 - 10	23,321	38	61	-	0	1655	1688	-	0
10 - 50	11,500	32	20	12	38	927	866	61	7
50 - 100	3,500	19	6	13	68	329	273	56	17
100 - 200	2,000	23	3	20	87	218	147	71	33
200 +	1,000	30	2	28	93	132	68	64	48
Total	76,000	202	122	80	40	5,734	5,474	260	5

Source: Shimizu 1987.

Hanford Cancer Study. An observable excess cancer rate corresponding to much lower doses of radiation has been reported in studies involving occupationally exposed individuals. Mortality studies of Department of Energy (DOE) site workers were initiated in 1965 by the Atomic Energy Commission, under the direction of Dr. Thomas Mancuso of the University of Pittsburgh. Using mortality data dating to the 1940s, researchers examined the death rates among 44,100 Hanford employees. In 1977, Mancuso and his associates, Alice Stewart and George Kneale, first reported their findings (Mancuso 1977). Their analysis of death certificates for 1,336 "non-exposed" and 2,184 "exposed" male workers who died between 1944 and 1972 found statistically significant associations between cumulative external radiation dose and cancer mortality involving the lung, pancreas, and bone marrow. A subsequent analysis of 4,033 deaths among "radiation monitored" male and female workers also indicated elevated cancer risks among male and female workers for cancer of the pancreas, stomach, lung, and bone marrow (Kneale 1978).

The estimates of cancer risks from these two studies are markedly higher than estimates based on data from the Japanese A-bomb survivors and medically exposed populations. However, many scientists, including those belonging to the National Academy of Sciences, have criticized the studies' methodologies (NAS 1980).

3.1.2 Cancer Induction for Childhood Exposures

Some epidemiologic data suggest that young children may be more sensitive to the carcinogenic effects of radiation. However, these data also have not been without controversy. One such study involved thyroid cancers among individuals exposed during childhood.

Scalp Irradiation for Tinea Capitis in Israel. A total of 10,902 Jewish children immigrating into Israel were studied after having received scalp irradiation for ringworm. All but 60 of the patients were successfully traced and matched against an equal number of nonirradiated controls with tinea capitis and a nonirradiated sibling group of half the size. A sixfold increase in malignant thyroid tumors was found in the irradiated group, compared with the controls. Nine of the 12 thyroid cancers in the irradiated group occurred in females, most of them of the papillary-cell type. Ten of the tumors occurred between 9 and 16 years after therapy. A total of 10 patients who developed cancer had an estimated dose of about 6-9 rads to the thyroid, and the other two received 12 and 18 rads (Modan and others 1974; Modan and others 1977a; Modan and others 1977b).

Scalp Irradiation for Tinea Capitis in New York. Shore, Albert, and Pasternak reported on the second survey of a population of 2,215 irradiated and 1,395 nonirradiated control subjects with tinea capitis (Shore and others 1976). Scalp epilation was accomplished with essentially the same technique as in the Israeli population just discussed; the authors produced almost exactly the dosimetry estimates of 6-10 rads to the thyroid. The average age at irradiation was about 8 years, and the average interval of follow-up was about 20 years after irradiation. No thyroid cancers were observed, although patients with benign ademonas were identified. The variance of this study from that of Modan and others (1977b) may be due to the much smaller size of the population.

3.1.3 Cancer Among Children Exposure in Utero

Earlier epidemiologic studies of in-utero exposure have also yielded inconsistent data regarding the risks of in-utero exposure and subsequent childhood cancers. No significant excess mortalities from juvenile leukemia or other cancers were observed among the 1,630 pregnant Japanese women for embryo/fetus doses of 1,000 to 50,000 mrem (1 to 5 rem) (Jablon 1970). However, a tentative link between in-utero

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exposure and childhood cancers was reported in a study of pregnant women exposed to diagnostic radiation to the abdomen in doses in the range of 500 to 5,000 mrem (0.5 to 5 rem) (Stewart 1970; Monson 1984).

For years, the surveys involving diagnostic radiation remained controversial. It was suggested that the original surveys were flawed by certain selection criteria of study subjects since many of the radiological procedures were requested by physicians for medical reasons (Oppenheim 1974; Totter 1981). To rule out the possibility that the diagnostic exposure and observed childhood cancers were not causally linked but merely shared a common risk factor, additional studies involving twin pregnancies were undertaken (Harvey 1985). The study focused on twin pregnancies where the diagnostic x-rays were performed solely because the pregnancy involved twins rather than an existing (or suspected) medical problem, as in the previously studied singleton births. When irradiated twin pregnancies were compared to non-irradiated twin pregnancies, a small increase in childhood cancers was observed (Harvey 1985). However, even this improved study design was clouded by the fact that the majority of individual twins affected by childhood cancers were children of mothers with a history of previous pregnancy loss, which may have predisposed these children to cancer. The National Academy of Sciences (NAS 1990) in its reevaluation of all current data nevertheless stated:

> "These complications, notwithstanding the concordance of the studies of twins with the studies of prenatally irradiated singleton births, prompt the tentative conclusion that susceptibility to the carcinogenic effects of irradiation is high during prenatal life."

Based on the limited available human data, the National Academy of Sciences estimated the risk per unit absorbed dose to be between 0.2 and 0.25 excess cancer deaths in the first 10 years of life per 1,000 children each receiving 1,000 mrem (1 rem) of exposure before birth. About 50% of the excess cancers would be expected to be leukemia.

3.2 LOAELS FOR OTHER IN-UTERO DEVELOPMENT EFFECTS

Although animal experiments have shown developmental health effects in the embryo/fetus for radiation doses as low as 5,000 to 10,000 mrem (5 to 10 rem), it can not be demonstrated with certainty that such low doses can induce injury to a human fetus. The evidence is based on the epidemiologic studies of children born to women of Hiroshima and Nagasaki who were exposed to atomic radiation in- utero. The atomic bomb studies were not able to associate doses below 25,000 mrem (25 rem) with developmental abnormalities of the newborn, such as central nervous system defects, skeletal abnormalities, or reduced stature. For doses above 25,000 mrem (25 rem), the most definitive human data concerning the effects of prenatal irradiation are related to brain development (Beebe 1981). In humans, impaired central nervous system development may lead to small-head size and/or severe mental retardation. Severe mental retardation in the fetus is most likely to result from exposure during the 8th to the 15th week of pregnancy, a period when specific cells, including those of the brain, are undergoing crucial development.

Among the approximately 1,600 Japanese subjects studied who had been exposed to radiation in-utero, there were 30 cases of severe mental retardation (Otake 1987). Severe mental retardation was defined as unable to perform simple calculations, to make simple conversation, or to care of himself or herself (i.e., institutionalized). The association between severe mental retardation and small-head size is not clear. Of the 30 cases of severe mental retardation, 18 individuals exhibited small-head size. For the entire study cohort, the number of individuals exhibiting small heads totaled 71 (Wood 1965).

1

019247

Aside from the classification of severe mental retardation, the study cohort of 1,600 individuals exposed in-utero were also given intelligence tests (i.e., Koga test). Intelligence test (Koga) scores of the exposed individuals revealed that radiation-related effects on intelligence was most pronounced when exposure in-utero occurred 8-15 weeks after conception. The distribution of test scores suggests a progressive reduction in IQ scores with increasing radiation exposure. For fetal exposure in the 8th through 15th week, the reduction in intelligence score under a linear dose-response model was 21-29 points at a dose of 100 rad (100,000 mrad) (Schull 1988). For a fetal dose of 1 rad (1,000 mrad), the corresponding risk implies a reduction of about one-quarter of one IQ point.

3.3 LOAELs ASSOCIATED WITH GENETIC MUTATIONS

Radiation exposure of reproductive cells have the potential for inducing developmental malformation, still births, neonatal deaths, and ill-health (inclusive of cancer) in the offspring that is the result of a genetic mutation in the exposed gamete. Japanese A-bomb survivors to date have provided important information using biochemical indicators to screen for mutations. In a total of 289,868 locus tests, involving measurements of 28 different protein phenotypes using one-dimensional electrophoresis to detect protein variants, Neel et al. (1980), have found one probable mutation in the offspring of proximally exposed parents, who received an estimated average gonadal exposure of 31-39 rem in the atomic bombings of Hiroshima and Nagasaki. There were no mutations in 208,196 locus tests involving children of distally exposed parents, who received essentially no radiation exposure. These findings correspond to mutation rates of 0.34×10^{-5} per locus per generations in the proximally exposed parents and zero in the distally exposed parents.

However, the significance of this observed gene mutation remains uncertain. Among the 38,000 children born to parents irradiated at Hiroshima and Nagasaki with average doses between 31,000 and 39,000 mrem (31 and 39 rem), no statistically significant increase in genetic defects has been seen (Neel 1988; Schull 1981).

It is also recognized that certain types of cancers have a heritable component. To test the hypothesis that a parent's job exposure to ionizing radiation affects his or her child's risk of cancer, investigators compared this occupational exposure the year before the child's birth for parents of children with and without cancer (Hicks 1984). The parents of 283 children diagnosed with cancer and the parents of controls were identified and classified by profession (i.e., dentists, radiologists, x-ray technicians, etc.) and industry (i.e., nuclear industry, veterinary medicine, industrial radiography, etc.) in which the potential for occupational exposure was high, moderate, or none. The researchers found no evidence of increased cancer risks among children whose parent(s) worked in occupations classified as having high potential exposures. Another study, however, found that leukemia incidence was higher than normal among children fathered by men who had previously received comparatively high exposures (Gardner 1990). However, this observation by no means proves a causal connection between occupational irradiation of a parent and leukemia in the offspring. In fact, any assumed causal relationship is inconsistent with what is known about radiation genetics, mechanisms of leukemogenesis, and the results of other independent epidemiologic studies.

4.0 CONCLUSION

LOAELs between 10 rem (10,000 mrem) and several 10's of rem have been cited in the literature in behalf of deterministic radiation health effects. These effects principally reflect fractional cell death and reduced division of hemopoietic and male reproductive stem cells. However, these low-level effects are transient and reversible and, therefore, require a subjective interpretation of the definition of an "adverse" health

effect. Moreover, for deterministic effects, the radiation dose must be delivered over a very short time and would reflect "accidental" conditions of exposure.

LOAELs of less than 10 rem (10,000 mrem) for stochastic radiation health effects are primarily linked to childhood cancer induction (i.e., cancers that result from radiation exposure received during childhood/in-utero, or by genetic mutation of male sperm), and other in-utero effects. However, some of these data remain controversial.

These values must be viewed in context with regulatory exposure limits for members of the public. For all anthropogenic sources of radiation, the regulatory limit for public exposure is 0.1 rem per year (or 100 mrem per year). For a discrete source of radiation exposure, the most common limit for public exposure is 0.025 rem per year (or 25 mrem per year).

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019247

REFERENCES

Beebe, G.W., 1981, "The Atomic Bomb Survivors and the Problem of Low-Dose Radiation Effects," American Journal of Epidemiology 114(6):761.

Blot, W.J., and H. Sawada, 1977, "Fertility Among Female Survivors of the Atomic Bombs of Hiroshima and Nagaski," Amer. J. Hum. Genet. 24:613.

Gardner, M.J., M.P. Snee, A.J. Hall, C.A. Powell, S. Downes, J.D. Terrell, 1990, "Results of Case-control Study of Leukaemia and Lymphoma among Young People near Sellafield Nuclear Plant in West Cumbria," British Med. J. 300:423.

Harvey, E.B., J.D. Boice, Jr., M. Honeymann, and J.T. Fannery, 1985, "Prenatal X-ray exposure and Childhood Cancer in Twins," New England Journal of Medicine 312:541.

Hicks, N., M. Zack, G.G. Caldwell, D.J. Fernback, and J.M. Falletta, 1984, "Childhood Cancer and Occupational Radiation Exposure in Parents," Cancer 53:1637.

International Commission on Radiological Protection (ICRP), 1984, "Nonstochastic Effects of Ionizing Radiation," ICRP Publication 41, Oxford: Pergamon Press.

Jablon, S. and H. Kato, 1970, "Childhood Cancer in Relation to Prenatal Exposure to Atomic Bomb Radiation," Lancet 2:1000.

Kneale, G.W., A.M. Stewart, and T.F. Mancuso, 1978, "Reanalysis of Data Relating to the Hanford Study of the Cancer Risks of Radiation Workers," in Late Biological Effects of Ionizing Radiation, Vol. 1: Proceedings of the International Symposium Held in Vienna, March 13-17, 1978, S.M. Freeman, Editor, p 387, International Atomic Energy Agency.

Mancuso, R.F., A. Steward, and G. Kneale, 1977, "Radiation Exposure of Hanford Workers Dying from Cancer and Other Causes," Health Physics 33:369.

Modan, B., D. Baidatz, H. Mart, et al., 1974, "Radiation-induced Head and Neck Tumours," Lancet 1:277-279.

Modan, B., E. Ron, and A. Werner, 1977a, "Thyroid Cancer Following Scalp Irradiation," Radiology 123:741-744.

Modan, B., E. Ron, and Q. Werner, 1977b, "Thyroid Neoplasms in a Population Irradiated for Scalp Tinea in Childhood," pp. 449-457, In L.J. DeGroot, L.A. Frohman, E.L. Kaplan, and S.R. Refetoff, Eds. Radiation-Associated Thyroid Carcinoma, Grune & Stratton, New York.

Monson, R.R. and B. MacMahon, 1984, "Prenatal X-ray Exposure and Cancers in Children," in Radiation Carcinogenesis: Epidemiology and Biological Significance, J. D. Boice, Jr., and J.F. Fraumeni, Jr., Editors, New York: Raven, p 97.

National Academy of Sciences (NAS), 1980, National Research Council Advisory Committee on the Biological Effects of Ionizing Radiation, "The Effects on Populations of Exposure to Low Levels of

1

019247

Ionizing Radiation," BEIR III, Washington, D.C.

National Academy of Sciences (NAS), 1990, National Research Council Advisory Committee on the Biological Effects of Ionizing Radiation, "Health Effects of Exposure to Low Levels of Ionizing Radiation," BEIR V, Washington, D.C.

Neel, J.V., C. Satoh, H.B. Hamilton, et al., 1980, "Search for Mutations Affecting Protein Structure in Children of Atomic Bomb Survivors: Preliminary Report, Proceedings of the National Academy of Sciences 77:4221-4225.

Neel, J. V., C. Satoh, K. Goriki, J.I. Asakawa, M. Fujita, N. Takahashi, T. Kagcoka, and R. Hazama, 1988, "Search for Mutations Altering Protein Charge and/or Function in Children of Atomic Bomb Survivors," Am. J. Hum. Genet. 42:663.

Oppenheim, B.E., M.L. Griem, and P. Meier, 1974, "Effects of Low Dose Prenatal Irradiation in Humans: Analysis of Chicago Lying-In Data and Comparison with Other Studies," Radiat. Res. 57:508.

Otake, M., H. Yoshimaru, and W.J. Schull, 1987, "Severe Mental Retardation among the Prenatally Exposed Survivors of the Atomic Bombing of Hiroshima and Nagasaki: A Comparison of the Old and New Dosimetry Systems," RERF Technical Report 16-87.

Rowley, J.J., D.R. Leach, G.A. Warner, and C.G. Heller, 1974, "Effect of Graded Doses of Ionizing Radiation on the Human Testis," Radiat. Res. 59:665.

Schull, W.J., M. Otake, and J.V. Neel, 1981, "Genetic Effects of the Atomic Bombs: A Reappraisal," Science 213:1220.

Schull, W.J., M. Otake, and H. Yoshimaru, 1988, "Effect on Intelligence Test Score of Prenatal Exposure to Ionizing Radiation in Hiroshima and Nagasaki: A Comparison of the T65DR and DS86 Dosimetry Systems," Radiation Effects Research Foundation Technical Report 3-88.

Seigel, D.G., 1966, "Frequency of Live Births Among Survivors of Hiroshima and Nagasaki Atomic Bombs," Radiat. Res. 28:287.

Shimizu, Y., H. Kato, W.J. Schull, D.L. Preston, S. Fujita, and D.A. Pierce, 1987, "Life Span Study Report 11. Part 1. Comparison of Risk Coefficients for Site-Specific Cancer Mortality Based on the DS86 and T65DR Shielded Kerma and Organ Doses," Technical Report RERF TR 12-87, Hiroshima: Radiation Effect Research Foundation.

Shore, R.E., R.E. Albert, and B.S. Pasternak, 1976, "Follow-up Study of Patents Treated by X-ray Epilation for Tinea Capitis," Arch. Environ. Health 31:17-28.

Stewart, A.M. and G.W. Kneal, 1970, "Radiation Dose Effects in Relation to Obstetric X-rays and their Relevance to Cancer Latent Periods," Lancet 1:1185.

Totter, J.R. and H.G. MacPherson, 1981, "Do Childhood Cancers Result from Prenatal X-rays?" Health Physics 40:511.

019247

Upton, A.C., 1974, "Somatic and Genetic Effects of Low-Level Radiation," in Recent Advances in Nuclear Medicine, Vol. 4, J.H. Lawrence, Editor, New York: Grune & Stratton.

Wald, N., G.E. Thoma, Jr., and G. Broun, Jr., 1962, *Hematologic Manifestations of Radiation Exposure in Man*, In Progress in Hematology, Vol III, Grune & Stratton.

Wood, J.W., K.G. Johnson, and Y. Omori, 1965, "In Utero Exposure to the Hiroshima Atomic Bomb: Follow-up at Twenty Years," Atomic Bomb Casualty Commission Technical Report 9-65.

Appendix B-4

Information Regarding Human Health Risk Parameters for the Native American Receptors

Appendix B-4
Information Regarding Human Health Risk Parameters for the Native American Receptors

Contents

Article: "The Spokane Tribe's Multipathway Subsistence Exposure Scenario and Screening Level RME" (Harper et al. 2002) B4-1

Letter to Richard Reiss, Risk Analysis Journal, from EPA Regarding Inhalation Rate of 30 m^3/day found in Harper et al. 2002 ..... B4-15

Harper et al. Response to EPA B4-18

Risk Analysis, Vol. 22, No. 3, 2002

The Spokane Tribe's Multipathway Subsistence Exposure Scenario and Screening Level RME

Barbara L. Harper,[1]* Brian Flett,[2] Stuart Harris,[3] Corn Abeyta,[1] and Fred Kirschner[1]

Exposure scenarios are a critical part of risk assessment; however, representative scenarios are not generally available for tribal communities where a traditional subsistence lifestyle and diet are relevant and actively encouraged. This article presents portions of a multipathway exposure scenario developed by AESE, Inc. in conjunction with the Spokane Tribal Cultural Resources Program. The scenario serves as the basis for a screening-level reasonable maximum exposure (RME) developed for the Midnite Uranium Mine Superfund site. The process used in developing this scenario balances the need to characterize exposures without revealing proprietary information. The scenario and resulting RME reflect the subsistence use of original and existing natural resources by a hypothetical but representative family living on the reservation at or near the mine site. The representative family lives in a house in a sparsely populated conifer forest, tends a home garden, partakes in a high rate of subsistence activities (hunting, gathering, fishing), uses a sweat lodge daily, has a regular schedule of other cultural activities, and has members employed in outdoor monitoring of natural and cultural resources. The scenario includes two largely subsistence diets based on fish or game, both of which include native plants and home-grown produce. Data gaps and sources of uncertainty are identified. Additional information that risk assessors and agencies need to understand before doing any kind of risk assessment or public health assessment in tribal situations is presented.

KEY WORDS: Native American; subsistence diet; multipathway; exposure scenario

1. INTRODUCTION

Exposure assessment has been termed the "wasteland of risk assessment"[4] because so much information is lacking with regard to exposure patterns and rates, and this is especially true for specific populations such as Native American communities. The need to address a tribe's subsistence exposure is based on fundamental considerations of the tribe, as a people, and the role the reservation and its natural resources play in supporting them. The United States recognizes that Indian reservations were, and are, intended to provide permanent homelands for members of the particular tribes. As such, those members possess the inherent right to use reservation natural resources for subsistence, religious, and other cultural purposes. The Spokane

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[4] Carol Henry, American Chemistry Council, quoted in Wakeland, 2001 *EHP 108*(12): A559.
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Tribe's effort to preserve its culture and environmental quality has, on numerous occasions, been formally memorialized by pronouncements of the tribe's official governing body. The immediate impetus for developing this tribal scenario is the Midnite Uranium Mine Superfund Site, an inactive open-pit uranium mine located on the Spokane Reservation, that has contaminated various media with radionuclides and heavy metals. The exposure scenario described herein is an effort to ensure the proper evaluation of risk to Spokane Tribal members who engage in traditional practices in areas affected by the mine. While this scenario attempts to include as many activities related to Spokane cultural practices as possible, there undoubtedly exist unintended omissions and instances of understated exposure. It is important for readers to understand that this scenario is designed to reflect traditional lifestyles whose practice has been and remain the long-term intent of the tribal council, rather than a current snapshot of statistical cross-sectional surveys. While the latter may be more "quantitative," such surveys would not provide the level of protection needed for safe practice of traditional ways.

The scenario relies on existing ethnographic information about traditional Spokane lifestyles identified by the tribe as accurate[1–3] as well as confirmatory interviews with elders. The Spokane Tribe has determined that information regarding cultural activities, gathering areas, and resources is a cultural resource, and restricts access to that information (Spokane Tribal Resolution 1996-0018); therefore, details regarding specific species, locations, uses, or activities that are deemed proprietary have been omitted.

The scenario also serves as the basis for a screening-level reasonable maximum exposure (RME) developed for the Midnite Uranium Mine Superfund site. This article presents portions of a multipathway exposure scenario developed by AESE, Inc.[4] in conjunction with the Spokane Tribal Cultural Resources Program. It includes dietary factors specific to the Spokane Tribe and builds on previous work,[5] refines some of the exposure factors used in earlier work, and demonstrates how a complex scenario can be used to develop a screening-level RME under CERCLA. It should be noted that the term "subsistence" has been used in this article as a short-hand term that encompasses a broader range of activities than those necessary to sustaining human life such as eating and drinking. It includes other cultural and religious practices as well, such as medicinal and ceremonial uses of natural resources.

Our experience in developing tribal subsistence-based exposure scenarios has led to a set of technical, ethical, and procedural rules:

- To be most useful to regulators and others seeking to protect the health of subsistence users, the information should be developed with an eye toward satisfying appropriate court rules for admissibility of expert testimony. While both state and federal courts have such rules, Federal Rule of Evidence 702, on which many state court rules are modeled, is the most widely applied and interpreted. Rule 702 permits "a witness qualified as an expert by knowledge, skill, experience, training, or education" to testify when his or her "scientific, technical, or other specialized knowledge will assist the trier of fact to understand the evidence or to determine a fact in issue." In response to two U.S. Supreme Court cases holding trial judges responsible for excluding unreliable expert testimony, Rule 702 recently was qualified by amendment. To be admissible, the rule now requires federal courts to find: "(1) the testimony is based upon sufficient facts or data, (2) the testimony is the product of reliable principles and methods, and (3) the witness has applied the principles and methods reliably to the facts of the case." The subsistence scenario incorporates information from a variety of disciplines, including cultural and traditional environmental knowledge. To prevent a challenge to the admissibility of the subsistence scenario as being unreliable, we wish to ensure that the subsistence scenario has been developed as much as possible using

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general scientific criteria adopted from the *Daubert* case:[5]

- That each parameter can be tested or verified (documented, modeled, measured, or elicited from acknowledged experts), and that each assumption has been systematically validated. Risk assessors can rely on ethnographic data, verbal representations from subsistence practitioners, and so on. We relied on (1) open peer-reviewed literature on exposures through different but analogous pathways and caloric content of foods, (2) ethnographic documents and reports concerning traditional lifestyles and practices, and (3) statements from tribally recognized cultural experts. This latter expertise derives from their traditional environmental knowledge, and is based on confidential information, so we cannot verify it in the sense of reanalyzing raw numerical data, but we can verify the expertise of the cultural experts who summarized their knowledge of resources and activity patterns for us.
- That another risk assessor could repeat the same steps and would construct essentially the same scenario, because the approach for developing an exposure scenario is fairly standardized.
- That the scenario is accepted by colleagues as reasonable and factual rather than eccentric, unreliable, or mere opinion, or that it meets the "general acceptance" test set forth in *Frye v. United States*, 293 F. 1013 (App. D.C. 1923), the predecessor case to *Daubert*. We satisfy this criteria by obtaining peer review from qualified colleagues ("the relevant scientific community") even beyond the editorial peer-review process. Does this mean that exposure scenarios for over 500 tribes must be peer reviewed and published in *Risk Analysis* in order to be admissible in court should they be challenged during a CERCLA or NEPA process? We believe that if a standardized process is followed and the scenario is reviewed by an advisory board of qualified peers that actual publication is not necessary, even though publication in a peer-reviewed journal is a commonly accepted standard for peer review.

- The scenario must be both scientifically relevant and reliable, and culturally relevant and reliable. The process must be culturally sensitive, respectful, draw on traditional environmental knowledge (such as the observational expertise of elders), and must be developed from within the tribe by a toxicologist/risk assessor in partnership with tribal cultural and technical experts. Collaboration with the Cultural Resources Program provided the cultural assurance.
- Policy-level approval must be obtained. The process must meet Institutional Review Board rules or their equivalent for conducting human research (which we believe includes cultural or anthropological research)

[5] See *Daubert v. Merrell Dow Pharmaceuticals, Inc.*, 509 U.S. 579 (1993) (holding trial courts responsible for excluding unreliable scientific expert testimony); *Kumho Tire Co. v. Carmichael*, 526 U.S. 137 (1999) (holding trial courts responsible for excluding unreliable nonscientific expert testimony). An authoritative discussion of *Daubert* and the reliability tests for expert testimony is contained in the Federal Rules of Evidence Advisory Committee Notes, which accompany Rule 702. They include a "nonexclusive" list of considerations for reliability of scientific expert testimony under *Daubert*:

(1) whether the expert's technique or theory can be or has been tested—that is, whether the expert's theory can be challenged in some objective sense, or whether it is instead simply a subjective, conclusory approach that cannot reasonably be assessed for reliability;
(2) whether the technique or theory has been subject to peer review and publication;
(3) the known or potential rate of error of the technique or theory when applied;
(4) the existence and maintenance of standards and controls; and
(5) whether the technique or theory has been generally accepted in the scientific community.

Kumho found that depending on the particular circumstances of the case, these factors may also apply to nonscientific testimony. Other factors considered by post-*Daubert* courts include: whether the expert's opinions were developed independent of litigation or for the purpose of testifying; whether there exists too great an analytical gap between data and opinion; whether obvious alternative explanations have been accounted for; and whether the same level of intellectual rigor is applied in the testimony as would be required in field practice. In addition to reliability, courts will require a testifying expert to be "qualified," and the testimony must be relevant and helpful to the trier of fact. Thus, the emphasis is on testimony being relevant and reliable more than on whether there is a strict litmus test of generating a theory and statistically testing a null hypothesis.

such as informed consent, benefit to the tribal community, disclosure of the risk of adverse consequences, and confidentiality. Repeated conversations with tribal program managers and/or policymakers ensured that there was an understanding of the way that the risk information was to be used, the potential adverse consequences of developing a scenario from a risk acceptance perspective or precedent, and related concerns.

- Identifying resources and activities on a base map overlain by ecological habitats, and constructing a dependency web (culturally relevant natural history diagrams)[6] as a pictorial representation of the ethnohabitat proved helpful. A subsistence food pyramid is another useful tool.

2. THE SPOKANE TRIBE AND ITS ECOCULTURAL LANDSCAPE

The Spokane Indians are part of the Interior Salish group, which has inhabited northeastern Washington and northern Idaho since time immemorial.[1] The Spokane Reservation lies at the confluence of the Spokane and Columbia Rivers in northeastern Washington. Salmon was the most important commodity in the early economy of the tribe. Since the construction of Columbia River dams the anadromous salmon are no longer available. Instead, Kokanee (landlocked sockeye salmon) and resident trout and other species have been substituted. Abundant game also supports an alternative game diet, along with a wide variety of roots, berries, and other plants. Because the reservation is still fairly pristine and undeveloped, it provides enough resources for some members to continue a traditional subsistence dietary lifestyle, and for all members to obtain traditional foods.

The ecology of the reservation area is characteristic of the arid montane areas of the northern Columbia Basin transitioning into the Okanagon highlands to the north. Annual precipitation is approximately 16 inches. The Spokane lands include the two major rivers (the Columbia River and one of its tributaries, the Spokane River) including the waters to their far banks, and various other large and small tributaries, springs, ponds, and wetlands. Mount Spokane is a central feature of the reservation landscape. A Douglas fir zone exists at the highest elevations, with Ponderosa pine and Western juniper zones with a variety of understories at lower elevations, and grassland-sagebrush shrub steppe and riparian areas along the waterways.[7–9] Areas affected by activities at the Midnite Mine include the mined area on Mount Spokane and adjacent upland habitats, several seeps and springs with riparian habitats, and a major creek (Blue Creek) that empties into the Spokane River arm of Lake Roosevelt, the reservoir created in the Columbia River by the Grand Coulee Dam.[10]

The Spokane traditional lifestyle is governed by ecological seasons and the activities that people undertake in response. A significant portion of the population follows this lifestyle in full or in part. Hunting, fishing, and gathering are essential to support nutritional, cultural, spiritual, and medicinal needs of tribal members. Hunting and gathering on the reservation is allowed based on the needs of the family. Typically, all family members work in the field on a regular basis to keep the extended family unit stocked with a wide variety of plants and wildlife. While in the field, tribal members live off the land by consuming surface and spring water, wild plants, and wildlife. In addition to the time spent in hunting, fishing, or gathering, time is also spent cleaning, processing, and preserving hides, drying vegetal food or medicines, and making a wide variety of items. The Spokane people use over 200 varieties of plants.[11] Huckleberries are gathered, as are a wide variety of roots, shoots, moss, leaves, stems, cambium, seeds, and flowers. Most natural resources have several human uses[12,13] as well as providing multiple ecological functions and services. A more complete description of edible plants, ethnographic information, plant technology, ethnobotany, and ethnopharmacology is found in AESE.[4]

3. GENERALIZED LIFESTYLE OF A REPRESENTATIVE COMPOSITE SPOKANE TRIBAL FAMILY

This section describes a family-based exposure scenario founded on traditional Spokane lifestyles and diets (one fish-based diet and one game-based diet). This hypothetical but representative family lives in a house in a sparsely populated conifer forest, tends a home garden, pursues a high rate of subsistence activities and a regular schedule of other cultural activities. The lifestyle is moderately active, with daily sweat lodge use and outdoor employment.

The family composition was determined with the guidance of the Spokane Tribal Culture Program and current tribal demographics. Each family includes an infant/child (age 0–2 years) who breastfeeds for two years and crawls and plays; a child (age 2–6), a youth (age 7–16) who attends school, plays outdoors near the residence, and is learning traditional practices; two adult workers (one male, one female, age 17–55; the female breastfeeds the infant) who work outdoors on reclamation and environmental and cultural activities and also engage in subsistence activities, and an elder (age 56–75) who is partly at home and partly outdoors teaching and demonstrating traditional cultural practices. All members (except the infant) partake in family sweat lodge use and in cultural activities throughout the year. In actuality, a family typically includes members who are employed conventionally and members who are full-time subsistence providers.

3.1. Residence

A conventional suburban scenario would identify a person living at home and growing a garden. The subsistence family is superficially similar to this, but they live in a more open house, spend more time outdoors in cultural and subsistence activities, eat both garden and native foods, and are fully interactive with the environment. The family spends its entire lifetime on the reservation, rather than the suburban default assumption of 30 years. The house has no landscaping other than the natural Ponderosa and understory, some naturally bare soil, a gravel driveway, no air conditioning, and a wood-burning stove in the winter for heat. Each house has its own well for domestic use and a garden irrigated with groundwater and/or surface water. Each house has a nearby sweat lodge. The amount of indoor dust is not known, but is likely to be higher than in suburban communities with manicured lawns, air conditioning, and paved streets.

3.2. Generalized Daily Activity Patterns of Each Family Member

Due to space limitations, the average daily activity pattern is not described for each age range and each gender, but in the full scenario, such information would be included in this section.[6] While activities of Spokane males and females are different, they likely result in a similar frequency and duration of environmental contact, so the genders may be separated or combined. The daily activity patterns can also be combined into entire lifetimes for the evaluation of cumulative risk.

3.3. Sweat Lodge Use (Ages 2–75)

The daily use of the sweat lodge is an integral part of the lifestyle that starts at age two. Sweat lodge construction has been described in the open literature.[14,15] Although the details vary among tribes and among individual families, sweat lodges are generally round structures (6 feet in diameter for single-family use). A nearby fire is used to heat rocks that are brought into the sweat lodge. Water (4L) is poured over the rocks to form steam (a confined hemispheric space with complete evaporation of the water, which is available for inhalation and dermal exposure over the entire skin area). Water is ingested (1L is included in the total drinking water ingestion rate) and medicinal plants are used (not specifically included).

3.4. Cultural Activities

All persons participate in day-long outdoor group cultural activities once a month, such as pow-wows, horse races, and seasonal ceremonial as well as private family cultural activities. These activities tend to be large gatherings with a greater rate of dust resuspension and particulate inhalation. Individuals also tend to be more active during the ceremonies, resulting in greater inhalation and water ingestion rates. These activities are folded into the higher soil ingestion, water ingestion, and inhalation rates rather than being estimated on a single-event basis.

3.5. Diet

The Spokane food pyramid looks markedly different from the USDA food pyramid. Caloric needs are generally cited in the range of 2,000 to 4,000 kcal per day for adult males, depending on the level of activity. We use 2,500 kcal/day for the Spokane Tribe, based on a moderately active outdoor lifestyle and renowned athletic prowess (as did Scholz[3]). The original diet of the Spokane Indians was based on salmon and included large and small game, roots, berries, and many other plants.[2,3,11] Hunn[16] estimated that 45% of the native Columbia Plateau dietary calories came from protein (fish and game), with higher estimates

for upriver tribes such as the Spokane.[3] Historically, the Spokane Tribe consumed roughly 1,000 to 1,500 grams of salmon and other fish per day.[2,3] The most robust upper bound estimate of original (predam) salmon intake by the Spokane Tribe is the Walker estimate (cited in Reference 3) of 1,200 pounds per year of salmon per adult, or 1,426 gpd (about 3 pounds/day), yielding 2,566 kcal/day before migration (i.e., if caught in the estuary) and 2566×0.64 1643 kcal/day after migration from the ocean to the Spokane area. With the construction of the Grand Coulee Dam, the anadromous salmon runs were destroyed, so there was a shift to big game and to Kokanee and resident trout. Because the intent of this scenario is to evaluate exposures that traditional members currently receive and that more members will receive as they regain a traditional diet, two diets were evaluated: a high fish diet and a high game diet. Eighty percent of each diet is native, augmented with vegetables grown in a household garden. The current realistic high fish diet based on availability, percentage of the diet, and caloric content consists primarily of fish (885 g/d, somewhat lower than historical levels), supplemented by big game, aquatic amphibian/crustacean/mollusks, small mammals, and upland game birds. The high game diet reverses the fish-game quantities, and both diets include identical amounts of native and domestic plants. Both forms of the diet are approximately 40% protein, 25% fat, and 35% carbohydrate (given the limited data available for native foods), which is comparable to other hunter-gatherer diets.[17] Until recently, this diet was even higher in fish-derived protein, and was stable for at least 5,000 years (based on archaeological evidence of salmon runs). The carbohydrates are largely unprocessed and include many roots but little grain. The fats are from fish, game, nuts, and seeds.

3.6. Drinking Water

Daily replacement water needs are approximately 2L/100 pounds body weight (more during exercise or pregnancy).[6] Athletic activity can result in a loss of 1.5 L/hour; replacement volumes are recommended as 1 to 1.5 ml/kcal of energy expended.[18] Harris and Harper[5] estimated an average water ingestion rate of 3 L/day for adults, based on total fluid intake for the Confederated Tribes of the Umatilla Indian Reservation. However, that number did not account for all uses. This scenario includes adult water ingestion of 1L while at home (from the household water supply), 1L taken from home to the worksite, 1L consumed from worksite sources, and 1L from the household or spring to rehydrate during use of the sweat lodge, for a total of 4 L/d.

3.7. Soil Ingestion

Soil ingestion by young children (0–6 years) is assumed to be 400 mg/day for 365 days/year. This is higher than the prior EPA default value of 200 mg/day.[19] It reflects both indoor dust and continuous outdoor activities analogous to gardening or camping,[20] but is less than a single-incident sports or construction ingestion rate.[21,22,23] For adults, the soil ingestion value is also 400 mg/day, reflecting an unspecified upper percentile.[21] This value also better reflects the environmental setting, the typical residential situation, gardening and gathering activities, the preparation and consumption of native and garden plants, the consumption of other natural foods, and a variety of additional outdoor activities (work, play, cultural activities). However, it may still substantially underestimate the amount of soil and sediment on garden produce and gathered plant foods. In particular, episodic events such as gathering in wetlands or road work could result in 1 gram of soil ingested per event,[21,22,23] which may be over and above the 400 mg ingested daily. If there is geophagy (eating dirt for micronutrients or salt), the ingestion would be higher yet. In fact, the intentional presence of some Mother Earth in food may be beneficial medically[23] and spiritually.

3.8. Inhalation Rate

We believe that an inhalation rate of 30 m^3/d is more accurate for the Spokanes' active, outdoor lifestyle than the EPA default rate of 20 m^3/d.[21] EPA[21] reviewed several extensive studies that examined ventilation rates based on direct management and activity diaries in developing the default rate of 20 m^3/day. EPA recognizes that special populations, such as athletes or outdoor workers, have higher average rates and recommends

[6] U.S. Air Force at http://www.capnhq.gov/nhq/cp/ encampments/AETC.htm#AETC.; Coyle at http://www.veggie.org/veggie/fluid.exercise.shtml).

Table I. The Spokane Subsistence Composite RME Scenario

Medium	Description (Not All Routes of Exposure are Listed)
Groundwater	Each family has their own well for drinking/household, watering the garden, sweat lodge
Surface water	Each family uses surface water (seep and creek) for domestic and garden use, washing locally gathered materials, and the worker uses surface water during fieldwork and sweat lodge
Air	Indoor radon, sweat lodge radon, outdoor radon daughters, inhalation of resuspended dust, inhalation of aerosols
Soil	Direct ingestion, deposition on plants, as-gathered conditions, and indirect (uptake from soil to plant)
Sediment	Duplicates the soil; gathering may include high rates of sediment exposure that may be underestimated
Sweat lodge	Daily for 2 hours, using groundwater (springs) or surface water
Pathway	**Description (Not All Routes of Exposure are Listed)**
Inhalation	30 m^3/d to accommodate indoor and outdoor activities; the inhalation rate for strenuous outdoor activities may actually be underestimated (can be discussed as a source of uncertainty)
Drinking water	4 L/d; this is duplicated for surface and groundwater if both are contaminated; fluid replacement needs for strenuous activity may be underestimated
Other water uses	Garden irrigation, dermal and inhalation while showering, other standard routes of exposure
Sweat lodge	Steam, inhalation, immersion
Soil ingestion	400 mg/d (100 mg/d from indoor sources and 300 mg/d from outside sources); outdoor sources may vary in concentration; indoor dust is equal to local outside soil; this is duplicated if sediment is included; episodic events 1 gram each
Other	Other factors are as reported previously (dermal, etc.; Harris and Harper, 1997)

High Fish Diet—About 2500–3000 kcal/d (Moderate Adult Level)		High Game Diet—About 2500–3000 kcal/d (Moderate Adult Level)	
Fish (10% of which is organ meat with 10x concentrations; sockeye and mixed trout are used for calorie estimates)	885 g/d = 1300 kcal	Big game (10% of which is organ meat with 10x concentrations; deer and elk are used for calorie estimates, not beef)	885 g/d = 1000 kcal
Big game	100 g/d = 110 kcal	Fish	75 g/d = 180 kcal
Local small game, fowl	50g/d = 75 kcal (or 25g birds, 25g rabbits)	Local small game, fowl	50 g/d = 75 kcal (or 25g birds, 25g rabbits)
Aquatic foods (mussels and crayfish are nutritionally similar)	175 g/d = 120 kcal	Aquatic foods	175 g/d = 120 kcal
Vegetal calories	1600 gpd = about 1000 kcal (mixed species)	Vegetal calories	1600 gpd = about 1000 kcal (mixed species)
10% garden (above ground)		10% garden (above ground)	
10% garden (below ground)		10% garden (below ground)	
40% gathered terrestrial below ground		40% gathered terrestrial below ground	
20% gathered terrestrial above ground		20% gathered terrestrial above ground	
20% aquatic		20% aquatic	
Other calories (medicines, etc.)	Not determined	Other calories (medicines, etc.)	Not determined
Dairy (children only)	0.5 L/d milk	Dairy (children only)	0.5 L/d milk

Note: The best estimate of original (predam) salmon intake by the Spokane Tribe is the Walker estimate (cited in Scholz *et al.*, 1985) of 1,200 pounds per year of salmon per adult, or 1,426 gpd (about 3 pounds), yielding 2,566 kcal before migration and 2566 × 0.64 = 1643 kcal after migration from the ocean to the Spokane area. The current 885 gpd is based on a combination of calories estimates, availability, interviews, and dietary balance. The current Spokane diet relies on Kokanee (landlocked sockeye) and trout (bull or Dolly Varden, rainbow), suckers, whitefish, other species. Salmon and steelhead are obtained whenever possible. Mussels and crayfish were also eaten regularly.

Both fish and game are eaten fresh, smoked, or dried, but there are few data on calories or contaminant concentrations according to method of preparation. No contaminant loss during preparation is assumed, since contaminants could become more concentrated as well as being lost with fat loss.

The dietary data are not adequate to distinguish fruit, berries, greens, roots, bulbs, fungi/moss, seeds/nuts, medicines, or sweeteners on a caloric basis, nor domesticated from wild plants. If data for uptake from soil/sediment or dust/sediment load for a native species becomes available, the intake of that species will be estimated. The proportion of above and below ground plants is based on reliance on tubers and bulbs, using USDA caloric information on domesticated plants from the same plant families. Intake of other plants (medicines, rose hips, etc.) occurs but was not determined.

Dairy may be underestimated (cheese, milk), and eggs are not specifically included, but should be included depending on the information supplied by tribal members.

While many animal species are similar with respect to how much nutrition they provide to people, their contaminant concentration will vary according to their habitat and ecological niche, as well as their location and size of home range. This is estimated through the ecological food web or actual sampling data.

All the exposure factors are constant through the year (i.e., they apply 365 days/year).

calculating their inhalation rates using the following median hourly intakes for various activity levels (in m^3/hr): resting = 0.4, sedentary = 0.5, light activity = 1, moderate activity = 1.6, heavy activity = 3.2. For outdoor workers, a median rate is 1.3, with an upper percentile of 3.3, depending on the ratio of light, moderate, and heavy activities during the observation time. "Inhalation rates may be higher among outdoor workers/athletes because levels of activity outdoors may be higher, therefore, this subpopulation group may be more susceptible to air pollutants and are considered a 'high risk' subgroup."[21] Using this EPA guidance, a median rate of 26.2 m^3/d is obtained from eight hours sleeping, two hours sedentary, six hours light activity, six hours moderate activity, and two hours heavy activity. This represents minimal heavy activity (construction, climbing hills, etc.), and is a median rather than a reasonable maximum. The California Air Resources Board[25] also reviewed daily breathing rates based on activity levels and concluded that 20 m^3/d represents an 85th percentile of typical American adult lifestyle (eight hours sleeping and 16 hours of light to moderate activity), a lifestyle that is less active than an outdoor lifestyle in a topography that includes steep slopes, as on the Spokane Reservation.

4. A SCREENING-LEVEL COMPOSITE RME

Due to the number of age groups, daily activities, and limited EPA funds for determining both media-specific exposure point concentrations as well as developing and subsequently running the risk model, EPA requested that the tribe condense the scenario into a screening-level composite RME application for use in the Midnite Mine risk assessment (Table I). The principle of developing a screening scenario is to reduce the number of calculations by combining (not eliminating) pathways and age groups, and maximizing exposure factors to a reasonable degree. The screening-level risk assessment then generally employs the composite RME and the upper 95th percentile exposure point concentrations in each medium, wherever they occur throughout the site, so that any location, activity, diet, or water source has the chance to drive risk. This means that the result of the screening-level risk assessment is not strictly location, pathway, age, or activity specific. It only indicates whether unacceptable sitewide risk is possible and shows the spatial aspects of the risk profile if plotted on a base map. In the future, EPA or the tribe will need to use the full scenario and location-specific exposure point concentrations to assess risk attributable to location, pathway, age, or activity. Such information will be required to evaluate the remedial alternative during the feasibility study and to quantify residual risk once remediation has been completed.

The full scenario was condensed as follows. The daily time allocation is 12 hrs/d indoors, 2 hours in the sweat lodge, 7 hours outdoors working, playing, and other nonsubsistence activities, and 3 hours of subsistence activities in *each* contaminated area where these activities might occur. This will result in more than a 24-hour day, but is necessary to reduce the number of calculations. Alternately, the person can live and subsist at the single most contaminated location. Soil ingestion remains at 400 mg/d for 365 days/year (100 mg from indoor sources and 300 from outdoor sources; for multiple contaminated subsites, each contributes 300 mg, which could result in more than 400 mg/d; alternately, the single most contaminated soil location can serve as the sole source of soil-based exposure). For application to other areas, such as wetlands, 1 gram per visit may be used.[21,22] Drinking water

Table II. Examples of Differences in Exposure Factors for a 70 kg Adult

Parameter	Default Value[1]	Subsistence Value[2]
Drinking water ingestion	2 L/day	4 L/d (includes 1L during sweat lodge use)
Soil ingestion	200 mg/d (children) 50 mg/d (adult)	400 mg/d for all ages
Inhalation rate	20 m^3/d	Varies by average activity level; 30 m^3/d.
Meat & fish ingestion[3]	21.1 g/d (general population) and 70–170 (subsistence); 17.5 g/d (general population) and 142.4 g/d (subsistence)	885–1000 g/d fish and 100 g/d meat (high fish diet), or 885 g/d meat and 75 g/d fish (high game diet); 50 g/d small game for each, 175 g/d shellfish for each; no dairy for adults is included in this total
Vegetable ingestion	Fruit and vegetable totals: 539 g/d; grain: 287 g/d[4]	1600 g/d; fraction obtained locally = 1, both gathered and home-grown
Exposure frequency	Varies according to climate and activity	365 d/yr unless documented otherwise
Exposure duration	30 yrs (assumes retirement elsewhere) or less (average time spent in a home)	70 yrs (a full lifetime)

[1] EPA *Exposure Factors Handbook*, in totals per day assuming 70 kg body weight.
[2] These values apply only to the Spokane Tribe unless verified specifically for other tribes. Dietary factors are specific to the Spokane Tribe. Total caloric intake is assumed to be the same for both scenarios but in fact may be higher for the more athletic outdoor lifestyle.
[3] *Exposure Factors Handbook*, Volume II, Section 10.10 recommends using 21.1 g/d total fish and shellfish as the mean value for the general population and 70 g/d for Native American subsistence populations (mean value) or 170 g/d (95th percentile). EPA Office of Water (Methodology for Deriving Ambient Water Quality Criteria for the Protection of Human Health 2000, EPA-822-B-00-004 and Water Quality Standards for Indian Country at www.epa.gov/ost/standards/tribal/tribalfact.html) uses 17.5 g/d as the 90th percentile for the general population and 142.4 g/d for subsistence populations as the 99th percentile, all in uncooked weight. These values are all for adults and are all based on current cross-sectional surveys that likely omit traditional tribal members. The Spokane value reflects existing documentation on historical subsistence consumption rates with caloric evaluation, confirmatory interviews with the tribal cultural staff, and tribal policy goals for regaining traditional healthy cultural lifestyles, not on dietary surveys.
[4] *Exposure Factors Handbook*, Volume II (mean values).

remains at 4 L/d, which is derived from the most contaminated source (this is duplicated for surface and groundwater if both are contaminated). This results in an upper bound sitewide risk estimate. Risks for an actual individual who specializes in certain activities (i.e., the hunter or the fisher), spends more time in fewer locations or a single location, or fully utilizes a contaminated medium such as groundwater, could be as high as but no higher than this upper bound estimate. Subsequent analyses using either the complete scenario or the composite RME can examine particular pathways and locations, or can be used to support risk management decisions such as remedial goals, subsistence soil and water remedial screening levels, or tribal regulatory standards.

Table II shows some of the major differences between EPA default exposure factors and our subsistence scenario. We are not presenting a sensitivity analysis in this article because the relative contribution of various exposure factors will depend on the concentration of contaminants in various media and their physical parameters, and specific human activity patterns at the contaminated site. This will be the subject of another article. However, we expect that the major factors for subsistence lifestyles or lifestyles with high environmental contact rates will be soil ingestion, drinking water, exposure duration, and diet. We should note that the dietary factors in the *Exposure Factors Handbook* reflect major categories of the diet rather than a necessarily complete diet—adding average caloric content for the categories identified in the *Handbook* totals about 2000 kcal/d for the general population, which is lower than actual national average caloric intakes by up to one-third. That other third of the diet is not likely to come from the contaminated site, so from an exposure perspective this does not detract from suburban dietary exposure estimates. The subsistence diet in this article, however, yields a full day's calories (~2500 kcal). If one tried to construct a subsistence diet solely from the *Handbook*, the caloric intake would fall short of an adequate amount even if the intake factors for Native Americans were used. One could erroneously equate "subsistence" with a modern diet supplemented with fish, game, and wild plants using

intake rates that are given in the *Handbook*. This could be due to several factors: whether reservation dwellers were specifically sampled during the three-day recall surveys (versus urban or suburban dwellers who happened to be Native American), the difference between current reservation conditions (with USDA commodity foods) and a truly subsistence lifestyle, socioeconomic factors, and so on. Thus, developing a subsistence exposure scenario with a traditional diet and cultural practices specific to reservation living needs to rely primarily on ethnographic data and cultural information, and only secondarily on national dietary survey data.

5. DATA GAPS AND SOURCES OF UNCERTAINTY ASSOCIATED WITH THE SCREENING-LEVEL RME

An incomplete list of data gaps and uncertainties are briefly discussed below. The relative error caused by each uncertainty cannot be ascertained at this time. We believe that the overall uncertainty and variability are greater in tribal communities than in suburban communities due to the greater number of risk factors and the potential for several risk factors to cluster in particular communities and individuals. Because tribal members could be at greater risk due to both greater exposure and greater sensitivity, an additional safety factor or precautionary approach may be warranted in these types of situations.

5.1. Mobile Versus Stationary RME

The typical suburban RME for members of the general population is a house-bound individual with a local garden, or a residential farmer who is largely self-sufficient. In these cases, the house and garden are assumed to be located at the contaminated site and available for unrestricted use. The subsistence family also lives where the contamination occurs if this is physically possible, but may spend more time away from the immediate residence during subsistence activities. However, a subsistence RME should not assume that exposure is diluted by spending significant amounts of time in uncontaminated areas. For large sites with variable contaminant concentrations, problems arise when trying to perform a single risk assessment to evaluate multiple hot spots (as not-to-exceed concentrations), even if the risk assessment assumes that the person moves around from hot spot to hot spot or if all subsistence activities are assumed to occur where the upper 95th concentration limit occurs. Additionally, the problem of spatially integrating widespread contamination still remains because, conceptually, 10 acres of contamination poses a greater risk than one acre with the same contaminant concentration. Temporally, persistent contaminants pose a longer risk, and therefore a greater total risk, than degradable contaminants. Unfortunately, the present regulatory framework does not use spatial or temporal risk metrics (such as risk acre-years, or dose per community gene pool across several generations) to account for this cumulative exposure over time and space and people.

5.2. Special Activities

There are special circumstances when some people may be highly exposed that have not been included in the complete scenario or the screening-level RME. For instance, some men hunt or fish for the general community, and many people provide roots and fish and game to elders in addition to their own families. Gathering of some plants (e.g., cattails, water potatoes, reeds, and rushes) is a very muddy activity and rivershore or lakeshore activities may underestimate sediment exposure (soil ingestion can be 1 gram per event[21,22,23]). Washing, peeling, weaving rushes, and other activities results in additional exposure. For example, basketmakers clean and wash their materials, incur cuts on their hands, and hold materials in their mouth. Flintknappers may receive additional exposure through obtaining and working with their materials. In addition, there are potential pathways that are not specifically identified but that might contribute additional exposure, such as contaminated firewood used for smoking food, plants used for teas, flavoring, smudging, or medicine, contact with contaminated animal parts (paints, bone ornaments, clothing), sitting on the ground for long periods of time while processing or during ceremonial activities, and so on. Even though the composite activity patterns are intended to reflect reasonable maximum exposures, there is a potential for underestimating some pathways (i.e., this is not a worst-case scenario).

5.3. Community Exposure Burdens

An entire community exposure burden estimate or population dose estimate may be needed that

includes people who do not reside in but occasionally visit the contaminated area (this includes inadvertent intruders onto the site). If a resource is contaminated, the entire community is exposed. The assumption that protecting the RME adequately protects everyone else may result in a failure to provide all the information that the tribe's governing body needs for informing its members. There may be sensitive individuals (children, elders, the sick, the occupationally exposed) who, arguably, may or may not be protected by using standard reference doses and other factors. Also, tribal leaders often make decisions at the community rather than the individual level (i.e., the survival of the individual may not be as important as the survival of the family or community, so the community is also an appropriate unit of analysis). Therefore, decisions where everyone is exposed to a low level of contamination may be different from and more stringent than decisions where a few individuals are at high risk or decisions where risks are distributed over time, space, or populations rather than localized. We believe this to be an important but understated element of real risk and risk-based decision making (not to be dismissed as perceived risk, or cultural amplification of real risk, or a risk management determination). The nature and extent of community exposure can be estimated over time and space by estimating the number of people and the number of generations that could live in each area or concentration isopleth and be exposed (a community chemical effective dose equivalent). The total number of generations and the number of people per generation need to be described in terms of the total number of people exposed, total dose for the community (or the gene pool), proportion of each generation exposed, and so on. Even more broadly, the total dose for a small community's combined gene pool or neuronal pool could be estimated. Finally, the proportion of each generation that is affected, rather than simply the number of people (in a small population), can be determined.

5.4. Background Exposure and Communitywide Exposure from Other Sources

Under the National Contingency Plan and subsequent EPA guidance, EPA is charged with evaluating incremental risk to humans caused by a release from the subject site. This means that when evaluating a Superfund site, EPA is not charged with evaluating risk associated with high concentrations of naturally occurring substances, such as arsenic, measured in background soil, water, or food, if the concentrations were not increased by on-site activity, nor risk associated with releases of contaminants from another site. When there is background contamination (however that is defined), or widespread low-level contamination, this contamination contributes to cumulative exposure to many or all people in the community. From a human health standpoint, the origin of the contaminant is irrelevant. However, from a liability-based regulatory standpoint such as CERCLA, the origin is paramount. In the case of the Spokane scenario, it is known that Columbia River fish are contaminated with PCBs and metals (there are existing fish advisories for Lake Roosevelt and for an upriver portion of the Spokane River), but cleanup at the mine site is proceeding as if this contamination is not present or that people are not exposed to it. When an entire community is exposed to nonsite contaminants, we believe that this should be included as part of the total risk burden, and that the clean-up goals for the incremental risk posed by the site itself may need to be modified (see, for instance, OSWER Environmental Justice Action Agenda, EPA 540/R-95/023, which states that "OSWER supports Agency-wide efforts to develop scientifically valid standards to measure cumulative risk."). Other EPA approaches are more cumulative in nature, such as the Guidance on Cumulative Risk Assessment (http://www.epa.gov/ORD/spc/cumrisk2.htm); Toward Integrated Environmental Decision Making (EPA-SAB-EC-00-011; http://www.epa.gov/science1/ecirp011.pdf); and various permitting programs based on total toxicant burdens in a watershed or airshed. As another example, the EPA approach to arsenic or other substances in drinking water is to require treatment to safe levels even if these are lower than natural background levels.

5.5. Individual Exposure Factors

The exposure assessment literature is lacking relevant information for subsistence activities. For instance, gardening or camping are typically used by risk assessors as an analogue for hunting and gathering activities, athletic physiological factors are used as an analogue for more vigorous outdoor activities, sports nutrition information is used in checking diet, and so on. Several pathways are simply unknown, such as the use of medicinal plants

(further, certain of these pathways need to be included in a way that does not violate confidentiality). We believe that some factors, particularly soil ingestion, are still underestimated. The amount of exposure obtained as a person consumes wild foods (often without being able to wash them first as is assumed in a typical suburban scenario) is unknown, as is the amount of soil remaining on gathered vegetation even if it is washed, because environmental samples are generally not analyzed in an as-gathered or as-consumed condition.

5.6. Ecological Food Web as an Input to Human Exposure

At present, the tribe does not know if the ecological risk assessments being prepared by EPA for the Midnite Mine will provide the appropriate information for estimating human subsistence dietary information. Existing ecological and human health risk models are generally incompatible. Ecological models typically have more species but fewer pathways, while human health models have many more pathways but generally less trophic-level capability. The lack of transfer factors (soil to plant, and dispersion through the food web) may also pose a problem. EPA is attempting to address this nationally; it is especially important to include tribal considerations during these discussions.

5.7. Seasonality and Acute Exposures

Some of the original activity patterns over the annual seasonal cycle have been modified in modern times, but the ecological cycles have not. Therefore, people must still gather plants according to when they are ripe, hunt according to game and fowl patterns, and fish when the spawning runs occur. The Spokane Tribe Cultural Resources Program confirmed that although specific activities change from one season to the next throughout the year, these activities are replaced by other activities with a similar environmental contact rate. This scenario assumes that exposure is fairly homogeneous because even in winter months materials are gathered, cleaned, and used, and native foods are eaten (i.e., all factors are applied 365 days per year). However, it is possible that excessive acute exposures occur, over and above the annually averaged exposure rates included in this scenario.

5.8. Co-Risk Factors

Many co-risk factors cluster in tribal communities, including poverty, higher rates of existing health conditions (such as diabetes), poorer access to health care, inadequate infrastructure, 500 years of cumulative psychological stress, employment in occupations with more chemical exposures, and so on. Data on other factors such as enzyme polymorphisms related to detoxification or disease susceptibility are simply absent. Each of these factors is known to influence the health response to chemicals, although data are lacking about their combined effect as well as their prevalence in any particular tribal community.

6. CONCLUSION

Although the scenario discussed in this article greatly improves the accuracy of risk-based decision making in Indian Country, much still remains to be done in order for tribes to achieve the same proportional degree of risk reduction that suburban communities have enjoyed for many decades. Existing human-health-based regulatory standards were not developed with subsistence in mind, so tribes are always less protected because they are always more exposed. This is not meant to indict standards as intentionally ignoring certain populations, simply that there are situations and populations that did not receive attention when the regulations were written many years ago. The inequity of this situation has not been fully explored, but is the topic of current research. Additionally, this scenario is not generalizable to other tribes, particularly the diet section, although the soil and drinking water exposure factors may prove to be fairly similar for many tribal settings.

The true worth of any risk assessment is measured by whether its results are used, even if the ultimate decision is based more on other factors such as economics, technical feasibility, or precaution. One of the goals of a project manager is to achieve a stable decision, or one that is durable over time, even if this is not explicitly stated. Decision stability is not merely due to compromise or consensus, but also to whether a community's expectations are met regarding the specific metrics and impacts to be assessed. Decisionmakers or community leaders have certain information needs that can help design a truly useful risk assessment, even if the assessment takes form somewhat differ-

ently from the norm. We believe that deliberately incorporating community concerns into both the risk assessment and the risk management decision makes decisions more stable and robust, not less scientific. It is a matter of opinion whether responding to community issues within the risk assessment itself, rather than deferring these items until a later risk management phase, improves the assessment and makes it more useful by tailoring it to the specific situation, or merely results in inconsistency by making results less useful for comparing risks between sites.

We would also like to raise the bar for risk ethics. The traumatic history of federal actions against tribes is still recent history for many tribal nations and tribal members experience remnants of federal extermination and assimilation policies literally every day. This is a strong and discomforting statement, but it is a reality risk assessors and project managers must recognize if they work on tribal risk issues. It might even be said that tribes are still at war, a war that is being fought in the courts on a daily basis to preserve their rights, jurisdiction, resources, religion, homeland, and way of life. We do not want risk assessors to underestimate how serious this is to tribal members and tribal staff. Many or most tribal members can name ancestors who died defending their rights and homelands, and the current generation of tribal scientists honors this by vigilantly protecting the rights and resources on which their culture and identity and existence depend. Mistrust of the federal government and its risk assessment tools can be extremely high and pervasive. Particularly in tribal communities, risk assessors or public health assessors typically run afoul of tribal perspectives because they do not understand the community and its history. There is a tendency to want to get the details right first, then step back and look at the implementation or consequences (i.e., to keep risk assessment separate from risk management). We do not intend to introduce bias into the risk assessment that might come from knowing so much about the community that unconscious judgments are made about how to tailor the assessment (for instance, making a subconscious determination that remediation might take dollars away from other visibly urgent needs). We simply want the assessor to be more aware of the subjects of his or her assessment from the start so as to avoid pitfalls, missteps, and negative community reactions. Currently, tribes and regulators still operate from two different decision paradigms. We wish to recognize the tremendous progress made in recent years by various federal agencies in increasing the attention paid to these issues, but we recognize how much remains to be done.

DISCLAIMER

This exposure scenario has been approved for publication by the Spokane Tribal Council and for use in the Midnite Mine risk assessments. It should not be viewed as a release or waiver of any claims or rights concerning the protection of human health and the environment, the injury of natural resources, or any other claim or right.

REFERENCES

1. Wynecoop, D. C. 1969. *Children of the Sun—A History of the Spokane Indians*. Spokane, WA: Comet and Cole.
2. Ray, V. 1977. Ethnic Impact of the Events Incident to Federal Power Development on the Colville and Spokane Indian Reservation[s], cited in *Confederated Tribes of the Colville Reservation v. United States*, 43 Ind. Cl. Comm. *505*: 592–605 (1978).
3. Scholz, A., O'Laughlin, K., Geist, D., Peone, D., Uehara, J., Fields, L., Kleist, T., Zozaya, I., Peone, T., and Teesatuskie, K. 1985. *Compilation of Information on Salmon and Steelhead Total Run Size, Catch, and Hydropower Related Losses in the Upper Columbia River Basin, Above Grand Coulee Dam. Fisheries Technical Report No. 2., Upper Columbia United Tribes Fisheries Center*. Cheney, WA: Eastern Washington University Department of Biology.
4. AESE, Inc. 2001. *Spokane Tribe Subsistence Exposure Scenario. Prepared for the Spokane Tribe of Indians for use by EPA in the Midnite Mine RI/FS*. (Contact: F. Kirschner; www.aeseinc.com; (509) 924-0184.)
5. Harris, S. G. and Harper, B. L. 1997. A Native American Exposure Scenario. *Risk Analysis*, *17*: 789–795.
6. Harris, S. G. and Harper, B. L. 2000. Using Eco-Cultural Dependency Webs in Risk Assessment and Characterization. *Environmental Science & Pollution Research 7* (Special Issue 2):91–100.
7. Yocum, C. and Brown, V. 1971. *Wildlife and Plants of the Cascades*. Healdsburg, CA: Naturgraph Publishers.
8. Taylor, R. J. and Douglas, G. W. 1995. *Mountain Plants of the Pacific Northwest*. Missoula, MT: Mountain Press Publishing.
9. Little Spokane Watershed Council. 1996. *Critters of the Little Spokane Watershed*. Spokane, WA: Adventure Trail.
10. U.S. Environmental Protection Agency. 1998. *Midnite Mine. Expanded Site Inspection Report. Region 10 START (Superfund Technical Assessment and Response Team)*. Seattle, WA: U.S. EPA Region 10.
11. Nugent, D. 1997. *Research Notes: Traditional Coeur d'Alene Subsistence*. Waterville, ME: Department of Anthropology, Colby College.
12. Turner, N. J. 1997. *Food Plants of Interior First Peoples*. Vancouver, BC: University of British Columbia Press.
13. Turner, N. J. 1998. *Plant Technology of First Peoples in British Columbia*. Vancouver, BC: University of British Columbia Press.
14. Bruhac, J. 1997. *The Native American Sweat Lodge: History and Legends*. Freedom, CA: Crossing Press.

15. Bucko, R. A. 1998. *The Lakota Ritual of the Sweat Lodge: History and Contemporary Practice*. Lincoln, NE: University of Nebraska Press.
16. Hunn, E. S. 1990. *Nch'i-Wana, The Big River: Mid-Columbia Indians and Their Land*. Seattle, WA: University of Washington Press.
17. Cordain, L., Miller, J. B., Eaton, S. B., Mann, N., Hold, S. H. A., and Speth, J. D. 2000. Plant-Animal Subsistence Ratios and Macronutrient Energy Estimations in Worldwide Hunter-Gatherer Diets. *American Journal of Clinical Nutrition 71*: 682–692.
18. Whitney, E. N. and Rolfes, S. R. 1999. *Understanding Nutrition* (8th ed.). Belmont, CA: Wadsworth Publishing Co.
19. U.S. Environmental Protection Agency. 1989. *Exposure Factors Handbook*. Washington, DC: Office of Research and Development.
20. van Wijnen, J. H., Clausing, P., and Brunekreef, B. 1990. Estimated Soil Ingestion by Children. *Environmental Research 51* (2): 147–162.
21. U.S. Environmental Protection Agency. 1997. *Exposure Factors Handbook*. Washington, DC: Office of Research and Development.
22. Boyd, H. B., Pedersen, F., Cohr, K.-H., Damborg, A., Jakobsen, B. M., Kristensen, P., and Samsoe-Petersen, L. 1999. Exposure Scenarios and Guidance Values for Urban Soil Pollutants. *Reg. Toxicol. Phar. 30*:197–208.
23. Simon, S. L. 1997. Soil Ingestion by Human: A Review of History, Data, and Etiology with Application to Risk Assessment of Radioactive Contaminated Soil. *Health Physics 74*: 647–672.
24. Gereda, J. E., Leung, D. Y., Thatayatikom, A., Streib, J. E., Price, M. R., Klinnert, M. D., and Liu, A. H. 2000. Relation Between House-Dust Endotoxin Exposure, Type 1 T-Cell Development and Allergen Sensitisation in Infants at High Risk of Asthma. *Lancet 355*: 1680–1683.
25. California Air Resources Board 2000. Technical Support Document for Exposure Assessment and Stochastic Analysis. http://www.oehha.ca.gov/air/hot_spots/pdf/contents.pdf.

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Regarding: Daily Inhalation Rate of 30 m^3/day in: Risk Analysis, Vol. 22, No. 3, pp. 513-26 (2002).

Harper et al. specify a lifetime daily inhalation rate of 30 m^3/day in *The Spokane Tribe's Multipathway Subsistence Exposure Scenario and Screening Level RME*. At first glance, it seems reasonable that a higher inhalation rate would be appropriate for a tribal subsistence exposure scenario compared with rates applied to risk assessments prepared by EPA under CERCLA for non-subsistence exposure scenarios. However, upon closer examination, 30 m^3/day appears biologically implausible based on daily caloric requirements, which are a better measure of long-term breathing rates (Layton, 1993).

The EPA Exposure Factors Handbook (Handbook) (U.S. Environmental Protection Agency, 1997) recommendations described by (Harper et al., 2002) were taken out of context. The Handbook recommendations specifically apply to short-term exposures (i.e. data derived from short-term inhalation studies apply to exposures of similar duration) (U.S. Environmental Protection Agency, 1997). These studies measured inhalation rates within a time scale of hours. For lifetime exposures, the EPA Handbook (U.S. Environmental Protection Agency, 1997) recommends inhalation rates of 11.3 and 15.2 m^3/day for female and male adults, respectively based on (Layton, 1993).

With the exception of (Layton, 1993), most inhalation studies estimated inhalation rates by determining the relationship between inhalation rate and heart rate using short-duration, controlled activities over a range of exertion levels for each subject. Inhalation rates of individuals conducting daily activities were then derived by measuring heart rates and converting the heart rate to inhalation rate using the individual's heart/inhalation rate relationship. These studies reported hourly inhalation rates, appropriate for estimating short-term exposures. An alternative approach to measuring short-term inhalation rates associated with various activities is to calculate inhalation rates using caloric energy consumption to balance inhalation with metabolic respiration (Layton, 1993). This approach was the basis for the average lifetime inhalation rates recommend by the Handbook and has been expanded by others to develop metabolically consistent estimates of multi-route exposures (Layton, 1993; McCurdy, 2000). The metabolic approach is appealing because it relates caloric requirements to respiration to reduce the uncertainties associated with using hourly inhalation rates to estimate lifetime exposures. There is less uncertainty associated with daily energy consumption rates than with using short-term

inhalation rates to estimate average lifetime daily inhalation rates because it is easier to measure food intake than air intake. Dietary and activity patterns were based upon the probabilistic National Health and Nutrition Examination Survey and the Nationwide Food Consumption Survey (cited by Layton). Survey results were adjusted upwards to account for under reporting of foods consumed. The most recent survey reported daily intakes of approximately 2,000 kilocalories (U.S. Department of Agriculture Beltsville Human Nutrition Research Center, 1998).

Using equations developed by (Layton, 1993), and the caloric requirements of 2,500-3,000 kilocalories specified by (Harper et al., 2002) yields inhalation rates of 14.3-17.1 m^3/day, respectively, which contradict the 30 m^3/day rate. A lifetime inhalation rate 30 m^3/day is not supported by any of the studies evaluated by the Handbook (U.S. Environmental Protection Agency, 1997) or by more recent studies (Marty et al., 2002). Furthermore, 30 m^3/day equates to 5,250 kilocalories/day, an implausibly high value for a lifetime and approximately double the energy requirements specified by (Harper et al., 2002).

Using the equations from (Layton, 1993), yields the following results:

$V_E = E \times H \times VQ$

V_E = minute ventilation volume liters per minute (1 L/min = 1.44 m^3/day)
H = volume of O_2 in liters consumed per kJ expended .05 L O_2 /kJ
E = energy expenditure kJ per day (1 kJ = .239 kcal)
VQ = ventilatory equivalent ratio of V_E to V_{O2} unitless (both quantities are liters per minute)
VQ = 27

Daily Kilocalories Consumed	Estimated Daily Inhalation Rate
2,000	11.4 m^3/day
2,500	14.3 m^3/day
3,000	17.1 m^3/day
3,500	20 m^3/day
5,250	30 m^3/day

References

Harper, B.L., Flett, B., Harris, S., Abeyta, C. & Kirschner, F. (2002). The Spokane Tribe's multipathway subsistence exposure scenario and screening level RME. *Risk Anal*, **22,** 513-26.

Layton, D.W. (1993). Metabolically consistent breathing rates for use in dose assessments. *Health Phys*, **64,** 23-36.

Marty, M.A., Blaisdell, R.J., Broadwin, R., Hill, M., Shimer, D. & Jenkins, M. (2002). Distribution of Daily Breathing Rates For Use in California's Air Toxics Hot Spots Program Risk Assessments. *Human and Ecological Risk Assessment*, **8,** 1723-1737.

McCurdy, T. (2000). Conceptual basis for multi-route intake dose modeling using an energy expenditure approach. *J Expo Anal Environ Epidemiol*, **10,** 86-97.

U.S. Department of Agriculture Beltsville Human Nutrition Research Center. (1998). Continuing Survey of Food Intakes by Individuals (CSFII) 1994-96, 1998 pp. Table 1. Beltsville Human Nutrition Research Center: Beltsville, MD. PB98-500457INC

U.S. Environmental Protection Agency. (1997). Exposure Factors Handbook. U.S. Environmental Protection Agency, Office of Research and Development: Washington D.C. EPA/600/P-95/002Fc

Response to Stifelman

Harper et al.

We would like to address several points raised in Stifelman's letter. He says that the Layton metabolic approximation, developed via studies performed by others on the general population, indicates that a long-term inhalation rate of 30 m^3/d is biologically implausible relative to the Spokane Tribe's diet and traditional lifeways. Stifelman would apply national (urban and suburban) averages for respiratory and metabolic parameters, average suburban activity levels, and average suburban dietary values to people who maintain an active outdoor lifestyle throughout their entire adult lives (through age 70) and eat a native diet. However, we documented both the diet and its caloric content as well as the activity levels in the traditional lifestyle. In other words, instead of estimating inhalation rates based solely on caloric intakes (Layton's approach), we documented caloric intake rates *and* estimated inhalation rates from activity tables. This approach is preferred when activity data are available; otherwise, spirometry would no longer be necessary--one would only need caloric intake to calculate inhalation rates. Stifelman merely confirms that the parameters Layton used for the general population do not apply to traditional tribal members and their active, outdoor lifestyle and native diet.

1. What are traditional lifeways?

The exposure factors in the Spokane Tribe's scenario are based on the lifestyles of traditional tribal members, including youth who are learning traditional subsistence skills, adult outdoor workers who also hunt, gather, and fish, and elders who gather plants and medicines, and prepare and use them (e.g., making medicines or baskets, etc.) and who teach a variety of indoor and outdoor traditional activities. This may be hard for modern office workers to conceptualize, but traditional tribal communities have no sedentary members except the frail elderly, whereas one-quarter of modern American adults of all ages report no leisure time physical activity at all.[1] We provided EPA with a description of typical "days in the life of" and "years in the life of" each age group, including seasonal variations, for use in the Midnite Uranium Mine Baseline Human Health Risk Assessment. We further documented this lifestyle and diet with published anthropological studies specific to the Spokane Indians, and ethnographic literature on foraging theory, hunting-gathering lifestyles, and tribal recommendations on diabetes prevention.

2. Use of the Layton metabolic equation to calculate inhalation rate from dietary calories, rather than direct observation of activity levels and breathing rates.

EPA (1997) thoroughly reviewed the Layton method in the Exposure Factor Handbook. It is an alternative method, not necessarily a better method, and as noted by EPA "the lower [inhalation rate] level obtained with the metabolic approach (25%) compared to the activity pattern approach is not well supported by the data…" (Exposure Factors Handbook, page 5-16). The equation employed by Layton assumes such a tight link between ventilation rate and caloric intake, that caloric intake can be used to estimate ventilation rate and vice versa, by using national averages for the equation's simplifying factors. Stifelman asserts that this relationship can be extended to traditional tribal members and their unique genetics and lifestyle. We disagree. Any of a dozen variables for respiratory physiology, oxygen transport and oxidative processes in muscle cells may be different for people practicing active traditional lifeways, and some of these are known to be different in certain indigenous populations (e.g., Andes Quechan and Tibetan peoples and their genetically-based altitude adaptations for oxygen utilization). Another set of variables for metabolism and native diets need to be considered as well. All of these

[1] (http://www.cdc.gov/brfss/pdf/ 2001prvrpt.pdf and http://www.cdc.gov/brfss/pubrfdat.htm).

variables are well known, but it is not known how these variables cluster in various ethnic populations. We believe it is improper to assume all ranges of ages, genders, ethnicities, fitness levels, and pulmonary conditions are captured in single national averages. Tribal populations are not represented by a "high end tail" of a national melting pot of ethnicities, but discrete lifestyles protected by Treaties and/or federal Trusteeship obligations.

Perhaps the most relevant factors associated with ethnic-specificity are the thrifty genotype(s), insulin use, and oxidation and adiposity patterns (Goran, 2000; Fox et al., 1998; Muzzin et al., 1999; Rush et al., 1997; Saad et al., 1991; Kue Young et al., 2002), as well as ethnic differences in spirometry (Crapo et al., 1988; Lanese et al., 1978; Mapel et al., 1997; Aidaraliyev et al., 1993; Berman et al., 1994). Research on the thrifty genotype suggests that there may be several stress response genes that enable indigenous populations to respond to environmental stresses and to the rapid transition between extremes, including feast and famine, heat and cold, disruption in circadian rhythms, dehydration, seasonality, and explosive energy output or rapid transitions between minimum and maximum exercise and $VO2_{max}$ (Kimm et al., 2002; Snitker et al., 1998). These genes "uncouple" several energy expenditure parameters (Kimm et al., 2002) embedded in Layton's equation, further indicating that ethnic-specific data should be developed if Layton's equation is used.

Similarly, the national average diet cited by Stifelman is not relevant to populations who eat traditional diets. Most tribes are recommending a return to native diets wherever possible for people who are not already eating traditionally. We agree with Stifelman's implication that our caloric intake (we used 2500 kcal/day) might be somewhat underestimated (see, for instance, Steegman et al., 2002). However, we believe that the thrifty genotype, with its more efficient energy utilization, alters the ratios of ventilation rate, calorie needs, and activity levels so that the documented Spokane diet (2500 Kcal/d or a little more) and observed activity levels are compatible with an inhalation rate of 30 m^3/d.

3. Short-term versus long-term inhalation rates.

Most federal and state agencies use either the EPA default value of 20m^3/d or use activity levels to estimate long-term inhalation rates. We found no examples of federal or states agencies that rely on a metabolic equation to derive inhalation rates. When we developed the Spokane exposure scenario, we evaluated activity levels through anthropological data and confirmatory interviews, and used the CHAD-based EPA recommendations for ventilation rate for the different activity levels. Several examples of similar approaches are:

- EPA's National Air Toxics Assessment (homepage: http://www.epa.gov/ttn/atw/nata/natsa3.html) uses the CHAD database in its HAPEM4 model to estimate national average air toxics exposures even though "the lack of activity pattern data that extend over longer periods of times presents a challenge for HAPEM4 to predict the long-term (yearly) activity patterns that are required to determine chronic exposures." Therefore, "an approach of selection of a series of single day's patterns (from CHAD) to represent an individual's activity pattern for a year was developed."
- The California Air Resources Board (CARB, 2000) reviewed daily breathing rates based on activity levels and measured ventilation rates for many activities in the CHAD database. The average hourly rate for sleeping was 0.5 m^3/hr, light activities at 0.55 m^3/hr, moderate activities at 1.4 m^3/hr, and heavy rates of activity levels at 3.4 m^3/hr. The CARB concluded that 20 m^3/d represents an 85th percentile of typical adult sedentary/light activity lifestyles. This is based on 8 hours sleeping and 16 hours of light activity with no moderate or heavy activity, or 1 hour day of moderate and heavy activity each.

- In their technical guidance document, "Long-term Chemical Exposure Guidelines for Deployed Military Personnel," the US Army Center for Health Promotion and Preventive Medicine (USACHPPM) recommended an inhalation rate of 29.2 m^3/d for US service members. Deployed personnel were assumed to spend 6 hours sleeping at an inhalation rate of 0.4 m^3/hr, 4 hours in sedentary activities (at 0.5 m^3/hr), 6 hours in light duties (at 1.2 m^3/hr), and 8 hours in moderate duties (at 2.2 m^3/hr).[2]
- EPA used 30 m^3/day for a year-long exposure estimate for the general public at Hanford, based on a person doing 4 hours of heavy work, 8 hours of light activity, and 12 hours resting.[3]
- The DOE's Lawrence Berkeley Laboratory also used 30 m^3/d: "the working breathing rate is for 8 hours of work and, when combined with 8 hours of breathing at the active rate and 8 hours at the resting rate, gives a daily equivalent intake of 30 m^3 for an adult."[4]
- For radionuclide exposures, EPA recommends using a lifetime average value of 19.2 m^3/day for men and 16.5 m^3/day for women, based on the Third NHANES (EPA, 1999). They also reviewed the Layton paper and pointed out that the single VQ number proposed for all ages and activity levels and both genders poses great uncertainty, and stated that because "reliable age- and gender-specific central values for VQ have not been established, the ICRP's recommended age- and gender-specific inhalation rates, rather than rates derived from Layton's method, are applied in [this FGR 13 document]" (EPA, 1999, page 139).

4. The use of population-specific information rather than national averages.

EPA instructs risk assessors to identify the receptor population and their activities or land use.[5] "Assessors are encouraged to use values which most accurately reflect the exposed population."[6] The OSWER Land Use Directive[7] requires the identification of land uses for the baseline risk assessment; when the affected resources are on reservations or areas where tribes retain usory rights, a subsistence/residential land use must be assumed if the Tribe so indicates. Executive Order 12898[8] requires the identification of subsistence consumption of natural resources, and for Indian Tribes this includes the activities required to obtain those resources.

EPA recognizes that inhalation rates may be higher in certain populations, such as athletes or outdoor workers, because levels of activity outdoors may be higher over long time periods. "If site-specific data are available to show that subsistence farmers and fishers have higher respiration rates due to rigorous physical activities than other receptors, that data may be appropriate."[9] Such subpopulation groups are

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[2] http://www.gulflink.osd.mil/particulate_final/ particulate_final_s06.htm and http://www.gulflink.osd.mil/pm/pm_en.htm.

[3] (http://yosemite.epa.gov/r10/AIRPAGE.NSF/ 1887fc8b0c8f2aee8825648f00528583/f8e713058497152888256930007 2cd00?OpenDocument).

[4] (www.lbl.gov/ehs/epg/tritium/TritAppB.html)

[5] http://www.epa.gov/superfund/programs/risk/ragsd/table4instructions.pdf.

[6] Exposure Factor Handbook, Volume 1, page 5-23

[7] OSWER Directive 9355.7-04, "Land Use in the CERCLA Remedy Selection Process" (May 25, 1995)

[8] White House, 1994. Federal Actions To Address Environmental Justice In Minority Populations And Lowincome Populations: Feb. 11, 1994; 59 FR 7629, Feb. 16, 1994.

[9] EPA (OSWER) "Human Health Risk Assessment Protocol for Hazardous Waste Combustion Facilities, Support Materials Volume 1: Human Health Risk Assessment Protocol for Hazardous Waste

considered 'high risk' subgroups.[10] EPA (1997) recommends calculating their inhalation rates using the following median hourly intakes for various activity levels (in m^3/hr): resting = 0.4, sedentary = 0.5, light activity = 1, moderate activity = 1.6, heavy activity = 3.2. EPA's median rate for outdoor workers is 1.3 m^3/hr, with an upper percentile of 3.3 m^3/hr, depending on the ratio of light, moderate and heavy activities during the observation time. Other EPA risk assessments typically use 4.8 m^3/hr for construction workers, 2.5 m^3/hr for groundskeepers, and similar values applied to an 8 hour work day and extended for an entire worklife.

Since we have population-specific data, we believe that EPA is required to use it in order to meet its statutory mandate to protect human health – and particularly if members of an explicit population are identifiably discrete. Using EPA guidance on hourly inhalation rates for different activity levels, a reasonable inhalation rate for an average tribal member's active lifestyle is a median rate of 26.2 m^3/d, based on 8 hours sleeping at 0.4 m^3/hr, 2 hours sedentary at 0.5 m^3/hr, 6 hours light activity at 1 m^3/hr, 6 hours moderate activity at 1.6 m^3/hr, and 2 hours heavy activity at 3.2 m^3/hr.

5. Conclusion

Unlike other exposure factors, which are upper bounds, the inhalation rate is a median rate.

EPA says "an upper percentile is not recommended"[11] with no reason given. This is inconsistent with the usual RME approach used in Superfund risk assessments, and could result in under-protection of children, the elderly, athletes, asthmatics, and the half of the population with above-average inhalation rates. Due to a tribal desire to protect more than just the average traditional person, we have chosen to round up the value of 26.2 m^3/d to 30 m^3/day. We are continuing to collect data on tribal activities analogous to CHAD categories, and will continue to follow EPA's general HAPEM4 approach. We should note that we are not focusing on a cross-section of tribal members, some of whom have westernized lifestyles, but specifically on traditional lifeways, subsistence activities, and native diets which were reserved between the United States and the tribal governments and which continue to be protected by federal law.

We believe the real motivation for challenging the tribes' inhalation rate is EPA's concern for setting precedent for other applications, such as air emissions from the Umatilla Army Chemical Munitions Incinerator (and other point sources affecting tribal lands) and the national tribal air quality rule. EPA's Tribal Consultation Policy[12] requires genuine consultation before changing exposure factors developed by tribal scientists and promulgated through tribal law.

REFERENCES

Aidaraliyev, A.A., Maximov, A.L., & Mala, T. (1993). Physiologic adaptation changes of the "Bering Bridge" expedition participants. *Arctic Med. Res.* 52(2):55-62.

Combustion Facilities" page 6-4, at (http://www.epa.gov/earth1r6/6pd/rcra_c/protocol/volume_1/chpt6-hh.pdf)

[10] Exposure Factors Handbook, 1997, Volume 1. page 5-24

[11] Exposure Factors Handbook, Volume 1, page 5-23.

[12] EPA 2000. Guide on Consultation and Collaboration with Indian Tribal Governments, EPA/300-R-00-009.

Berman, S.M., Arnall, D.A., & Cornwall, M.W. (1994). Pulmonary function test outcomes in healthy Navajo Native American adolescents. *Am. J. Respir. Crit. Care Med*. 150(4):1150-3

CARB, 2000. *Technical Support Document for Exposure Assessment and Stochastic Analysis.* California Air Resources Board, September 2000. http://www.oehha.ca.gov/air/hot_spots/pdf/contents.pdf (see chapter 3 for daily breathing rates).

Crapo, R.O., Lockey, J., Aldrich, V., Jensen, R.L., & Elliott, C.G. (1998). Normal spirometric values in healthy American Indians. *J. Occup. Med.* 30(7) :556-60

EPA (1997). *Exposure Factors Handbook*, EPA/600/P-95/002Fa, http://www.epa.gov/ncea/pdfs/efh/sect5.pdf

EPA (1999). *Cancer Risk Coefficients for Environmental Exposure to Radionuclides,* Federal Guidance Report No. 13 (EPA/402-R-99-001).

EPA (2000) CHAD User's Guide. EPA National Exposure Research Laboratory, and associated web pages, factsheets, and summaries. Homepage: http://www.epa.gov/chadnet1/

Fox, C.S., Esparza, J., Nicolson, M., Bennett, P.H., Schulz, L.O., Valencia, M.E., & Ravussin, E. (1998). Is a low leptin concentration, a low resting metabolic rate, or both the expression of the "thrifty genotype"? Results from Mexican Pima Indians. *Am. J. Clin. Nutr.* 68(5):1053-7

Funk, L.M., Sedman, R., Beals, J.A., & Fountain, R. (1998). Quantifying the distribution of inhalation exposure in human populations: 2. Distributions of time spent by adults, adolescents, and children at home, at work, and at school. *Risk Anal.* 18(1):47-56

Goran, M.I. (2000). Energy metabolism and obesity. Med Clin North Am;84(2):347-62
Hartmann HM. 2002 Evaluation of risk assessment guideline levels for the chemical warfare agents mustard, GB, and VX. *Regul. Toxicol. Pharmacol*. 35(3):347-56

Kimm, S.Y., Glynn, N.W., Aston, C.E., Damcott, C.M., Poehlman, E.T., Daniels, S.R., & Ferrell, R.E. (2002). Racial differences in the relation between uncoupling protein genes and resting energy expenditure. *Am. J. Clin. Nutr*. 75(4):714-9

Kue Young, T., Chateau, D., & Zhang, M. (2002). Factor analysis of ethnic variation in the multiple metabolic (insulin resistance) syndrome in three Canadian populations. *Am. J. Human Biol.* 14(5):649-58

Lanese, R.R., Keller, M.D., Foley, M.F., & Underwood, E.H. (1978). Differences in pulmonary function tests among whites, blacks, and American Indians in a textile company. *J. Occup. Med.* 20(1):39-44

Mapel, D.W., Coultas, D.B., James, D.S., Hunt, W.C., Stidley, C.A., & Gilliland, F.D.(1997). Ethnic differences in the prevalence of nonmalignant respiratory disease among uranium miners. *Am. J. Public* Health 87(5):833-8.

Muzzin, P., Boss, O., & Giacobino, J.P. (1999). Uncoupling protein 3: its possible biological role and mode of regulation in rodents and humans. *J. Bioenerg. Biomembr*. 31(5):467-73

Rush, E.C., Plank, L.D., & Robinson, S.M. (1997). Resting metabolic rate in young Polynesian and Caucasian women. *Int. J. Obes. Relat. Metab. Disord*. 21(11):1071-5

Saad, M.F., Alger, S.A., Zurlo, F., Young, J.B., Bogardus, C., & Ravussin, E. (1991). Ethnic differences in sympathetic nervous system-mediated energy expenditure. Am. J. Physiol. 261(6 Pt 1):E789-94

Snitker, S., Tataranni, P.A., & Ravussin, E. (1998) Respiratory quotient is inversely associated with muscle sympathetic nerve activity. *J. Clin. Endocrinol. Metab*. 83(11):3977-9

Steegmann, A.T., Jr, Cerny, F.J., & Holliday, T.W. (2002). Neandertal cold adaptation: physiological and energetic factors. *Am. J. Human Biol*. 14(5):566-83.

Appendix C

Ecological Risk Assessment

Appendix C
Ecological Risk Assessment

Contents

Appendix C-1 Lists of Common Vascular Plants, Mammals, Common Birds, Amphibians and Reptiles, Plant Species of Concern, and Wildlife Species of Concern C1-i

Appendix C-2 Soil-to-Plant Transfer Factors, Terrestrial Bioaccumulation Factors, and Aquatic Bioaccumulation Factors for Ecological Chemicals of Potential Concern and Radionuclides of Potential Concern C2-i

Appendix C-3 Toxicity Reference Values for Plants, Terrestrial Invertebrates, Mammals, Birds, Surface Water Organisms and Sediment-Dwelling Biota C3-i

Appendix C-1

Lists of Common Vascular Plants, Mammals, Common Birds, Amphibians and Reptiles, Plant Species of Concern, and Wildlife Species of Concern

Appendix C-1
Lists of Common Vascular Plants, Mammals, Common Birds, Amphibians and Reptiles, Plant Species of Concern, and Wildlife Species of Concern

Contents

References for Appendix C-1 ..... **C1-iii**
- **Project Documents** **C1-iii**
- **Codes and Standards** **C1-iii**
- **Other Documents** **C1-iii**

Tables

Table C1-1 **Common Vascular Plants Found on the Hanford Site** **C1-1**
Table C1-2 **List of Mammals Occurring on the Hanford Site** **C1-4**
Table C1-3 **Common Birds Occurring on the Hanford Site** **C1-6**
Table C1-4 **Amphibians and Reptiles Occurring on the Hanford Site** **C1-8**
Table C1-5 **Plant Species of Concern on the Hanford Site** **C1-9**
Table C1-6 **Wildlife Species of Concern on the Hanford Site** **C1-11**

References for Appendix C-1

Project Documents

None

Codes and Standards

None

Other Documents

Cushing CE, ed. 1992. *Hanford Site National Environmental Policy Act (NEPA) Characterization*, PNL-6415, Rev 5, December 1992. Pacific Northwest Laboratory, Richland, Washington, USA.

Downs JL, Rickard WH, Brandt CA, Cadwell LL, Cushing CE, and others. 1993. *Habitat Types on the Hanford Site: Wildlife and Plant Species of Concern*, PNL-8942, December 1993. Pacific Northwest Laboratory, Richland, Washington, USA.

Landeen DS, Johnson AR, and Mitchell RM. 1992. *Status of Birds at the Hanford Site in Southeastern Washington*, WHC-EP-0402, June 1992. Westinghouse Hanford Company, Richland, Washington, USA.

Sackschewsky MR, Landeen DS, Downs JL, Rickard WH, and Baird GI. 1992. *Vascular Plants of the Hanford Site*, WHC-EP-0554, Rev 1, July 1992. Westinghouse Hanford Company, Richland, Washington, USA.

Stegen JA. 1993. *Vegetation Communities Associated with the 100-Area and 200-Area Facilities on the Hanford Site*, WHC-SD-EN-TI-216, Rev 0, January 1993. Westinghouse Hanford Company, Richland, Washington, USA.

Table C1-1 Common Vascular Plants Found on the Hanford Site

Scientific Name	Common Name
Shrub-Steppe Species Shrubs	
Artemisia tridentata	big sagebrush
Chrysothamnus nauseous	grey rabbitbrush
Chrysothamnus viscidiflorus	green rabbitbrush
Eriogonum niveum	snowy buckwheat
Grayia (*Atriplex*) *spinosa*	spiny hopsage
Purshia tridentata	bitterbrush
Perennial Grasses	
Agropyron dasystachyum	thick-spike wheatgrass
Agropyron desertorum (*cristatum*)	crested wheatgrass
Agropyron sibericum	Siberian-wheatgrass
Agropyron spicatum	bluebunch wheatgrass
Oryzopsis hymenoides	Indian-ricegrass
Poa sandbergii (*secunda*)	Sandbergs bluegrass
Sitanion hystrix	bottlebrush squirreltail
Sporobolus cryptandrus	sand dropseed
Stipa comata	needle-and-thread grass
Perennial Forbs	
Achillea millefolium	yarrow
Arenaria franklinii	sandwort
Astragalus caricinus	buckwheat milkvetch
Astragalus sclerocarpus	stalked-pod milkvetch
Balsamorhiza careyana	balsamroot
Brodiaea douglasii	cluster lily
Comandra umbellata	comandra
Cymopterus terebinthinus	turpentine cymopterus
Erigeron filifolius	threadleaf milkbane
Frittillaria pudica	yellow bell
Helianthus cusickii	Cusick’s sandflower
Lomatium grayi	Gray’s desert-parsley
Machaeranthera canescens	hoary aster
Oenothera pallida	pale evening primrose

Table C1-1 Common Vascular Plants Found on the Hanford Site

Scientific Name	Common Name
Penstemon acuminatus	Beard tongue
Phlox longifolia	long-leaved phlox
Psoralea lanceolata	scurf pea
Rumex venosus	sand dock
Sphaeralcea munroana	desert mallow
Thelypodium lanciniatum	thelypody
Annual Forbs	
Ambrosia acanthicarpa	ragweed
Amsinckia lycopsoides	fiddleneck tarweed
Chaenactis douglasii	false yarrow
Chorispora tenella	purple mustard
Crepis atrabarba	hawk beard
Cryptantha circumscissa	matted cryptantha
Cryptantha pterocarya	cryptantha
Descurainia pinnata	tansy mustard
Draba verna	spring draba
Epilobium paniculatum	willow-herb
Erodium cicutarium	filaree (cranes bill)
Erysimum asperum	western wall flower
Holosteum umbellatum	jagged chickweed
Lastuca serriola	prickly lettuce
Lepidium perfoliatum	pepperweed
Annual Grasses	
Bromus tectorum	cheatgrass
Festuca microstachys	small fescue
Festuca octoflora	six-weeks fescue
Riparian Plants Trees and Shrubs	
Apocynum cannabinum	dogbane
Morus alba	white mulberry
Populus trichocarpa	black cottonwood
Prunus spp.	peach, apricot, cherry
Robinia pseudo-acacia	black locust

Table C1-1 Common Vascular Plants Found on the Hanford Site

Scientific Name	Common Name
Salix amygdaloides	peachleaf willow
Salix exigua	sandbar willow
Salix spp.	willow
Perennial Grasses and Forbs	
Allium spp.	wild onion
Artemisia campestris	Pacific sage
Artemisia ludoviciana	prairie sage
Carex spp.	sedge
Centurea repens	Russian-knapweed
Coreopsis atkinsonia	tickseed
Eleocharis spp.	wiregrass
Equisetum spp.	horsetail
Gaillardia aristata	gaillardia
Grindelia columbiana	gumweed
Heterotheca villosa	golden aster
Juncus spp.	rushes
Lupinus spp.	lupine
Phalaris arundinacea	reed canary grass
Polygonum persicaria	smartweed
Scirpus spp.	bulrushes
Solidago occidentalis	goldenrod
Typha latifolia	cattail
Veronica anagallis-aquatica	speedwell
Aquatic Vascular	
Elodea canadensis	waterweed
Lemna minor	duckweed
Myriophyllum spicatum	water milfoil
Potamogeton spp.	pondweed
Rorippa nasturtium-aquaticum	watercress
Rorippa columbiae	Columbia yellow cress

Source: Cushing 1992 in Hanford Environmental Impact Statement.

Table C1-2 List of Mammals Occurring on the Hanford Site

Scientific Name	Common Name
Antrozous pallidus	pallid bat
Brachylagus idahoensis	pygmy rabbit
Canis latrans	coyote
Castor canadensis	beaver
Cervus elaphus	elk
Erethizon dorsatum	porcupine
Eutamias minimus	least chipmunk
Lagurus curtatus	sagebrush vole
Lasionycteris noctivagans	silver-haired bat
Lasiurus cinereus	hoary bat
Lepus californicus	black-tailed jackrabbit
Lepus townsendi	white-tailed jackrabbit
Lutra canadensis	river otter
Lynx rufus	bobcat
Marmota flaviventris	yellow-bellied marmot
Mephitis mephitis	striped skunk
Microtus montanus	montane meadow mouse
Mus musculus	house mouse
Mustela erminea	short-tailed weasel
Mustela frenata	long-tailed weasel
Mustela vison	mink
Myotis californicus	California brown bat
Myotis lucifugus	little brown bat
Myotis yumanensis	Yuma brown bat
Neotoma cinerea	bushy-tailed woodrat
Odocoileus hemionus	mule deer
Odocoileus virginianus	white-tailed deer
Ondatra zibethicus	muskrat
Onychomys leucogaster	northern grasshopper mouse
Perognathus parvus	Great Basin pocket mouse
Peromyscus maniculatus	deer mouse
Plecotus townsendii townsendii	Pacific western big-eared bat

Table C1-2 List of Mammals Occurring on the Hanford Site

Scientific Name	Common Name
Procyon lotor	raccoon
Rattus norvegicus	Norway rat
Reithrodontomys megalotis	western harvest mouse
Sorex merriami	Merriam shrew
Sorex vagrans	vagrant shrew
Spermophilus townsendii	Townsend ground squirrel
Sylvilagus nuttallii	Nuttall cottontail rabbit
Taxidea taxus	badger
Thomomys talpoides	northern pocket gopher

Source: Cushing 1992 in Hanford Environmental Impact Statement.

Table C1-3 Common Birds Occurring on the Hanford Site

Scientific Name	Common Name
Ageless phonics	red-winged blackbird
Alas aceta	northern pintail
Alas americana	American wigeon
Anas clypeata	northern shoveler
Anas platyrhynchos	mallard
Ardea herodias	great blue heron
Aythya americana	edhead
Branta canadensis	Canada goose
Bucephala albeola	bufflehead
Calidris mauri	western sandpiper
Calidris minutilla	least sandpiper
Carpodacus mexicanus	house finch
Charadrius vociferus	killdeer
Chordeiles minor	common nighthawk
*Columba livia*rock	dove
Corvus corax	common raven
Dendroica coronata	yellow-rumped warbler
Eremophila alpestris	horned lark
Fulica americana	American coot
Hirundo pyrrhonota	cliff swallow
Hirundo rustica	barn swallow
Junco hyemalis	dark-eyed junco
Larus californicus	California gull
Larus delawarensis	ring-billed gull
Limnodromus scolopaceus	long-billed dowitcher
Mergus merganser	common merganser
Numenius americanus	long-billed curlew
Passer domesticus	house sparrow
Pica pica	black-billed magpie
Podilymbus podiceps	pied-billed grebe
Sturnella neglecta	western meadowlark
Sturnus vulgaris	European starling

Table C1-3 Common Birds Occurring on the Hanford Site

Scientific Name	Common Name
Turdus migratorius	American robin
Tyrannus verticalis	western kingbird
Zenaida macroura	mourning dove
Zonotrichia leucophrys	white-crowned sparrow

Source: Cushing 1992 in Hanford Environmental Impact Statement.

Table C1-4 Amphibians and Reptiles Occurring on the Hanford Site

Scientific Name	Common Name
Amphibians	
Bufo woodhouseii	Woodhouse's toad
Hyla regilla	Pacific treefrog
Spea intermontana	Great Basin spadefoot
Reptiles	
Chrysemys picta	painted turtle
Coluber constrictor	western yellow-bellied racer
Crotalus viridis	western rattlesnake
Hyspiglena torquata	desert night snake
Masticophis taeniatus	striped whipsnake
Phrynosoma douglassii	short-horned lizard
Pituophis melanoleucus	gopher snake
Sceloporus graciosus	sagebrush lizard
Uta stansburiana	side-blotched lizard

Source: Cushing 1992 in Hanford Environmental Impact Statement.

Table C1-5 Plant Species of Concern on the Hanford Site

Scientific Name	Common Name	Status*
Allium robinsonii	Robinson's onion	M3
Allium scillioides	squill onion	M3
Arenaria franklinii v. thompsonii	Tompson's sandwort	FC3b, M2
Artemisia campestris var. wormskioldii	northern wormwood	FC1, SE
Artemisia lindleyana	Columbia River mugwort	M3
Astragalus columbianus	Columbia milkvetch	FC2, ST
Astragalus sclerocarpus	stalked-pod milkvetch	M3
Astragalus speirocarpus	medick milkvetch	M3
Astragalus succumbens	crouching milkvetch	M3
Balsamorhiza rosea	rosy balsamroot	M3
Carex densa	dense sedge	S
Cirsium brevifolium	palouse thistle	M3
Cryptantha interrupta	bristly cyptantha	S
Cryptantha leucophaea	gray cryptantha	S
Cuscuta denticulata	desert dodder	M1
Cyperus rivularis	shining flatsedge	S
Erigeron piperianus	Piper's daisy	S
Limosella acaulis	southern mudwort	S
Lindernia anagallidea	false-pimpernel	S
Lomatium tuberosum	Hoover's desert-parsley	FC2, ST
Oenothera pygmaea	dwarf evening-primrose	S
Pellaea glabella	smooth cliffbrake	M3
Penstemon eriantherus	fuzzy beardtongue	M3
Rorippa columbiae	Columbia yellowcress	FC2, SE

* Plant species of concern status definitions:

State Definitions (WSDNR 1990)

SE - State endangered: Plant taxa that are in danger of becoming extinct or extirpated within the near future if factors contributing to their decline continue.

S - State threatened: Plant taxa that are likely to become endangered within the near future if factors contributing to their population decline or habitat degradation continue.

S - Sensitive: Plant taxa that are vulnerable or declining, and that could become endangered or threatened without active management or removal of threats.

M1 - Monitor group 1: Plant taxa in need of further field work before a status can be assigned.

Table C1-5 Plant Species of Concern on the Hanford Site

M2 - Monitor group 2: Plant taxa with unresolved taxonomic questions.

M3 - Monitor group 3: Plant taxa that are more abundant and less threatened than previously assumed.

Federal Definitions (50 CFR 17)

FC1 - Candidate plant taxa for which enough substantial information on biological vulnerability and threat is available to support listing as threatened or endangered by the federal government.

FC2 - Candidate plant taxa for which there is some evidence of vulnerability, but not enough data to support listing proposals at this time.

FC3 - Candidate plant taxa that were once considered for listing as threatened or endangered but are no longer candidates for listing.

Subcategory (FC3b) includes names that, on the basis of current taxonomic understanding, do not represent distinct taxa meeting the *Endangered Species Act of 1973* definition of species.

Source: Sackschewsky and others 1992 in Hanford Environmental Impact Statement.

Table C1-6 Wildlife Species of Concern on the Hanford Site

Scientific Name	Common Name	Status*
Mammals		
Antrozous pallidus	pallid bat	SM
Brachylagus idahoensis	pygmy rabbit	FC2, ST
Lagurus curtatus	sagebrush vole	SM
Onychomys leucogaster	northern grasshopper mouse	SM
Plecotus townsendii	Pacific western big-eared bat	FC2, SC
Sorex merriami	Merriam's shrew	SC
Birds		
Accipter gentilis	northern goshawk	FC2, SC
Aechmophorus clarkii	Clark's grebe	SM
Aechmophorus occidentalis	western grebe	SM
Ammodramus savannarum	grasshopper sparrow	SM
Amphispiza belli	sage sparrow	SC
Aquila chrysaetos	golden eagle	SC
Ardea herodias	great blue heron	SM
Athene cunicularia	burrowing owl	SC
*Branta canadensis leucopareia***	Aleutian Canadian goose	FE, SE
Buteo regalis	ferruginous hawk	FC2, ST
Buteo swainsoni	Swainson's hawk	SC
Caserodius albus	great egret	SM
Cathartes aura	turkey vulture	SM
Centrocercus urophasianus	western sage grouse	FC2, SC
Chlidonias niger	black tern	FC2, SM
Falco columbarius	merlin	SM
Falco mexicanus	prairie falcon	SM
Falco peregrinus	peregrine falcon	FE, SE
Falco rusticolus	gyrfalcon	SM
Gavia immer	common loon	SC
Grus canadensis	sandhill crane	SE
Haliaeetus leucocephalus	bald eagle	FT, ST
Himantopus mexicanus	black-necked stilt	SM
Lanius ludovicianus	loggerhead shrike	FC2, SC

Table C1-6 Wildlife Species of Concern on the Hanford Site

Scientific Name	Common Name	Status*
Melanerpes lewis	Lewis' woodpecker	SC
Myiarchus cinerascens	ash-throated flycatcher	SM
Numenius americanus	long-billed curlew	SM
Nyctea scandiaca	snowy owl	SM
Nycticorax nycticorax	black-crowned night heron	SM
Oreoscoptes montanus	sage thrasher	SC
Otus flammeolus	flammulated owl	SC
Pandion haliaetus	osprey	SM
Pelecanus erythrorhychos	white pelican	SE
Podiceps auritus	horned grebe	SM
Podiceps grisegena	red-necked grebe	SM
Sialia mexicana	western bluebird	SC
Sterna caspia	Caspian tern	SM
Sterna forsteri	Forster's tern	SM
Sterna paradisaea	arctic tern	SM
Strix varia	barred owl	SM
Reptiles		
Hypsiglena torquata	desert night snake	SM
Masticophis taeniatus	striped whipsnake	SC
Amphibians		
Bufo woodhousei	Woodhouse's toad	SM
Fish		
Catostomus platyrhynchus	mountain sucker	SM
Cottus beldingi	Piute sculpin	SM
Cottus perplexus	reticulate sculpin	SM
Percopsis transmontana	sand roller	SM
Mollusks		
Fisherola nuttalli	short-faced lanx	FC2, SC
Fluminicola columbiana	Columbia pebble snail	FC2, SC
Insects		
Cicindela columbica	Columbia River tiger beetle	SC

Table C1-6 Wildlife Species of Concern on the Hanford Site

* Species of concern status definitions:

Federal Definitions (from *Endangered Species Act*, as amended by PL 100-207, November 23, 1988; Federal Register, Vol. 54, No. 4, January 6, 1989, Notice of Review–Animals, US Fish and Wildlife Service).

FE - Federal endangered: A species in danger of extinction or extirpation throughout all or a substantial portion of its range.

FT - Federal threatened: A species that is likely to become endangered within the near future because of threats to its population.

FC2 - Federal candidate for listing, Category 2: A species for which there is some evidence of vulnerability, but for which there are not enough data to support listing proposals at this time.

State Definitions (WSDW 1991)

SE - State endangered: A species native to Washington State that is seriously threatened with extinction throughout all or a substantial portion of its range within the state. Endangered species are designated in WAC 232-12-014.

ST - State threatened: A species native to Washington State likely to become endangered within the foreseeable future throughout substantial portions of its range within the state without cooperative management or the removal of threats. Threatened species are designated in WAC 232-12-011.

SC - State candidate: A wildlife species native to Washington State that the Department of Wildlife will review for possible listing as endangered, threatened, or sensitive.

SM - State monitor: A wildlife species native to Washington State of special interest because at one time it was classified as endangered, threatened, or sensitive; it requires habitat that has limited availability during some portion of its life cycle; it is an indicator of environmental quality; further field investigations are required to determine its population status; there are unresolved taxonomic problems that may bear upon its status classification; it may be competing with and impacting other species of concern; and it has substantial popular appeal.

** Rare migrant or accidental occurrence on the Hanford Site (Downs and others 1993).

Source: Downs and others 1993, Stengen 1993, Landeen and others 1992 in Hanford Environmental Impact Statement.

Appendix C-2

Soil-to-Plant Transfer Factors, Terrestrial Bioaccumulation Factors, and Aquatic Bioaccumulation Factors for Ecological Chemicals of Potential Concern and Radionuclides of Potential Concern

Appendix C-2
Soil-to-Plant Transfer Factors, Terrestrial Bioaccumulation Factors, and Aquatic Bioaccumulation Factors for Ecological Chemicals of Potential Concern and Radionuclides of Potential Concern

Contents

Annotated Contents of Appendix C-2 Tables **C2-iii**

Acronyms and Terms used in Appendix C-2 ..... **C2-vi**

References for Appendix C-2 ..... **C2-vii**

- **Project Documents** **C2-vii**
- **Codes and Standards** **C2-vii**
- **Other Documents** **C2-vii**

Tables

Table C2-1 **Ecological Transfer Factors for COPCs and ROPCs** **C2-1**

Table C2-2 **Bioaccumulation Factors for Accumulation of COPCs and ROPCs from Soil by Mammals and Birds** **C2-62**

Table C2-3 **Bioaccumulation Factors for Accumulation of COPCs and ROPCs from Food by Mammals and Birds** **C2-101**

Table C2-4 **Bioaccumulation Factors for Accumulation of COPCs and ROPCs from Water by Mammals and Birds** **C2-140**

Table C2-5 **Food Chain Multipliers for Bioaccumulation of COPCs and ROPCs by Mammals and Birds** **C2-179**

Table C2-6 **Dose Conversion Factors, Decay Energies, Absorption Factors, and Radiation Dose Factors for ROPCs** **C2-192**

Table C2-7 **Dose Conversion Factors, Decay Energies, Absorption Factors, and Radiation Dose Factors for Non-ROPC Daughter Radionuclides in Sediment** **C2-212**

Annotated Contents of Appendix C-2 Tables

Table C2-1, Ecological Transfer Factors for COPCs and ROPCs

This table contains values of log K_{ow} and log K_{oc} for organic COPCs; ecological bioconcentration factors for uptake from soil to plants; bioaccumulation factors for uptake from soil to terrestrial invertebrates; transfer factors from ingested material to mammals; and bioconcentration factors from water to aquatic biota, aquatic plants, aquatic invertebrates, and benthic invertebrates. The preferred source of data for each type of factor was EPA (1999). For plants and mammals, Baes and others (1984) was next in order of preference for inorganic COPCs and ROPCs. For organic COPCs for which no measured data were available, uptake factors were estimated by using equations derived by regression analysis of uptake of organic compounds under controlled conditions. Equations for uptake factors and for radiation dose factors, their numbers in the text, the locations of their descriptions in the text, and their sources follow:

Terrestrial plants- bioconcentration factor for uptake of organic COPCs from soil to terrestrial plant tissue (SPv):
$\log SPv = 1.588 - (0.578 \times \log K_{ow})$
Equation 8-60, section 8.2.5.3 (Travis and Arms 1988). Terms are defined in section 8.2.5.3 and in the notes to Table C2-1.

Terrestrial invertebrates – bioaccumulation factors for uptake of organic COPCs from soil to terrestrial invertebrates (BAF-S):
$\log BAF\text{-}S = 0.819 \times \log K_{ow} - 1.146$
Equation 8-63, section 8.2.5.3 (Southworth and others 1978). Terms are defined in section 8.2.5.3 and in the notes to Table C2-1.

Mammals and birds - transfer factors from ingested material to animal tissue (Ba):
For mammals, $\log Ba = \log K_{ow} - 7.6$
Equation 8-66, section 8.2.5.3 (Travis and Arms 1988). Terms are defined in section 8.2.5.3 and in the notes to Table C2-1.
For birds, $Ba = 0.8 \times Ba$ for mammals

Aquatic plants - bioconcentration factors for uptake of organic COPCs from water to plant tissue (WP):
$\log WP = 0.819 \times \log K_{ow} - 1.146$
Equation 8-72, section 8.2.5.4 (Southworth and others 1978). Terms are defined in section 8.2.5.4 and in the notes to Table C2-1.

Aquatic plants - bioconcentration factor for uptake of organic COPCs from sediment to rooted aquatic plant tissue (SP):
$\log SP = 1.588 - (0.578 \times \log K_{ow})$
Equation 8-73, section 8.2.5.4 (Travis and Arms 1988). Terms are defined in section 8.2.5.4 and in the notes to Table C2-1.

Aquatic invertebrates - bioconcentration factors for uptake of organic COPCs from water to invertebrate tissue (BCF_{inv}):
$\log BCF_{inv} = 0.819 \log K_{ow} - 1.146$
Equation 8-74, section 8.2.5.4 (Southworth and others 1978). Terms are defined in section 8.2.5.4 and in the notes to Table C2-1.

Fish - bioconcentration factors for uptake of organic COPCs from water to invertebrate tissue (BCF_{fish}):
$\log BCF_{fish} = 0.91 \times \log K_{ow} - 1.975 \times \log (6.8 \times 10^{-7} \times K_{ow} + 1.0) - 0.786$
Equation 8-75, section 8.2.5.4 (Bintein and others 1993). Terms are defined in section 8.2.5.4 and in the notes to Table C2-1.

Benthic invertebrates - bioaccumulation factors for uptake of organic COPCs from sediment to benthic invertebrates (BASF):
$\log BASF = 0.819 \times \log K_{ow} - 1.146$
Equation 8-76, section 8.2.5.4 (Southworth and others 1978). Terms are defined in section 8.2.5.4 and in the notes to Table C2-1.

Table C2-2, Bioaccumulation Factors for Accumulation of COPCs and ROPCs from Soil by Mammals and Birds

Bioaccumulation factors for uptake from ingested soil by mammals and birds ($BAF\text{-}T_s$) was calculated as:
$BAF\text{-}T_s = Ba \times IR_F \times SF \times BW$
Equation 8-10, sections 8.2.3.1 and 8.2.5.3 (EPA 1999).
Terms are defined in sections 8.2.3.1 and 8.2.5.3 and in the notes to Table C2-2.

Table C2-3, Bioaccumulation Factors for Accumulation of COPCs and ROPCs from Food by Mammals and Birds

Bioaccumulation factors for uptake from ingested plant tissue by mammals and birds ($BAF\text{-}T_p$) was calculated as:
$BAF\text{-}T_p = Ba \times IR_F \times PF \times BW$
Equation 8-11, sections 8.2.3.1 and 8.2.5.3 (EPA 1999).
Terms are defined in Sections 8.2.3.1 and 8.2.5.3 and in the notes to Table C2-3.

Table C2-4, Bioaccumulation Factors for Accumulation of COPCs and ROPCs from Water by Mammals and Birds

Bioaccumulation factors for uptake from ingested water by mammals and birds ($BAF\text{-}T_w$) was calculated as:
$BAF\text{-}T_w = Ba \times IR_W \times BW$
Equation 8-42, sections 8.2.4.1 and 8.2.5.3 (EPA 1999).
Terms are defined in sections 8.2.4.1 and 8.2.5.3 and in the notes to Table C2-4.

Table C2-5, Food Chain Multipliers for Bioaccumulation of Organic COPCs by Mammals and Birds

Food chain multipliers (FCMs) for bioaccumulation of organic COPCs to receptors at different trophic levels (section 8.2.5.3) were developed for aquatic biota by EPA (1995) and are applied in the Risk Assessment Work Plan for terrestrial biota as described by EPA (1999). They are used in sections 8.2.3.1, 8.2.3.3, 8.2.4.1, and 8.2.4.3.

Table C2-6, Dose Conversion Factors, Decay Energies, Absorption Factors, and Radiation Dose Factors for ROPCs

Dose factors (DFs) are factors for ROPCs that convert activities of ROPCs in air, soil, and water to external radiation doses.

Dose factor for external radiation from soil (DF_{soil}):

$DF_{soil} = F_{above} \times F_{ruf} \times DCF \times CFb \times ECF + 1.05 \times F_{below} \times E_{\gamma}n_{\gamma} \times \Phi_{\gamma} \times CFa$

Equation 8-24, section 8.2.3.4 (Sample and others 1997).

Dose factor for external radiation from air (DF_{air}):

$DF_{air} = 3.2 \times 10^5 \times DCF$

Values of DCF are given in Eckerman and Ryman (1993).

Dose factor for external radiation from immersion in water ($DF_{water,\ imm}$)

$DF_{water,\ imm} = C_{wctot} \times (1\text{-}F_s\text{-}F_{in}) \times 0.001 \times CFa \times [(1\text{-}\Phi_{\beta}) \times E_{\beta}n_{\beta} + (1\text{-}\Phi_{\gamma}) \times E_{\gamma}n_{\gamma}]$

Equation 8-55, section 8.2.4.4 (Blaylock, Frank, and O'Neal 1993).

Dose factor for external radiation from sediment ($DF_{sediment}$)

$DF_{sediment} = C_s \times (0.5 \times F_s + F_{in}) \times CFa \times [(1\text{-}\Phi_{\beta}) \times E_{\beta}n_{\beta} + (1\text{-}\Phi_{\gamma}) \times E_{\gamma}n_{\gamma}]$

Equation 8-56, section 8.2.4.4 (Blaylock, Frank, and O'Neal 1993).

Dose factor for external radiation from proximity to water ($DF_{water,\ prox}$)

$DF_{water,\ prox} = C_{wctot} \times F_{near} \times 0.001 \times CFa \times [(1\text{-}\Phi_{\gamma}) \times E_{\gamma}n_{\gamma}]$,

Equation 8-58, section 8.2.4.4 (Blaylock, Frank, and O'Neal 1993).

The DF for internal exposure is:

$DF_{int} = CFa \times (QF \times E_{\alpha}n_{\alpha} \times \Phi_{\alpha} + E_{\beta}n_{\beta} \times \Phi_{\beta} + E_{\gamma}n_{\gamma} \times \Phi_{\gamma})$.

Equation 8-28, sections 8.2.3.4 and 8.2.4.3 (Sample and others 1997). Terms are defined in sections 8.2.3.4 and 8.2.4.4 and in the notes to Table C2-6.

Radiation dose factors (DFs) are ROPC-specific because the decay energy is ROPC-specific and are receptor-specific because the absorption fraction is receptor-specific. The decay energies ($E_{\alpha}n_{\alpha}$, $E_{\beta}n_{\beta}$, and $E_{\gamma}n_{\gamma}$) are the product of the energy of disintegration and the fraction of disintegrations that produce the specific type of radiation (α or β particles) or the photon energy emitted during transition from a higher to a lower energy state (γ radiation) (Eckerman and Ryman 1993), and absorption factors (Φ_{α},Φ_{β}, and Φ_{γ}) are the receptor-specific fraction of the decay energy absorbed by tissue (Blaylock, Frank, and O'Neal 1993; Sample and others 1997).

Table C2-7, Dose Conversion Factors, Decay Energies, Absorption Factors, and Radiation Dose Factors for Non-ROPC Daughter Radionuclides in Sediment

Radiation dose factors for non-ROPC daughter radionuclides have the same definitions as the dose factors for ROPCs. Non-ROPC daughter radionuclides are radionuclides that are produced by radioactive decay of ROPCs. They are included in dose assessment for exposure to sediment because they may accumulate in sediment.

Acronyms and Terms used in Appendix C-2

BW	Body weight of receptor (kg).
COPC	Chemical of potential concern.
FCM	Food chain multiplier.
IR_F	Receptor-specific daily ingestion rate of food (kg fresh weight of food/d).
IR_W	Receptor-specific daily ingestion rate of water (L/d).
$\log K_{ow}$	logarithm of the octanol-water partitioning coefficient (L/kg).
$\log K_{oc}$	organic carbon-water partitioning coefficient (L/kg).
PF	Fraction of IR_F that is plant tissue.
QF	Quality factor to adjust radiation dose for relative abilities of α, β, and γ radiation to harm tissue.
ROPC	Radionuclide of potential concern.
SF	Fraction of IR_F equal to the daily soil consumption rate.

Uptake factors are defined on pages C2-iii through C2-v and in the notes to the Appendix C2 tables.

References for Appendix C-2

Project Documents

None

Codes and Standards

None

Other Documents

Baes CF, III, Sharp RD, Sjoreen AL, and Shor RW. 1984. *A Review and Analysis of Parameters for Assessing Transport of Environmentally Released Radionuclides Through Agriculture*, ORNL-5786. Oak Ridge National Laboratory, Oak Ridge, Tennessee, USA.

Bintein S, Devillers J, and Karcher W. 1993. "Nonlinear Dependence of Fish Bioconcentration on n-Octanol/Water Partition Coefficients," SAR and QSAR in *Environ. Res.*, Volume 1, p 29–39.

Blaylock BG, Frank ML, and O'Neal BR. 1993. *Methodology for Estimating Radiation Dose Rates to Freshwater Biota Exposed to Radionuclides in the Environment*, ES/ER/TM-78. Oak Ridge National Laboratory, Oak Ridge, Tennessee, USA.

DOE. 1997. *Vadose Zone Characterization Project at the Hanford Tank Farms - AX Tank Farm Report*. GJO-97-14-TAR, GJO-HAN-12. August 1997. DOE Grand Junction Office, Grand Junction, Colorado, USA.

Eckerman KF and Ryman JC. 1993. *External Exposure to Radionuclides in Air, Water, and Soil*, EPA 402-R-93-081, Federal Guidance Report No. 12. Office of Radiation and Indoor Air, US Environmental Protection Agency, Washington, DC, USA.

EPA. 1995. *Great Lakes Water Quality Initiative Technical Support Document for Wildlife Criteria*, EPA-820-B-95-009. Office of Water, US Environmental Protection Agency, Washington, DC, USA.

EPA. 1999. *Screening-Level Ecological Risk Assessment Protocol for Hazardous Waste Combustion Facilities*, Vol. III, EPA 530-D-99-001C. Office of Solid Waste and Emergency Response, US Environmental Protection Agency, Washington, DC, USA.

Sample BE, Aplin MS, Efroymson RA, Suter II GW, and Welsh CJE. 1997. *Methods and Tools for Estimation of the Exposure of Terrestrial Wildlife to Contaminants*, ORNL/TM-13391. Environmental Sciences Division, Oak Ridge National Laboratory, Oak Ridge, Tennessee, USA.

Southworth GR, Beauchamp JJ, and Schmieder PK. 1978. "Bioaccumulation Potential of Polycyclic Aromatic Hydrocarbons in *Daphnia pulex*," *Water Res.*, Volume 12, p 973–977.

Travis CC and Arms AD. 1988. "Bioconcentration of Organics in Beef, Milk, and Vegetation," *Environ. Sci. Technol*., Volume 22, p 271–274.

Table C2-1 Ecological Transfer Factors for COPCs and ROPCs

Constituent of Potential Concern	CAS Registry Number	Log K_{ow}[a]	Log K_{oc}[a]	SPv (kg dry soil/kg dry tissue)	Source	BAF-S (kg dry soil/ kg tissue)	Source
Organic Compounds							
Aromatic Halogenated Hydrocarbons							
2,3,4,6-Tetrachlorophenol	58-90-2	4.30	2.40	1.26E-01	Equation 1	2.38E+02	Equation 2[b]
4-Chloro-3-methylphenol	59-50-7	3.10	2.57	6.25E-01	Equation 1	2.47E+01	Equation 2[b]
Aromatic Nonhalogenated Hydrocarbons							
2-Nitrotoluene	88-72-2	2.30	2.63	1.81E+00	Equation 1	5.47E+00	Equation 2
4-Nitrobiphenyl	92-93-3	3.77	3.09	2.56E-01	Equation 1	8.74E+01	Equation 2[b]
Benzaldehyde	100-52-7	1.48	1.30	5.42E+00	Equation 1	1.16E+00	Equation 2
Benzene	71-43-2	2.14	1.79	2.25E+00	Equation 1	4.02E+00	Equation 2
Benzyl alcohol	100-51-6	1.10	1.01	8.95E+00	Equation 1	5.69E-01	Equation 2
Ethyl benzene	100-41-4	3.12	2.31	6.06E-01	Equation 1	2.58E+01	Equation 2[b]
m-Xylene	108-38-3	3.20	2.29	5.47E-01	Equation 1	2.99E+01	Equation 2[b]
o-Xylene	95-47-6	3.13	2.38	6.01E-01	Equation 1	2.62E+01	Equation 2[b]
p-Xylene	106-42-3	3.17	2.49	5.70E-01	Equation 1	2.82E+01	Equation 2[b]
Styrene	100-42-5	2.93	2.96	7.85E-01	Equation 1	1.79E+01	Equation 2[b]
Toluene	108-88-3	2.67	2.15	1.11E+00	Equation 1	1.09E+01	Equation 2[b]
Non-aromatic Nonhalogenated Hydrocarbons							
1,2-Epoxybutane	106-88-7	0.86	0.65	1.23E+01	Equation 1	3.62E-01	Equation 2
1,3-Butadiene	106-99-0	1.99	1.64	2.74E+00	Equation 1	3.05E+00	Equation 2
1,4-Dioxane	123-91-1	-0.27	-0.06	5.53E+01	EPA (1999)	4.00E-02	EPA (1999)
1-Methylpropyl alcohol	78-92-2	0.61	0.63	1.72E+01	Equation 1	2.26E-01	Equation 2
1-Nitropropane	108-03-2	0.87	0.83	1.22E+01	Equation 1	3.69E-01	Equation 2
2,2,4-Trimethylpentane	540-84-1	5.02	4.07	4.86E-02	Equation 1	9.23E+02	Equation 2[b]
2-Butanone	78-93-3	0.28	0.37	2.66E+01	Equation 1	1.21E-01	Equation 2

Table C2-1 Ecological Transfer Factors for COPCs and ROPCs

Constituent of Potential Concern	CAS Registry Number	Mammal Ba ([mg/kg tissue] / [mg ingested /day])	Source	WP (L/kg tissue)	Source	SP (kg dry sediment/ kg dry tissue)	Source
Organic Compounds							
Aromatic Halogenated Hydrocarbons							
2,3,4,6-Tetrachlorophenol	58-90-2	5.02E-04	Equation 3	2.38E+02	Equation 2	1.26E-01	Equation 1
4-Chloro-3-methylphenol	59-50-7	3.16E-05	Equation 3	2.47E+01	Equation 2	6.25E-01	Equation 1
Aromatic Nonhalogenated Hydrocarbons							
2-Nitrotoluene	88-72-2	5.01E-06	Equation 3	5.47E+00	Equation 2	1.81E+00	Equation 1
4-Nitrobiphenyl	92-93-3	1.48E-04	Equation 3	8.74E+01	Equation 2	2.56E-01	Equation 1
Benzaldehyde	100-52-7	7.54E-07	Equation 3	1.16E+00	Equation 2	5.42E+00	Equation 1
Benzene	71-43-2	3.44E-06	Equation 3	4.02E+00	Equation 2	2.25E+00	Equation 1
Benzyl alcohol	100-51-6	3.16E-07	Equation 3	5.69E-01	Equation 2	8.95E+00	Equation 1
Ethyl benzene	100-41-4	3.34E-05	Equation 3	2.58E+01	Equation 2	6.06E-01	Equation 1
m-Xylene	108-38-3	3.99E-05	Equation 3	2.99E+01	Equation 2	5.47E-01	Equation 1
o-Xylene	95-47-6	3.39E-05	Equation 3	2.62E+01	Equation 2	6.01E-01	Equation 1
p-Xylene	106-42-3	3.72E-05	Equation 3	2.82E+01	Equation 2	5.70E-01	Equation 1
Styrene	100-42-5	2.13E-05	Equation 3	1.79E+01	Equation 2	7.85E-01	Equation 1
Toluene	108-88-3	1.17E-05	Equation 3	1.09E+01	Equation 2	1.11E+00	Equation 1
Non-aromatic Nonhalogenated Hydrocarbons							
1,2-Epoxybutane	106-88-7	1.82E-07	Equation 3	3.62E-01	Equation 2	1.23E+01	Equation 1
1,3-Butadiene	106-99-0	2.45E-06	Equation 3	3.05E+00	Equation 2	2.74E+00	Equation 1
1,4-Dioxane	123-91-1	1.36E-08	Equation 3	4.00E-02	EPA (1999)	5.53E+01	EPA (1999)
1-Methylpropyl alcohol	78-92-2	1.02E-07	Equation 3	2.26E-01	Equation 2	1.72E+01	Equation 1
1-Nitropropane	108-03-2	1.86E-07	Equation 3	3.69E-01	Equation 2	1.22E+01	Equation 1
2,2,4-Trimethylpentane	540-84-1	2.63E-03	Equation 3	9.23E+02	Equation 2	4.86E-02	Equation 1
2-Butanone	78-93-3	4.80E-08	Equation 3	1.21E-01	Equation 2	2.66E+01	Equation 1

Table C2-1 Ecological Transfer Factors for COPCs and ROPCs

Constituent of Potential Concern	CAS Registry Number	BCF_{fish} (L/kg tissue)	Source	BASF (kg dry sediment/ kg tissue)	Source
Organic Compounds					
Aromatic Halogenated Hydrocarbons					
2,3,4,6-Tetrachlorophenol	58-90-2	1.30E+03	Equation 4	2.38E+02	Equation 2
4-Chloro-3-methylphenol	59-50-7	1.08E+02	Equation 4	2.47E+01	Equation 2
Aromatic Nonhalogenated Hydrocarbons					
2-Nitrotoluene	88-72-2	2.03E+01	Equation 4	5.47E+00	Equation 2
4-Nitrobiphenyl	92-93-3	4.38E+02	Equation 4	8.74E+01	Equation 2
Benzaldehyde	100-52-7	3.62E+00	Equation 4	1.16E+00	Equation 2
Benzene	71-43-2	1.44E+01	Equation 4	4.02E+00	Equation 2
Benzyl alcohol	100-51-6	1.64E+00	Equation 4	5.69E-01	Equation 2
Ethyl benzene	100-41-4	1.14E+02	Equation 4	2.58E+01	Equation 2
m-Xylene	108-38-3	1.34E+02	Equation 4	2.99E+01	Equation 2
o-Xylene	95-47-6	1.15E+02	Equation 4	2.62E+01	Equation 2
p-Xylene	106-42-3	1.25E+02	Equation 4	2.82E+01	Equation 2
Styrene	100-42-5	7.57E+01	Equation 4	1.79E+01	Equation 2
Toluene	108-88-3	4.38E+01	Equation 4	1.09E+01	Equation 2
Non-aromatic Nonhalogenated Hydrocarbons					
1,2-Epoxybutane	106-88-7	9.92E-01	Equation 4	3.62E-01	Equation 2
1,3-Butadiene	106-99-0	1.06E+01	Equation 4	3.05E+00	Equation 2
1,4-Dioxane	123-91-1	9.34E-02	EPA (1999)	4.00E-02	EPA (1999)
1-Methylpropyl alcohol	78-92-2	5.88E-01	Equation 4	2.26E-01	Equation 2
1-Nitropropane	108-03-2	1.01E+00	Equation 4	3.69E-01	Equation 2
2,2,4-Trimethylpentane	540-84-1	5.29E+03	Equation 4	9.23E+02	Equation 2
2-Butanone	78-93-3	2.95E-01	Equation 4	1.21E-01	Equation 2

Table C2-1 Ecological Transfer Factors for COPCs and ROPCs

Constituent of Potential Concern	CAS Registry Number	Log K_{ow} [a]	Log K_{oc} [a]	SPv (kg dry soil/kg dry tissue)	Source	BAF-S (kg dry soil/ kg tissue)	Source
2-Butenaldehyde (2-Butenal)	4170-30-3	0.55	0.58	1.86E+01	EPA (1999)	2.00E-01	EPA (1999)
2-Ethoxyethanol	110-80-5	-0.10	1.32	4.42E+01	Equation 1	5.92E-02	Equation 2
2-Heptanone	110-43-0	1.98	1.70	2.78E+00	Equation 1	2.99E+00	Equation 2
2-Hexanone	591-78-6	1.38	2.13	6.17E+00	Equation 1	9.64E-01	Equation 2
2-Methoxyethanol	109-86-4	-0.77	0.00	1.08E+02	Equation 1	1.67E-02	Equation 2
2-Methyl-2-propanol	75-65-0	0.35	1.57	2.43E+01	Equation 1	1.38E-01	Equation 2
2-Methyl-2-propenenitrile	126-98-7	0.54	0.57	1.89E+01	Equation 1	1.98E-01	Equation 2
2-Methylaziridine	75-55-8	-0.60	-0.32	8.61E+01	Equation 1	2.30E-02	Equation 2
2-Methylpropyl alcohol	78-83-1	0.76	0.74	1.41E+01	Equation 1	3.00E-01	Equation 2
2-Pentanone	107-87-9	0.91	1.87	1.15E+01	Equation 1	3.97E-01	Equation 2
2-Propanone (Acetone)	67-64-1	-0.22	-0.02	5.20E+01	EPA (1999)	5.00E-02	EPA (1999)
2-Propene-1-ol	107-18-6	0.17	0.28	3.09E+01	Equation 1	9.85E-02	Equation 2
2-Propyl alcohol	67-63-0	0.05	0.19	3.62E+01	Equation 1	7.85E-02	Equation 2
3-Heptanone	106-35-4	No data	No data	No data	No data	No data	No data
3-Methyl-1-butanol	123-51-3	No data	No data	No data	No data	No data	No data
3-Methyl-2-butanone	563-80-4	No data	No data	No data	No data	No data	No data
3-Pentanone	96-22-0	0.99	1.08	1.04E+01	Equation 1	4.62E-01	Equation 2
4-Heptanone	123-19-3	No data	No data	No data	No data	No data	No data
4-Methyl-2-pentanone	108-10-1	1.19	1.08	7.94E+00	Equation 1	6.74E-01	Equation 2
4-Methyl-3-penten-2-one	141-79-7	NA	NA	No data	No data	No data	No data
5-Methyl-2-hexanone	110-12-3	1.72	1.59	3.93E+00	Equation 1	1.83E+00	Equation 2
Acetaldehyde	75-07-0	-0.22	-0.02	5.19E+01	Equation 1	4.72E-02	Equation 2
Acetamide	60-35-5	-1.26	-1.55	2.07E+02	Equation 1	6.64E-03	Equation 2
Acetic acid	64-19-7	-0.17	0.00	4.86E+01	Equation 1	5.19E-02	Equation 2
Acetic acid ethyl ester	141-78-6	0.73	0.36	1.47E+01	Equation 1	2.83E-01	Equation 2
Acetic acid n-butyl ester	123-86-4	1.73	1.50	3.87E+00	Equation 1	1.87E+00	Equation 2
Acetonitrile	75-05-8	-0.34	-0.11	6.09E+01	Equation 1	3.76E-02	Equation 2

Table C2-1 Ecological Transfer Factors for COPCs and ROPCs

Constituent of Potential Concern	CAS Registry Number	Mammal Ba ([mg/kg tissue] / [mg ingested /day])	Source	WP (L/kg tissue)	Source	SP (kg dry sediment/ kg dry tissue)	Source
2-Butenaldehyde (2-Butenal)	4170-30-3	8.91E-08	EPA (1999)	2.00E-01	EPA (1999)	1.86E+01	EPA (1999)
2-Ethoxyethanol	110-80-5	2.00E-08	Equation 3	5.92E-02	Equation 2	4.42E+01	Equation 1
2-Heptanone	110-43-0	2.40E-06	Equation 3	2.99E+00	Equation 2	2.78E+00	Equation 1
2-Hexanone	591-78-6	6.03E-07	Equation 3	9.64E-01	Equation 2	6.17E+00	Equation 1
2-Methoxyethanol	109-86-4	4.27E-09	Equation 3	1.67E-02	Equation 2	1.08E+02	Equation 1
2-Methyl-2-propanol	75-65-0	5.62E-08	Equation 3	1.38E-01	Equation 2	2.43E+01	Equation 1
2-Methyl-2-propenenitrile	126-98-7	8.72E-08	Equation 3	1.98E-01	Equation 2	1.89E+01	Equation 1
2-Methylaziridine	75-55-8	6.31E-09	Equation 3	2.30E-02	Equation 2	8.61E+01	Equation 1
2-Methylpropyl alcohol	78-83-1	1.45E-07	Equation 3	3.00E-01	Equation 2	1.41E+01	Equation 1
2-Pentanone	107-87-9	2.04E-07	Equation 3	3.97E-01	Equation 2	1.15E+01	Equation 1
2-Propanone (Acetone)	67-64-1	1.51E-08	Equation 3	5.00E-02	EPA (1999)	5.20E+01	EPA (1999)
2-Propene-1-ol	107-18-6	3.72E-08	Equation 3	9.85E-02	Equation 2	3.09E+01	Equation 1
2-Propyl alcohol	67-63-0	2.82E-08	Equation 3	7.85E-02	Equation 2	3.62E+01	Equation 1
3-Heptanone	106-35-4	No data	No data	No data	No data	No data	No data
3-Methyl-1-butanol	123-51-3	No data	No data	No data	No data	No data	No data
3-Methyl-2-butanone	563-80-4	No data	No data	No data	No data	No data	No data
3-Pentanone	96-22-0	2.45E-07	Equation 3	4.62E-01	Equation 2	1.04E+01	Equation 1
4-Heptanone	123-19-3	No data	No data	No data	No data	No data	No data
4-Methyl-2-pentanone	108-10-1	3.89E-07	Equation 3	6.74E-01	Equation 2	7.94E+00	Equation 1
4-Methyl-3-penten-2-one	141-79-7	No data	No data	No data	No data	No data	No data
5-Methyl-2-hexanone	110-12-3	1.32E-06	Equation 3	1.83E+00	Equation 2	3.93E+00	Equation 1
Acetaldehyde	75-07-0	1.51E-08	Equation 3	4.72E-02	Equation 2	5.19E+01	Equation 1
Acetamide	60-35-5	1.38E-09	Equation 3	6.64E-03	Equation 2	2.07E+02	Equation 1
Acetic acid	64-19-7	1.70E-08	Equation 3	5.19E-02	Equation 2	4.86E+01	Equation 1
Acetic acid ethyl ester	141-78-6	1.35E-07	Equation 3	2.83E-01	Equation 2	1.47E+01	Equation 1
Acetic acid n-butyl ester	123-86-4	1.35E-06	Equation 3	1.87E+00	Equation 2	3.87E+00	Equation 1
Acetonitrile	75-05-8	1.15E-08	Equation 3	3.76E-02	Equation 2	6.09E+01	Equation 1

Table C2-1 Ecological Transfer Factors for COPCs and ROPCs

Constituent of Potential Concern	CAS Registry Number	BCF_{fish} (L/kg tissue)	Source	BASF (kg dry sediment/ kg tissue)	Source
2-Butenaldehyde (2-Butenal)	4170-30-3	5.18E-01	EPA (1999)	2.00E-01	EPA (1999)
2-Ethoxyethanol	110-80-5	1.33E-01	Equation 4	5.92E-02	Equation 2
2-Heptanone	110-43-0	1.04E+01	Equation 4	2.99E+00	Equation 2
2-Hexanone	591-78-6	2.95E+00	Equation 4	9.64E-01	Equation 2
2-Methoxyethanol	109-86-4	3.26E-02	Equation 4	1.67E-02	Equation 2
2-Methyl-2-propanol	75-65-0	3.41E-01	Equation 4	1.38E-01	Equation 2
2-Methyl-2-propenenitrile	126-98-7	5.08E-01	Equation 4	1.98E-01	Equation 2
2-Methylaziridine	75-55-8	4.66E-02	Equation 4	2.30E-02	Equation 2
2-Methylpropyl alcohol	78-83-1	8.05E-01	Equation 4	3.00E-01	Equation 2
2-Pentanone	107-87-9	1.10E+00	Equation 4	3.97E-01	Equation 2
2-Propanone (Acetone)	67-64-1	1.00E-01	EPA (1999)	5.00E-02	EPA (1999)
2-Propene-1-ol	107-18-6	2.34E-01	Equation 4	9.85E-02	Equation 2
2-Propyl alcohol	67-63-0	1.82E-01	Equation 4	7.85E-02	Equation 2
3-Heptanone	106-35-4	No data	No data	No data	No data
3-Methyl-1-butanol	123-51-3	No data	No data	No data	No data
3-Methyl-2-butanone	563-80-4	No data	No data	No data	No data
3-Pentanone	96-22-0	1.30E+00	Equation 4	4.62E-01	Equation 2
4-Heptanone	123-19-3	No data	No data	No data	No data
4-Methyl-2-pentanone	108-10-1	1.98E+00	Equation 4	6.74E-01	Equation 2
4-Methyl-3-penten-2-one	141-79-7	No data	No data	No data	No data
5-Methyl-2-hexanone	110-12-3	6.01E+00	Equation 4	1.83E+00	Equation 2
Acetaldehyde	75-07-0	1.03E-01	Equation 4	4.72E-02	Equation 2
Acetamide	60-35-5	1.17E-02	Equation 4	6.64E-03	Equation 2
Acetic acid	64-19-7	1.15E-01	Equation 4	5.19E-02	Equation 2
Acetic acid ethyl ester	141-78-6	7.56E-01	Equation 4	2.83E-01	Equation 2
Acetic acid n-butyl ester	123-86-4	6.14E+00	Equation 4	1.87E+00	Equation 2
Acetonitrile	75-05-8	8.03E-02	Equation 4	3.76E-02	Equation 2

Table C2-1 Ecological Transfer Factors for COPCs and ROPCs

Constituent of Potential Concern	CAS Registry Number	Log K_{ow}[a]	Log K_{oc}[a]	SPv (kg dry soil/kg dry tissue)	Source	BAF-S (kg dry soil/ kg tissue)	Source
Acrolein	107-02-8	-0.01	0.14	3.92E+01	Equation 1	7.03E-02	Equation 2
Acrylonitrile	107-13-1	0.25	0.35	2.78E+01	EPA (1999)	1.10E-01	EPA (1999)
Bis(isopropyl)ether	108-20-3	1.56	2.23	4.86E+00	Equation 1	1.35E+00	Equation 2
Butane	106-97-8	2.89	2.41	8.27E-01	Equation 1	1.66E+01	Equation 2[b]
Carbon disulfide	75-15-0	2.00	1.71	2.70E+00	Equation 1	3.10E+00	Equation 2
Cyanogen	460-19-5	0.07	0.92	3.53E+01	Equation 1	8.15E-02	Equation 2
Cyclohexane	110-82-7	3.44	2.68	3.98E-01	Equation 1	4.69E+01	Equation 2[b]
Cyclohexanone	108-94-1	0.81	0.78	1.32E+01	Equation 1	3.29E-01	Equation 2
Cyclohexene	110-83-8	2.86	2.38	8.61E-01	Equation 1	1.57E+01	Equation 2[b]
Cyclopentane	287-92-3	3.00	2.49	7.14E-01	Equation 1	2.05E+01	Equation 2[b]
Ethyl alcohol	64-17-5	-0.31	-0.09	5.85E+01	Equation 1	3.98E-02	Equation 2
Ethyl ether	60-29-7	0.89	0.85	1.18E+01	Equation 1	3.83E-01	Equation 2
Ethyl methacrylate	97-63-2	1.59	1.39	4.67E+00	Equation 1	1.43E+00	Equation 2
Formaldehyde	50-00-0	0.34	0.42	2.46E+01	EPA (1999)	1.40E-01	EPA (1999)
Formamide	75-12-7	-1.51	-1.03	2.89E+02	Equation 1	4.14E-03	Equation 2
Formic acid	64-18-6	-0.54	-0.27	7.92E+01	Equation 1	2.59E-02	Equation 2
Formic acid, methyl ester	107-31-3	-0.26	-0.05	5.50E+01	Equation 1	4.34E-02	Equation 2
Glycidylaldehyde	765-34-4	-0.12	0.00	4.54E+01	Equation 1	5.70E-02	Equation 2
Methyl acetate	79-20-9	0.46	0.51	2.10E+01	Equation 1	1.70E-01	Equation 2
Methyl alcohol	67-56-1	-0.71	-0.40	9.96E+01	Equation 1	1.87E-02	Equation 2
Methyl isocyanate	624-83-9	No data	No data	No data	No data	No data	No data
Methyl methacrylate	80-62-6	0.79	1.80	1.35E+01	Equation 1	3.17E-01	Equation 2
Methyl tert-butyl ether	1634-04-4	0.94	0.88	1.11E+01	Equation 1	4.21E-01	Equation 2
Methylacetylene	74-99-7	0.94	0.88	1.11E+01	Equation 1	4.21E-01	Equation 2
Methylcyclohexane	108-87-2	4.10	3.35	1.65E-01	Equation 1	1.63E+02	Equation 2[b]
N,N-Dimethylacetamide	127-19-5	No data	No data	No data	No data	No data	No data

Table C2-1 Ecological Transfer Factors for COPCs and ROPCs

Constituent of Potential Concern	CAS Registry Number	Mammal Ba ([mg/kg tissue] / [mg ingested /day])	Source	WP (L/kg tissue)	Source	SP (kg dry sediment/ kg dry tissue)	Source
Acrolein	107-02-8	2.46E-08	Equation 3	7.03E-02	Equation 2	3.92E+01	Equation 1
Acrylonitrile	107-13-1	4.47E-08	Equation 3	1.10E-01	EPA (1999)	2.78E+01	EPA (1999)
Bis(isopropyl)ether	108-20-3	9.12E-07	Equation 3	1.35E+00	Equation 2	4.86E+00	Equation 1
Butane	106-97-8	1.95E-05	Equation 3	1.66E+01	Equation 2	8.27E-01	Equation 1
Carbon disulfide	75-15-0	2.51E-06	Equation 3	3.10E+00	Equation 2	2.70E+00	Equation 1
Cyanogen	460-19-5	2.95E-08	Equation 3	8.15E-02	Equation 2	3.53E+01	Equation 1
Cyclohexane	110-82-7	6.92E-05	Equation 3	4.69E+01	Equation 2	3.98E-01	Equation 1
Cyclohexanone	108-94-1	1.62E-07	Equation 3	3.29E-01	Equation 2	1.32E+01	Equation 1
Cyclohexene	110-83-8	1.82E-05	Equation 3	1.57E+01	Equation 2	8.61E-01	Equation 1
Cyclopentane	287-92-3	2.51E-05	Equation 3	2.05E+01	Equation 2	7.14E-01	Equation 1
Ethyl alcohol	64-17-5	1.23E-08	Equation 3	3.98E-02	Equation 2	5.85E+01	Equation 1
Ethyl ether	60-29-7	1.95E-07	Equation 3	3.83E-01	Equation 2	1.18E+01	Equation 1
Ethyl methacrylate	97-63-2	9.77E-07	Equation 3	1.43E+00	Equation 2	4.67E+00	Equation 1
Formaldehyde	50-00-0	5.56E-08	Equation 3	1.40E-01	EPA (1999)	2.46E+01	EPA (1999)
Formamide	75-12-7	7.76E-10	Equation 3	4.14E-03	Equation 2	2.89E+02	Equation 1
Formic acid	64-18-6	7.28E-09	Equation 3	2.59E-02	Equation 2	7.92E+01	Equation 1
Formic acid, methyl ester	107-31-3	1.37E-08	Equation 3	4.34E-02	Equation 2	5.50E+01	Equation 1
Glycidylaldehyde	765-34-4	1.91E-08	Equation 3	5.70E-02	Equation 2	4.54E+01	Equation 1
Methyl acetate	79-20-9	7.24E-08	Equation 3	1.70E-01	Equation 2	2.10E+01	Equation 1
Methyl alcohol	67-56-1	4.90E-09	Equation 3	1.87E-02	Equation 2	9.96E+01	Equation 1
Methyl isocyanate	624-83-9	No data	No data	No data	No data	No data	No data
Methyl methacrylate	80-62-6	1.55E-07	Equation 3	3.17E-01	Equation 2	1.35E+01	Equation 1
Methyl tert-butyl ether	1634-04-4	2.19E-07	Equation 3	4.21E-01	Equation 2	1.11E+01	Equation 1
Methylacetylene	74-99-7	2.19E-07	Equation 3	4.21E-01	Equation 2	1.11E+01	Equation 1
Methylcyclohexane	108-87-2	3.16E-04	Equation 3	1.63E+02	Equation 2	1.65E-01	Equation 1
N,N-Dimethylacetamide	127-19-5	No data	No data	No data	No data	No data	No data

Table C2-1 Ecological Transfer Factors for COPCs and ROPCs

Constituent of Potential Concern	CAS Registry Number	BCF_{fish} (L/kg tissue)	Source	BASF (kg dry sediment/ kg tissue)	Source
Acrolein	107-02-8	1.61E-01	Equation 4	7.03E-02	Equation 2
Acrylonitrile	107-13-1	4.80E+01	EPA (1999)	1.10E-01	EPA (1999)
Bis(isopropyl)ether	108-20-3	4.30E+00	Equation 4	1.35E+00	Equation 2
Butane	106-97-8	6.97E+01	Equation 4	1.66E+01	Equation 2
Carbon disulfide	75-15-0	1.08E+01	Equation 4	3.10E+00	Equation 2
Cyanogen	460-19-5	1.90E-01	Equation 4	8.15E-02	Equation 2
Cyclohexane	110-82-7	2.20E+02	Equation 4	4.69E+01	Equation 2
Cyclohexanone	108-94-1	8.94E-01	Equation 4	3.29E-01	Equation 2
Cyclohexene	110-83-8	6.55E+01	Equation 4	1.57E+01	Equation 2
Cyclopentane	287-92-3	8.78E+01	Equation 4	2.05E+01	Equation 2
Ethyl alcohol	64-17-5	8.55E-02	Equation 4	3.98E-02	Equation 2
Ethyl ether	60-29-7	1.06E+00	Equation 4	3.83E-01	Equation 2
Ethyl methacrylate	97-63-2	4.58E+00	Equation 4	1.43E+00	Equation 2
Formaldehyde	50-00-0	3.35E-01	EPA (1999)	1.40E-01	EPA (1999)
Formamide	75-12-7	6.92E-03	Equation 4	4.14E-03	Equation 2
Formic acid	64-18-6	5.31E-02	Equation 4	2.59E-02	Equation 2
Formic acid, methyl ester	107-31-3	9.41E-02	Equation 4	4.34E-02	Equation 2
Glycidylaldehyde	765-34-4	1.27E-01	Equation 4	5.70E-02	Equation 2
Methyl acetate	79-20-9	4.29E-01	Equation 4	1.70E-01	Equation 2
Methyl alcohol	67-56-1	3.70E-02	Equation 4	1.87E-02	Equation 2
Methyl isocyanate	624-83-9	No data	No data	No data	No data
Methyl methacrylate	80-62-6	8.57E-01	Equation 4	3.17E-01	Equation 2
Methyl tert-butyl ether	1634-04-4	1.17E+00	Equation 4	4.21E-01	Equation 2
Methylacetylene	74-99-7	1.17E+00	Equation 4	4.21E-01	Equation 2
Methylcyclohexane	108-87-2	8.66E+02	Equation 4	1.63E+02	Equation 2
N,N-Dimethylacetamide	127-19-5	No data	No data	No data	No data

Table C2-1 Ecological Transfer Factors for COPCs and ROPCs

Constituent of Potential Concern	CAS Registry Number	Log K_{ow}[a]	Log K_{oc}[a]	SPv (kg dry soil/kg dry tissue)	Source	BAF-S (kg dry soil/ kg tissue)	Source
n-Butyl alcohol	71-36-3	0.88	0.84	1.20E+01	Equation 1	3.76E-01	Equation 2
n-Heptane	142-82-5	4.66	3.79	7.84E-02	Equation 1	4.68E+02	Equation 2[b]
n-Hexane	110-54-3	4.11	3.36	1.63E-01	Equation 1	1.66E+02	Equation 2[b]
Nitromethane	75-52-5	-0.35	-0.12	6.17E+01	Equation 1	3.69E-02	Equation 2
n-Nonane	111-84-2	5.65	4.56	2.10E-02	Equation 1	3.03E+03	Equation 2[b]
n-Octane	111-65-9	4.00	3.27	1.89E-01	Equation 1	1.35E+02	Equation 2[b]
n-Pentane	109-66-0	3.21	2.65	5.40E-01	Equation 1	3.04E+01	Equation 2[b]
n-Propionaldehyde	123-38-6	0.59	0.61	1.77E+01	Equation 1	2.17E-01	Equation 2
n-Propyl alcohol	71-23-8	0.25	0.35	2.78E+01	Equation 1	1.14E-01	Equation 2
n-Valeraldehyde	110-62-3	No data	No data	No data	No data	No data	No data
Oxirane	75-21-8	-0.30	-0.08	5.77E+01	Equation 1	4.06E-02	Equation 2
p-Cymene	99-87-6	4.10	3.35	1.65E-01	Equation 1	1.63E+02	Equation 2[b]
Phosgene	75-44-5	No data	No data	No data	No data	No data	No data
Propargyl alcohol	107-19-7	-0.38	0.12	6.42E+01	Equation 1	3.49E-02	Equation 2
Propionic acid	79-09-4	0.33	0.41	2.50E+01	Equation 1	1.33E-01	Equation 2
Propionitrile	107-12-0	0.16	0.28	3.13E+01	Equation 1	9.66E-02	Equation 2
Propylene glycol monomethyl ether	107-98-2	-0.49	0.00	7.43E+01	Equation 1	2.84E-02	Equation 2
p-tert-Butyltoluene	98-51-1	No data	No data	No data	No data	No data	No data
Triethylamine	121-44-8	1.45	2.03	5.62E+00	Equation 1	1.10E+00	Equation 2
Trimethylamine	75-50-3	0.16	0.60	3.13E+01	Equation 1	9.66E-02	Equation 2
Vinyl acetate	108-05-4	0.70	0.70	1.53E+01	Equation 1	2.67E-01	Equation 2
Non-aromatic Halogenated Hydrocarbons							
1,1,1,2-Tetrachloro-2,2-difluoroethane	76-11-9	3.41	2.54	4.14E-01	Equation 1	4.43E+01	Equation 2[b]
1,1,1,2-Tetrachloroethane	630-20-6	2.63	2.20	1.17E+00	Equation 1	1.02E+01	Equation 2[b]
1,1,1-Trichloroethane	71-55-6	2.42	5.13	1.54E+00	Equation 1	6.88E+00	Equation 2

Table C2-1 Ecological Transfer Factors for COPCs and ROPCs

Constituent of Potential Concern	CAS Registry Number	Mammal Ba ([mg/kg tissue] / [mg ingested /day])	Source	WP (L/kg tissue)	Source	SP (kg dry sediment/ kg dry tissue)	Source
n-Butyl alcohol	71-36-3	1.91E-07	Equation 3	3.76E-01	Equation 2	1.20E+01	Equation 1
n-Heptane	142-82-5	1.15E-03	Equation 3	4.68E+02	Equation 2	7.84E-02	Equation 1
n-Hexane	110-54-3	3.24E-04	Equation 3	1.66E+02	Equation 2	1.63E-01	Equation 1
Nitromethane	75-52-5	1.12E-08	Equation 3	3.69E-02	Equation 2	6.17E+01	Equation 1
n-Nonane	111-84-2	1.12E-02	Equation 3	3.03E+03	Equation 2	2.10E-02	Equation 1
n-Octane	111-65-9	2.51E-04	Equation 3	1.35E+02	Equation 2	1.89E-01	Equation 1
n-Pentane	109-66-0	4.07E-05	Equation 3	3.04E+01	Equation 2	5.40E-01	Equation 1
n-Propionaldehyde	123-38-6	9.77E-08	Equation 3	2.17E-01	Equation 2	1.77E+01	Equation 1
n-Propyl alcohol	71-23-8	4.47E-08	Equation 3	1.14E-01	Equation 2	2.78E+01	Equation 1
n-Valeraldehyde	110-62-3	No data	No data	No data	No data	No data	No data
Oxirane	75-21-8	1.26E-08	Equation 3	4.06E-02	Equation 2	5.77E+01	Equation 1
p-Cymene	99-87-6	3.16E-04	Equation 3	1.63E+02	Equation 2	1.65E-01	Equation 1
Phosgene	75-44-5	No data	No data	No data	No data	No data	No data
Propargyl alcohol	107-19-7	1.05E-08	Equation 3	3.49E-02	Equation 2	6.42E+01	Equation 1
Propionic acid	79-09-4	5.37E-08	Equation 3	1.33E-01	Equation 2	2.50E+01	Equation 1
Propionitrile	107-12-0	3.63E-08	Equation 3	9.66E-02	Equation 2	3.13E+01	Equation 1
Propylene glycol monomethyl ether	107-98-2	8.13E-09	Equation 3	2.84E-02	Equation 2	7.43E+01	Equation 1
p-tert-Butyltoluene	98-51-1	No data	No data	No data	No data	No data	No data
Triethylamine	121-44-8	7.08E-07	Equation 3	1.10E+00	Equation 2	5.62E+00	Equation 1
Trimethylamine	75-50-3	3.63E-08	Equation 3	9.66E-02	Equation 2	3.13E+01	Equation 1
Vinyl acetate	108-05-4	1.26E-07	Equation 3	2.67E-01	Equation 2	1.53E+01	Equation 1
Non-aromatic Halogenated Hydrocarbons							
1,1,1,2-Tetrachloro-2,2-difluoroethane	76-11-9	6.46E-05	Equation 3	4.43E+01	Equation 2[b]	4.14E-01	Equation 1
1,1,1,2-Tetrachloroethane	630-20-6	1.07E-05	Equation 3	1.02E+01	Equation 2	1.17E+00	Equation 1
1,1,1-Trichloroethane	71-55-6	6.63E-06	Equation 3	6.88E+00	Equation 2	1.54E+00	Equation 1

Table C2-1 Ecological Transfer Factors for COPCs and ROPCs

Constituent of Potential Concern	CAS Registry Number	BCF_{fish} (L/kg tissue)	Source	BASF (kg dry sediment/ kg tissue)	Source
n-Butyl alcohol	71-36-3	1.03E+00	Equation 4	3.76E-01	Equation 2
n-Heptane	142-82-5	2.68E+03	Equation 4	4.68E+02	Equation 2
n-Hexane	110-54-3	8.84E+02	Equation 4	1.66E+02	Equation 2
Nitromethane	75-52-5	7.86E-02	Equation 4	3.69E-02	Equation 2
n-Nonane	111-84-2	1.34E+04	Equation 4	3.03E+03	Equation 2
n-Octane	111-65-9	7.05E+02	Equation 4	1.35E+02	Equation 2
n-Pentane	109-66-0	1.36E+02	Equation 4	3.04E+01	Equation 2
n-Propionaldehyde	123-38-6	5.64E-01	Equation 4	2.17E-01	Equation 2
n-Propyl alcohol	71-23-8	2.76E-01	Equation 4	1.14E-01	Equation 2
n-Valeraldehyde	110-62-3	No data	No data	No data	No data
Oxirane	75-21-8	8.73E-02	Equation 4	4.06E-02	Equation 2
p-Cymene	99-87-6	8.66E+02	Equation 4	1.63E+02	Equation 2
Phosgene	75-44-5	No data	No data	No data	No data
Propargyl alcohol	107-19-7	7.38E-02	Equation 4	3.49E-02	Equation 2
Propionic acid	79-09-4	3.27E-01	Equation 4	1.33E-01	Equation 2
Propionitrile	107-12-0	2.29E-01	Equation 4	9.66E-02	Equation 2
Propylene glycol monomethyl ether	107-98-2	5.86E-02	Equation 4	2.84E-02	Equation 2
p-tert-Butyltoluene	98-51-1	No data	No data	No data	No data
Triethylamine	121-44-8	3.42E+00	Equation 4	1.10E+00	Equation 2
Trimethylamine	75-50-3	2.29E-01	Equation 4	9.66E-02	Equation 2
Vinyl acetate	108-05-4	7.08E-01	Equation 4	2.67E-01	Equation 2
Non-aromatic Halogenated Hydrocarbons					
1,1,1,2-Tetrachloro-2,2-difluoroethane	76-11-9	2.07E+02	Equation 4	4.43E+01	Equation 2[b]
1,1,1,2-Tetrachloroethane	630-20-6	4.05E+01	Equation 4	1.02E+01	Equation 2
1,1,1-Trichloroethane	71-55-6	2.62E+01	Equation 4	6.88E+00	Equation 2

Table C2-1 Ecological Transfer Factors for COPCs and ROPCs

Constituent of Potential Concern	CAS Registry Number	Log K_{ow}[a]	Log K_{oc}[a]	SPv (kg dry soil/kg dry tissue)	Source	BAF-S (kg dry soil/ kg tissue)	Source
1,1,2,2-Tetrachloro-1,2-difluoroethane	76-12-0	3.73	2.50	2.70E-01	Equation 1	8.11E+01	Equation 2
1,1,2,2-Tetrachloroethane	79-34-5	4.64	1.90	8.02E-02	Equation 1	4.54E+02	Equation 2[b]
1,1,2,2-Tetrachloroethene	127-18-4	2.55	2.42	1.31E+00	Equation 1	8.68E+00	Equation 2
1,1,2-Trichloroethane	79-00-5	2.10	1.88	2.38E+00	Equation 1	3.73E+00	Equation 2
1,1,2-Trichloroethylene	79-01-6	2.43	1.97	1.52E+00	Equation 1	7.02E+00	Equation 2
1,1-Dichloroethane	75-34-3	1.79	1.72	3.56E+00	Equation 1	2.10E+00	Equation 2
1,1-Dichloroethene	75-35-4	2.12	1.81	2.30E+00	Equation 1	3.90E+00	Equation 2
1,2,2-Trichloro-1,1,2-trifluoroethane	76-13-1	3.16	2.41	5.77E-01	Equation 1	2.77E+01	Equation 2[b]
1,2,3-Trichloropropane	96-18-4	2.25	1.91	1.94E+00	Equation 1	4.98E+00	Equation 2
1,2-Dibromo-3-chloropropane	96-12-8	2.34	1.98	1.72E+00	Equation 1	5.90E+00	Equation 2
1,2-Dichloro-1,1,2,2-tetrafluoroethane	76-14-2	2.82	2.35	9.08E-01	Equation 1	1.46E+01	Equation 2[b]
1,2-Dichloroethane	107-06-2	1.46	1.29	5.53E+00	Equation 1	1.13E+00	Equation 2
1,2-Dichloroethylene	540-59-0	2.09	1.64	2.40E+00	Equation 1	3.68E+00	Equation 2
1,2-Dichloropropane	78-87-5	2.25	1.67	1.94E+00	Equation 1	4.98E+00	Equation 2
1,3-Dichloropropene	542-75-6	1.75	1.43	3.78E+00	Equation 1	1.93E+00	Equation 2
1,4-Dichloro-2-butene	764-41-0	2.60	2.17	1.21E+01	Equation 1	3.70E-01	Equation 2
1-Chloroethene	75-01-4	1.15	1.05	8.43E+00	EPA (1999)	6.20E-01	EPA (1999)
2,2-Dichloropropionic acid	75-99-0	1.68	0.44	4.14E+00	Equation 1	1.70E+00	Equation 2
2-Chloropropane	75-29-6	1.90	1.63	3.09E+00	Equation 1	2.57E+00	Equation 2
3-Chloropropene (Allyl chloride)	107-05-1	1.93	1.64	2.97E+00	Equation 1	2.72E+00	Equation 2
Bromochloromethane	74-97-5	1.41	1.25	5.93E+00	Equation 1	1.02E+00	Equation 2
Bromodichloromethane	75-27-4	2.03	1.73	2.61E+00	Equation 1	3.26E+00	Equation 2
Bromoethene	593-60-2	1.57	1.38	9.37E+00	Equation 1	5.34E-01	Equation 2
Bromoform	75-25-2	2.35	2.10	1.70E+00	Equation 1	6.01E+00	Equation 2
Bromomethane	74-83-9	1.11	0.95	8.79E+00	Equation 1	5.84E-01	Equation 2
Carbon tetrachloride	56-23-5	2.72	2.18	1.04E+00	EPA (1999)	1.20E+01	EPA (1999)

Table C2-1 Ecological Transfer Factors for COPCs and ROPCs

Constituent of Potential Concern	CAS Registry Number	Mammal Ba ([mg/kg tissue] / [mg ingested /day])	Source	WP (L/kg tissue)	Source	SP (kg dry sediment/ kg dry tissue)	Source
1,1,2,2-Tetrachloro-1,2-difluoroethane	76-12-0	1.35E-04	Equation 3	8.11E+01	Equation 2	2.70E-01	Equation 1
1,1,2,2-Tetrachloroethane	79-34-5	1.11E-03	Equation 3	4.54E+02	Equation 2	8.02E-02	Equation 1
1,1,2,2-Tetrachloroethene	127-18-4	8.82E-06	Equation 3	8.68E+00	Equation 2	1.31E+00	Equation 1
1,1,2-Trichloroethane	79-00-5	3.14E-06	Equation 3	3.73E+00	Equation 2	2.38E+00	Equation 1
1,1,2-Trichloroethylene	79-01-6	6.81E-06	Equation 3	7.02E+00	Equation 2	1.52E+00	Equation 1
1,1-Dichloroethane	75-34-3	1.56E-06	Equation 3	2.10E+00	Equation 2	3.56E+00	Equation 1
1,1-Dichloroethene	75-35-4	3.32E-06	Equation 3	3.90E+00	Equation 2	2.30E+00	Equation 1
1,2,2-Trichloro-1,1,2-trifluoroethane	76-13-1	3.63E-05	Equation 3	2.77E+01	Equation 2	5.77E-01	Equation 1
1,2,3-Trichloropropane	96-18-4	4.47E-06	Equation 3	4.98E+00	Equation 2	1.94E+00	Equation 1
1,2-Dibromo-3-chloropropane	96-12-8	5.50E-06	Equation 3	5.90E+00	Equation 2	1.72E+00	Equation 1
1,2-Dichloro-1,1,2,2-tetrafluoroethane	76-14-2	1.66E-05	Equation 3	1.46E+01	Equation 2	9.08E-01	Equation 1
1,2-Dichloroethane	107-06-2	7.28E-07	Equation 3	1.13E+00	Equation 2	5.53E+00	Equation 1
1,2-Dichloroethylene	540-59-0	3.09E-06	Equation 3	3.68E+00	Equation 2	2.40E+00	Equation 1
1,2-Dichloropropane	78-87-5	4.47E-06	Equation 3	4.98E+00	Equation 2	1.94E+00	Equation 1
1,3-Dichloropropene	542-75-6	1.41E-06	Equation 3	1.93E+00	Equation 2	3.78E+00	Equation 1
1,4-Dichloro-2-butene	764-41-0	1.87E-07	Equation 3	3.70E-01	Equation 2	1.21E+01	Equation 1
1-Chloroethene	75-01-4	3.52E-07	Equation 3	6.20E-01	EPA (1999)	8.43E+00	EPA (1999)
2,2-Dichloropropionic acid	75-99-0	1.20E-06	Equation 3	1.70E+00	Equation 2	4.14E+00	Equation 1
2-Chloropropane	75-29-6	2.00E-06	Equation 3	2.57E+00	Equation 2	3.09E+00	Equation 1
3-Chloropropene (Allyl chloride)	107-05-1	2.14E-06	Equation 3	2.72E+00	Equation 2	2.97E+00	Equation 1
Bromochloromethane	74-97-5	6.46E-07	Equation 3	1.02E+00	Equation 2	5.93E+00	Equation 1
Bromodichloromethane	75-27-4	2.66E-06	Equation 3	3.26E+00	Equation 2	2.61E+00	Equation 1
Bromoethene	593-60-2	2.93E-07	Equation 3	5.34E-01	Equation 2	9.37E+00	Equation 1
Bromoform	75-25-2	5.63E-06	Equation 3	6.01E+00	Equation 2	1.70E+00	Equation 1
Bromomethane	74-83-9	3.27E-07	Equation 3	5.84E-01	Equation 2	8.79E+00	Equation 1
Carbon tetrachloride	56-23-5	1.31E-05	Equation 3	3.00E+02	EPA (1999)	1.04E+00	EPA (1999)

Table C2-1 Ecological Transfer Factors for COPCs and ROPCs

Constituent of Potential Concern	CAS Registry Number	BCF_{fish} (L/kg tissue)	Source	BASF (kg dry sediment/ kg tissue)	Source
1,1,2,2-Tetrachloro-1,2-difluoroethane	76-12-0	4.03E+02	Equation 4	8.11E+01	Equation 2
1,1,2,2-Tetrachloroethane	79-34-5	2.60E+03	Equation 4	4.54E+02	Equation 2
1,1,2,2-Tetrachloroethene	127-18-4	3.39E+01	Equation 4	8.68E+00	Equation 2
1,1,2-Trichloroethane	79-00-5	1.32E+01	Equation 4	3.73E+00	Equation 2
1,1,2-Trichloroethylene	79-01-6	2.68E+01	Equation 4	7.02E+00	Equation 2
1,1-Dichloroethane	75-34-3	7.00E+00	Equation 4	2.10E+00	Equation 2
1,1-Dichloroethene	75-35-4	1.39E+01	Equation 4	3.90E+00	Equation 2
1,2,2-Trichloro-1,1,2-trifluoroethane	76-13-1	1.23E+02	Equation 4	2.77E+01	Equation 2
1,2,3-Trichloropropane	96-18-4	1.83E+01	Equation 4	4.98E+00	Equation 2
1,2-Dibromo-3-chloropropane	96-12-8	2.21E+01	Equation 4	5.90E+00	Equation 2
1,2-Dichloro-1,1,2,2-tetrafluoroethane	76-14-2	6.02E+01	Equation 4	1.46E+01	Equation 2
1,2-Dichloroethane	107-06-2	3.51E+00	Equation 4	1.13E+00	Equation 2
1,2-Dichloroethylene	540-59-0	1.31E+01	Equation 4	3.68E+00	Equation 2
1,2-Dichloropropane	78-87-5	1.83E+01	Equation 4	4.98E+00	Equation 2
1,3-Dichloropropene	542-75-6	6.38E+00	Equation 4	1.93E+00	Equation 2
1,4-Dichloro-2-butene	764-41-0	1.02E+00	Equation 4	3.70E-01	Equation 2
1-Chloroethene	75-01-4	1.81E+00	EPA (1999)	6.20E-01	EPA (1999)
2,2-Dichloropropionic acid	75-99-0	5.53E+00	Equation 4	1.70E+00	Equation 2
2-Chloropropane	75-29-6	8.77E+00	Equation 4	2.57E+00	Equation 2
3-Chloropropene (Allyl chloride)	107-05-1	9.34E+00	Equation 4	2.72E+00	Equation 2
Bromochloromethane	74-97-5	3.14E+00	Equation 4	1.02E+00	Equation 2
Bromodichloromethane	75-27-4	1.14E+01	Equation 4	3.26E+00	Equation 2
Bromoethene	593-60-2	1.53E+00	Equation 4	5.34E-01	Equation 2
Bromoform	75-25-2	2.25E+01	Equation 4	6.01E+00	Equation 2
Bromomethane	74-83-9	1.69E+00	Equation 4	5.84E-01	Equation 2
Carbon tetrachloride	56-23-5	3.00E+01	EPA (1999)	1.20E+01	EPA (1999)

Table C2-1 Ecological Transfer Factors for COPCs and ROPCs

Constituent of Potential Concern	CAS Registry Number	Log K_{ow}[a]	Log K_{oc}[a]	SPv (kg dry soil/kg dry tissue)	Source	BAF-S (kg dry soil/ kg tissue)	Source
Chlorodibromomethane	124-48-1	2.18	1.85	2.14E+00	Equation 1	4.33E+00	Equation 2
Chlorodifluoromethane	75-45-6	1.08	0.99	9.21E+00	Equation 1	5.47E-01	Equation 2
Chloroethane	75-00-3	3.10	2.57	6.25E-01	Equation 1	2.47E+01	Equation 2[b]
Chloroform	67-66-3	1.95	1.72	2.90E+00	EPA (1999)	2.82E+00	EPA (1999)
Chloromethane	74-87-3	0.90	0.78	1.16E+01	Equation 1	3.92E-01	Equation 2
Chloropentafluoroethane	76-15-3	2.10	2.85	2.37E+00	Equation 1	3.75E+00	Equation 2
cis-1,2-Dichloroethene	156-59-2	1.98	1.70	2.77E+00	Equation 1	3.00E+00	Equation 2
cis-1,3-Dichloropropene	10061-01-5	No data	No data	No data	No data	No data	No data
Cyanogen bromide	506-68-3	-0.29	-0.08	5.70E+01	Equation 1	4.14E-02	Equation 2
Cyanogen chloride	506-77-4	-0.38	0.65	6.42E+01	Equation 1	3.49E-02	Equation 2
Dichlorodifluoromethane	75-71-8	2.16	0.84	2.19E+00	Equation 1	4.19E+00	Equation 2
Dichlorofluoromethane	75-43-4	1.55	1.54	4.92E+00	Equation 1	1.33E+00	Equation 2
Dichloromethane	75-09-2	1.26	1.00	7.29E+00	Equation 1	7.62E-01	Equation 2
Difluorodibromomethane	75-61-6	No data	No data	No data	No data	No data	No data
Hexafluoroacetone	684-16-2	No data	No data	No data	No data	No data	No data
Iodomethane	74-88-4	1.69	1.47	4.08E+00	Equation 1	1.73E+00	Equation 2
Methylene bromide	74-95-3	1.62	1.41	4.48E+00	Equation 1	1.52E+00	Equation 2
Pentachloroethane	76-01-7	3.05	2.53	6.68E-01	Equation 1	2.25E+01	Equation 2[b]
trans-1,2-Dichloroethylene	156-60-5	1.98	1.58	2.77E+00	Equation 1	3.00E+00	Equation 2
trans-1,3-Dichloropropene	10061-02-6	2.06	1.76	2.50E+00	Equation 1	3.48E+00	Equation 2
Trichloroacetic acid	76-03-9	1.33	1.19	6.60E+00	Equation 1	8.78E-01	Equation 2
Trichlorofluoroethane	27154-33-2	No data	No data	No data	No data	No data	No data
Trichlorofluoromethane	75-69-4	2.53	2.13	1.33E+00	Equation 1	8.46E+00	Equation 2
Trifluorobromomethane	75-63-8	1.86	1.60	3.26E+00	Equation 1	2.38E+00	Equation 2
Dioxin and Furan Compounds (PCDDs/PCDFs)							
1,2,3,4,6,7,8-Heptachlorodibenzo(p)dioxin	35822-46-9	8.20	7.99	2.90E-04	EPA (1999)	8.10E-02	EPA (1999)

Table C2-1 Ecological Transfer Factors for COPCs and ROPCs

Constituent of Potential Concern	CAS Registry Number	Mammal Ba ([mg/kg tissue] / [mg ingested /day])	Source	WP (L/kg tissue)	Source	SP (kg dry sediment/ kg dry tissue)	Source
Chlorodibromomethane	124-48-1	3.77E-06	Equation 3	4.33E+00	Equation 2	2.14E+00	Equation 1
Chlorodifluoromethane	75-45-6	3.01E-07	Equation 3	5.47E-01	Equation 2	9.21E+00	Equation 1
Chloroethane	75-00-3	3.16E-05	Equation 3	2.47E+01	Equation 2	6.25E-01	Equation 1
Chloroform	67-66-3	2.24E-06	Equation 3	2.82E+00	EPA (1999)	2.90E+00	EPA (1999)
Chloromethane	74-87-3	2.01E-07	Equation 3	3.92E-01	Equation 2	1.16E+01	Equation 1
Chloropentafluoroethane	76-15-3	3.16E-06	Equation 3	3.75E+00	Equation 2	2.37E+00	Equation 1
cis-1,2-Dichloroethene	156-59-2	2.41E-06	Equation 3	3.00E+00	Equation 2	2.77E+00	Equation 1
cis-1,3-Dichloropropene	10061-01-5	No data	No data	No data	No data	No data	No data
Cyanogen bromide	506-68-3	1.29E-08	Equation 3	4.14E-02	Equation 2	5.70E+01	Equation 1
Cyanogen chloride	506-77-4	1.05E-08	Equation 3	3.49E-02	Equation 2	6.42E+01	Equation 1
Dichlorodifluoromethane	75-71-8	3.62E-06	Equation 3	4.19E+00	Equation 2	2.19E+00	Equation 1
Dichlorofluoromethane	75-43-4	8.91E-07	Equation 3	1.33E+00	Equation 2	4.92E+00	Equation 1
Dichloromethane	75-09-2	4.52E-07	Equation 3	7.62E-01	Equation 2	7.29E+00	Equation 1
Difluorodibromomethane	75-61-6	No data	No data	No data	No data	No data	No data
Hexafluoroacetone	684-16-2	No data	No data	No data	No data	No data	No data
Iodomethane	74-88-4	1.23E-06	Equation 3	1.73E+00	Equation 2	4.08E+00	Equation 1
Methylene bromide	74-95-3	1.05E-06	Equation 3	1.52E+00	Equation 2	4.48E+00	Equation 1
Pentachloroethane	76-01-7	2.82E-05	Equation 3	2.25E+01	Equation 2	6.68E-01	Equation 1
trans-1,2-Dichloroethylene	156-60-5	2.41E-06	Equation 3	3.00E+00	Equation 2	2.77E+00	Equation 1
trans-1,3-Dichloropropene	10061-02-6	2.88E-06	Equation 3	3.48E+00	Equation 2	2.50E+00	Equation 1
Trichloroacetic acid	76-03-9	5.37E-07	Equation 3	8.78E-01	Equation 2	6.60E+00	Equation 1
Trichlorofluoroethane	27154-33-2	No data	No data	No data	No data	No data	No data
Trichlorofluoromethane	75-69-4	8.54E-06	Equation 3	8.46E+00	Equation 2	1.33E+00	Equation 1
Trifluorobromomethane	75-63-8	1.82E-06	Equation 3	2.38E+00	Equation 2	3.26E+00	Equation 1
Dioxin and Furan Compounds (PCDDs/PCDFs)							
1,2,3,4,6,7,8-Heptachlorodibenzo(p)dioxin	35822-46-9	2.77E-03	TCDD x BEF	1.68E+02	EPA (1999)	2.90E-04	EPA (1999)

Table C2-1 Ecological Transfer Factors for COPCs and ROPCs

Constituent of Potential Concern	CAS Registry Number	BCF_{fish} (L/kg tissue)	Source	BASF (kg dry sediment/ kg tissue)	Source
Chlorodibromomethane	124-48-1	1.56E+01	Equation 4	4.33E+00	Equation 2
Chlorodifluoromethane	75-45-6	1.57E+00	Equation 4	5.47E-01	Equation 2
Chloroethane	75-00-3	1.08E+02	Equation 4	2.47E+01	Equation 2
Chloroform	67-66-3	3.59E+00	EPA (1999)	2.82E+00	EPA (1999)
Chloromethane	74-87-3	1.09E+00	Equation 4	3.92E-01	Equation 2
Chloropentafluoroethane	76-15-3	1.33E+01	Equation 4	3.75E+00	Equation 2
cis-1,2-Dichloroethene	156-59-2	1.04E+01	Equation 4	3.00E+00	Equation 2
cis-1,3-Dichloropropene	10061-01-5	No data	No data	No data	No data
Cyanogen bromide	506-68-3	8.91E-02	Equation 4	4.14E-02	Equation 2
Cyanogen chloride	506-77-4	7.38E-02	Equation 4	3.49E-02	Equation 2
Dichlorodifluoromethane	75-71-8	1.51E+01	Equation 4	4.19E+00	Equation 2
Dichlorofluoromethane	75-43-4	4.21E+00	Equation 4	1.33E+00	Equation 2
Dichloromethane	75-09-2	2.27E+00	Equation 4	7.62E-01	Equation 2
Difluorodibromomethane	75-61-6	No data	No data	No data	No data
Hexafluoroacetone	684-16-2	No data	No data	No data	No data
Iodomethane	74-88-4	5.65E+00	Equation 4	1.73E+00	Equation 2
Methylene bromide	74-95-3	4.88E+00	Equation 4	1.52E+00	Equation 2
Pentachloroethane	76-01-7	9.75E+01	Equation 4	2.25E+01	Equation 2
trans-1,2-Dichloroethylene	156-60-5	1.04E+01	Equation 4	3.00E+00	Equation 2
trans-1,3-Dichloropropene	10061-02-6	1.23E+01	Equation 4	3.48E+00	Equation 2
Trichloroacetic acid	76-03-9	2.66E+00	Equation 4	8.78E-01	Equation 2
Trichlorofluoroethane	27154-33-2	No data	No data	No data	No data
Trichlorofluoromethane	75-69-4	3.29E+01	Equation 4	8.46E+00	Equation 2
Trifluorobromomethane	75-63-8	8.06E+00	Equation 4	2.38E+00	Equation 2
Dioxin and Furan Compounds (PCDDs/PCDFs)					
1,2,3,4,6,7,8-Heptachlorodibenzo(p)dioxin	35822-46-9	2.16E+02	EPA (1999)	9.94E+01	EPA (1999)

Table C2-1 Ecological Transfer Factors for COPCs and ROPCs

Constituent of Potential Concern	CAS Registry Number	Log K_{ow}[a]	Log K_{oc}[a]	SPv (kg dry soil/kg dry tissue)	Source	BAF-S (kg dry soil/ kg tissue)	Source
1,2,3,4,6,7,8-Heptachlorodibenzofuran	67562-39-4	7.92	7.71	6.20E-05	EPA (1999)	1.70E-02	EPA (1999)
1,2,3,4,7,8,9-Heptachlorodibenzofuran	55673-89-7	7.92	7.71	2.20E-03	EPA (1999)	6.20E-01	EPA (1999)
1,2,3,4,7,8-Hexachlorodibenzo(p)dioxin	39227-28-6	7.79	7.58	1.70E-03	EPA (1999)	4.90E-01	EPA (1999)
1,2,3,4,7,8-Hexachlorodibenzofuran	70648-26-9	7.25	7.04	4.30E-04	EPA (1999)	1.21E-01	EPA (1999)
1,2,3,6,7,8-Hexachlorodibenzo(p)dioxin	57653-85-7	7.25	7.04	6.70E-04	EPA (1999)	1.90E-01	EPA (1999)
1,2,3,6,7,8-Hexachlorodibenzofuran	57117-44-9	7.25	7.04	1.10E-03	EPA (1999)	3.00E-01	EPA (1999)
1,2,3,7,8,9-Hexachlorodibenzo(p)dioxin	19408-74-3	7.25	7.04	7.80E-04	EPA (1999)	2.20E-01	EPA (1999)
1,2,3,7,8,9-Hexachlorodibenzofuran	72918-21-9	7.25	7.04	3.50E-03	EPA (1999)	1.00E+00	EPA (1999)
1,2,3,7,8-Pentachlorodibenzo(p)dioxin	40321-76-4	6.64	6.43	5.20E-03	EPA (1999)	1.46E+00	EPA (1999)
1,2,3,7,8-Pentachlorodibenzofuran	57117-41-6	6.79	6.58	1.10E-03	EPA (1999)	3.20E-01	EPA (1999)
2,3,4,6,7,8-Hexachlorodibenzofuran	60851-34-5	7.25	7.04	3.80E-03	EPA (1999)	1.07E+00	EPA (1999)
2,3,4,7,8-Pentachlorodibenzofuran	57117-31-4	6.92	6.71	9.00E-03	EPA (1999)	2.54E+00	EPA (1999)
2,3,7,8-Tetrachlorodibenzo(p)dioxin	1746-01-6	6.64	6.43	5.60E-03	EPA (1999)	1.59E+00	EPA (1999)
2,3,7,8-Tetrachlorodibenzofuran	51207-31-9	6.53	6.32	4.50E-03	EPA (1999)	1.27E+00	EPA (1999)
Dibenzofuran	132-64-9	4.33	4.12	1.22E-01	Equation 1	2.51E+02	Equation 2[b]
Octachlorodibenzo(p)dioxin	3268-87-9	7.59	7.38	6.70E-05	EPA (1999)	1.90E-02	EPA (1999)
Octachlorodibenzofuran	39001-02-0	8.78	8.57	9.00E-05	EPA (1999)	2.50E-02	EPA (1999)
Total dioxins and dibenzofurans	No CAS #	No data	No data	No data	No data	No data	No data
Polychlorinated Biphenyls (PCBs)							
2,2',3,3',4,4',5-Heptachlorobiphenyl	35065-30-6	7.08	6.85	3.13E-03	Equation 1	4.88E+03	Mass-limited
2,2',3,4,4',5,5'-Heptachlorobiphenyl	35065-29-3	7.12	6.92	2.97E-03	Equation 1	4.88E+03	Mass-limited
2,3,3',4,4',5,5'-Heptachlorobiphenyl	39635-31-9	No data	No data	No data	No data	No data	No data
2,3,3',4,4',5'-Hexachlorobiphenyl	69782-90-7	No data	No data	No data	No data	No data	No data
2,3,3',4,4',5-Hexachlorobiphenyl	38380-08-4	No data	No data	No data	No data	No data	No data
2,3,3',4,4'-Pentachlorobiphenyl	32598-14-4	No data	No data	No data	No data	No data	No data
2,3',4,4',5,5'-Hexachlorobiphenyl	52663-72-6	No data	No data	No data	No data	No data	No data
2,3,4,4',5-Pentachlorobiphenyl	74472-37-0	No data	No data	No data	No data	No data	No data

Table C2-1 Ecological Transfer Factors for COPCs and ROPCs

Constituent of Potential Concern	CAS Registry Number	Mammal Ba ([mg/kg tissue] / [mg ingested /day])	Source	WP (L/kg tissue)	Source	SP (kg dry sediment/ kg dry tissue)	Source
1,2,3,4,6,7,8-Heptachlorodibenzofuran	67562-39-4	5.98E-04	TCDD x BEF	3.63E+01	EPA (1999)	6.20E-05	EPA (1999)
1,2,3,4,7,8,9-Heptachlorodibenzofuran	55673-89-7	2.12E-02	TCDD x BEF	1.29E+03	EPA (1999)	2.20E-03	EPA (1999)
1,2,3,4,7,8-Hexachlorodibenzo(p)dioxin	39227-28-6	1.68E-02	TCDD x BEF	1.02E+03	EPA (1999)	1.70E-03	EPA (1999)
1,2,3,4,7,8-Hexachlorodibenzofuran	70648-26-9	4.13E-03	TCDD x BEF	2.51E+02	EPA (1999)	4.30E-04	EPA (1999)
1,2,3,6,7,8-Hexachlorodibenzo(p)dioxin	57653-85-7	6.52E-03	TCDD x BEF	3.96E+02	EPA (1999)	6.70E-04	EPA (1999)
1,2,3,6,7,8-Hexachlorodibenzofuran	57117-44-9	1.03E-02	TCDD x BEF	6.27E+02	EPA (1999)	1.10E-03	EPA (1999)
1,2,3,7,8,9-Hexachlorodibenzo(p)dioxin	19408-74-3	7.61E-03	TCDD x BEF	4.62E+02	EPA (1999)	7.80E-04	EPA (1999)
1,2,3,7,8,9-Hexachlorodibenzofuran	72918-21-9	3.42E-02	TCDD x BEF	2.08E+03	EPA (1999)	3.50E-03	EPA (1999)
1,2,3,7,8-Pentachlorodibenzo(p)dioxin	40321-76-4	5.00E-02	TCDD x BEF	3.04E+03	EPA (1999)	5.20E-03	EPA (1999)
1,2,3,7,8-Pentachlorodibenzofuran	57117-41-6	1.20E-02	TCDD x BEF	7.26E+02	EPA (1999)	1.10E-03	EPA (1999)
2,3,4,6,7,8-Hexachlorodibenzofuran	60851-34-5	3.64E-02	TCDD x BEF	2.21E+03	EPA (1999)	3.80E-03	EPA (1999)
2,3,4,7,8-Pentachlorodibenzofuran	57117-31-4	8.70E-02	TCDD x BEF	5.28E+03	EPA (1999)	9.00E-03	EPA (1999)
2,3,7,8-Tetrachlorodibenzo(p)dioxin	1746-01-6	5.43E-02	EPA (1999)	3.30E+03	EPA (1999)	5.60E-03	EPA (1999)
2,3,7,8-Tetrachlorodibenzofuran	51207-31-9	4.34E-02	TCDD x BEF	2.64E+03	EPA (1999)	4.50E-03	EPA (1999)
Dibenzofuran	132-64-9	5.37E-04	Equation 3	2.51E+02	Equation 2	1.22E-01	Equation 1
Octachlorodibenzo(p)dioxin	3268-87-9	6.52E-04	TCDD x BEF	3.96E+01	EPA (1999)	6.70E-05	EPA (1999)
Octachlorodibenzofuran	39001-02-0	8.70E-04	TCDD x BEF	5.28E+01	EPA (1999)	9.00E-05	EPA (1999)
Total dioxins and dibenzofurans	No CAS #	No data	No data	No data	No data	No data	No data
Polychlorinated Biphenyls (PCBs)							
2,2',3,3',4,4',5-Heptachlorobiphenyl	35065-30-6	3.02E-01	Equation 3	4.49E+04	Equation 2	3.13E-03	Equation 1
2,2',3,4,4',5,5'-Heptachlorobiphenyl	35065-29-3	3.31E-01	Equation 3	4.84E+04	Equation 2	2.97E-03	Equation 1
2,3,3',4,4',5,5'-Heptachlorobiphenyl	39635-31-9	No data	No data	No data	No data	No data	No data
2,3,3',4,4',5'-Hexachlorobiphenyl	69782-90-7	No data	No data	No data	No data	No data	No data
2,3,3',4,4',5-Hexachlorobiphenyl	38380-08-4	No data	No data	No data	No data	No data	No data
2,3,3',4,4'-Pentachlorobiphenyl	32598-14-4	No data	No data	No data	No data	No data	No data
2,3',4,4',5,5'-Hexachlorobiphenyl	52663-72-6	No data	No data	No data	No data	No data	No data
2,3,4,4',5-Pentachlorobiphenyl	74472-37-0	No data	No data	No data	No data	No data	No data

Table C2-1 Ecological Transfer Factors for COPCs and ROPCs

Constituent of Potential Concern	CAS Registry Number	BCF_{fish} (L/kg tissue)	Source	BASF (kg dry sediment/ kg tissue)	Source
1,2,3,4,6,7,8-Heptachlorodibenzofuran	67562-39-4	4.66E+01	EPA (1999)	2.16E+02	EPA (1999)
1,2,3,4,7,8,9-Heptachlorodibenzofuran	55673-89-7	1.65E+03	EPA (1999)	7.64E+03	EPA (1999)
1,2,3,4,7,8-Hexachlorodibenzo(p)dioxin	39227-28-6	1.31E+03	EPA (1999)	6.08E+03	EPA (1999)
1,2,3,4,7,8-Hexachlorodibenzofuran	70648-26-9	3.22E+02	EPA (1999)	1.49E+03	EPA (1999)
1,2,3,6,7,8-Hexachlorodibenzo(p)dioxin	57653-85-7	5.08E+02	EPA (1999)	2.35E+03	EPA (1999)
1,2,3,6,7,8-Hexachlorodibenzofuran	57117-44-9	8.05E+02	EPA (1999)	3.72E+03	EPA (1999)
1,2,3,7,8,9-Hexachlorodibenzo(p)dioxin	19408-74-3	5.93E+02	EPA (1999)	2.74E+03	EPA (1999)
1,2,3,7,8,9-Hexachlorodibenzofuran	72918-21-9	2.67E+03	EPA (1999)	1.23E+04	EPA (1999)
1,2,3,7,8-Pentachlorodibenzo(p)dioxin	40321-76-4	3.90E+03	EPA (1999)	1.80E+04	EPA (1999)
1,2,3,7,8-Pentachlorodibenzofuran	57117-41-6	9.32E+02	EPA (1999)	4.31E+03	EPA (1999)
2,3,4,6,7,8-Hexachlorodibenzofuran	60851-34-5	2.84E+03	EPA (1999)	1.31E+04	EPA (1999)
2,3,4,7,8-Pentachlorodibenzofuran	57117-31-4	6.78E+03	EPA (1999)	3.14E+04	EPA (1999)
2,3,7,8-Tetrachlorodibenzo(p)dioxin	1746-01-6	4.24E+03	EPA (1999)	1.96E+04	EPA (1999)
2,3,7,8-Tetrachlorodibenzofuran	51207-31-9	3.39E+03	EPA (1999)	2.64E+03	EPA (1999)
Dibenzofuran	132-64-9	1.39E+03	Equation 4	2.51E+02	Equation 2
Octachlorodibenzo(p)dioxin	3268-87-9	5.08E+01	EPA (1999)	2.35E+01	EPA (1999)
Octachlorodibenzofuran	39001-02-0	6.78E+01	EPA (1999)	3.14E+02	EPA (1999)
Total dioxins and dibenzofurans	No CAS #	No data	No data	No data	No data
Polychlorinated Biphenyls (PCBs)					
2,2',3,3',4,4',5-Heptachlorobiphenyl	35065-30-6	5.70E+03	Equation 4	4.49E+04	Equation 2
2,2',3,4,4',5,5'-Heptachlorobiphenyl	35065-29-3	5.26E+03	Equation 4	4.84E+04	Equation 2
2,3,3',4,4',5,5'-Heptachlorobiphenyl	39635-31-9	No data	No data	No data	No data
2,3,3',4,4',5'-Hexachlorobiphenyl	69782-90-7	No data	No data	No data	No data
2,3,3',4,4',5-Hexachlorobiphenyl	38380-08-4	No data	No data	No data	No data
2,3,3',4,4'-Pentachlorobiphenyl	32598-14-4	No data	No data	No data	No data
2,3',4,4',5,5'-Hexachlorobiphenyl	52663-72-6	No data	No data	No data	No data
2,3,4,4',5-Pentachlorobiphenyl	74472-37-0	No data	No data	No data	No data

Table C2-1 Ecological Transfer Factors for COPCs and ROPCs

Constituent of Potential Concern	CAS Registry Number	Log K_{ow}[a]	Log K_{oc}[a]	SPv (kg dry soil/kg dry tissue)	Source	BAF-S (kg dry soil/ kg tissue)	Source
2',3,4,4',5-Pentachlorobiphenyl	65510-44-3	No data	No data	No data	No data	No data	No data
2,3',4,4',5-Pentachlorobiphenyl	31508-00-6	7.12	7.00	2.97E-03	Equation 1	4.88E+03	Mass-limited
3,3',4,4',5,5'-Hexachlorobiphenyl	32774-16-6	7.41	6.60	2.02E-03	Equation 1	4.88E+03	Mass-limited
3,3',4,4',5-Pentachlorobiphenyl	57465-28-8	No data	No data	No data	No data	No data	No data
3,3',4,4'-Tetrachlorobiphenyl	32598-13-3	No data	No data	No data	No data	No data	No data
3,4,4',5-Tetrachlorobiphenyl	70362-50-4	No data	No data	No data	No data	No data	No data
Polychlorinated biphenyls (PCBs)[c]	1336-36-3	6.29	4.65	8.96E-03	Equation 1	1.13E+00	EPA (1999)
Phthalates							
Bis(2-ethylhexyl)phthalate (DEHP)	117-81-7	5.20	5.05	3.80E-02	EPA (1999)	1.31E+03	EPA (1999)
Butylbenzyl phthalate	85-68-7	4.41	4.14	1.09E-01	Equation 1	2.94E+02	Equation 2[b]
Dibutyl phthalate	84-74-2	4.72	3.20	7.24E-02	Equation 1	5.25E+02	Equation 2[b]
Diethyl phthalate	84-66-2	4.44	1.91	1.06E-01	Equation 1	3.07E+02	Equation 2[b]
Dimethyl phthalate	131-11-3	1.63	1.49	4.40E+00	Equation 1	1.56E+00	Equation 2
n-Dioctyl phthalate	117-84-0	9.33	8.96	1.57E-04	EPA (1999)	4.88E+03	Mass-limited
Light Polycyclic Aromatic Hydrocarbons (molecular weight <200 g/mole)							
2-Chloronaphthalene	91-58-7	4.07	3.85	1.72E-01	Equation 1	1.53E+02	Equation 2[b]
2-Methyl naphthalene	91-57-6	3.86	3.65	2.27E-01	Equation 1	1.04E+02	Equation 2[b]
5-Nitroacenaphthene	602-87-9	No data	No data	No data	No data	No data	No data
Acenaphthene	83-32-9	3.96	3.69	1.98E-01	Equation 1	1.26E+02	Equation 2[b]
Acenaphthylene	208-96-8	4.07	3.83	1.72E-01	Equation 1	1.54E+02	Equation 2[b]
Anthracene	120-12-7	4.47	4.37	1.01E-01	Equation 1	3.27E+02	Equation 2[b]
Fluorene	86-73-7	4.17	3.89	1.51E-01	Equation 1	1.86E+02	Equation 2[b]
Indene	95-13-6	No data	No data	No data	No data	No data	No data
Naphthalene	91-20-3	3.37	3.08	4.35E-01	Equation 1	4.13E+01	Equation 2[b]

Table C2-1 Ecological Transfer Factors for COPCs and ROPCs

Constituent of Potential Concern	CAS Registry Number	Mammal Ba ([mg/kg tissue] / [mg ingested /day])	Source	WP (L/kg tissue)	Source	SP (kg dry sediment/ kg dry tissue)	Source
2',3,4,4',5-Pentachlorobiphenyl	65510-44-3	No data	No data	No data	No data	No data	No data
2,3',4,4',5-Pentachlorobiphenyl	31508-00-6	3.31E-01	Equation 3	4.84E+04	Equation 2	2.97E-03	Equation 1
3,3',4,4',5,5'-Hexachlorobiphenyl	32774-16-6	6.43E-01	Equation 3	8.34E+04	Equation 2	2.02E-03	Equation 1
3,3',4,4',5-Pentachlorobiphenyl	57465-28-8	No data	No data	No data	No data	No data	No data
3,3',4,4'-Tetrachlorobiphenyl	32598-13-3	No data	No data	No data	No data	No data	No data
3,4,4',5-Tetrachlorobiphenyl	70362-50-4	No data	No data	No data	No data	No data	No data
Polychlorinated biphenyls (PCBs)[c]	1336-36-3	4.90E-02	Equation 3	1.13E+00	EPA (1999)	8.96E-03	Equation 1
	Phthalates						
Bis(2-ethylhexyl)phthalate (DEHP)	117-81-7	4.02E-03	Equation 3	9.93E+03	EPA (1999)	3.80E-02	EPA (1999)
Butylbenzyl phthalate	85-68-7	6.51E-04	Equation 3	2.94E+02	Equation 2	1.09E-01	Equation 1
Dibutyl phthalate	84-74-2	1.32E-03	Equation 3	5.25E+02	Equation 2	7.24E-02	Equation 1
Diethyl phthalate	84-66-2	6.86E-04	Equation 3	3.07E+02	Equation 2	1.06E-01	Equation 1
Dimethyl phthalate	131-11-3	1.08E-06	Equation 3	1.56E+00	Equation 2	4.40E+00	Equation 1
n-Dioctyl phthalate	117-84-0	5.37E+01	Equation 3	2.85E+04	EPA (1999)	1.57E-04	EPA (1999)
	Light Polycyclic Aromatic Hydrocarbons (molecular weight <200 g/mole)						
2-Chloronaphthalene	91-58-7	2.94E-04	Equation 3	1.53E+02	Equation 2	1.72E-01	Equation 1
2-Methyl naphthalene	91-57-6	1.82E-04	Equation 3	1.04E+02	Equation 2	2.27E-01	Equation 1
5-Nitroacenaphthene	602-87-9	No data	No data	No data	No data	No data	No data
Acenaphthene	83-32-9	2.32E-04	Equation 3	1.26E+02	Equation 2	1.98E-01	Equation 1
Acenaphthylene	208-96-8	2.95E-04	Equation 3	1.54E+02	Equation 2	1.72E-01	Equation 1
Anthracene	120-12-7	7.41E-04	Equation 3	3.27E+02	Equation 2	1.01E-01	Equation 1
Fluorene	86-73-7	3.72E-04	Equation 3	1.86E+02	Equation 2	1.51E-01	Equation 1
Indene	95-13-6	No data	No data	No data	No data	No data	No data
Naphthalene	91-20-3	5.93E-05	Equation 3	4.13E+01	Equation 2	4.35E-01	Equation 1

Table C2-1 Ecological Transfer Factors for COPCs and ROPCs

Constituent of Potential Concern	CAS Registry Number	BCF_{fish} (L/kg tissue)	Source	BASF (kg dry sediment/ kg tissue)	Source
2',3,4,4',5-Pentachlorobiphenyl	65510-44-3	No data	No data	No data	No data
2,3',4,4',5-Pentachlorobiphenyl	31508-00-6	5.26E+03	Equation 4	4.84E+04	Equation 2
3,3',4,4',5,5'-Hexachlorobiphenyl	32774-16-6	2.87E+03	Equation 4	8.34E+04	Equation 2
3,3',4,4',5-Pentachlorobiphenyl	57465-28-8	No data	No data	No data	No data
3,3',4,4'-Tetrachlorobiphenyl	32598-13-3	No data	No data	No data	No data
3,4,4',5-Tetrachlorobiphenyl	70362-50-4	No data	No data	No data	No data
Polychlorinated biphenyls (PCBs)[c]	1336-36-3	1.64E+04	Equation 4	1.13E+00	EPA (1999)
Phthalates					
Bis(2-ethylhexyl)phthalate (DEHP)	117-81-7	7.00E+01	EPA (1999)	1.31E+03	EPA (1999)
Butylbenzyl phthalate	85-68-7	1.64E+03	Equation 4	2.94E+02	Equation 2
Dibutyl phthalate	84-74-2	3.01E+03	Equation 4	5.25E+02	Equation 2
Diethyl phthalate	84-66-2	1.72E+03	Equation 4	3.07E+02	Equation 2
Dimethyl phthalate	131-11-3	5.02E+00	Equation 4	1.56E+00	Equation 2
n-Dioctyl phthalate	117-84-0	9.40E+03	EPA (1999)	3.13E+06	EPA (1999)
Light Polycyclic Aromatic Hydrocarbons (molecular weight <200 g/mole)					
2-Chloronaphthalene	91-58-7	8.11E+02	Equation 4	1.53E+02	Equation 2
2-Methyl naphthalene	91-57-6	5.28E+02	Equation 4	1.04E+02	Equation 2
5-Nitroacenaphthene	602-87-9	No data	No data	No data	No data
Acenaphthene	83-32-9	6.55E+02	Equation 4	1.26E+02	Equation 2
Acenaphthylene	208-96-8	8.14E+02	Equation 4	1.54E+02	Equation 2
Anthracene	120-12-7	1.84E+03	Equation 4	3.27E+02	Equation 2
Fluorene	86-73-7	1.00E+03	Equation 4	1.86E+02	Equation 2
Indene	95-13-6	No data	No data	No data	No data
Naphthalene	91-20-3	1.91E+02	Equation 4	4.13E+01	Equation 2

Table C2-1 Ecological Transfer Factors for COPCs and ROPCs

Constituent of Potential Concern	CAS Registry Number	Log K_{ow}[a]	Log K_{oc}[a]	SPv (kg dry soil/kg dry tissue)	Source	BAF-S (kg dry soil/ kg tissue)	Source
Phenanthrene	85-01-8	4.55	4.32	9.08E-02	Equation 1	3.81E+02	Equation 2[b]
Pyrene	129-00-0	5.00	4.83	4.99E-02	Equation 1	8.89E+02	Equation 2[b]
Heavy Polycyclic Aromatic Hydrocarbons (molecular weight >200 g/mole)							
3-Methylcholanthrene	56-49-5	7.11	6.18	3.01E-03	Equation 1	4.88E+03	Mass-limited
5-Methylchrysene	3697-24-3	No data	No data	No data	No data	No data	No data
Benzo[a]anthracene	56-55-3	5.68	5.41	2.02E-02	EPA (1999)	3.00E-02	EPA (1999)
Benzo[a]pyrene	50-32-8	6.13	5.99	1.11E-02	EPA (1999)	7.00E-02	EPA (1999)
Benzo[a,i]pyrene	191-30-0	No data	No data	No data	No data	No data	No data
Benzo[b]fluoranthene	205-99-2	6.20	5.92	1.01E-02	EPA (1999)	7.00E-02	EPA (1999)
Benzo[e]pyrene	192-97-2	7.40	7.20	2.05E-03	Equation 1	4.88E+03	Mass-limited
Benzo[g,h,i]perylene	191-24-2	7.10	6.26	3.05E-03	Equation 1	4.88E+03	Mass-limited
Benzo[j]fluoranthene	205-82-3	6.44	6.15	7.34E-03	Equation 1	4.88E+03	Mass-limited
Benzo[k]fluoranthene	207-08-9	6.19	5.92	1.01E-02	EPA (1999)	8.00E-02	EPA (1999)
Chrysene	218-01-9	5.74	5.47	1.87E-02	EPA (1999)	4.00E-02	EPA (1999)
Dibenz[a,h]acridine	226-36-8	No data	No data	No data	No data	No data	No data
Dibenz[a,h]anthracene	53-70-3	6.55	6.25	6.40E-03	EPA (1999)	7.00E-02	EPA (1999)
Dibenz[a,j]acridine	224-42-0	No data	No data	No data	No data	No data	No data
Dibenzo[a,e]fluoranthene	5385-75-1	No data	No data	No data	No data	No data	No data
Dibenzo[a,e]pyrene	192-65-4	No data	No data	No data	No data	No data	No data
Dibenzo[a,h]fluoranthene	No CAS #	No data	No data	No data	No data	No data	No data
Dibenzo[a,h]pyrene	189-64-0	No data	No data	No data	No data	No data	No data
Dibenzo[a,i]pyrene	189-55-9	7.29	6.98	2.37E-03	Equation 1	4.88E+03	Mass-limited
Fluoranthene	206-44-0	5.08	4.69	4.47E-02	Equation 1	1.04E+03	Equation 2[b]
Hexachloronaphthalene	1335-87-1	7.59	7.27	1.59E-03	Equation 1	4.88E+03	Mass-limited
Indeno[1,2,3-cd]pyrene	193-39-5	6.91	6.61	3.90E-03	EPA (1999)	8.00E-02	EPA (1999)
Octachloronaphthalene	2234-13-1	6.42	6.13	7.54E-03	Equation 1	4.88E+03	Mass-limited

Table C2-1 Ecological Transfer Factors for COPCs and ROPCs

Constituent of Potential Concern	CAS Registry Number	Mammal Ba ([mg/kg tissue] / [mg ingested /day])	Source	WP (L/kg tissue)	Source	SP (kg dry sediment/ kg dry tissue)	Source
Phenanthrene	85-01-8	8.92E-04	Equation 3	3.81E+02	Equation 2	9.08E-02	Equation 1
Pyrene	129-00-0	2.51E-03	Equation 3	8.89E+02	Equation 2	4.99E-02	Equation 1
Heavy Polycyclic Aromatic Hydrocarbons (molecular weight >200 g/mole)							
3-Methylcholanthrene	56-49-5	3.24E-01	Equation 3	4.75E+04	Equation 2	3.01E-03	Equation 1
5-Methylchrysene	3697-24-3	No data	No data	No data	No data	No data	No data
Benzo[a]anthracene	56-55-3	1.20E-02	Equation 3	5.26E+03	EPA (1999)	2.02E-02	EPA (1999)
Benzo[a]pyrene	50-32-8	2.74E-02	EPA (1999)	5.26E+03	EPA (1999)	1.11E-02	EPA (1999)
Benzo[a,i]pyrene	191-30-0	No data	No data	No data	No data	No data	No data
Benzo[b]fluoranthene	205-99-2	4.00E-02	Equation 3	5.26E+03	EPA (1999)	1.01E-02	EPA (1999)
Benzo[e]pyrene	192-97-2	6.31E-01	Equation 3	8.21E+04	Equation 2	2.05E-03	Equation 1
Benzo[g,h,i]perylene	191-24-2	3.16E-01	Equation 3	4.67E+04	Equation 2	3.05E-03	Equation 1
Benzo[j]fluoranthene	205-82-3	6.92E-02	Equation 3	1.34E+04	Equation 2	7.34E-03	Equation 1
Benzo[k]fluoranthene	207-08-9	3.98E-02	Equation 3	5.26E+03	EPA (1999)	1.01E-02	EPA (1999)
Chrysene	218-01-9	1.38E-02	Equation 3	5.26E+03	EPA (1999)	1.87E-02	EPA (1999)
Dibenz[a,h]acridine	226-36-8	No data	No data	No data	No data	No data	No data
Dibenz[a,h]anthracene	53-70-3	8.86E-02	Equation 3	5.26E+03	EPA (1999)	6.40E-03	EPA (1999)
Dibenz[a,j]acridine	224-42-0	No data	No data	No data	No data	No data	No data
Dibenzo[a,e]fluoranthene	5385-75-1	No data	No data	No data	No data	No data	No data
Dibenzo[a,e]pyrene	192-65-4	No data	No data	No data	No data	No data	No data
Dibenzo[a,h]fluoranthene	No CAS #	No data	No data	No data	No data	No data	No data
Dibenzo[a,h]pyrene	189-64-0	No data	No data	No data	No data	No data	No data
Dibenzo[a,i]pyrene	189-55-9	4.90E-01	Equation 3	6.68E+04	Equation 2	2.37E-03	Equation 1
Fluoranthene	206-44-0	3.04E-03	Equation 3	1.04E+03	Equation 2	4.47E-02	Equation 1
Hexachloronaphthalene	1335-87-1	9.77E-01	Equation 3	1.18E+05	Equation 2	1.59E-03	Equation 1
Indeno[1,2,3-cd]pyrene	193-39-5	2.07E-01	Equation 3	5.26E+03	EPA (1999)	3.90E-03	EPA (1999)
Octachloronaphthalene	2234-13-1	6.61E-02	Equation 3	1.29E+04	Equation 2	7.54E-03	Equation 1

Table C2-1 Ecological Transfer Factors for COPCs and ROPCs

Constituent of Potential Concern	CAS Registry Number	BCF_{fish} (L/kg tissue)	Source	BASF (kg dry sediment/ kg tissue)	Source
Phenanthrene	85-01-8	2.16E+03	Equation 4	3.81E+02	Equation 2
Pyrene	129-00-0	5.10E+03	Equation 4	8.89E+02	Equation 2
Heavy Polycyclic Aromatic Hydrocarbons (molecular weight >200 g/mole)					
3-Methylcholanthrene	56-49-5	5.37E+03	Equation 4	4.75E+04	Equation 2
5-Methylchrysene	3697-24-3	No data	No data	No data	No data
Benzo[a]anthracene	56-55-3	5.00E+02	EPA (1999)	1.45E+00	EPA (1999)
Benzo[a]pyrene	50-32-8	5.00E+02	EPA (1999)	1.59E+00	EPA (1999)
Benzo[a,i]pyrene	191-30-0	No data	No data	No data	No data
Benzo[b]fluoranthene	205-99-2	5.00E+02	EPA (1999)	1.61E+00	EPA (1999)
Benzo[e]pyrene	192-97-2	2.92E+03	Equation 4	8.21E+04	Equation 2
Benzo[g,h,i]perylene	191-24-2	5.48E+03	Equation 4	4.67E+04	Equation 2
Benzo[j]fluoranthene	205-82-3	1.48E+04	Equation 4	1.34E+04	Equation 2
Benzo[k]fluoranthene	207-08-9	5.00E+02	EPA (1999)	1.61E+00	EPA (1999)
Chrysene	218-01-9	5.00E+02	EPA (1999)	1.38E+00	EPA (1999)
Dibenz[a,h]acridine	226-36-8	No data	No data	No data	No data
Dibenz[a,h]anthracene	53-70-3	5.00E+02	EPA (1999)	1.61E+00	EPA (1999)
Dibenz[a,j]acridine	224-42-0	No data	No data	No data	No data
Dibenzo[a,e]fluoranthene	5385-75-1	No data	No data	No data	No data
Dibenzo[a,e]pyrene	192-65-4	No data	No data	No data	No data
Dibenzo[a,h]fluoranthene	No CAS #	No data	No data	No data	No data
Dibenzo[a,h]pyrene	189-64-0	No data	No data	No data	No data
Dibenzo[a,i]pyrene	189-55-9	3.70E+03	Equation 4	6.68E+04	Equation 2
Fluoranthene	206-44-0	5.91E+03	Equation 4	1.04E+03	Equation 2
Hexachloronaphthalene	1335-87-1	1.90E+03	Equation 4	1.18E+05	Equation 2
Indeno[1,2,3-cd]pyrene	193-39-5	5.00E+02	EPA (1999)	1.61E+00	EPA (1999)
Octachloronaphthalene	2234-13-1	1.50E+04	Equation 4	1.29E+04	Equation 2

Table C2-1 Ecological Transfer Factors for COPCs and ROPCs

Constituent of Potential Concern	CAS Registry Number	Log K_{ow}[a]	Log K_{oc}[a]	SPv (kg dry soil/kg dry tissue)	Source	BAF-S (kg dry soil/ kg tissue)	Source
Pentachloronaphthalene	1321-64-8	No data	No data	No data	No data	No data	No data
Tetrachloronaphthalene	1335-88-2	No data	No data	No data	No data	No data	No data
Trichloronaphthalene	1321-65-9	No data	No data	No data	No data	No data	No data
Light Substituted Benzene Compounds (molecular weight <200 g/mole)							
1,2,3-Trichlorobenzene	87-61-6	4.05	3.31	1.78E-01	Equation 1	1.47E+02	Equation 2[b]
1,2,4-Trichlorobenzene	120-82-1	3.99	3.22	1.92E-01	Equation 1	1.32E+02	Equation 2[b]
1,2,4-Trimethyl benzene	95-63-6	3.65	3.00	3.01E-01	Equation 1	6.97E+01	Equation 2[b]
1,2-Dichlorobenzene	95-50-1	3.45	2.58	3.95E-01	Equation 1	4.74E+01	Equation 2[b]
1,3,5-Trimethyl benzene	108-67-8	3.42	3.22	4.09E-01	Equation 1	4.52E+01	Equation 2[b]
1,3-Dichlorobenzene	541-73-1	3.53	2.90	3.53E-01	Equation 1	5.56E+01	Equation 2[b]
1,3-Dinitrobenzene	99-65-0	1.49	1.31	5.32E+00	EPA (1999)	1.19E+00	EPA (1999)
1,4-Dichlorobenzene	106-46-7	3.41	2.79	4.13E-01	Equation 1	4.45E+01	Equation 2[b]
1,4-Dinitrobenzene	100-25-4	1.50	2.34	5.26E+00	Equation 1	1.21E+00	Equation 2
2,4,5-Trichlorophenol	95-95-4	3.87	3.05	2.25E-01	Equation 1	1.06E+02	Equation 2[b]
2,4,6-Trichlorophenol	88-06-2	3.71	2.35	2.77E-01	Equation 1	7.83E+01	Equation 2[b]
2,4-Dichlorophenol	120-83-2	3.04	2.14	6.80E-01	Equation 1	2.20E+01	Equation 2[b]
2,4-Dimethylphenol	105-67-9	2.36	2.10	1.68E+00	Equation 1	6.12E+00	Equation 2
2,4-Dinitrophenol	51-28-5	1.52	-2.00	5.13E+00	Equation 1	1.25E+00	Equation 2
2,4-Dinitrotoluene	121-14-2	2.00	1.71	2.72E+00	EPA (1999)	3.08E+00	EPA (1999)
2,6-Dinitrotoluene	606-20-2	1.89	1.62	3.15E+00	EPA (1999)	2.50E+00	EPA (1999)
2-Chlorophenol	95-57-8	2.16	2.59	2.18E+00	Equation 1	4.21E+00	Equation 2
2-Chlorotoluene	95-49-8	3.42	2.65	3.50E-01	Equation 1	5.63E+01	Equation 2[b]
2-Nitrophenol	88-75-5	1.79	1.55	3.57E+00	Equation 1	2.09E+00	Equation 2
4,6-Dinitro-o-cresol	534-52-1	2.12	2.78	2.30E+00	Equation 1	3.89E+00	Equation 2

Table C2-1 Ecological Transfer Factors for COPCs and ROPCs

Constituent of Potential Concern	CAS Registry Number	Mammal Ba ([mg/kg tissue] / [mg ingested /day])	Source	WP (L/kg tissue)	Source	SP (kg dry sediment/ kg dry tissue)	Source
Pentachloronaphthalene	1321-64-8	No data	No data	No data	No data	No data	No data
Tetrachloronaphthalene	1335-88-2	No data	No data	No data	No data	No data	No data
Trichloronaphthalene	1321-65-9	No data	No data	No data	No data	No data	No data
Light Substituted Benzene Compounds (molecular weight <200 g/mole)							
1,2,3-Trichlorobenzene	87-61-6	2.79E-04	Equation 3	1.47E+02	Equation 2	1.78E-01	Equation 1
1,2,4-Trichlorobenzene	120-82-1	2.44E-04	Equation 3	1.32E+02	Equation 2	1.92E-01	Equation 1
1,2,4-Trimethyl benzene	95-63-6	1.12E-04	Equation 3	6.97E+01	Equation 2	3.01E-01	Equation 1
1,2-Dichlorobenzene	95-50-1	7.01E-05	Equation 3	4.74E+01	Equation 2	3.95E-01	Equation 1
1,3,5-Trimethyl benzene	108-67-8	6.61E-05	Equation 3	4.52E+01	Equation 2	4.09E-01	Equation 1
1,3-Dichlorobenzene	541-73-1	8.52E-05	Equation 3	5.56E+01	Equation 2	3.53E-01	Equation 1
1,3-Dinitrobenzene	99-65-0	7.79E-07	Equation 3	2.51E+03	EPA (1999)	5.32E+00	EPA (1999)
1,4-Dichlorobenzene	106-46-7	6.48E-05	Equation 3	4.45E+01	Equation 2	4.13E-01	Equation 1
1,4-Dinitrobenzene	100-25-4	7.94E-07	Equation 3	1.21E+00	Equation 2	5.26E+00	Equation 1
2,4,5-Trichlorophenol	95-95-4	1.86E-04	Equation 3	1.06E+02	Equation 2	2.25E-01	Equation 1
2,4,6-Trichlorophenol	88-06-2	1.29E-04	Equation 3	7.83E+01	Equation 2	2.77E-01	Equation 1
2,4-Dichlorophenol	120-83-2	2.74E-05	Equation 3	2.20E+01	Equation 2	6.80E-01	Equation 1
2,4-Dimethylphenol	105-67-9	5.75E-06	Equation 3	6.12E+00	Equation 2	1.68E+00	Equation 1
2,4-Dinitrophenol	51-28-5	8.29E-07	Equation 3	1.25E+00	Equation 2	5.13E+00	Equation 1
2,4-Dinitrotoluene	121-14-2	2.49E-06	Equation 3	2.51E+03	EPA (1999)	2.72E+00	EPA (1999)
2,6-Dinitrotoluene	606-20-2	1.93E-06	Equation 3	2.51E+03	EPA (1999)	3.15E+00	EPA (1999)
2-Chlorophenol	95-57-8	3.64E-06	Equation 3	4.21E+00	Equation 2	2.18E+00	Equation 1
2-Chlorotoluene	95-49-8	8.64E-05	Equation 3	5.63E+01	Equation 2	3.50E-01	Equation 1
2-Nitrophenol	88-75-5	1.55E-06	Equation 3	2.09E+00	Equation 2	3.57E+00	Equation 1
4,6-Dinitro-o-cresol	534-52-1	3.31E-06	Equation 3	3.89E+00	Equation 2	2.30E+00	Equation 1

Table C2-1 Ecological Transfer Factors for COPCs and ROPCs

Constituent of Potential Concern	CAS Registry Number	BCF_{fish} (L/kg tissue)	Source	BASF (kg dry sediment/ kg tissue)	Source
Pentachloronaphthalene	1321-64-8	No data	No data	No data	No data
Tetrachloronaphthalene	1335-88-2	No data	No data	No data	No data
Trichloronaphthalene	1321-65-9	No data	No data	No data	No data
Light Substituted Benzene Compounds (molecular weight <200 g/mole)					
1,2,3-Trichlorobenzene	87-61-6	7.74E+02	Equation 4	1.47E+02	Equation 2
1,2,4-Trichlorobenzene	120-82-1	6.88E+02	Equation 4	1.32E+02	Equation 2
1,2,4-Trimethyl benzene	95-63-6	3.41E+02	Equation 4	6.97E+01	Equation 2
1,2-Dichlorobenzene	95-50-1	2.23E+02	Equation 4	4.74E+01	Equation 2
1,3,5-Trimethyl benzene	108-67-8	2.11E+02	Equation 4	4.52E+01	Equation 2
1,3-Dichlorobenzene	541-73-1	2.66E+02	Equation 4	5.56E+01	Equation 2
1,3-Dinitrobenzene	99-65-0	7.40E+01	EPA (1999)	1.19E+00	EPA (1999)
1,4-Dichlorobenzene	106-46-7	2.08E+02	Equation 4	4.45E+01	Equation 2
1,4-Dinitrobenzene	100-25-4	3.79E+00	Equation 4	1.21E+00	Equation 2
2,4,5-Trichlorophenol	95-95-4	5.39E+02	Equation 4	1.06E+02	Equation 2
2,4,6-Trichlorophenol	88-06-2	3.88E+02	Equation 4	7.83E+01	Equation 2
2,4-Dichlorophenol	120-83-2	9.49E+01	Equation 4	2.20E+01	Equation 2
2,4-Dimethylphenol	105-67-9	2.30E+01	Equation 4	6.12E+00	Equation 2
2,4-Dinitrophenol	51-28-5	3.94E+00	Equation 4	1.25E+00	Equation 2
2,4-Dinitrotoluene	121-14-2	2.10E+01	EPA (1999)	5.80E+01	EPA (1999)
2,6-Dinitrotoluene	606-20-2	2.10E+01	EPA (1999)	2.50E+00	EPA (1999)
2-Chlorophenol	95-57-8	1.52E+01	Equation 4	4.21E+00	Equation 2
2-Chlorotoluene	95-49-8	2.69E+02	Equation 4	5.63E+01	Equation 2
2-Nitrophenol	88-75-5	6.97E+00	Equation 4	2.09E+00	Equation 2
4,6-Dinitro-o-cresol	534-52-1	1.39E+01	Equation 4	3.89E+00	Equation 2

Table C2-1 Ecological Transfer Factors for COPCs and ROPCs

Constituent of Potential Concern	CAS Registry Number	Log K_{ow}[a]	Log K_{oc}[a]	SPv (kg dry soil/kg dry tissue)	Source	BAF-S (kg dry soil/ kg tissue)	Source
4-Chlorotoluene	106-43-4	3.33	2.75	4.61E-01	Equation 1	3.81E+01	Equation 2[b]
4-Nitrophenol	100-02-7	1.91	1.64	3.05E+00	Equation 1	2.62E+00	Equation 2
alpha-Methylstyrene	98-83-9	3.48	2.91	3.86E-01	Equation 1	4.90E+01	Equation 2[b]
Aniline	62-53-3	0.98	0.92	1.05E+01	Equation 1	4.54E-01	Equation 2
Benzotrichloride	98-07-7	2.92	3.07	7.95E-01	Equation 1	1.76E+01	Equation 2[b]
Benzyl chloride	100-44-7	2.30	1.95	1.81E+00	Equation 1	5.47E+00	Equation 2
Bromobenzene	108-86-1	2.99	2.65	7.24E-01	Equation 1	2.01E+01	Equation 2[b]
Chlorobenzene	108-90-7	2.79	2.35	9.45E-01	Equation 1	1.38E+01	Equation 2[b]
Cumene	98-82-8	3.61	2.97	3.16E-01	Equation 1	6.50E+01	Equation 2[b]
m-Cresol	108-39-4	1.96	1.68	2.86E+00	Equation 1	2.87E+00	Equation 2
n-Butyl benzene	104-51-8	4.28	3.40	1.30E-01	Equation 1	2.29E+02	Equation 2[b]
Nitrobenzene	98-95-3	1.83	2.08	3.38E+00	EPA (1999)	2.26E+00	EPA (1999)
n-Propyl benzene	103-65-1	3.69	2.86	2.85E-01	Equation 1	7.52E+01	Equation 2[b]
o-Cresol	95-48-7	2.02	1.73	2.63E+00	Equation 1	3.23E+00	Equation 2
o-Dinitrobenzene	528-29-0	1.69	2.35	4.08E+00	Equation 1	1.73E+00	Equation 2
o-Nitroaniline	88-74-4	1.85	1.59	3.30E+00	Equation 1	2.34E+00	Equation 2
o-Toluidine	95-53-4	1.34	1.20	6.50E+00	Equation 1	8.95E-01	Equation 2
p-Chloroaniline	106-47-8	1.87	1.61	3.22E+00	Equation 1	2.43E+00	Equation 2
p-Cresol	106-44-5	1.94	1.66	2.93E+00	Equation 1	2.77E+00	Equation 2
Phenol	108-95-2	1.48	1.34	5.42E+00	Equation 1	1.16E+00	Equation 2
p-Nitrochlorobenzene	100-00-5	2.39	2.02	1.61E+00	Equation 1	6.48E+00	Equation 2
p-Toluidine	106-49-0	1.40	1.24	6.01E+00	Equation 1	1.00E+00	Equation 2
sec-Butyl benzene	135-98-8	No data	No data	No data	No data	No data	No data
tert-Butyl benzene	98-06-6	4.11	3.36	1.63E-01	Equation 1	1.66E+02	Equation 2[b]
Toluene-2,6-diamine	823-40-5	0.16	2.09	3.13E+01	Equation 1	9.66E-02	Equation 2

Table C2-1 Ecological Transfer Factors for COPCs and ROPCs

Constituent of Potential Concern	CAS Registry Number	Mammal Ba ([mg/kg tissue] / [mg ingested /day])	Source	WP (L/kg tissue)	Source	SP (kg dry sediment/ kg dry tissue)	Source
4-Chlorotoluene	106-43-4	5.37E-05	Equation 3	3.81E+01	Equation 2	4.61E-01	Equation 1
4-Nitrophenol	100-02-7	2.04E-06	Equation 3	2.62E+00	Equation 2	3.05E+00	Equation 1
alpha-Methylstyrene	98-83-9	7.30E-05	Equation 3	4.90E+01	Equation 2	3.86E-01	Equation 1
Aniline	62-53-3	2.40E-07	Equation 3	4.54E-01	Equation 2	1.05E+01	Equation 1
Benzotrichloride	98-07-7	2.09E-05	Equation 3	1.76E+01	Equation 2	7.95E-01	Equation 1
Benzyl chloride	100-44-7	5.01E-06	Equation 3	5.47E+00	Equation 2	1.81E+00	Equation 1
Bromobenzene	108-86-1	2.45E-05	Equation 3	2.01E+01	Equation 2	7.24E-01	Equation 1
Chlorobenzene	108-90-7	1.55E-05	Equation 3	1.38E+01	Equation 2	9.45E-01	Equation 1
Cumene	98-82-8	1.03E-04	Equation 3	6.50E+01	Equation 2	3.16E-01	Equation 1
m-Cresol	108-39-4	2.29E-06	Equation 3	2.87E+00	Equation 2	2.86E+00	Equation 1
n-Butyl benzene	104-51-8	4.79E-04	Equation 3	2.29E+02	Equation 2	1.30E-01	Equation 1
Nitrobenzene	98-95-3	1.71E-06	Equation 3	2.40E+01	EPA (1999)	3.38E+00	EPA (1999)
n-Propyl benzene	103-65-1	1.23E-04	Equation 3	7.52E+01	Equation 2	2.85E-01	Equation 1
o-Cresol	95-48-7	2.64E-06	Equation 3	3.23E+00	Equation 2	2.63E+00	Equation 1
o-Dinitrobenzene	528-29-0	1.23E-06	Equation 3	1.73E+00	Equation 2	4.08E+00	Equation 1
o-Nitroaniline	88-74-4	1.78E-06	Equation 3	2.34E+00	Equation 2	3.30E+00	Equation 1
o-Toluidine	95-53-4	5.50E-07	Equation 3	8.95E-01	Equation 2	6.50E+00	Equation 1
p-Chloroaniline	106-47-8	1.86E-06	Equation 3	2.43E+00	Equation 2	3.22E+00	Equation 1
p-Cresol	106-44-5	2.19E-06	Equation 3	2.77E+00	Equation 2	2.93E+00	Equation 1
Phenol	108-95-2	7.54E-07	Equation 3	1.16E+00	Equation 2	5.42E+00	Equation 1
p-Nitrochlorobenzene	100-00-5	6.17E-06	Equation 3	6.48E+00	Equation 2	1.61E+00	Equation 1
p-Toluidine	106-49-0	6.31E-07	Equation 3	1.00E+00	Equation 2	6.01E+00	Equation 1
sec-Butyl benzene	135-98-8	No data	No data	No data	No data	No data	No data
tert-Butyl benzene	98-06-6	3.24E-04	Equation 3	1.66E+02	Equation 2	1.63E-01	Equation 1
Toluene-2,6-diamine	823-40-5	3.63E-08	Equation 3	9.66E-02	Equation 2	3.13E+01	Equation 1

Table C2-1 Ecological Transfer Factors for COPCs and ROPCs

Constituent of Potential Concern	CAS Registry Number	BCF_{fish} (L/kg tissue)	Source	BASF (kg dry sediment/ kg tissue)	Source
4-Chlorotoluene	106-43-4	1.75E+02	Equation 4	3.81E+01	Equation 2
4-Nitrophenol	100-02-7	8.96E+00	Equation 4	2.62E+00	Equation 2
alpha-Methylstyrene	98-83-9	2.31E+02	Equation 4	4.90E+01	Equation 2
Aniline	62-53-3	1.28E+00	Equation 4	4.54E-01	Equation 2
Benzotrichloride	98-07-7	7.43E+01	Equation 4	1.76E+01	Equation 2
Benzyl chloride	100-44-7	2.03E+01	Equation 4	5.47E+00	Equation 2
Bromobenzene	108-86-1	8.60E+01	Equation 4	2.01E+01	Equation 2
Chlorobenzene	108-90-7	5.65E+01	Equation 4	1.38E+01	Equation 2
Cumene	98-82-8	3.16E+02	Equation 4	6.50E+01	Equation 2
m-Cresol	108-39-4	9.92E+00	Equation 4	2.87E+00	Equation 2
n-Butyl benzene	104-51-8	1.25E+03	Equation 4	2.29E+02	Equation 2
Nitrobenzene	98-95-3	2.10E+01	EPA (1999)	2.27E+00	EPA (1999)
n-Propyl benzene	103-65-1	3.71E+02	Equation 4	7.52E+01	Equation 2
o-Cresol	95-48-7	1.13E+01	Equation 4	3.23E+00	Equation 2
o-Dinitrobenzene	528-29-0	5.65E+00	Equation 4	1.73E+00	Equation 2
o-Nitroaniline	88-74-4	7.90E+00	Equation 4	2.34E+00	Equation 2
o-Toluidine	95-53-4	2.72E+00	Equation 4	8.95E-01	Equation 2
p-Chloroaniline	106-47-8	8.22E+00	Equation 4	2.43E+00	Equation 2
p-Cresol	106-44-5	9.53E+00	Equation 4	2.77E+00	Equation 2
Phenol	108-95-2	3.62E+00	Equation 4	1.16E+00	Equation 2
p-Nitrochlorobenzene	100-00-5	2.45E+01	Equation 4	6.48E+00	Equation 2
p-Toluidine	106-49-0	3.08E+00	Equation 4	1.00E+00	Equation 2
sec-Butyl benzene	135-98-8	No data	No data	No data	No data
tert-Butyl benzene	98-06-6	8.84E+02	Equation 4	1.66E+02	Equation 2
Toluene-2,6-diamine	823-40-5	2.29E-01	Equation 4	9.66E-02	Equation 2

Table C2-1 Ecological Transfer Factors for COPCs and ROPCs

Constituent of Potential Concern	CAS Registry Number	Log K_{ow}[a]	Log K_{oc}[a]	SPv (kg dry soil/kg dry tissue)	Source	BAF-S (kg dry soil/ kg tissue)	Source
Trimethyl benzene	25551-13-7	3.42	2.85	4.09E-01	Equation 1	4.52E+01	Equation 2[b]
Other Light Semivolatile Compounds (molecular weight <200 g/mole)							
1,1'-Biphenyl	92-52-4	3.90	3.40	2.16E-01	Equation 1	1.12E+02	Equation 2[b]
1,1-Dimethylhydrazine	57-14-7	-1.19	1.30	1.89E+02	Equation 1	7.58E-03	Equation 2
1,2-Dimethylhydrazine	540-73-8	-1.37	-0.92	2.39E+02	Equation 1	5.42E-03	Equation 2
1,2-Diphenylhydrazine	122-66-7	2.94	2.44	7.74E-01	Equation 1	1.83E+01	Equation 2[b]
1,3-Propane sultone	1120-71-4	-0.52	-0.26	7.77E+01	Equation 1	2.66E-02	Equation 2
2,4-Toluene diisocyanate	584-84-9	No data	No data	No data	No data	No data	No data
2-Chloroacetophenone	532-27-4	1.93	1.95	2.97E+00	Equation 1	2.72E+00	Equation 2
2-Propenoic acid	79-10-7	0.43	0.49	2.19E+01	Equation 1	1.61E-01	Equation 2
4,4'-Methylenedianiline	101-77-9	1.59	3.69	4.67E+00	Equation 1	1.43E+00	Equation 2
Acetophenone	98-86-2	1.64	1.43	4.36E+00	Equation 1	1.58E+00	Equation 2
Benzoic acid	65-85-0	1.87	-0.26	3.21E+00	Equation 1	2.43E+00	Equation 2
bis(2-Chloroethoxy)methane	111-91-1	1.30	0.44	6.86E+00	Equation 1	8.29E-01	Equation 2
bis(2-Chloroethyl) ether	111-44-4	1.30	1.88	6.85E+00	Equation 1	8.31E-01	Equation 2
Chlorocyclopentadiene	41851-50-7	2.43	2.16	1.53E+00	Equation 1	6.99E+00	Equation 2
Cyclohexanol	108-93-0	1.23	1.11	7.53E+00	Equation 1	7.27E-01	Equation 2
Dichloroisopropyl ether	108-60-1	2.58	1.78	1.25E+00	Equation 1	9.27E+00	Equation 2
Dichloromethyl ether	542-88-1	0.58	0.64	1.79E+01	Equation 1	2.13E-01	Equation 2
Dichloropentadiene	61626-71-9	No data	No data	No data	No data	No data	No data
Dimethyl sulfate	77-78-1	0.16	1.38	3.13E+01	Equation 1	9.66E-02	Equation 2
Dimethylaniline	121-69-7	2.31	1.89	1.79E+00	Equation 1	5.57E+00	Equation 2
Di-n-propylnitrosamine	621-64-7	1.38	1.23	6.17E+00	Equation 1	9.65E-01	Equation 2
Diphenyl ether	101-84-8	4.21	3.43	1.43E-01	Equation 1	2.00E+02	Equation 2[b]
Epichlorohydrin	106-89-8	0.25	0.35	2.77E+01	Equation 1	1.15E-01	Equation 2
Ethyl carbamate (Urethane)	51-79-6	-0.15	0.03	4.73E+01	Equation 1	5.38E-02	Equation 2

Table C2-1 Ecological Transfer Factors for COPCs and ROPCs

Constituent of Potential Concern	CAS Registry Number	Mammal Ba ([mg/kg tissue] / [mg ingested /day])	Source	WP (L/kg tissue)	Source	SP (kg dry sediment/ kg dry tissue)	Source
Trimethyl benzene	25551-13-7	6.61E-05	Equation 3	4.52E+01	Equation 2[b]	4.09E-01	Equation 1
Other Light Semivolatile Compounds (molecular weight <200 g/mole)							
1,1'-Biphenyl	92-52-4	2.00E-04	Equation 3	1.12E+02	Equation 2	2.16E-01	Equation 1
1,1-Dimethylhydrazine	57-14-7	1.62E-09	Equation 3	7.58E-03	Equation 2	1.89E+02	Equation 1
1,2-Dimethylhydrazine	540-73-8	1.08E-09	Equation 3	5.42E-03	Equation 2	2.39E+02	Equation 1
1,2-Diphenylhydrazine	122-66-7	2.19E-05	Equation 3	1.83E+01	Equation 2	7.74E-01	Equation 1
1,3-Propane sultone	1120-71-4	7.53E-09	Equation 3	2.66E-02	Equation 2	7.77E+01	Equation 1
2,4-Toluene diisocyanate	584-84-9	No data	No data	No data	No data	No data	No data
2-Chloroacetophenone	532-27-4	2.14E-06	Equation 3	2.72E+00	Equation 2	2.97E+00	Equation 1
2-Propenoic acid	79-10-7	6.76E-08	Equation 3	1.61E-01	Equation 2	2.19E+01	Equation 1
4,4'-Methylenedianiline	101-77-9	9.77E-07	Equation 3	1.43E+00	Equation 2	4.67E+00	Equation 1
Acetophenone	98-86-2	1.10E-06	Equation 3	1.58E+00	Equation 2	4.36E+00	Equation 1
Benzoic acid	65-85-0	1.86E-06	Equation 3	2.43E+00	Equation 2	3.21E+00	Equation 1
bis(2-Chloroethoxy)methane	111-91-1	5.01E-07	Equation 3	8.29E-01	Equation 2	6.86E+00	Equation 1
bis(2-Chloroethyl) ether	111-44-4	5.02E-07	Equation 3	8.31E-01	Equation 2	6.85E+00	Equation 1
Chlorocyclopentadiene	41851-50-7	6.76E-06	Equation 3	6.99E+00	Equation 2	1.53E+00	Equation 1
Cyclohexanol	108-93-0	4.27E-07	Equation 3	7.27E-01	Equation 2	7.53E+00	Equation 1
Dichloroisopropyl ether	108-60-1	9.55E-06	Equation 3	9.27E+00	Equation 2	1.25E+00	Equation 1
Dichloromethyl ether	542-88-1	9.55E-08	Equation 3	2.13E-01	Equation 2	1.79E+01	Equation 1
Dichloropentadiene	61626-71-9	No data	No data	No data	No data	No data	No data
Dimethyl sulfate	77-78-1	3.63E-08	Equation 3	9.66E-02	Equation 2	3.13E+01	Equation 1
Dimethylaniline	121-69-7	5.13E-06	Equation 3	5.57E+00	Equation 2	1.79E+00	Equation 1
Di-n-propylnitrosamine	621-64-7	6.03E-07	Equation 3	9.65E-01	Equation 2	6.17E+00	Equation 1
Diphenyl ether	101-84-8	4.07E-04	Equation 3	2.00E+02	Equation 2	1.43E-01	Equation 1
Epichlorohydrin	106-89-8	4.47E-08	Equation 3	1.15E-01	Equation 2	2.77E+01	Equation 1
Ethyl carbamate (Urethane)	51-79-6	1.78E-08	Equation 3	5.38E-02	Equation 2	4.73E+01	Equation 1

Table C2-1 Ecological Transfer Factors for COPCs and ROPCs

Constituent of Potential Concern	CAS Registry Number	BCF_{fish} (L/kg tissue)	Source	BASF (kg dry sediment/ kg tissue)	Source
Trimethyl benzene	25551-13-7	2.11E+02	Equation 4	4.52E+01	Equation 2[b]
Other Light Semivolatile Compounds (molecular weight <200 g/mole)					
1,1'-Biphenyl	92-52-4	5.73E+02	Equation 4	1.12E+02	Equation 2
1,1-Dimethylhydrazine	57-14-7	1.35E-02	Equation 4	7.58E-03	Equation 2
1,2-Dimethylhydrazine	540-73-8	9.31E-03	Equation 4	5.42E-03	Equation 2
1,2-Diphenylhydrazine	122-66-7	7.74E+01	Equation 4	1.83E+01	Equation 2
1,3-Propane sultone	1120-71-4	5.47E-02	Equation 4	2.66E-02	Equation 2
2,4-Toluene diisocyanate	584-84-9	No data	No data	No data	No data
2-Chloroacetophenone	532-27-4	9.34E+00	Equation 4	2.72E+00	Equation 2
2-Propenoic acid	79-10-7	4.03E-01	Equation 4	1.61E-01	Equation 2
4,4'-Methylenedianiline	101-77-9	4.58E+00	Equation 4	1.43E+00	Equation 2
Acetophenone	98-86-2	5.09E+00	Equation 4	1.58E+00	Equation 2
Benzoic acid	65-85-0	8.23E+00	Equation 4	2.43E+00	Equation 2
bis(2-Chloroethoxy)methane	111-91-1	2.49E+00	Equation 4	8.29E-01	Equation 2
bis(2-Chloroethyl) ether	111-44-4	2.50E+00	Equation 4	8.31E-01	Equation 2
Chlorocyclopentadiene	41851-50-7	2.66E+01	Equation 4	6.99E+00	Equation 2
Cyclohexanol	108-93-0	2.15E+00	Equation 4	7.27E-01	Equation 2
Dichloroisopropyl ether	108-60-1	3.64E+01	Equation 4	9.27E+00	Equation 2
Dichloromethyl ether	542-88-1	5.52E-01	Equation 4	2.13E-01	Equation 2
Dichloropentadiene	61626-71-9	No data	No data	No data	No data
Dimethyl sulfate	77-78-1	2.29E-01	Equation 4	9.66E-02	Equation 2
Dimethylaniline	121-69-7	2.07E+01	Equation 4	5.57E+00	Equation 2
Di-n-propylnitrosamine	621-64-7	2.95E+00	Equation 4	9.65E-01	Equation 2
Diphenyl ether	101-84-8	1.09E+03	Equation 4	2.00E+02	Equation 2
Epichlorohydrin	106-89-8	2.77E-01	Equation 4	1.15E-01	Equation 2
Ethyl carbamate (Urethane)	51-79-6	1.20E-01	Equation 4	5.38E-02	Equation 2

Table C2-1 Ecological Transfer Factors for COPCs and ROPCs

Constituent of Potential Concern	CAS Registry Number	Log K_{ow}[a]	Log K_{oc}[a]	SPv (kg dry soil/kg dry tissue)	Source	BAF-S (kg dry soil/ kg tissue)	Source
Ethyl methanesulfonate	62-50-0	0.05	0.19	3.63E+01	Equation 1	7.84E-02	Equation 2
Ethylene dibromide	106-93-4	1.75	1.52	3.77E+00	Equation 1	1.94E+00	Equation 2
Ethylene glycol	107-21-1	-1.36	0.00	2.37E+02	Equation 1	5.50E-03	Equation 2
Ethylene glycol monobutyl ether	111-76-2	0.83	0.00	1.28E+01	Equation 1	3.42E-01	Equation 2
Ethylene glycol monoethyl ether acetate	111-15-9	0.59	0.32	1.77E+01	Equation 1	2.17E-01	Equation 2
Ethylene thiourea	96-45-7	-0.66	0.81	9.32E+01	Equation 1	2.06E-02	Equation 2
Furfural	98-01-1	0.96	0.90	1.08E+01	Equation 1	4.37E-01	Equation 2
Maleic hydrazide	123-33-1	-0.84	1.01	1.18E+02	Equation 1	1.47E-02	Equation 2
Malononitrile	109-77-3	-0.60	1.18	8.61E+01	Equation 1	2.30E-02	Equation 2
Methyl styrene (mixed isomers)	25013-15-4	3.48	2.91	3.77E-01	Equation 1	5.06E+01	Equation 2[b]
Methylhydrazine	60-34-4	-1.05	-0.67	1.57E+02	Equation 1	9.86E-03	Equation 2
N,N-Diphenylamine	122-39-4	3.50	2.54	3.67E-01	Equation 1	5.25E+01	Equation 2[b]
Nitric acid, propyl ester	627-13-4	No data	No data	No data	No data	No data	No data
N-Nitrosodi-n-butylamine	924-16-3	2.41	2.03	1.57E+00	Equation 1	6.73E+00	Equation 2
N-Nitrosomorpholine	59-89-2	0.98	0.92	1.05E+01	Equation 1	4.54E-01	Equation 2
N-Nitroso-N,N-dimethylamine	62-75-9	-0.57	1.58	8.27E+01	Equation 1	2.44E-02	Equation 2
o-Anisidine	90-04-0	1.18	1.07	8.05E+00	Equation 1	6.61E-01	Equation 2
Oxalic acid	144-62-7	No data	No data	No data	No data	No data	No data
Phthalic anhydride	85-44-9	-0.60	-0.68	8.63E+01	Equation 1	2.30E-02	Equation 2
p-Phthalic acid	100-21-0	2.00	1.85	2.70E+00	Equation 1	3.10E+00	Equation 2
Pyridine	110-86-1	0.67	0.67	1.59E+01	Equation 1	2.53E-01	Equation 2
Quinoline	91-22-5	2.03	3.26	2.60E+00	Equation 1	3.29E+00	Equation 2
Quinone	106-51-4	0.20	0.31	2.97E+01	Equation 1	1.04E-01	Equation 2
Safrole	94-59-7	2.66	2.23	1.12E+00	Equation 1	1.08E+01	Equation 2[b]
Tetrahydrofuran	109-99-9	0.45	0.50	2.14E+01	Equation 1	1.66E-01	Equation 2

Table C2-1 Ecological Transfer Factors for COPCs and ROPCs

Constituent of Potential Concern	CAS Registry Number	Mammal Ba ([mg/kg tissue] / [mg ingested /day])	Source	WP (L/kg tissue)	Source	SP (kg dry sediment/ kg dry tissue)	Source
Ethyl methanesulfonate	62-50-0	2.81E-08	Equation 3	7.84E-02	Equation 2	3.63E+01	Equation 1
Ethylene dibromide	106-93-4	1.41E-06	Equation 3	1.94E+00	Equation 2	3.77E+00	Equation 1
Ethylene glycol	107-21-1	1.10E-09	Equation 3	5.50E-03	Equation 2	2.37E+02	Equation 1
Ethylene glycol monobutyl ether	111-76-2	1.70E-07	Equation 3	3.42E-01	Equation 2	1.28E+01	Equation 1
Ethylene glycol monoethyl ether acetate	111-15-9	9.77E-08	Equation 3	2.17E-01	Equation 2	1.77E+01	Equation 1
Ethylene thiourea	96-45-7	5.50E-09	Equation 3	2.06E-02	Equation 2	9.32E+01	Equation 1
Furfural	98-01-1	2.29E-07	Equation 3	4.37E-01	Equation 2	1.08E+01	Equation 1
Maleic hydrazide	123-33-1	3.63E-09	Equation 3	1.47E-02	Equation 2	1.18E+02	Equation 1
Malononitrile	109-77-3	6.31E-09	Equation 3	2.30E-02	Equation 2	8.61E+01	Equation 1
Methyl styrene (mixed isomers)	25013-15-4	7.59E-05	Equation 3	5.06E+01	Equation 2[b]	3.77E-01	Equation 1
Methylhydrazine	60-34-4	2.24E-09	Equation 3	9.86E-03	Equation 2	1.57E+02	Equation 1
N,N-Diphenylamine	122-39-4	7.94E-05	Equation 3	5.25E+01	Equation 2	3.67E-01	Equation 1
Nitric acid, propyl ester	627-13-4	No data	No data	No data	No data	No data	No data
N-Nitrosodi-n-butylamine	924-16-3	6.46E-06	Equation 3	6.73E+00	Equation 2	1.57E+00	Equation 1
N-Nitrosomorpholine	59-89-2	2.40E-07	Equation 3	4.54E-01	Equation 2	1.05E+01	Equation 1
N-Nitroso-N,N-dimethylamine	62-75-9	6.76E-09	Equation 3	2.44E-02	Equation 2	8.27E+01	Equation 1
o-Anisidine	90-04-0	3.80E-07	Equation 3	6.61E-01	Equation 2	8.05E+00	Equation 1
Oxalic acid	144-62-7	No data	No data	No data	No data	No data	No data
Phthalic anhydride	85-44-9	6.28E-09	Equation 3	2.30E-02	Equation 2	8.63E+01	Equation 1
p-Phthalic acid	100-21-0	2.51E-06	Equation 3	3.10E+00	Equation 2	2.70E+00	Equation 1
Pyridine	110-86-1	1.18E-07	Equation 3	2.53E-01	Equation 2	1.59E+01	Equation 1
Quinoline	91-22-5	2.69E-06	Equation 3	3.29E+00	Equation 2	2.60E+00	Equation 1
Quinone	106-51-4	3.98E-08	Equation 3	1.04E-01	Equation 2	2.97E+01	Equation 1
Safrole	94-59-7	1.15E-05	Equation 3	1.08E+01	Equation 2	1.12E+00	Equation 1
Tetrahydrofuran	109-99-9	7.03E-08	Equation 3	1.66E-01	Equation 2	2.14E+01	Equation 1

Table C2-1 Ecological Transfer Factors for COPCs and ROPCs

Constituent of Potential Concern	CAS Registry Number	BCF_{fish} (L/kg tissue)	Source	BASF (kg dry sediment/ kg tissue)	Source
Ethyl methanesulfonate	62-50-0	1.81E-01	Equation 4	7.84E-02	Equation 2
Ethylene dibromide	106-93-4	6.40E+00	Equation 4	1.94E+00	Equation 2
Ethylene glycol	107-21-1	9.47E-03	Equation 4	5.50E-03	Equation 2
Ethylene glycol monobutyl ether	111-76-2	9.32E-01	Equation 4	3.42E-01	Equation 2
Ethylene glycol monoethyl ether acetate	111-15-9	5.64E-01	Equation 4	2.17E-01	Equation 2
Ethylene thiourea	96-45-7	4.11E-02	Equation 4	2.06E-02	Equation 2
Furfural	98-01-1	1.22E+00	Equation 4	4.37E-01	Equation 2
Maleic hydrazide	123-33-1	2.82E-02	Equation 4	1.47E-02	Equation 2
Malononitrile	109-77-3	4.66E-02	Equation 4	2.30E-02	Equation 2
Methyl styrene (mixed isomers)	25013-15-4	2.39E+02	Equation 4	5.06E+01	Equation 2[b]
Methylhydrazine	60-34-4	1.81E-02	Equation 4	9.86E-03	Equation 2
N,N-Diphenylamine	122-39-4	2.50E+02	Equation 4	5.25E+01	Equation 2
Nitric acid, propyl ester	627-13-4	No data	No data	No data	No data
N-Nitrosodi-n-butylamine	924-16-3	2.55E+01	Equation 4	6.73E+00	Equation 2
N-Nitrosomorpholine	59-89-2	1.28E+00	Equation 4	4.54E-01	Equation 2
N-Nitroso-N,N-dimethylamine	62-75-9	4.96E-02	Equation 4	2.44E-02	Equation 2
o-Anisidine	90-04-0	1.94E+00	Equation 4	6.61E-01	Equation 2
Oxalic acid	144-62-7	No data	No data	No data	No data
Phthalic anhydride	85-44-9	4.64E-02	Equation 4	2.30E-02	Equation 2
p-Phthalic acid	100-21-0	1.08E+01	Equation 4	3.10E+00	Equation 2
Pyridine	110-86-1	6.67E-01	Equation 4	2.53E-01	Equation 2
Quinoline	91-22-5	1.15E+01	Equation 4	3.29E+00	Equation 2
Quinone	106-51-4	2.49E-01	Equation 4	1.04E-01	Equation 2
Safrole	94-59-7	4.31E+01	Equation 4	1.08E+01	Equation 2
Tetrahydrofuran	109-99-9	4.18E-01	Equation 4	1.66E-01	Equation 2

Table C2-1 Ecological Transfer Factors for COPCs and ROPCs

Constituent of Potential Concern	CAS Registry Number	Log K_{ow} [a]	Log K_{oc} [a]	SPv (kg dry soil/kg dry tissue)	Source	BAF-S (kg dry soil/ kg tissue)	Source
Other Heavy Semivolatile Compounds (molecular weight >200 g/mole)							
1,2,4,5-Tetrachlorobenzene	95-94-3	4.64	3.77	8.06E-02	Equation 1	4.51E+02	Equation 2[b]
1,3,5-Trinitrobenzene	99-35-4	1.18	1.07	8.06E+00	Equation 1	6.60E-01	Equation 2
2,6-Bis(tert-butyl)-4-methylphenol	128-37-0	4.17	3.40	1.51E-01	Equation 1	1.86E+02	Equation 2[b]
2-Cyclohexyl-4,6-dinitrophenol	131-89-5	4.54	3.69	9.20E-02	Equation 1	3.73E+02	Equation 2[b]
2-sec-Butyl-4,6-dinitrophenol	88-85-7	3.56	3.55	3.39E-01	Equation 1	5.88E+01	Equation 2[b]
3,3'-Dichlorobenzidine	91-94-1	3.58	2.94	3.30E-01	Equation 1	6.11E+01	Equation 2[b]
3,3'-Dimethoxybenzidine	119-90-4	1.81	1.56	3.48E+00	Equation 1	2.17E+00	Equation 2
4-Bromophenylphenyl ether	101-55-3	5.04	4.08	4.72E-02	Equation 1	9.59E+02	Equation 2[b]
Ammonium perfluorooctanoate	3825-26-1	No data	No data	No data	No data	No data	No data
Azobenzene	103-33-3	3.82	3.29	2.40E-01	Equation 1	9.61E+01	Equation 2[b]
Bis(3-tert-butyl-4-hydroxy-6-methyl-phenyl)sulfide	96-69-5	NA	NA	No data	No data	No data	No data
Captan	133-06-2	2.35	2.30	1.70E+00	Equation 1	6.01E+00	Equation 2
Chlorobenzilate	510-15-6	4.38	3.57	1.14E-01	Equation 1	2.76E+02	Equation 2[b]
Dibutylphosphate	107-66-4	No data	No data	No data	No data	No data	No data
Dimethyl aminoazobenzene	60-11-7	4.58	3.72	8.72E-02	Equation 1	4.03E+02	Equation 2[b]
Hexachlorobenzene	118-74-1	5.50	4.90	2.55E-02	EPA (1999)	2.30E+03	EPA (1999)
Hexachlorobutadiene	87-68-3	4.73	3.84	7.14E-02	EPA (1999)	5.35E+02	EPA (1999)
Hexachlorocyclopentadiene	77-47-4	4.91	3.98	5.65E-02	EPA (1999)	7.45E+02	EPA (1999)
Hexachloroethane	67-72-1	3.98	3.26	1.93E-01	Equation 1	1.31E+02	Equation 2[b]
Hexachlorophene	70-30-4	7.54	6.03	1.70E-03	EPA (1999)	4.88E+03	Mass-limited
Hexamethylene-1,5-diisocyanate	822-06-0	3.20	3.77	5.48E-01	Equation 1	2.98E+01	Equation 2[b]
Mirex	2385-85-5	6.89	6.00	4.03E-03	Equation 1	4.88E+03	Mass-limited
Nitrofen	1836-75-5	5.53	4.46	2.46E-02	Equation 1	2.42E+03	Equation 2[b]

Table C2-1 Ecological Transfer Factors for COPCs and ROPCs

Constituent of Potential Concern	CAS Registry Number	Mammal Ba ([mg/kg tissue] / [mg ingested /day])	Source	WP (L/kg tissue)	Source	SP (kg dry sediment/ kg dry tissue)	Source
Other Heavy Semivolatile Compounds (molecular weight >200 g/mole)							
1,2,4,5-Tetrachlorobenzene	95-94-3	1.10E-03	Equation 3	4.51E+02	Equation 2	8.06E-02	Equation 1
1,3,5-Trinitrobenzene	99-35-4	3.79E-07	Equation 3	6.60E-01	Equation 2	8.06E+00	Equation 1
2,6-Bis(tert-butyl)-4-methylphenol	128-37-0	3.72E-04	Equation 3	1.86E+02	Equation 2	1.51E-01	Equation 1
2-Cyclohexyl-4,6-dinitrophenol	131-89-5	8.71E-04	Equation 3	3.73E+02	Equation 2	9.20E-02	Equation 1
2-sec-Butyl-4,6-dinitrophenol	88-85-7	9.12E-05	Equation 3	5.88E+01	Equation 2[b]	3.39E-01	Equation 1
3,3'-Dichlorobenzidine	91-94-1	9.44E-05	Equation 3	6.11E+01	Equation 2	3.30E-01	Equation 1
3,3'-Dimethoxybenzidine	119-90-4	1.62E-06	Equation 3	2.17E+00	Equation 2	3.48E+00	Equation 1
4-Bromophenylphenyl ether	101-55-3	2.76E-03	Equation 3	9.59E+02	Equation 2	4.72E-02	Equation 1
Ammonium perfluorooctanoate	3825-26-1	No data	No data	No data	No data	No data	No data
Azobenzene	103-33-3	1.66E-04	Equation 3	9.61E+01	Equation 2	2.40E-01	Equation 1
Bis(3-tert-butyl-4-hydroxy-6-methyl-phenyl)sulfide	96-69-5	No data	No data	No data	No data	No data	No data
Captan	133-06-2	5.62E-06	Equation 3	6.01E+00	Equation 2	1.70E+00	Equation 1
Chlorobenzilate	510-15-6	6.03E-04	Equation 3	2.76E+02	Equation 2	1.14E-01	Equation 1
Dibutylphosphate	107-66-4	No data	No data	No data	No data	No data	No data
Dimethyl aminoazobenzene	60-11-7	9.55E-04	Equation 3	4.03E+02	Equation 2	8.72E-02	Equation 1
Hexachlorobenzene	118-74-1	7.99E-03	Equation 3	1.11E+04	EPA (1999)	2.55E-02	EPA (1999)
Hexachlorobutadiene	87-68-3	1.35E-03	Equation 3	1.60E+02	EPA (1999)	7.14E-02	EPA (1999)
Hexachlorocyclopentadiene	77-47-4	2.03E-03	EPA (1999)	6.10E+02	EPA (1999)	5.65E-02	EPA (1999)
Hexachloroethane	67-72-1	2.43E-04	Equation 3	1.31E+02	Equation 2	1.93E-01	Equation 1
Hexachlorophene	70-30-4	8.72E-01	Equation 3	1.50E+03	EPA (1999)	1.70E-03	EPA (1999)
Hexamethylene-1,5-diisocyanate	822-06-0	3.98E-05	Equation 3	2.98E+01	Equation 2[b]	5.48E-01	Equation 1
Mirex	2385-85-5	1.95E-01	Equation 3	3.14E+04	Equation 2	4.03E-03	Equation 1
Nitrofen	1836-75-5	8.51E-03	Equation 3	2.42E+03	Equation 2	2.46E-02	Equation 1

Table C2-1 Ecological Transfer Factors for COPCs and ROPCs

Constituent of Potential Concern	CAS Registry Number	BCF_{fish} (L/kg tissue)	Source	BASF (kg dry sediment/ kg tissue)	Source
Other Heavy Semivolatile Compounds (molecular weight >200 g/mole)					
1,2,4,5-Tetrachlorobenzene	95-94-3	2.58E+03	Equation 4	4.51E+02	Equation 2
1,3,5-Trinitrobenzene	99-35-4	1.94E+00	Equation 4	6.60E-01	Equation 2
2,6-Bis(tert-butyl)-4-methylphenol	128-37-0	1.00E+03	Equation 4	1.86E+02	Equation 2
2-Cyclohexyl-4,6-dinitrophenol	131-89-5	2.12E+03	Equation 4	3.73E+02	Equation 2
2-sec-Butyl-4,6-dinitrophenol	88-85-7	2.83E+02	Equation 4	5.88E+01	Equation 2b
3,3'-Dichlorobenzidine	91-94-1	2.92E+02	Equation 4	6.11E+01	Equation 2
3,3'-Dimethoxybenzidine	119-90-4	7.26E+00	Equation 4	2.17E+00	Equation 2
4-Bromophenylphenyl ether	101-55-3	5.48E+03	Equation 4	9.61E+02	Equation 2
Ammonium perfluorooctanoate	3825-26-1	No data	No data	No data	No data
Azobenzene	103-33-3	4.86E+02	Equation 4	9.61E+01	Equation 2
Bis(3-tert-butyl-4-hydroxy-6-methyl-phenyl)sulfide	96-69-5	No data	No data	No data	No data
Captan	133-06-2	2.25E+01	Equation 4	6.01E+00	Equation 2
Chlorobenzilate	510-15-6	1.53E+03	Equation 4	2.76E+02	Equation 2
Dibutylphosphate	107-66-4	No data	No data	No data	No data
Dimethyl aminoazobenzene	60-11-7	2.29E+03	Equation 4	4.03E+02	Equation 2
Hexachlorobenzene	118-74-1	2.53E+02	EPA (1999)	2.30E+03	EPA (1999)
Hexachlorobutadiene	87-68-3	7.83E+02	EPA (1999)	4.40E-01	EPA (1999)
Hexachlorocyclopentadiene	77-47-4	1.65E+02	EPA (1999)	7.46E+02	EPA (1999)
Hexachloroethane	67-72-1	6.83E+02	Equation 4	1.31E+02	Equation 2
Hexachlorophene	70-30-4	2.78E+02	EPA (1999)	1.07E+05	EPA (1999)
Hexamethylene-1,5-diisocyanate	822-06-0	1.33E+02	Equation 4	2.98E+01	Equation 2[b]
Mirex	2385-85-5	8.09E+03	Equation 4	3.14E+04	Equation 2
Nitrofen	1836-75-5	1.17E+04	Equation 4	2.42E+03	Equation 2

Table C2-1 Ecological Transfer Factors for COPCs and ROPCs

Constituent of Potential Concern	CAS Registry Number	Log K_{ow}[a]	Log K_{oc}[a]	SPv (kg dry soil/kg dry tissue)	Source	BAF-S (kg dry soil/ kg tissue)	Source
Pentachlorobenzene	608-93-5	5.09	4.51	4.40E-02	EPA (1999)	1.05E+03	EPA (1999)
Pentachloronitrobenzene	82-68-8	4.64	3.77	8.00E-02	EPA (1999)	4.51E+02	EPA (1999)
Pentachlorophenol	87-86-5	5.08	2.70	4.49E-02	EPA (1999)	1.03E+03	EPA (1999)
Picric acid	88-89-1	2.03	1.73	2.60E+00	Equation 1	3.29E+00	Equation 2
Pronamide	23950-58-5	3.51	2.89	3.62E-01	Equation 1	5.36E+01	Equation 2[b]
Strychnine	57-24-9	1.93	1.66	2.97E+00	Equation 1	2.72E+00	Equation 2
Terphenyls	26140-60-3	No data	No data	No data	No data	No data	No data
Tributyl phosphate	126-73-8	4.00	3.27	1.89E-01	Equation 1	1.35E+02	Equation 2[b]
Trifluralin	1582-09-8	5.34	3.78	3.17E-02	Equation 1	1.69E+03	Equation 2[b]
Triphenylamine	603-34-9	No data	No data	No data	No data	No data	No data
Herbicides and Organochlorinated Pesticides							
2,4,5-T	93-76-5	3.36	1.72	4.43E-01	Equation 1	4.03E+01	Equation 2[b]
2,4-D and esters	94-75-7	2.81	1.30	9.20E-01	Equation 1	1.43E+01	Equation 2[b]
4,4'-DDD	72-54-8	6.12	4.66	1.12E-02	Equation 1	4.88E+03	Mass-limited
4,4'-DDE	72-55-9	6.26	4.94	9.37E-03	EPA (1999)	1.26E+00	EPA (1999)
4,4'-DDT	50-29-3	6.07	5.83	1.20E-02	Equation 1	4.88E+03	Mass-limited
Aldrin	309-00-2	6.18	4.69	1.04E-02	Equation 1	4.88E+03	Mass-limited
alpha-BHC	319-84-6	3.80	3.25	2.47E-01	Equation 1	9.24E+01	Equation 2[b]
beta-BHC	319-85-7	3.83	3.33	2.36E-01	Equation 1	9.85E+01	Equation 2[b]
Chlordane	57-74-9	5.94	4.71	1.43E-02	Equation 1	5.21E+03	Equation 2[b]
Delta-BHC	319-86-8	4.14	2.82	1.57E-01	Equation 1	1.76E+02	Equation 2[b]
Dieldrin	60-57-1	5.27	4.41	3.49E-02	Equation 1	1.48E+03	Equation 2[b]
Endothall	145-73-3	-0.87	-0.53	1.23E+02	Equation 1	1.39E-02	Equation 2
Endrin	72-20-8	4.89	4.03	5.76E-02	Equation 1	7.25E+02	Equation 2[b]

Table C2-1 Ecological Transfer Factors for COPCs and ROPCs

Constituent of Potential Concern	CAS Registry Number	Mammal Ba ([mg/kg tissue] / [mg ingested /day])	Source	WP (L/kg tissue)	Source	SP (kg dry sediment/ kg dry tissue)	Source
Pentachlorobenzene	608-93-5	3.08E-03	Equation 3	4.00E+03	EPA (1999)	4.40E-02	EPA (1999)
Pentachloronitrobenzene	82-68-8	1.10E-03	Equation 3	4.74E+03	EPA (1999)	8.00E-02	EPA (1999)
Pentachlorophenol	87-86-5	3.01E-03	EPA (1999)	1.71E+03	EPA (1999)	4.49E-02	EPA (1999)
Picric acid	88-89-1	2.69E-06	Equation 3	3.29E+00	Equation 2	2.60E+00	Equation 1
Pronamide	23950-58-5	8.14E-05	Equation 3	5.36E+01	Equation 2	3.62E-01	Equation 1
Strychnine	57-24-9	2.14E-06	Equation 3	2.72E+00	Equation 2	2.97E+00	Equation 1
Terphenyls	26140-60-3	No data	No data	No data	No data	No data	No data
Tributyl phosphate	126-73-8	2.51E-04	Equation 3	1.35E+02	Equation 2	1.89E-01	Equation 1
Trifluralin	1582-09-8	5.50E-03	Equation 3	1.69E+03	Equation 2	3.17E-02	Equation 1
Triphenylamine	603-34-9	No data	No data	No data	No data	No data	No data
Herbicides and Organochlorinated Pesticides							
2,4,5-T	93-76-5	5.75E-05	Equation 3	4.03E+01	Equation 2	4.43E-01	Equation 1
2,4-D and esters	94-75-7	1.62E-05	Equation 3	1.43E+01	Equation 2	9.20E-01	Equation 1
4,4'-DDD	72-54-8	3.32E-02	Equation 3	7.35E+03	Equation 2	1.12E-02	Equation 1
4,4'-DDE	72-55-9	4.54E-02	Equation 3	1.13E+04	EPA (1999)	9.37E-03	EPA (1999)
4,4'-DDT	50-29-3	2.95E-02	Equation 3	6.69E+03	Equation 2	1.20E-02	Equation 1
Aldrin	309-00-2	3.79E-02	Equation 3	8.21E+03	Equation 2	1.04E-02	Equation 1
alpha-BHC	319-84-6	1.58E-04	Equation 3	9.24E+01	Equation 2	2.47E-01	Equation 1
beta-BHC	319-85-7	1.71E-04	Equation 3	9.85E+01	Equation 2	2.36E-01	Equation 1
Chlordane	57-74-9	2.18E-02	Equation 3	5.21E+03	Equation 2	1.43E-02	Equation 1
Delta-BHC	319-86-8	3.47E-04	Equation 3	1.76E+02	Equation 2	1.57E-01	Equation 1
Dieldrin	60-57-1	4.67E-03	Equation 3	1.48E+03	Equation 2	3.49E-02	Equation 1
Endothall	145-73-3	3.39E-09	Equation 3	1.39E-02	Equation 2	1.23E+02	Equation 1
Endrin	72-20-8	1.96E-03	Equation 3	7.25E+02	Equation 2	5.76E-02	Equation 1

Table C2-1 Ecological Transfer Factors for COPCs and ROPCs

Constituent of Potential Concern	CAS Registry Number	BCF_{fish} (L/kg tissue)	Source	BASF (kg dry sediment/ kg tissue)	Source
Pentachlorobenzene	608-93-5	1.27E+04	EPA (1999)	3.20E-01	EPA (1999)
Pentachloronitrobenzene	82-68-8	2.14E+02	EPA (1999)	4.51E+02	EPA (1999)
Pentachlorophenol	87-86-5	1.09E+02	EPA (1999)	1.03E+03	EPA (1999)
Picric acid	88-89-1	1.15E+01	Equation 4	3.29E+00	Equation 2
Pronamide	23950-58-5	2.55E+02	Equation 4	5.36E+01	Equation 2
Strychnine	57-24-9	9.34E+00	Equation 4	2.72E+00	Equation 2
Terphenyls	26140-60-3	No data	No data	No data	No data
Tributyl phosphate	126-73-8	7.05E+02	Equation 4	1.35E+02	Equation 2
Trifluralin	1582-09-8	9.00E+03	Equation 4	1.69E+03	Equation 2
Triphenylamine	603-34-9	No data	No data	No data	No data
Herbicides and Organochlorinated Pesticides					
2,4,5-T	93-76-5	1.86E+02	Equation 4	4.03E+01	Equation 2
2,4-D and esters	94-75-7	5.90E+01	Equation 4	1.43E+01	Equation 2
4,4'-DDD	72-54-8	1.72E+04	Equation 4	7.35E+03	Equation 2
4,4'-DDE	72-55-9	2.55E+04	EPA (1999)	9.50E-01	EPA (1999)
4,4'-DDT	50-29-3	1.71E+04	Equation 4	6.69E+03	Equation 2
Aldrin	309-00-2	1.70E+04	Equation 4	8.21E+03	Equation 2
alpha-BHC	319-84-6	4.65E+02	Equation 4	9.24E+01	Equation 2
beta-BHC	319-85-7	4.99E+02	Equation 4	9.85E+01	Equation 2
Chlordane	57-74-9	1.66E+04	Equation 4	5.21E+03	Equation 2
Delta-BHC	319-86-8	9.41E+02	Equation 4	1.76E+02	Equation 2
Dieldrin	60-57-1	8.07E+03	Equation 4	1.48E+03	Equation 2
Endothall	145-73-3	2.64E-02	Equation 4	1.39E-02	Equation 2
Endrin	72-20-8	4.18E+03	Equation 4	7.25E+02	Equation 2

Table C2-1 Ecological Transfer Factors for COPCs and ROPCs

Constituent of Potential Concern	CAS Registry Number	Log K_{ow}[a]	Log K_{oc}[a]	SPv (kg dry soil/kg dry tissue)	Source	BAF-S (kg dry soil/ kg tissue)	Source
gamma-BHC (Lindane)	58-89-9	3.72	3.03	2.74E-01	Equation 1	7.96E+01	Equation 2[b]
Heptachlor	76-44-8	5.02	3.98	4.89E-02	EPA (1999)	1.40E+00	EPA (1999)
Isodrin	465-73-6	No data	No data	No data	No data	No data	No data
Methoxychlor	72-43-5	4.53	4.90	9.37E-02	Equation 1	3.64E+02	Equation 2[b]
Silvex (2,4,5-TP)	93-72-1	3.80	1.91	2.46E-01	Equation 1	9.25E+01	Equation 2[b]
Toxaphene	8001-35-2	5.50	5.00	2.56E-02	Equation 1	2.28E+03	Equation 2[b]
Inorganic Chemicals and Compounds							
	Metals						
Aluminum	7429-90-5	NA	NA	4.00E-03	EPA (1999)	2.20E-01	EPA (1999)
Antimony	7440-36-0	NA	NA	2.00E-01	EPA (1999)	2.20E-01	EPA (1999)
Arsenic	7440-38-2	NA	NA	3.60E-02	EPA (1999)	1.10E-01	EPA (1999)
Barium	7440-39-3	NA	NA	1.50E-01	EPA (1999)	2.20E-01	EPA (1999)
Beryllium	7440-41-7	NA	NA	1.00E-02	EPA (1999)	2.20E-01	EPA (1999)
Bismuth	7440-69-9	NA	NA	3.50E-02	Baes and others (1984)	3.21E-01	Average[d]
Boron	7440-42-8	NA	NA	4.00E+00	Baes and others (1984)	3.21E-01	Average[d]
Cadmium	7440-43-9	NA	NA	3.64E-01	EPA (1999)	9.60E-01	EPA (1999)
Calcium	7440-70-2	NA	NA	3.50E+00	Baes and others (1984)	3.21E-01	Average[d]
Chromium[e]	18540-29-9	NA	NA	7.50E-03	EPA (1999)	1.00E-02	EPA (1999)
Cobalt	7440-48-4	NA	NA	2.00E-02	Baes and others (1984)	3.21E-01	Average[d]
Copper	7440-50-8	NA	NA	4.00E-01	EPA (1999)	4.00E-02	EPA (1999)
Iron	7439-89-6	NA	NA	4.00E-03	Baes and others (1984)	3.21E-01	Average[d]
Lead	7439-92-1	NA	NA	4.50E-02	EPA (1999)	3.00E-02	EPA (1999)
Lithium	7439-93-2	NA	NA	2.50E-02	Baes and others (1984)	3.21E-01	Average[d]
Magnesium	7439-95-4	NA	NA	1.00E+00	Baes and others (1984)	3.21E-01	Average[d]

Table C2-1 Ecological Transfer Factors for COPCs and ROPCs

Constituent of Potential Concern	CAS Registry Number	Mammal Ba ([mg/kg tissue] / [mg ingested /day])	Source	WP (L/kg tissue)	Source	SP (kg dry sediment/ kg dry tissue)	Source
gamma-BHC (Lindane)	58-89-9	1.32E-04	Equation 3	7.96E+01	Equation 2	2.74E-01	Equation 1
Heptachlor	76-44-8	2.60E-03	Equation 3	2.10E+04	EPA (1999)	4.89E-02	EPA (1999)
Isodrin	465-73-6	No data	No data	No data	No data	No data	No data
Methoxychlor	72-43-5	8.44E-04	Equation 3	3.64E+02	Equation 2	9.37E-02	Equation 1
Silvex (2,4,5-TP)	93-72-1	1.58E-04	Equation 3	9.25E+01	Equation 2[b]	2.46E-01	Equation 1
Toxaphene	8001-35-2	7.94E-03	Equation 3	2.28E+03	Equation 2	2.56E-02	Equation 1
Inorganic Chemicals and Compounds							
	Metals						
Aluminum	7429-90-5	1.50E-03	Baes and others (1984)	8.33E+02	EPA (1999)	4.00E-03	EPA (1999)
Antimony	7440-36-0	1.00E-03	Baes and others (1984)	1.48E+03	EPA (1999)	2.00E-01	EPA (1999)
Arsenic	7440-38-2	2.00E-03	Baes and others (1984)	2.93E+02	EPA (1999)	3.60E-02	EPA (1999)
Barium	7440-39-3	1.50E-04	Baes and others (1984)	2.60E+02	EPA (1999)	1.50E-01	EPA (1999)
Beryllium	7440-41-7	1.00E-03	Baes and others (1984)	1.41E+02	EPA (1999)	1.00E-02	EPA (1999)
Bismuth	7440-69-9	4.00E-04	Baes and others (1984)	4.06E+03	Average[d]	3.50E-02	Baes and others (1984)
Boron	7440-42-8	8.00E-04	Baes and others (1984)	4.06E+03	Average[d]	4.00E+00	Baes and others (1984)
Cadmium	7440-43-9	3.40E-03	Baes and others (1984)	7.82E+02	EPA (1999)	3.64E-01	EPA (1999)
Calcium	7440-70-2	7.00E-04	Baes and others (1984)	4.06E+03	Average[d]	3.50E+00	Baes and others (1984)
Chromium[e]	18540-29-9	5.51E-03	Baes and others (1984)	4.41E+03	EPA (1999)	7.50E-03	EPA (1999)
Cobalt	7440-48-4	2.00E-02	Baes and others (1984)	4.06E+03	Average[d]	2.00E-02	Baes and others (1984)
Copper	7440-50-8	1.00E-02	Baes and others (1984)	5.41E+02	EPA (1999)	4.00E-01	EPA (1999)
Iron	7439-89-6	2.00E-02	Baes and others (1984)	4.06E+03	Average[d]	4.00E-03	Baes and others (1984)
Lead	7439-92-1	3.00E-04	Baes and others (1984)	1.71E+03	EPA (1999)	4.50E-02	EPA (1999)
Lithium	7439-93-2	1.00E-02	Baes and others (1984)	4.06E+03	Average[d]	2.50E-02	Baes and others (1984)
Magnesium	7439-95-4	5.00E-03	Baes and others (1984)	4.06E+03	Average[d]	1.00E+00	Baes and others (1984)

Table C2-1 Ecological Transfer Factors for COPCs and ROPCs

Constituent of Potential Concern	CAS Registry Number	BCF_{fish} (L/kg tissue)	Source	BASF (kg dry sediment/ kg tissue)	Source
gamma-BHC (Lindane)	58-89-9	3.95E+02	Equation 4	7.96E+01	Equation 2
Heptachlor	76-44-8	5.52E+03	EPA (1999)	1.67E+00	EPA (1999)
Isodrin	465-73-6	No data	No data	No data	No data
Methoxychlor	72-43-5	2.06E+03	Equation 4	3.64E+02	Equation 2
Silvex (2,4,5-TP)	93-72-1	4.66E+02	Equation 4	9.25E+01	Equation 2[b]
Toxaphene	8001-35-2	1.13E+04	Equation 4	2.28E+03	Equation 2[b]
Inorganic Chemicals and Compounds					
	Metals				
Aluminum	7429-90-5	2.70E+00	EPA (1999)	9.00E-01	EPA (1999)
Antimony	7440-36-0	4.00E+01	EPA (1999)	9.00E-01	EPA (1999)
Arsenic	7440-38-2	1.14E+02	EPA (1999)	9.00E-01	EPA (1999)
Barium	7440-39-3	6.33E+02	EPA (1999)	9.00E-01	EPA (1999)
Beryllium	7440-41-7	6.20E+01	EPA (1999)	9.00E-01	EPA (1999)
Bismuth	7440-69-9	1.23E+03	Average[d]	8.93E-01	Average[d]
Boron	7440-42-8	1.23E+03	Average[d]	8.93E-01	Average[d]
Cadmium	7440-43-9	9.07E+02	EPA (1999)	3.40E+00	EPA (1999)
Calcium	7440-70-2	1.23E+03	Average[d]	8.93E-01	Average[d]
Chromium[e]	18540-29-9	1.90E+01	EPA (1999)	3.90E-01	EPA (1999)
Cobalt	7440-48-4	1.23E+03	Average[d]	8.93E-01	Average[d]
Copper	7440-50-8	7.10E+02	EPA (1999)	3.00E-01	EPA (1999)
Iron	7439-89-6	1.23E+03	Average[d]	8.93E-01	Average[d]
Lead	7439-92-1	9.00E-02	EPA (1999)	6.30E-01	EPA (1999)
Lithium	7439-93-2	1.23E+03	Average[d]	8.93E-01	Average[d]
Magnesium	7439-95-4	1.23E+03	Average[d]	8.93E-01	Average[d]

Table C2-1 Ecological Transfer Factors for COPCs and ROPCs

Constituent of Potential Concern	CAS Registry Number	Log K_{ow}[a]	Log K_{oc}[a]	SPv (kg dry soil/kg dry tissue)	Source	BAF-S (kg dry soil/ kg tissue)	Source
Manganese	7439-96-5	NA	NA	2.50E-01	Baes and others (1984)	3.21E-01	Average[d]
Mercury	7439-97-6	NA	NA	NA	NA	NA	NA
Mercury - Hg+2	7487-94-7	NA	NA	3.75E-02	EPA (1999)	4.00E-02	EPA (1999)
Methylmercury	22967-92-6	NA	NA	1.37E-01	EPA (1999)	8.50E+00	EPA (1999)
Molybdenum	7439-98-7	NA	NA	2.50E-01	Baes and others (1984)	3.21E-01	Average[d]
Nickel	7440-02-0	NA	NA	3.20E-02	EPA (1999)	2.00E-02	EPA (1999)
Potassium	7440-09-7	NA	NA	1.00E+00	Baes and others (1984)	3.21E-01	Average[d]
Rhodium	7440-16-6	NA	NA	1.50E-01	Baes and others (1984)	3.21E-01	Average[d]
Selenium	7782-49-2	NA	NA	1.60E-02	EPA (1999)	2.20E-01	EPA (1999)
Silicon	7440-21-3	NA	NA	3.50E-01	Baes and others (1984)	3.21E-01	Average[d]
Silver	7440-22-4	NA	NA	4.00E-01	EPA (1999)	2.20E-01	EPA (1999)
Sodium	7440-23-5	NA	NA	7.50E-02	Baes and others (1984)	3.21E-01	Average[d]
Strontium	7440-24-6	NA	NA	2.50E+00	Baes and others (1984)	3.21E-01	Average[d]
Tantalum	7440-25-7	NA	NA	1.00E-02	Baes and others (1984)	3.21E-01	Average[d]
Thallium	7440-28-0	NA	NA	4.00E-03	EPA (1999)	2.20E-01	EPA (1999)
Tin	7440-31-5	NA	NA	3.00E-02	Baes and others (1984)	3.21E-01	Average[d]
Tungsten	7440-33-7	NA	NA	4.50E-02	Baes and others (1984)	3.21E-01	Average[d]
Uranium	7440-61-1	NA	NA	8.50E-03	Baes and others (1984)	3.21E-01	Average[d]
Vanadium	7440-62-2	NA	NA	5.50E-03	Baes and others (1984)	3.21E-01	Average[d]
Yttrium	7440-65-5	NA	NA	1.50E-02	Baes and others (1984)	3.21E-01	Average[d]
Zinc	7440-66-6	NA	NA	1.20E-12	EPA (1999)	5.60E-01	EPA (1999)
Zirconium	7440-67-7	NA	NA	2.00E-03	Baes and others (1984)	3.21E-01	Average[d]

Table C2-1 Ecological Transfer Factors for COPCs and ROPCs

Constituent of Potential Concern	CAS Registry Number	Mammal Ba ([mg/kg tissue] / [mg ingested /day])	Source	WP (L/kg tissue)	Source	SP (kg dry sediment/ kg dry tissue)	Source
Manganese	7439-96-5	4.00E-04	Baes and others (1984)	4.06E+03	Average[d]	2.50E-01	Baes and others (1984)
Mercury	7439-97-6	NA	NA	NA	NA	NA	NA
Mercury - Hg+2	7487-94-7	5.21E-03	EPA (1999)	2.48E+04	EPA (1999)	3.75E-02	EPA (1999)
Methylmercury	22967-92-6	7.81E-04	EPA (1999)	8.00E+04	EPA (1999)	1.37E-01	EPA (1999)
Molybdenum	7439-98-7	6.00E-03	Baes and others (1984)	4.06E+03	Average[c]	2.50E-01	Baes and others (1984)
Nickel	7440-02-0	6.00E-03	Baes and others (1984)	6.10E+01	EPA (1999)	3.20E-02	EPA (1999)
Potassium	7440-09-7	2.00E-02	Baes and others (1984)	4.06E+03	Average[d]	1.00E+00	Baes and others (1984)
Rhodium	7440-16-6	2.00E-03	Baes and others (1984)	4.06E+03	Average[d]	1.50E-01	Baes and others (1984)
Selenium	7782-49-2	1.90E-03	Baes and others (1984)	1.85E+03	EPA (1999)	1.60E-02	EPA (1999)
Silicon	7440-21-3	4.00E-05	Baes and others (1984)	4.06E+03	Average[d]	3.50E-01	Baes and others (1984)
Silver	7440-22-4	3.00E-03	Baes and others (1984)	1.07E+04	EPA (1999)	4.00E-01	EPA (1999)
Sodium	7440-23-5	5.50E-02	Baes and others (1984)	4.06E+03	Average[d]	7.50E-02	Baes and others (1984)
Strontium	7440-24-6	3.00E-04	Baes and others (1984)	4.06E+03	Average[d]	2.50E+00	Baes and others (1984)
Tantalum	7440-25-7	6.00E-04	Baes and others (1984)	4.06E+03	Average[d]	1.00E-02	Baes and others (1984)
Thallium	7440-28-0	4.00E-02	Baes and others (1984)	1.50E+04	EPA (1999)	4.00E-03	EPA (1999)
Tin	7440-31-5	8.00E-02	Baes and others (1984)	4.06E+03	Average[d]	3.00E-02	Baes and others (1984)
Tungsten	7440-33-7	4.50E-02	Baes and others (1984)	4.06E+03	Average[d]	4.50E-02	Baes and others (1984)
Uranium	7440-61-1	2.00E-04	Baes and others (1984)	4.06E+03	Average[d]	8.50E-03	Baes and others (1984)
Vanadium	7440-62-2	2.50E-03	Baes and others (1984)	4.06E+03	Average[d]	5.50E-03	Baes and others (1984)
Yttrium	7440-65-5	3.00E-04	Baes and others (1984)	4.06E+03	Average[d]	1.50E-02	Baes and others (1984)
Zinc	7440-66-6	1.00E-01	Baes and others (1984)	2.18E+03	EPA (1999)	1.20E-12	EPA (1999)
Zirconium	7440-67-7	5.50E-03	Baes and others (1984)	4.06E+03	Average[d]	2.00E-03	Baes and others (1984)

Table C2-1 Ecological Transfer Factors for COPCs and ROPCs

Constituent of Potential Concern	CAS Registry Number	BCF_{fish} (L/kg tissue)	Source	BASF (kg dry sediment/ kg tissue)	Source
Manganese	7439-96-5	1.23E+03	Average[d]	8.93E-01	Average[d]
Mercury	7439-97-6	NA	NA	NA	NA
Mercury - Hg+2	7487-94-7	3.53E+03	EPA (1999)	6.80E-02	EPA (1999)
Methylmercury	22967-92-6	1.12E+04	EPA (1999)	4.80E-01	EPA (1999)
Molybdenum	7439-98-7	1.23E+03	Average[d]	8.93E-01	Average[d]
Nickel	7440-02-0	7.80E+01	EPA (1999)	9.00E-01	EPA (1999)
Potassium	7440-09-7	1.23E+03	Average[d]	8.93E-01	Average[d]
Rhodium	7440-16-6	1.23E+03	Average[d]	8.93E-01	Average[d]
Selenium	7782-49-2	1.29E+02	EPA (1999)	9.00E-01	EPA (1999)
Silicon	7440-21-3	1.23E+03	Average[d]	8.93E-01	Average[d]
Silver	7440-22-4	8.77E+01	EPA (1999)	9.00E-01	EPA (1999)
Sodium	7440-23-5	1.23E+03	Average[d]	8.93E-01	Average[d]
Strontium	7440-24-6	1.23E+03	Average[d]	8.93E-01	Average[d]
Tantalum	7440-25-7	1.23E+03	Average[d]	8.93E-01	Average[d]
Thallium	7440-28-0	1.00E+04	EPA (1999)	9.00E-01	EPA (1999)
Tin	7440-31-5	1.23E+03	Average[d]	8.93E-01	Average[d]
Tungsten	7440-33-7	1.23E+03	Average[d]	8.93E-01	Average[d]
Uranium	7440-61-1	1.23E+03	Average[d]	8.93E-01	Average[d]
Vanadium	7440-62-2	1.23E+03	Average[d]	8.93E-01	Average[d]
Yttrium	7440-65-5	1.23E+03	Average[d]	8.93E-01	Average[d]
Zinc	7440-66-6	2.06E+03	EPA (1999)	5.70E-01	EPA (1999)
Zirconium	7440-67-7	1.23E+03	Average[d]	8.93E-01	Average[d]

Table C2-1 Ecological Transfer Factors for COPCs and ROPCs

Constituent of Potential Concern	CAS Registry Number	Log K_{ow}[a]	Log K_{oc}[a]	SPv (kg dry soil/kg dry tissue)	Source	BAF-S (kg dry soil/ kg tissue)	Source
Non-metals and Anions							
Ammonia/Ammonium	7664-41-7	NA	NA	1.72E+00	Average[d]	3.21E-01	Average[d]
Bromide	24959-67-9	NA	NA	1.50E+00	Baes and others (1984)	3.21E-01	Average[d]
Chloride	16887-00-6	NA	NA	7.00E+01	Baes and others (1984)	3.21E-01	Average[d]
Cyanide	57-12-5	NA	NA	1.72E+00	Average[d]	1.12E+00	EPA (1999)
Fluoride	16984-48-8	NA	NA	6.00E-02	Baes and others (1984)	3.21E-01	Average[d]
Hydroxide	14280-30-9	NA	NA	NA	NA	NA	NA
Iodine	7553-56-2	NA	NA	1.50E-01	Baes and others (1984)	3.21E-01	Average[d]
Nitrate	14797-55-8	NA	NA	1.72E+00	Average[d]	3.21E-01	Average[d]
Nitrite	14797-65-0	NA	NA	1.72E+00	Average[d]	3.21E-01	Average[d]
Phosphate	14265-44-2	NA	NA	3.50E+00	Baes and others (1984)	3.21E-01	Average[d]
Phosphorus	7723-14-0	NA	NA	3.50E+00	Baes and others (1984)	3.21E-01	Average[d]
Sulfate	14808-79-8	NA	NA	1.50E+00	Baes and others (1984)	3.21E-01	Average[d]
Total Sulfur	63705-05-5	NA	NA	1.50E+00	Baes and others (1984)	3.21E-01	Average[d]
Criteria Pollutants							
Carbon monoxide	630-08-0	NA	NA	1.72E+00	Average[d]	3.21E-01	Average[d]
Nitrogen dioxide	10102-44-0	NA	NA	1.72E+00	Average[d]	3.21E-01	Average[d]
Ozone	10028-15-6	NA	NA	1.72E+00	Average[d]	3.21E-01	Average[d]
Particulate matter	No CAS #	NA	NA	NA	NA	NA	NA
Sulfur dioxide	7446-09-5	NA	NA	1.72E+00	Average[d]	3.21E-01	Average[d]
Radionuclides							
All radionuclides combined (rad/d)	No CAS #	NA	NA	NA	NA	NA	NA
Actinium-227	14952-40-0	NA	NA	3.50E-03	Baes and others (1984)	3.21E-01	Average[d]

Table C2-1 Ecological Transfer Factors for COPCs and ROPCs

Constituent of Potential Concern	CAS Registry Number	Mammal Ba ([mg/kg tissue] / [mg ingested /day])	Source	WP (L/kg tissue)	Source	SP (kg dry sediment/ kg dry tissue)	Source
Non-metals and Anions							
Ammonia/Ammonium	7664-41-7	1.95E-02	Average[d]	4.06E+03	Average[d]	1.72E+00	Average[d]
Bromide	24959-67-9	2.50E-02	Baes and others (1984)	4.06E+03	Average[d]	1.50E+00	Baes and others (1984)
Chloride	16887-00-6	8.00E-02	Baes and others (1984)	4.06E+03	Average[d]	7.00E+01	Baes and others (1984)
Cyanide	57-12-5	1.95E-02	Average[d]	2.20E+01	EPA (1999)	1.72E+00	Average[d]
Fluoride	16984-48-8	1.50E-01	Baes and others (1984)	4.06E+03	Average[d]	6.00E-02	Baes and others (1984)
Hydroxide	14280-30-9	NA	NA	NA	NA	NA	NA
Iodine	7553-56-2	7.00E-03	Baes and others (1984)	4.06E+03	Average[d]	1.50E-01	Baes and others (1984)
Nitrate	14797-55-8	7.50E-02	Baes and others (1984)	4.06E+03	Average[d]	1.72E+00	Average[d]
Nitrite	14797-65-0	7.50E-02	Baes and others (1984)	4.06E+03	Average[d]	1.72E+00	Average[d]
Phosphate	14265-44-2	5.50E-02	Baes and others (1984)	4.06E+03	Average[d]	3.50E+00	Baes and others (1984)
Phosphorus	7723-14-0	5.50E-02	Baes and others (1984)	4.06E+03	Average[d]	3.50E+00	Baes and others (1984)
Sulfate	14808-79-8	1.00E-01	Baes and others (1984)	4.06E+03	Average[d]	1.50E+00	Baes and others (1984)
Total Sulfur	63705-05-5	1.00E-01	Baes and others (1984)	4.06E+03	Average[d]	1.50E+00	Baes and others (1984)
Criteria Pollutants							
Carbon monoxide	630-08-0	1.95E-02	Average[d]	4.06E+03	Average[d]	1.72E+00	Average[d]
Nitrogen dioxide	10102-44-0	1.95E-02	Average[d]	4.06E+03	Average[d]	1.72E+00	Average[d]
Ozone	10028-15-6	1.95E-02	Average[d]	4.06E+03	Average[d]	1.72E+00	Average[d]
Particulate matter	No CAS #	NA	NA	NA	NA	NA	NA
Sulfur dioxide	7446-09-5	1.95E-02	Average[d]	4.06E+03	Average[d]	1.72E+00	Average[d]
Radionuclides							
All radionuclides combined (rad/d)	No CAS #	NA	NA	NA	NA	NA	NA
Actinium-227	14952-40-0	2.50E-03	Baes and others (1984)	4.06E+03	Average[d]	3.50E-03	Baes and others (1984)

Table C2-1 Ecological Transfer Factors for COPCs and ROPCs

Constituent of Potential Concern	CAS Registry Number	BCF_{fish} (L/kg tissue)	Source	BASF (kg dry sediment/ kg tissue)	Source
Non-metals and Anions					
Ammonia/Ammonium	7664-41-7	1.23E+03	Average[d]	8.93E-01	Average[d]
Bromide	24959-67-9	1.23E+03	Average[d]	8.93E-01	Average[d]
Chloride	16887-00-6	1.23E+03	Average[d]	8.93E-01	Average[d]
Cyanide	57-12-5	6.33E+02	EPA (1999)	9.00E-01	EPA (1999)
Fluoride	16984-48-8	1.23E+03	Average[d]	8.93E-01	Average[d]
Hydroxide	14280-30-9	NA	NA	NA	NA
Iodine	7553-56-2	1.23E+03	Average[d]	8.93E-01	Average[d]
Nitrate	14797-55-8	1.23E+03	Average[d]	8.93E-01	Average[d]
Nitrite	14797-65-0	1.23E+03	Average[d]	8.93E-01	Average[d]
Phosphate	14265-44-2	1.23E+03	Average[d]	8.93E-01	Average[d]
Phosphorus	7723-14-0	1.23E+03	Average[d]	8.93E-01	Average[d]
Sulfate	14808-79-8	1.23E+03	Average[d]	8.93E-01	Average[d]
Total Sulfur	63705-05-5	1.23E+03	Average[d]	8.93E-01	Average[d]
Criteria Pollutants					
Carbon monoxide	630-08-0	1.23E+03	Average[d]	8.93E-01	Average[d]
Nitrogen dioxide	10102-44-0	1.23E+03	Average[d]	8.93E-01	Average[d]
Ozone	10028-15-6	1.23E+03	Average[d]	8.93E-01	Average[d]
Particulate matter	No CAS #	NA	NA	NA	NA
Sulfur dioxide	7446-09-5	1.23E+03	Average[d]	8.93E-01	Average[d]
Radionuclides					
All radionuclides combined (rad/d)	No CAS #	NA	NA	NA	NA
Actinium-227	14952-40-0	1.23E+03	Average[d]	8.93E-01	Average[d]

Table C2-1 Ecological Transfer Factors for COPCs and ROPCs

Constituent of Potential Concern	CAS Registry Number	Log K_{ow}[a]	Log K_{oc}[a]	SPv (kg dry soil/kg dry tissue)	Source	BAF-S (kg dry soil/ kg tissue)	Source
Americium-241	14596-10-2	NA	NA	5.50E-03	Baes and others (1984)	3.21E-01	Average[d]
Americium-243	14993-75-0	NA	NA	5.50E-03	Baes and others (1984)	3.21E-01	Average[d]
Antimony-125	14234-35-6	NA	NA	2.00E-01	EPA (1999)	3.21E-01	Average[d]
Barium-137m	13981-97-0	NA	NA	1.50E-01	EPA (1999)	3.21E-01	Average[d]
Cadmium-113m	14336-66-4	NA	NA	3.64E-01	EPA (1999)	9.60E-01	EPA (1999)
Carbon-14	14762-75-5	NA	NA	NA	Baes and others (1984)	NA	NA
Cesium-134	13967-70-9	NA	NA	8.00E-02	Baes and others (1984)	3.21E-01	Average[d]
Cesium-137	10045-97-3	NA	NA	8.00E-02	Baes and others (1984)	3.21E-01	Average[d]
Cobalt-60	10198-40-0	NA	NA	2.00E-02	Baes and others (1984)	3.21E-01	Average[d]
Curium-242	15510-73-3	NA	NA	8.50E-03	Baes and others (1984)	3.21E-01	Average[d]
Curium-243	15757-87-6	NA	NA	8.50E-03	Baes and others (1984)	3.21E-01	Average[d]
Curium-244	13981-15-2	NA	NA	8.50E-03	Baes and others (1984)	3.21E-01	Average[d]
Europium-152	14683-23-9	NA	NA	1.00E-02	Baes and others (1984)	3.21E-01	Average[d]
Europium-154	15585-10-1	NA	NA	1.00E-02	Baes and others (1984)	3.21E-01	Average[d]
Europium-155	14391-16-3	NA	NA	1.00E-02	Baes and others (1984)	3.21E-01	Average[d]
Iodine-129	15046-84-1	NA	NA	1.50E-01	Baes and others (1984)	3.21E-01	Average[d]
Neptunium-237	13994-20-2	NA	NA	1.00E-01	Baes and others (1984)	3.21E-01	Average[d]
Nickel-59	14336-70-0	NA	NA	3.20E-02	EPA (1999)	2.00E-02	EPA (1999)
Nickel-63	13981-37-8	NA	NA	3.20E-02	EPA (1999)	2.00E-02	EPA (1999)
Niobium-93m	7440-03-1[f]	NA	NA	2.00E-02	Baes and others (1984)	3.21E-01	Average[d]
Plutonium-238	13981-16-3	NA	NA	4.50E-04	Baes and others (1984)	3.21E-01	Average[d]
Plutonium-239	15117-48-3	NA	NA	4.50E-04	Baes and others (1984)	3.21E-01	Average[d]
Plutonium-240	14119-33-6	NA	NA	4.50E-04	Baes and others (1984)	3.21E-01	Average[d]

Table C2-1 Ecological Transfer Factors for COPCs and ROPCs

Constituent of Potential Concern	CAS Registry Number	Mammal Ba ([mg/kg tissue] / [mg ingested /day])	Source	WP (L/kg tissue)	Source	SP (kg dry sediment/ kg dry tissue)	Source
Americium-241	14596-10-2	3.50E-06	Baes and others (1984)	4.06E+03	Average[d]	5.50E-03	Baes and others (1984)
Americium-243	14993-75-0	3.50E-06	Baes and others (1984)	4.06E+03	Average[d]	5.50E-03	Baes and others (1984)
Antimony-125	14234-35-6	1.00E-03	Baes and others (1984)	1.48E+03	EPA (1999)	2.00E-01	EPA (1999)
Barium-137m	13981-97-0	1.50E-04	Baes and others (1984)	2.60E+02	EPA (1999)	1.50E-01	EPA (1999)
Cadmium-113m	14336-66-4	1.20E-04	Baes and others (1984)	7.82E+02	EPA (1999)	3.64E-01	EPA (1999)
Carbon-14	14762-75-5	NA	NA	NA	NA	NA	Baes and others (1984)
Cesium-134	13967-70-9	2.00E-02	Baes and others (1984)	4.06E+03	Average[d]	8.00E-02	Baes and others (1984)
Cesium-137	10045-97-3	2.00E-02	Baes and others (1984)	4.06E+03	Average[d]	8.00E-02	Baes and others (1984)
Cobalt-60	10198-40-0	2.00E-02	Baes and others (1984)	4.06E+03	Average[d]	2.00E-02	Baes and others (1984)
Curium-242	15510-73-3	3.50E-06	Baes and others (1984)	4.06E+03	Average[d]	8.50E-03	Baes and others (1984)
Curium-243	15757-87-6	3.50E-06	Baes and others (1984)	4.06E+03	Average[d]	8.50E-03	Baes and others (1984)
Curium-244	13981-15-2	3.50E-06	Baes and others (1984)	4.06E+03	Average[d]	8.50E-03	Baes and others (1984)
Europium-152	14683-23-9	5.00E-03	Baes and others (1984)	4.06E+03	Average[d]	1.00E-02	Baes and others (1984)
Europium-154	15585-10-1	5.00E-03	Baes and others (1984)	4.06E+03	Average[d]	1.00E-02	Baes and others (1984)
Europium-155	14391-16-3	5.00E-03	Baes and others (1984)	4.06E+03	Average[d]	1.00E-02	Baes and others (1984)
Iodine-129	15046-84-1	7.00E-03	Baes and others (1984)	4.06E+03	Average[d]	1.50E-01	Baes and others (1984)
Neptunium-237	13994-20-2	5.50E-03	Baes and others (1984)	4.06E+03	Average[d]	1.00E-01	Baes and others (1984)
Nickel-59	14336-70-0	6.00E-03	Baes and others (1984)	6.10E+01	EPA (1999)	3.20E-02	EPA (1999)
Nickel-63	13981-37-8	6.00E-03	Baes and others (1984)	6.10E+01	EPA (1999)	3.20E-02	EPA (1999)
Niobium-93m	7440-03-1[f]	2.50E-01	Baes and others (1984)	4.06E+03	Average[d]	2.00E-02	Baes and others (1984)
Plutonium-238	13981-16-3	5.00E-07	Baes and others (1984)	4.06E+03	Average[d]	4.50E-04	Baes and others (1984)
Plutonium-239	15117-48-3	5.00E-07	Baes and others (1984)	4.06E+03	Average[d]	4.50E-04	Baes and others (1984)
Plutonium-240	14119-33-6	5.00E-07	Baes and others (1984)	4.06E+03	Average[d]	4.50E-04	Baes and others (1984)

Table C2-1 Ecological Transfer Factors for COPCs and ROPCs

Constituent of Potential Concern	CAS Registry Number	BCF_{fish} (L/kg tissue)	Source	BASF (kg dry sediment/ kg tissue)	Source
Americium-241	14596-10-2	1.23E+03	Average[d]	8.93E-01	Average[d]
Americium-243	14993-75-0	1.23E+03	Average[d]	8.93E-01	Average[d]
Antimony-125	14234-35-6	4.00E+01	EPA (1999)	9.00E-01	EPA (1999)
Barium-137m	13981-97-0	1.23E+03	EPA (1999)	9.00E-01	EPA (1999)
Cadmium-113m	14336-66-4	9.07E+02	EPA (1999)	3.40E+00	EPA (1999)
Carbon-14	14762-75-5	NA	NA	NA	NA
Cesium-134	13967-70-9	1.23E+03	Average[d]	8.93E-01	Average[d]
Cesium-137	10045-97-3	1.23E+03	Average[d]	8.93E-01	Average[d]
Cobalt-60	10198-40-0	1.23E+03	Average[d]	8.93E-01	Average[d]
Curium-242	15510-73-3	1.23E+03	Average[d]	8.93E-01	Average[d]
Curium-243	15757-87-6	1.23E+03	Average[d]	8.93E-01	Average[d]
Curium-244	13981-15-2	1.23E+03	Average[d]	8.93E-01	Average[d]
Europium-152	14683-23-9	1.23E+03	Average[d]	8.93E-01	Average[d]
Europium-154	15585-10-1	1.23E+03	Average[d]	8.93E-01	Average[d]
Europium-155	14391-16-3	1.23E+03	Average[d]	8.93E-01	Average[d]
Iodine-129	15046-84-1	1.23E+03	Average[d]	8.93E-01	Average[d]
Neptunium-237	13994-20-2	1.23E+03	Average[d]	8.93E-01	Average[d]
Nickel-59	14336-70-0	7.80E+01	EPA (1999)	8.93E-01	EPA (1999)
Nickel-63	13981-37-8	7.80E+01	EPA (1999)	8.93E-01	EPA (1999)
Niobium-93m	7440-03-1[m]	1.23E+03	Average[d]	8.93E-01	Average[d]
Plutonium-238	13981-16-3	1.23E+03	Average[d]	8.93E-01	Average[d]
Plutonium-239	15117-48-3	1.23E+03	Average[d]	8.93E-01	Average[d]
Plutonium-240	14119-33-6	1.23E+03	Average[d]	8.93E-01	Average[d]

Table C2-1 Ecological Transfer Factors for COPCs and ROPCs

Constituent of Potential Concern	CAS Registry Number	Log K_{ow}[a]	Log K_{oc}[a]	SPv (kg dry soil/kg dry tissue)	Source	BAF-S (kg dry soil/ kg tissue)	Source
Plutonium-241	14119-32-5	NA	NA	4.50E-04	Baes and others (1984)	3.21E-01	Average[d]
Plutonium-242	13982-10-0	NA	NA	4.50E-04	Baes and others (1984)	3.21E-01	Average[d]
Protactinium-231	14331-85-2	NA	NA	2.50E-03	Baes and others (1984)	3.21E-01	Average[d]
Radium-226	13982-63-3	NA	NA	1.50E-02	Baes and others (1984)	3.21E-01	Average[d]
Radium-228	15262-20-1	NA	NA	1.50E-02	Baes and others (1984)	3.21E-01	Average[d]
Ruthenium-106	13967-48-1	NA	NA	7.50E-02	Baes and others (1984)	3.21E-01	Average[d]
Samarium-151	15715-94-3	NA	NA	1.00E-02	Baes and others (1984)	3.21E-01	Average[d]
Selenium-79	15758-45-9	NA	NA	2.50E-02	EPA (1999)	3.21E-01	Average[d]
Strontium-90	10098-97-2	NA	NA	2.50E+00	Baes and others (1984)	3.21E-01	Average[d]
Technetium-99	14133-76-7	NA	NA	9.50E+00	Baes and others (1984)	3.21E-01	Average[d]
Thorium-229	15594-54-4	NA	NA	8.50E-04	Baes and others (1984)	3.21E-01	Average[d]
Thorium-232	7440-29-1	NA	NA	8.50E-04	Baes and others (1984)	3.21E-01	Average[d]
Tin-126	15832-50-5	NA	NA	3.00E-02	Baes and others (1984)	3.21E-01	Average[d]
Tritium	10028-17-8	NA	NA	NA	NA	NA	NA
Uranium-232	14158-29-3	NA	NA	8.50E-03	Baes and others (1984)	3.21E-01	Average[d]
Uranium-233	13968-55-3	NA	NA	8.50E-03	Baes and others (1984)	3.21E-01	Average[d]
Uranium-234	13966-29-5	NA	NA	8.50E-03	Baes and others (1984)	3.21E-01	Average[d]
Uranium-235	15117-96-1	NA	NA	8.50E-03	Baes and others (1984)	3.21E-01	Average[d]
Uranium-236	13982-70-2	NA	NA	8.50E-03	Baes and others (1984)	3.21E-01	Average[d]
Uranium-238	7440-61-1	NA	NA	8.50E-03	Baes and others (1984)	3.21E-01	Average[d]
Yttrium-90	10098-91-6	NA	NA	1.50E-02	Baes and others (1984)	3.21E-01	Average[d]
Zirconium-93	15751-77-6	NA	NA	2.00E-03	Baes and others (1984)	3.21E-01	Average[d]

Table C2-1 Ecological Transfer Factors for COPCs and ROPCs

Constituent of Potential Concern	CAS Registry Number	Mammal Ba ([mg/kg tissue] / [mg ingested /day])	Source	WP (L/kg tissue)	Source	SP (kg dry sediment/ kg dry tissue)	Source
Plutonium-241	14119-32-5	5.00E-07	Baes and others (1984)	4.06E+03	Average[d]	4.50E-04	Baes and others (1984)
Plutonium-242	13982-10-0	5.00E-07	Baes and others (1984)	4.06E+03	Average[d]	4.50E-04	Baes and others (1984)
Protactinium-231	14331-85-2	1.00E-05	Baes and others (1984)	4.06E+03	Average[d]	2.50E-03	Baes and others (1984)
Radium-226	13982-63-3	2.50E-04	Baes and others (1984)	4.06E+03	Average[d]	1.50E-02	Baes and others (1984)
Radium-228	15262-20-1	2.50E-04	Baes and others (1984)	4.06E+03	Average[d]	1.50E-02	Baes and others (1984)
Ruthenium-106	13967-48-1	2.00E-03	Baes and others (1984)	4.06E+03	Average[d]	7.50E-02	Baes and others (1984)
Samarium-151	15715-94-3	5.00E-03	Baes and others (1984)	4.06E+03	Average[d]	1.00E-02	Baes and others (1984)
Selenium-79	15758-45-9	1.50E-02	Baes and others (1984)	1.85E+03	EPA (1999)	2.50E-02	EPA (1999)
Strontium-90	10098-97-2	3.00E-04	Baes and others (1984)	4.06E+03	Average[d]	2.50E+00	Baes and others (1984)
Technetium-99	14133-76-7	8.50E-03	Baes and others (1984)	4.06E+03	Average[d]	9.50E+00	Baes and others (1984)
Thorium-229	15594-54-4	6.00E-06	Baes and others (1984)	4.06E+03	Average[d]	8.50E-04	Baes and others (1984)
Thorium-232	7440-29-1	6.00E-06	Baes and others (1984)	4.06E+03	Average[d]	8.50E-04	Baes and others (1984)
Tin-126	15832-50-5	8.00E-02	Baes and others (1984)	4.06E+03	Average[d]	3.00E-02	Baes and others (1984)
Tritium	10028-17-8	NA	NA	NA	NA	NA	NA
Uranium-232	14158-29-3	2.00E-04	Baes and others (1984)	4.06E+03	Average[d]	8.50E-03	Baes and others (1984)
Uranium-233	13968-55-3	2.00E-04	Baes and others (1984)	4.06E+03	Average[d]	8.50E-03	Baes and others (1984)
Uranium-234	13966-29-5	2.00E-04	Baes and others (1984)	4.06E+03	Average[d]	8.50E-03	Baes and others (1984)
Uranium-235	15117-96-1	2.00E-04	Baes and others (1984)	4.06E+03	Average[d]	8.50E-03	Baes and others (1984)
Uranium-236	13982-70-2	2.00E-04	Baes and others (1984)	4.06E+03	Average[d]	8.50E-03	Baes and others (1984)
Uranium-238	7440-61-1	2.00E-04	Baes and others (1984)	4.06E+03	Average[d]	8.50E-03	Baes and others (1984)
Yttrium-90	10098-91-6	3.00E-04	Baes and others (1984)	4.06E+03	Average[d]	1.50E-02	Baes and others (1984)
Zirconium-93	15751-77-6	5.50E-03	Baes and others (1984)	4.06E+03	Average[d]	2.00E-03	Baes and others (1984)

Table C2-1 Ecological Transfer Factors for COPCs and ROPCs

Constituent of Potential Concern	CAS Registry Number	BCF_{fish} (L/kg tissue)	Source	BASF (kg dry sediment/ kg tissue)	Source
Plutonium-241	14119-32-5	1.23E+03	Average[d]	8.93E-01	Average[d]
Plutonium-242	13982-10-0	1.23E+03	Average[d]	8.93E-01	Average[d]
Protactinium-231	14331-85-2	1.23E+03	Average[d]	8.93E-01	Average[d]
Radium-226	13982-63-3	1.23E+03	Average[d]	8.93E-01	Average[d]
Radium-228	15262-20-1	1.23E+03	Average[d]	8.93E-01	Average[d]
Ruthenium-106	13967-48-1	1.23E+03	Average[d]	8.93E-01	Average[d]
Samarium-151	15715-94-3	1.23E+03	Average[d]	8.93E-01	Average[d]
Selenium-79	15758-45-9	1.29E+02	EPA (1999)	9.00E-01	EPA (1999)
Strontium-90	10098-97-2	1.23E+03	Average[d]	8.93E-01	Average[d]
Technetium-99	14133-76-7	1.23E+03	Average[d]	8.93E-01	Average[d]
Thorium-229	15594-54-4	1.23E+03	Average[d]	8.93E-01	Average[d]
Thorium-232	7440-29-1	1.23E+03	Average[d]	8.93E-01	Average[d]
Tin-126	15832-50-5	1.23E+03	Average[d]	8.93E-01	Average[d]
Tritium	10028-17-8	NA	NA	NA	NA
Uranium-232	14158-29-3	1.23E+03	Average[d]	8.93E-01	Average[d]
Uranium-233	13968-55-3	1.23E+03	Average[d]	8.93E-01	Average[d]
Uranium-234	13966-29-5	1.23E+03	Average[d]	8.93E-01	Average[d]
Uranium-235	15117-96-1	1.23E+03	Average[d]	8.93E-01	Average[d]
Uranium-236	13982-70-2	1.23E+03	Average[d]	8.93E-01	Average[d]
Uranium-238	7440-61-1	1.23E+03	Average[d]	8.93E-01	Average[d]
Yttrium-90	10098-91-6	1.23E+03	Average[d]	8.93E-01	Average[d]
Zirconium-93	15751-77-6	1.23E+03	Average[d]	8.93E-01	Average[d]

Table C2-1 Ecological Transfer Factors for COPCs and ROPCs

Notes/Sources

NA = Not applicable.

[a] From Appendix B, Table B-1.

[b] BAF-S values for which equilibrium partitioning approach will be used.

[c] Values for Aroclor-1254 were used for polychlorinated biphenyl mixtures.

[d] Arithmetic average of reported values for inorganics (EPA 1999).

[e] Values for Cr(VI) were used for calculations.

[f] Chemical Abstracts Service Registry number for niobium metal.

Equation 1: log BCF = 1.588 - (0.578 × log K_{ow}) (Travis and Arms 1988) as referenced in EPA (1999).

Equation 2: log BCF = 0.819 × log K_{ow} - 1.146 (Southworth, Beauchamp, and Schmieder 1978) as referenced in EPA (1999).

Equation 3: log Ba = log K_{ow} - 7.6 (Travis and Arms 1988) as referenced in EPA (1999).

Equation 4: log BCF = 0.91 × log K_{ow} - 1.975 × log(6.8E-07 × K_{ow} + 1.0) - 0.786 (Bintein and others 1993) as referenced in EPA (1999).

EPA (US Environmental Protection Agency). 1999. *Screening-Level Ecological Risk Assessment Protocol for Hazardous Waste Combustion Facilities, Vol. III*. EPA 530-D-99-001C. Office of Solid Waste and Emergency Response, US Environmental Protection Agency, Washington, DC, USA.

Baes CF, III, Sharp RD, Sjoren AL, and Shor RW. 1984. *A Review and Analysis of Parameters for Assessing Transport of Environmentally Released Radionuclides through Agriculture*. ORNL-5786. Oak Ridge National Laboratory, Oak Ridge, Tennessee, USA.

Table C2-2 Bioaccumulation Factors for Accumulation of COPCs and ROPCs from Soil by Mammals and Birds

Constituent of Potential Concern	CAS Registry Number	Log K_{ow} [a]	Mammal Ba[b] ([mg/kg tissue] / [mg ingested /day])	Bird Ba[c] ([mg/kg tissue] / [mg ingested /day])	Bioaccumulation Factor (BAF-T_s) ([mg/kg tissue]/[mg/kg soil])			
					Mule Deer[d]	Mourning Dove[d]	Great Basin Pocket Mouse[d]	Western Meadow-lark[d]
Organic Compounds								
Aromatic Halogenated Hydrocarbons								
2,3,4,6-Tetrachlorophenol	58-90-2	4.30	5.02E-04	4.02E-04	2.32E-05	2.18E-07	8.81E-07	3.10E-07
4-Chloro-3-methylphenol	59-50-7	3.10	3.16E-05	2.53E-05	1.46E-06	1.37E-08	5.55E-08	1.95E-08
Aromatic Nonhalogenated Hydrocarbons								
2-Nitrotoluene	88-72-2	2.30	5.01E-06	4.01E-06	2.32E-07	2.17E-09	8.79E-09	3.09E-09
4-Nitrobiphenyl	92-93-3	3.77	1.48E-04	1.18E-04	6.84E-06	6.41E-08	2.60E-07	9.13E-08
Benzaldehyde	100-52-7	1.48	7.54E-07	6.03E-07	3.48E-08	3.27E-10	1.32E-09	4.65E-10
Benzene	71-43-2	2.14	3.44E-06	2.75E-06	1.59E-07	1.49E-09	6.04E-09	2.12E-09
Benzyl alcohol	100-51-6	1.10	3.16E-07	2.53E-07	1.46E-08	1.37E-10	5.55E-10	1.95E-10
Ethyl benzene	100-41-4	3.12	3.34E-05	2.67E-05	1.54E-06	1.45E-08	5.86E-08	2.06E-08
m-Xylene	108-38-3	3.20	3.99E-05	3.20E-05	1.85E-06	1.73E-08	7.01E-08	2.46E-08
o-Xylene	95-47-6	3.13	3.39E-05	2.71E-05	1.57E-06	1.47E-08	5.95E-08	2.09E-08
p-Xylene	106-42-3	3.17	3.72E-05	2.97E-05	1.72E-06	1.61E-08	6.52E-08	2.29E-08
Styrene	100-42-5	2.93	2.13E-05	1.71E-05	9.86E-07	9.25E-09	3.74E-08	1.32E-08
Toluene	108-88-3	2.67	1.17E-05	9.34E-06	5.40E-07	5.06E-09	2.05E-08	7.21E-09
Non-aromatic Nonhalogenated Hydrocarbons								
1,2-Epoxybutane	106-88-7	0.86	1.82E-07	1.46E-07	8.41E-09	7.89E-11	3.19E-10	1.12E-10
1,3-Butadiene	106-99-0	1.99	2.45E-06	1.96E-06	1.13E-07	1.06E-09	4.31E-09	1.51E-09
1,4-Dioxane	123-91-1	-0.27	1.36E-08	1.09E-08	6.27E-10	5.88E-12	2.38E-11	8.37E-12
1-Methylpropyl alcohol	78-92-2	0.61	1.02E-07	8.19E-08	4.73E-09	4.44E-11	1.80E-10	6.31E-11
1-Nitropropane	108-03-2	0.87	1.86E-07	1.49E-07	8.61E-09	8.07E-11	3.27E-10	1.15E-10
2,2,4-Trimethylpentane	540-84-1	5.02	2.63E-03	2.10E-03	1.22E-04	1.14E-06	4.62E-06	1.62E-06
2-Butanone	78-93-3	0.28	4.80E-08	3.84E-08	2.22E-09	2.08E-11	8.42E-11	2.96E-11
2-Butenaldehyde (2-Butenal)	4170-30-3	0.55	8.91E-08	7.13E-08	4.12E-09	3.86E-11	1.56E-10	5.50E-11
2-Ethoxyethanol	110-80-5	-0.10	2.00E-08	1.60E-08	9.22E-10	8.65E-12	3.50E-11	1.23E-11
2-Heptanone	110-43-0	1.98	2.40E-06	1.92E-06	1.11E-07	1.04E-09	4.21E-09	1.48E-09

Table C2-2 Bioaccumulation Factors for Accumulation of COPCs and ROPCs from Soil by Mammals and Birds

Constituent of Potential Concern	CAS Registry Number	Bioaccumulation Factor (BAF-T_s) ([mg/kg tissue]/[mg/kg soil])							
		Coyote[d]	Burrowing Owl[d]	Red-tailed Hawk[d]	Canada Goose[d]	Spotted Sandpiper[d]	Great Blue Heron[d]	Bald Eagle[d]	Mink[d]
Organic Compounds									
Aromatic Halogenated Hydrocarbons									
2,3,4,6-Tetrachlorophenol	58-90-2	2.65E-07	2.47E-07	0.00E+00	7.65E-07	4.63E-07	0.00E+00	0.00E+00	0.00E+00
4-Chloro-3-methylphenol	59-50-7	1.67E-08	1.56E-08	0.00E+00	4.82E-08	2.92E-08	0.00E+00	0.00E+00	0.00E+00
Aromatic Nonhalogenated Hydrocarbons									
2-Nitrotoluene	88-72-2	2.65E-09	2.47E-09	0.00E+00	7.64E-09	4.62E-09	0.00E+00	0.00E+00	0.00E+00
4-Nitrobiphenyl	92-93-3	7.81E-08	7.28E-08	0.00E+00	2.25E-07	1.36E-07	0.00E+00	0.00E+00	0.00E+00
Benzaldehyde	100-52-7	3.98E-10	3.71E-10	0.00E+00	1.15E-09	6.95E-10	0.00E+00	0.00E+00	0.00E+00
Benzene	71-43-2	1.82E-09	1.69E-09	0.00E+00	5.24E-09	3.17E-09	0.00E+00	0.00E+00	0.00E+00
Benzyl alcohol	100-51-6	1.67E-10	1.56E-10	0.00E+00	4.82E-10	2.92E-10	0.00E+00	0.00E+00	0.00E+00
Ethyl benzene	100-41-4	1.76E-08	1.64E-08	0.00E+00	5.09E-08	3.08E-08	0.00E+00	0.00E+00	0.00E+00
m-Xylene	108-38-3	2.11E-08	1.96E-08	0.00E+00	6.09E-08	3.68E-08	0.00E+00	0.00E+00	0.00E+00
o-Xylene	95-47-6	1.79E-08	1.67E-08	0.00E+00	5.17E-08	3.13E-08	0.00E+00	0.00E+00	0.00E+00
p-Xylene	106-42-3	1.96E-08	1.83E-08	0.00E+00	5.66E-08	3.43E-08	0.00E+00	0.00E+00	0.00E+00
Styrene	100-42-5	1.13E-08	1.05E-08	0.00E+00	3.25E-08	1.97E-08	0.00E+00	0.00E+00	0.00E+00
Toluene	108-88-3	6.17E-09	5.75E-09	0.00E+00	1.78E-08	1.08E-08	0.00E+00	0.00E+00	0.00E+00
Non-aromatic Nonhalogenated Hydrocarbons									
1,2-Epoxybutane	106-88-7	9.61E-11	8.95E-11	0.00E+00	2.77E-10	1.68E-10	0.00E+00	0.00E+00	0.00E+00
1,3-Butadiene	106-99-0	1.30E-09	1.21E-09	0.00E+00	3.74E-09	2.26E-09	0.00E+00	0.00E+00	0.00E+00
1,4-Dioxane	123-91-1	7.16E-12	6.67E-12	0.00E+00	2.07E-11	1.25E-11	0.00E+00	0.00E+00	0.00E+00
1-Methylpropyl alcohol	78-92-2	5.40E-11	5.03E-11	0.00E+00	1.56E-10	9.44E-11	0.00E+00	0.00E+00	0.00E+00
1-Nitropropane	108-03-2	9.83E-11	9.16E-11	0.00E+00	2.84E-10	1.72E-10	0.00E+00	0.00E+00	0.00E+00
2,2,4-Trimethylpentane	540-84-1	1.39E-06	1.29E-06	0.00E+00	4.01E-06	2.43E-06	0.00E+00	0.00E+00	0.00E+00
2-Butanone	78-93-3	2.53E-11	2.36E-11	0.00E+00	7.31E-11	4.42E-11	0.00E+00	0.00E+00	0.00E+00
2-Butenaldehyde (2-Butenal)	4170-30-3	4.70E-11	4.38E-11	0.00E+00	1.36E-10	8.22E-11	0.00E+00	0.00E+00	0.00E+00
2-Ethoxyethanol	110-80-5	1.05E-11	9.82E-12	0.00E+00	3.04E-11	1.84E-11	0.00E+00	0.00E+00	0.00E+00
2-Heptanone	110-43-0	1.27E-09	1.18E-09	0.00E+00	3.66E-09	2.21E-09	0.00E+00	0.00E+00	0.00E+00

Table C2-2 Bioaccumulation Factors for Accumulation of COPCs and ROPCs from Soil by Mammals and Birds

Constituent of Potential Concern	CAS Registry Number	Log K_{ow} [a]	Mammal Ba[b] ([mg/kg tissue] / [mg ingested /day])	Bird Ba[c] ([mg/kg tissue] / [mg ingested /day])	Bioaccumulation Factor (BAF-T_s) ([mg/kg tissue]/[mg/kg soil])			
					Mule Deer[d]	Mourning Dove[d]	Great Basin Pocket Mouse[d]	Western Meadow-lark[d]
2-Hexanone	591-78-6	1.38	6.03E-07	4.82E-07	2.79E-08	2.61E-10	1.06E-09	3.72E-10
2-Methoxyethanol	109-86-4	-0.77	4.27E-09	3.41E-09	1.97E-10	1.85E-12	7.49E-12	2.63E-12
2-Methyl-2-propanol	75-65-0	0.35	5.62E-08	4.50E-08	2.60E-09	2.44E-11	9.87E-11	3.47E-11
2-Methyl-2-propenenitrile	126-98-7	0.54	8.72E-08	6.97E-08	4.03E-09	3.78E-11	1.53E-10	5.38E-11
2-Methylaziridine	75-55-8	-0.60	6.31E-09	5.05E-09	2.92E-10	2.74E-12	1.11E-11	3.89E-12
2-Methylpropyl alcohol	78-83-1	0.76	1.45E-07	1.16E-07	6.68E-09	6.27E-11	2.54E-10	8.92E-11
2-Pentanone	107-87-9	0.91	2.04E-07	1.63E-07	9.44E-09	8.85E-11	3.58E-10	1.26E-10
2-Propanone (Acetone)	67-64-1	-0.22	1.51E-08	1.21E-08	6.98E-10	6.54E-12	2.65E-11	9.31E-12
2-Propene-1-ol	107-18-6	0.17	3.72E-08	2.97E-08	1.72E-09	1.61E-11	6.52E-11	2.29E-11
2-Propyl alcohol	67-63-0	0.05	2.82E-08	2.25E-08	1.30E-09	1.22E-11	4.95E-11	1.74E-11
3-Heptanone	106-35-4	No data	No data	No data	No data	No data	No data	No data
3-Methyl-1-butanol	123-51-3	No data	No data	No data	No data	No data	No data	No data
3-Methyl-2-butanone	563-80-4	No data	No data	No data	No data	No data	No data	No data
3-Pentanone	96-22-0	0.99	2.45E-07	1.96E-07	1.13E-08	1.06E-10	4.31E-10	1.51E-10
4-Heptanone	123-19-3	No data	No data	No data	No data	No data	No data	No data
4-Methyl-2-pentanone	108-10-1	1.19	3.89E-07	3.11E-07	1.80E-08	1.69E-10	6.83E-10	2.40E-10
4-Methyl-3-penten-2-one	141-79-7	No data	No data	No data	No data	No data	No data	No data
5-Methyl-2-hexanone	110-12-3	1.72	1.32E-06	1.05E-06	6.09E-08	5.72E-10	2.31E-09	8.13E-10
Acetaldehyde	75-07-0	-0.22	1.51E-08	1.21E-08	6.99E-10	6.56E-12	2.65E-11	9.33E-12
Acetamide	60-35-5	-1.26	1.38E-09	1.10E-09	6.38E-11	5.98E-13	2.42E-12	8.52E-13
Acetic acid	64-19-7	-0.17	1.70E-08	1.36E-08	7.85E-10	7.36E-12	2.98E-11	1.05E-11
Acetic acid ethyl ester	141-78-6	0.73	1.35E-07	1.08E-07	6.24E-09	5.85E-11	2.37E-10	8.32E-11
Acetic acid n-butyl ester	123-86-4	1.73	1.35E-06	1.08E-06	6.24E-08	5.85E-10	2.37E-09	8.32E-10
Acetonitrile	75-05-8	-0.34	1.15E-08	9.18E-09	5.31E-10	4.98E-12	2.01E-11	7.08E-12
Acrolein	107-02-8	-0.01	2.46E-08	1.97E-08	1.14E-09	1.07E-11	4.32E-11	1.52E-11
Acrylonitrile	107-13-1	0.25	4.47E-08	3.58E-08	2.07E-09	1.94E-11	7.84E-11	2.76E-11
Bis(isopropyl)ether	108-20-3	1.56	9.12E-07	7.30E-07	4.22E-08	3.95E-10	1.60E-09	5.63E-10

Table C2-2 Bioaccumulation Factors for Accumulation of COPCs and ROPCs from Soil by Mammals and Birds

Constituent of Potential Concern	CAS Registry Number	Bioaccumulation Factor (BAF-T_s) ([mg/kg tissue]/[mg/kg soil])							
		Coyote[d]	Burrowing Owl[d]	Red-tailed Hawk[d]	Canada Goose[d]	Spotted Sandpiper[d]	Great Blue Heron[d]	Bald Eagle[d]	Mink[d]
2-Hexanone	591-78-6	3.18E-10	2.96E-10	0.00E+00	9.18E-10	5.56E-10	0.00E+00	0.00E+00	0.00E+00
2-Methoxyethanol	109-86-4	2.25E-12	2.10E-12	0.00E+00	6.50E-12	3.93E-12	0.00E+00	0.00E+00	0.00E+00
2-Methyl-2-propanol	75-65-0	2.97E-11	2.77E-11	0.00E+00	8.57E-11	5.19E-11	0.00E+00	0.00E+00	0.00E+00
2-Methyl-2-propenenitrile	126-98-7	4.60E-11	4.29E-11	0.00E+00	1.33E-10	8.04E-11	0.00E+00	0.00E+00	0.00E+00
2-Methylaziridine	75-55-8	3.33E-12	3.10E-12	0.00E+00	9.61E-12	5.82E-12	0.00E+00	0.00E+00	0.00E+00
2-Methylpropyl alcohol	78-83-1	7.63E-11	7.11E-11	0.00E+00	2.20E-10	1.33E-10	0.00E+00	0.00E+00	0.00E+00
2-Pentanone	107-87-9	1.08E-10	1.00E-10	0.00E+00	3.11E-10	1.88E-10	0.00E+00	0.00E+00	0.00E+00
2-Propanone (Acetone)	67-64-1	7.97E-12	7.43E-12	0.00E+00	2.30E-11	1.39E-11	0.00E+00	0.00E+00	0.00E+00
2-Propene-1-ol	107-18-6	1.96E-11	1.83E-11	0.00E+00	5.66E-11	3.43E-11	0.00E+00	0.00E+00	0.00E+00
2-Propyl alcohol	67-63-0	1.49E-11	1.39E-11	0.00E+00	4.29E-11	2.60E-11	0.00E+00	0.00E+00	0.00E+00
3-Heptanone	106-35-4	No data	No data	No data	No data	No data	No data	No data	No data
3-Methyl-1-butanol	123-51-3	No data	No data	No data	No data	No data	No data	No data	No data
3-Methyl-2-butanone	563-80-4	No data	No data	No data	No data	No data	No data	No data	No data
3-Pentanone	96-22-0	1.30E-10	1.21E-10	0.00E+00	3.74E-10	2.26E-10	0.00E+00	0.00E+00	0.00E+00
4-Heptanone	123-19-3	No data	No data	No data	No data	No data	No data	No data	No data
4-Methyl-2-pentanone	108-10-1	2.06E-10	1.92E-10	0.00E+00	5.93E-10	3.59E-10	0.00E+00	0.00E+00	0.00E+00
4-Methyl-3-penten-2-one	141-79-7	No data	No data	No data	No data	No data	No data	No data	No data
5-Methyl-2-hexanone	110-12-3	6.96E-10	6.49E-10	0.00E+00	2.01E-09	1.22E-09	0.00E+00	0.00E+00	0.00E+00
Acetaldehyde	75-07-0	7.98E-12	7.44E-12	0.00E+00	2.30E-11	1.39E-11	0.00E+00	0.00E+00	0.00E+00
Acetamide	60-35-5	7.29E-13	6.79E-13	0.00E+00	2.10E-12	1.27E-12	0.00E+00	0.00E+00	0.00E+00
Acetic acid	64-19-7	8.96E-12	8.36E-12	0.00E+00	2.59E-11	1.57E-11	0.00E+00	0.00E+00	0.00E+00
Acetic acid ethyl ester	141-78-6	7.12E-11	6.64E-11	0.00E+00	2.06E-10	1.24E-10	0.00E+00	0.00E+00	0.00E+00
Acetic acid n-butyl ester	123-86-4	7.12E-10	6.64E-10	0.00E+00	2.06E-09	1.24E-09	0.00E+00	0.00E+00	0.00E+00
Acetonitrile	75-05-8	6.06E-12	5.65E-12	0.00E+00	1.75E-11	1.06E-11	0.00E+00	0.00E+00	0.00E+00
Acrolein	107-02-8	1.30E-11	1.21E-11	0.00E+00	3.75E-11	2.27E-11	0.00E+00	0.00E+00	0.00E+00
Acrylonitrile	107-13-1	2.36E-11	2.20E-11	0.00E+00	6.81E-11	4.12E-11	0.00E+00	0.00E+00	0.00E+00
Bis(isopropyl)ether	108-20-3	4.81E-10	4.49E-10	0.00E+00	1.39E-09	8.41E-10	0.00E+00	0.00E+00	0.00E+00

Table C2-2 Bioaccumulation Factors for Accumulation of COPCs and ROPCs from Soil by Mammals and Birds

Constituent of Potential Concern	CAS Registry Number	Log K_{ow} [a]	Mammal Ba[b] ([mg/kg tissue] / [mg ingested /day])	Bird Ba[c] ([mg/kg tissue] / [mg ingested /day])	Bioaccumulation Factor (BAF-T_s) ([mg/kg tissue]/[mg/kg soil])			
					Mule Deer[d]	Mourning Dove[d]	Great Basin Pocket Mouse[d]	Western Meadow-lark[d]
Butane	106-97-8	2.89	1.95E-05	1.56E-05	9.01E-07	8.45E-09	3.42E-08	1.20E-08
Carbon disulfide	75-15-0	2.00	2.51E-06	2.01E-06	1.16E-07	1.09E-09	4.41E-09	1.55E-09
Cyanogen	460-19-5	0.07	2.95E-08	2.36E-08	1.36E-09	1.28E-11	5.18E-11	1.82E-11
Cyclohexane	110-82-7	3.44	6.92E-05	5.53E-05	3.20E-06	3.00E-08	1.21E-07	4.27E-08
Cyclohexanone	108-94-1	0.81	1.62E-07	1.30E-07	7.50E-09	7.03E-11	2.85E-10	1.00E-10
Cyclohexene	110-83-8	2.86	1.82E-05	1.46E-05	8.41E-07	7.89E-09	3.19E-08	1.12E-08
Cyclopentane	287-92-3	3.00	2.51E-05	2.01E-05	1.16E-06	1.09E-08	4.41E-08	1.55E-08
Ethyl alcohol	64-17-5	-0.31	1.23E-08	9.84E-09	5.69E-10	5.33E-12	2.16E-11	7.59E-12
Ethyl ether	60-29-7	0.89	1.95E-07	1.56E-07	9.01E-09	8.45E-11	3.42E-10	1.20E-10
Ethyl methacrylate	97-63-2	1.59	9.77E-07	7.82E-07	4.52E-08	4.24E-10	1.71E-09	6.03E-10
Formaldehyde	50-00-0	0.34	5.56E-08	4.45E-08	2.57E-09	2.41E-11	9.76E-11	3.43E-11
Formamide	75-12-7	-1.51	7.76E-10	6.21E-10	3.59E-11	3.37E-13	1.36E-12	4.79E-13
Formic acid	64-18-6	-0.54	7.28E-09	5.83E-09	3.37E-10	3.16E-12	1.28E-11	4.49E-12
Formic acid, methyl ester	107-31-3	-0.26	1.37E-08	1.09E-08	6.32E-10	5.93E-12	2.40E-11	8.44E-12
Glycidylaldehyde	765-34-4	-0.12	1.91E-08	1.52E-08	8.81E-10	8.26E-12	3.34E-11	1.18E-11
Methyl acetate	79-20-9	0.46	7.24E-08	5.79E-08	3.35E-09	3.14E-11	1.27E-10	4.47E-11
Methyl alcohol	67-56-1	-0.71	4.90E-09	3.92E-09	2.26E-10	2.12E-12	8.60E-12	3.02E-12
Methyl isocyanate	624-83-9	No data	No data	No data	No data	No data	No data	No data
Methyl methacrylate	80-62-6	0.79	1.55E-07	1.24E-07	7.16E-09	6.71E-11	2.72E-10	9.56E-11
Methyl tert-butyl ether	1634-04-4	0.94	2.19E-07	1.75E-07	1.01E-08	9.48E-11	3.84E-10	1.35E-10
Methylacetylene	74-99-7	0.94	2.19E-07	1.75E-07	1.01E-08	9.48E-11	3.84E-10	1.35E-10
Methylcyclohexane	108-87-2	4.10	3.16E-04	2.53E-04	1.46E-05	1.37E-07	5.55E-07	1.95E-07
N,N-Dimethylacetamide	127-19-5	No data	No data	No data	No data	No data	No data	No data
n-Butyl alcohol	71-36-3	0.88	1.91E-07	1.52E-07	8.81E-09	8.26E-11	3.34E-10	1.18E-10
n-Heptane	142-82-5	4.66	1.15E-03	9.19E-04	5.31E-05	4.98E-07	2.01E-06	7.08E-07
n-Hexane	110-54-3	4.11	3.24E-04	2.59E-04	1.50E-05	1.40E-07	5.68E-07	2.00E-07
Nitromethane	75-52-5	-0.35	1.12E-08	8.98E-09	5.19E-10	4.86E-12	1.97E-11	6.92E-12

Table C2-2 Bioaccumulation Factors for Accumulation of COPCs and ROPCs from Soil by Mammals and Birds

Constituent of Potential Concern	CAS Registry Number	Bioaccumulation Factor (BAF-T_s) ([mg/kg tissue]/[mg/kg soil])							
		Coyote[d]	Burrowing Owl[d]	Red-tailed Hawk[d]	Canada Goose[d]	Spotted Sandpiper[d]	Great Blue Heron[d]	Bald Eagle[d]	Mink[d]
Butane	106-97-8	1.03E-08	9.59E-09	0.00E+00	2.97E-08	1.80E-08	0.00E+00	0.00E+00	0.00E+00
Carbon disulfide	75-15-0	1.33E-09	1.24E-09	0.00E+00	3.83E-09	2.32E-09	0.00E+00	0.00E+00	0.00E+00
Cyanogen	460-19-5	1.56E-11	1.45E-11	0.00E+00	4.50E-11	2.72E-11	0.00E+00	0.00E+00	0.00E+00
Cyclohexane	110-82-7	3.65E-08	3.40E-08	0.00E+00	1.05E-07	6.38E-08	0.00E+00	0.00E+00	0.00E+00
Cyclohexanone	108-94-1	8.56E-11	7.98E-11	0.00E+00	2.47E-10	1.50E-10	0.00E+00	0.00E+00	0.00E+00
Cyclohexene	110-83-8	9.61E-09	8.95E-09	0.00E+00	2.77E-08	1.68E-08	0.00E+00	0.00E+00	0.00E+00
Cyclopentane	287-92-3	1.33E-08	1.24E-08	0.00E+00	3.83E-08	2.32E-08	0.00E+00	0.00E+00	0.00E+00
Ethyl alcohol	64-17-5	6.49E-12	6.05E-12	0.00E+00	1.87E-11	1.13E-11	0.00E+00	0.00E+00	0.00E+00
Ethyl ether	60-29-7	1.03E-10	9.59E-11	0.00E+00	2.97E-10	1.80E-10	0.00E+00	0.00E+00	0.00E+00
Ethyl methacrylate	97-63-2	5.16E-10	4.81E-10	0.00E+00	1.49E-09	9.01E-10	0.00E+00	0.00E+00	0.00E+00
Formaldehyde	50-00-0	2.93E-11	2.74E-11	0.00E+00	8.47E-11	5.13E-11	0.00E+00	0.00E+00	0.00E+00
Formamide	75-12-7	4.10E-13	3.82E-13	0.00E+00	1.18E-12	7.16E-13	0.00E+00	0.00E+00	0.00E+00
Formic acid	64-18-6	3.85E-12	3.58E-12	0.00E+00	1.11E-11	6.72E-12	0.00E+00	0.00E+00	0.00E+00
Formic acid, methyl ester	107-31-3	7.22E-12	6.73E-12	0.00E+00	2.08E-11	1.26E-11	0.00E+00	0.00E+00	0.00E+00
Glycidylaldehyde	765-34-4	1.01E-11	9.37E-12	0.00E+00	2.90E-11	1.76E-11	0.00E+00	0.00E+00	0.00E+00
Methyl acetate	79-20-9	3.82E-11	3.56E-11	0.00E+00	1.10E-10	6.68E-11	0.00E+00	0.00E+00	0.00E+00
Methyl alcohol	67-56-1	2.59E-12	2.41E-12	0.00E+00	7.46E-12	4.52E-12	0.00E+00	0.00E+00	0.00E+00
Methyl isocyanate	624-83-9	No data	No data	No data	No data	No data	No data	No data	No data
Methyl methacrylate	80-62-6	8.18E-11	7.62E-11	0.00E+00	2.36E-10	1.43E-10	0.00E+00	0.00E+00	0.00E+00
Methyl tert-butyl ether	1634-04-4	1.15E-10	1.08E-10	0.00E+00	3.33E-10	2.02E-10	0.00E+00	0.00E+00	0.00E+00
Methylacetylene	74-99-7	1.15E-10	1.08E-10	0.00E+00	3.33E-10	2.02E-10	0.00E+00	0.00E+00	0.00E+00
Methylcyclohexane	108-87-2	1.67E-07	1.56E-07	0.00E+00	4.82E-07	2.92E-07	0.00E+00	0.00E+00	0.00E+00
N,N-Dimethylacetamide	127-19-5	No data	No data	No data	No data	No data	No data	No data	No data
n-Butyl alcohol	71-36-3	1.01E-10	9.37E-11	0.00E+00	2.90E-10	1.76E-10	0.00E+00	0.00E+00	0.00E+00
n-Heptane	142-82-5	6.06E-07	5.65E-07	0.00E+00	1.75E-06	1.06E-06	0.00E+00	0.00E+00	0.00E+00
n-Hexane	110-54-3	1.71E-07	1.59E-07	0.00E+00	4.93E-07	2.98E-07	0.00E+00	0.00E+00	0.00E+00
Nitromethane	75-52-5	5.92E-12	5.52E-12	0.00E+00	1.71E-11	1.03E-11	0.00E+00	0.00E+00	0.00E+00

Table C2-2 Bioaccumulation Factors for Accumulation of COPCs and ROPCs from Soil by Mammals and Birds

Constituent of Potential Concern	CAS Registry Number	Log K_{ow} [a]	Mammal Ba[b] ([mg/kg tissue] / [mg ingested /day])	Bird Ba[c] ([mg/kg tissue] / [mg ingested /day])	Bioaccumulation Factor (BAF-T_s) ([mg/kg tissue]/[mg/kg soil])			
					Mule Deer[d]	Mourning Dove[d]	Great Basin Pocket Mouse[d]	Western Meadow-lark[d]
n-Nonane	111-84-2	5.65	1.12E-02	8.98E-03	5.19E-04	4.86E-06	1.97E-05	6.92E-06
n-Octane	111-65-9	4.00	2.51E-04	2.01E-04	1.16E-05	1.09E-07	4.41E-07	1.55E-07
n-Pentane	109-66-0	3.21	4.07E-05	3.26E-05	1.88E-06	1.77E-08	7.15E-08	2.51E-08
n-Propionaldehyde	123-38-6	0.59	9.77E-08	7.82E-08	4.52E-09	4.24E-11	1.71E-10	6.03E-11
n-Propyl alcohol	71-23-8	0.25	4.47E-08	3.57E-08	2.07E-09	1.94E-11	7.84E-11	2.76E-11
n-Valeraldehyde	110-62-3	No data	No data	No data	No data	No data	No data	No data
Oxirane	75-21-8	-0.30	1.26E-08	1.01E-08	5.82E-10	5.46E-12	2.21E-11	7.76E-12
p-Cymene	99-87-6	4.10	3.16E-04	2.53E-04	1.46E-05	1.37E-07	5.55E-07	1.95E-07
Phosgene	75-44-5	No data	No data	No data	No data	No data	No data	No data
Propargyl alcohol	107-19-7	-0.38	1.05E-08	8.38E-09	4.84E-10	4.54E-12	1.84E-11	6.46E-12
Propionic acid	79-09-4	0.33	5.37E-08	4.30E-08	2.48E-09	2.33E-11	9.42E-11	3.31E-11
Propionitrile	107-12-0	0.16	3.63E-08	2.90E-08	1.68E-09	1.57E-11	6.37E-11	2.24E-11
Propylene glycol monomethyl ether	107-98-2	-0.49	8.13E-09	6.50E-09	3.76E-10	3.52E-12	1.43E-11	5.01E-12
p-tert-Butyltoluene	98-51-1	No data	No data	No data	No data	No data	No data	No data
Triethylamine	121-44-8	1.45	7.08E-07	5.66E-07	3.27E-08	3.07E-10	1.24E-09	4.37E-10
Trimethylamine	75-50-3	0.16	3.63E-08	2.90E-08	1.68E-09	1.57E-11	6.37E-11	2.24E-11
Vinyl acetate	108-05-4	0.70	1.26E-07	1.00E-07	5.81E-09	5.44E-11	2.20E-10	7.75E-11
Non-aromatic Halogenated Hydrocarbons								
1,1,1,2-Tetrachloro-2,2-difluoroethane	76-11-9	3.41	6.46E-05	5.17E-05	2.99E-06	2.80E-08	1.13E-07	3.98E-08
1,1,1,2-Tetrachloroethane	630-20-6	2.63	1.07E-05	8.58E-06	4.96E-07	4.65E-09	1.88E-08	6.62E-09
1,1,1-Trichloroethane	71-55-6	2.42	6.63E-06	5.31E-06	3.07E-07	2.87E-09	1.16E-08	4.09E-09
1,1,2,2-Tetrachloro-1,2-difluoroethane	76-12-0	3.73	1.35E-04	1.08E-04	6.24E-06	5.85E-08	2.37E-07	8.32E-08
1,1,2,2-Tetrachloroethane	79-34-5	4.64	1.11E-03	8.84E-04	5.11E-05	4.79E-07	1.94E-06	6.82E-07
1,1,2,2-Tetrachloroethene	127-18-4	2.55	8.82E-06	7.05E-06	4.08E-07	3.82E-09	1.55E-08	5.44E-09
1,1,2-Trichloroethane	79-00-5	2.10	3.14E-06	2.51E-06	1.45E-07	1.36E-09	5.51E-09	1.94E-09
1,1,2-Trichloroethylene	79-01-6	2.43	6.81E-06	5.45E-06	3.15E-07	2.95E-09	1.19E-08	4.20E-09
1,1-Dichloroethane	75-34-3	1.79	1.56E-06	1.25E-06	7.20E-08	6.75E-10	2.73E-09	9.61E-10

Table C2-2 Bioaccumulation Factors for Accumulation of COPCs and ROPCs from Soil by Mammals and Birds

Constituent of Potential Concern	CAS Registry Number	Bioaccumulation Factor (BAF-T_s) ([mg/kg tissue]/[mg/kg soil])							
		Coyote[d]	Burrowing Owl[d]	Red-tailed Hawk[d]	Canada Goose[d]	Spotted Sandpiper[d]	Great Blue Heron[d]	Bald Eagle[d]	Mink[d]
n-Nonane	111-84-2	5.92E-06	5.52E-06	0.00E+00	1.71E-05	1.03E-05	0.00E+00	0.00E+00	0.00E+00
n-Octane	111-65-9	1.33E-07	1.24E-07	0.00E+00	3.83E-07	2.32E-07	0.00E+00	0.00E+00	0.00E+00
n-Pentane	109-66-0	2.15E-08	2.00E-08	0.00E+00	6.21E-08	3.76E-08	0.00E+00	0.00E+00	0.00E+00
n-Propionaldehyde	123-38-6	5.16E-11	4.81E-11	0.00E+00	1.49E-10	9.01E-11	0.00E+00	0.00E+00	0.00E+00
n-Propyl alcohol	71-23-8	2.36E-11	2.20E-11	0.00E+00	6.81E-11	4.12E-11	0.00E+00	0.00E+00	0.00E+00
n-Valeraldehyde	110-62-3	No data	No data	No data	No data	No data	No data	No data	No data
Oxirane	75-21-8	6.64E-12	6.19E-12	0.00E+00	1.92E-11	1.16E-11	0.00E+00	0.00E+00	0.00E+00
p-Cymene	99-87-6	1.67E-07	1.56E-07	0.00E+00	4.82E-07	2.92E-07	0.00E+00	0.00E+00	0.00E+00
Phosgene	75-44-5	No data	No data	No data	No data	No data	No data	No data	No data
Propargyl alcohol	107-19-7	5.53E-12	5.15E-12	0.00E+00	1.60E-11	9.66E-12	0.00E+00	0.00E+00	0.00E+00
Propionic acid	79-09-4	2.83E-11	2.64E-11	0.00E+00	8.18E-11	4.95E-11	0.00E+00	0.00E+00	0.00E+00
Propionitrile	107-12-0	1.92E-11	1.79E-11	0.00E+00	5.53E-11	3.35E-11	0.00E+00	0.00E+00	0.00E+00
Propylene glycol monomethyl ether	107-98-2	4.29E-12	4.00E-12	0.00E+00	1.24E-11	7.50E-12	0.00E+00	0.00E+00	0.00E+00
p-tert-Butyltoluene	98-51-1	No data	No data	No data	No data	No data	No data	No data	No data
Triethylamine	121-44-8	3.74E-10	3.48E-10	0.00E+00	1.08E-09	6.53E-10	0.00E+00	0.00E+00	0.00E+00
Trimethylamine	75-50-3	1.92E-11	1.79E-11	0.00E+00	5.53E-11	3.35E-11	0.00E+00	0.00E+00	0.00E+00
Vinyl acetate	108-05-4	6.63E-11	6.18E-11	0.00E+00	1.91E-10	1.16E-10	0.00E+00	0.00E+00	0.00E+00
Non-aromatic Halogenated Hydrocarbons									
1,1,1,2-Tetrachloro-2,2-difluoroethane	76-11-9	3.41E-08	3.18E-08	0.00E+00	9.84E-08	5.95E-08	0.00E+00	0.00E+00	0.00E+00
1,1,1,2-Tetrachloroethane	630-20-6	5.66E-09	5.28E-09	0.00E+00	1.63E-08	9.89E-09	0.00E+00	0.00E+00	0.00E+00
1,1,1-Trichloroethane	71-55-6	3.50E-09	3.26E-09	0.00E+00	1.01E-08	6.12E-09	0.00E+00	0.00E+00	0.00E+00
1,1,2,2-Tetrachloro-1,2-difluoroethane	76-12-0	7.12E-08	6.64E-08	0.00E+00	2.06E-07	1.24E-07	0.00E+00	0.00E+00	0.00E+00
1,1,2,2-Tetrachloroethane	79-34-5	5.83E-07	5.44E-07	0.00E+00	1.68E-06	1.02E-06	0.00E+00	0.00E+00	0.00E+00
1,1,2,2-Tetrachloroethene	127-18-4	4.65E-09	4.34E-09	0.00E+00	1.34E-08	8.13E-09	0.00E+00	0.00E+00	0.00E+00
1,1,2-Trichloroethane	79-00-5	1.66E-09	1.54E-09	0.00E+00	4.78E-09	2.90E-09	0.00E+00	0.00E+00	0.00E+00
1,1,2-Trichloroethylene	79-01-6	3.59E-09	3.35E-09	0.00E+00	1.04E-08	6.28E-09	0.00E+00	0.00E+00	0.00E+00
1,1-Dichloroethane	75-34-3	8.22E-10	7.66E-10	0.00E+00	2.37E-09	1.44E-09	0.00E+00	0.00E+00	0.00E+00

Table C2-2 Bioaccumulation Factors for Accumulation of COPCs and ROPCs from Soil by Mammals and Birds

Constituent of Potential Concern	CAS Registry Number	Log K_{ow} [a]	Mammal Ba[b] ([mg/kg tissue] / [mg ingested /day])	Bird Ba[c] ([mg/kg tissue] / [mg ingested /day])	Bioaccumulation Factor (BAF-T_s) ([mg/kg tissue]/[mg/kg soil])			
					Mule Deer[d]	Mourning Dove[d]	Great Basin Pocket Mouse[d]	Western Meadow-lark[d]
1,1-Dichloroethene	75-35-4	2.12	3.32E-06	2.65E-06	1.53E-07	1.44E-09	5.82E-09	2.05E-09
1,2,2-Trichloro-1,1,2-trifluoroethane	76-13-1	3.16	3.63E-05	2.90E-05	1.68E-06	1.57E-08	6.37E-08	2.24E-08
1,2,3-Trichloropropane	96-18-4	2.25	4.47E-06	3.58E-06	2.07E-07	1.94E-09	7.85E-09	2.76E-09
1,2-Dibromo-3-chloropropane	96-12-8	2.34	5.50E-06	4.40E-06	2.54E-07	2.38E-09	9.65E-09	3.39E-09
1,2-Dichloro-1,1,2,2-tetrafluoroethane	76-14-2	2.82	1.66E-05	1.33E-05	7.67E-07	7.19E-09	2.91E-08	1.02E-08
1,2-Dichloroethane	107-06-2	1.46	7.28E-07	5.83E-07	3.37E-08	3.16E-10	1.28E-09	4.49E-10
1,2-Dichloroethylene	540-59-0	2.09	3.09E-06	2.47E-06	1.43E-07	1.34E-09	5.42E-09	1.91E-09
1,2-Dichloropropane	78-87-5	2.25	4.47E-06	3.58E-06	2.07E-07	1.94E-09	7.85E-09	2.76E-09
1,3-Dichloropropene	542-75-6	1.75	1.41E-06	1.13E-06	6.50E-08	6.10E-10	2.47E-09	8.68E-10
1,4-Dichloro-2-butene	764-41-0	0.87	1.87E-07	1.50E-07	8.66E-09	8.12E-11	3.29E-10	1.16E-10
1-Chloroethene	75-01-4	1.15	3.52E-07	2.81E-07	1.63E-08	1.52E-10	6.17E-10	2.17E-10
2,2-Dichloropropionic acid	75-99-0	1.68	1.20E-06	9.62E-07	5.56E-08	5.21E-10	2.11E-09	7.42E-10
2-Chloropropane	75-29-6	1.90	2.00E-06	1.60E-06	9.22E-08	8.65E-10	3.50E-09	1.23E-09
3-Chloropropene (Allyl chloride)	107-05-1	1.93	2.14E-06	1.71E-06	9.88E-08	9.27E-10	3.75E-09	1.32E-09
Bromochloromethane	74-97-5	1.41	6.46E-07	5.17E-07	2.99E-08	2.80E-10	1.13E-09	3.98E-10
Bromodichloromethane	75-27-4	2.03	2.66E-06	2.13E-06	1.23E-07	1.15E-09	4.67E-09	1.64E-09
Bromoethene	593-60-2	1.07	2.93E-07	2.34E-07	1.35E-08	1.27E-10	5.14E-10	1.81E-10
Bromoform	75-25-2	2.35	5.63E-06	4.50E-06	2.60E-07	2.44E-09	9.87E-09	3.47E-09
Bromomethane	74-83-9	1.11	3.27E-07	2.61E-07	1.51E-08	1.42E-10	5.73E-10	2.01E-10
Carbon tetrachloride	56-23-5	2.72	1.31E-05	1.05E-05	6.05E-07	5.67E-09	2.30E-08	8.07E-09
Chlorodibromomethane	124-48-1	2.18	3.77E-06	3.01E-06	1.74E-07	1.63E-09	6.61E-09	2.32E-09
Chlorodifluoromethane	75-45-6	1.08	3.01E-07	2.41E-07	1.39E-08	1.31E-10	5.29E-10	1.86E-10
Chloroethane	75-00-3	3.10	3.16E-05	2.53E-05	1.46E-06	1.37E-08	5.55E-08	1.95E-08
Chloroform	67-66-3	1.95	2.24E-06	1.79E-06	1.04E-07	9.71E-10	3.93E-09	1.38E-09
Chloromethane	74-87-3	0.90	2.01E-07	1.61E-07	9.29E-09	8.71E-11	3.53E-10	1.24E-10
Chloropentafluoroethane	76-15-3	2.10	3.16E-06	2.53E-06	1.46E-07	1.37E-09	5.55E-09	1.95E-09
cis-1,2-Dichloroethene	156-59-2	1.98	2.41E-06	1.93E-06	1.11E-07	1.05E-09	4.23E-09	1.49E-09

Table C2-2 Bioaccumulation Factors for Accumulation of COPCs and ROPCs from Soil by Mammals and Birds

Constituent of Potential Concern	CAS Registry Number	Bioaccumulation Factor (BAF-T_s) ([mg/kg tissue]/[mg/kg soil])							
		Coyote[d]	Burrowing Owl[d]	Red-tailed Hawk[d]	Canada Goose[d]	Spotted Sandpiper[d]	Great Blue Heron[d]	Bald Eagle[d]	Mink[d]
1,1-Dichloroethene	75-35-4	1.75E-09	1.63E-09	0.00E+00	5.05E-09	3.06E-09	0.00E+00	0.00E+00	0.00E+00
1,2,2-Trichloro-1,1,2-trifluoroethane	76-13-1	1.92E-08	1.79E-08	0.00E+00	5.53E-08	3.35E-08	0.00E+00	0.00E+00	0.00E+00
1,2,3-Trichloropropane	96-18-4	2.36E-09	2.20E-09	0.00E+00	6.81E-09	4.12E-09	0.00E+00	0.00E+00	0.00E+00
1,2-Dibromo-3-chloropropane	96-12-8	2.90E-09	2.71E-09	0.00E+00	8.38E-09	5.07E-09	0.00E+00	0.00E+00	0.00E+00
1,2-Dichloro-1,1,2,2-tetrafluoroethane	76-14-2	8.76E-09	8.17E-09	0.00E+00	2.53E-08	1.53E-08	0.00E+00	0.00E+00	0.00E+00
1,2-Dichloroethane	107-06-2	3.85E-10	3.58E-10	0.00E+00	1.11E-09	6.72E-10	0.00E+00	0.00E+00	0.00E+00
1,2-Dichloroethylene	540-59-0	1.63E-09	1.52E-09	0.00E+00	4.71E-09	2.85E-09	0.00E+00	0.00E+00	0.00E+00
1,2-Dichloropropane	78-87-5	2.36E-09	2.20E-09	0.00E+00	6.81E-09	4.12E-09	0.00E+00	0.00E+00	0.00E+00
1,3-Dichloropropene	542-75-6	7.43E-10	6.92E-10	0.00E+00	2.14E-09	1.30E-09	0.00E+00	0.00E+00	0.00E+00
1,4-Dichloro-2-butene	764-41-0	9.89E-11	9.22E-11	0.00E+00	2.85E-10	1.73E-10	0.00E+00	0.00E+00	0.00E+00
1-Chloroethene	75-01-4	1.86E-10	1.73E-10	0.00E+00	5.36E-10	3.24E-10	0.00E+00	0.00E+00	0.00E+00
2,2-Dichloropropionic acid	75-99-0	6.35E-10	5.92E-10	0.00E+00	1.83E-09	1.11E-09	0.00E+00	0.00E+00	0.00E+00
2-Chloropropane	75-29-6	1.05E-09	9.82E-10	0.00E+00	3.04E-09	1.84E-09	0.00E+00	0.00E+00	0.00E+00
3-Chloropropene (Allyl chloride)	107-05-1	1.13E-09	1.05E-09	0.00E+00	3.26E-09	1.97E-09	0.00E+00	0.00E+00	0.00E+00
Bromochloromethane	74-97-5	3.41E-10	3.18E-10	0.00E+00	9.84E-10	5.95E-10	0.00E+00	0.00E+00	0.00E+00
Bromodichloromethane	75-27-4	1.41E-09	1.31E-09	0.00E+00	4.06E-09	2.46E-09	0.00E+00	0.00E+00	0.00E+00
Bromoethene	593-60-2	1.55E-10	1.44E-10	0.00E+00	4.46E-10	2.70E-10	0.00E+00	0.00E+00	0.00E+00
Bromoform	75-25-2	2.97E-09	2.77E-09	0.00E+00	8.57E-09	5.19E-09	0.00E+00	0.00E+00	0.00E+00
Bromomethane	74-83-9	1.72E-10	1.61E-10	0.00E+00	4.98E-10	3.01E-10	0.00E+00	0.00E+00	0.00E+00
Carbon tetrachloride	56-23-5	6.91E-09	6.44E-09	0.00E+00	1.99E-08	1.21E-08	0.00E+00	0.00E+00	0.00E+00
Chlorodibromomethane	124-48-1	1.99E-09	1.85E-09	0.00E+00	5.74E-09	3.47E-09	0.00E+00	0.00E+00	0.00E+00
Chlorodifluoromethane	75-45-6	1.59E-10	1.48E-10	0.00E+00	4.59E-10	2.78E-10	0.00E+00	0.00E+00	0.00E+00
Chloroethane	75-00-3	1.67E-08	1.56E-08	0.00E+00	4.82E-08	2.92E-08	0.00E+00	0.00E+00	0.00E+00
Chloroform	67-66-3	1.18E-09	1.10E-09	0.00E+00	3.41E-09	2.07E-09	0.00E+00	0.00E+00	0.00E+00
Chloromethane	74-87-3	1.06E-10	9.89E-11	0.00E+00	3.06E-10	1.85E-10	0.00E+00	0.00E+00	0.00E+00
Chloropentafluoroethane	76-15-3	1.67E-09	1.56E-09	0.00E+00	4.82E-09	2.92E-09	0.00E+00	0.00E+00	0.00E+00
cis-1,2-Dichloroethene	156-59-2	1.27E-09	1.19E-09	0.00E+00	3.67E-09	2.22E-09	0.00E+00	0.00E+00	0.00E+00

Table C2-2 Bioaccumulation Factors for Accumulation of COPCs and ROPCs from Soil by Mammals and Birds

Constituent of Potential Concern	CAS Registry Number	Log K_{ow} [a]	Mammal Ba[b] ([mg/kg tissue] / [mg ingested /day])	Bird Ba[c] ([mg/kg tissue] / [mg ingested /day])	Bioaccumulation Factor (BAF-T_s) ([mg/kg tissue]/[mg/kg soil])			
					Mule Deer[d]	Mourning Dove[d]	Great Basin Pocket Mouse[d]	Western Meadow-lark[d]
cis-1,3-Dichloropropene	10061-01-5	No data	No data	No data	No data	No data	No data	No data
Cyanogen bromide	506-68-3	-0.29	1.29E-08	1.03E-08	5.96E-10	5.59E-12	2.26E-11	7.95E-12
Cyanogen chloride	506-77-4	-0.38	1.05E-08	8.38E-09	4.84E-10	4.54E-12	1.84E-11	6.46E-12
Dichlorodifluoromethane	75-71-8	2.16	3.62E-06	2.89E-06	1.67E-07	1.57E-09	6.35E-09	2.23E-09
Dichlorofluoromethane	75-43-4	1.55	8.91E-07	7.13E-07	4.12E-08	3.86E-10	1.56E-09	5.50E-10
Dichloromethane	75-09-2	1.26	4.52E-07	3.62E-07	2.09E-08	1.96E-10	7.93E-10	2.79E-10
Difluorodibromomethane	75-61-6	No data	No data	No data	No data	No data	No data	No data
Hexafluoroacetone	684-16-2	No data	No data	No data	No data	No data	No data	No data
Iodomethane	74-88-4	1.69	1.23E-06	9.84E-07	5.69E-08	5.33E-10	2.16E-09	7.59E-10
Methylene bromide	74-95-3	1.62	1.05E-06	8.38E-07	4.84E-08	4.54E-10	1.84E-09	6.46E-10
Pentachloroethane	76-01-7	3.05	2.82E-05	2.25E-05	1.30E-06	1.22E-08	4.95E-08	1.74E-08
trans-1,2-Dichloroethylene	156-60-5	1.98	2.41E-06	1.93E-06	1.11E-07	1.05E-09	4.23E-09	1.49E-09
trans-1,3-Dichloropropene	10061-02-6	2.06	2.88E-06	2.31E-06	1.33E-07	1.25E-09	5.06E-09	1.78E-09
Trichloroacetic acid	76-03-9	1.33	5.37E-07	4.30E-07	2.48E-08	2.33E-10	9.42E-10	3.31E-10
Trichlorofluoroethane	27154-33-2	No data	No data	No data	No data	No data	No data	No data
Trichlorofluoromethane	75-69-4	2.53	8.54E-06	6.83E-06	3.95E-07	3.70E-09	1.50E-08	5.27E-09
Trifluorobromomethane	75-63-8	1.86	1.82E-06	1.46E-06	8.41E-08	7.89E-10	3.19E-09	1.12E-09
Dioxin and Furan Compounds (PCDDs/PCDFs)								
1,2,3,4,6,7,8-Heptachlorodibenzo(p)dioxin	35822-46-9	8.20	2.77E-03	2.22E-03	1.28E-04	1.20E-06	4.87E-06	1.71E-06
1,2,3,4,6,7,8-Heptachlorodibenzofuran	67562-39-4	7.92	5.98E-04	4.78E-04	2.76E-05	2.59E-07	1.05E-06	3.69E-07
1,2,3,4,7,8,9-Heptachlorodibenzofuran	55673-89-7	7.92	2.12E-02	1.69E-02	9.79E-04	9.18E-06	3.71E-05	1.31E-05
1,2,3,4,7,8-Hexachlorodibenzo(p)dioxin	39227-28-6	7.79	1.68E-02	1.35E-02	7.78E-04	7.29E-06	2.95E-05	1.04E-05
1,2,3,4,7,8-Hexachlorodibenzofuran	70648-26-9	7.25	4.13E-03	3.30E-03	1.91E-04	1.79E-06	7.24E-06	2.55E-06
1,2,3,6,7,8-Hexachlorodibenzo(p)dioxin	57653-85-7	7.25	6.52E-03	5.22E-03	3.01E-04	2.83E-06	1.14E-05	4.02E-06
1,2,3,6,7,8-Hexachlorodibenzofuran	57117-44-9	7.25	1.03E-02	8.26E-03	4.77E-04	4.47E-06	1.81E-05	6.37E-06
1,2,3,7,8,9-Hexachlorodibenzo(p)dioxin	19408-74-3	7.25	7.61E-03	6.08E-03	3.52E-04	3.30E-06	1.33E-05	4.69E-06
1,2,3,7,8,9-Hexachlorodibenzofuran	72918-21-9	7.25	3.42E-02	2.74E-02	1.58E-03	1.48E-05	6.01E-05	2.11E-05

Table C2-2 Bioaccumulation Factors for Accumulation of COPCs and ROPCs from Soil by Mammals and Birds

Constituent of Potential Concern	CAS Registry Number	Bioaccumulation Factor (BAF-T_s) ([mg/kg tissue]/[mg/kg soil])							
		Coyote[d]	Burrowing Owl[d]	Red-tailed Hawk[d]	Canada Goose[d]	Spotted Sandpiper[d]	Great Blue Heron[d]	Bald Eagle[d]	Mink[d]
cis-1,3-Dichloropropene	10061-01-5	No data	No data	No data	No data	No data	No data	No data	No data
Cyanogen bromide	506-68-3	6.80E-12	6.34E-12	0.00E+00	1.96E-11	1.19E-11	0.00E+00	0.00E+00	0.00E+00
Cyanogen chloride	506-77-4	5.53E-12	5.15E-12	0.00E+00	1.60E-11	9.66E-12	0.00E+00	0.00E+00	0.00E+00
Dichlorodifluoromethane	75-71-8	1.91E-09	1.78E-09	0.00E+00	5.51E-09	3.34E-09	0.00E+00	0.00E+00	0.00E+00
Dichlorofluoromethane	75-43-4	4.70E-10	4.38E-10	0.00E+00	1.36E-09	8.22E-10	0.00E+00	0.00E+00	0.00E+00
Dichloromethane	75-09-2	2.39E-10	2.22E-10	0.00E+00	6.89E-10	4.17E-10	0.00E+00	0.00E+00	0.00E+00
Difluorodibromomethane	75-61-6	No data	No data	No data	No data	No data	No data	No data	No data
Hexafluoroacetone	684-16-2	No data	No data	No data	No data	No data	No data	No data	No data
Iodomethane	74-88-4	6.49E-10	6.05E-10	0.00E+00	1.87E-09	1.13E-09	0.00E+00	0.00E+00	0.00E+00
Methylene bromide	74-95-3	5.53E-10	5.15E-10	0.00E+00	1.60E-09	9.66E-10	0.00E+00	0.00E+00	0.00E+00
Pentachloroethane	76-01-7	1.49E-08	1.39E-08	0.00E+00	4.29E-08	2.60E-08	0.00E+00	0.00E+00	0.00E+00
trans-1,2-Dichloroethylene	156-60-5	1.27E-09	1.19E-09	0.00E+00	3.67E-09	2.22E-09	0.00E+00	0.00E+00	0.00E+00
trans-1,3-Dichloropropene	10061-02-6	1.52E-09	1.42E-09	0.00E+00	4.39E-09	2.66E-09	0.00E+00	0.00E+00	0.00E+00
Trichloroacetic acid	76-03-9	2.83E-10	2.64E-10	0.00E+00	8.18E-10	4.95E-10	0.00E+00	0.00E+00	0.00E+00
Trichlorofluoroethane	27154-33-2	No data	No data	No data	No data	No data	No data	No data	No data
Trichlorofluoromethane	75-69-4	4.51E-09	4.20E-09	0.00E+00	1.30E-08	7.88E-09	0.00E+00	0.00E+00	0.00E+00
Trifluorobromomethane	75-63-8	9.61E-10	8.95E-10	0.00E+00	2.77E-09	1.68E-09	0.00E+00	0.00E+00	0.00E+00
Dioxin and Furan Compounds (PCDDs/PCDFs)									
1,2,3,4,6,7,8-Heptachlorodibenzo(p)dioxin	35822-46-9	1.46E-06	1.36E-06	0.00E+00	4.23E-06	2.56E-06	0.00E+00	0.00E+00	0.00E+00
1,2,3,4,6,7,8-Heptachlorodibenzofuran	67562-39-4	3.15E-07	2.94E-07	0.00E+00	9.11E-07	5.51E-07	0.00E+00	0.00E+00	0.00E+00
1,2,3,4,7,8,9-Heptachlorodibenzofuran	55673-89-7	1.12E-05	1.04E-05	0.00E+00	3.23E-05	1.95E-05	0.00E+00	0.00E+00	0.00E+00
1,2,3,4,7,8-Hexachlorodibenzo(p)dioxin	39227-28-6	8.88E-06	8.28E-06	0.00E+00	2.56E-05	1.55E-05	0.00E+00	0.00E+00	0.00E+00
1,2,3,4,7,8-Hexachlorodibenzofuran	70648-26-9	2.18E-06	2.03E-06	0.00E+00	6.29E-06	3.81E-06	0.00E+00	0.00E+00	0.00E+00
1,2,3,6,7,8-Hexachlorodibenzo(p)dioxin	57653-85-7	3.44E-06	3.21E-06	0.00E+00	9.93E-06	6.01E-06	0.00E+00	0.00E+00	0.00E+00
1,2,3,6,7,8-Hexachlorodibenzofuran	57117-44-9	5.45E-06	5.08E-06	0.00E+00	1.57E-05	9.52E-06	0.00E+00	0.00E+00	0.00E+00
1,2,3,7,8,9-Hexachlorodibenzo(p)dioxin	19408-74-3	4.01E-06	3.74E-06	0.00E+00	1.16E-05	7.01E-06	0.00E+00	0.00E+00	0.00E+00
1,2,3,7,8,9-Hexachlorodibenzofuran	72918-21-9	1.81E-05	1.68E-05	0.00E+00	5.22E-05	3.16E-05	0.00E+00	0.00E+00	0.00E+00

Table C2-2 Bioaccumulation Factors for Accumulation of COPCs and ROPCs from Soil by Mammals and Birds

Constituent of Potential Concern	CAS Registry Number	Log K_{ow} [a]	Mammal Ba[b] ([mg/kg tissue] / [mg ingested /day])	Bird Ba[c] ([mg/kg tissue] / [mg ingested /day])	Bioaccumulation Factor (BAF-T_s) ([mg/kg tissue]/[mg/kg soil])			
					Mule Deer[d]	Mourning Dove[d]	Great Basin Pocket Mouse[d]	Western Meadow-lark[d]
1,2,3,7,8-Pentachlorodibenzo(p)dioxin	40321-76-4	6.64	5.00E-02	4.00E-02	2.31E-03	2.17E-05	8.76E-05	3.08E-05
1,2,3,7,8-Pentachlorodibenzofuran	57117-41-6	6.79	1.20E-02	9.56E-03	5.52E-04	5.18E-06	2.10E-05	7.37E-06
2,3,4,6,7,8-Hexachlorodibenzofuran	60851-34-5	7.25	3.64E-02	2.91E-02	1.68E-03	1.58E-05	6.39E-05	2.25E-05
2,3,4,7,8-Pentachlorodibenzofuran	57117-31-4	6.92	8.70E-02	6.96E-02	4.02E-03	3.77E-05	1.53E-04	5.36E-05
2,3,7,8-Tetrachlorodibenzo(p)dioxin	1746-01-6	6.64	5.43E-02	4.35E-02	2.51E-03	2.35E-05	9.53E-05	3.35E-05
2,3,7,8-Tetrachlorodibenzofuran	51207-31-9	6.53	4.34E-02	3.47E-02	2.01E-03	1.88E-05	7.62E-05	2.68E-05
Dibenzofuran	132-64-9	4.33	5.37E-04	4.30E-04	2.48E-05	2.33E-07	9.42E-07	3.31E-07
Octachlorodibenzo(p)dioxin	3268-87-9	7.59	6.52E-04	5.22E-04	3.01E-05	2.83E-07	1.14E-06	4.02E-07
Octachlorodibenzofuran	39001-02-0	8.78	8.70E-04	6.96E-04	4.02E-05	3.77E-07	1.53E-06	5.36E-07
Total dioxins and dibenzofurans	No CAS #	No data	No data	No data	No data	No data	No data	No data
Polychlorinated Biphenyls (PCBs)								
2,2',3,3',4,4',5-Heptachlorobiphenyl	35065-30-6	7.08	3.02E-01	2.42E-01	1.40E-02	1.31E-04	5.30E-04	1.86E-04
2,2',3,4,4',5,5'-Heptachlorobiphenyl	35065-29-3	7.12	3.31E-01	2.65E-01	1.53E-02	1.44E-04	5.81E-04	2.04E-04
2,3,3',4,4',5,5'-Heptachlorobiphenyl	39635-31-9	No data	No data	No data	No data	No data	No data	No data
2,3,3',4,4',5'-Hexachlorobiphenyl	69782-90-7	No data	No data	No data	No data	No data	No data	No data
2,3,3',4,4',5-Hexachlorobiphenyl	38380-08-4	No data	No data	No data	No data	No data	No data	No data
2,3,3',4,4'-Pentachlorobiphenyl	32598-14-4	No data	No data	No data	No data	No data	No data	No data
2,3',4,4',5,5'-Hexachlorobiphenyl	52663-72-6	No data	No data	No data	No data	No data	No data	No data
2,3,4,4',5-Pentachlorobiphenyl	74472-37-0	No data	No data	No data	No data	No data	No data	No data
2',3,4,4',5-Pentachlorobiphenyl	65510-44-3	No data	No data	No data	No data	No data	No data	No data
2,3',4,4',5-Pentachlorobiphenyl	31508-00-6	7.12	3.31E-01	2.65E-01	1.53E-02	1.44E-04	5.81E-04	2.04E-04
3,3',4,4',5,5'-Hexachlorobiphenyl	32774-16-6	7.41	6.43E-01	5.14E-01	2.97E-02	2.79E-04	1.13E-03	3.97E-04
3,3',4,4',5-Pentachlorobiphenyl	57465-28-8	No data	No data	No data	No data	No data	No data	No data
3,3',4,4'-Tetrachlorobiphenyl	32598-13-3	No data	No data	No data	No data	No data	No data	No data
3,4,4',5-Tetrachlorobiphenyl	70362-50-4	No data	No data	No data	No data	No data	No data	No data
Polychlorinated biphenyls (PCBs)[e]	1336-36-3	6.29	4.90E-02	3.92E-02	2.26E-03	2.12E-05	8.59E-05	3.02E-05

Table C2-2 Bioaccumulation Factors for Accumulation of COPCs and ROPCs from Soil by Mammals and Birds

Constituent of Potential Concern	CAS Registry Number	Bioaccumulation Factor (BAF-T_s) ([mg/kg tissue]/[mg/kg soil])							
		Coyote[d]	Burrowing Owl[d]	Red-tailed Hawk[d]	Canada Goose[d]	Spotted Sandpiper[d]	Great Blue Heron[d]	Bald Eagle[d]	Mink[d]
1,2,3,7,8-Pentachlorodibenzo(p)dioxin	40321-76-4	2.64E-05	2.46E-05	0.00E+00	7.61E-05	4.61E-05	0.00E+00	0.00E+00	0.00E+00
1,2,3,7,8-Pentachlorodibenzofuran	57117-41-6	6.31E-06	5.88E-06	0.00E+00	1.82E-05	1.10E-05	0.00E+00	0.00E+00	0.00E+00
2,3,4,6,7,8-Hexachlorodibenzofuran	60851-34-5	1.92E-05	1.79E-05	0.00E+00	5.55E-05	3.36E-05	0.00E+00	0.00E+00	0.00E+00
2,3,4,7,8-Pentachlorodibenzofuran	57117-31-4	4.59E-05	4.28E-05	0.00E+00	1.33E-04	8.02E-05	0.00E+00	0.00E+00	0.00E+00
2,3,7,8-Tetrachlorodibenzo(p)dioxin	1746-01-6	2.87E-05	2.67E-05	0.00E+00	8.28E-05	5.01E-05	0.00E+00	0.00E+00	0.00E+00
2,3,7,8-Tetrachlorodibenzofuran	51207-31-9	2.29E-05	2.14E-05	0.00E+00	6.61E-05	4.00E-05	0.00E+00	0.00E+00	0.00E+00
Dibenzofuran	132-64-9	2.83E-07	2.64E-07	0.00E+00	8.18E-07	4.95E-07	0.00E+00	0.00E+00	0.00E+00
Octachlorodibenzo(p)dioxin	3268-87-9	3.44E-07	3.21E-07	0.00E+00	9.93E-07	6.01E-07	0.00E+00	0.00E+00	0.00E+00
Octachlorodibenzofuran	39001-02-0	4.59E-07	4.28E-07	0.00E+00	1.33E-06	8.02E-07	0.00E+00	0.00E+00	0.00E+00
Total dioxins and dibenzofurans	No CAS #	No data	No data	No data	No data	No data	No data	No data	No data
Polychlorinated Biphenyls (PCBs)									
2,2',3,3',4,4',5-Heptachlorobiphenyl	35065-30-6	1.59E-04	1.49E-04	0.00E+00	4.60E-04	2.79E-04	0.00E+00	0.00E+00	0.00E+00
2,2',3,4,4',5,5'-Heptachlorobiphenyl	35065-29-3	1.75E-04	1.63E-04	0.00E+00	5.05E-04	3.05E-04	0.00E+00	0.00E+00	0.00E+00
2,3,3',4,4',5,5'-Heptachlorobiphenyl	39635-31-9	No data	No data	No data	No data	No data	No data	No data	No data
2,3,3',4,4',5'-Hexachlorobiphenyl	69782-90-7	No data	No data	No data	No data	No data	No data	No data	No data
2,3,3',4,4',5-Hexachlorobiphenyl	38380-08-4	No data	No data	No data	No data	No data	No data	No data	No data
2,3,3',4,4'-Pentachlorobiphenyl	32598-14-4	No data	No data	No data	No data	No data	No data	No data	No data
2,3',4,4',5,5'-Hexachlorobiphenyl	52663-72-6	No data	No data	No data	No data	No data	No data	No data	No data
2,3,4,4',5-Pentachlorobiphenyl	74472-37-0	No data	No data	No data	No data	No data	No data	No data	No data
2',3,4,4',5-Pentachlorobiphenyl	65510-44-3	No data	No data	No data	No data	No data	No data	No data	No data
2,3',4,4',5-Pentachlorobiphenyl	31508-00-6	1.75E-04	1.63E-04	0.00E+00	5.05E-04	3.05E-04	0.00E+00	0.00E+00	0.00E+00
3,3',4,4',5,5'-Hexachlorobiphenyl	32774-16-6	3.39E-04	3.16E-04	0.00E+00	9.79E-04	5.93E-04	0.00E+00	0.00E+00	0.00E+00
3,3',4,4',5-Pentachlorobiphenyl	57465-28-8	No data	No data	No data	No data	No data	No data	No data	No data
3,3',4,4'-Tetrachlorobiphenyl	32598-13-3	No data	No data	No data	No data	No data	No data	No data	No data
3,4,4',5-Tetrachlorobiphenyl	70362-50-4	No data	No data	No data	No data	No data	No data	No data	No data
Polychlorinated biphenyls (PCBs)[e]	1336-36-3	2.59E-05	2.41E-05	0.00E+00	7.46E-05	4.52E-05	0.00E+00	0.00E+00	0.00E+00

Table C2-2 Bioaccumulation Factors for Accumulation of COPCs and ROPCs from Soil by Mammals and Birds

Constituent of Potential Concern	CAS Registry Number	Log K_{ow} [a]	Mammal Ba[b] ([mg/kg tissue] / [mg ingested /day])	Bird Ba[c] ([mg/kg tissue] / [mg ingested /day])	Bioaccumulation Factor (BAF-T_s) ([mg/kg tissue]/[mg/kg soil])			
					Mule Deer[d]	Mourning Dove[d]	Great Basin Pocket Mouse[d]	Western Meadow-lark[d]
Phthalates								
Bis(2-ethylhexyl) phthalate (DEHP)	117-81-7	5.20	4.02E-03	3.22E-03	1.86E-04	1.74E-06	7.05E-06	2.48E-06
Butylbenzyl phthalate	85-68-7	4.41	6.51E-04	5.20E-04	3.01E-05	2.82E-07	1.14E-06	4.01E-07
Dibutyl phthalate	84-74-2	4.72	1.32E-03	1.05E-03	6.10E-05	5.72E-07	2.31E-06	8.14E-07
Diethyl phthalate	84-66-2	4.44	6.86E-04	5.49E-04	3.17E-05	2.97E-07	1.20E-06	4.23E-07
Dimethyl phthalate	131-11-3	1.63	1.08E-06	8.64E-07	4.99E-08	4.68E-10	1.90E-09	6.66E-10
n-Dioctyl phthalate	117-84-0	9.33	5.37E+01	4.29E+01	2.48E+00	2.33E-02	9.42E-02	3.31E-02
Light Polycyclic Aromatic Hydrocarbons (molecular weight <200 g/mole)								
2-Chloronaphthalene	91-58-7	4.07	2.94E-04	2.35E-04	1.36E-05	1.27E-07	5.16E-07	1.81E-07
2-Methyl naphthalene	91-57-6	3.86	1.82E-04	1.46E-04	8.41E-06	7.89E-08	3.19E-07	1.12E-07
5-Nitroacenaphthene	602-87-9	No data	No data	No data	No data	No data	No data	No data
Acenaphthene	83-32-9	3.96	2.32E-04	1.85E-04	1.07E-05	1.00E-07	4.06E-07	1.43E-07
Acenaphthylene	208-96-8	4.07	2.95E-04	2.36E-04	1.36E-05	1.28E-07	5.18E-07	1.82E-07
Anthracene	120-12-7	4.47	7.41E-04	5.93E-04	3.43E-05	3.21E-07	1.30E-06	4.57E-07
Fluorene	86-73-7	4.17	3.72E-04	2.98E-04	1.72E-05	1.61E-07	6.53E-07	2.30E-07
Indene	95-13-6	No data	No data	No data	No data	No data	No data	No data
Naphthalene	91-20-3	3.37	5.93E-05	4.74E-05	2.74E-06	2.57E-08	1.04E-07	3.66E-08
Phenanthrene	85-01-8	4.55	8.92E-04	7.13E-04	4.12E-05	3.87E-07	1.56E-06	5.50E-07
Pyrene	129-00-0	5.00	2.51E-03	2.01E-03	1.16E-04	1.09E-06	4.41E-06	1.55E-06
Heavy Polycyclic Aromatic Hydrocarbons (molecular weight >200 g/mole)								
3-Methylcholanthrene	56-49-5	7.11	3.24E-01	2.59E-01	1.50E-02	1.40E-04	5.68E-04	2.00E-04
5-Methylchrysene	3697-24-3	No data	No data	No data	No data	No data	No data	No data
Benzo[a]anthracene	56-55-3	5.68	1.20E-02	9.62E-03	5.56E-04	5.21E-06	2.11E-05	7.42E-06
Benzo[a]pyrene	50-32-8	6.13	2.74E-02	2.20E-02	1.27E-03	1.19E-05	4.82E-05	1.69E-05
Benzo[a,i]pyrene	191-30-0	No data	No data	No data	No data	No data	No data	No data
Benzo[b]fluoranthene	205-99-2	6.20	4.00E-02	3.20E-02	1.85E-03	1.74E-05	7.02E-05	2.47E-05
Benzo[e]pyrene	192-97-2	7.40	6.31E-01	5.05E-01	2.92E-02	2.74E-04	1.11E-03	3.89E-04

Table C2-2 Bioaccumulation Factors for Accumulation of COPCs and ROPCs from Soil by Mammals and Birds

Constituent of Potential Concern	CAS Registry Number	Bioaccumulation Factor (BAF-T_s) ([mg/kg tissue]/[mg/kg soil])							
		Coyote[d]	Burrowing Owl[d]	Red-tailed Hawk[d]	Canada Goose[d]	Spotted Sandpiper[d]	Great Blue Heron[d]	Bald Eagle[d]	Mink[d]
Phthalates									
Bis(2-ethylhexyl) phthalate (DEHP)	117-81-7	2.12E-06	1.98E-06	0.00E+00	6.13E-06	3.71E-06	0.00E+00	0.00E+00	0.00E+00
Butylbenzyl phthalate	85-68-7	3.43E-07	3.20E-07	0.00E+00	9.91E-07	6.00E-07	0.00E+00	0.00E+00	0.00E+00
Dibutyl phthalate	84-74-2	6.96E-07	6.49E-07	0.00E+00	2.01E-06	1.22E-06	0.00E+00	0.00E+00	0.00E+00
Diethyl phthalate	84-66-2	3.62E-07	3.37E-07	0.00E+00	1.04E-06	6.32E-07	0.00E+00	0.00E+00	0.00E+00
Dimethyl phthalate	131-11-3	5.70E-10	5.31E-10	0.00E+00	1.65E-09	9.96E-10	0.00E+00	0.00E+00	0.00E+00
n-Dioctyl phthalate	117-84-0	2.83E-02	2.64E-02	0.00E+00	8.18E-02	4.95E-02	0.00E+00	0.00E+00	0.00E+00
Light Polycyclic Aromatic Hydrocarbons (molecular weight <200 g/mole)									
2-Chloronaphthalene	91-58-7	1.55E-07	1.45E-07	0.00E+00	4.48E-07	2.71E-07	0.00E+00	0.00E+00	0.00E+00
2-Methyl naphthalene	91-57-6	9.61E-08	8.95E-08	0.00E+00	2.77E-07	1.68E-07	0.00E+00	0.00E+00	0.00E+00
5-Nitroacenaphthene	602-87-9	No data	No data	No data	No data	No data	No data	No data	No data
Acenaphthene	83-32-9	1.22E-07	1.14E-07	0.00E+00	3.53E-07	2.14E-07	0.00E+00	0.00E+00	0.00E+00
Acenaphthylene	208-96-8	1.56E-07	1.45E-07	0.00E+00	4.50E-07	2.72E-07	0.00E+00	0.00E+00	0.00E+00
Anthracene	120-12-7	3.91E-07	3.65E-07	0.00E+00	1.13E-06	6.83E-07	0.00E+00	0.00E+00	0.00E+00
Fluorene	86-73-7	1.96E-07	1.83E-07	0.00E+00	5.67E-07	3.43E-07	0.00E+00	0.00E+00	0.00E+00
Indene	95-13-6	No data	No data	No data	No data	No data	No data	No data	No data
Naphthalene	91-20-3	3.13E-08	2.92E-08	0.00E+00	9.03E-08	5.47E-08	0.00E+00	0.00E+00	0.00E+00
Phenanthrene	85-01-8	4.71E-07	4.39E-07	0.00E+00	1.36E-06	8.22E-07	0.00E+00	0.00E+00	0.00E+00
Pyrene	129-00-0	1.33E-06	1.24E-06	0.00E+00	3.83E-06	2.32E-06	0.00E+00	0.00E+00	0.00E+00
Heavy Polycyclic Aromatic Hydrocarbons (molecular weight >200 g/mole)									
3-Methylcholanthrene	56-49-5	1.71E-04	1.59E-04	0.00E+00	4.93E-04	2.98E-04	0.00E+00	0.00E+00	0.00E+00
5-Methylchrysene	3697-24-3	No data	No data	No data	No data	No data	No data	No data	No data
Benzo[a]anthracene	56-55-3	6.35E-06	5.92E-06	0.00E+00	1.83E-05	1.11E-05	0.00E+00	0.00E+00	0.00E+00
Benzo[a]pyrene	50-32-8	1.45E-05	1.35E-05	0.00E+00	4.18E-05	2.53E-05	0.00E+00	0.00E+00	0.00E+00
Benzo[a,i]pyrene	191-30-0	No data	No data	No data	No data	No data	No data	No data	No data
Benzo[b]fluoranthene	205-99-2	2.11E-05	1.97E-05	0.00E+00	6.10E-05	3.69E-05	0.00E+00	0.00E+00	0.00E+00
Benzo[e]pyrene	192-97-2	3.33E-04	3.10E-04	0.00E+00	9.61E-04	5.82E-04	0.00E+00	0.00E+00	0.00E+00

Table C2-2 Bioaccumulation Factors for Accumulation of COPCs and ROPCs from Soil by Mammals and Birds

Constituent of Potential Concern	CAS Registry Number	Log K_{ow} [a]	Mammal Ba[b] ([mg/kg tissue] / [mg ingested /day])	Bird Ba[c] ([mg/kg tissue] / [mg ingested /day])	Bioaccumulation Factor (BAF-T_s) ([mg/kg tissue]/[mg/kg soil])			
					Mule Deer[d]	Mourning Dove[d]	Great Basin Pocket Mouse[d]	Western Meadow-lark[d]
Benzo[g,h,i]perylene	191-24-2	7.10	3.16E-01	2.53E-01	1.46E-02	1.37E-04	5.55E-04	1.95E-04
Benzo[j]fluoranthene	205-82-3	6.44	6.92E-02	5.53E-02	3.20E-03	3.00E-05	1.21E-04	4.27E-05
Benzo[k]fluoranthene	207-08-9	6.19	3.98E-02	3.18E-02	1.84E-03	1.73E-05	6.99E-05	2.46E-05
Chrysene	218-01-9	5.74	1.38E-02	1.11E-02	6.39E-04	5.99E-06	2.43E-05	8.53E-06
Dibenz[a,h]acridine	226-36-8	No data	No data	No data	No data	No data	No data	No data
Dibenz[a,h]anthracene	53-70-3	6.55	8.86E-02	7.09E-02	4.10E-03	3.84E-05	1.55E-04	5.47E-05
Dibenz[a,j]acridine	224-42-0	No data	No data	No data	No data	No data	No data	No data
Dibenzo[a,e]fluoranthene	5385-75-1	No data	No data	No data	No data	No data	No data	No data
Dibenzo[a,e]pyrene	192-65-4	No data	No data	No data	No data	No data	No data	No data
Dibenzo[a,h]fluoranthene	No CAS #	No data	No data	No data	No data	No data	No data	No data
Dibenzo[a,h]pyrene	189-64-0	No data	No data	No data	No data	No data	No data	No data
Dibenzo[a,i]pyrene	189-55-9	7.29	4.90E-01	3.92E-01	2.26E-02	2.12E-04	8.59E-04	3.02E-04
Fluoranthene	206-44-0	5.08	3.04E-03	2.43E-03	1.41E-04	1.32E-06	5.33E-06	1.88E-06
Hexachloronaphthalene	1335-87-1	7.59	9.77E-01	7.82E-01	4.52E-02	4.24E-04	1.71E-03	6.03E-04
Indeno[1,2,3-cd]pyrene	193-39-5	6.91	2.07E-01	1.66E-01	9.57E-03	8.97E-05	3.63E-04	1.28E-04
Octachloronaphthalene	2234-13-1	6.42	6.61E-02	5.29E-02	3.06E-03	2.87E-05	1.16E-04	4.08E-05
Pentachloronaphthalene	1321-64-8	No data	No data	No data	No data	No data	No data	No data
Tetrachloronaphthalene	1335-88-2	No data	No data	No data	No data	No data	No data	No data
Trichloronaphthalene	1321-65-9	No data	No data	No data	No data	No data	No data	No data
Light Substituted Benzene Compounds (molecular weight <200 g/mole)								
1,2,3-Trichlorobenzene	87-61-6	4.05	2.79E-04	2.23E-04	1.29E-05	1.21E-07	4.89E-07	1.72E-07
1,2,4-Trichlorobenzene	120-82-1	3.99	2.44E-04	1.96E-04	1.13E-05	1.06E-07	4.29E-07	1.51E-07
1,2,4-Trimethyl benzene	95-63-6	3.65	1.12E-04	8.98E-05	5.19E-06	4.86E-08	1.97E-07	6.92E-08
1,2-Dichlorobenzene	95-50-1	3.45	7.01E-05	5.61E-05	3.24E-06	3.04E-08	1.23E-07	4.32E-08
1,3,5-Trimethyl benzene	108-67-8	3.42	6.61E-05	5.29E-05	3.05E-06	2.86E-08	1.16E-07	4.08E-08
1,3-Dichlorobenzene	541-73-1	3.53	8.52E-05	6.81E-05	3.94E-06	3.69E-08	1.49E-07	5.25E-08
1,3-Dinitrobenzene	99-65-0	1.49	7.79E-07	6.23E-07	3.60E-08	3.38E-10	1.37E-09	4.81E-10

Table C2-2 Bioaccumulation Factors for Accumulation of COPCs and ROPCs from Soil by Mammals and Birds

Constituent of Potential Concern	CAS Registry Number	Bioaccumulation Factor (BAF-T_s) ([mg/kg tissue]/[mg/kg soil])							
		Coyote[d]	Burrowing Owl[d]	Red-tailed Hawk[d]	Canada Goose[d]	Spotted Sandpiper[d]	Great Blue Heron[d]	Bald Eagle[d]	Mink[d]
Benzo[g,h,i]perylene	191-24-2	1.67E-04	1.56E-04	0.00E+00	4.82E-04	2.92E-04	0.00E+00	0.00E+00	0.00E+00
Benzo[j]fluoranthene	205-82-3	3.65E-05	3.40E-05	0.00E+00	1.05E-04	6.38E-05	0.00E+00	0.00E+00	0.00E+00
Benzo[k]fluoranthene	207-08-9	2.10E-05	1.96E-05	0.00E+00	6.07E-05	3.67E-05	0.00E+00	0.00E+00	0.00E+00
Chrysene	218-01-9	7.30E-06	6.80E-06	0.00E+00	2.11E-05	1.27E-05	0.00E+00	0.00E+00	0.00E+00
Dibenz[a,h]acridine	226-36-8	No data	No data	No data	No data	No data	No data	No data	No data
Dibenz[a,h]anthracene	53-70-3	4.68E-05	4.36E-05	0.00E+00	1.35E-04	8.17E-05	0.00E+00	0.00E+00	0.00E+00
Dibenz[a,j]acridine	224-42-0	No data	No data	No data	No data	No data	No data	No data	No data
Dibenzo[a,e]fluoranthene	5385-75-1	No data	No data	No data	No data	No data	No data	No data	No data
Dibenzo[a,e]pyrene	192-65-4	No data	No data	No data	No data	No data	No data	No data	No data
Dibenzo[a,h]fluoranthene	No CAS #	No data	No data	No data	No data	No data	No data	No data	No data
Dibenzo[a,h]pyrene	189-64-0	No data	No data	No data	No data	No data	No data	No data	No data
Dibenzo[a,i]pyrene	189-55-9	2.59E-04	2.41E-04	0.00E+00	7.46E-04	4.52E-04	0.00E+00	0.00E+00	0.00E+00
Fluoranthene	206-44-0	1.60E-06	1.50E-06	0.00E+00	4.63E-06	2.80E-06	0.00E+00	0.00E+00	0.00E+00
Hexachloronaphthalene	1335-87-1	5.16E-04	4.81E-04	0.00E+00	1.49E-03	9.01E-04	0.00E+00	0.00E+00	0.00E+00
Indeno[1,2,3-cd]pyrene	193-39-5	1.09E-04	1.02E-04	0.00E+00	3.15E-04	1.91E-04	0.00E+00	0.00E+00	0.00E+00
Octachloronaphthalene	2234-13-1	3.49E-05	3.25E-05	0.00E+00	1.01E-04	6.10E-05	0.00E+00	0.00E+00	0.00E+00
Pentachloronaphthalene	1321-64-8	No data	No data	No data	No data	No data	No data	No data	No data
Tetrachloronaphthalene	1335-88-2	No data	No data	No data	No data	No data	No data	No data	No data
Trichloronaphthalene	1321-65-9	No data	No data	No data	No data	No data	No data	No data	No data
Light Substituted Benzene Compounds (molecular weight <200 g/mole)									
1,2,3-Trichlorobenzene	87-61-6	1.47E-07	1.37E-07	0.00E+00	4.25E-07	2.57E-07	0.00E+00	0.00E+00	0.00E+00
1,2,4-Trichlorobenzene	120-82-1	1.29E-07	1.20E-07	0.00E+00	3.72E-07	2.25E-07	0.00E+00	0.00E+00	0.00E+00
1,2,4-Trimethyl benzene	95-63-6	5.92E-08	5.52E-08	0.00E+00	1.71E-07	1.03E-07	0.00E+00	0.00E+00	0.00E+00
1,2-Dichlorobenzene	95-50-1	3.70E-08	3.45E-08	0.00E+00	1.07E-07	6.46E-08	0.00E+00	0.00E+00	0.00E+00
1,3,5-Trimethyl benzene	108-67-8	3.49E-08	3.25E-08	0.00E+00	1.01E-07	6.09E-08	0.00E+00	0.00E+00	0.00E+00
1,3-Dichlorobenzene	541-73-1	4.49E-08	4.19E-08	0.00E+00	1.30E-07	7.85E-08	0.00E+00	0.00E+00	0.00E+00
1,3-Dinitrobenzene	99-65-0	4.11E-10	3.83E-10	0.00E+00	1.19E-09	7.18E-10	0.00E+00	0.00E+00	0.00E+00

Table C2-2 Bioaccumulation Factors for Accumulation of COPCs and ROPCs from Soil by Mammals and Birds

Constituent of Potential Concern	CAS Registry Number	Log K_{ow} [a]	Mammal Ba[b] ([mg/kg tissue] / [mg ingested /day])	Bird Ba[c] ([mg/kg tissue] / [mg ingested /day])	Bioaccumulation Factor (BAF-T_s) ([mg/kg tissue]/[mg/kg soil])			
					Mule Deer[d]	Mourning Dove[d]	Great Basin Pocket Mouse[d]	Western Meadow-lark[d]
1,4-Dichlorobenzene	106-46-7	3.41	6.48E-05	5.18E-05	3.00E-06	2.81E-08	1.14E-07	4.00E-08
1,4-Dinitrobenzene	100-25-4	1.50	7.94E-07	6.35E-07	3.67E-08	3.44E-10	1.39E-09	4.90E-10
2,4,5-Trichlorophenol	95-95-4	3.87	1.86E-04	1.49E-04	8.61E-06	8.07E-08	3.27E-07	1.15E-07
2,4,6-Trichlorophenol	88-06-2	3.71	1.29E-04	1.03E-04	5.98E-06	5.61E-08	2.27E-07	7.98E-08
2,4-Dichlorophenol	120-83-2	3.04	2.74E-05	2.19E-05	1.27E-06	1.19E-08	4.80E-08	1.69E-08
2,4-Dimethylphenol	105-67-9	2.36	5.75E-06	4.60E-06	2.66E-07	2.49E-09	1.01E-08	3.55E-09
2,4-Dinitrophenol	51-28-5	1.52	8.29E-07	6.63E-07	3.83E-08	3.59E-10	1.45E-09	5.11E-10
2,4-Dinitrotoluene	121-14-2	2.00	2.49E-06	1.99E-06	1.15E-07	1.08E-09	4.37E-09	1.54E-09
2,6-Dinitrotoluene	606-20-2	1.89	1.93E-06	1.55E-06	8.93E-08	8.38E-10	3.39E-09	1.19E-09
2-Chlorophenol	95-57-8	2.16	3.64E-06	2.91E-06	1.68E-07	1.58E-09	6.39E-09	2.25E-09
2-Chlorotoluene	95-49-8	3.54	8.64E-05	6.91E-05	3.99E-06	3.74E-08	1.52E-07	5.33E-08
2-Nitrophenol	88-75-5	1.79	1.55E-06	1.24E-06	7.17E-08	6.72E-10	2.72E-09	9.56E-10
4,6-Dinitro-o-cresol	534-52-1	2.12	3.31E-06	2.65E-06	1.53E-07	1.44E-09	5.81E-09	2.04E-09
4-Chlorotoluene	106-43-4	3.33	5.37E-05	4.30E-05	2.48E-06	2.33E-08	9.42E-08	3.31E-08
4-Nitrophenol	100-02-7	1.91	2.04E-06	1.63E-06	9.44E-08	8.85E-10	3.58E-09	1.26E-09
alpha-Methylstyrene	98-83-9	3.46	7.30E-05	5.84E-05	3.38E-06	3.17E-08	1.28E-07	4.51E-08
Aniline	62-53-3	0.98	2.40E-07	1.92E-07	1.11E-08	1.04E-10	4.21E-10	1.48E-10
Benzotrichloride	98-07-7	2.92	2.09E-05	1.67E-05	9.66E-07	9.06E-09	3.67E-08	1.29E-08
Benzyl chloride	100-44-7	2.30	5.01E-06	4.01E-06	2.32E-07	2.17E-09	8.79E-09	3.09E-09
Bromobenzene	108-86-1	2.99	2.45E-05	1.96E-05	1.13E-06	1.06E-08	4.31E-08	1.51E-08
Chlorobenzene	108-90-7	2.79	1.55E-05	1.24E-05	7.15E-07	6.71E-09	2.72E-08	9.55E-09
Cumene	98-82-8	3.61	1.03E-04	8.24E-05	4.76E-06	4.46E-08	1.81E-07	6.35E-08
m-Cresol	108-39-4	1.96	2.29E-06	1.83E-06	1.06E-07	9.91E-10	4.01E-09	1.41E-09
n-Butyl benzene	104-51-8	4.28	4.79E-04	3.83E-04	2.21E-05	2.08E-07	8.40E-07	2.95E-07
Nitrobenzene	98-95-3	1.83	1.71E-06	1.37E-06	7.91E-08	7.42E-10	3.00E-09	1.06E-09
n-Propyl benzene	103-65-1	3.69	1.23E-04	9.84E-05	5.69E-06	5.33E-08	2.16E-07	7.59E-08
o-Cresol	95-48-7	2.02	2.64E-06	2.11E-06	1.22E-07	1.14E-09	4.63E-09	1.63E-09

Table C2-2 Bioaccumulation Factors for Accumulation of COPCs and ROPCs from Soil by Mammals and Birds

Constituent of Potential Concern	CAS Registry Number	Bioaccumulation Factor (BAF-T_s) ([mg/kg tissue]/[mg/kg soil])							
		Coyote[d]	Burrowing Owl[d]	Red-tailed Hawk[d]	Canada Goose[d]	Spotted Sandpiper[d]	Great Blue Heron[d]	Bald Eagle[d]	Mink[d]
1,4-Dichlorobenzene	106-46-7	3.42E-08	3.19E-08	0.00E+00	9.87E-08	5.98E-08	0.00E+00	0.00E+00	0.00E+00
1,4-Dinitrobenzene	100-25-4	4.19E-10	3.91E-10	0.00E+00	1.21E-09	7.33E-10	0.00E+00	0.00E+00	0.00E+00
2,4,5-Trichlorophenol	95-95-4	9.82E-08	9.16E-08	0.00E+00	2.84E-07	1.72E-07	0.00E+00	0.00E+00	0.00E+00
2,4,6-Trichlorophenol	88-06-2	6.83E-08	6.36E-08	0.00E+00	1.97E-07	1.19E-07	0.00E+00	0.00E+00	0.00E+00
2,4-Dichlorophenol	120-83-2	1.45E-08	1.35E-08	0.00E+00	4.17E-08	2.53E-08	0.00E+00	0.00E+00	0.00E+00
2,4-Dimethylphenol	105-67-9	3.04E-09	2.83E-09	0.00E+00	8.76E-09	5.30E-09	0.00E+00	0.00E+00	0.00E+00
2,4-Dinitrophenol	51-28-5	4.38E-10	4.08E-10	0.00E+00	1.26E-09	7.64E-10	0.00E+00	0.00E+00	0.00E+00
2,4-Dinitrotoluene	121-14-2	1.31E-09	1.23E-09	0.00E+00	3.80E-09	2.30E-09	0.00E+00	0.00E+00	0.00E+00
2,6-Dinitrotoluene	606-20-2	1.02E-09	9.51E-10	0.00E+00	2.94E-09	1.78E-09	0.00E+00	0.00E+00	0.00E+00
2-Chlorophenol	95-57-8	1.92E-09	1.79E-09	0.00E+00	5.55E-09	3.36E-09	0.00E+00	0.00E+00	0.00E+00
2-Chlorotoluene	95-49-8	4.56E-08	4.25E-08	0.00E+00	1.32E-07	7.96E-08	0.00E+00	0.00E+00	0.00E+00
2-Nitrophenol	88-75-5	8.18E-10	7.63E-10	0.00E+00	2.36E-09	1.43E-09	0.00E+00	0.00E+00	0.00E+00
4,6-Dinitro-o-cresol	534-52-1	1.75E-09	1.63E-09	0.00E+00	5.05E-09	3.05E-09	0.00E+00	0.00E+00	0.00E+00
4-Chlorotoluene	106-43-4	2.83E-08	2.64E-08	0.00E+00	8.18E-08	4.95E-08	0.00E+00	0.00E+00	0.00E+00
4-Nitrophenol	100-02-7	1.08E-09	1.00E-09	0.00E+00	3.11E-09	1.88E-09	0.00E+00	0.00E+00	0.00E+00
alpha-Methylstyrene	98-83-9	3.86E-08	3.59E-08	0.00E+00	1.11E-07	6.74E-08	0.00E+00	0.00E+00	0.00E+00
Aniline	62-53-3	1.27E-10	1.18E-10	0.00E+00	3.66E-10	2.21E-10	0.00E+00	0.00E+00	0.00E+00
Benzotrichloride	98-07-7	1.10E-08	1.03E-08	0.00E+00	3.18E-08	1.93E-08	0.00E+00	0.00E+00	0.00E+00
Benzyl chloride	100-44-7	2.64E-09	2.46E-09	0.00E+00	7.63E-09	4.62E-09	0.00E+00	0.00E+00	0.00E+00
Bromobenzene	108-86-1	1.30E-08	1.21E-08	0.00E+00	3.74E-08	2.26E-08	0.00E+00	0.00E+00	0.00E+00
Chlorobenzene	108-90-7	8.17E-09	7.61E-09	0.00E+00	2.36E-08	1.43E-08	0.00E+00	0.00E+00	0.00E+00
Cumene	98-82-8	5.44E-08	5.07E-08	0.00E+00	1.57E-07	9.50E-08	0.00E+00	0.00E+00	0.00E+00
m-Cresol	108-39-4	1.21E-09	1.12E-09	0.00E+00	3.48E-09	2.11E-09	0.00E+00	0.00E+00	0.00E+00
n-Butyl benzene	104-51-8	2.53E-07	2.35E-07	0.00E+00	7.29E-07	4.41E-07	0.00E+00	0.00E+00	0.00E+00
Nitrobenzene	98-95-3	9.03E-10	8.42E-10	0.00E+00	2.61E-09	1.58E-09	0.00E+00	0.00E+00	0.00E+00
n-Propyl benzene	103-65-1	6.49E-08	6.05E-08	0.00E+00	1.87E-07	1.13E-07	0.00E+00	0.00E+00	0.00E+00
o-Cresol	95-48-7	1.39E-09	1.30E-09	0.00E+00	4.02E-09	2.43E-09	0.00E+00	0.00E+00	0.00E+00

Table C2-2 Bioaccumulation Factors for Accumulation of COPCs and ROPCs from Soil by Mammals and Birds

Constituent of Potential Concern	CAS Registry Number	Log K_{ow} [a]	Mammal Ba[b] ([mg/kg tissue] / [mg ingested /day])	Bird Ba[c] ([mg/kg tissue] / [mg ingested /day])	Bioaccumulation Factor (BAF-T_s) ([mg/kg tissue]/[mg/kg soil])			
					Mule Deer[d]	Mourning Dove[d]	Great Basin Pocket Mouse[d]	Western Meadow-lark[d]
o-Dinitrobenzene	528-29-0	1.69	1.23E-06	9.84E-07	5.69E-08	5.33E-10	2.16E-09	7.59E-10
o-Nitroaniline	88-74-4	1.85	1.78E-06	1.42E-06	8.22E-08	7.71E-10	3.12E-09	1.10E-09
o-Toluidine	95-53-4	1.34	5.50E-07	4.40E-07	2.54E-08	2.38E-10	9.65E-10	3.39E-10
p-Chloroaniline	106-47-8	1.87	1.86E-06	1.49E-06	8.59E-08	8.06E-10	3.26E-09	1.15E-09
p-Cresol	106-44-5	1.94	2.19E-06	1.75E-06	1.01E-07	9.47E-10	3.83E-09	1.35E-09
Phenol	108-95-2	1.48	7.54E-07	6.03E-07	3.48E-08	3.27E-10	1.32E-09	4.65E-10
p-Nitrochlorobenzene	100-00-5	2.39	6.17E-06	4.93E-06	2.85E-07	2.67E-09	1.08E-08	3.80E-09
p-Toluidine	106-49-0	1.40	6.31E-07	5.05E-07	2.92E-08	2.74E-10	1.11E-09	3.89E-10
sec-Butyl benzene	135-98-8	No data	No data	No data	No data	No data	No data	No data
tert-Butyl benzene	98-06-6	4.11	3.24E-04	2.59E-04	1.50E-05	1.40E-07	5.68E-07	2.00E-07
Toluene-2,6-diamine	823-40-5	0.16	3.63E-08	2.90E-08	1.68E-09	1.57E-11	6.37E-11	2.24E-11
Trimethyl benzene	25551-13-7	3.42	6.61E-05	5.29E-05	3.05E-06	2.86E-08	1.16E-07	4.08E-08
Other Light Semivolatile Compounds (molecular weight <200 g/mole)								
1,1'-Biphenyl	92-52-4	3.90	2.00E-04	1.60E-04	9.22E-06	8.65E-08	3.50E-07	1.23E-07
1,1-Dimethylhydrazine	57-14-7	-1.19	1.62E-09	1.30E-09	7.50E-11	7.03E-13	2.85E-12	1.00E-12
1,2-Dimethylhydrazine	540-73-8	-1.37	1.08E-09	8.61E-10	4.98E-11	4.67E-13	1.89E-12	6.64E-13
1,2-Diphenylhydrazine	122-66-7	2.94	2.19E-05	1.75E-05	1.01E-06	9.49E-09	3.84E-08	1.35E-08
1,3-Propane sultone	1120-71-4	-0.52	7.53E-09	6.03E-09	3.48E-10	3.27E-12	1.32E-11	4.65E-12
2,4-Toluene diisocyanate	584-84-9	No data	No data	No data	No data	No data	No data	No data
2-Chloroacetophenone	532-27-4	1.93	2.14E-06	1.71E-06	9.88E-08	9.27E-10	3.75E-09	1.32E-09
2-Propenoic acid	79-10-7	0.43	6.76E-08	5.41E-08	3.13E-09	2.93E-11	1.19E-10	4.17E-11
4,4'-Methylenedianiline	101-77-9	1.59	9.77E-07	7.82E-07	4.52E-08	4.24E-10	1.71E-09	6.03E-10
Acetophenone	98-86-2	1.64	1.10E-06	8.78E-07	5.08E-08	4.76E-10	1.93E-09	6.77E-10
Benzoic acid	65-85-0	1.87	1.86E-06	1.49E-06	8.61E-08	8.07E-10	3.27E-09	1.15E-09
bis(2-Chloroethoxy)methane	111-91-1	1.30	5.01E-07	4.01E-07	2.32E-08	2.17E-10	8.79E-10	3.09E-10
bis(2-Chloroethyl) ether	111-44-4	1.30	5.02E-07	4.02E-07	2.32E-08	2.18E-10	8.82E-10	3.10E-10
Chlorocyclopentadiene	41851-50-7	2.43	6.76E-06	5.41E-06	3.13E-07	2.93E-09	1.19E-08	4.17E-09

Table C2-2 Bioaccumulation Factors for Accumulation of COPCs and ROPCs from Soil by Mammals and Birds

Constituent of Potential Concern	CAS Registry Number	Bioaccumulation Factor (BAF-T_s) ([mg/kg tissue]/[mg/kg soil])							
		Coyote[d]	Burrowing Owl[d]	Red-tailed Hawk[d]	Canada Goose[d]	Spotted Sandpiper[d]	Great Blue Heron[d]	Bald Eagle[d]	Mink[d]
o-Dinitrobenzene	528-29-0	6.49E-10	6.05E-10	0.00E+00	1.87E-09	1.13E-09	0.00E+00	0.00E+00	0.00E+00
o-Nitroaniline	88-74-4	9.39E-10	8.75E-10	0.00E+00	2.71E-09	1.64E-09	0.00E+00	0.00E+00	0.00E+00
o-Toluidine	95-53-4	2.90E-10	2.71E-10	0.00E+00	8.38E-10	5.07E-10	0.00E+00	0.00E+00	0.00E+00
p-Chloroaniline	106-47-8	9.81E-10	9.15E-10	0.00E+00	2.83E-09	1.71E-09	0.00E+00	0.00E+00	0.00E+00
p-Cresol	106-44-5	1.15E-09	1.08E-09	0.00E+00	3.33E-09	2.02E-09	0.00E+00	0.00E+00	0.00E+00
Phenol	108-95-2	3.98E-10	3.71E-10	0.00E+00	1.15E-09	6.95E-10	0.00E+00	0.00E+00	0.00E+00
p-Nitrochlorobenzene	100-00-5	3.25E-09	3.03E-09	0.00E+00	9.40E-09	5.69E-09	0.00E+00	0.00E+00	0.00E+00
p-Toluidine	106-49-0	3.33E-10	3.10E-10	0.00E+00	9.61E-10	5.82E-10	0.00E+00	0.00E+00	0.00E+00
sec-Butyl benzene	135-98-8	No data	No data	No data	No data	No data	No data	No data	No data
tert-Butyl benzene	98-06-6	1.71E-07	1.59E-07	0.00E+00	4.93E-07	2.98E-07	0.00E+00	0.00E+00	0.00E+00
Toluene-2,6-diamine	823-40-5	1.92E-11	1.79E-11	0.00E+00	5.53E-11	3.35E-11	0.00E+00	0.00E+00	0.00E+00
Trimethyl benzene	25551-13-7	3.49E-08	3.25E-08	0.00E+00	1.01E-07	6.09E-08	0.00E+00	0.00E+00	0.00E+00
Other Light Semivolatile Compounds (molecular weight <200 g/mole)									
1,1'-Biphenyl	92-52-4	1.05E-07	9.82E-08	0.00E+00	3.04E-07	1.84E-07	0.00E+00	0.00E+00	0.00E+00
1,1-Dimethylhydrazine	57-14-7	8.56E-13	7.98E-13	0.00E+00	2.47E-12	1.50E-12	0.00E+00	0.00E+00	0.00E+00
1,2-Dimethylhydrazine	540-73-8	5.68E-13	5.30E-13	0.00E+00	1.64E-12	9.93E-13	0.00E+00	0.00E+00	0.00E+00
1,2-Diphenylhydrazine	122-66-7	1.15E-08	1.08E-08	0.00E+00	3.33E-08	2.02E-08	0.00E+00	0.00E+00	0.00E+00
1,3-Propane sultone	1120-71-4	3.98E-12	3.71E-12	0.00E+00	1.15E-11	6.95E-12	0.00E+00	0.00E+00	0.00E+00
2,4-Toluene diisocyanate	584-84-9	No data	No data	No data	No data	No data	No data	No data	No data
2-Chloroacetophenone	532-27-4	1.13E-09	1.05E-09	0.00E+00	3.26E-09	1.97E-09	0.00E+00	0.00E+00	0.00E+00
2-Propenoic acid	79-10-7	3.57E-11	3.33E-11	0.00E+00	1.03E-10	6.24E-11	0.00E+00	0.00E+00	0.00E+00
4,4'-Methylenedianiline	101-77-9	5.16E-10	4.81E-10	0.00E+00	1.49E-09	9.01E-10	0.00E+00	0.00E+00	0.00E+00
Acetophenone	98-86-2	5.79E-10	5.40E-10	0.00E+00	1.67E-09	1.01E-09	0.00E+00	0.00E+00	0.00E+00
Benzoic acid	65-85-0	9.83E-10	9.16E-10	0.00E+00	2.84E-09	1.72E-09	0.00E+00	0.00E+00	0.00E+00
bis(2-Chloroethoxy)methane	111-91-1	2.65E-10	2.47E-10	0.00E+00	7.64E-10	4.62E-10	0.00E+00	0.00E+00	0.00E+00
bis(2-Chloroethyl) ether	111-44-4	2.65E-10	2.47E-10	0.00E+00	7.65E-10	4.63E-10	0.00E+00	0.00E+00	0.00E+00
Chlorocyclopentadiene	41851-50-7	3.57E-09	3.33E-09	0.00E+00	1.03E-08	6.24E-09	0.00E+00	0.00E+00	0.00E+00

Table C2-2 Bioaccumulation Factors for Accumulation of COPCs and ROPCs from Soil by Mammals and Birds

Constituent of Potential Concern	CAS Registry Number	Log K_{ow} [a]	Mammal Ba[b] ([mg/kg tissue] / [mg ingested /day])	Bird Ba[c] ([mg/kg tissue] / [mg ingested /day])	Bioaccumulation Factor (BAF-T_s) ([mg/kg tissue]/[mg/kg soil])			
					Mule Deer[d]	Mourning Dove[d]	Great Basin Pocket Mouse[d]	Western Meadow-lark[d]
Cyclohexanol	108-93-0	1.23	4.27E-07	3.41E-07	1.97E-08	1.85E-10	7.49E-10	2.63E-10
Dichloroisopropyl ether	108-60-1	2.58	9.55E-06	7.64E-06	4.42E-07	4.14E-09	1.68E-08	5.89E-09
Dichloromethyl ether	542-88-1	0.58	9.55E-08	7.64E-08	4.42E-09	4.14E-11	1.68E-10	5.89E-11
Dichloropentadiene	61626-71-9	No data	No data	No data	No data	No data	No data	No data
Dimethyl sulfate	77-78-1	0.16	3.63E-08	2.90E-08	1.68E-09	1.57E-11	6.37E-11	2.24E-11
Dimethylaniline	121-69-7	2.31	5.13E-06	4.10E-06	2.37E-07	2.22E-09	9.00E-09	3.16E-09
Di-n-propylnitrosamine	621-64-7	1.38	6.03E-07	4.82E-07	2.79E-08	2.61E-10	1.06E-09	3.72E-10
Diphenyl ether	101-84-8	4.21	4.07E-04	3.26E-04	1.88E-05	1.77E-07	7.15E-07	2.51E-07
Epichlorohydrin	106-89-8	0.25	4.47E-08	3.58E-08	2.07E-09	1.94E-11	7.85E-11	2.76E-11
Ethyl carbamate (Urethane)	51-79-6	-0.15	1.78E-08	1.42E-08	8.22E-10	7.71E-12	3.12E-11	1.10E-11
Ethyl methanesulfonate	62-50-0	0.05	2.81E-08	2.25E-08	1.30E-09	1.22E-11	4.94E-11	1.74E-11
Ethylene dibromide	106-93-4	1.75	1.41E-06	1.13E-06	6.53E-08	6.12E-10	2.48E-09	8.71E-10
Ethylene glycol	107-21-1	-1.36	1.10E-09	8.77E-10	5.07E-11	4.75E-13	1.92E-12	6.76E-13
Ethylene glycol monobutyl ether	111-76-2	0.83	1.70E-07	1.36E-07	7.85E-09	7.36E-11	2.98E-10	1.05E-10
Ethylene glycol monoethyl ether acetate	111-15-9	0.59	9.77E-08	7.82E-08	4.52E-09	4.24E-11	1.71E-10	6.03E-11
Ethylene thiourea	96-45-7	-0.66	5.50E-09	4.40E-09	2.54E-10	2.38E-12	9.64E-12	3.39E-12
Furfural	98-01-1	0.96	2.29E-07	1.83E-07	1.06E-08	9.93E-11	4.02E-10	1.41E-10
Maleic hydrazide	123-33-1	-0.84	3.63E-09	2.90E-09	1.68E-10	1.57E-12	6.37E-12	2.24E-12
Malononitrile	109-77-3	-0.60	6.31E-09	5.05E-09	2.92E-10	2.74E-12	1.11E-11	3.89E-12
Methyl styrene (mixed isomers)	25013-15-4	3.48	7.59E-05	6.07E-05	3.51E-06	3.29E-08	1.33E-07	4.68E-08
Methylhydrazine	60-34-4	-1.05	2.24E-09	1.79E-09	1.04E-10	9.71E-13	3.93E-12	1.38E-12
N,N-Diphenylamine	122-39-4	3.50	7.94E-05	6.35E-05	3.67E-06	3.44E-08	1.39E-07	4.90E-08
Nitric acid, propyl ester	627-13-4	No data	No data	No data	No data	No data	No data	No data
N-Nitrosodi-n-butylamine	924-16-3	2.41	6.46E-06	5.16E-06	2.98E-07	2.80E-09	1.13E-08	3.98E-09
N-Nitrosomorpholine	59-89-2	0.98	2.40E-07	1.92E-07	1.11E-08	1.04E-10	4.21E-10	1.48E-10
N-Nitroso-N,N-dimethylamine	62-75-9	-0.57	6.76E-09	5.41E-09	3.13E-10	2.93E-12	1.19E-11	4.17E-12
o-Anisidine	90-04-0	1.18	3.80E-07	3.04E-07	1.76E-08	1.65E-10	6.67E-10	2.35E-10

Table C2-2 Bioaccumulation Factors for Accumulation of COPCs and ROPCs from Soil by Mammals and Birds

Constituent of Potential Concern	CAS Registry Number	Bioaccumulation Factor (BAF-T_s) ([mg/kg tissue]/[mg/kg soil])							
		Coyote[d]	Burrowing Owl[d]	Red-tailed Hawk[d]	Canada Goose[d]	Spotted Sandpiper[d]	Great Blue Heron[d]	Bald Eagle[d]	Mink[d]
Cyclohexanol	108-93-0	2.25E-10	2.10E-10	0.00E+00	6.50E-10	3.93E-10	0.00E+00	0.00E+00	0.00E+00
Dichloroisopropyl ether	108-60-1	5.04E-09	4.70E-09	0.00E+00	1.46E-08	8.81E-09	0.00E+00	0.00E+00	0.00E+00
Dichloromethyl ether	542-88-1	5.04E-11	4.70E-11	0.00E+00	1.46E-10	8.81E-11	0.00E+00	0.00E+00	0.00E+00
Dichloropentadiene	61626-71-9	No data	No data	No data	No data	No data	No data	No data	No data
Dimethyl sulfate	77-78-1	1.92E-11	1.79E-11	0.00E+00	5.53E-11	3.35E-11	0.00E+00	0.00E+00	0.00E+00
Dimethylaniline	121-69-7	2.71E-09	2.52E-09	0.00E+00	7.81E-09	4.73E-09	0.00E+00	0.00E+00	0.00E+00
Di-n-propylnitrosamine	621-64-7	3.18E-10	2.97E-10	0.00E+00	9.19E-10	5.56E-10	0.00E+00	0.00E+00	0.00E+00
Diphenyl ether	101-84-8	2.15E-07	2.00E-07	0.00E+00	6.21E-07	3.76E-07	0.00E+00	0.00E+00	0.00E+00
Epichlorohydrin	106-89-8	2.36E-11	2.20E-11	0.00E+00	6.81E-11	4.12E-11	0.00E+00	0.00E+00	0.00E+00
Ethyl carbamate (Urethane)	51-79-6	9.39E-12	8.75E-12	0.00E+00	2.71E-11	1.64E-11	0.00E+00	0.00E+00	0.00E+00
Ethyl methanesulfonate	62-50-0	1.49E-11	1.38E-11	0.00E+00	4.29E-11	2.59E-11	0.00E+00	0.00E+00	0.00E+00
Ethylene dibromide	106-93-4	7.45E-10	6.95E-10	0.00E+00	2.15E-09	1.30E-09	0.00E+00	0.00E+00	0.00E+00
Ethylene glycol	107-21-1	5.79E-13	5.39E-13	0.00E+00	1.67E-12	1.01E-12	0.00E+00	0.00E+00	0.00E+00
Ethylene glycol monobutyl ether	111-76-2	8.96E-11	8.36E-11	0.00E+00	2.59E-10	1.57E-10	0.00E+00	0.00E+00	0.00E+00
Ethylene glycol monoethyl ether acetate	111-15-9	5.16E-11	4.81E-11	0.00E+00	1.49E-10	9.01E-11	0.00E+00	0.00E+00	0.00E+00
Ethylene thiourea	96-45-7	2.90E-12	2.70E-12	0.00E+00	8.37E-12	5.07E-12	0.00E+00	0.00E+00	0.00E+00
Furfural	98-01-1	1.21E-10	1.13E-10	0.00E+00	3.49E-10	2.11E-10	0.00E+00	0.00E+00	0.00E+00
Maleic hydrazide	123-33-1	1.92E-12	1.79E-12	0.00E+00	5.53E-12	3.35E-12	0.00E+00	0.00E+00	0.00E+00
Malononitrile	109-77-3	3.33E-12	3.10E-12	0.00E+00	9.61E-12	5.82E-12	0.00E+00	0.00E+00	0.00E+00
Methyl styrene (mixed isomers)	25013-15-4	4.00E-08	3.73E-08	0.00E+00	1.16E-07	7.00E-08	0.00E+00	0.00E+00	0.00E+00
Methylhydrazine	60-34-4	1.18E-12	1.10E-12	0.00E+00	3.41E-12	2.07E-12	0.00E+00	0.00E+00	0.00E+00
N,N-Diphenylamine	122-39-4	4.19E-08	3.91E-08	0.00E+00	1.21E-07	7.33E-08	0.00E+00	0.00E+00	0.00E+00
Nitric acid, propyl ester	627-13-4	No data	No data	No data	No data	No data	No data	No data	No data
N-Nitrosodi-n-butylamine	924-16-3	3.41E-09	3.18E-09	0.00E+00	9.84E-09	5.95E-09	0.00E+00	0.00E+00	0.00E+00
N-Nitrosomorpholine	59-89-2	1.27E-10	1.18E-10	0.00E+00	3.66E-10	2.21E-10	0.00E+00	0.00E+00	0.00E+00
N-Nitroso-N,N-dimethylamine	62-75-9	3.57E-12	3.33E-12	0.00E+00	1.03E-11	6.24E-12	0.00E+00	0.00E+00	0.00E+00
o-Anisidine	90-04-0	2.01E-10	1.87E-10	0.00E+00	5.79E-10	3.51E-10	0.00E+00	0.00E+00	0.00E+00

Table C2-2 Bioaccumulation Factors for Accumulation of COPCs and ROPCs from Soil by Mammals and Birds

Constituent of Potential Concern	CAS Registry Number	Log K_{ow} [a]	Mammal Ba[b] ([mg/kg tissue] / [mg ingested /day])	Bird Ba[c] ([mg/kg tissue] / [mg ingested /day])	Bioaccumulation Factor (BAF-T_s) ([mg/kg tissue]/[mg/kg soil])			
					Mule Deer[d]	Mourning Dove[d]	Great Basin Pocket Mouse[d]	Western Meadow-lark[d]
Oxalic acid	144-62-7	No data	No data	No data	No data	No data	No data	No data
Phthalic anhydride	85-44-9	-0.60	6.28E-09	5.02E-09	2.90E-10	2.72E-12	1.10E-11	3.87E-12
p-Phthalic acid	100-21-0	2.00	2.51E-06	2.01E-06	1.16E-07	1.09E-09	4.41E-09	1.55E-09
Pyridine	110-86-1	0.67	1.18E-07	9.40E-08	5.44E-09	5.10E-11	2.06E-10	7.25E-11
Quinoline	91-22-5	2.03	2.69E-06	2.15E-06	1.24E-07	1.17E-09	4.72E-09	1.66E-09
Quinone	106-51-4	0.20	3.98E-08	3.18E-08	1.84E-09	1.73E-11	6.99E-11	2.46E-11
Safrole	94-59-7	2.66	1.15E-05	9.18E-06	5.31E-07	4.98E-09	2.01E-08	7.08E-09
Tetrahydrofuran	109-99-9	0.45	7.03E-08	5.63E-08	3.25E-09	3.05E-11	1.23E-10	4.34E-11
Other Heavy Semivolatile Compounds (molecular weight >200 g/mole)								
1,2,4,5-Tetrachlorobenzene	95-94-3	4.64	1.10E-03	8.76E-04	5.06E-05	4.75E-07	1.92E-06	6.76E-07
1,3,5-Trinitrobenzene	99-35-4	1.18	3.79E-07	3.03E-07	1.75E-08	1.64E-10	6.66E-10	2.34E-10
2,6-Bis(tert-butyl)-4-methylphenol	128-37-0	4.17	3.72E-04	2.97E-04	1.72E-05	1.61E-07	6.52E-07	2.29E-07
2-Cyclohexyl-4,6-dinitrophenol	131-89-5	4.54	8.71E-04	6.97E-04	4.03E-05	3.78E-07	1.53E-06	5.37E-07
2-sec-Butyl-4,6-dinitrophenol	88-85-7	3.56	9.12E-05	7.30E-05	4.22E-06	3.95E-08	1.60E-07	5.63E-08
3,3'-Dichlorobenzidine	91-94-1	3.58	9.44E-05	7.56E-05	4.37E-06	4.09E-08	1.66E-07	5.83E-08
3,3'-Dimethoxybenzidine	119-90-4	1.81	1.62E-06	1.30E-06	7.50E-08	7.03E-10	2.85E-09	1.00E-09
4-Bromophenylphenyl ether	101-55-3	5.04	2.76E-03	2.21E-03	1.28E-04	1.20E-06	4.84E-06	1.70E-06
Ammonium perfluorooctanoate	3825-26-1	No data	No data	No data	No data	No data	No data	No data
Azobenzene	103-33-3	3.82	1.66E-04	1.33E-04	7.67E-06	7.19E-08	2.91E-07	1.02E-07
Bis(3-tert-butyl-4-hydroxy-6-methyl-phenyl)sulfide	96-69-5	No data	No data	No data	No data	No data	No data	No data
Captan	133-06-2	2.35	5.62E-06	4.50E-06	2.60E-07	2.44E-09	9.87E-09	3.47E-09
Chlorobenzilate	510-15-6	4.38	6.03E-04	4.82E-04	2.79E-05	2.61E-07	1.06E-06	3.72E-07
Dibutylphosphate	107-66-4	No data	No data	No data	No data	No data	No data	No data
Dimethyl aminoazobenzene	60-11-7	4.58	9.55E-04	7.64E-04	4.42E-05	4.14E-07	1.68E-06	5.89E-07
Hexachlorobenzene	118-74-1	5.50	7.99E-03	6.39E-03	3.69E-04	3.46E-06	1.40E-05	4.93E-06
Hexachlorobutadiene	87-68-3	4.73	1.35E-03	1.08E-03	6.25E-05	5.86E-07	2.37E-06	8.34E-07
Hexachlorocyclopentadiene	77-47-4	4.91	2.03E-03	1.62E-03	9.39E-05	8.80E-07	3.56E-06	1.25E-06

Table C2-2 Bioaccumulation Factors for Accumulation of COPCs and ROPCs from Soil by Mammals and Birds

Constituent of Potential Concern	CAS Registry Number	Bioaccumulation Factor (BAF-T_s) ([mg/kg tissue]/[mg/kg soil])							
		Coyote[d]	Burrowing Owl[d]	Red-tailed Hawk[d]	Canada Goose[d]	Spotted Sandpiper[d]	Great Blue Heron[d]	Bald Eagle[d]	Mink[d]
Oxalic acid	144-62-7	No data	No data	No data	No data	No data	No data	No data	No data
Phthalic anhydride	85-44-9	3.31E-12	3.09E-12	0.00E+00	9.57E-12	5.79E-12	0.00E+00	0.00E+00	0.00E+00
p-Phthalic acid	100-21-0	1.33E-09	1.24E-09	0.00E+00	3.83E-09	2.32E-09	0.00E+00	0.00E+00	0.00E+00
Pyridine	110-86-1	6.21E-11	5.78E-11	0.00E+00	1.79E-10	1.08E-10	0.00E+00	0.00E+00	0.00E+00
Quinoline	91-22-5	1.42E-09	1.32E-09	0.00E+00	4.10E-09	2.48E-09	0.00E+00	0.00E+00	0.00E+00
Quinone	106-51-4	2.10E-11	1.96E-11	0.00E+00	6.07E-11	3.67E-11	0.00E+00	0.00E+00	0.00E+00
Safrole	94-59-7	6.06E-09	5.65E-09	0.00E+00	1.75E-08	1.06E-08	0.00E+00	0.00E+00	0.00E+00
Tetrahydrofuran	109-99-9	3.71E-11	3.46E-11	0.00E+00	1.07E-10	6.49E-11	0.00E+00	0.00E+00	0.00E+00
Other Heavy Semivolatile Compounds (molecular weight >200 g/mole)									
1,2,4,5-Tetrachlorobenzene	95-94-3	5.78E-07	5.39E-07	0.00E+00	1.67E-06	1.01E-06	0.00E+00	0.00E+00	0.00E+00
1,3,5-Trinitrobenzene	99-35-4	2.00E-10	1.87E-10	0.00E+00	5.78E-10	3.50E-10	0.00E+00	0.00E+00	0.00E+00
2,6-Bis(tert-butyl)-4-methylphenol	128-37-0	1.96E-07	1.83E-07	0.00E+00	5.66E-07	3.43E-07	0.00E+00	0.00E+00	0.00E+00
2-Cyclohexyl-4,6-dinitrophenol	131-89-5	4.60E-07	4.29E-07	0.00E+00	1.33E-06	8.03E-07	0.00E+00	0.00E+00	0.00E+00
2-sec-Butyl-4,6-dinitrophenol	88-85-7	4.81E-08	4.49E-08	0.00E+00	1.39E-07	8.41E-08	0.00E+00	0.00E+00	0.00E+00
3,3'-Dichlorobenzidine	91-94-1	4.99E-08	4.65E-08	0.00E+00	1.44E-07	8.71E-08	0.00E+00	0.00E+00	0.00E+00
3,3'-Dimethoxybenzidine	119-90-4	8.57E-10	7.98E-10	0.00E+00	2.47E-09	1.50E-09	0.00E+00	0.00E+00	0.00E+00
4-Bromophenylphenyl ether	101-55-3	1.46E-06	1.36E-06	0.00E+00	4.21E-06	2.55E-06	0.00E+00	0.00E+00	0.00E+00
Ammonium perfluorooctanoate	3825-26-1	No data	No data	No data	No data	No data	No data	No data	No data
Azobenzene	103-33-3	8.76E-08	8.17E-08	0.00E+00	2.53E-07	1.53E-07	0.00E+00	0.00E+00	0.00E+00
Bis(3-tert-butyl-4-hydroxy-6-methyl-phenyl)sulfide	96-69-5	No data	No data	No data	No data	No data	No data	No data	No data
Captan	133-06-2	2.97E-09	2.77E-09	0.00E+00	8.57E-09	5.19E-09	0.00E+00	0.00E+00	0.00E+00
Chlorobenzilate	510-15-6	3.18E-07	2.97E-07	0.00E+00	9.19E-07	5.56E-07	0.00E+00	0.00E+00	0.00E+00
Dibutylphosphate	107-66-4	No data	No data	No data	No data	No data	No data	No data	No data
Dimethyl aminoazobenzene	60-11-7	5.04E-07	4.70E-07	0.00E+00	1.46E-06	8.81E-07	0.00E+00	0.00E+00	0.00E+00
Hexachlorobenzene	118-74-1	4.22E-06	3.93E-06	0.00E+00	1.22E-05	7.37E-06	0.00E+00	0.00E+00	0.00E+00
Hexachlorobutadiene	87-68-3	7.14E-07	6.65E-07	0.00E+00	2.06E-06	1.25E-06	0.00E+00	0.00E+00	0.00E+00
Hexachlorocyclopentadiene	77-47-4	1.07E-06	9.99E-07	0.00E+00	3.09E-06	1.87E-06	0.00E+00	0.00E+00	0.00E+00

Table C2-2 Bioaccumulation Factors for Accumulation of COPCs and ROPCs from Soil by Mammals and Birds

Constituent of Potential Concern	CAS Registry Number	Log K_{ow} [a]	Mammal Ba[b] ([mg/kg tissue] / [mg ingested /day])	Bird Ba[c] ([mg/kg tissue] / [mg ingested /day])	Bioaccumulation Factor (BAF-T_s) ([mg/kg tissue]/[mg/kg soil])			
					Mule Deer[d]	Mourning Dove[d]	Great Basin Pocket Mouse[d]	Western Meadow-lark[d]
Hexachloroethane	67-72-1	3.98	2.43E-04	1.94E-04	1.12E-05	1.05E-07	4.26E-07	1.50E-07
Hexachlorophene	70-30-4	7.54	8.72E-01	6.98E-01	4.03E-02	3.78E-04	1.53E-03	5.38E-04
Hexamethylene-1,5-diisocyanate	822-06-0	3.20	3.98E-05	3.18E-05	1.84E-06	1.73E-08	6.99E-08	2.46E-08
Mirex	2385-85-5	6.89	1.95E-01	1.56E-01	9.01E-03	8.45E-05	3.42E-04	1.20E-04
Nitrofen	1836-75-5	5.53	8.51E-03	6.81E-03	3.94E-04	3.69E-06	1.49E-05	5.25E-06
Pentachlorobenzene	608-93-5	5.09	3.08E-03	2.46E-03	1.42E-04	1.34E-06	5.40E-06	1.90E-06
Pentachloronitrobenzene	82-68-8	4.64	1.10E-03	8.81E-04	5.09E-05	4.77E-07	1.93E-06	6.79E-07
Pentachlorophenol	87-86-5	5.08	3.01E-03	2.41E-03	1.39E-04	1.31E-06	5.29E-06	1.86E-06
Picric acid	88-89-1	2.03	2.69E-06	2.15E-06	1.24E-07	1.17E-09	4.72E-09	1.66E-09
Pronamide	23950-58-5	3.51	8.14E-05	6.51E-05	3.76E-06	3.53E-08	1.43E-07	5.02E-08
Strychnine	57-24-9	1.93	2.14E-06	1.71E-06	9.88E-08	9.27E-10	3.75E-09	1.32E-09
Terphenyls	26140-60-3	No data	No data	No data	No data	No data	No data	No data
Tributyl phosphate	126-73-8	4.00	2.51E-04	2.01E-04	1.16E-05	1.09E-07	4.41E-07	1.55E-07
Trifluralin	1582-09-8	5.34	5.50E-03	4.40E-03	2.54E-04	2.38E-06	9.64E-06	3.39E-06
Triphenylamine	603-34-9	No data	No data	No data	No data	No data	No data	No data
Herbicides and Organochlorinated Pesticides								
2,4,5-T	93-76-5	3.36	5.75E-05	4.60E-05	2.66E-06	2.49E-08	1.01E-07	3.55E-08
2,4-D and esters	94-75-7	2.81	1.62E-05	1.30E-05	7.50E-07	7.03E-09	2.85E-08	1.00E-08
4,4'-DDD	72-54-8	6.12	3.32E-02	2.66E-02	1.53E-03	1.44E-05	5.82E-05	2.05E-05
4,4'-DDE	72-55-9	6.26	4.54E-02	3.63E-02	2.10E-03	1.97E-05	7.96E-05	2.80E-05
4,4'-DDT	50-29-3	6.07	2.95E-02	2.36E-02	1.36E-03	1.28E-05	5.18E-05	1.82E-05
Aldrin	309-00-2	6.18	3.79E-02	3.03E-02	1.75E-03	1.64E-05	6.66E-05	2.34E-05
alpha-BHC	319-84-6	3.80	1.58E-04	1.27E-04	7.32E-06	6.86E-08	2.78E-07	9.76E-08
beta-BHC	319-85-7	3.83	1.71E-04	1.37E-04	7.91E-06	7.42E-08	3.00E-07	1.06E-07
Chlordane	57-74-9	5.94	2.18E-02	1.74E-02	1.01E-03	9.43E-06	3.82E-05	1.34E-05
Delta-BHC	319-86-8	4.14	3.47E-04	2.77E-04	1.60E-05	1.50E-07	6.08E-07	2.14E-07
Dieldrin	60-57-1	5.27	4.67E-03	3.74E-03	2.16E-04	2.03E-06	8.20E-06	2.88E-06

Table C2-2 Bioaccumulation Factors for Accumulation of COPCs and ROPCs from Soil by Mammals and Birds

Constituent of Potential Concern	CAS Registry Number	Bioaccumulation Factor (BAF-T_s) ([mg/kg tissue]/[mg/kg soil])							
		Coyote[d]	Burrowing Owl[d]	Red-tailed Hawk[d]	Canada Goose[d]	Spotted Sandpiper[d]	Great Blue Heron[d]	Bald Eagle[d]	Mink[d]
Hexachloroethane	67-72-1	1.28E-07	1.19E-07	0.00E+00	3.70E-07	2.24E-07	0.00E+00	0.00E+00	0.00E+00
Hexachlorophene	70-30-4	4.60E-04	4.29E-04	0.00E+00	1.33E-03	8.04E-04	0.00E+00	0.00E+00	0.00E+00
Hexamethylene-1,5-diisocyanate	822-06-0	2.10E-08	1.96E-08	0.00E+00	6.07E-08	3.67E-08	0.00E+00	0.00E+00	0.00E+00
Mirex	2385-85-5	1.03E-04	9.59E-05	0.00E+00	2.97E-04	1.80E-04	0.00E+00	0.00E+00	0.00E+00
Nitrofen	1836-75-5	4.49E-06	4.19E-06	0.00E+00	1.30E-05	7.85E-06	0.00E+00	0.00E+00	0.00E+00
Pentachlorobenzene	608-93-5	1.63E-06	1.52E-06	0.00E+00	4.69E-06	2.84E-06	0.00E+00	0.00E+00	0.00E+00
Pentachloronitrobenzene	82-68-8	5.81E-07	5.42E-07	0.00E+00	1.68E-06	1.02E-06	0.00E+00	0.00E+00	0.00E+00
Pentachlorophenol	87-86-5	1.59E-06	1.48E-06	0.00E+00	4.59E-06	2.78E-06	0.00E+00	0.00E+00	0.00E+00
Picric acid	88-89-1	1.42E-09	1.32E-09	0.00E+00	4.10E-09	2.48E-09	0.00E+00	0.00E+00	0.00E+00
Pronamide	23950-58-5	4.30E-08	4.00E-08	0.00E+00	1.24E-07	7.51E-08	0.00E+00	0.00E+00	0.00E+00
Strychnine	57-24-9	1.13E-09	1.05E-09	0.00E+00	3.26E-09	1.97E-09	0.00E+00	0.00E+00	0.00E+00
Terphenyls	26140-60-3	No data	No data	No data	No data	No data	No data	No data	No data
Tributyl phosphate	126-73-8	1.33E-07	1.24E-07	0.00E+00	3.83E-07	2.32E-07	0.00E+00	0.00E+00	0.00E+00
Trifluralin	1582-09-8	2.90E-06	2.70E-06	0.00E+00	8.37E-06	5.07E-06	0.00E+00	0.00E+00	0.00E+00
Triphenylamine	603-34-9	No data	No data	No data	No data	No data	No data	No data	No data
Herbicides and Organochlorinated Pesticides									
2,4,5-T	93-76-5	3.04E-08	2.83E-08	0.00E+00	8.77E-08	5.31E-08	0.00E+00	0.00E+00	0.00E+00
2,4-D and esters	94-75-7	8.56E-09	7.98E-09	0.00E+00	2.47E-08	1.50E-08	0.00E+00	0.00E+00	0.00E+00
4,4'-DDD	72-54-8	1.75E-05	1.63E-05	0.00E+00	5.06E-05	3.06E-05	0.00E+00	0.00E+00	0.00E+00
4,4'-DDE	72-55-9	2.39E-05	2.23E-05	0.00E+00	6.91E-05	4.18E-05	0.00E+00	0.00E+00	0.00E+00
4,4'-DDT	50-29-3	1.56E-05	1.45E-05	0.00E+00	4.49E-05	2.72E-05	0.00E+00	0.00E+00	0.00E+00
Aldrin	309-00-2	2.00E-05	1.87E-05	0.00E+00	5.78E-05	3.50E-05	0.00E+00	0.00E+00	0.00E+00
alpha-BHC	319-84-6	8.35E-08	7.79E-08	0.00E+00	2.41E-07	1.46E-07	0.00E+00	0.00E+00	0.00E+00
beta-BHC	319-85-7	9.03E-08	8.42E-08	0.00E+00	2.61E-07	1.58E-07	0.00E+00	0.00E+00	0.00E+00
Chlordane	57-74-9	1.15E-05	1.07E-05	0.00E+00	3.31E-05	2.01E-05	0.00E+00	0.00E+00	0.00E+00
Delta-BHC	319-86-8	1.83E-07	1.71E-07	0.00E+00	5.28E-07	3.20E-07	0.00E+00	0.00E+00	0.00E+00
Dieldrin	60-57-1	2.47E-06	2.30E-06	0.00E+00	7.12E-06	4.31E-06	0.00E+00	0.00E+00	0.00E+00

Table C2-2 Bioaccumulation Factors for Accumulation of COPCs and ROPCs from Soil by Mammals and Birds

Constituent of Potential Concern	CAS Registry Number	Log K_{ow} [a]	Mammal Ba[b] ([mg/kg tissue] / [mg ingested /day])	Bird Ba[c] ([mg/kg tissue] / [mg ingested /day])	Bioaccumulation Factor (BAF-T_s) ([mg/kg tissue]/[mg/kg soil])			
					Mule Deer[d]	Mourning Dove[d]	Great Basin Pocket Mouse[d]	Western Meadow-lark[d]
Endothall	145-73-3	-0.87	3.39E-09	2.71E-09	1.57E-10	1.47E-12	5.95E-12	2.09E-12
Endrin	72-20-8	4.89	1.96E-03	1.57E-03	9.05E-05	8.48E-07	3.43E-06	1.21E-06
gamma-BHC (Lindane)	58-89-9	3.72	1.32E-04	1.05E-04	6.09E-06	5.72E-08	2.31E-07	8.13E-08
Heptachlor	76-44-8	5.02	2.60E-03	2.08E-03	1.20E-04	1.13E-06	4.57E-06	1.61E-06
Isodrin	465-73-6	No data	No data	No data	No data	No data	No data	No data
Methoxychlor	72-43-5	4.53	8.44E-04	6.75E-04	3.90E-05	3.66E-07	1.48E-06	5.21E-07
Silvex (2,4,5-TP)	93-72-1	3.80	1.58E-04	1.27E-04	7.33E-06	6.87E-08	2.78E-07	9.78E-08
Toxaphene	8001-35-2	5.50	7.94E-03	6.35E-03	3.67E-04	3.44E-06	1.39E-05	4.90E-06
Inorganic Chemicals and Compounds								
	Metals							
Aluminum	7429-90-5	NA	1.50E-03	1.50E-03	6.94E-05	8.13E-07	2.63E-06	1.16E-06
Antimony	7440-36-0	NA	1.00E-03	1.00E-03	4.62E-05	5.42E-07	1.75E-06	7.71E-07
Arsenic	7440-38-2	NA	2.00E-03	2.00E-03	9.25E-05	1.08E-06	3.51E-06	1.54E-06
Barium	7440-39-3	NA	1.50E-04	1.50E-04	6.94E-06	8.13E-08	2.63E-07	1.16E-07
Beryllium	7440-41-7	NA	1.00E-03	1.00E-03	4.62E-05	5.42E-07	1.75E-06	7.71E-07
Bismuth	7440-69-9	NA	4.00E-04	4.00E-04	1.85E-05	2.17E-07	7.02E-07	3.08E-07
Boron	7440-42-8	NA	8.00E-04	8.00E-04	3.70E-05	4.34E-07	1.40E-06	6.17E-07
Cadmium	7440-43-9	NA	3.40E-03	3.40E-03	1.57E-04	1.84E-06	5.97E-06	2.62E-06
Calcium	7440-70-2	NA	7.00E-04	7.00E-04	3.24E-05	3.79E-07	1.23E-06	5.40E-07
Chromium[f]	18540-29-9	NA	5.51E-03	5.51E-03	2.55E-04	2.99E-06	9.67E-06	4.25E-06
Cobalt	7440-48-4	NA	2.00E-02	2.00E-02	9.25E-04	1.08E-05	3.51E-05	1.54E-05
Copper	7440-50-8	NA	1.00E-02	1.00E-02	4.62E-04	5.42E-06	1.75E-05	7.71E-06
Iron	7439-89-6	NA	2.00E-02	2.00E-02	9.25E-04	1.08E-05	3.51E-05	1.54E-05
Lead	7439-92-1	NA	3.00E-04	3.00E-04	1.39E-05	1.63E-07	5.26E-07	2.31E-07
Lithium	7439-93-2	NA	1.00E-02	1.00E-02	4.62E-04	5.42E-06	1.75E-05	7.71E-06
Magnesium	7439-95-4	NA	5.00E-03	5.00E-03	2.31E-04	2.71E-06	8.77E-06	3.86E-06

Table C2-2 Bioaccumulation Factors for Accumulation of COPCs and ROPCs from Soil by Mammals and Birds

Constituent of Potential Concern	CAS Registry Number	Bioaccumulation Factor (BAF-T_s) ([mg/kg tissue]/[mg/kg soil])							
		Coyote[d]	Burrowing Owl[d]	Red-tailed Hawk[d]	Canada Goose[d]	Spotted Sandpiper[d]	Great Blue Heron[d]	Bald Eagle[d]	Mink[d]
Endothall	145-73-3	1.79E-12	1.67E-12	0.00E+00	5.16E-12	3.12E-12	0.00E+00	0.00E+00	0.00E+00
Endrin	72-20-8	1.03E-06	9.63E-07	0.00E+00	2.98E-06	1.80E-06	0.00E+00	0.00E+00	0.00E+00
gamma-BHC (Lindane)	58-89-9	6.96E-08	6.49E-08	0.00E+00	2.01E-07	1.22E-07	0.00E+00	0.00E+00	0.00E+00
Heptachlor	76-44-8	1.37E-06	1.28E-06	0.00E+00	3.97E-06	2.40E-06	0.00E+00	0.00E+00	0.00E+00
Isodrin	465-73-6	No data	No data	No data	No data	No data	No data	No data	No data
Methoxychlor	72-43-5	4.46E-07	4.15E-07	0.00E+00	1.29E-06	7.78E-07	0.00E+00	0.00E+00	0.00E+00
Silvex (2,4,5-TP)	93-72-1	8.37E-08	7.80E-08	0.00E+00	2.41E-07	1.46E-07	0.00E+00	0.00E+00	0.00E+00
Toxaphene	8001-35-2	4.19E-06	3.91E-06	0.00E+00	1.21E-05	7.33E-06	0.00E+00	0.00E+00	0.00E+00
Inorganic Chemicals and Compounds									
	Metals								
Aluminum	7429-90-5	7.92E-07	9.23E-07	0.00E+00	2.86E-06	1.73E-06	0.00E+00	0.00E+00	0.00E+00
Antimony	7440-36-0	5.28E-07	6.15E-07	0.00E+00	1.90E-06	1.15E-06	0.00E+00	0.00E+00	0.00E+00
Arsenic	7440-38-2	1.06E-06	1.23E-06	0.00E+00	3.81E-06	2.31E-06	0.00E+00	0.00E+00	0.00E+00
Barium	7440-39-3	7.92E-08	9.23E-08	0.00E+00	2.86E-07	1.73E-07	0.00E+00	0.00E+00	0.00E+00
Beryllium	7440-41-7	5.28E-07	6.15E-07	0.00E+00	1.90E-06	1.15E-06	0.00E+00	0.00E+00	0.00E+00
Bismuth	7440-69-9	2.11E-07	2.46E-07	0.00E+00	7.62E-07	4.61E-07	0.00E+00	0.00E+00	0.00E+00
Boron	7440-42-8	4.22E-07	4.92E-07	0.00E+00	1.52E-06	9.22E-07	0.00E+00	0.00E+00	0.00E+00
Cadmium	7440-43-9	1.79E-06	2.09E-06	0.00E+00	6.48E-06	3.92E-06	0.00E+00	0.00E+00	0.00E+00
Calcium	7440-70-2	3.69E-07	4.31E-07	0.00E+00	1.33E-06	8.07E-07	0.00E+00	0.00E+00	0.00E+00
Chromium[f]	18540-29-9	2.91E-06	3.39E-06	0.00E+00	1.05E-05	6.35E-06	0.00E+00	0.00E+00	0.00E+00
Cobalt	7440-48-4	1.06E-05	1.23E-05	0.00E+00	3.81E-05	2.31E-05	0.00E+00	0.00E+00	0.00E+00
Copper	7440-50-8	5.28E-06	6.15E-06	0.00E+00	1.90E-05	1.15E-05	0.00E+00	0.00E+00	0.00E+00
Iron	7439-89-6	1.06E-05	1.23E-05	0.00E+00	3.81E-05	2.31E-05	0.00E+00	0.00E+00	0.00E+00
Lead	7439-92-1	1.58E-07	1.85E-07	0.00E+00	5.71E-07	3.46E-07	0.00E+00	0.00E+00	0.00E+00
Lithium	7439-93-2	5.28E-06	6.15E-06	0.00E+00	1.90E-05	1.15E-05	0.00E+00	0.00E+00	0.00E+00
Magnesium	7439-95-4	2.64E-06	3.08E-06	0.00E+00	9.52E-06	5.76E-06	0.00E+00	0.00E+00	0.00E+00

Table C2-2 Bioaccumulation Factors for Accumulation of COPCs and ROPCs from Soil by Mammals and Birds

Constituent of Potential Concern	CAS Registry Number	Log K_{ow} [a]	Mammal Ba[b] ([mg/kg tissue] / [mg ingested /day])	Bird Ba[c] ([mg/kg tissue] / [mg ingested /day])	Bioaccumulation Factor (BAF-T_s) ([mg/kg tissue]/[mg/kg soil])			
					Mule Deer[d]	Mourning Dove[d]	Great Basin Pocket Mouse[d]	Western Meadow-lark[d]
Manganese	7439-96-5	NA	4.00E-04	4.00E-04	1.85E-05	2.17E-07	7.02E-07	3.08E-07
Mercury	7439-97-6	NA	NA	No data	NA	NA	NA	NA
Mercury - Hg+2	7487-94-7	NA	5.21E-03	5.21E-03	2.41E-04	2.82E-06	9.14E-06	4.01E-06
Methylmercury	22967-92-6	NA	7.81E-04	7.81E-04	3.61E-05	4.23E-07	1.37E-06	6.02E-07
Molybdenum	7439-98-7	NA	6.00E-03	6.00E-03	2.77E-04	3.25E-06	1.05E-05	4.63E-06
Nickel	7440-02-0	NA	6.00E-03	6.00E-03	2.77E-04	3.25E-06	1.05E-05	4.63E-06
Potassium	7440-09-7	NA	2.00E-02	2.00E-02	9.25E-04	1.08E-05	3.51E-05	1.54E-05
Rhodium	7440-16-6	NA	2.00E-03	2.00E-03	9.25E-05	1.08E-06	3.51E-06	1.54E-06
Selenium	7782-49-2	NA	1.90E-03	1.90E-03	8.78E-05	1.03E-06	3.33E-06	1.47E-06
Silicon	7440-21-3	NA	4.00E-05	4.00E-05	1.85E-06	2.17E-08	7.02E-08	3.08E-08
Silver	7440-22-4	NA	3.00E-03	3.00E-03	1.39E-04	1.63E-06	5.26E-06	2.31E-06
Sodium	7440-23-5	NA	5.50E-02	5.50E-02	2.54E-03	2.98E-05	9.65E-05	4.24E-05
Strontium	7440-24-6	NA	3.00E-04	3.00E-04	1.39E-05	1.63E-07	5.26E-07	2.31E-07
Tantalum	7440-25-7	NA	6.00E-04	6.00E-04	2.77E-05	3.25E-07	1.05E-06	4.63E-07
Thallium	7440-28-0	NA	4.00E-02	4.00E-02	1.85E-03	2.17E-05	7.02E-05	3.08E-05
Tin	7440-31-5	NA	8.00E-02	8.00E-02	3.70E-03	4.34E-05	1.40E-04	6.17E-05
Tungsten	7440-33-7	NA	4.50E-02	4.50E-02	2.08E-03	2.44E-05	7.90E-05	3.47E-05
Uranium	7440-61-1	NA	2.00E-04	2.00E-04	9.25E-06	1.08E-07	3.51E-07	1.54E-07
Vanadium	7440-62-2	NA	2.50E-03	2.50E-03	1.16E-04	1.35E-06	4.39E-06	1.93E-06
Yttrium	7440-65-5	NA	3.00E-04	3.00E-04	1.39E-05	1.63E-07	5.26E-07	2.31E-07
Zinc	7440-66-6	NA	1.00E-01	1.00E-01	4.62E-03	5.42E-05	1.75E-04	7.71E-05
Zirconium	7440-67-7	NA	5.50E-03	5.50E-03	2.54E-04	2.98E-06	9.65E-06	4.24E-06
Non-metals and Anions								
Ammonia/Ammonium	7664-41-7	NA	1.95E-02	1.95E-02	9.02E-04	1.06E-05	3.42E-05	1.50E-05
Bromide	24959-67-9	NA	2.50E-02	2.50E-02	1.16E-03	1.35E-05	4.39E-05	1.93E-05
Chloride	16887-00-6	NA	8.00E-02	8.00E-02	3.70E-03	4.34E-05	1.40E-04	6.17E-05
Cyanide	57-12-5	NA	1.95E-02	1.95E-02	9.02E-04	1.06E-05	3.42E-05	1.50E-05

Table C2-2 Bioaccumulation Factors for Accumulation of COPCs and ROPCs from Soil by Mammals and Birds

Constituent of Potential Concern	CAS Registry Number	Bioaccumulation Factor (BAF-T_s) ([mg/kg tissue]/[mg/kg soil])							
		Coyote[d]	Burrowing Owl[d]	Red-tailed Hawk[d]	Canada Goose[d]	Spotted Sandpiper[d]	Great Blue Heron[d]	Bald Eagle[d]	Mink[d]
Manganese	7439-96-5	2.11E-07	2.46E-07	0.00E+00	7.62E-07	4.61E-07	0.00E+00	0.00E+00	0.00E+00
Mercury	7439-97-6	NA	NA	NA	NA	NA	NA	NA	NA
Mercury - Hg+2	7487-94-7	2.75E-06	3.20E-06	0.00E+00	9.92E-06	6.00E-06	0.00E+00	0.00E+00	0.00E+00
Methylmercury	22967-92-6	4.12E-07	4.80E-07	0.00E+00	1.49E-06	9.00E-07	0.00E+00	0.00E+00	0.00E+00
Molybdenum	7439-98-7	3.17E-06	3.69E-06	0.00E+00	1.14E-05	6.92E-06	0.00E+00	0.00E+00	0.00E+00
Nickel	7440-02-0	3.17E-06	3.69E-06	0.00E+00	1.14E-05	6.92E-06	0.00E+00	0.00E+00	0.00E+00
Potassium	7440-09-7	1.06E-05	1.23E-05	0.00E+00	3.81E-05	2.31E-05	0.00E+00	0.00E+00	0.00E+00
Rhodium	7440-16-6	1.06E-06	1.23E-06	0.00E+00	3.81E-06	2.31E-06	0.00E+00	0.00E+00	0.00E+00
Selenium	7782-49-2	1.00E-06	1.17E-06	0.00E+00	3.62E-06	2.19E-06	0.00E+00	0.00E+00	0.00E+00
Silicon	7440-21-3	2.11E-08	2.46E-08	0.00E+00	7.62E-08	4.61E-08	0.00E+00	0.00E+00	0.00E+00
Silver	7440-22-4	1.58E-06	1.85E-06	0.00E+00	5.71E-06	3.46E-06	0.00E+00	0.00E+00	0.00E+00
Sodium	7440-23-5	2.90E-05	3.38E-05	0.00E+00	1.05E-04	6.34E-05	0.00E+00	0.00E+00	0.00E+00
Strontium	7440-24-6	1.58E-07	1.85E-07	0.00E+00	5.71E-07	3.46E-07	0.00E+00	0.00E+00	0.00E+00
Tantalum	7440-25-7	3.17E-07	3.69E-07	0.00E+00	1.14E-06	6.92E-07	0.00E+00	0.00E+00	0.00E+00
Thallium	7440-28-0	2.11E-05	2.46E-05	0.00E+00	7.62E-05	4.61E-05	0.00E+00	0.00E+00	0.00E+00
Tin	7440-31-5	4.22E-05	4.92E-05	0.00E+00	1.52E-04	9.22E-05	0.00E+00	0.00E+00	0.00E+00
Tungsten	7440-33-7	2.38E-05	2.77E-05	0.00E+00	8.57E-05	5.19E-05	0.00E+00	0.00E+00	0.00E+00
Uranium	7440-61-1	1.06E-07	1.23E-07	0.00E+00	3.81E-07	2.31E-07	0.00E+00	0.00E+00	0.00E+00
Vanadium	7440-62-2	1.32E-06	1.54E-06	0.00E+00	4.76E-06	2.88E-06	0.00E+00	0.00E+00	0.00E+00
Yttrium	7440-65-5	1.58E-07	1.85E-07	0.00E+00	5.71E-07	3.46E-07	0.00E+00	0.00E+00	0.00E+00
Zinc	7440-66-6	5.28E-05	6.15E-05	0.00E+00	1.90E-04	1.15E-04	0.00E+00	0.00E+00	0.00E+00
Zirconium	7440-67-7	2.90E-06	3.38E-06	0.00E+00	1.05E-05	6.34E-06	0.00E+00	0.00E+00	0.00E+00
Non-metals and Anions									
Ammonia/Ammonium	7664-41-7	1.03E-05	1.20E-05	0.00E+00	3.71E-05	2.25E-05	0.00E+00	0.00E+00	0.00E+00
Bromide	24959-67-9	1.32E-05	1.54E-05	0.00E+00	4.76E-05	2.88E-05	0.00E+00	0.00E+00	0.00E+00
Chloride	16887-00-6	4.22E-05	4.92E-05	0.00E+00	1.52E-04	9.22E-05	0.00E+00	0.00E+00	0.00E+00
Cyanide	57-12-5	1.03E-05	1.20E-05	0.00E+00	3.71E-05	2.25E-05	0.00E+00	0.00E+00	0.00E+00

Table C2-2 Bioaccumulation Factors for Accumulation of COPCs and ROPCs from Soil by Mammals and Birds

Constituent of Potential Concern	CAS Registry Number	Log K_{ow} [a]	Mammal Ba[b] ([mg/kg tissue] / [mg ingested /day])	Bird Ba[c] ([mg/kg tissue] / [mg ingested /day])	Bioaccumulation Factor (BAF-T_s) ([mg/kg tissue]/[mg/kg soil])			
					Mule Deer[d]	Mourning Dove[d]	Great Basin Pocket Mouse[d]	Western Meadow-lark[d]
Fluoride	16984-48-8	NA	1.50E-01	1.50E-01	6.94E-03	8.13E-05	2.63E-04	1.16E-04
Hydroxide	14280-30-9	NA	NA	NA	NA	NA	NA	NA
Iodine	7553-56-2	NA	7.00E-03	7.00E-03	3.24E-04	3.79E-06	1.23E-05	5.40E-06
Nitrate	14797-55-8	NA	7.50E-02	7.50E-02	3.47E-03	4.06E-05	1.32E-04	5.78E-05
Nitrite	14797-65-0	NA	7.50E-02	7.50E-02	3.47E-03	4.06E-05	1.32E-04	5.78E-05
Phosphate	14265-44-2	NA	5.50E-02	5.50E-02	2.54E-03	2.98E-05	9.65E-05	4.24E-05
Phosphorus	7723-14-0	NA	5.50E-02	5.50E-02	2.54E-03	2.98E-05	9.65E-05	4.24E-05
Sulfate	14808-79-8	NA	1.00E-01	1.00E-01	4.62E-03	5.42E-05	1.75E-04	7.71E-05
Total Sulfur	63705-05-5	NA	1.00E-01	1.00E-01	4.62E-03	5.42E-05	1.75E-04	7.71E-05
Criteria Pollutants								
Carbon monoxide	630-08-0	NA	1.95E-02	1.95E-02	9.02E-04	1.06E-05	3.42E-05	1.50E-05
Nitrogen dioxide	10102-44-0	NA	1.95E-02	1.95E-02	9.02E-04	1.06E-05	3.42E-05	1.50E-05
Ozone	10028-15-6	NA	1.95E-02	1.95E-02	9.02E-04	1.06E-05	3.42E-05	1.50E-05
Particulate matter	No CAS #	NA	NA	NA	NA	NA	NA	NA
Sulfur dioxide	7446-09-5	NA	1.95E-02	1.95E-02	9.02E-04	1.06E-05	3.42E-05	1.50E-05
Radionuclides								
All radionuclides combined (rad/d)	No CAS #	NA	NA	NA	NA	NA	NA	NA
Actinium-227	14952-40-0	NA	2.50E-03	2.50E-03	1.16E-04	1.35E-06	4.39E-06	1.93E-06
Americium-241	14596-10-2	NA	3.50E-06	3.50E-06	1.62E-07	1.90E-09	6.14E-09	2.70E-09
Americium-243	14993-75-0	NA	3.50E-06	3.50E-06	1.62E-07	1.90E-09	6.14E-09	2.70E-09
Antimony-125	14234-35-6	NA	1.00E-03	1.00E-03	4.62E-05	5.42E-07	1.75E-06	7.71E-07
Barium-137m	13981-97-0	NA	1.50E-04	1.50E-04	6.94E-06	8.13E-08	2.63E-07	1.16E-07
Cadmium-113m	14336-66-4	NA	1.20E-04	1.20E-04	5.55E-06	6.50E-08	2.11E-07	9.25E-08
Carbon-14	14762-75-5	NA	NA	NA	NA	NA	NA	NA
Cesium-134	13967-70-9	NA	2.00E-02	2.00E-02	9.25E-04	1.08E-05	3.51E-05	1.54E-05
Cesium-137	10045-97-3	NA	2.00E-02	2.00E-02	9.25E-04	1.08E-05	3.51E-05	1.54E-05
Cobalt-60	10198-40-0	NA	2.00E-02	2.00E-02	9.25E-04	1.08E-05	3.51E-05	1.54E-05

Table C2-2 Bioaccumulation Factors for Accumulation of COPCs and ROPCs from Soil by Mammals and Birds

Constituent of Potential Concern	CAS Registry Number	Bioaccumulation Factor (BAF-T_s) ([mg/kg tissue]/[mg/kg soil])							
		Coyote[d]	Burrowing Owl[d]	Red-tailed Hawk[d]	Canada Goose[d]	Spotted Sandpiper[d]	Great Blue Heron[d]	Bald Eagle[d]	Mink[d]
Fluoride	16984-48-8	7.92E-05	9.23E-05	0.00E+00	2.86E-04	1.73E-04	0.00E+00	0.00E+00	0.00E+00
Hydroxide	14280-30-9	NA	NA	NA	NA	NA	NA	NA	NA
Iodine	7553-56-2	3.69E-06	4.31E-06	0.00E+00	1.33E-05	8.07E-06	0.00E+00	0.00E+00	0.00E+00
Nitrate	14797-55-8	3.96E-05	4.61E-05	0.00E+00	1.43E-04	8.65E-05	0.00E+00	0.00E+00	0.00E+00
Nitrite	14797-65-0	3.96E-05	4.61E-05	0.00E+00	1.43E-04	8.65E-05	0.00E+00	0.00E+00	0.00E+00
Phosphate	14265-44-2	2.90E-05	3.38E-05	0.00E+00	1.05E-04	6.34E-05	0.00E+00	0.00E+00	0.00E+00
Phosphorus	7723-14-0	2.90E-05	3.38E-05	0.00E+00	1.05E-04	6.34E-05	0.00E+00	0.00E+00	0.00E+00
Sulfate	14808-79-8	5.28E-05	6.15E-05	0.00E+00	1.90E-04	1.15E-04	0.00E+00	0.00E+00	0.00E+00
Total Sulfur	63705-05-5	5.28E-05	6.15E-05	0.00E+00	1.90E-04	1.15E-04	0.00E+00	0.00E+00	0.00E+00
Criteria Pollutants									
Carbon monoxide	630-08-0	1.03E-05	1.20E-05	0.00E+00	3.71E-05	2.25E-05	0.00E+00	0.00E+00	0.00E+00
Nitrogen dioxide	10102-44-0	1.03E-05	1.20E-05	0.00E+00	3.71E-05	2.25E-05	0.00E+00	0.00E+00	0.00E+00
Ozone	10028-15-6	1.03E-05	1.20E-05	0.00E+00	3.71E-05	2.25E-05	0.00E+00	0.00E+00	0.00E+00
Particulate matter	No CAS #	NA	NA	NA	NA	NA	NA	NA	NA
Sulfur dioxide	7446-09-5	1.03E-05	1.20E-05	0.00E+00	3.71E-05	2.25E-05	0.00E+00	0.00E+00	0.00E+00
Radionuclides									
All radionuclides combined (rad/d)	No CAS #	NA	NA	NA	NA	NA	NA	NA	NA
Actinium-227	14952-40-0	1.32E-06	1.54E-06	0.00E+00	4.76E-06	2.88E-06	0.00E+00	0.00E+00	0.00E+00
Americium-241	14596-10-2	1.85E-09	2.15E-09	0.00E+00	6.67E-09	4.03E-09	0.00E+00	0.00E+00	0.00E+00
Americium-243	14993-75-0	1.85E-09	2.15E-09	0.00E+00	6.67E-09	4.03E-09	0.00E+00	0.00E+00	0.00E+00
Antimony-125	14234-35-6	5.28E-07	6.15E-07	0.00E+00	1.90E-06	1.15E-06	0.00E+00	0.00E+00	0.00E+00
Barium-137m	13981-97-0	7.92E-08	9.23E-08	0.00E+00	2.86E-07	1.73E-07	0.00E+00	0.00E+00	0.00E+00
Cadmium-113m	14336-66-4	6.33E-08	7.38E-08	0.00E+00	2.29E-07	1.38E-07	0.00E+00	0.00E+00	0.00E+00
Carbon-14	14762-75-5	NA	NA	NA	NA	NA	NA	NA	NA
Cesium-134	13967-70-9	1.06E-05	1.23E-05	0.00E+00	3.81E-05	2.31E-05	0.00E+00	0.00E+00	0.00E+00
Cesium-137	10045-97-3	1.06E-05	1.23E-05	0.00E+00	3.81E-05	2.31E-05	0.00E+00	0.00E+00	0.00E+00
Cobalt-60	10198-40-0	1.06E-05	1.23E-05	0.00E+00	3.81E-05	2.31E-05	0.00E+00	0.00E+00	0.00E+00

Table C2-2 Bioaccumulation Factors for Accumulation of COPCs and ROPCs from Soil by Mammals and Birds

Constituent of Potential Concern	CAS Registry Number	Log K_{ow} [a]	Mammal Ba[b] ([mg/kg tissue] / [mg ingested /day])	Bird Ba[c] ([mg/kg tissue] / [mg ingested /day])	Bioaccumulation Factor (BAF-T_s) ([mg/kg tissue]/[mg/kg soil])			
					Mule Deer[d]	Mourning Dove[d]	Great Basin Pocket Mouse[d]	Western Meadow-lark[d]
Curium-242	15510-73-3	NA	3.50E-06	3.50E-06	1.62E-07	1.90E-09	6.14E-09	2.70E-09
Curium-243	15757-87-6	NA	3.50E-06	3.50E-06	1.62E-07	1.90E-09	6.14E-09	2.70E-09
Curium-244	13981-15-2	NA	3.50E-06	3.50E-06	1.62E-07	1.90E-09	6.14E-09	2.70E-09
Europium-152	14683-23-9	NA	5.00E-03	5.00E-03	2.31E-04	2.71E-06	8.77E-06	3.86E-06
Europium-154	15585-10-1	NA	5.00E-03	5.00E-03	2.31E-04	2.71E-06	8.77E-06	3.86E-06
Europium-155	14391-16-3	NA	5.00E-03	5.00E-03	2.31E-04	2.71E-06	8.77E-06	3.86E-06
Iodine-129	15046-84-1	NA	7.00E-03	7.00E-03	3.24E-04	3.79E-06	1.23E-05	5.40E-06
Neptunium-237	13994-20-2	NA	5.50E-03	5.50E-03	2.54E-04	2.98E-06	9.65E-06	4.24E-06
Nickel-59	14336-70-0	NA	6.00E-03	6.00E-03	2.77E-04	3.25E-06	1.05E-05	4.63E-06
Nickel-63	13981-37-8	NA	6.00E-03	6.00E-03	2.77E-04	3.25E-06	1.05E-05	4.63E-06
Niobium-93m	7440-03-1[g]	NA	2.50E-01	2.50E-01	1.16E-02	1.35E-04	4.39E-04	1.93E-04
Plutonium-238	13981-16-3	NA	5.00E-07	5.00E-07	2.31E-08	2.71E-10	8.77E-10	3.86E-10
Plutonium-239	15117-48-3	NA	5.00E-07	5.00E-07	2.31E-08	2.71E-10	8.77E-10	3.86E-10
Plutonium-240	14119-33-6	NA	5.00E-07	5.00E-07	2.31E-08	2.71E-10	8.77E-10	3.86E-10
Plutonium-241	14119-32-5	NA	5.00E-07	5.00E-07	2.31E-08	2.71E-10	8.77E-10	3.86E-10
Plutonium-242	13982-10-0	NA	5.00E-07	5.00E-07	2.31E-08	2.71E-10	8.77E-10	3.86E-10
Protactinium-231	14331-85-2	NA	1.00E-05	1.00E-05	4.62E-07	5.42E-09	1.75E-08	7.71E-09
Radium-226	13982-63-3	NA	2.50E-04	2.50E-04	1.16E-05	1.35E-07	4.39E-07	1.93E-07
Radium-228	15262-20-1	NA	2.50E-04	2.50E-04	1.16E-05	1.35E-07	4.39E-07	1.93E-07
Ruthenium-106	13967-48-1	NA	2.00E-03	2.00E-03	9.25E-05	1.08E-06	3.51E-06	1.54E-06
Samarium-151	15715-94-3	NA	5.00E-03	5.00E-03	2.31E-04	2.71E-06	8.77E-06	3.86E-06
Selenium-79	15758-45-9	NA	1.50E-02	1.50E-02	6.94E-04	8.13E-06	2.63E-05	1.16E-05
Strontium-90	10098-97-2	NA	3.00E-04	3.00E-04	1.39E-05	1.63E-07	5.26E-07	2.31E-07
Technetium-99	14133-76-7	NA	8.50E-03	8.50E-03	3.93E-04	4.61E-06	1.49E-05	6.55E-06
Thorium-229	15594-54-4	NA	6.00E-06	6.00E-06	2.77E-07	3.25E-09	1.05E-08	4.63E-09
Thorium-232	7440-29-1	NA	6.00E-06	6.00E-06	2.77E-07	3.25E-09	1.05E-08	4.63E-09

Table C2-2 Bioaccumulation Factors for Accumulation of COPCs and ROPCs from Soil by Mammals and Birds

Constituent of Potential Concern	CAS Registry Number	Bioaccumulation Factor (BAF-T_s) ([mg/kg tissue]/[mg/kg soil])							
		Coyote[d]	Burrowing Owl[d]	Red-tailed Hawk[d]	Canada Goose[d]	Spotted Sandpiper[d]	Great Blue Heron[d]	Bald Eagle[d]	Mink[d]
Curium-242	15510-73-3	1.85E-09	2.15E-09	0.00E+00	6.67E-09	4.03E-09	0.00E+00	0.00E+00	0.00E+00
Curium-243	15757-87-6	1.85E-09	2.15E-09	0.00E+00	6.67E-09	4.03E-09	0.00E+00	0.00E+00	0.00E+00
Curium-244	13981-15-2	1.85E-09	2.15E-09	0.00E+00	6.67E-09	4.03E-09	0.00E+00	0.00E+00	0.00E+00
Europium-152	14683-23-9	2.64E-06	3.08E-06	0.00E+00	9.52E-06	5.76E-06	0.00E+00	0.00E+00	0.00E+00
Europium-154	15585-10-1	2.64E-06	3.08E-06	0.00E+00	9.52E-06	5.76E-06	0.00E+00	0.00E+00	0.00E+00
Europium-155	14391-16-3	2.64E-06	3.08E-06	0.00E+00	9.52E-06	5.76E-06	0.00E+00	0.00E+00	0.00E+00
Iodine-129	15046-84-1	3.69E-06	4.31E-06	0.00E+00	1.33E-05	8.07E-06	0.00E+00	0.00E+00	0.00E+00
Neptunium-237	13994-20-2	2.90E-06	3.38E-06	0.00E+00	1.05E-05	6.34E-06	0.00E+00	0.00E+00	0.00E+00
Nickel-59	14336-70-0	3.17E-06	3.69E-06	0.00E+00	1.14E-05	6.92E-06	0.00E+00	0.00E+00	0.00E+00
Nickel-63	13981-37-8	3.17E-06	3.69E-06	0.00E+00	1.14E-05	6.92E-06	0.00E+00	0.00E+00	0.00E+00
Niobium-93m	7440-03-1[g]	1.32E-04	1.54E-04	0.00E+00	4.76E-04	2.88E-04	0.00E+00	0.00E+00	0.00E+00
Plutonium-238	13981-16-3	2.64E-10	3.08E-10	0.00E+00	9.52E-10	5.76E-10	0.00E+00	0.00E+00	0.00E+00
Plutonium-239	15117-48-3	2.64E-10	3.08E-10	0.00E+00	9.52E-10	5.76E-10	0.00E+00	0.00E+00	0.00E+00
Plutonium-240	14119-33-6	2.64E-10	3.08E-10	0.00E+00	9.52E-10	5.76E-10	0.00E+00	0.00E+00	0.00E+00
Plutonium-241	14119-32-5	2.64E-10	3.08E-10	0.00E+00	9.52E-10	5.76E-10	0.00E+00	0.00E+00	0.00E+00
Plutonium-242	13982-10-0	2.64E-10	3.08E-10	0.00E+00	9.52E-10	5.76E-10	0.00E+00	0.00E+00	0.00E+00
Protactinium-231	14331-85-2	5.28E-09	6.15E-09	0.00E+00	1.90E-08	1.15E-08	0.00E+00	0.00E+00	0.00E+00
Radium-226	13982-63-3	1.32E-07	1.54E-07	0.00E+00	4.76E-07	2.88E-07	0.00E+00	0.00E+00	0.00E+00
Radium-228	15262-20-1	1.32E-07	1.54E-07	0.00E+00	4.76E-07	2.88E-07	0.00E+00	0.00E+00	0.00E+00
Ruthenium-106	13967-48-1	1.06E-06	1.23E-06	0.00E+00	3.81E-06	2.31E-06	0.00E+00	0.00E+00	0.00E+00
Samarium-151	15715-94-3	2.64E-06	3.08E-06	0.00E+00	9.52E-06	5.76E-06	0.00E+00	0.00E+00	0.00E+00
Selenium-79	15758-45-9	7.92E-06	9.23E-06	0.00E+00	2.86E-05	1.73E-05	0.00E+00	0.00E+00	0.00E+00
Strontium-90	10098-97-2	1.58E-07	1.85E-07	0.00E+00	5.71E-07	3.46E-07	0.00E+00	0.00E+00	0.00E+00
Technetium-99	14133-76-7	4.49E-06	5.23E-06	0.00E+00	1.62E-05	9.80E-06	0.00E+00	0.00E+00	0.00E+00
Thorium-229	15594-54-4	3.17E-09	3.69E-09	0.00E+00	1.14E-08	6.92E-09	0.00E+00	0.00E+00	0.00E+00
Thorium-232	7440-29-1	3.17E-09	3.69E-09	0.00E+00	1.14E-08	6.92E-09	0.00E+00	0.00E+00	0.00E+00

Table C2-2 Bioaccumulation Factors for Accumulation of COPCs and ROPCs from Soil by Mammals and Birds

Constituent of Potential Concern	CAS Registry Number	Log K_{ow} [a]	Mammal Ba[b] ([mg/kg tissue] / [mg ingested /day])	Bird Ba[c] ([mg/kg tissue] / [mg ingested /day])	Bioaccumulation Factor (BAF-T_s) ([mg/kg tissue]/[mg/kg soil])			
					Mule Deer[d]	Mourning Dove[d]	Great Basin Pocket Mouse[d]	Western Meadow-lark[d]
Tin-126	15832-50-5	NA	8.00E-02	8.00E-02	3.70E-03	4.34E-05	1.40E-04	6.17E-05
Tritium	10028-17-8	NA	NA	NA	NA	NA	NA	NA
Uranium-232	14158-29-3	NA	2.00E-04	2.00E-04	9.25E-06	1.08E-07	3.51E-07	1.54E-07
Uranium-233	13968-55-3	NA	2.00E-04	2.00E-04	9.25E-06	1.08E-07	3.51E-07	1.54E-07
Uranium-234	13966-29-5	NA	2.00E-04	2.00E-04	9.25E-06	1.08E-07	3.51E-07	1.54E-07
Uranium-235	15117-96-1	NA	2.00E-04	2.00E-04	9.25E-06	1.08E-07	3.51E-07	1.54E-07
Uranium-236	13982-70-2	NA	2.00E-04	2.00E-04	9.25E-06	1.08E-07	3.51E-07	1.54E-07
Uranium-238	7440-61-1	NA	2.00E-04	2.00E-04	9.25E-06	1.08E-07	3.51E-07	1.54E-07
Yttrium-90	10098-91-6	NA	3.00E-04	3.00E-04	1.39E-05	1.63E-07	5.26E-07	2.31E-07
Zirconium-93	15751-77-6	NA	5.50E-03	5.50E-03	2.54E-04	2.98E-06	9.65E-06	4.24E-06

Table C2-2 Bioaccumulation Factors for Accumulation of COPCs and ROPCs from Soil by Mammals and Birds

Constituent of Potential Concern	CAS Registry Number	Bioaccumulation Factor (BAF-T_s) ([mg/kg tissue]/[mg/kg soil])							
		Coyote[d]	Burrowing Owl[d]	Red-tailed Hawk[d]	Canada Goose[d]	Spotted Sandpiper[d]	Great Blue Heron[d]	Bald Eagle[d]	Mink[d]
Tin-126	15832-50-5	4.22E-05	4.92E-05	0.00E+00	1.52E-04	9.22E-05	0.00E+00	0.00E+00	0.00E+00
Tritium	10028-17-8	NA	NA	NA	NA	NA	NA	NA	NA
Uranium-232	14158-29-3	1.06E-07	1.23E-07	0.00E+00	3.81E-07	2.31E-07	0.00E+00	0.00E+00	0.00E+00
Uranium-233	13968-55-3	1.06E-07	1.23E-07	0.00E+00	3.81E-07	2.31E-07	0.00E+00	0.00E+00	0.00E+00
Uranium-234	13966-29-5	1.06E-07	1.23E-07	0.00E+00	3.81E-07	2.31E-07	0.00E+00	0.00E+00	0.00E+00
Uranium-235	15117-96-1	1.06E-07	1.23E-07	0.00E+00	3.81E-07	2.31E-07	0.00E+00	0.00E+00	0.00E+00
Uranium-236	13982-70-2	1.06E-07	1.23E-07	0.00E+00	3.81E-07	2.31E-07	0.00E+00	0.00E+00	0.00E+00
Uranium-238	7440-61-1	1.06E-07	1.23E-07	0.00E+00	3.81E-07	2.31E-07	0.00E+00	0.00E+00	0.00E+00
Yttrium-90	10098-91-6	1.58E-07	1.85E-07	0.00E+00	5.71E-07	3.46E-07	0.00E+00	0.00E+00	0.00E+00
Zirconium-93	15751-77-6	2.90E-06	3.38E-06	0.00E+00	1.05E-05	6.34E-06	0.00E+00	0.00E+00	0.00E+00

Table C2-2 Bioaccumulation Factors for Accumulation of COPCs and ROPCs from Soil by Mammals and Birds

Notes/Sources

NA = Not applicable.

[a] From Appendix B, Table B-1.

[b] Ingestion-to-tissue transfer factor (mg/kgBW per mg/d); from Table C2-1.

[c] Bird Ba is the same as Mammal Ba multiplied by 0.8 for organic COPCs, and the same as Mammal Ba for inorganic COPCs and ROPCs.

[d] $Ba \times IR_F \times SF \times BW$ for each receptor, where IR_F is the daily food ingestion rate (kg/kgBW/d), SF is the total amount of soil ingested daily per unit of food ingested, and BW is the body weight (kg) of the receptor (Risk Assessment Work Plan section 8.1.3.3).

[e] Values for Aroclor-1254 were used for polychlorinated biphenyl mixtures.

[f] Values for Cr(VI) were used for calculations.

[g] Chemical Abstracts Service Registry number for niobium metal.

Table C2-3 Bioaccumulation Factors for Accumulation of COPCs and ROPCs from Food by Mammals and Birds

Constituent of Potential Concern	CAS Registry Number	Log K_{ow} [a]	Mammal Ba[b] ([mg/kg tissue] / [mg ingested /day])	Bird Ba[c] ([mg/kg tissue] / [mg ingested /day])	Bioaccumulation Factor (BAF-T_p) ([mg/kg tissue]/[mg/kg food])			
					Mule Deer[d]	Mourning Dove[d]	Great Basin Pocket Mouse[d]	Western Meadow-lark[d]
Organic Compounds								
Aromatic Halogenated Hydrocarbons								
2,3,4,6-Tetrachlorophenol	58-90-2	4.30	5.02E-04	4.02E-04	1.16E-03	1.09E-05	3.36E-06	1.06E-06
4-Chloro-3-methylphenol	59-50-7	3.10	3.16E-05	2.53E-05	7.31E-05	6.85E-07	2.12E-07	6.66E-08
Aromatic Nonhalogenated Hydrocarbons								
2-Nitrotoluene	88-72-2	2.30	5.01E-06	4.01E-06	1.16E-05	1.09E-07	3.36E-08	1.06E-08
4-Nitrobiphenyl	92-93-3	3.77	1.48E-04	1.18E-04	3.42E-04	3.21E-06	9.91E-07	3.11E-07
Benzaldehyde	100-52-7	1.48	7.54E-07	6.03E-07	1.74E-06	1.63E-08	5.05E-09	1.59E-09
Benzene	71-43-2	2.14	3.44E-06	2.75E-06	7.95E-06	7.46E-08	2.30E-08	7.24E-09
Benzyl alcohol	100-51-6	1.10	3.16E-07	2.53E-07	7.32E-07	6.86E-09	2.12E-09	6.66E-10
Ethyl benzene	100-41-4	3.12	3.34E-05	2.67E-05	7.72E-05	7.24E-07	2.24E-07	7.03E-08
m-Xylene	108-38-3	3.20	3.99E-05	3.20E-05	9.23E-05	8.66E-07	2.67E-07	8.41E-08
o-Xylene	95-47-6	3.13	3.39E-05	2.71E-05	7.84E-05	7.35E-07	2.27E-07	7.14E-08
p-Xylene	106-42-3	3.17	3.72E-05	2.97E-05	8.59E-05	8.06E-07	2.49E-07	7.83E-08
Styrene	100-42-5	2.93	2.13E-05	1.71E-05	4.93E-05	4.62E-07	1.43E-07	4.49E-08
Toluene	108-88-3	2.67	1.17E-05	9.34E-06	2.70E-05	2.53E-07	7.82E-08	2.46E-08
Non-aromatic Nonhalogenated Hydrocarbons								
1,2-Epoxybutane	106-88-7	0.86	1.82E-07	1.46E-07	4.21E-07	3.94E-09	1.22E-09	3.83E-10
1,3-Butadiene	106-99-0	1.99	2.45E-06	1.96E-06	5.67E-06	5.32E-08	1.64E-08	5.17E-09
1,4-Dioxane	123-91-1	-0.27	1.36E-08	1.09E-08	3.14E-08	2.94E-10	9.08E-11	2.86E-11
1-Methylpropyl alcohol	78-92-2	0.61	1.02E-07	8.19E-08	2.37E-07	2.22E-09	6.85E-10	2.15E-10
1-Nitropropane	108-03-2	0.87	1.86E-07	1.49E-07	4.30E-07	4.04E-09	1.25E-09	3.92E-10
2,2,4-Trimethylpentane	540-84-1	5.02	2.63E-03	2.10E-03	6.08E-03	5.70E-05	1.76E-05	5.54E-06
2-Butanone	78-93-3	0.28	4.80E-08	3.84E-08	1.11E-07	1.04E-09	3.21E-10	1.01E-10
2-Butenaldehyde (2-Butenal)	4170-30-3	0.55	8.91E-08	7.13E-08	2.06E-07	1.93E-09	5.97E-10	1.88E-10
2-Ethoxyethanol	110-80-5	-0.10	2.00E-08	1.60E-08	4.61E-08	4.33E-10	1.34E-10	4.20E-11

Table C2-3 Bioaccumulation Factors for Accumulation of COPCs and ROPCs from Food by Mammals and Birds

Constituent of Potential Concern	CAS Registry Number	Bioaccumulation Factor (BAF-T_p) ([mg/kg tissue]/[mg/kg food])							
		Coyote[d]	Burrowing Owl[d]	Red-tailed Hawk[d]	Canada Goose[d]	Spotted Sandpiper[d]	Great Blue Heron[d]	Bald Eagle[d]	Mink[d]
Organic Compounds									
Aromatic Halogenated Hydrocarbons									
2,3,4,6-Tetrachlorophenol	58-90-2	1.15E-04	2.47E-06	4.45E-05	4.78E-05	1.49E-05	1.73E-04	1.81E-04	5.97E-05
4-Chloro-3-methylphenol	59-50-7	7.26E-06	1.56E-07	2.80E-06	3.01E-06	9.41E-07	1.09E-05	1.14E-05	3.76E-06
Aromatic Nonhalogenated Hydrocarbons									
2-Nitrotoluene	88-72-2	1.15E-06	2.47E-08	4.44E-07	4.77E-07	1.49E-07	1.72E-06	1.80E-06	5.96E-07
4-Nitrobiphenyl	92-93-3	3.39E-05	7.28E-07	1.31E-05	1.41E-05	4.40E-06	5.09E-05	5.32E-05	1.76E-05
Benzaldehyde	100-52-7	1.73E-07	3.71E-09	6.68E-08	7.18E-08	2.24E-08	2.59E-07	2.71E-07	8.97E-08
Benzene	71-43-2	7.89E-07	1.69E-08	3.05E-07	3.28E-07	1.02E-07	1.18E-06	1.24E-06	4.09E-07
Benzyl alcohol	100-51-6	7.26E-08	1.56E-09	2.80E-08	3.01E-08	9.42E-09	1.09E-07	1.14E-07	3.77E-08
Ethyl benzene	100-41-4	7.67E-06	1.64E-07	2.96E-06	3.18E-06	9.94E-07	1.15E-05	1.20E-05	3.98E-06
m-Xylene	108-38-3	9.17E-06	1.96E-07	3.54E-06	3.80E-06	1.19E-06	1.37E-05	1.44E-05	4.75E-06
o-Xylene	95-47-6	7.78E-06	1.67E-07	3.01E-06	3.23E-06	1.01E-06	1.17E-05	1.22E-05	4.04E-06
p-Xylene	106-42-3	8.53E-06	1.83E-07	3.29E-06	3.54E-06	1.11E-06	1.28E-05	1.34E-05	4.42E-06
Styrene	100-42-5	4.89E-06	1.05E-07	1.89E-06	2.03E-06	6.34E-07	7.34E-06	7.68E-06	2.54E-06
Toluene	108-88-3	2.68E-06	5.75E-08	1.04E-06	1.11E-06	3.47E-07	4.02E-06	4.20E-06	1.39E-06
Non-aromatic Nonhalogenated Hydrocarbons									
1,2-Epoxybutane	106-88-7	4.18E-08	8.95E-10	1.61E-08	1.73E-08	5.41E-09	6.26E-08	6.55E-08	2.17E-08
1,3-Butadiene	106-99-0	5.63E-07	1.21E-08	2.18E-07	2.34E-07	7.30E-08	8.45E-07	8.84E-07	2.92E-07
1,4-Dioxane	123-91-1	3.11E-09	6.67E-11	1.20E-09	1.29E-09	4.04E-10	4.67E-09	4.88E-09	1.61E-09
1-Methylpropyl alcohol	78-92-2	2.35E-08	5.03E-10	9.07E-09	9.75E-09	3.04E-09	3.52E-08	3.68E-08	1.22E-08
1-Nitropropane	108-03-2	4.27E-08	9.16E-10	1.65E-08	1.77E-08	5.54E-09	6.41E-08	6.70E-08	2.22E-08
2,2,4-Trimethylpentane	540-84-1	6.04E-04	1.29E-05	2.33E-04	2.50E-04	7.83E-05	9.05E-04	9.47E-04	3.13E-04
2-Butanone	78-93-3	1.10E-08	2.36E-10	4.25E-09	4.57E-09	1.43E-09	1.65E-08	1.73E-08	5.71E-09
2-Butenaldehyde (2-Butenal)	4170-30-3	2.04E-08	4.38E-10	7.90E-09	8.49E-09	2.65E-09	3.07E-08	3.21E-08	1.06E-08
2-Ethoxyethanol	110-80-5	4.58E-09	9.82E-11	1.77E-09	1.90E-09	5.94E-10	6.87E-09	7.18E-09	2.37E-09

Table C2-3 Bioaccumulation Factors for Accumulation of COPCs and ROPCs from Food by Mammals and Birds

Constituent of Potential Concern	CAS Registry Number	Log K_{ow} [a]	Mammal Ba[b] ([mg/kg tissue] / [mg ingested /day])	Bird Ba[c] ([mg/kg tissue] / [mg ingested /day])	Bioaccumulation Factor (BAF-T_p) ([mg/kg tissue]/[mg/kg food])			
					Mule Deer[d]	Mourning Dove[d]	Great Basin Pocket Mouse[d]	Western Meadow-lark[d]
2-Heptanone	110-43-0	1.98	2.40E-06	1.92E-06	5.55E-06	5.20E-08	1.61E-08	5.05E-09
2-Hexanone	591-78-6	1.38	6.03E-07	4.82E-07	1.39E-06	1.31E-08	4.04E-09	1.27E-09
2-Methoxyethanol	109-86-4	-0.77	4.27E-09	3.41E-09	9.86E-09	9.25E-11	2.86E-11	8.98E-12
2-Methyl-2-propanol	75-65-0	0.35	5.62E-08	4.50E-08	1.30E-07	1.22E-09	3.77E-10	1.18E-10
2-Methyl-2-propenenitrile	126-98-7	0.54	8.72E-08	6.97E-08	2.01E-07	1.89E-09	5.84E-10	1.84E-10
2-Methylaziridine	75-55-8	-0.60	6.31E-09	5.05E-09	1.46E-08	1.37E-10	4.23E-11	1.33E-11
2-Methylpropyl alcohol	78-83-1	0.76	1.45E-07	1.16E-07	3.34E-07	3.13E-09	9.68E-10	3.04E-10
2-Pentanone	107-87-9	0.91	2.04E-07	1.63E-07	4.72E-07	4.43E-09	1.37E-09	4.30E-10
2-Propanone (Acetone)	67-64-1	-0.22	1.51E-08	1.21E-08	3.49E-08	3.27E-10	1.01E-10	3.18E-11
2-Propene-1-ol	107-18-6	0.17	3.72E-08	2.97E-08	8.59E-08	8.05E-10	2.49E-10	7.82E-11
2-Propyl alcohol	67-63-0	0.05	2.82E-08	2.25E-08	6.52E-08	6.11E-10	1.89E-10	5.93E-11
3-Heptanone	106-35-4	No data	No data	No data	No data	No data	No data	No data
3-Methyl-1-butanol	123-51-3	No data	No data	No data	No data	No data	No data	No data
3-Methyl-2-butanone	563-80-4	No data	No data	No data	No data	No data	No data	No data
3-Pentanone	96-22-0	0.99	2.45E-07	1.96E-07	5.67E-07	5.32E-09	1.64E-09	5.17E-10
4-Heptanone	123-19-3	No data	No data	No data	No data	No data	No data	No data
4-Methyl-2-pentanone	108-10-1	1.19	3.89E-07	3.11E-07	9.00E-07	8.44E-09	2.61E-09	8.20E-10
4-Methyl-3-penten-2-one	141-79-7	No data	No data	No data	No data	No data	No data	No data
5-Methyl-2-hexanone	110-12-3	1.72	1.32E-06	1.05E-06	3.05E-06	2.86E-08	8.83E-09	2.78E-09
Acetaldehyde	75-07-0	-0.22	1.51E-08	1.21E-08	3.50E-08	3.28E-10	1.01E-10	3.18E-11
Acetamide	60-35-5	-1.26	1.38E-09	1.10E-09	3.19E-09	2.99E-11	9.25E-12	2.91E-12
Acetic acid	64-19-7	-0.17	1.70E-08	1.36E-08	3.93E-08	3.68E-10	1.14E-10	3.58E-11
Acetic acid ethyl ester	141-78-6	0.73	1.35E-07	1.08E-07	3.12E-07	2.92E-09	9.03E-10	2.84E-10
Acetic acid n-butyl ester	123-86-4	1.73	1.35E-06	1.08E-06	3.12E-06	2.92E-08	9.03E-09	2.84E-09
Acetonitrile	75-05-8	-0.34	1.15E-08	9.18E-09	2.65E-08	2.49E-10	7.69E-11	2.42E-11
Acrolein	107-02-8	-0.01	2.46E-08	1.97E-08	5.69E-08	5.34E-10	1.65E-10	5.18E-11

Table C2-3 Bioaccumulation Factors for Accumulation of COPCs and ROPCs from Food by Mammals and Birds

Constituent of Potential Concern	CAS Registry Number	Bioaccumulation Factor (BAF-T_p) ([mg/kg tissue]/[mg/kg food])							
		Coyote[d]	Burrowing Owl[d]	Red-tailed Hawk[d]	Canada Goose[d]	Spotted Sandpiper[d]	Great Blue Heron[d]	Bald Eagle[d]	Mink[d]
2-Heptanone	110-43-0	5.51E-07	1.18E-08	2.13E-07	2.28E-07	7.14E-08	8.26E-07	8.64E-07	2.85E-07
2-Hexanone	591-78-6	1.38E-07	2.96E-09	5.34E-08	5.74E-08	1.79E-08	2.07E-07	2.17E-07	7.17E-08
2-Methoxyethanol	109-86-4	9.79E-10	2.10E-11	3.78E-10	4.06E-10	1.27E-10	1.47E-09	1.54E-09	5.08E-10
2-Methyl-2-propanol	75-65-0	1.29E-08	2.77E-10	4.98E-09	5.36E-09	1.67E-09	1.94E-08	2.02E-08	6.69E-09
2-Methyl-2-propenenitrile	126-98-7	2.00E-08	4.29E-10	7.72E-09	8.30E-09	2.59E-09	3.00E-08	3.14E-08	1.04E-08
2-Methylaziridine	75-55-8	1.45E-09	3.10E-11	5.59E-10	6.01E-10	1.88E-10	2.17E-09	2.27E-09	7.51E-10
2-Methylpropyl alcohol	78-83-1	3.32E-08	7.11E-10	1.28E-08	1.38E-08	4.30E-09	4.97E-08	5.20E-08	1.72E-08
2-Pentanone	107-87-9	4.69E-08	1.00E-09	1.81E-08	1.94E-08	6.07E-09	7.03E-08	7.35E-08	2.43E-08
2-Propanone (Acetone)	67-64-1	3.46E-09	7.43E-11	1.34E-09	1.44E-09	4.49E-10	5.19E-09	5.43E-09	1.80E-09
2-Propene-1-ol	107-18-6	8.53E-09	1.83E-10	3.29E-09	3.54E-09	1.11E-09	1.28E-08	1.34E-08	4.42E-09
2-Propyl alcohol	67-63-0	6.47E-09	1.39E-10	2.50E-09	2.68E-09	8.38E-10	9.70E-09	1.01E-08	3.35E-09
3-Heptanone	106-35-4	No data	No data	No data	No data	No data	No data	No data	No data
3-Methyl-1-butanol	123-51-3	No data	No data	No data	No data	No data	No data	No data	No data
3-Methyl-2-butanone	563-80-4	No data	No data	No data	No data	No data	No data	No data	No data
3-Pentanone	96-22-0	5.63E-08	1.21E-09	2.18E-08	2.34E-08	7.30E-09	8.45E-08	8.84E-08	2.92E-08
4-Heptanone	123-19-3	No data	No data	No data	No data	No data	No data	No data	No data
4-Methyl-2-pentanone	108-10-1	8.94E-08	1.92E-09	3.45E-08	3.71E-08	1.16E-08	1.34E-07	1.40E-07	4.63E-08
4-Methyl-3-penten-2-one	141-79-7	No data	No data	No data	No data	No data	No data	No data	No data
5-Methyl-2-hexanone	110-12-3	3.03E-07	6.49E-09	1.17E-07	1.26E-07	3.92E-08	4.54E-07	4.75E-07	1.57E-07
Acetaldehyde	75-07-0	3.47E-09	7.44E-11	1.34E-09	1.44E-09	4.50E-10	5.20E-09	5.44E-09	1.80E-09
Acetamide	60-35-5	3.17E-10	6.79E-12	1.22E-10	1.31E-10	4.11E-11	4.75E-10	4.97E-10	1.64E-10
Acetic acid	64-19-7	3.90E-09	8.36E-11	1.50E-09	1.62E-09	5.05E-10	5.84E-09	6.11E-09	2.02E-09
Acetic acid ethyl ester	141-78-6	3.10E-08	6.64E-10	1.20E-08	1.28E-08	4.01E-09	4.64E-08	4.86E-08	1.61E-08
Acetic acid n-butyl ester	123-86-4	3.10E-07	6.64E-09	1.20E-07	1.28E-07	4.01E-08	4.64E-07	4.86E-07	1.61E-07
Acetonitrile	75-05-8	2.63E-09	5.65E-11	1.02E-09	1.09E-09	3.42E-10	3.95E-09	4.13E-09	1.37E-09
Acrolein	107-02-8	5.65E-09	1.21E-10	2.18E-09	2.34E-09	7.32E-10	8.47E-09	8.86E-09	2.93E-09

Table C2-3 Bioaccumulation Factors for Accumulation of COPCs and ROPCs from Food by Mammals and Birds

Constituent of Potential Concern	CAS Registry Number	Log K_{ow} [a]	Mammal Ba[b] ([mg/kg tissue] / [mg ingested /day])	Bird Ba[c] ([mg/kg tissue] / [mg ingested /day])	Bioaccumulation Factor (BAF-T_p) ([mg/kg tissue]/[mg/kg food])			
					Mule Deer[d]	Mourning Dove[d]	Great Basin Pocket Mouse[d]	Western Meadow-lark[d]
Acrylonitrile	107-13-1	0.25	4.47E-08	3.58E-08	1.03E-07	9.69E-10	2.99E-10	9.41E-11
Bis(isopropyl)ether	108-20-3	1.56	9.12E-07	7.30E-07	2.11E-06	1.98E-08	6.11E-09	1.92E-09
Butane	106-97-8	2.89	1.95E-05	1.56E-05	4.51E-05	4.23E-07	1.31E-07	4.11E-08
Carbon disulfide	75-15-0	2.00	2.51E-06	2.01E-06	5.81E-06	5.44E-08	1.68E-08	5.29E-09
Cyanogen	460-19-5	0.07	2.95E-08	2.36E-08	6.82E-08	6.40E-10	1.98E-10	6.21E-11
Cyclohexane	110-82-7	3.44	6.92E-05	5.53E-05	1.60E-04	1.50E-06	4.63E-07	1.46E-07
Cyclohexanone	108-94-1	0.81	1.62E-07	1.30E-07	3.75E-07	3.52E-09	1.09E-09	3.41E-10
Cyclohexene	110-83-8	2.86	1.82E-05	1.46E-05	4.21E-05	3.94E-07	1.22E-07	3.83E-08
Cyclopentane	287-92-3	3.00	2.51E-05	2.01E-05	5.81E-05	5.44E-07	1.68E-07	5.29E-08
Ethyl alcohol	64-17-5	-0.31	1.23E-08	9.84E-09	2.84E-08	2.67E-10	8.24E-11	2.59E-11
Ethyl ether	60-29-7	0.89	1.95E-07	1.56E-07	4.51E-07	4.23E-09	1.31E-09	4.11E-10
Ethyl methacrylate	97-63-2	1.59	9.77E-07	7.82E-07	2.26E-06	2.12E-08	6.54E-09	2.06E-09
Formaldehyde	50-00-0	0.34	5.56E-08	4.45E-08	1.29E-07	1.21E-09	3.72E-10	1.17E-10
Formamide	75-12-7	-1.51	7.76E-10	6.21E-10	1.79E-09	1.68E-11	5.20E-12	1.63E-12
Formic acid	64-18-6	-0.54	7.28E-09	5.83E-09	1.68E-08	1.58E-10	4.88E-11	1.53E-11
Formic acid, methyl ester	107-31-3	-0.26	1.37E-08	1.09E-08	3.16E-08	2.96E-10	9.16E-11	2.88E-11
Glycidylaldehyde	765-34-4	-0.12	1.91E-08	1.52E-08	4.40E-08	4.13E-10	1.28E-10	4.01E-11
Methyl acetate	79-20-9	0.46	7.24E-08	5.79E-08	1.67E-07	1.57E-09	4.85E-10	1.52E-10
Methyl alcohol	67-56-1	-0.71	4.90E-09	3.92E-09	1.13E-08	1.06E-10	3.28E-11	1.03E-11
Methyl isocyanate	624-83-9	No data	No data	No data	No data	No data	No data	No data
Methyl methacrylate	80-62-6	0.79	1.55E-07	1.24E-07	3.58E-07	3.36E-09	1.04E-09	3.26E-10
Methyl tert-butyl ether	1634-04-4	0.94	2.19E-07	1.75E-07	5.06E-07	4.74E-09	1.47E-09	4.61E-10
Methylacetylene	74-99-7	0.94	2.19E-07	1.75E-07	5.06E-07	4.74E-09	1.47E-09	4.61E-10
Methylcyclohexane	108-87-2	4.10	3.16E-04	2.53E-04	7.31E-04	6.85E-06	2.12E-06	6.66E-07
N,N-Dimethylacetamide	127-19-5	No data	No data	No data	No data	No data	No data	No data
n-Butyl alcohol	71-36-3	0.88	1.91E-07	1.52E-07	4.40E-07	4.13E-09	1.28E-09	4.01E-10

Table C2-3 Bioaccumulation Factors for Accumulation of COPCs and ROPCs from Food by Mammals and Birds

Constituent of Potential Concern	CAS Registry Number	Bioaccumulation Factor (BAF-T_p) ([mg/kg tissue]/[mg/kg food])							
		Coyote[d]	Burrowing Owl[d]	Red-tailed Hawk[d]	Canada Goose[d]	Spotted Sandpiper[d]	Great Blue Heron[d]	Bald Eagle[d]	Mink[d]
Acrylonitrile	107-13-1	1.03E-08	2.20E-10	3.96E-09	4.26E-09	1.33E-09	1.54E-08	1.61E-08	5.32E-09
Bis(isopropyl)ether	108-20-3	2.09E-07	4.49E-09	8.08E-08	8.69E-08	2.71E-08	3.14E-07	3.28E-07	1.09E-07
Butane	106-97-8	4.47E-06	9.59E-08	1.73E-06	1.86E-06	5.80E-07	6.71E-06	7.02E-06	2.32E-06
Carbon disulfide	75-15-0	5.76E-07	1.24E-08	2.23E-07	2.39E-07	7.47E-08	8.64E-07	9.04E-07	2.99E-07
Cyanogen	460-19-5	6.77E-09	1.45E-10	2.62E-09	2.81E-09	8.78E-10	1.02E-08	1.06E-08	3.51E-09
Cyclohexane	110-82-7	1.59E-05	3.40E-07	6.13E-06	6.59E-06	2.06E-06	2.38E-05	2.49E-05	8.23E-06
Cyclohexanone	108-94-1	3.72E-08	7.98E-10	1.44E-08	1.54E-08	4.82E-09	5.58E-08	5.84E-08	1.93E-08
Cyclohexene	110-83-8	4.18E-06	8.95E-08	1.61E-06	1.73E-06	5.41E-07	6.26E-06	6.55E-06	2.17E-06
Cyclopentane	287-92-3	5.76E-06	1.24E-07	2.23E-06	2.39E-06	7.47E-07	8.64E-06	9.04E-06	2.99E-06
Ethyl alcohol	64-17-5	2.82E-09	6.05E-11	1.09E-09	1.17E-09	3.66E-10	4.23E-09	4.43E-09	1.46E-09
Ethyl ether	60-29-7	4.47E-08	9.59E-10	1.73E-08	1.86E-08	5.80E-09	6.71E-08	7.02E-08	2.32E-08
Ethyl methacrylate	97-63-2	2.24E-07	4.81E-09	8.66E-08	9.31E-08	2.91E-08	3.36E-07	3.52E-07	1.16E-07
Formaldehyde	50-00-0	1.28E-08	2.74E-10	4.93E-09	5.29E-09	1.65E-09	1.91E-08	2.00E-08	6.62E-09
Formamide	75-12-7	1.78E-10	3.82E-12	6.88E-11	7.39E-11	2.31E-11	2.67E-10	2.79E-10	9.24E-11
Formic acid	64-18-6	1.67E-09	3.58E-11	6.46E-10	6.94E-10	2.17E-10	2.51E-09	2.62E-09	8.67E-10
Formic acid, methyl ester	107-31-3	3.14E-09	6.73E-11	1.21E-09	1.30E-09	4.07E-10	4.71E-09	4.92E-09	1.63E-09
Glycidylaldehyde	765-34-4	4.37E-09	9.37E-11	1.69E-09	1.81E-09	5.67E-10	6.56E-09	6.86E-09	2.27E-09
Methyl acetate	79-20-9	1.66E-08	3.56E-10	6.42E-09	6.89E-09	2.15E-09	2.49E-08	2.61E-08	8.62E-09
Methyl alcohol	67-56-1	1.12E-09	2.41E-11	4.34E-10	4.66E-10	1.46E-10	1.69E-09	1.76E-09	5.83E-10
Methyl isocyanate	624-83-9	No data	No data	No data	No data	No data	No data	No data	No data
Methyl methacrylate	80-62-6	3.55E-08	7.62E-10	1.37E-08	1.47E-08	4.61E-09	5.33E-08	5.58E-08	1.84E-08
Methyl tert-butyl ether	1634-04-4	5.02E-08	1.08E-09	1.94E-08	2.08E-08	6.51E-09	7.53E-08	7.88E-08	2.60E-08
Methylacetylene	74-99-7	5.02E-08	1.08E-09	1.94E-08	2.08E-08	6.51E-09	7.53E-08	7.88E-08	2.60E-08
Methylcyclohexane	108-87-2	7.26E-05	1.56E-06	2.80E-05	3.01E-05	9.41E-06	1.09E-04	1.14E-04	3.76E-05
N,N-Dimethylacetamide	127-19-5	No data	No data	No data	No data	No data	No data	No data	No data
n-Butyl alcohol	71-36-3	4.37E-08	9.37E-10	1.69E-08	1.81E-08	5.67E-09	6.56E-08	6.86E-08	2.27E-08

Table C2-3 Bioaccumulation Factors for Accumulation of COPCs and ROPCs from Food by Mammals and Birds

Constituent of Potential Concern	CAS Registry Number	Log K_{ow} [a]	Mammal Ba[b] ([mg/kg tissue] / [mg ingested /day])	Bird Ba[c] ([mg/kg tissue] / [mg ingested /day])	Bioaccumulation Factor (BAF-T_p) ([mg/kg tissue]/[mg/kg food])			
					Mule Deer[d]	Mourning Dove[d]	Great Basin Pocket Mouse[d]	Western Meadow-lark[d]
n-Heptane	142-82-5	4.66	1.15E-03	9.19E-04	2.65E-03	2.49E-05	7.69E-06	2.42E-06
n-Hexane	110-54-3	4.11	3.24E-04	2.59E-04	7.48E-04	7.01E-06	2.17E-06	6.81E-07
Nitromethane	75-52-5	-0.35	1.12E-08	8.98E-09	2.59E-08	2.43E-10	7.51E-11	2.36E-11
n-Nonane	111-84-2	5.65	1.12E-02	8.98E-03	2.59E-02	2.43E-04	7.51E-05	2.36E-05
n-Octane	111-65-9	4.00	2.51E-04	2.01E-04	5.81E-04	5.44E-06	1.68E-06	5.29E-07
n-Pentane	109-66-0	3.21	4.07E-05	3.26E-05	9.42E-05	8.83E-07	2.73E-07	8.58E-08
n-Propionaldehyde	123-38-6	0.59	9.77E-08	7.82E-08	2.26E-07	2.12E-09	6.55E-10	2.06E-10
n-Propyl alcohol	71-23-8	0.25	4.47E-08	3.57E-08	1.03E-07	9.68E-10	2.99E-10	9.41E-11
n-Valeraldehyde	110-62-3	No data	No data	No data	No data	No data	No data	No data
Oxirane	75-21-8	-0.30	1.26E-08	1.01E-08	2.91E-08	2.73E-10	8.43E-11	2.65E-11
p-Cymene	99-87-6	4.10	3.16E-04	2.53E-04	7.31E-04	6.85E-06	2.12E-06	6.66E-07
Phosgene	75-44-5	No data	No data	No data	No data	No data	No data	No data
Propargyl alcohol	107-19-7	-0.38	1.05E-08	8.38E-09	2.42E-08	2.27E-10	7.01E-11	2.20E-11
Propionic acid	79-09-4	0.33	5.37E-08	4.30E-08	1.24E-07	1.16E-09	3.60E-10	1.13E-10
Propionitrile	107-12-0	0.16	3.63E-08	2.90E-08	8.39E-08	7.87E-10	2.43E-10	7.64E-11
Propylene glycol monomethyl ether	107-98-2	-0.49	8.13E-09	6.50E-09	1.88E-08	1.76E-10	5.44E-11	1.71E-11
p-tert-Butyltoluene	98-51-1	No data	No data	No data	No data	No data	No data	No data
Triethylamine	121-44-8	1.45	7.08E-07	5.66E-07	1.64E-06	1.53E-08	4.74E-09	1.49E-09
Trimethylamine	75-50-3	0.16	3.63E-08	2.90E-08	8.39E-08	7.87E-10	2.43E-10	7.64E-11
Vinyl acetate	108-05-4	0.70	1.26E-07	1.00E-07	2.90E-07	2.72E-09	8.41E-10	2.64E-10
Non-aromatic Halogenated Hydrocarbons								
1,1,1,2-Tetrachloro-2,2-difluoroethane	76-11-9	3.41	6.46E-05	5.17E-05	1.49E-04	1.40E-06	4.32E-07	1.36E-07
1,1,1,2-Tetrachloroethane	630-20-6	2.63	1.07E-05	8.58E-06	2.48E-05	2.32E-07	7.18E-08	2.26E-08
1,1,1-Trichloroethane	71-55-6	2.42	6.63E-06	5.31E-06	1.53E-05	1.44E-07	4.44E-08	1.40E-08
1,1,2,2-Tetrachloro-1,2-difluoroethane	76-12-0	3.73	1.35E-04	1.08E-04	3.12E-04	2.92E-06	9.03E-07	2.84E-07
1,1,2,2-Tetrachloroethane	79-34-5	4.64	1.11E-03	8.84E-04	2.55E-03	2.40E-05	7.40E-06	2.33E-06

Table C2-3 Bioaccumulation Factors for Accumulation of COPCs and ROPCs from Food by Mammals and Birds

Constituent of Potential Concern	CAS Registry Number	Bioaccumulation Factor (BAF-T_p) ([mg/kg tissue]/[mg/kg food])							
		Coyote[d]	Burrowing Owl[d]	Red-tailed Hawk[d]	Canada Goose[d]	Spotted Sandpiper[d]	Great Blue Heron[d]	Bald Eagle[d]	Mink[d]
n-Heptane	142-82-5	2.64E-04	5.65E-06	1.02E-04	1.09E-04	3.42E-05	3.95E-04	4.13E-04	1.37E-04
n-Hexane	110-54-3	7.43E-05	1.59E-06	2.87E-05	3.08E-05	9.63E-06	1.11E-04	1.16E-04	3.85E-05
Nitromethane	75-52-5	2.58E-09	5.52E-11	9.94E-10	1.07E-09	3.34E-10	3.86E-09	4.04E-09	1.34E-09
n-Nonane	111-84-2	2.58E-03	5.52E-05	9.94E-04	1.07E-03	3.34E-04	3.86E-03	4.04E-03	1.34E-03
n-Octane	111-65-9	5.76E-05	1.24E-06	2.23E-05	2.39E-05	7.47E-06	8.64E-05	9.04E-05	2.99E-05
n-Pentane	109-66-0	9.35E-06	2.00E-07	3.61E-06	3.88E-06	1.21E-06	1.40E-05	1.47E-05	4.85E-06
n-Propionaldehyde	123-38-6	2.24E-08	4.81E-10	8.66E-09	9.31E-09	2.91E-09	3.36E-08	3.52E-08	1.16E-08
n-Propyl alcohol	71-23-8	1.03E-08	2.20E-10	3.96E-09	4.25E-09	1.33E-09	1.54E-08	1.61E-08	5.32E-09
n-Valeraldehyde	110-62-3	No data	No data	No data	No data	No data	No data	No data	No data
Oxirane	75-21-8	2.89E-09	6.19E-11	1.12E-09	1.20E-09	3.74E-10	4.33E-09	4.53E-09	1.50E-09
p-Cymene	99-87-6	7.26E-05	1.56E-06	2.80E-05	3.01E-05	9.41E-06	1.09E-04	1.14E-04	3.76E-05
Phosgene	75-44-5	No data	No data	No data	No data	No data	No data	No data	No data
Propargyl alcohol	107-19-7	2.40E-09	5.15E-11	9.28E-10	9.97E-10	3.12E-10	3.60E-09	3.77E-09	1.25E-09
Propionic acid	79-09-4	1.23E-08	2.64E-10	4.76E-09	5.11E-09	1.60E-09	1.85E-08	1.93E-08	6.39E-09
Propionitrile	107-12-0	8.33E-09	1.79E-10	3.22E-09	3.46E-09	1.08E-09	1.25E-08	1.31E-08	4.32E-09
Propylene glycol monomethyl ether	107-98-2	1.87E-09	4.00E-11	7.20E-10	7.74E-10	2.42E-10	2.80E-09	2.93E-09	9.67E-10
p-tert-Butyltoluene	98-51-1	No data	No data	No data	No data	No data	No data	No data	No data
Triethylamine	121-44-8	1.62E-07	3.48E-09	6.27E-08	6.74E-08	2.11E-08	2.44E-07	2.55E-07	8.42E-08
Trimethylamine	75-50-3	8.33E-09	1.79E-10	3.22E-09	3.46E-09	1.08E-09	1.25E-08	1.31E-08	4.32E-09
Vinyl acetate	108-05-4	2.88E-08	6.18E-10	1.11E-08	1.20E-08	3.74E-09	4.32E-08	4.52E-08	1.49E-08
Non-aromatic Halogenated Hydrocarbons									
1,1,1,2-Tetrachloro-2,2-difluoroethane	76-11-9	1.48E-05	3.18E-07	5.72E-06	6.15E-06	1.92E-06	2.22E-05	2.32E-05	7.68E-06
1,1,1,2-Tetrachloroethane	630-20-6	2.46E-06	5.28E-08	9.51E-07	1.02E-06	3.19E-07	3.69E-06	3.86E-06	1.28E-06
1,1,1-Trichloroethane	71-55-6	1.52E-06	3.26E-08	5.88E-07	6.32E-07	1.97E-07	2.28E-06	2.39E-06	7.89E-07
1,1,2,2-Tetrachloro-1,2-difluoroethane	76-12-0	3.10E-05	6.64E-07	1.20E-05	1.28E-05	4.01E-06	4.64E-05	4.86E-05	1.61E-05
1,1,2,2-Tetrachloroethane	79-34-5	2.54E-04	5.44E-06	9.79E-05	1.05E-04	3.29E-05	3.80E-04	3.98E-04	1.32E-04

Table C2-3 Bioaccumulation Factors for Accumulation of COPCs and ROPCs from Food by Mammals and Birds

Constituent of Potential Concern	CAS Registry Number	Log K_{ow}[a]	Mammal Ba[b] ([mg/kg tissue] / [mg ingested /day])	Bird Ba[c] ([mg/kg tissue] / [mg ingested /day])	Bioaccumulation Factor (BAF-T_p) ([mg/kg tissue]/[mg/kg food])			
					Mule Deer[d]	Mourning Dove[d]	Great Basin Pocket Mouse[d]	Western Meadow-lark[d]
1,1,2,2-Tetrachloroethene	127-18-4	2.55	8.82E-06	7.05E-06	2.04E-05	1.91E-07	5.90E-08	1.86E-08
1,1,2-Trichloroethane	79-00-5	2.10	3.14E-06	2.51E-06	7.26E-06	6.81E-08	2.10E-08	6.61E-09
1,1,2-Trichloroethylene	79-01-6	2.43	6.81E-06	5.45E-06	1.57E-05	1.48E-07	4.56E-08	1.43E-08
1,1-Dichloroethane	75-34-3	1.79	1.56E-06	1.25E-06	3.60E-06	3.38E-08	1.04E-08	3.28E-09
1,1-Dichloroethene	75-35-4	2.12	3.32E-06	2.65E-06	7.66E-06	7.19E-08	2.22E-08	6.98E-09
1,2,2-Trichloro-1,1,2-trifluoroethane	76-13-1	3.16	3.63E-05	2.90E-05	8.39E-05	7.87E-07	2.43E-07	7.64E-08
1,2,3-Trichloropropane	96-18-4	2.25	4.47E-06	3.58E-06	1.03E-05	9.69E-08	2.99E-08	9.41E-09
1,2-Dibromo-3-chloropropane	96-12-8	2.34	5.50E-06	4.40E-06	1.27E-05	1.19E-07	3.68E-08	1.16E-08
1,2-Dichloro-1,1,2,2-tetrafluoroethane	76-14-2	2.82	1.66E-05	1.33E-05	3.84E-05	3.60E-07	1.11E-07	3.49E-08
1,2-Dichloroethane	107-06-2	1.46	7.28E-07	5.83E-07	1.68E-06	1.58E-08	4.88E-09	1.53E-09
1,2-Dichloroethylene	540-59-0	2.09	3.09E-06	2.47E-06	7.14E-06	6.70E-08	2.07E-08	6.51E-09
1,2-Dichloropropane	78-87-5	2.25	4.47E-06	3.58E-06	1.03E-05	9.69E-08	2.99E-08	9.41E-09
1,3-Dichloropropene	542-75-6	1.75	1.41E-06	1.13E-06	3.25E-06	3.05E-08	9.42E-09	2.96E-09
1,4-Dichloro-2-butene	764-41-0	0.87	1.87E-07	1.50E-07	4.33E-07	4.06E-09	1.25E-09	3.94E-10
1-Chloroethene	75-01-4	1.15	3.52E-07	2.81E-07	8.13E-07	7.62E-09	2.36E-09	7.40E-10
2,2-Dichloropropionic acid	75-99-0	1.68	1.20E-06	9.62E-07	2.78E-06	2.61E-08	8.05E-09	2.53E-09
2-Chloropropane	75-29-6	1.90	2.00E-06	1.60E-06	4.61E-06	4.33E-08	1.34E-08	4.20E-09
3-Chloropropene (Allyl chloride)	107-05-1	1.93	2.14E-06	1.71E-06	4.94E-06	4.63E-08	1.43E-08	4.50E-09
Bromochloromethane	74-97-5	1.41	6.46E-07	5.17E-07	1.49E-06	1.40E-08	4.32E-09	1.36E-09
Bromodichloromethane	75-27-4	2.03	2.66E-06	2.13E-06	6.16E-06	5.77E-08	1.78E-08	5.61E-09
Bromoethene	593-60-2	1.07	2.93E-07	2.34E-07	6.77E-07	6.35E-09	1.96E-09	6.16E-10
Bromoform	75-25-2	2.35	5.63E-06	4.50E-06	1.30E-05	1.22E-07	3.77E-08	1.18E-08
Bromomethane	74-83-9	1.11	3.27E-07	2.61E-07	7.55E-07	7.08E-09	2.19E-09	6.88E-10
Carbon tetrachloride	56-23-5	2.72	1.31E-05	1.05E-05	3.03E-05	2.84E-07	8.76E-08	2.76E-08
Chlorodibromomethane	124-48-1	2.18	3.77E-06	3.01E-06	8.71E-06	8.17E-08	2.52E-08	7.93E-09
Chlorodifluoromethane	75-45-6	1.08	3.01E-07	2.41E-07	6.97E-07	6.53E-09	2.02E-09	6.35E-10

Table C2-3 Bioaccumulation Factors for Accumulation of COPCs and ROPCs from Food by Mammals and Birds

Constituent of Potential Concern	CAS Registry Number	Bioaccumulation Factor (BAF-T_p) ([mg/kg tissue]/[mg/kg food])							
		Coyote[d]	Burrowing Owl[d]	Red-tailed Hawk[d]	Canada Goose[d]	Spotted Sandpiper[d]	Great Blue Heron[d]	Bald Eagle[d]	Mink[d]
1,1,2,2-Tetrachloroethene	127-18-4	2.02E-06	4.34E-08	7.81E-07	8.40E-07	2.62E-07	3.03E-06	3.17E-06	1.05E-06
1,1,2-Trichloroethane	79-00-5	7.21E-07	1.54E-08	2.78E-07	2.99E-07	9.34E-08	1.08E-06	1.13E-06	3.74E-07
1,1,2-Trichloroethylene	79-01-6	1.56E-06	3.35E-08	6.03E-07	6.48E-07	2.03E-07	2.34E-06	2.45E-06	8.10E-07
1,1-Dichloroethane	75-34-3	3.57E-07	7.66E-09	1.38E-07	1.48E-07	4.63E-08	5.36E-07	5.61E-07	1.85E-07
1,1-Dichloroethene	75-35-4	7.61E-07	1.63E-08	2.94E-07	3.16E-07	9.86E-08	1.14E-06	1.19E-06	3.95E-07
1,2,2-Trichloro-1,1,2-trifluoroethane	76-13-1	8.33E-06	1.79E-07	3.22E-06	3.46E-06	1.08E-06	1.25E-05	1.31E-05	4.32E-06
1,2,3-Trichloropropane	96-18-4	1.03E-06	2.20E-08	3.96E-07	4.26E-07	1.33E-07	1.54E-06	1.61E-06	5.32E-07
1,2-Dibromo-3-chloropropane	96-12-8	1.26E-06	2.71E-08	4.88E-07	5.24E-07	1.64E-07	1.89E-06	1.98E-06	6.55E-07
1,2-Dichloro-1,1,2,2-tetrafluoroethane	76-14-2	3.81E-06	8.17E-08	1.47E-06	1.58E-06	4.94E-07	5.71E-06	5.97E-06	1.97E-06
1,2-Dichloroethane	107-06-2	1.67E-07	3.58E-09	6.46E-08	6.94E-08	2.17E-08	2.51E-07	2.62E-07	8.67E-08
1,2-Dichloroethylene	540-59-0	7.09E-07	1.52E-08	2.74E-07	2.94E-07	9.19E-08	1.06E-06	1.11E-06	3.68E-07
1,2-Dichloropropane	78-87-5	1.03E-06	2.20E-08	3.96E-07	4.26E-07	1.33E-07	1.54E-06	1.61E-06	5.32E-07
1,3-Dichloropropene	542-75-6	3.23E-07	6.92E-09	1.25E-07	1.34E-07	4.18E-08	4.84E-07	5.06E-07	1.67E-07
1,4-Dichloro-2-butene	764-41-0	4.30E-08	9.22E-10	1.66E-08	1.78E-08	5.57E-09	6.45E-08	6.74E-08	2.23E-08
1-Chloroethene	75-01-4	8.07E-08	1.73E-09	3.12E-08	3.35E-08	1.05E-08	1.21E-07	1.27E-07	4.18E-08
2,2-Dichloropropionic acid	75-99-0	2.76E-07	5.92E-09	1.07E-07	1.14E-07	3.58E-08	4.14E-07	4.33E-07	1.43E-07
2-Chloropropane	75-29-6	4.58E-07	9.82E-09	1.77E-07	1.90E-07	5.94E-08	6.87E-07	7.18E-07	2.37E-07
3-Chloropropene (Allyl chloride)	107-05-1	4.91E-07	1.05E-08	1.89E-07	2.04E-07	6.36E-08	7.36E-07	7.70E-07	2.54E-07
Bromochloromethane	74-97-5	1.48E-07	3.18E-09	5.72E-08	6.15E-08	1.92E-08	2.22E-07	2.32E-07	7.68E-08
Bromodichloromethane	75-27-4	6.11E-07	1.31E-08	2.36E-07	2.54E-07	7.92E-08	9.16E-07	9.59E-07	3.17E-07
Bromoethene	593-60-2	6.72E-08	1.44E-09	2.59E-08	2.79E-08	8.71E-09	1.01E-07	1.05E-07	3.48E-08
Bromoform	75-25-2	1.29E-06	2.77E-08	4.99E-07	5.36E-07	1.67E-07	1.94E-06	2.03E-06	6.70E-07
Bromomethane	74-83-9	7.49E-08	1.61E-09	2.89E-08	3.11E-08	9.71E-09	1.12E-07	1.18E-07	3.89E-08
Carbon tetrachloride	56-23-5	3.00E-06	6.44E-08	1.16E-06	1.25E-06	3.89E-07	4.50E-06	4.71E-06	1.56E-06
Chlorodibromomethane	124-48-1	8.65E-07	1.85E-08	3.34E-07	3.59E-07	1.12E-07	1.30E-06	1.36E-06	4.48E-07
Chlorodifluoromethane	75-45-6	6.92E-08	1.48E-09	2.67E-08	2.87E-08	8.97E-09	1.04E-07	1.09E-07	3.59E-08

Table C2-3 Bioaccumulation Factors for Accumulation of COPCs and ROPCs from Food by Mammals and Birds

Constituent of Potential Concern	CAS Registry Number	Log K_{ow} [a]	Mammal Ba[b] ([mg/kg tissue] / [mg ingested /day])	Bird Ba[c] ([mg/kg tissue] / [mg ingested /day])	Bioaccumulation Factor (BAF-T_p) ([mg/kg tissue]/[mg/kg food])			
					Mule Deer[d]	Mourning Dove[d]	Great Basin Pocket Mouse[d]	Western Meadow-lark[d]
Chloroethane	75-00-3	3.10	3.16E-05	2.53E-05	7.32E-05	6.86E-07	2.12E-07	6.66E-08
Chloroform	67-66-3	1.95	2.24E-06	1.79E-06	5.18E-06	4.85E-08	1.50E-08	4.72E-09
Chloromethane	74-87-3	0.90	2.01E-07	1.61E-07	4.65E-07	4.36E-09	1.35E-09	4.23E-10
Chloropentafluoroethane	76-15-3	2.10	3.16E-06	2.53E-06	7.31E-06	6.85E-08	2.12E-08	6.66E-09
cis-1,2-Dichloroethene	156-59-2	1.98	2.41E-06	1.93E-06	5.57E-06	5.23E-08	1.62E-08	5.08E-09
cis-1,3-Dichloropropene	10061-01-5	No data	No data	No data	No data	No data	No data	No data
Cyanogen bromide	506-68-3	-0.29	1.29E-08	1.03E-08	2.98E-08	2.79E-10	8.63E-11	2.71E-11
Cyanogen chloride	506-77-4	-0.38	1.05E-08	8.38E-09	2.42E-08	2.27E-10	7.01E-11	2.20E-11
Dichlorodifluoromethane	75-71-8	2.16	3.62E-06	2.89E-06	8.36E-06	7.84E-08	2.42E-08	7.62E-09
Dichlorofluoromethane	75-43-4	1.55	8.91E-07	7.13E-07	2.06E-06	1.93E-08	5.97E-09	1.88E-09
Dichloromethane	75-09-2	1.26	4.52E-07	3.62E-07	1.05E-06	9.80E-09	3.03E-09	9.52E-10
Difluorodibromomethane	75-61-6	No data	No data	No data	No data	No data	No data	No data
Hexafluoroacetone	684-16-2	No data	No data	No data	No data	No data	No data	No data
Iodomethane	74-88-4	1.69	1.23E-06	9.84E-07	2.84E-06	2.67E-08	8.24E-09	2.59E-09
Methylene bromide	74-95-3	1.62	1.05E-06	8.38E-07	2.42E-06	2.27E-08	7.02E-09	2.21E-09
Pentachloroethane	76-01-7	3.05	2.82E-05	2.25E-05	6.52E-05	6.11E-07	1.89E-07	5.93E-08
trans-1,2-Dichloroethylene	156-60-5	1.98	2.41E-06	1.93E-06	5.57E-06	5.23E-08	1.62E-08	5.08E-09
trans-1,3-Dichloropropene	10061-02-6	2.06	2.88E-06	2.31E-06	6.67E-06	6.25E-08	1.93E-08	6.07E-09
Trichloroacetic acid	76-03-9	1.33	5.37E-07	4.30E-07	1.24E-06	1.16E-08	3.60E-09	1.13E-09
Trichlorofluoroethane	27154-33-2	No data	No data	No data	No data	No data	No data	No data
Trichlorofluoromethane	75-69-4	2.53	8.54E-06	6.83E-06	1.97E-05	1.85E-07	5.72E-08	1.80E-08
Trifluorobromomethane	75-63-8	1.86	1.82E-06	1.46E-06	4.21E-06	3.94E-08	1.22E-08	3.83E-09
Dioxin and Furan Compounds (PCDDs/PCDFs)								
1,2,3,4,6,7,8-Heptachlorodibenzo(p)dioxin	35822-46-9	8.20	2.77E-03	2.22E-03	6.41E-03	6.01E-05	1.86E-05	5.84E-06
1,2,3,4,6,7,8-Heptachlorodibenzofuran	67562-39-4	7.92	5.98E-04	4.78E-04	1.38E-03	1.30E-05	4.00E-06	1.26E-06
1,2,3,4,7,8,9-Heptachlorodibenzofuran	55673-89-7	7.92	2.12E-02	1.69E-02	4.89E-02	4.59E-04	1.42E-04	4.46E-05

Table C2-3 Bioaccumulation Factors for Accumulation of COPCs and ROPCs from Food by Mammals and Birds

Constituent of Potential Concern	CAS Registry Number	Bioaccumulation Factor (BAF-T_p) ([mg/kg tissue]/[mg/kg food])							
		Coyote[d]	Burrowing Owl[d]	Red-tailed Hawk[d]	Canada Goose[d]	Spotted Sandpiper[d]	Great Blue Heron[d]	Bald Eagle[d]	Mink[d]
Chloroethane	75-00-3	7.26E-06	1.56E-07	2.80E-06	3.01E-06	9.42E-07	1.09E-05	1.14E-05	3.77E-06
Chloroform	67-66-3	5.14E-07	1.10E-08	1.98E-07	2.13E-07	6.66E-08	7.71E-07	8.06E-07	2.67E-07
Chloromethane	74-87-3	4.61E-08	9.89E-10	1.78E-08	1.91E-08	5.98E-09	6.92E-08	7.23E-08	2.39E-08
Chloropentafluoroethane	76-15-3	7.26E-07	1.56E-08	2.80E-07	3.01E-07	9.41E-08	1.09E-06	1.14E-06	3.76E-07
cis-1,2-Dichloroethene	156-59-2	5.53E-07	1.19E-08	2.14E-07	2.30E-07	7.17E-08	8.30E-07	8.68E-07	2.87E-07
cis-1,3-Dichloropropene	10061-01-5	No data	No data	No data	No data	No data	No data	No data	No data
Cyanogen bromide	506-68-3	2.96E-09	6.34E-11	1.14E-09	1.23E-09	3.83E-10	4.43E-09	4.64E-09	1.53E-09
Cyanogen chloride	506-77-4	2.40E-09	5.15E-11	9.28E-10	9.97E-10	3.12E-10	3.60E-09	3.77E-09	1.25E-09
Dichlorodifluoromethane	75-71-8	8.30E-07	1.78E-08	3.21E-07	3.44E-07	1.08E-07	1.24E-06	1.30E-06	4.30E-07
Dichlorofluoromethane	75-43-4	2.05E-07	4.38E-09	7.90E-08	8.49E-08	2.65E-08	3.07E-07	3.21E-07	1.06E-07
Dichloromethane	75-09-2	1.04E-07	2.22E-09	4.01E-08	4.31E-08	1.35E-08	1.56E-07	1.63E-07	5.38E-08
Difluorodibromomethane	75-61-6	No data	No data	No data	No data	No data	No data	No data	No data
Hexafluoroacetone	684-16-2	No data	No data	No data	No data	No data	No data	No data	No data
Iodomethane	74-88-4	2.82E-07	6.05E-09	1.09E-07	1.17E-07	3.66E-08	4.23E-07	4.43E-07	1.46E-07
Methylene bromide	74-95-3	2.40E-07	5.15E-09	9.28E-08	9.98E-08	3.12E-08	3.60E-07	3.77E-07	1.25E-07
Pentachloroethane	76-01-7	6.47E-06	1.39E-07	2.50E-06	2.68E-06	8.38E-07	9.70E-06	1.01E-05	3.35E-06
trans-1,2-Dichloroethylene	156-60-5	5.53E-07	1.19E-08	2.14E-07	2.30E-07	7.17E-08	8.30E-07	8.68E-07	2.87E-07
trans-1,3-Dichloropropene	10061-02-6	6.62E-07	1.42E-08	2.56E-07	2.75E-07	8.58E-08	9.93E-07	1.04E-06	3.43E-07
Trichloroacetic acid	76-03-9	1.23E-07	2.64E-09	4.76E-08	5.11E-08	1.60E-08	1.85E-07	1.93E-07	6.39E-08
Trichlorofluoroethane	27154-33-2	No data	No data	No data	No data	No data	No data	No data	No data
Trichlorofluoromethane	75-69-4	1.96E-06	4.20E-08	7.57E-07	8.13E-07	2.54E-07	2.94E-06	3.07E-06	1.02E-06
Trifluorobromomethane	75-63-8	4.18E-07	8.95E-09	1.61E-07	1.73E-07	5.41E-08	6.26E-07	6.55E-07	2.17E-07
Dioxin and Furan Compounds (PCDDs/PCDFs)									
1,2,3,4,6,7,8-Heptachlorodibenzo(p)dioxin	35822-46-9	6.36E-04	1.36E-05	2.46E-04	2.64E-04	8.25E-05	9.54E-04	9.98E-04	3.30E-04
1,2,3,4,6,7,8-Heptachlorodibenzofuran	67562-39-4	1.37E-04	2.94E-06	5.30E-05	5.69E-05	1.78E-05	2.06E-04	2.15E-04	7.11E-05
1,2,3,4,7,8,9-Heptachlorodibenzofuran	55673-89-7	4.86E-03	1.04E-04	1.88E-03	2.02E-03	6.30E-04	7.29E-03	7.62E-03	2.52E-03

Table C2-3 Bioaccumulation Factors for Accumulation of COPCs and ROPCs from Food by Mammals and Birds

Constituent of Potential Concern	CAS Registry Number	Log K_{ow} [a]	Mammal Ba[b] ([mg/kg tissue] / [mg ingested /day])	Bird Ba[c] ([mg/kg tissue] / [mg ingested /day])	Bioaccumulation Factor (BAF-T_p) ([mg/kg tissue]/[mg/kg food])			
					Mule Deer[d]	Mourning Dove[d]	Great Basin Pocket Mouse[d]	Western Meadow-lark[d]
1,2,3,4,7,8-Hexachlorodibenzo(p)dioxin	39227-28-6	7.79	1.68E-02	1.35E-02	3.89E-02	3.65E-04	1.13E-04	3.54E-05
1,2,3,4,7,8-Hexachlorodibenzofuran	70648-26-9	7.25	4.13E-03	3.30E-03	9.54E-03	8.95E-05	2.76E-05	8.69E-06
1,2,3,6,7,8-Hexachlorodibenzo(p)dioxin	57653-85-7	7.25	6.52E-03	5.22E-03	1.51E-02	1.41E-04	4.37E-05	1.37E-05
1,2,3,6,7,8-Hexachlorodibenzofuran	57117-44-9	7.25	1.03E-02	8.26E-03	2.39E-02	2.24E-04	6.91E-05	2.17E-05
1,2,3,7,8,9-Hexachlorodibenzo(p)dioxin	19408-74-3	7.25	7.61E-03	6.08E-03	1.76E-02	1.65E-04	5.09E-05	1.60E-05
1,2,3,7,8,9-Hexachlorodibenzofuran	72918-21-9	7.25	3.42E-02	2.74E-02	7.91E-02	7.42E-04	2.29E-04	7.21E-05
1,2,3,7,8-Pentachlorodibenzo(p)dioxin	40321-76-4	6.64	5.00E-02	4.00E-02	1.15E-01	1.08E-03	3.35E-04	1.05E-04
1,2,3,7,8-Pentachlorodibenzofuran	57117-41-6	6.79	1.20E-02	9.56E-03	2.76E-02	2.59E-04	8.00E-05	2.52E-05
2,3,4,6,7,8-Hexachlorodibenzofuran	60851-34-5	7.25	3.64E-02	2.91E-02	8.42E-02	7.89E-04	2.44E-04	7.67E-05
2,3,4,7,8-Pentachlorodibenzofuran	57117-31-4	6.92	8.70E-02	6.96E-02	2.01E-01	1.89E-03	5.82E-04	1.83E-04
2,3,7,8-Tetrachlorodibenzo(p)dioxin	1746-01-6	6.64	5.43E-02	4.35E-02	1.26E-01	1.18E-03	3.64E-04	1.14E-04
2,3,7,8-Tetrachlorodibenzofuran	51207-31-9	6.53	4.34E-02	3.47E-02	1.00E-01	9.41E-04	2.91E-04	9.14E-05
Dibenzofuran	132-64-9	4.33	5.37E-04	4.30E-04	1.24E-03	1.16E-05	3.60E-06	1.13E-06
Octachlorodibenzo(p)dioxin	3268-87-9	7.59	6.52E-04	5.22E-04	1.51E-03	1.41E-05	4.37E-06	1.37E-06
Octachlorodibenzofuran	39001-02-0	8.78	8.70E-04	6.96E-04	2.01E-03	1.89E-05	5.82E-06	1.83E-06
Total dioxins and dibenzofurans	No CAS #	No data	No data	No data	No data	No data	No data	No data
Polychlorinated Biphenyls (PCBs)								
2,2',3,3',4,4',5-Heptachlorobiphenyl	35065-30-6	7.08	3.02E-01	2.42E-01	6.98E-01	6.55E-03	2.02E-03	6.36E-04
2,2',3,4,4',5,5'-Heptachlorobiphenyl	35065-29-3	7.12	3.31E-01	2.65E-01	7.65E-01	7.18E-03	2.22E-03	6.97E-04
2,3,3',4,4',5,5'-Heptachlorobiphenyl	39635-31-9	No data	No data	No data	No data	No data	No data	No data
2,3,3',4,4',5'-Hexachlorobiphenyl	69782-90-7	No data	No data	No data	No data	No data	No data	No data
2,3,3',4,4',5-Hexachlorobiphenyl	38380-08-4	No data	No data	No data	No data	No data	No data	No data
2,3,3',4,4'-Pentachlorobiphenyl	32598-14-4	No data	No data	No data	No data	No data	No data	No data
2,3',4,4',5,5'-Hexachlorobiphenyl	52663-72-6	No data	No data	No data	No data	No data	No data	No data
2,3,4,4',5-Pentachlorobiphenyl	74472-37-0	No data	No data	No data	No data	No data	No data	No data
2',3,4,4',5-Pentachlorobiphenyl	65510-44-3	No data	No data	No data	No data	No data	No data	No data

Table C2-3 Bioaccumulation Factors for Accumulation of COPCs and ROPCs from Food by Mammals and Birds

Constituent of Potential Concern	CAS Registry Number	Bioaccumulation Factor (BAF-T_p) ([mg/kg tissue]/[mg/kg food])							
		Coyote[d]	Burrowing Owl[d]	Red-tailed Hawk[d]	Canada Goose[d]	Spotted Sandpiper[d]	Great Blue Heron[d]	Bald Eagle[d]	Mink[d]
1,2,3,4,7,8-Hexachlorodibenzo(p)dioxin	39227-28-6	3.86E-03	8.28E-05	1.49E-03	1.60E-03	5.00E-04	5.79E-03	6.06E-03	2.00E-03
1,2,3,4,7,8-Hexachlorodibenzofuran	70648-26-9	9.47E-04	2.03E-05	3.66E-04	3.93E-04	1.23E-04	1.42E-03	1.49E-03	4.91E-04
1,2,3,6,7,8-Hexachlorodibenzo(p)dioxin	57653-85-7	1.50E-03	3.21E-05	5.78E-04	6.21E-04	1.94E-04	2.24E-03	2.35E-03	7.76E-04
1,2,3,6,7,8-Hexachlorodibenzofuran	57117-44-9	2.37E-03	5.08E-05	9.15E-04	9.83E-04	3.07E-04	3.55E-03	3.72E-03	1.23E-03
1,2,3,7,8,9-Hexachlorodibenzo(p)dioxin	19408-74-3	1.75E-03	3.74E-05	6.74E-04	7.24E-04	2.26E-04	2.62E-03	2.74E-03	9.05E-04
1,2,3,7,8,9-Hexachlorodibenzofuran	72918-21-9	7.86E-03	1.68E-04	3.03E-03	3.26E-03	1.02E-03	1.18E-02	1.23E-02	4.07E-03
1,2,3,7,8-Pentachlorodibenzo(p)dioxin	40321-76-4	1.15E-02	2.46E-04	4.43E-03	4.76E-03	1.49E-03	1.72E-02	1.80E-02	5.94E-03
1,2,3,7,8-Pentachlorodibenzofuran	57117-41-6	2.74E-03	5.88E-05	1.06E-03	1.14E-03	3.56E-04	4.11E-03	4.30E-03	1.42E-03
2,3,4,6,7,8-Hexachlorodibenzofuran	60851-34-5	8.36E-03	1.79E-04	3.23E-03	3.47E-03	1.08E-03	1.25E-02	1.31E-02	4.33E-03
2,3,4,7,8-Pentachlorodibenzofuran	57117-31-4	2.00E-02	4.28E-04	7.71E-03	8.28E-03	2.59E-03	2.99E-02	3.13E-02	1.03E-02
2,3,7,8-Tetrachlorodibenzo(p)dioxin	1746-01-6	1.25E-02	2.67E-04	4.81E-03	5.17E-03	1.62E-03	1.87E-02	1.96E-02	6.46E-03
2,3,7,8-Tetrachlorodibenzofuran	51207-31-9	9.96E-03	2.14E-04	3.85E-03	4.13E-03	1.29E-03	1.49E-02	1.56E-02	5.16E-03
Dibenzofuran	132-64-9	1.23E-04	2.64E-06	4.76E-05	5.11E-05	1.60E-05	1.85E-04	1.93E-04	6.39E-05
Octachlorodibenzo(p)dioxin	3268-87-9	1.50E-04	3.21E-06	5.78E-05	6.21E-05	1.94E-05	2.24E-04	2.35E-04	7.76E-05
Octachlorodibenzofuran	39001-02-0	2.00E-04	4.28E-06	7.71E-05	8.28E-05	2.59E-05	2.99E-04	3.13E-04	1.03E-04
Total dioxins and dibenzofurans	No CAS #	No data	No data	No data	No data	No data	No data	No data	No data
Polychlorinated Biphenyls (PCBs)									
2,2',3,3',4,4',5-Heptachlorobiphenyl	35065-30-6	6.93E-02	1.49E-03	2.68E-02	2.88E-02	8.98E-03	1.04E-01	1.09E-01	3.59E-02
2,2',3,4,4',5,5'-Heptachlorobiphenyl	35065-29-3	7.60E-02	1.63E-03	2.93E-02	3.15E-02	9.85E-03	1.14E-01	1.19E-01	3.94E-02
2,3,3',4,4',5,5'-Heptachlorobiphenyl	39635-31-9	No data	No data	No data	No data	No data	No data	No data	No data
2,3,3',4,4',5'-Hexachlorobiphenyl	69782-90-7	No data	No data	No data	No data	No data	No data	No data	No data
2,3,3',4,4',5-Hexachlorobiphenyl	38380-08-4	No data	No data	No data	No data	No data	No data	No data	No data
2,3,3',4,4'-Pentachlorobiphenyl	32598-14-4	No data	No data	No data	No data	No data	No data	No data	No data
2,3',4,4',5,5'-Hexachlorobiphenyl	52663-72-6	No data	No data	No data	No data	No data	No data	No data	No data
2,3,4,4',5-Pentachlorobiphenyl	74472-37-0	No data	No data	No data	No data	No data	No data	No data	No data
2',3,4,4',5-Pentachlorobiphenyl	65510-44-3	No data	No data	No data	No data	No data	No data	No data	No data

Table C2-3 Bioaccumulation Factors for Accumulation of COPCs and ROPCs from Food by Mammals and Birds

Constituent of Potential Concern	CAS Registry Number	Log K_{ow} [a]	Mammal Ba[b] ([mg/kg tissue] / [mg ingested /day])	Bird Ba[c] ([mg/kg tissue] / [mg ingested /day])	Bioaccumulation Factor (BAF-T_p) ([mg/kg tissue]/[mg/kg food])			
					Mule Deer[d]	Mourning Dove[d]	Great Basin Pocket Mouse[d]	Western Meadow-lark[d]
2,3',4,4',5-Pentachlorobiphenyl	31508-00-6	7.12	3.31E-01	2.65E-01	7.65E-01	7.18E-03	2.22E-03	6.97E-04
3,3',4,4',5,5'-Hexachlorobiphenyl	32774-16-6	7.41	6.43E-01	5.14E-01	1.49E+00	1.39E-02	4.30E-03	1.35E-03
3,3',4,4',5-Pentachlorobiphenyl	57465-28-8	No data	No data	No data	No data	No data	No data	No data
3,3',4,4'-Tetrachlorobiphenyl	32598-13-3	No data	No data	No data	No data	No data	No data	No data
3,4,4',5-Tetrachlorobiphenyl	70362-50-4	No data	No data	No data	No data	No data	No data	No data
Polychlorinated biphenyls (PCBs)[e]	1336-36-3	6.29	4.90E-02	3.92E-02	1.13E-01	1.06E-03	3.28E-04	1.03E-04
Phthalates								
Bis(2-ethylhexyl) phthalate (DEHP)	117-81-7	5.20	4.02E-03	3.22E-03	9.29E-03	8.71E-05	2.69E-05	8.46E-06
Butylbenzyl phthalate	85-68-7	4.41	6.51E-04	5.20E-04	1.50E-03	1.41E-05	4.36E-06	1.37E-06
Dibutyl phthalate	84-74-2	4.72	1.32E-03	1.05E-03	3.05E-03	2.86E-05	8.83E-06	2.78E-06
Diethyl phthalate	84-66-2	4.44	6.86E-04	5.49E-04	1.59E-03	1.49E-05	4.59E-06	1.44E-06
Dimethyl phthalate	131-11-3	1.63	1.08E-06	8.64E-07	2.50E-06	2.34E-08	7.23E-09	2.27E-09
n-Dioctyl phthalate	117-84-0	9.33	5.37E+01	4.29E+01	1.24E+02	1.16E+00	3.59E-01	1.13E-01
Light Polycyclic Aromatic Hydrocarbons (molecular weight <200 g/mole)								
2-Chloronaphthalene	91-58-7	4.07	2.94E-04	2.35E-04	6.79E-04	6.37E-06	1.97E-06	6.19E-07
2-Methyl naphthalene	91-57-6	3.86	1.82E-04	1.46E-04	4.21E-04	3.94E-06	1.22E-06	3.83E-07
5-Nitroacenaphthene	602-87-9	No data	No data	No data	No data	No data	No data	No data
Acenaphthene	83-32-9	3.96	2.32E-04	1.85E-04	5.35E-04	5.02E-06	1.55E-06	4.88E-07
Acenaphthylene	208-96-8	4.07	2.95E-04	2.36E-04	6.82E-04	6.40E-06	1.98E-06	6.21E-07
Anthracene	120-12-7	4.47	7.41E-04	5.93E-04	1.71E-03	1.61E-05	4.96E-06	1.56E-06
Fluorene	86-73-7	4.17	3.72E-04	2.98E-04	8.60E-04	8.06E-06	2.49E-06	7.83E-07
Indene	95-13-6	No data	No data	No data	No data	No data	No data	No data
Naphthalene	91-20-3	3.37	5.93E-05	4.74E-05	1.37E-04	1.29E-06	3.97E-07	1.25E-07
Phenanthrene	85-01-8	4.55	8.92E-04	7.13E-04	2.06E-03	1.93E-05	5.97E-06	1.88E-06
Pyrene	129-00-0	5.00	2.51E-03	2.01E-03	5.81E-03	5.44E-05	1.68E-05	5.29E-06

Table C2-3 Bioaccumulation Factors for Accumulation of COPCs and ROPCs from Food by Mammals and Birds

Constituent of Potential Concern	CAS Registry Number	Bioaccumulation Factor (BAF-T_p) ([mg/kg tissue]/[mg/kg food])							
		Coyote[d]	Burrowing Owl[d]	Red-tailed Hawk[d]	Canada Goose[d]	Spotted Sandpiper[d]	Great Blue Heron[d]	Bald Eagle[d]	Mink[d]
2,3',4,4',5-Pentachlorobiphenyl	31508-00-6	7.60E-02	1.63E-03	2.93E-02	3.15E-02	9.85E-03	1.14E-01	1.19E-01	3.94E-02
3,3',4,4',5,5'-Hexachlorobiphenyl	32774-16-6	1.47E-01	3.16E-03	5.70E-02	6.12E-02	1.91E-02	2.21E-01	2.31E-01	7.65E-02
3,3',4,4',5-Pentachlorobiphenyl	57465-28-8	No data	No data	No data	No data	No data	No data	No data	No data
3,3',4,4'-Tetrachlorobiphenyl	32598-13-3	No data	No data	No data	No data	No data	No data	No data	No data
3,4,4',5-Tetrachlorobiphenyl	70362-50-4	No data	No data	No data	No data	No data	No data	No data	No data
Polychlorinated biphenyls (PCBs)[e]	1336-36-3	1.12E-02	2.41E-04	4.34E-03	4.66E-03	1.46E-03	1.69E-02	1.76E-02	5.83E-03
Phthalates									
Bis(2-ethylhexyl) phthalate (DEHP)	117-81-7	9.23E-04	1.98E-05	3.56E-04	3.83E-04	1.20E-04	1.38E-03	1.45E-03	4.78E-04
Butylbenzyl phthalate	85-68-7	1.49E-04	3.20E-06	5.77E-05	6.20E-05	1.94E-05	2.24E-04	2.34E-04	7.74E-05
Dibutyl phthalate	84-74-2	3.03E-04	6.49E-06	1.17E-04	1.26E-04	3.92E-05	4.54E-04	4.75E-04	1.57E-04
Diethyl phthalate	84-66-2	1.57E-04	3.37E-06	6.08E-05	6.53E-05	2.04E-05	2.36E-04	2.47E-04	8.16E-05
Dimethyl phthalate	131-11-3	2.48E-07	5.31E-09	9.57E-08	1.03E-07	3.21E-08	3.72E-07	3.89E-07	1.29E-07
n-Dioctyl phthalate	117-84-0	1.23E+01	2.64E-01	4.76E+00	5.11E+00	1.60E+00	1.85E+01	1.93E+01	6.39E+00
Light Polycyclic Aromatic Hydrocarbons (molecular weight <200 g/mole)									
2-Chloronaphthalene	91-58-7	6.74E-05	1.45E-06	2.60E-05	2.80E-05	8.74E-06	1.01E-04	1.06E-04	3.50E-05
2-Methyl naphthalene	91-57-6	4.18E-05	8.95E-07	1.61E-05	1.73E-05	5.41E-06	6.26E-05	6.55E-05	2.17E-05
5-Nitroacenaphthene	602-87-9	No data	No data	No data	No data	No data	No data	No data	No data
Acenaphthene	83-32-9	5.32E-05	1.14E-06	2.05E-05	2.21E-05	6.89E-06	7.97E-05	8.34E-05	2.76E-05
Acenaphthylene	208-96-8	6.77E-05	1.45E-06	2.62E-05	2.81E-05	8.78E-06	1.02E-04	1.06E-04	3.51E-05
Anthracene	120-12-7	1.70E-04	3.65E-06	6.57E-05	7.06E-05	2.20E-05	2.55E-04	2.67E-04	8.82E-05
Fluorene	86-73-7	8.54E-05	1.83E-06	3.30E-05	3.54E-05	1.11E-05	1.28E-04	1.34E-04	4.43E-05
Indene	95-13-6	No data	No data	No data	No data	No data	No data	No data	No data
Naphthalene	91-20-3	1.36E-05	2.92E-07	5.25E-06	5.65E-06	1.76E-06	2.04E-05	2.13E-05	7.05E-06
Phenanthrene	85-01-8	2.05E-04	4.39E-06	7.90E-05	8.49E-05	2.65E-05	3.07E-04	3.21E-04	1.06E-04
Pyrene	129-00-0	5.76E-04	1.24E-05	2.23E-04	2.39E-04	7.47E-05	8.64E-04	9.04E-04	2.99E-04

Table C2-3 Bioaccumulation Factors for Accumulation of COPCs and ROPCs from Food by Mammals and Birds

Constituent of Potential Concern	CAS Registry Number	Log K_{ow} [a]	Mammal Ba[b] ([mg/kg tissue] / [mg ingested /day])	Bird Ba[c] ([mg/kg tissue] / [mg ingested /day])	Bioaccumulation Factor (BAF-T_p) ([mg/kg tissue]/[mg/kg food])			
					Mule Deer[d]	Mourning Dove[d]	Great Basin Pocket Mouse[d]	Western Meadow-lark[d]
Heavy Polycyclic Aromatic Hydrocarbons (molecular weight >200 g/mole)								
3-Methylcholanthrene	56-49-5	7.11	3.24E-01	2.59E-01	7.48E-01	7.01E-03	2.17E-03	6.81E-04
5-Methylchrysene	3697-24-3	No data	No data	No data	No data	No data	No data	No data
Benzo[a]anthracene	56-55-3	5.68	1.20E-02	9.62E-03	2.78E-02	2.61E-04	8.05E-05	2.53E-05
Benzo[a]pyrene	50-32-8	6.13	2.74E-02	2.20E-02	6.34E-02	5.95E-04	1.84E-04	5.78E-05
Benzo[a,i]pyrene	191-30-0	No data	No data	No data	No data	No data	No data	No data
Benzo[b]fluoranthene	205-99-2	6.20	4.00E-02	3.20E-02	9.25E-02	8.68E-04	2.68E-04	8.43E-05
Benzo[e]pyrene	192-97-2	7.40	6.31E-01	5.05E-01	1.46E+00	1.37E-02	4.23E-03	1.33E-03
Benzo[g,h,i]perylene	191-24-2	7.10	3.16E-01	2.53E-01	7.31E-01	6.85E-03	2.12E-03	6.66E-04
Benzo[j]fluoranthene	205-82-3	6.44	6.92E-02	5.53E-02	1.60E-01	1.50E-03	4.63E-04	1.46E-04
Benzo[k]fluoranthene	207-08-9	6.19	3.98E-02	3.18E-02	9.20E-02	8.63E-04	2.67E-04	8.38E-05
Chrysene	218-01-9	5.74	1.38E-02	1.11E-02	3.19E-02	3.00E-04	9.26E-05	2.91E-05
Dibenz[a,h]acridine	226-36-8	No data	No data	No data	No data	No data	No data	No data
Dibenz[a,h]anthracene	53-70-3	6.55	8.86E-02	7.09E-02	2.05E-01	1.92E-03	5.93E-04	1.87E-04
Dibenz[a,j]acridine	224-42-0	No data	No data	No data	No data	No data	No data	No data
Dibenzo[a,e]fluoranthene	5385-75-1	No data	No data	No data	No data	No data	No data	No data
Dibenzo[a,e]pyrene	192-65-4	No data	No data	No data	No data	No data	No data	No data
Dibenzo[a,h]fluoranthene	No CAS #	No data	No data	No data	No data	No data	No data	No data
Dibenzo[a,h]pyrene	189-64-0	No data	No data	No data	No data	No data	No data	No data
Dibenzo[a,i]pyrene	189-55-9	7.29	4.90E-01	3.92E-01	1.13E+00	1.06E-02	3.28E-03	1.03E-03
Fluoranthene	206-44-0	5.08	3.04E-03	2.43E-03	7.03E-03	6.59E-05	2.04E-05	6.40E-06
Hexachloronaphthalene	1335-87-1	7.59	9.77E-01	7.82E-01	2.26E+00	2.12E-02	6.55E-03	2.06E-03
Indeno[1,2,3-cd]pyrene	193-39-5	6.91	2.07E-01	1.66E-01	4.78E-01	4.48E-03	1.39E-03	4.36E-04
Octachloronaphthalene	2234-13-1	6.42	6.61E-02	5.29E-02	1.53E-01	1.43E-03	4.43E-04	1.39E-04
Pentachloronaphthalene	1321-64-8	No data	No data	No data	No data	No data	No data	No data
Tetrachloronaphthalene	1335-88-2	No data	No data	No data	No data	No data	No data	No data

Table C2-3 Bioaccumulation Factors for Accumulation of COPCs and ROPCs from Food by Mammals and Birds

Constituent of Potential Concern	CAS Registry Number	Bioaccumulation Factor (BAF-T_p) ([mg/kg tissue]/[mg/kg food])							
		Coyote[d]	Burrowing Owl[d]	Red-tailed Hawk[d]	Canada Goose[d]	Spotted Sandpiper[d]	Great Blue Heron[d]	Bald Eagle[d]	Mink[d]
Heavy Polycyclic Aromatic Hydrocarbons (molecular weight >200 g/mole)									
3-Methylcholanthrene	56-49-5	7.43E-02	1.59E-03	2.87E-02	3.08E-02	9.63E-03	1.11E-01	1.16E-01	3.85E-02
5-Methylchrysene	3697-24-3	No data	No data	No data	No data	No data	No data	No data	No data
Benzo[a]anthracene	56-55-3	2.76E-03	5.92E-05	1.07E-03	1.14E-03	3.58E-04	4.14E-03	4.33E-03	1.43E-03
Benzo[a]pyrene	50-32-8	6.30E-03	1.35E-04	2.43E-03	2.61E-03	8.16E-04	9.44E-03	9.88E-03	3.27E-03
Benzo[a,i]pyrene	191-30-0	No data	No data	No data	No data	No data	No data	No data	No data
Benzo[b]fluoranthene	205-99-2	9.19E-03	1.97E-04	3.55E-03	3.81E-03	1.19E-03	1.38E-02	1.44E-02	4.76E-03
Benzo[e]pyrene	192-97-2	1.45E-01	3.10E-03	5.59E-02	6.01E-02	1.88E-02	2.17E-01	2.27E-01	7.51E-02
Benzo[g,h,i]perylene	191-24-2	7.26E-02	1.56E-03	2.80E-02	3.01E-02	9.41E-03	1.09E-01	1.14E-01	3.76E-02
Benzo[j]fluoranthene	205-82-3	1.59E-02	3.40E-04	6.13E-03	6.59E-03	2.06E-03	2.38E-02	2.49E-02	8.23E-03
Benzo[k]fluoranthene	207-08-9	9.14E-03	1.96E-04	3.53E-03	3.79E-03	1.18E-03	1.37E-02	1.43E-02	4.74E-03
Chrysene	218-01-9	3.17E-03	6.80E-05	1.22E-03	1.32E-03	4.11E-04	4.76E-03	4.98E-03	1.64E-03
Dibenz[a,h]acridine	226-36-8	No data	No data	No data	No data	No data	No data	No data	No data
Dibenz[a,h]anthracene	53-70-3	2.03E-02	4.36E-04	7.85E-03	8.44E-03	2.64E-03	3.05E-02	3.19E-02	1.05E-02
Dibenz[a,j]acridine	224-42-0	No data	No data	No data	No data	No data	No data	No data	No data
Dibenzo[a,e]fluoranthene	5385-75-1	No data	No data	No data	No data	No data	No data	No data	No data
Dibenzo[a,e]pyrene	192-65-4	No data	No data	No data	No data	No data	No data	No data	No data
Dibenzo[a,h]fluoranthene	No CAS #	No data	No data	No data	No data	No data	No data	No data	No data
Dibenzo[a,h]pyrene	189-64-0	No data	No data	No data	No data	No data	No data	No data	No data
Dibenzo[a,i]pyrene	189-55-9	1.12E-01	2.41E-03	4.34E-02	4.66E-02	1.46E-02	1.69E-01	1.76E-01	5.83E-02
Fluoranthene	206-44-0	6.98E-04	1.50E-05	2.69E-04	2.89E-04	9.04E-05	1.05E-03	1.09E-03	3.62E-04
Hexachloronaphthalene	1335-87-1	2.24E-01	4.81E-03	8.66E-02	9.31E-02	2.91E-02	3.36E-01	3.52E-01	1.16E-01
Indeno[1,2,3-cd]pyrene	193-39-5	4.75E-02	1.02E-03	1.83E-02	1.97E-02	6.16E-03	7.12E-02	7.45E-02	2.46E-02
Octachloronaphthalene	2234-13-1	1.52E-02	3.25E-04	5.86E-03	6.29E-03	1.97E-03	2.27E-02	2.38E-02	7.87E-03
Pentachloronaphthalene	1321-64-8	No data	No data	No data	No data	No data	No data	No data	No data
Tetrachloronaphthalene	1335-88-2	No data	No data	No data	No data	No data	No data	No data	No data

Table C2-3 Bioaccumulation Factors for Accumulation of COPCs and ROPCs from Food by Mammals and Birds

Constituent of Potential Concern	CAS Registry Number	Log K_{ow} [a]	Mammal Ba[b] ([mg/kg tissue] / [mg ingested /day])	Bird Ba[c] ([mg/kg tissue] / [mg ingested /day])	Bioaccumulation Factor (BAF-T_p) ([mg/kg tissue]/[mg/kg food])			
					Mule Deer[d]	Mourning Dove[d]	Great Basin Pocket Mouse[d]	Western Meadow-lark[d]
Trichloronaphthalene	1321-65-9	No data	No data	No data	No data	No data	No data	No data
Light Substituted Benzene Compounds (molecular weight <200 g/mole)								
1,2,3-Trichlorobenzene	87-61-6	4.05	2.79E-04	2.23E-04	6.45E-04	6.04E-06	1.87E-06	5.87E-07
1,2,4-Trichlorobenzene	120-82-1	3.99	2.44E-04	1.96E-04	5.65E-04	5.30E-06	1.64E-06	5.15E-07
1,2,4-Trimethyl benzene	95-63-6	3.65	1.12E-04	8.98E-05	2.59E-04	2.43E-06	7.51E-07	2.36E-07
1,2-Dichlorobenzene	95-50-1	3.45	7.01E-05	5.61E-05	1.62E-04	1.52E-06	4.69E-07	1.48E-07
1,3,5-Trimethyl benzene	108-67-8	3.42	6.61E-05	5.29E-05	1.53E-04	1.43E-06	4.42E-07	1.39E-07
1,3-Dichlorobenzene	541-73-1	3.53	8.52E-05	6.81E-05	1.97E-04	1.85E-06	5.70E-07	1.79E-07
1,3-Dinitrobenzene	99-65-0	1.49	7.79E-07	6.23E-07	1.80E-06	1.69E-08	5.22E-09	1.64E-09
1,4-Dichlorobenzene	106-46-7	3.41	6.48E-05	5.18E-05	1.50E-04	1.40E-06	4.34E-07	1.36E-07
1,4-Dinitrobenzene	100-25-4	1.50	7.94E-07	6.35E-07	1.84E-06	1.72E-08	5.32E-09	1.67E-09
2,4,5-Trichlorophenol	95-95-4	3.87	1.86E-04	1.49E-04	4.30E-04	4.03E-06	1.25E-06	3.92E-07
2,4,6-Trichlorophenol	88-06-2	3.71	1.29E-04	1.03E-04	2.99E-04	2.80E-06	8.66E-07	2.72E-07
2,4-Dichlorophenol	120-83-2	3.04	2.74E-05	2.19E-05	6.33E-05	5.93E-07	1.83E-07	5.77E-08
2,4-Dimethylphenol	105-67-9	2.36	5.75E-06	4.60E-06	1.33E-05	1.25E-07	3.85E-08	1.21E-08
2,4-Dinitrophenol	51-28-5	1.52	8.29E-07	6.63E-07	1.92E-06	1.80E-08	5.55E-09	1.75E-09
2,4-Dinitrotoluene	121-14-2	2.00	2.49E-06	1.99E-06	5.76E-06	5.40E-08	1.67E-08	5.24E-09
2,6-Dinitrotoluene	606-20-2	1.89	1.93E-06	1.55E-06	4.47E-06	4.19E-08	1.29E-08	4.07E-09
2-Chlorophenol	95-57-8	2.16	3.64E-06	2.91E-06	8.42E-06	7.90E-08	2.44E-08	7.67E-09
2-Chlorotoluene	95-49-8	3.54	8.64E-05	6.91E-05	2.00E-04	1.87E-06	5.78E-07	1.82E-07
2-Nitrophenol	88-75-5	1.79	1.55E-06	1.24E-06	3.58E-06	3.36E-08	1.04E-08	3.26E-09
4,6-Dinitro-o-cresol	534-52-1	2.12	3.31E-06	2.65E-06	7.65E-06	7.18E-08	2.22E-08	6.97E-09
4-Chlorotoluene	106-43-4	3.33	5.37E-05	4.30E-05	1.24E-04	1.16E-06	3.60E-07	1.13E-07
4-Nitrophenol	100-02-7	1.91	2.04E-06	1.63E-06	4.72E-06	4.43E-08	1.37E-08	4.30E-09
alpha-Methylstyrene	98-83-9	3.46	7.30E-05	5.84E-05	1.69E-04	1.58E-06	4.89E-07	1.54E-07
Aniline	62-53-3	0.98	2.40E-07	1.92E-07	5.55E-07	5.20E-09	1.61E-09	5.05E-10

Table C2-3 Bioaccumulation Factors for Accumulation of COPCs and ROPCs from Food by Mammals and Birds

Constituent of Potential Concern	CAS Registry Number	Bioaccumulation Factor (BAF-T_p) ([mg/kg tissue]/[mg/kg food])							
		Coyote[d]	Burrowing Owl[d]	Red-tailed Hawk[d]	Canada Goose[d]	Spotted Sandpiper[d]	Great Blue Heron[d]	Bald Eagle[d]	Mink[d]
Trichloronaphthalene	1321-65-9	No data	No data	No data	No data	No data	No data	No data	No data
Light Substituted Benzene Compounds (molecular weight <200 g/mole)									
1,2,3-Trichlorobenzene	87-61-6	6.40E-05	1.37E-06	2.47E-05	2.66E-05	8.29E-06	9.60E-05	1.00E-04	3.32E-05
1,2,4-Trichlorobenzene	120-82-1	5.61E-05	1.20E-06	2.17E-05	2.33E-05	7.27E-06	8.41E-05	8.80E-05	2.91E-05
1,2,4-Trimethyl benzene	95-63-6	2.58E-05	5.52E-07	9.94E-06	1.07E-05	3.34E-06	3.86E-05	4.04E-05	1.34E-05
1,2-Dichlorobenzene	95-50-1	1.61E-05	3.45E-07	6.21E-06	6.67E-06	2.08E-06	2.41E-05	2.52E-05	8.34E-06
1,3,5-Trimethyl benzene	108-67-8	1.52E-05	3.25E-07	5.85E-06	6.29E-06	1.97E-06	2.27E-05	2.38E-05	7.86E-06
1,3-Dichlorobenzene	541-73-1	1.95E-05	4.19E-07	7.55E-06	8.11E-06	2.53E-06	2.93E-05	3.07E-05	1.01E-05
1,3-Dinitrobenzene	99-65-0	1.79E-07	3.83E-09	6.90E-08	7.42E-08	2.32E-08	2.68E-07	2.80E-07	9.27E-08
1,4-Dichlorobenzene	106-46-7	1.49E-05	3.19E-07	5.74E-06	6.17E-06	1.93E-06	2.23E-05	2.33E-05	7.71E-06
1,4-Dinitrobenzene	100-25-4	1.82E-07	3.91E-09	7.04E-08	7.56E-08	2.36E-08	2.73E-07	2.86E-07	9.45E-08
2,4,5-Trichlorophenol	95-95-4	4.27E-05	9.16E-07	1.65E-05	1.77E-05	5.54E-06	6.41E-05	6.70E-05	2.21E-05
2,4,6-Trichlorophenol	88-06-2	2.97E-05	6.36E-07	1.15E-05	1.23E-05	3.85E-06	4.45E-05	4.66E-05	1.54E-05
2,4-Dichlorophenol	120-83-2	6.28E-06	1.35E-07	2.43E-06	2.61E-06	8.15E-07	9.42E-06	9.86E-06	3.26E-06
2,4-Dimethylphenol	105-67-9	1.32E-06	2.83E-08	5.10E-07	5.48E-07	1.71E-07	1.98E-06	2.07E-06	6.85E-07
2,4-Dinitrophenol	51-28-5	1.90E-07	4.08E-09	7.35E-08	7.89E-08	2.47E-08	2.85E-07	2.98E-07	9.86E-08
2,4-Dinitrotoluene	121-14-2	5.72E-07	1.23E-08	2.21E-07	2.37E-07	7.41E-08	8.57E-07	8.97E-07	2.96E-07
2,6-Dinitrotoluene	606-20-2	4.44E-07	9.51E-09	1.71E-07	1.84E-07	5.75E-08	6.65E-07	6.96E-07	2.30E-07
2-Chlorophenol	95-57-8	8.36E-07	1.79E-08	3.23E-07	3.47E-07	1.08E-07	1.25E-06	1.31E-06	4.33E-07
2-Chlorotoluene	95-49-8	1.98E-05	4.25E-07	7.65E-06	8.22E-06	2.57E-06	2.97E-05	3.11E-05	1.03E-05
2-Nitrophenol	88-75-5	3.56E-07	7.63E-09	1.37E-07	1.48E-07	4.61E-08	5.33E-07	5.58E-07	1.84E-07
4,6-Dinitro-o-cresol	534-52-1	7.60E-07	1.63E-08	2.93E-07	3.15E-07	9.85E-08	1.14E-06	1.19E-06	3.94E-07
4-Chlorotoluene	106-43-4	1.23E-05	2.64E-07	4.76E-06	5.11E-06	1.60E-06	1.85E-05	1.93E-05	6.39E-06
4-Nitrophenol	100-02-7	4.69E-07	1.00E-08	1.81E-07	1.94E-07	6.08E-08	7.03E-07	7.35E-07	2.43E-07
alpha-Methylstyrene	98-83-9	1.68E-05	3.59E-07	6.47E-06	6.96E-06	2.17E-06	2.51E-05	2.63E-05	8.69E-06
Aniline	62-53-3	5.51E-08	1.18E-09	2.13E-08	2.28E-08	7.14E-09	8.26E-08	8.64E-08	2.85E-08

Table C2-3 Bioaccumulation Factors for Accumulation of COPCs and ROPCs from Food by Mammals and Birds

Constituent of Potential Concern	CAS Registry Number	Log K_{ow} [a]	Mammal Ba[b] ([mg/kg tissue] / [mg ingested /day])	Bird Ba[c] ([mg/kg tissue] / [mg ingested /day])	Bioaccumulation Factor (BAF-T_p) ([mg/kg tissue]/[mg/kg food])			
					Mule Deer[d]	Mourning Dove[d]	Great Basin Pocket Mouse[d]	Western Meadow-lark[d]
Benzotrichloride	98-07-7	2.92	2.09E-05	1.67E-05	4.83E-05	4.53E-07	1.40E-07	4.40E-08
Benzyl chloride	100-44-7	2.30	5.01E-06	4.01E-06	1.16E-05	1.09E-07	3.36E-08	1.05E-08
Bromobenzene	108-86-1	2.99	2.45E-05	1.96E-05	5.67E-05	5.32E-07	1.64E-07	5.17E-08
Chlorobenzene	108-90-7	2.79	1.55E-05	1.24E-05	3.58E-05	3.35E-07	1.04E-07	3.26E-08
Cumene	98-82-8	3.61	1.03E-04	8.24E-05	2.38E-04	2.23E-06	6.90E-07	2.17E-07
m-Cresol	108-39-4	1.96	2.29E-06	1.83E-06	5.28E-06	4.95E-08	1.53E-08	4.81E-09
n-Butyl benzene	104-51-8	4.28	4.79E-04	3.83E-04	1.11E-03	1.04E-05	3.21E-06	1.01E-06
Nitrobenzene	98-95-3	1.83	1.71E-06	1.37E-06	3.96E-06	3.71E-08	1.15E-08	3.60E-09
n-Propyl benzene	103-65-1	3.69	1.23E-04	9.84E-05	2.84E-04	2.67E-06	8.24E-07	2.59E-07
o-Cresol	95-48-7	2.02	2.64E-06	2.11E-06	6.10E-06	5.72E-08	1.77E-08	5.55E-09
o-Dinitrobenzene	528-29-0	1.69	1.23E-06	9.84E-07	2.84E-06	2.67E-08	8.24E-09	2.59E-09
o-Nitroaniline	88-74-4	1.85	1.78E-06	1.42E-06	4.11E-06	3.86E-08	1.19E-08	3.74E-09
o-Toluidine	95-53-4	1.34	5.50E-07	4.40E-07	1.27E-06	1.19E-08	3.68E-09	1.16E-09
p-Chloroaniline	106-47-8	1.87	1.86E-06	1.49E-06	4.30E-06	4.03E-08	1.24E-08	3.91E-09
p-Cresol	106-44-5	1.94	2.19E-06	1.75E-06	5.05E-06	4.74E-08	1.46E-08	4.60E-09
Phenol	108-95-2	1.48	7.54E-07	6.03E-07	1.74E-06	1.63E-08	5.05E-09	1.59E-09
p-Nitrochlorobenzene	100-00-5	2.39	6.17E-06	4.93E-06	1.43E-05	1.34E-07	4.13E-08	1.30E-08
p-Toluidine	106-49-0	1.40	6.31E-07	5.05E-07	1.46E-06	1.37E-08	4.23E-09	1.33E-09
sec-Butyl benzene	135-98-8	No data	No data	No data	No data	No data	No data	No data
tert-Butyl benzene	98-06-6	4.11	3.24E-04	2.59E-04	7.48E-04	7.01E-06	2.17E-06	6.81E-07
Toluene-2,6-diamine	823-40-5	0.16	3.63E-08	2.90E-08	8.39E-08	7.87E-10	2.43E-10	7.64E-11
Trimethyl benzene	25551-13-7	3.42	6.61E-05	5.29E-05	1.53E-04	1.43E-06	4.42E-07	1.39E-07
Other Light Semivolatile Compounds (molecular weight <200 g/mole)								
1,1'-Biphenyl	92-52-4	3.90	2.00E-04	1.60E-04	4.61E-04	4.33E-06	1.34E-06	4.20E-07
1,1-Dimethylhydrazine	57-14-7	-1.19	1.62E-09	1.30E-09	3.75E-09	3.52E-11	1.09E-11	3.41E-12
1,2-Dimethylhydrazine	540-73-8	-1.37	1.08E-09	8.61E-10	2.49E-09	2.33E-11	7.21E-12	2.27E-12

Table C2-3 Bioaccumulation Factors for Accumulation of COPCs and ROPCs from Food by Mammals and Birds

Constituent of Potential Concern	CAS Registry Number	Bioaccumulation Factor (BAF-T_p) ([mg/kg tissue]/[mg/kg food])							
		Coyote[d]	Burrowing Owl[d]	Red-tailed Hawk[d]	Canada Goose[d]	Spotted Sandpiper[d]	Great Blue Heron[d]	Bald Eagle[d]	Mink[d]
Benzotrichloride	98-07-7	4.79E-06	1.03E-07	1.85E-06	1.99E-06	6.22E-07	7.19E-06	7.52E-06	2.49E-06
Benzyl chloride	100-44-7	1.15E-06	2.46E-08	4.44E-07	4.77E-07	1.49E-07	1.72E-06	1.80E-06	5.96E-07
Bromobenzene	108-86-1	5.63E-06	1.21E-07	2.18E-06	2.34E-06	7.30E-07	8.45E-06	8.84E-06	2.92E-06
Chlorobenzene	108-90-7	3.55E-06	7.61E-08	1.37E-06	1.47E-06	4.60E-07	5.33E-06	5.57E-06	1.84E-06
Cumene	98-82-8	2.36E-05	5.07E-07	9.13E-06	9.81E-06	3.06E-06	3.54E-05	3.71E-05	1.23E-05
m-Cresol	108-39-4	5.25E-07	1.12E-08	2.03E-07	2.18E-07	6.80E-08	7.87E-07	8.23E-07	2.72E-07
n-Butyl benzene	104-51-8	1.10E-04	2.35E-06	4.24E-05	4.56E-05	1.42E-05	1.65E-04	1.72E-04	5.70E-05
Nitrobenzene	98-95-3	3.93E-07	8.42E-09	1.52E-07	1.63E-07	5.09E-08	5.89E-07	6.16E-07	2.04E-07
n-Propyl benzene	103-65-1	2.82E-05	6.05E-07	1.09E-05	1.17E-05	3.66E-06	4.23E-05	4.43E-05	1.46E-05
o-Cresol	95-48-7	6.05E-07	1.30E-08	2.34E-07	2.51E-07	7.85E-08	9.08E-07	9.49E-07	3.14E-07
o-Dinitrobenzene	528-29-0	2.82E-07	6.05E-09	1.09E-07	1.17E-07	3.66E-08	4.23E-07	4.43E-07	1.46E-07
o-Nitroaniline	88-74-4	4.08E-07	8.75E-09	1.58E-07	1.69E-07	5.29E-08	6.12E-07	6.40E-07	2.12E-07
o-Toluidine	95-53-4	1.26E-07	2.71E-09	4.88E-08	5.24E-08	1.64E-08	1.89E-07	1.98E-07	6.55E-08
p-Chloroaniline	106-47-8	4.27E-07	9.15E-09	1.65E-07	1.77E-07	5.53E-08	6.40E-07	6.69E-07	2.21E-07
p-Cresol	106-44-5	5.02E-07	1.08E-08	1.94E-07	2.08E-07	6.50E-08	7.52E-07	7.87E-07	2.60E-07
Phenol	108-95-2	1.73E-07	3.71E-09	6.68E-08	7.18E-08	2.24E-08	2.59E-07	2.71E-07	8.97E-08
p-Nitrochlorobenzene	100-00-5	1.42E-06	3.03E-08	5.46E-07	5.87E-07	1.83E-07	2.12E-06	2.22E-06	7.34E-07
p-Toluidine	106-49-0	1.45E-07	3.10E-09	5.59E-08	6.01E-08	1.88E-08	2.17E-07	2.27E-07	7.51E-08
sec-Butyl benzene	135-98-8	No data	No data	No data	No data	No data	No data	No data	No data
tert-Butyl benzene	98-06-6	7.43E-05	1.59E-06	2.87E-05	3.08E-05	9.63E-06	1.11E-04	1.16E-04	3.85E-05
Toluene-2,6-diamine	823-40-5	8.33E-09	1.79E-10	3.22E-09	3.46E-09	1.08E-09	1.25E-08	1.31E-08	4.32E-09
Trimethyl benzene	25551-13-7	1.52E-05	3.25E-07	5.86E-06	6.29E-06	1.97E-06	2.27E-05	2.38E-05	7.86E-06
Other Light Semivolatile Compounds (molecular weight <200 g/mole)									
1,1'-Biphenyl	92-52-4	4.58E-05	9.82E-07	1.77E-05	1.90E-05	5.94E-06	6.87E-05	7.18E-05	2.37E-05
1,1-Dimethylhydrazine	57-14-7	3.72E-10	7.98E-12	1.44E-10	1.54E-10	4.82E-11	5.58E-10	5.84E-10	1.93E-10
1,2-Dimethylhydrazine	540-73-8	2.47E-10	5.30E-12	9.54E-11	1.03E-10	3.20E-11	3.70E-10	3.88E-10	1.28E-10

Table C2-3 Bioaccumulation Factors for Accumulation of COPCs and ROPCs from Food by Mammals and Birds

Constituent of Potential Concern	CAS Registry Number	Log K_{ow} [a]	Mammal Ba[b] ([mg/kg tissue] / [mg ingested /day])	Bird Ba[c] ([mg/kg tissue] / [mg ingested /day])	Bioaccumulation Factor (BAF-T_p) ([mg/kg tissue]/[mg/kg food])			
					Mule Deer[d]	Mourning Dove[d]	Great Basin Pocket Mouse[d]	Western Meadow-lark[d]
1,2-Diphenylhydrazine	122-66-7	2.94	2.19E-05	1.75E-05	5.06E-05	4.74E-07	1.47E-07	4.61E-08
1,3-Propane sultone	1120-71-4	-0.52	7.53E-09	6.03E-09	1.74E-08	1.63E-10	5.05E-11	1.59E-11
2,4-Toluene diisocyanate	584-84-9	No data	No data	No data	No data	No data	No data	No data
2-Chloroacetophenone	532-27-4	1.93	2.14E-06	1.71E-06	4.94E-06	4.63E-08	1.43E-08	4.50E-09
2-Propenoic acid	79-10-7	0.43	6.76E-08	5.41E-08	1.56E-07	1.47E-09	4.53E-10	1.42E-10
4,4'-Methylenedianiline	101-77-9	1.59	9.77E-07	7.82E-07	2.26E-06	2.12E-08	6.55E-09	2.06E-09
Acetophenone	98-86-2	1.64	1.10E-06	8.78E-07	2.54E-06	2.38E-08	7.35E-09	2.31E-09
Benzoic acid	65-85-0	1.87	1.86E-06	1.49E-06	4.30E-06	4.04E-08	1.25E-08	3.92E-09
bis(2-Chloroethoxy)methane	111-91-1	1.30	5.01E-07	4.01E-07	1.16E-06	1.09E-08	3.36E-09	1.06E-09
bis(2-Chloroethyl) ether	111-44-4	1.30	5.02E-07	4.02E-07	1.16E-06	1.09E-08	3.36E-09	1.06E-09
Chlorocyclopentadiene	41851-50-7	2.43	6.76E-06	5.41E-06	1.56E-05	1.47E-07	4.53E-08	1.42E-08
Cyclohexanol	108-93-0	1.23	4.27E-07	3.41E-07	9.86E-07	9.25E-09	2.86E-09	8.98E-10
Dichloroisopropyl ether	108-60-1	2.58	9.55E-06	7.64E-06	2.21E-05	2.07E-07	6.40E-08	2.01E-08
Dichloromethyl ether	542-88-1	0.58	9.55E-08	7.64E-08	2.21E-07	2.07E-09	6.40E-10	2.01E-10
Dichloropentadiene	61626-71-9	No data	No data	No data	No data	No data	No data	No data
Dimethyl sulfate	77-78-1	0.16	3.63E-08	2.90E-08	8.39E-08	7.87E-10	2.43E-10	7.64E-11
Dimethylaniline	121-69-7	2.31	5.13E-06	4.10E-06	1.19E-05	1.11E-07	3.43E-08	1.08E-08
Di-n-propylnitrosamine	621-64-7	1.38	6.03E-07	4.82E-07	1.39E-06	1.31E-08	4.04E-09	1.27E-09
Diphenyl ether	101-84-8	4.21	4.07E-04	3.26E-04	9.42E-04	8.83E-06	2.73E-06	8.58E-07
Epichlorohydrin	106-89-8	0.25	4.47E-08	3.58E-08	1.03E-07	9.69E-10	2.99E-10	9.41E-11
Ethyl carbamate (Urethane)	51-79-6	-0.15	1.78E-08	1.42E-08	4.11E-08	3.85E-10	1.19E-10	3.74E-11
Ethyl methanesulfonate	62-50-0	0.05	2.81E-08	2.25E-08	6.50E-08	6.10E-10	1.88E-10	5.92E-11
Ethylene dibromide	106-93-4	1.75	1.41E-06	1.13E-06	3.26E-06	3.06E-08	9.45E-09	2.97E-09
Ethylene glycol	107-21-1	-1.36	1.10E-09	8.77E-10	2.53E-09	2.38E-11	7.34E-12	2.31E-12
Ethylene glycol monobutyl ether	111-76-2	0.83	1.70E-07	1.36E-07	3.93E-07	3.68E-09	1.14E-09	3.58E-10
Ethylene glycol monoethyl ether acetate	111-15-9	0.59	9.77E-08	7.82E-08	2.26E-07	2.12E-09	6.55E-10	2.06E-10

Table C2-3 Bioaccumulation Factors for Accumulation of COPCs and ROPCs from Food by Mammals and Birds

Constituent of Potential Concern	CAS Registry Number	Bioaccumulation Factor (BAF-T_p) ([mg/kg tissue]/[mg/kg food])							
		Coyote[d]	Burrowing Owl[d]	Red-tailed Hawk[d]	Canada Goose[d]	Spotted Sandpiper[d]	Great Blue Heron[d]	Bald Eagle[d]	Mink[d]
1,2-Diphenylhydrazine	122-66-7	5.02E-06	1.08E-07	1.94E-06	2.08E-06	6.51E-07	7.53E-06	7.88E-06	2.60E-06
1,3-Propane sultone	1120-71-4	1.73E-09	3.71E-11	6.68E-10	7.17E-10	2.24E-10	2.59E-09	2.71E-09	8.96E-10
2,4-Toluene diisocyanate	584-84-9	No data	No data	No data	No data	No data	No data	No data	No data
2-Chloroacetophenone	532-27-4	4.91E-07	1.05E-08	1.89E-07	2.04E-07	6.36E-08	7.36E-07	7.70E-07	2.54E-07
2-Propenoic acid	79-10-7	1.55E-08	3.33E-10	5.99E-09	6.44E-09	2.01E-09	2.33E-08	2.43E-08	8.05E-09
4,4'-Methylenedianiline	101-77-9	2.24E-07	4.81E-09	8.66E-08	9.31E-08	2.91E-08	3.36E-07	3.52E-07	1.16E-07
Acetophenone	98-86-2	2.52E-07	5.40E-09	9.73E-08	1.05E-07	3.27E-08	3.78E-07	3.95E-07	1.31E-07
Benzoic acid	65-85-0	4.27E-07	9.16E-09	1.65E-07	1.77E-07	5.54E-08	6.41E-07	6.70E-07	2.22E-07
bis(2-Chloroethoxy)methane	111-91-1	1.15E-07	2.47E-09	4.44E-08	4.77E-08	1.49E-08	1.72E-07	1.80E-07	5.96E-08
bis(2-Chloroethyl) ether	111-44-4	1.15E-07	2.47E-09	4.45E-08	4.78E-08	1.49E-08	1.73E-07	1.81E-07	5.98E-08
Chlorocyclopentadiene	41851-50-7	1.55E-06	3.33E-08	5.99E-07	6.44E-07	2.01E-07	2.33E-06	2.43E-06	8.05E-07
Cyclohexanol	108-93-0	9.79E-08	2.10E-09	3.78E-08	4.06E-08	1.27E-08	1.47E-07	1.54E-07	5.08E-08
Dichloroisopropyl ether	108-60-1	2.19E-06	4.70E-08	8.46E-07	9.09E-07	2.84E-07	3.29E-06	3.44E-06	1.14E-06
Dichloromethyl ether	542-88-1	2.19E-08	4.70E-10	8.46E-09	9.09E-09	2.84E-09	3.29E-08	3.44E-08	1.14E-08
Dichloropentadiene	61626-71-9	No data	No data	No data	No data	No data	No data	No data	No data
Dimethyl sulfate	77-78-1	8.33E-09	1.79E-10	3.22E-09	3.46E-09	1.08E-09	1.25E-08	1.31E-08	4.32E-09
Dimethylaniline	121-69-7	1.18E-06	2.52E-08	4.54E-07	4.88E-07	1.53E-07	1.77E-06	1.85E-06	6.10E-07
Di-n-propylnitrosamine	621-64-7	1.38E-07	2.97E-09	5.34E-08	5.74E-08	1.79E-08	2.07E-07	2.17E-07	7.17E-08
Diphenyl ether	101-84-8	9.35E-05	2.00E-06	3.61E-05	3.88E-05	1.21E-05	1.40E-04	1.47E-04	4.85E-05
Epichlorohydrin	106-89-8	1.03E-08	2.20E-10	3.96E-09	4.26E-09	1.33E-09	1.54E-08	1.61E-08	5.32E-09
Ethyl carbamate (Urethane)	51-79-6	4.08E-09	8.75E-11	1.58E-09	1.69E-09	5.29E-10	6.12E-09	6.40E-09	2.12E-09
Ethyl methanesulfonate	62-50-0	6.46E-09	1.38E-10	2.49E-09	2.68E-09	8.37E-10	9.68E-09	1.01E-08	3.35E-09
Ethylene dibromide	106-93-4	3.24E-07	6.95E-09	1.25E-07	1.34E-07	4.20E-08	4.86E-07	5.08E-07	1.68E-07
Ethylene glycol	107-21-1	2.52E-10	5.39E-12	9.72E-11	1.04E-10	3.26E-11	3.77E-10	3.95E-10	1.30E-10
Ethylene glycol monobutyl ether	111-76-2	3.90E-08	8.36E-10	1.50E-08	1.62E-08	5.05E-09	5.84E-08	6.11E-08	2.02E-08
Ethylene glycol monoethyl ether acetate	111-15-9	2.24E-08	4.81E-10	8.66E-09	9.31E-09	2.91E-09	3.36E-08	3.52E-08	1.16E-08

Table C2-3 Bioaccumulation Factors for Accumulation of COPCs and ROPCs from Food by Mammals and Birds

Constituent of Potential Concern	CAS Registry Number	Log K_{ow} [a]	Mammal Ba[b] ([mg/kg tissue] / [mg ingested /day])	Bird Ba[c] ([mg/kg tissue] / [mg ingested /day])	Bioaccumulation Factor (BAF-T_p) ([mg/kg tissue]/[mg/kg food])			
					Mule Deer[d]	Mourning Dove[d]	Great Basin Pocket Mouse[d]	Western Meadow-lark[d]
Ethylene thiourea	96-45-7	-0.66	5.50E-09	4.40E-09	1.27E-08	1.19E-10	3.68E-11	1.16E-11
Furfural	98-01-1	0.96	2.29E-07	1.83E-07	5.30E-07	4.97E-09	1.53E-09	4.82E-10
Maleic hydrazide	123-33-1	-0.84	3.63E-09	2.90E-09	8.39E-09	7.87E-11	2.43E-11	7.64E-12
Malononitrile	109-77-3	-0.60	6.31E-09	5.05E-09	1.46E-08	1.37E-10	4.23E-11	1.33E-11
Methyl styrene (mixed isomers)	25013-15-4	3.48	7.59E-05	6.07E-05	1.75E-04	1.64E-06	5.08E-07	1.60E-07
Methylhydrazine	60-34-4	-1.05	2.24E-09	1.79E-09	5.18E-09	4.86E-11	1.50E-11	4.72E-12
N,N-Diphenylamine	122-39-4	3.50	7.94E-05	6.35E-05	1.84E-04	1.72E-06	5.32E-07	1.67E-07
Nitric acid, propyl ester	627-13-4	No data	No data	No data	No data	No data	No data	No data
N-Nitrosodi-n-butylamine	924-16-3	2.41	6.46E-06	5.16E-06	1.49E-05	1.40E-07	4.32E-08	1.36E-08
N-Nitrosomorpholine	59-89-2	0.98	2.40E-07	1.92E-07	5.55E-07	5.21E-09	1.61E-09	5.06E-10
N-Nitroso-N,N-dimethylamine	62-75-9	-0.57	6.76E-09	5.41E-09	1.56E-08	1.47E-10	4.53E-11	1.42E-11
o-Anisidine	90-04-0	1.18	3.80E-07	3.04E-07	8.79E-07	8.24E-09	2.55E-09	8.01E-10
Oxalic acid	144-62-7	No data	No data	No data	No data	No data	No data	No data
Phthalic anhydride	85-44-9	-0.60	6.28E-09	5.02E-09	1.45E-08	1.36E-10	4.21E-11	1.32E-11
p-Phthalic acid	100-21-0	2.00	2.51E-06	2.01E-06	5.81E-06	5.44E-08	1.68E-08	5.29E-09
Pyridine	110-86-1	0.67	1.18E-07	9.40E-08	2.72E-07	2.55E-09	7.87E-10	2.48E-10
Quinoline	91-22-5	2.03	2.69E-06	2.15E-06	6.22E-06	5.83E-08	1.80E-08	5.67E-09
Quinone	106-51-4	0.20	3.98E-08	3.18E-08	9.20E-08	8.63E-10	2.67E-10	8.38E-11
Safrole	94-59-7	2.66	1.15E-05	9.18E-06	2.65E-05	2.49E-07	7.69E-08	2.42E-08
Tetrahydrofuran	109-99-9	0.45	7.03E-08	5.63E-08	1.63E-07	1.52E-09	4.71E-10	1.48E-10
Other Heavy Semivolatile Compounds (molecular weight >200 g/mole)								
1,2,4,5-Tetrachlorobenzene	95-94-3	4.64	1.10E-03	8.76E-04	2.53E-03	2.37E-05	7.33E-06	2.31E-06
1,3,5-Trinitrobenzene	99-35-4	1.18	3.79E-07	3.03E-07	8.77E-07	8.22E-09	2.54E-09	7.99E-10
2,6-Bis(tert-butyl)-4-methylphenol	128-37-0	4.17	3.72E-04	2.97E-04	8.59E-04	8.05E-06	2.49E-06	7.82E-07
2-Cyclohexyl-4,6-dinitrophenol	131-89-5	4.54	8.71E-04	6.97E-04	2.01E-03	1.89E-05	5.83E-06	1.83E-06
2-sec-Butyl-4,6-dinitrophenol	88-85-7	3.56	9.12E-05	7.30E-05	2.11E-04	1.98E-06	6.11E-07	1.92E-07

Table C2-3 Bioaccumulation Factors for Accumulation of COPCs and ROPCs from Food by Mammals and Birds

Constituent of Potential Concern	CAS Registry Number	Bioaccumulation Factor (BAF-T_p) ([mg/kg tissue]/[mg/kg food])							
		Coyote[d]	Burrowing Owl[d]	Red-tailed Hawk[d]	Canada Goose[d]	Spotted Sandpiper[d]	Great Blue Heron[d]	Bald Eagle[d]	Mink[d]
Ethylene thiourea	96-45-7	1.26E-09	2.70E-11	4.87E-10	5.23E-10	1.63E-10	1.89E-09	1.98E-09	6.54E-10
Furfural	98-01-1	5.26E-08	1.13E-09	2.03E-08	2.18E-08	6.82E-09	7.88E-08	8.25E-08	2.73E-08
Maleic hydrazide	123-33-1	8.33E-10	1.79E-11	3.22E-10	3.46E-10	1.08E-10	1.25E-09	1.31E-09	4.32E-10
Malononitrile	109-77-3	1.45E-09	3.10E-11	5.59E-10	6.01E-10	1.88E-10	2.17E-09	2.27E-09	7.51E-10
Methyl styrene (mixed isomers)	25013-15-4	1.74E-05	3.73E-07	6.72E-06	7.22E-06	2.26E-06	2.61E-05	2.73E-05	9.03E-06
Methylhydrazine	60-34-4	5.14E-10	1.10E-11	1.99E-10	2.13E-10	6.66E-11	7.71E-10	8.06E-10	2.67E-10
N,N-Diphenylamine	122-39-4	1.82E-05	3.91E-07	7.04E-06	7.56E-06	2.36E-06	2.73E-05	2.86E-05	9.45E-06
Nitric acid, propyl ester	627-13-4	No data	No data	No data	No data	No data	No data	No data	No data
N-Nitrosodi-n-butylamine	924-16-3	1.48E-06	3.18E-08	5.72E-07	6.15E-07	1.92E-07	2.22E-06	2.32E-06	7.68E-07
N-Nitrosomorpholine	59-89-2	5.51E-08	1.18E-09	2.13E-08	2.29E-08	7.14E-09	8.26E-08	8.64E-08	2.86E-08
N-Nitroso-N,N-dimethylamine	62-75-9	1.55E-09	3.33E-11	5.99E-10	6.44E-10	2.01E-10	2.33E-09	2.43E-09	8.05E-10
o-Anisidine	90-04-0	8.73E-08	1.87E-09	3.37E-08	3.62E-08	1.13E-08	1.31E-07	1.37E-07	4.52E-08
Oxalic acid	144-62-7	No data	No data	No data	No data	No data	No data	No data	No data
Phthalic anhydride	85-44-9	1.44E-09	3.09E-11	5.57E-10	5.98E-10	1.87E-10	2.16E-09	2.26E-09	7.47E-10
p-Phthalic acid	100-21-0	5.76E-07	1.24E-08	2.23E-07	2.39E-07	7.47E-08	8.64E-07	9.04E-07	2.99E-07
Pyridine	110-86-1	2.70E-08	5.78E-10	1.04E-08	1.12E-08	3.50E-09	4.05E-08	4.23E-08	1.40E-08
Quinoline	91-22-5	6.18E-07	1.32E-08	2.39E-07	2.56E-07	8.01E-08	9.26E-07	9.69E-07	3.20E-07
Quinone	106-51-4	9.14E-09	1.96E-10	3.53E-09	3.79E-09	1.18E-09	1.37E-08	1.43E-08	4.74E-09
Safrole	94-59-7	2.63E-06	5.65E-08	1.02E-06	1.09E-06	3.42E-07	3.95E-06	4.13E-06	1.37E-06
Tetrahydrofuran	109-99-9	1.61E-08	3.46E-10	6.23E-09	6.70E-09	2.09E-09	2.42E-08	2.53E-08	8.37E-09
Other Heavy Semivolatile Compounds (molecular weight >200 g/mole)									
1,2,4,5-Tetrachlorobenzene	95-94-3	2.51E-04	5.39E-06	9.71E-05	1.04E-04	3.26E-05	3.77E-04	3.94E-04	1.30E-04
1,3,5-Trinitrobenzene	99-35-4	8.70E-08	1.87E-09	3.36E-08	3.61E-08	1.13E-08	1.31E-07	1.37E-07	4.51E-08
2,6-Bis(tert-butyl)-4-methylphenol	128-37-0	8.53E-05	1.83E-06	3.29E-05	3.54E-05	1.11E-05	1.28E-04	1.34E-04	4.42E-05
2-Cyclohexyl-4,6-dinitrophenol	131-89-5	2.00E-04	4.29E-06	7.72E-05	8.29E-05	2.59E-05	3.00E-04	3.14E-04	1.04E-04
2-sec-Butyl-4,6-dinitrophenol	88-85-7	2.09E-05	4.49E-07	8.08E-06	8.69E-06	2.71E-06	3.14E-05	3.28E-05	1.09E-05

Table C2-3 Bioaccumulation Factors for Accumulation of COPCs and ROPCs from Food by Mammals and Birds

Constituent of Potential Concern	CAS Registry Number	Log K_{ow} [a]	Mammal Ba[b] ([mg/kg tissue] / [mg ingested /day])	Bird Ba[c] ([mg/kg tissue] / [mg ingested /day])	Bioaccumulation Factor (BAF-T_p) ([mg/kg tissue]/[mg/kg food])			
					Mule Deer[d]	Mourning Dove[d]	Great Basin Pocket Mouse[d]	Western Meadow-lark[d]
3,3'-Dichlorobenzidine	91-94-1	3.58	9.44E-05	7.56E-05	2.18E-04	2.05E-06	6.33E-07	1.99E-07
3,3'-Dimethoxybenzidine	119-90-4	1.81	1.62E-06	1.30E-06	3.75E-06	3.52E-08	1.09E-08	3.42E-09
4-Bromophenylphenyl ether	101-55-3	5.04	2.76E-03	2.21E-03	6.38E-03	5.98E-05	1.85E-05	5.81E-06
Ammonium perfluorooctanoate	3825-26-1	No data	No data	No data	No data	No data	No data	No data
Azobenzene	103-33-3	3.82	1.66E-04	1.33E-04	3.84E-04	3.60E-06	1.11E-06	3.49E-07
Bis(3-tert-butyl-4-hydroxy-6-methyl-phenyl)sulfide	96-69-5	No data	No data	No data	No data	No data	No data	No data
Captan	133-06-2	2.35	5.62E-06	4.50E-06	1.30E-05	1.22E-07	3.77E-08	1.18E-08
Chlorobenzilate	510-15-6	4.38	6.03E-04	4.82E-04	1.39E-03	1.31E-05	4.04E-06	1.27E-06
Dibutylphosphate	107-66-4	No data	No data	No data	No data	No data	No data	No data
Dimethyl aminoazobenzene	60-11-7	4.58	9.55E-04	7.64E-04	2.21E-03	2.07E-05	6.40E-06	2.01E-06
Hexachlorobenzene	118-74-1	5.50	7.99E-03	6.39E-03	1.85E-02	1.73E-04	5.35E-05	1.68E-05
Hexachlorobutadiene	87-68-3	4.73	1.35E-03	1.08E-03	3.13E-03	2.93E-05	9.06E-06	2.85E-06
Hexachlorocyclopentadiene	77-47-4	4.91	2.03E-03	1.62E-03	4.69E-03	4.40E-05	1.36E-05	4.27E-06
Hexachloroethane	67-72-1	3.98	2.43E-04	1.94E-04	5.61E-04	5.26E-06	1.63E-06	5.11E-07
Hexachlorophene	70-30-4	7.54	8.72E-01	6.98E-01	2.02E+00	1.89E-02	5.84E-03	1.84E-03
Hexamethylene-1,5-diisocyanate	822-06-0	3.20	3.98E-05	3.18E-05	9.20E-05	8.63E-07	2.67E-07	8.38E-08
Mirex	2385-85-5	6.89	1.95E-01	1.56E-01	4.51E-01	4.23E-03	1.31E-03	4.11E-04
Nitrofen	1836-75-5	5.53	8.51E-03	6.81E-03	1.97E-02	1.84E-04	5.70E-05	1.79E-05
Pentachlorobenzene	608-93-5	5.09	3.08E-03	2.46E-03	7.12E-03	6.68E-05	2.06E-05	6.49E-06
Pentachloronitrobenzene	82-68-8	4.64	1.10E-03	8.81E-04	2.55E-03	2.39E-05	7.37E-06	2.32E-06
Pentachlorophenol	87-86-5	5.08	3.01E-03	2.41E-03	6.97E-03	6.53E-05	2.02E-05	6.35E-06
Picric acid	88-89-1	2.03	2.69E-06	2.15E-06	6.22E-06	5.83E-08	1.80E-08	5.67E-09
Pronamide	23950-58-5	3.51	8.14E-05	6.51E-05	1.88E-04	1.76E-06	5.45E-07	1.71E-07
Strychnine	57-24-9	1.93	2.14E-06	1.71E-06	4.94E-06	4.63E-08	1.43E-08	4.50E-09
Terphenyls	26140-60-3	No data	No data	No data	No data	No data	No data	No data
Tributyl phosphate	126-73-8	4.00	2.51E-04	2.01E-04	5.81E-04	5.44E-06	1.68E-06	5.29E-07

Table C2-3 Bioaccumulation Factors for Accumulation of COPCs and ROPCs from Food by Mammals and Birds

Constituent of Potential Concern	CAS Registry Number	Bioaccumulation Factor (BAF-T_p) ([mg/kg tissue]/[mg/kg food])							
		Coyote[d]	Burrowing Owl[d]	Red-tailed Hawk[d]	Canada Goose[d]	Spotted Sandpiper[d]	Great Blue Heron[d]	Bald Eagle[d]	Mink[d]
3,3'-Dichlorobenzidine	91-94-1	2.17E-05	4.65E-07	8.37E-06	8.99E-06	2.81E-06	3.25E-05	3.40E-05	1.12E-05
3,3'-Dimethoxybenzidine	119-90-4	3.72E-07	7.98E-09	1.44E-07	1.55E-07	4.83E-08	5.58E-07	5.84E-07	1.93E-07
4-Bromophenylphenyl ether	101-55-3	6.33E-04	1.36E-05	2.45E-04	2.63E-04	8.21E-05	9.50E-04	9.94E-04	3.28E-04
Ammonium perfluorooctanoate	3825-26-1	No data	No data	No data	No data	No data	No data	No data	No data
Azobenzene	103-33-3	3.81E-05	8.17E-07	1.47E-05	1.58E-05	4.94E-06	5.71E-05	5.97E-05	1.97E-05
Bis(3-tert-butyl-4-hydroxy-6-methyl-phenyl)sulfide	96-69-5	No data	No data	No data	No data	No data	No data	No data	No data
Captan	133-06-2	1.29E-06	2.77E-08	4.98E-07	5.36E-07	1.67E-07	1.94E-06	2.02E-06	6.69E-07
Chlorobenzilate	510-15-6	1.38E-04	2.97E-06	5.34E-05	5.74E-05	1.79E-05	2.07E-04	2.17E-04	7.17E-05
Dibutylphosphate	107-66-4	No data	No data	No data	No data	No data	No data	No data	No data
Dimethyl aminoazobenzene	60-11-7	2.19E-04	4.70E-06	8.46E-05	9.09E-05	2.84E-05	3.29E-04	3.44E-04	1.14E-04
Hexachlorobenzene	118-74-1	1.83E-03	3.93E-05	7.08E-04	7.61E-04	2.38E-04	2.75E-03	2.88E-03	9.51E-04
Hexachlorobutadiene	87-68-3	3.10E-04	6.65E-06	1.20E-04	1.29E-04	4.02E-05	4.65E-04	4.87E-04	1.61E-04
Hexachlorocyclopentadiene	77-47-4	4.66E-04	9.99E-06	1.80E-04	1.93E-04	6.04E-05	6.99E-04	7.31E-04	2.42E-04
Hexachloroethane	67-72-1	5.57E-05	1.19E-06	2.15E-05	2.31E-05	7.22E-06	8.35E-05	8.74E-05	2.89E-05
Hexachlorophene	70-30-4	2.00E-01	4.29E-03	7.73E-02	8.30E-02	2.59E-02	3.00E-01	3.14E-01	1.04E-01
Hexamethylene-1,5-diisocyanate	822-06-0	9.14E-06	1.96E-07	3.53E-06	3.79E-06	1.18E-06	1.37E-05	1.43E-05	4.74E-06
Mirex	2385-85-5	4.47E-02	9.59E-04	1.73E-02	1.86E-02	5.80E-03	6.71E-02	7.02E-02	2.32E-02
Nitrofen	1836-75-5	1.95E-03	4.19E-05	7.54E-04	8.11E-04	2.53E-04	2.93E-03	3.06E-03	1.01E-03
Pentachlorobenzene	608-93-5	7.07E-04	1.52E-05	2.73E-04	2.93E-04	9.16E-05	1.06E-03	1.11E-03	3.67E-04
Pentachloronitrobenzene	82-68-8	2.53E-04	5.42E-06	9.76E-05	1.05E-04	3.28E-05	3.79E-04	3.96E-04	1.31E-04
Pentachlorophenol	87-86-5	6.92E-04	1.48E-05	2.67E-04	2.87E-04	8.97E-05	1.04E-03	1.09E-03	3.59E-04
Picric acid	88-89-1	6.18E-07	1.32E-08	2.39E-07	2.56E-07	8.01E-08	9.26E-07	9.69E-07	3.20E-07
Pronamide	23950-58-5	1.87E-05	4.00E-07	7.21E-06	7.75E-06	2.42E-06	2.80E-05	2.93E-05	9.68E-06
Strychnine	57-24-9	4.91E-07	1.05E-08	1.89E-07	2.04E-07	6.36E-08	7.36E-07	7.70E-07	2.54E-07
Terphenyls	26140-60-3	No data	No data	No data	No data	No data	No data	No data	No data
Tributyl phosphate	126-73-8	5.76E-05	1.24E-06	2.23E-05	2.39E-05	7.47E-06	8.64E-05	9.04E-05	2.99E-05

Table C2-3 Bioaccumulation Factors for Accumulation of COPCs and ROPCs from Food by Mammals and Birds

Constituent of Potential Concern	CAS Registry Number	Log K_{ow} [a]	Mammal Ba[b] ([mg/kg tissue] / [mg ingested /day])	Bird Ba[c] ([mg/kg tissue] / [mg ingested /day])	Bioaccumulation Factor (BAF-T_p) ([mg/kg tissue]/[mg/kg food])			
					Mule Deer[d]	Mourning Dove[d]	Great Basin Pocket Mouse[d]	Western Meadow-lark[d]
Trifluralin	1582-09-8	5.34	5.50E-03	4.40E-03	1.27E-02	1.19E-04	3.68E-05	1.16E-05
Triphenylamine	603-34-9	No data	No data	No data	No data	No data	No data	No data
Herbicides and Organochlorinated Pesticides								
2,4,5-T	93-76-5	3.36	5.75E-05	4.60E-05	1.33E-04	1.25E-06	3.85E-07	1.21E-07
2,4-D and esters	94-75-7	2.81	1.62E-05	1.30E-05	3.75E-05	3.52E-07	1.09E-07	3.41E-08
4,4'-DDD	72-54-8	6.12	3.32E-02	2.66E-02	7.67E-02	7.20E-04	2.22E-04	6.99E-05
4,4'-DDE	72-55-9	6.26	4.54E-02	3.63E-02	1.05E-01	9.83E-04	3.04E-04	9.55E-05
4,4'-DDT	50-29-3	6.07	2.95E-02	2.36E-02	6.82E-02	6.39E-04	1.98E-04	6.21E-05
Aldrin	309-00-2	6.18	3.79E-02	3.03E-02	8.77E-02	8.22E-04	2.54E-04	7.99E-05
alpha-BHC	319-84-6	3.80	1.58E-04	1.27E-04	3.66E-04	3.43E-06	1.06E-06	3.33E-07
beta-BHC	319-85-7	3.83	1.71E-04	1.37E-04	3.95E-04	3.71E-06	1.15E-06	3.60E-07
Chlordane	57-74-9	5.94	2.18E-02	1.74E-02	5.03E-02	4.72E-04	1.46E-04	4.58E-05
Delta-BHC	319-86-8	4.14	3.47E-04	2.77E-04	8.02E-04	7.52E-06	2.32E-06	7.30E-07
Dieldrin	60-57-1	5.27	4.67E-03	3.74E-03	1.08E-02	1.01E-04	3.13E-05	9.84E-06
Endothall	145-73-3	-0.87	3.39E-09	2.71E-09	7.83E-09	7.35E-11	2.27E-11	7.13E-12
Endrin	72-20-8	4.89	1.96E-03	1.57E-03	4.52E-03	4.24E-05	1.31E-05	4.12E-06
gamma-BHC (Lindane)	58-89-9	3.72	1.32E-04	1.05E-04	3.05E-04	2.86E-06	8.83E-07	2.78E-07
Heptachlor	76-44-8	5.02	2.60E-03	2.08E-03	6.02E-03	5.64E-05	1.74E-05	5.48E-06
Isodrin	465-73-6	No data	No data	No data	No data	No data	No data	No data
Methoxychlor	72-43-5	4.53	8.44E-04	6.75E-04	1.95E-03	1.83E-05	5.65E-06	1.78E-06
Silvex (2,4,5-TP)	93-72-1	3.80	1.58E-04	1.27E-04	3.66E-04	3.44E-06	1.06E-06	3.34E-07
Toxaphene	8001-35-2	5.50	7.94E-03	6.35E-03	1.84E-02	1.72E-04	5.32E-05	1.67E-05
Inorganic Chemicals and Compounds								
Metals								
Aluminum	7429-90-5	NA	1.50E-03	1.50E-03	3.47E-03	4.06E-05	1.00E-05	3.95E-06
Antimony	7440-36-0	NA	1.00E-03	1.00E-03	2.31E-03	2.71E-05	6.70E-06	2.63E-06

Table C2-3 Bioaccumulation Factors for Accumulation of COPCs and ROPCs from Food by Mammals and Birds

Constituent of Potential Concern	CAS Registry Number	Bioaccumulation Factor (BAF-T_p) ([mg/kg tissue]/[mg/kg food])							
		Coyote[d]	Burrowing Owl[d]	Red-tailed Hawk[d]	Canada Goose[d]	Spotted Sandpiper[d]	Great Blue Heron[d]	Bald Eagle[d]	Mink[d]
Trifluralin	1582-09-8	1.26E-03	2.70E-05	4.87E-04	5.23E-04	1.63E-04	1.89E-03	1.98E-03	6.54E-04
Triphenylamine	603-34-9	No data	No data	No data	No data	No data	No data	No data	No data
Herbicides and Organochlorinated Pesticides									
2,4,5-T	93-76-5	1.32E-05	2.83E-07	5.10E-06	5.48E-06	1.71E-06	1.98E-05	2.07E-05	6.85E-06
2,4-D and esters	94-75-7	3.72E-06	7.98E-08	1.44E-06	1.54E-06	4.82E-07	5.58E-06	5.84E-06	1.93E-06
4,4'-DDD	72-54-8	7.62E-03	1.63E-04	2.94E-03	3.16E-03	9.88E-04	1.14E-02	1.20E-02	3.95E-03
4,4'-DDE	72-55-9	1.04E-02	2.23E-04	4.02E-03	4.32E-03	1.35E-03	1.56E-02	1.63E-02	5.40E-03
4,4'-DDT	50-29-3	6.77E-03	1.45E-04	2.61E-03	2.81E-03	8.78E-04	1.02E-02	1.06E-02	3.51E-03
Aldrin	309-00-2	8.70E-03	1.87E-04	3.36E-03	3.61E-03	1.13E-03	1.31E-02	1.37E-02	4.51E-03
alpha-BHC	319-84-6	3.63E-05	7.79E-07	1.40E-05	1.51E-05	4.71E-06	5.45E-05	5.70E-05	1.88E-05
beta-BHC	319-85-7	3.93E-05	8.42E-07	1.52E-05	1.63E-05	5.09E-06	5.89E-05	6.16E-05	2.04E-05
Chlordane	57-74-9	4.99E-03	1.07E-04	1.93E-03	2.07E-03	6.47E-04	7.49E-03	7.83E-03	2.59E-03
Delta-BHC	319-86-8	7.96E-05	1.71E-06	3.07E-05	3.30E-05	1.03E-05	1.19E-04	1.25E-04	4.13E-05
Dieldrin	60-57-1	1.07E-03	2.30E-05	4.14E-04	4.45E-04	1.39E-04	1.61E-03	1.68E-03	5.56E-04
Endothall	145-73-3	7.78E-10	1.67E-11	3.00E-10	3.23E-10	1.01E-10	1.17E-09	1.22E-09	4.03E-10
Endrin	72-20-8	4.49E-04	9.63E-06	1.73E-04	1.86E-04	5.82E-05	6.73E-04	7.04E-04	2.33E-04
gamma-BHC (Lindane)	58-89-9	3.03E-05	6.49E-07	1.17E-05	1.26E-05	3.92E-06	4.54E-05	4.75E-05	1.57E-05
Heptachlor	76-44-8	5.97E-04	1.28E-05	2.31E-04	2.48E-04	7.74E-05	8.96E-04	9.37E-04	3.10E-04
Isodrin	465-73-6	No data	No data	No data	No data	No data	No data	No data	No data
Methoxychlor	72-43-5	1.94E-04	4.15E-06	7.48E-05	8.04E-05	2.51E-05	2.90E-04	3.04E-04	1.00E-04
Silvex (2,4,5-TP)	93-72-1	3.64E-05	7.80E-07	1.40E-05	1.51E-05	4.72E-06	5.45E-05	5.71E-05	1.89E-05
Toxaphene	8001-35-2	1.82E-03	3.91E-05	7.04E-04	7.56E-04	2.36E-04	2.73E-03	2.86E-03	9.45E-04
Inorganic Chemicals and Compounds									
Metals									
Aluminum	7429-90-5	3.44E-04	9.23E-06	1.66E-04	1.79E-04	5.58E-05	6.45E-04	6.75E-04	1.79E-04
Antimony	7440-36-0	2.30E-04	6.15E-06	1.11E-04	1.19E-04	3.72E-05	4.30E-04	4.50E-04	1.19E-04

Table C2-3 Bioaccumulation Factors for Accumulation of COPCs and ROPCs from Food by Mammals and Birds

Constituent of Potential Concern	CAS Registry Number	Log K_{ow} [a]	Mammal Ba[b] ([mg/kg tissue] / [mg ingested /day])	Bird Ba[c] ([mg/kg tissue] / [mg ingested /day])	Bioaccumulation Factor (BAF-T_p) ([mg/kg tissue]/[mg/kg food])			
					Mule Deer[d]	Mourning Dove[d]	Great Basin Pocket Mouse[d]	Western Meadow-lark[d]
Arsenic	7440-38-2	NA	2.00E-03	2.00E-03	4.62E-03	5.42E-05	1.34E-05	5.26E-06
Barium	7440-39-3	NA	1.50E-04	1.50E-04	3.47E-04	4.06E-06	1.00E-06	3.95E-07
Beryllium	7440-41-7	NA	1.00E-03	1.00E-03	2.31E-03	2.71E-05	6.70E-06	2.63E-06
Bismuth	7440-69-9	NA	4.00E-04	4.00E-04	9.25E-04	1.08E-05	2.68E-06	1.05E-06
Boron	7440-42-8	NA	8.00E-04	8.00E-04	1.85E-03	2.17E-05	5.36E-06	2.11E-06
Cadmium	7440-43-9	NA	3.40E-03	3.40E-03	7.86E-03	9.21E-05	2.28E-05	8.95E-06
Calcium	7440-70-2	NA	7.00E-04	7.00E-04	1.62E-03	1.90E-05	4.69E-06	1.84E-06
Chromium[f]	18540-29-9	NA	5.51E-03	5.51E-03	1.27E-02	1.49E-04	3.69E-05	1.45E-05
Cobalt	7440-48-4	NA	2.00E-02	2.00E-02	4.62E-02	5.42E-04	1.34E-04	5.26E-05
Copper	7440-50-8	NA	1.00E-02	1.00E-02	2.31E-02	2.71E-04	6.70E-05	2.63E-05
Iron	7439-89-6	NA	2.00E-02	2.00E-02	4.62E-02	5.42E-04	1.34E-04	5.26E-05
Lead	7439-92-1	NA	3.00E-04	3.00E-04	6.94E-04	8.13E-06	2.01E-06	7.90E-07
Lithium	7439-93-2	NA	1.00E-02	1.00E-02	2.31E-02	2.71E-04	6.70E-05	2.63E-05
Magnesium	7439-95-4	NA	5.00E-03	5.00E-03	1.16E-02	1.35E-04	3.35E-05	1.32E-05
Manganese	7439-96-5	NA	4.00E-04	4.00E-04	9.25E-04	1.08E-05	2.68E-06	1.05E-06
Mercury	7439-97-6	NA	NA	No data	No data	No data	No data	No data
Mercury - Hg+2	7487-94-7	NA	5.21E-03	5.21E-03	1.20E-02	1.41E-04	3.49E-05	1.37E-05
Methylmercury	22967-92-6	NA	7.81E-04	7.81E-04	1.81E-03	2.12E-05	5.23E-06	2.06E-06
Molybdenum	7439-98-7	NA	6.00E-03	6.00E-03	1.39E-02	1.63E-04	4.02E-05	1.58E-05
Nickel	7440-02-0	NA	6.00E-03	6.00E-03	1.39E-02	1.63E-04	4.02E-05	1.58E-05
Potassium	7440-09-7	NA	2.00E-02	2.00E-02	4.62E-02	5.42E-04	1.34E-04	5.26E-05
Rhodium	7440-16-6	NA	2.00E-03	2.00E-03	4.62E-03	5.42E-05	1.34E-05	5.26E-06
Selenium	7782-49-2	NA	1.90E-03	1.90E-03	4.39E-03	5.15E-05	1.27E-05	5.00E-06
Silicon	7440-21-3	NA	4.00E-05	4.00E-05	9.25E-05	1.08E-06	2.68E-07	1.05E-07
Silver	7440-22-4	NA	3.00E-03	3.00E-03	6.94E-03	8.13E-05	2.01E-05	7.90E-06
Sodium	7440-23-5	NA	5.50E-02	5.50E-02	1.27E-01	1.49E-03	3.68E-04	1.45E-04

Table C2-3 Bioaccumulation Factors for Accumulation of COPCs and ROPCs from Food by Mammals and Birds

Constituent of Potential Concern	CAS Registry Number	Bioaccumulation Factor ($BAF\text{-}T_p$) ([mg/kg tissue]/[mg/kg food])							
		Coyote[d]	Burrowing Owl[d]	Red-tailed Hawk[d]	Canada Goose[d]	Spotted Sandpiper[d]	Great Blue Heron[d]	Bald Eagle[d]	Mink[d]
Arsenic	7440-38-2	4.59E-04	1.23E-05	2.22E-04	2.38E-04	7.44E-05	8.60E-04	9.00E-04	2.38E-04
Barium	7440-39-3	3.44E-05	9.23E-07	1.66E-05	1.79E-05	5.58E-06	6.45E-05	6.75E-05	1.79E-05
Beryllium	7440-41-7	2.30E-04	6.15E-06	1.11E-04	1.19E-04	3.72E-05	4.30E-04	4.50E-04	1.19E-04
Bismuth	7440-69-9	9.18E-05	2.46E-06	4.43E-05	4.76E-05	1.49E-05	1.72E-04	1.80E-04	4.76E-05
Boron	7440-42-8	1.84E-04	4.92E-06	8.86E-05	9.52E-05	2.98E-05	3.44E-04	3.60E-04	9.52E-05
Cadmium	7440-43-9	7.80E-04	2.09E-05	3.77E-04	4.05E-04	1.26E-04	1.46E-03	1.53E-03	4.05E-04
Calcium	7440-70-2	1.61E-04	4.31E-06	7.75E-05	8.33E-05	2.60E-05	3.01E-04	3.15E-04	8.33E-05
Chromium[f]	18540-29-9	1.26E-03	3.39E-05	6.10E-04	6.56E-04	2.05E-04	2.37E-03	2.48E-03	6.56E-04
Cobalt	7440-48-4	4.59E-03	1.23E-04	2.22E-03	2.38E-03	7.44E-04	8.60E-03	9.00E-03	2.38E-03
Copper	7440-50-8	2.30E-03	6.15E-05	1.11E-03	1.19E-03	3.72E-04	4.30E-03	4.50E-03	1.19E-03
Iron	7439-89-6	4.59E-03	1.23E-04	2.22E-03	2.38E-03	7.44E-04	8.60E-03	9.00E-03	2.38E-03
Lead	7439-92-1	6.89E-05	1.85E-06	3.32E-05	3.57E-05	1.12E-05	1.29E-04	1.35E-04	3.57E-05
Lithium	7439-93-2	2.30E-03	6.15E-05	1.11E-03	1.19E-03	3.72E-04	4.30E-03	4.50E-03	1.19E-03
Magnesium	7439-95-4	1.15E-03	3.08E-05	5.54E-04	5.95E-04	1.86E-04	2.15E-03	2.25E-03	5.95E-04
Manganese	7439-96-5	9.18E-05	2.46E-06	4.43E-05	4.76E-05	1.49E-05	1.72E-04	1.80E-04	4.76E-05
Mercury	7439-97-6	No data	No data	No data	No data	No data	No data	No data	No data
Mercury - Hg+2	7487-94-7	1.19E-03	3.20E-05	5.77E-04	6.20E-04	1.94E-04	2.24E-03	2.34E-03	6.20E-04
Methylmercury	22967-92-6	1.79E-04	4.80E-06	8.65E-05	9.30E-05	2.90E-05	3.36E-04	3.51E-04	9.29E-05
Molybdenum	7439-98-7	1.38E-03	3.69E-05	6.65E-04	7.14E-04	2.23E-04	2.58E-03	2.70E-03	7.14E-04
Nickel	7440-02-0	1.38E-03	3.69E-05	6.65E-04	7.14E-04	2.23E-04	2.58E-03	2.70E-03	7.14E-04
Potassium	7440-09-7	4.59E-03	1.23E-04	2.22E-03	2.38E-03	7.44E-04	8.60E-03	9.00E-03	2.38E-03
Rhodium	7440-16-6	4.59E-04	1.23E-05	2.22E-04	2.38E-04	7.44E-05	8.60E-04	9.00E-04	2.38E-04
Selenium	7782-49-2	4.36E-04	1.17E-05	2.10E-04	2.26E-04	7.07E-05	8.17E-04	8.55E-04	2.26E-04
Silicon	7440-21-3	9.18E-06	2.46E-07	4.43E-06	4.76E-06	1.49E-06	1.72E-05	1.80E-05	4.76E-06
Silver	7440-22-4	6.89E-04	1.85E-05	3.32E-04	3.57E-04	1.12E-04	1.29E-03	1.35E-03	3.57E-04
Sodium	7440-23-5	1.26E-02	3.38E-04	6.09E-03	6.55E-03	2.05E-03	2.37E-02	2.48E-02	6.55E-03

Table C2-3 Bioaccumulation Factors for Accumulation of COPCs and ROPCs from Food by Mammals and Birds

Constituent of Potential Concern	CAS Registry Number	Log K_{ow} [a]	Mammal Ba[b] ([mg/kg tissue] / [mg ingested /day])	Bird Ba[c] ([mg/kg tissue] / [mg ingested /day])	Bioaccumulation Factor (BAF-T_p) ([mg/kg tissue]/[mg/kg food])			
					Mule Deer[d]	Mourning Dove[d]	Great Basin Pocket Mouse[d]	Western Meadow-lark[d]
Strontium	7440-24-6	NA	3.00E-04	3.00E-04	6.94E-04	8.13E-06	2.01E-06	7.90E-07
Tantalum	7440-25-7	NA	6.00E-04	6.00E-04	1.39E-03	1.63E-05	4.02E-06	1.58E-06
Thallium	7440-28-0	NA	4.00E-02	4.00E-02	9.25E-02	1.08E-03	2.68E-04	1.05E-04
Tin	7440-31-5	NA	8.00E-02	8.00E-02	1.85E-01	2.17E-03	5.36E-04	2.11E-04
Tungsten	7440-33-7	NA	4.50E-02	4.50E-02	1.04E-01	1.22E-03	3.01E-04	1.18E-04
Uranium	7440-61-1	NA	2.00E-04	2.00E-04	4.62E-04	5.42E-06	1.34E-06	5.26E-07
Vanadium	7440-62-2	NA	2.50E-03	2.50E-03	5.78E-03	6.77E-05	1.67E-05	6.58E-06
Yttrium	7440-65-5	NA	3.00E-04	3.00E-04	6.94E-04	8.13E-06	2.01E-06	7.90E-07
Zinc	7440-66-6	NA	1.00E-01	1.00E-01	2.31E-01	2.71E-03	6.70E-04	2.63E-04
Zirconium	7440-67-7	NA	5.50E-03	5.50E-03	1.27E-02	1.49E-04	3.68E-05	1.45E-05
Non-metals and Anions								
Ammonia/Ammonium	7664-41-7	NA	2.23E-02	1.95E-02	2.85E-02	4.79E-04	1.31E-04	5.13E-05
Bromide	24959-67-9	NA	2.50E-02	2.50E-02	3.66E-02	6.14E-04	1.67E-04	6.58E-05
Chloride	16887-00-6	NA	8.00E-02	8.00E-02	1.17E-01	1.97E-03	5.36E-04	2.11E-04
Cyanide	57-12-5	NA	2.23E-02	1.95E-02	2.85E-02	4.79E-04	1.31E-04	5.13E-05
Fluoride	16984-48-8	NA	1.50E-01	1.50E-01	2.19E-01	3.69E-03	1.00E-03	3.95E-04
Hydroxide	14280-30-9	NA	NA	NA	NA	NA	NA	NA
Iodine	7553-56-2	NA	7.00E-03	7.00E-03	1.02E-02	1.72E-04	4.69E-05	1.84E-05
Nitrate	14797-55-8	NA	7.50E-02	7.50E-02	1.10E-01	1.84E-03	5.02E-04	1.97E-04
Nitrite	14797-65-0	NA	7.50E-02	7.50E-02	1.10E-01	1.84E-03	5.02E-04	1.97E-04
Phosphate	14265-44-2	NA	5.50E-02	5.50E-02	8.05E-02	1.35E-03	3.68E-04	1.45E-04
Phosphorus	7723-14-0	NA	5.50E-02	5.50E-02	8.05E-02	1.35E-03	3.68E-04	1.45E-04
Sulfate	14808-79-8	NA	1.00E-01	1.00E-01	1.46E-01	2.46E-03	6.70E-04	2.63E-04
Total Sulfur	63705-05-5	NA	1.00E-01	1.00E-01	1.46E-01	2.46E-03	6.70E-04	2.63E-04
Criteria Pollutants								
Carbon monoxide	630-08-0	NA	2.23E-02	1.95E-02	2.85E-02	4.79E-04	1.31E-04	5.13E-05

Table C2-3 Bioaccumulation Factors for Accumulation of COPCs and ROPCs from Food by Mammals and Birds

Constituent of Potential Concern	CAS Registry Number	Bioaccumulation Factor (BAF-T_p) ([mg/kg tissue]/[mg/kg food])							
		Coyote[d]	Burrowing Owl[d]	Red-tailed Hawk[d]	Canada Goose[d]	Spotted Sandpiper[d]	Great Blue Heron[d]	Bald Eagle[d]	Mink[d]
Strontium	7440-24-6	6.89E-05	1.85E-06	3.32E-05	3.57E-05	1.12E-05	1.29E-04	1.35E-04	3.57E-05
Tantalum	7440-25-7	1.38E-04	3.69E-06	6.65E-05	7.14E-05	2.23E-05	2.58E-04	2.70E-04	7.14E-05
Thallium	7440-28-0	9.18E-03	2.46E-04	4.43E-03	4.76E-03	1.49E-03	1.72E-02	1.80E-02	4.76E-03
Tin	7440-31-5	1.84E-02	4.92E-04	8.86E-03	9.52E-03	2.98E-03	3.44E-02	3.60E-02	9.52E-03
Tungsten	7440-33-7	1.03E-02	2.77E-04	4.98E-03	5.36E-03	1.67E-03	1.94E-02	2.03E-02	5.36E-03
Uranium	7440-61-1	4.59E-05	1.23E-06	2.22E-05	2.38E-05	7.44E-06	8.60E-05	9.00E-05	2.38E-05
Vanadium	7440-62-2	5.74E-04	1.54E-05	2.77E-04	2.98E-04	9.30E-05	1.08E-03	1.13E-03	2.98E-04
Yttrium	7440-65-5	6.89E-05	1.85E-06	3.32E-05	3.57E-05	1.12E-05	1.29E-04	1.35E-04	3.57E-05
Zinc	7440-66-6	2.30E-02	6.15E-04	1.11E-02	1.19E-02	3.72E-03	4.30E-02	4.50E-02	1.19E-02
Zirconium	7440-67-7	1.26E-03	3.38E-05	6.09E-04	6.55E-04	2.05E-04	2.37E-03	2.48E-03	6.55E-04
Non-metals and Anions									
Ammonia/Ammonium	7664-41-7	1.17E-02	2.69E-04	2.16E-03	2.32E-03	1.45E-04	8.39E-03	8.78E-03	2.32E-03
Bromide	24959-67-9	1.50E-02	3.45E-04	2.77E-03	2.98E-03	1.86E-04	1.08E-02	1.13E-02	2.98E-03
Chloride	16887-00-6	4.79E-02	1.10E-03	8.86E-03	9.52E-03	5.95E-04	3.44E-02	3.60E-02	9.52E-03
Cyanide	57-12-5	1.33E-02	2.69E-04	2.16E-03	2.32E-03	1.45E-04	8.39E-03	8.78E-03	2.32E-03
Fluoride	16984-48-8	8.99E-02	2.07E-03	1.66E-02	1.79E-02	1.12E-03	6.45E-02	6.75E-02	1.79E-02
Hydroxide	14280-30-9	NA	NA	NA	NA	NA	NA	NA	NA
Iodine	7553-56-2	4.19E-03	9.66E-05	7.75E-04	8.33E-04	5.21E-05	3.01E-03	3.15E-03	8.33E-04
Nitrate	14797-55-8	4.49E-02	1.04E-03	8.31E-03	8.93E-03	5.58E-04	3.23E-02	3.38E-02	8.93E-03
Nitrite	14797-65-0	4.49E-02	1.04E-03	8.31E-03	8.93E-03	5.58E-04	3.23E-02	3.38E-02	8.93E-03
Phosphate	14265-44-2	3.30E-02	7.59E-04	6.09E-03	6.55E-03	4.09E-04	2.37E-02	2.48E-02	6.55E-03
Phosphorus	7723-14-0	3.30E-02	7.59E-04	6.09E-03	6.55E-03	4.09E-04	2.37E-02	2.48E-02	6.55E-03
Sulfate	14808-79-8	5.99E-02	1.38E-03	1.11E-02	1.19E-02	7.44E-04	4.30E-02	4.50E-02	1.19E-02
Total Sulfur	63705-05-5	5.99E-02	1.38E-03	1.11E-02	1.19E-02	7.44E-04	4.30E-02	4.50E-02	1.19E-02
Criteria Pollutants									
Carbon monoxide	630-08-0	1.17E-02	2.69E-04	2.16E-03	2.32E-03	1.45E-04	8.39E-03	8.78E-03	2.32E-03

Table C2-3 Bioaccumulation Factors for Accumulation of COPCs and ROPCs from Food by Mammals and Birds

Constituent of Potential Concern	CAS Registry Number	Log K_{ow} [a]	Mammal Ba[b] ([mg/kg tissue] / [mg ingested /day])	Bird Ba[c] ([mg/kg tissue] / [mg ingested /day])	Bioaccumulation Factor (BAF-T_p) ([mg/kg tissue]/[mg/kg food])			
					Mule Deer[d]	Mourning Dove[d]	Great Basin Pocket Mouse[d]	Western Meadow-lark[d]
Nitrogen dioxide	10102-44-0	NA	2.23E-02	1.95E-02	2.85E-02	4.79E-04	1.31E-04	5.13E-05
Ozone	10028-15-6	NA	2.23E-02	1.95E-02	2.85E-02	4.79E-04	1.31E-04	5.13E-05
Particulate matter	No CAS #	NA	NA	NA	NA	NA	NA	NA
Sulfur dioxide	7446-09-5	NA	2.23E-02	1.95E-02	2.85E-02	4.79E-04	1.31E-04	5.13E-05
Radionuclides								
All radionuclides combined (rad/d)	No CAS #	NA	NA	NA	NA	NA	NA	NA
Actinium-227	14952-40-0	NA	2.50E-03	2.50E-03	3.66E-03	6.14E-05	1.67E-05	6.58E-06
Americium-241	14596-10-2	NA	3.50E-06	3.50E-06	5.12E-06	8.60E-08	2.34E-08	9.21E-09
Americium-243	14993-75-0	NA	3.50E-06	3.50E-06	5.12E-06	8.60E-08	2.34E-08	9.21E-09
Antimony-125	14234-35-6	NA	1.00E-03	1.00E-03	1.46E-03	2.46E-05	6.70E-06	2.63E-06
Barium-137m	13981-97-0	NA	1.50E-04	1.50E-04	2.19E-04	3.69E-06	1.00E-06	3.95E-07
Cadmium-113m	14336-66-4	NA	1.20E-04	1.20E-04	1.76E-04	2.95E-06	8.04E-07	3.16E-07
Carbon-14	14762-75-5	NA	NA	NA	NA	NA	NA	NA
Cesium-134	13967-70-9	NA	2.00E-02	2.00E-02	2.93E-02	4.92E-04	1.34E-04	5.26E-05
Cesium-137	10045-97-3	NA	2.00E-02	2.00E-02	2.93E-02	4.92E-04	1.34E-04	5.26E-05
Cobalt-60	10198-40-0	NA	2.00E-02	2.00E-02	2.93E-02	4.92E-04	1.34E-04	5.26E-05
Curium-242	15510-73-3	NA	3.50E-06	3.50E-06	5.12E-06	8.60E-08	2.34E-08	9.21E-09
Curium-243	15757-87-6	NA	3.50E-06	3.50E-06	5.12E-06	8.60E-08	2.34E-08	9.21E-09
Curium-244	13981-15-2	NA	3.50E-06	3.50E-06	5.12E-06	8.60E-08	2.34E-08	9.21E-09
Europium-152	14683-23-9	NA	5.00E-03	5.00E-03	7.32E-03	1.23E-04	3.35E-05	1.32E-05
Europium-154	15585-10-1	NA	5.00E-03	5.00E-03	7.32E-03	1.23E-04	3.35E-05	1.32E-05
Europium-155	14391-16-3	NA	5.00E-03	5.00E-03	7.32E-03	1.23E-04	3.35E-05	1.32E-05
Iodine-129	15046-84-1	NA	7.00E-03	7.00E-03	1.02E-02	1.72E-04	4.69E-05	1.84E-05
Neptunium-237	13994-20-2	NA	5.50E-03	5.50E-03	8.05E-03	1.35E-04	3.68E-05	1.45E-05
Nickel-59	14336-70-0	NA	6.00E-03	6.00E-03	8.78E-03	1.47E-04	4.02E-05	1.58E-05
Nickel-63	13981-37-8	NA	6.00E-03	6.00E-03	8.78E-03	1.47E-04	4.02E-05	1.58E-05

Table C2-3 Bioaccumulation Factors for Accumulation of COPCs and ROPCs from Food by Mammals and Birds

Constituent of Potential Concern	CAS Registry Number	Bioaccumulation Factor (BAF-T_p) ([mg/kg tissue]/[mg/kg food])							
		Coyote[d]	Burrowing Owl[d]	Red-tailed Hawk[d]	Canada Goose[d]	Spotted Sandpiper[d]	Great Blue Heron[d]	Bald Eagle[d]	Mink[d]
Nitrogen dioxide	10102-44-0	1.17E-02	2.69E-04	2.16E-03	2.32E-03	1.45E-04	8.39E-03	8.78E-03	2.32E-03
Ozone	10028-15-6	1.17E-02	2.69E-04	2.16E-03	2.32E-03	1.45E-04	8.39E-03	8.78E-03	2.32E-03
Particulate matter	No CAS #	NA	NA	NA	NA	NA	NA	NA	NA
Sulfur dioxide	7446-09-5	1.17E-02	2.69E-04	2.16E-03	2.32E-03	1.45E-04	8.39E-03	8.78E-03	2.32E-03
Radionuclides									
All radionuclides combined (rad/d)	No CAS #	NA	NA	NA	NA	NA	NA	NA	NA
Actinium-227	14952-40-0	1.50E-03	3.45E-05	2.77E-04	2.98E-04	1.86E-05	1.08E-03	1.13E-03	2.98E-04
Americium-241	14596-10-2	2.10E-06	4.83E-08	3.88E-07	4.17E-07	2.60E-08	1.51E-06	1.58E-06	4.17E-07
Americium-243	14993-75-0	2.10E-06	4.83E-08	3.88E-07	4.17E-07	2.60E-08	1.51E-06	1.58E-06	4.17E-07
Antimony-125	14234-35-6	5.99E-04	1.38E-05	1.11E-04	1.19E-04	7.44E-06	4.30E-04	4.50E-04	1.19E-04
Barium-137m	13981-97-0	8.99E-05	2.07E-06	1.66E-05	1.79E-05	1.12E-06	6.45E-05	6.75E-05	1.79E-05
Cadmium-113m	14336-66-4	7.19E-05	1.66E-06	1.33E-05	1.43E-05	8.93E-07	5.16E-05	5.40E-05	1.43E-05
Carbon-14	14762-75-5	NA	NA	NA	NA	NA	NA	NA	NA
Cesium-134	13967-70-9	1.20E-02	2.76E-04	2.22E-03	2.38E-03	1.49E-04	8.60E-03	9.00E-03	2.38E-03
Cesium-137	10045-97-3	1.20E-02	2.76E-04	2.22E-03	2.38E-03	1.49E-04	8.60E-03	9.00E-03	2.38E-03
Cobalt-60	10198-40-0	1.20E-02	2.76E-04	2.22E-03	2.38E-03	1.49E-04	8.60E-03	9.00E-03	2.38E-03
Curium-242	15510-73-3	2.10E-06	4.83E-08	3.88E-07	4.17E-07	2.60E-08	1.51E-06	1.58E-06	4.17E-07
Curium-243	15757-87-6	2.10E-06	4.83E-08	3.88E-07	4.17E-07	2.60E-08	1.51E-06	1.58E-06	4.17E-07
Curium-244	13981-15-2	2.10E-06	4.83E-08	3.88E-07	4.17E-07	2.60E-08	1.51E-06	1.58E-06	4.17E-07
Europium-152	14683-23-9	3.00E-03	6.90E-05	5.54E-04	5.95E-04	3.72E-05	2.15E-03	2.25E-03	5.95E-04
Europium-154	15585-10-1	3.00E-03	6.90E-05	5.54E-04	5.95E-04	3.72E-05	2.15E-03	2.25E-03	5.95E-04
Europium-155	14391-16-3	3.00E-03	6.90E-05	5.54E-04	5.95E-04	3.72E-05	2.15E-03	2.25E-03	5.95E-04
Iodine-129	15046-84-1	4.19E-03	9.66E-05	7.75E-04	8.33E-04	5.21E-05	3.01E-03	3.15E-03	8.33E-04
Neptunium-237	13994-20-2	3.30E-03	7.59E-05	6.09E-04	6.55E-04	4.09E-05	2.37E-03	2.48E-03	6.55E-04
Nickel-59	14336-70-0	3.60E-03	8.28E-05	6.65E-04	7.14E-04	4.46E-05	2.58E-03	2.70E-03	7.14E-04
Nickel-63	13981-37-8	3.60E-03	8.28E-05	6.65E-04	7.14E-04	4.46E-05	2.58E-03	2.70E-03	7.14E-04

Table C2-3 Bioaccumulation Factors for Accumulation of COPCs and ROPCs from Food by Mammals and Birds

Constituent of Potential Concern	CAS Registry Number	Log K_{ow} [a]	Mammal Ba[b] ([mg/kg tissue] / [mg ingested /day])	Bird Ba[c] ([mg/kg tissue] / [mg ingested /day])	Bioaccumulation Factor (BAF-T_p) ([mg/kg tissue]/[mg/kg food])			
					Mule Deer[d]	Mourning Dove[d]	Great Basin Pocket Mouse[d]	Western Meadow-lark[d]
Niobium-93m	7440-03-1[g]	NA	2.50E-01	2.50E-01	3.66E-01	6.14E-03	1.67E-03	6.58E-04
Plutonium-238	13981-16-3	NA	5.00E-07	5.00E-07	7.32E-07	1.23E-08	3.35E-09	1.32E-09
Plutonium-239	15117-48-3	NA	5.00E-07	5.00E-07	7.32E-07	1.23E-08	3.35E-09	1.32E-09
Plutonium-240	14119-33-6	NA	5.00E-07	5.00E-07	7.32E-07	1.23E-08	3.35E-09	1.32E-09
Plutonium-241	14119-32-5	NA	5.00E-07	5.00E-07	7.32E-07	1.23E-08	3.35E-09	1.32E-09
Plutonium-242	13982-10-0	NA	5.00E-07	5.00E-07	7.32E-07	1.23E-08	3.35E-09	1.32E-09
Protactinium-231	14331-85-2	NA	1.00E-05	1.00E-05	1.46E-05	2.46E-07	6.70E-08	2.63E-08
Radium-226	13982-63-3	NA	2.50E-04	2.50E-04	3.66E-04	6.14E-06	1.67E-06	6.58E-07
Radium-228	15262-20-1	NA	2.50E-04	2.50E-04	3.66E-04	6.14E-06	1.67E-06	6.58E-07
Ruthenium-106	13967-48-1	NA	2.00E-03	2.00E-03	2.93E-03	4.92E-05	1.34E-05	5.26E-06
Samarium-151	15715-94-3	NA	5.00E-03	5.00E-03	7.32E-03	1.23E-04	3.35E-05	1.32E-05
Selenium-79	15758-45-9	NA	1.50E-02	1.50E-02	2.19E-02	3.69E-04	1.00E-04	3.95E-05
Strontium-90	10098-97-2	NA	3.00E-04	3.00E-04	4.39E-04	7.37E-06	2.01E-06	7.90E-07
Technetium-99	14133-76-7	NA	8.50E-03	8.50E-03	1.24E-02	2.09E-04	5.69E-05	2.24E-05
Thorium-229	15594-54-4	NA	6.00E-06	6.00E-06	8.78E-06	1.47E-07	4.02E-08	1.58E-08
Thorium-232	7440-29-1	NA	6.00E-06	6.00E-06	8.78E-06	1.47E-07	4.02E-08	1.58E-08
Tin-126	15832-50-5	NA	8.00E-02	8.00E-02	1.17E-01	1.97E-03	5.36E-04	2.11E-04
Tritium	10028-17-8	NA	NA	NA	NA	NA	NA	NA
Uranium-232	14158-29-3	NA	2.00E-04	2.00E-04	2.93E-04	4.92E-06	1.34E-06	5.26E-07
Uranium-233	13968-55-3	NA	2.00E-04	2.00E-04	2.93E-04	4.92E-06	1.34E-06	5.26E-07
Uranium-234	13966-29-5	NA	2.00E-04	2.00E-04	2.93E-04	4.92E-06	1.34E-06	5.26E-07
Uranium-235	15117-96-1	NA	2.00E-04	2.00E-04	2.93E-04	4.92E-06	1.34E-06	5.26E-07
Uranium-236	13982-70-2	NA	2.00E-04	2.00E-04	2.93E-04	4.92E-06	1.34E-06	5.26E-07
Uranium-238	7440-61-1	NA	2.00E-04	2.00E-04	2.93E-04	4.92E-06	1.34E-06	5.26E-07
Yttrium-90	10098-91-6	NA	3.00E-04	3.00E-04	4.39E-04	7.37E-06	2.01E-06	7.90E-07
Zirconium-93	15751-77-6	NA	5.50E-03	5.50E-03	8.05E-03	1.35E-04	3.68E-05	1.45E-05

Table C2-3 Bioaccumulation Factors for Accumulation of COPCs and ROPCs from Food by Mammals and Birds

Constituent of Potential Concern	CAS Registry Number	Bioaccumulation Factor (BAF-T_p) ([mg/kg tissue]/[mg/kg food])							
		Coyote[d]	Burrowing Owl[d]	Red-tailed Hawk[d]	Canada Goose[d]	Spotted Sandpiper[d]	Great Blue Heron[d]	Bald Eagle[d]	Mink[d]
Niobium-93m	7440-03-1[g]	1.50E-01	3.45E-03	2.77E-02	2.98E-02	1.86E-03	1.08E-01	1.13E-01	2.98E-02
Plutonium-238	13981-16-3	3.00E-07	6.90E-09	5.54E-08	5.95E-08	3.72E-09	2.15E-07	2.25E-07	5.95E-08
Plutonium-239	15117-48-3	3.00E-07	6.90E-09	5.54E-08	5.95E-08	3.72E-09	2.15E-07	2.25E-07	5.95E-08
Plutonium-240	14119-33-6	3.00E-07	6.90E-09	5.54E-08	5.95E-08	3.72E-09	2.15E-07	2.25E-07	5.95E-08
Plutonium-241	14119-32-5	3.00E-07	6.90E-09	5.54E-08	5.95E-08	3.72E-09	2.15E-07	2.25E-07	5.95E-08
Plutonium-242	13982-10-0	3.00E-07	6.90E-09	5.54E-08	5.95E-08	3.72E-09	2.15E-07	2.25E-07	5.95E-08
Protactinium-231	14331-85-2	5.99E-06	1.38E-07	1.11E-06	1.19E-06	7.44E-08	4.30E-06	4.50E-06	1.19E-06
Radium-226	13982-63-3	1.50E-04	3.45E-06	2.77E-05	2.98E-05	1.86E-06	1.08E-04	1.13E-04	2.98E-05
Radium-228	15262-20-1	1.50E-04	3.45E-06	2.77E-05	2.98E-05	1.86E-06	1.08E-04	1.13E-04	2.98E-05
Ruthenium-106	13967-48-1	1.20E-03	2.76E-05	2.22E-04	2.38E-04	1.49E-05	8.60E-04	9.00E-04	2.38E-04
Samarium-151	15715-94-3	3.00E-03	6.90E-05	5.54E-04	5.95E-04	3.72E-05	2.15E-03	2.25E-03	5.95E-04
Selenium-79	15758-45-9	8.99E-03	2.07E-04	1.66E-03	1.79E-03	1.12E-04	6.45E-03	6.75E-03	1.79E-03
Strontium-90	10098-97-2	1.80E-04	4.14E-06	3.32E-05	3.57E-05	2.23E-06	1.29E-04	1.35E-04	3.57E-05
Technetium-99	14133-76-7	5.09E-03	1.17E-04	9.42E-04	1.01E-03	6.32E-05	3.66E-03	3.83E-03	1.01E-03
Thorium-229	15594-54-4	3.60E-06	8.28E-08	6.65E-07	7.14E-07	4.46E-08	2.58E-06	2.70E-06	7.14E-07
Thorium-232	7440-29-1	3.60E-06	8.28E-08	6.65E-07	7.14E-07	4.46E-08	2.58E-06	2.70E-06	7.14E-07
Tin-126	15832-50-5	4.79E-02	1.10E-03	8.86E-03	9.52E-03	5.95E-04	3.44E-02	3.60E-02	9.52E-03
Tritium	10028-17-8	NA	NA	NA	NA	NA	NA	NA	NA
Uranium-232	14158-29-3	1.20E-04	2.76E-06	2.22E-05	2.38E-05	1.49E-06	8.60E-05	9.00E-05	2.38E-05
Uranium-233	13968-55-3	1.20E-04	2.76E-06	2.22E-05	2.38E-05	1.49E-06	8.60E-05	9.00E-05	2.38E-05
Uranium-234	13966-29-5	1.20E-04	2.76E-06	2.22E-05	2.38E-05	1.49E-06	8.60E-05	9.00E-05	2.38E-05
Uranium-235	15117-96-1	1.20E-04	2.76E-06	2.22E-05	2.38E-05	1.49E-06	8.60E-05	9.00E-05	2.38E-05
Uranium-236	13982-70-2	1.20E-04	2.76E-06	2.22E-05	2.38E-05	1.49E-06	8.60E-05	9.00E-05	2.38E-05
Uranium-238	7440-61-1	1.20E-04	2.76E-06	2.22E-05	2.38E-05	1.49E-06	8.60E-05	9.00E-05	2.38E-05
Yttrium-90	10098-91-6	1.80E-04	4.14E-06	3.32E-05	3.57E-05	2.23E-06	1.29E-04	1.35E-04	3.57E-05
Zirconium-93	15751-77-6	3.30E-03	7.59E-05	6.09E-04	6.55E-04	4.09E-05	2.37E-03	2.48E-03	6.55E-04

Table C2-3 Bioaccumulation Factors for Accumulation of COPCs and ROPCs from Food by Mammals and Birds

Notes/Sources

NA = Not applicable.

[a] From Appendix B, Table B-1.

[b] Ingestion-to-tissue transfer factor (mg/kgBW per mg/d); from Table C2-1.

[c] Bird Ba is the same as Mammal Ba multiplied by 0.8 for organic COPCs, and the same as Mammal Ba for inorganic COPCs and ROPCs.

[d] $Ba \times IR_F \times BW$ for each receptor, where IR_F is the daily food ingestion rate (kg/kgBW/d) and BW is the body weight (kg) of the receptor (Risk Assessment Work Plan section 8.1.3.3).

[e] Values for Aroclor-1254 were used for polychlorinated biphenyl mixtures.

[f] Values for Cr(VI) were used for calculations.

[g] Chemical Abstracts Service Registry number for niobium metal.

Table C2-4 Bioaccumulation Factors for Accumulation of COPCs and ROPCs from Water by Mammals and Birds

Constituent of Potential Concern	CAS Registry Number	Log K_{ow} [a]	Mammal Ba[b] ([mg/kg tissue] / [mg ingested /day])	Bird Ba[c] ([mg/kg tissue] / [mg ingested /day])	Bioaccumulation Factor (BAF-T_w) ([mg/kg tissue]/[mg/L water])			
					Mule Deer[d]	Mourning Dove[d]	Great Basin Pocket Mouse[d]	Western Meadow-lark[d]
Organic Compounds								
Aromatic Halogenated Hydrocarbons								
2,3,4,6-Tetrachlorophenol	58-90-2	4.30	5.02E-04	4.02E-04	1.47E-03	5.96E-06	0.00E+00	4.91E-06
4-Chloro-3-methylphenol	59-50-7	3.10	3.16E-05	2.53E-05	9.25E-05	3.76E-07	0.00E+00	3.09E-07
Aromatic Nonhalogenated Hydrocarbons								
2-Nitrotoluene	88-72-2	2.30	5.01E-06	4.01E-06	1.47E-05	5.95E-08	0.00E+00	4.90E-08
4-Nitrobiphenyl	92-93-3	3.77	1.48E-04	1.18E-04	4.33E-04	1.76E-06	0.00E+00	1.45E-06
Benzaldehyde	100-52-7	1.48	7.54E-07	6.03E-07	2.20E-06	8.95E-09	0.00E+00	7.37E-09
Benzene	71-43-2	2.14	3.44E-06	2.75E-06	1.01E-05	4.09E-08	0.00E+00	3.36E-08
Benzyl alcohol	100-51-6	1.10	3.16E-07	2.53E-07	9.26E-07	3.76E-09	0.00E+00	3.09E-09
Ethyl benzene	100-41-4	3.12	3.34E-05	2.67E-05	9.78E-05	3.97E-07	0.00E+00	3.27E-07
m-Xylene	108-38-3	3.20	3.99E-05	3.20E-05	1.17E-04	4.74E-07	0.00E+00	3.90E-07
o-Xylene	95-47-6	3.13	3.39E-05	2.71E-05	9.92E-05	4.03E-07	0.00E+00	3.32E-07
p-Xylene	106-42-3	3.17	3.72E-05	2.97E-05	1.09E-04	4.42E-07	0.00E+00	3.63E-07
Styrene	100-42-5	2.93	2.13E-05	1.71E-05	6.24E-05	2.53E-07	0.00E+00	2.08E-07
Toluene	108-88-3	2.67	1.17E-05	9.34E-06	3.42E-05	1.39E-07	0.00E+00	1.14E-07
Non-aromatic Nonhalogenated Hydrocarbons								
1,2-Epoxybutane	106-88-7	0.86	1.82E-07	1.46E-07	5.32E-07	2.16E-09	0.00E+00	1.78E-09
1,3-Butadiene	106-99-0	1.99	2.45E-06	1.96E-06	7.18E-06	2.92E-08	0.00E+00	2.40E-08
1,4-Dioxane	123-91-1	-0.27	1.36E-08	1.09E-08	3.97E-08	1.61E-10	0.00E+00	1.33E-10
1-Methylpropyl alcohol	78-92-2	0.61	1.02E-07	8.19E-08	2.99E-07	1.22E-09	0.00E+00	1.00E-09
1-Nitropropane	108-03-2	0.87	1.86E-07	1.49E-07	5.45E-07	2.21E-09	0.00E+00	1.82E-09
2,2,4-Trimethylpentane	540-84-1	5.02	2.63E-03	2.10E-03	7.70E-03	3.12E-05	0.00E+00	2.57E-05
2-Butanone	78-93-3	0.28	4.80E-08	3.84E-08	1.40E-07	5.70E-10	0.00E+00	4.69E-10
2-Butenaldehyde (2-Butenal)	4170-30-3	0.55	8.91E-08	7.13E-08	2.61E-07	1.06E-09	0.00E+00	8.71E-10
2-Ethoxyethanol	110-80-5	-0.10	2.00E-08	1.60E-08	5.84E-08	2.37E-10	0.00E+00	1.95E-10

Table C2-4 Bioaccumulation Factors for Accumulation of COPCs and ROPCs from Water by Mammals and Birds

Constituent of Potential Concern	CAS Registry Number	Bioaccumulation Factor (BAF-T_w) ([mg/kg tissue]/[mg/L water])							
		Coyote[d]	Burrowing Owl[d]	Red-tailed Hawk[d]	Canada Goose[d]	Spotted Sandpiper[d]	Great Blue Heron[d]	Bald Eagle[d]	Mink[d]
Organic Compounds									
Aromatic Halogenated Hydrocarbons									
2,3,4,6-Tetrachlorophenol	58-90-2	4.93E-04	6.63E-06	2.42E-05	6.57E-05	2.82E-06	4.32E-05	5.42E-05	4.69E-05
4-Chloro-3-methylphenol	59-50-7	3.10E-05	4.17E-07	1.52E-06	4.14E-06	1.77E-07	2.72E-06	3.42E-06	2.96E-06
Aromatic Nonhalogenated Hydrocarbons									
2-Nitrotoluene	88-72-2	4.92E-06	6.62E-08	2.41E-07	6.56E-07	2.81E-08	4.31E-07	5.41E-07	4.69E-07
4-Nitrobiphenyl	92-93-3	1.45E-04	1.95E-06	7.12E-06	1.94E-05	8.30E-07	1.27E-05	1.60E-05	1.38E-05
Benzaldehyde	100-52-7	7.40E-07	9.95E-09	3.63E-08	9.87E-08	4.23E-09	6.48E-08	8.14E-08	7.05E-08
Benzene	71-43-2	3.38E-06	4.54E-08	1.65E-07	4.50E-07	1.93E-08	2.96E-07	3.72E-07	3.22E-07
Benzyl alcohol	100-51-6	3.11E-07	4.18E-09	1.52E-08	4.14E-08	1.78E-09	2.72E-08	3.42E-08	2.96E-08
Ethyl benzene	100-41-4	3.28E-05	4.41E-07	1.61E-06	4.37E-06	1.87E-07	2.87E-06	3.61E-06	3.12E-06
m-Xylene	108-38-3	3.92E-05	5.27E-07	1.92E-06	5.23E-06	2.24E-07	3.44E-06	4.31E-06	3.73E-06
o-Xylene	95-47-6	3.33E-05	4.48E-07	1.63E-06	4.44E-06	1.90E-07	2.92E-06	3.66E-06	3.17E-06
p-Xylene	106-42-3	3.65E-05	4.91E-07	1.79E-06	4.87E-06	2.09E-07	3.20E-06	4.01E-06	3.48E-06
Styrene	100-42-5	2.09E-05	2.82E-07	1.03E-06	2.79E-06	1.20E-07	1.83E-06	2.30E-06	1.99E-06
Toluene	108-88-3	1.15E-05	1.54E-07	5.62E-07	1.53E-06	6.55E-08	1.00E-06	1.26E-06	1.09E-06
Non-aromatic Nonhalogenated Hydrocarbons									
1,2-Epoxybutane	106-88-7	1.79E-07	2.40E-09	8.75E-09	2.38E-08	1.02E-09	1.57E-08	1.97E-08	1.70E-08
1,3-Butadiene	106-99-0	2.41E-06	3.24E-08	1.18E-07	3.21E-07	1.38E-08	2.11E-07	2.65E-07	2.30E-07
1,4-Dioxane	123-91-1	1.33E-08	1.79E-10	6.53E-10	1.78E-09	7.61E-11	1.17E-09	1.46E-09	1.27E-09
1-Methylpropyl alcohol	78-92-2	1.00E-07	1.35E-09	4.92E-09	1.34E-08	5.74E-10	8.80E-09	1.11E-08	9.57E-09
1-Nitropropane	108-03-2	1.83E-07	2.46E-09	8.96E-09	2.44E-08	1.04E-09	1.60E-08	2.01E-08	1.74E-08
2,2,4-Trimethylpentane	540-84-1	2.58E-03	3.47E-05	1.27E-04	3.44E-04	1.48E-05	2.26E-04	2.84E-04	2.46E-04
2-Butanone	78-93-3	4.71E-08	6.33E-10	2.31E-09	6.28E-09	2.69E-10	4.13E-09	5.18E-09	4.49E-09
2-Butenaldehyde (2-Butenal)	4170-30-3	8.75E-08	1.18E-09	4.29E-09	1.17E-08	5.00E-10	7.67E-09	9.62E-09	8.33E-09
2-Ethoxyethanol	110-80-5	1.96E-08	2.63E-10	9.60E-10	2.61E-09	1.12E-10	1.72E-09	2.15E-09	1.87E-09

Table C2-4 Bioaccumulation Factors for Accumulation of COPCs and ROPCs from Water by Mammals and Birds

Constituent of Potential Concern	CAS Registry Number	Log K_{ow} [a]	Mammal Ba[b] ([mg/kg tissue] / [mg ingested /day])	Bird Ba[c] ([mg/kg tissue] / [mg ingested /day])	Bioaccumulation Factor (BAF-T_w) ([mg/kg tissue]/[mg/L water])			
					Mule Deer[d]	Mourning Dove[d]	Great Basin Pocket Mouse[d]	Western Meadow-lark[d]
2-Heptanone	110-43-0	1.98	2.40E-06	1.92E-06	7.02E-06	2.85E-08	0.00E+00	2.35E-08
2-Hexanone	591-78-6	1.38	6.03E-07	4.82E-07	1.76E-06	7.16E-09	0.00E+00	5.89E-09
2-Methoxyethanol	109-86-4	-0.77	4.27E-09	3.41E-09	1.25E-08	5.07E-11	0.00E+00	4.17E-11
2-Methyl-2-propanol	75-65-0	0.35	5.62E-08	4.50E-08	1.65E-07	6.68E-10	0.00E+00	5.50E-10
2-Methyl-2-propenenitrile	126-98-7	0.54	8.72E-08	6.97E-08	2.55E-07	1.04E-09	0.00E+00	8.52E-10
2-Methylaziridine	75-55-8	-0.60	6.31E-09	5.05E-09	1.85E-08	7.50E-11	0.00E+00	6.17E-11
2-Methylpropyl alcohol	78-83-1	0.76	1.45E-07	1.16E-07	4.23E-07	1.72E-09	0.00E+00	1.41E-09
2-Pentanone	107-87-9	0.91	2.04E-07	1.63E-07	5.97E-07	2.43E-09	0.00E+00	2.00E-09
2-Propanone (Acetone)	67-64-1	-0.22	1.51E-08	1.21E-08	4.42E-08	1.79E-10	0.00E+00	1.48E-10
2-Propene-1-ol	107-18-6	0.17	3.72E-08	2.97E-08	1.09E-07	4.41E-10	0.00E+00	3.63E-10
2-Propyl alcohol	67-63-0	0.05	2.82E-08	2.25E-08	8.25E-08	3.35E-10	0.00E+00	2.76E-10
3-Heptanone	106-35-4	No data	No data	No data	No data	No data	No data	No data
3-Methyl-1-butanol	123-51-3	No data	No data	No data	No data	No data	No data	No data
3-Methyl-2-butanone	563-80-4	No data	No data	No data	No data	No data	No data	No data
3-Pentanone	96-22-0	0.99	2.45E-07	1.96E-07	7.18E-07	2.92E-09	0.00E+00	2.40E-09
4-Heptanone	123-19-3	No data	No data	No data	No data	No data	No data	No data
4-Methyl-2-pentanone	108-10-1	1.19	3.89E-07	3.11E-07	1.14E-06	4.62E-09	0.00E+00	3.81E-09
4-Methyl-3-penten-2-one	141-79-7	No data	No data	No data	No data	No data	No data	No data
5-Methyl-2-hexanone	110-12-3	1.72	1.32E-06	1.05E-06	3.86E-06	1.57E-08	0.00E+00	1.29E-08
Acetaldehyde	75-07-0	-0.22	1.51E-08	1.21E-08	4.42E-08	1.80E-10	0.00E+00	1.48E-10
Acetamide	60-35-5	-1.26	1.38E-09	1.10E-09	4.04E-09	1.64E-11	0.00E+00	1.35E-11
Acetic acid	64-19-7	-0.17	1.70E-08	1.36E-08	4.97E-08	2.02E-10	0.00E+00	1.66E-10
Acetic acid ethyl ester	141-78-6	0.73	1.35E-07	1.08E-07	3.95E-07	1.60E-09	0.00E+00	1.32E-09
Acetic acid n-butyl ester	123-86-4	1.73	1.35E-06	1.08E-06	3.95E-06	1.60E-08	0.00E+00	1.32E-08
Acetonitrile	75-05-8	-0.34	1.15E-08	9.18E-09	3.36E-08	1.36E-10	0.00E+00	1.12E-10
Acrolein	107-02-8	-0.01	2.46E-08	1.97E-08	7.20E-08	2.92E-10	0.00E+00	2.41E-10

Table C2-4 Bioaccumulation Factors for Accumulation of COPCs and ROPCs from Water by Mammals and Birds

Constituent of Potential Concern	CAS Registry Number	Bioaccumulation Factor (BAF-T_w) ([mg/kg tissue]/[mg/L water])							
		Coyote[d]	Burrowing Owl[d]	Red-tailed Hawk[d]	Canada Goose[d]	Spotted Sandpiper[d]	Great Blue Heron[d]	Bald Eagle[d]	Mink[d]
2-Heptanone	110-43-0	2.36E-06	3.17E-08	1.15E-07	3.14E-07	1.35E-08	2.06E-07	2.59E-07	2.24E-07
2-Hexanone	591-78-6	5.92E-07	7.95E-09	2.90E-08	7.89E-08	3.38E-09	5.18E-08	6.51E-08	5.63E-08
2-Methoxyethanol	109-86-4	4.19E-09	5.63E-11	2.05E-10	5.59E-10	2.39E-11	3.67E-10	4.61E-10	3.99E-10
2-Methyl-2-propanol	75-65-0	5.52E-08	7.42E-10	2.71E-09	7.36E-09	3.15E-10	4.84E-09	6.07E-09	5.26E-09
2-Methyl-2-propenenitrile	126-98-7	8.56E-08	1.15E-09	4.19E-09	1.14E-08	4.89E-10	7.50E-09	9.41E-09	8.15E-09
2-Methylaziridine	75-55-8	6.19E-09	8.33E-11	3.04E-10	8.26E-10	3.54E-11	5.43E-10	6.81E-10	5.90E-10
2-Methylpropyl alcohol	78-83-1	1.42E-07	1.91E-09	6.95E-09	1.89E-08	8.11E-10	1.24E-08	1.56E-08	1.35E-08
2-Pentanone	107-87-9	2.00E-07	2.70E-09	9.82E-09	2.67E-08	1.15E-09	1.76E-08	2.21E-08	1.91E-08
2-Propanone (Acetone)	67-64-1	1.48E-08	1.99E-10	7.26E-10	1.98E-09	8.47E-11	1.30E-09	1.63E-09	1.41E-09
2-Propene-1-ol	107-18-6	3.65E-08	4.90E-10	1.79E-09	4.87E-09	2.08E-10	3.20E-09	4.01E-09	3.47E-09
2-Propyl alcohol	67-63-0	2.77E-08	3.72E-10	1.36E-09	3.69E-09	1.58E-10	2.42E-09	3.04E-09	2.64E-09
3-Heptanone	106-35-4	No data	No data	No data	No data	No data	No data	No data	No data
3-Methyl-1-butanol	123-51-3	No data	No data	No data	No data	No data	No data	No data	No data
3-Methyl-2-butanone	563-80-4	No data	No data	No data	No data	No data	No data	No data	No data
3-Pentanone	96-22-0	2.41E-07	3.24E-09	1.18E-08	3.21E-08	1.38E-09	2.11E-08	2.65E-08	2.30E-08
4-Heptanone	123-19-3	No data	No data	No data	No data	No data	No data	No data	No data
4-Methyl-2-pentanone	108-10-1	3.82E-07	5.14E-09	1.87E-08	5.10E-08	2.18E-09	3.35E-08	4.20E-08	3.64E-08
4-Methyl-3-penten-2-one	141-79-7	No data	No data	No data	No data	No data	No data	No data	No data
5-Methyl-2-hexanone	110-12-3	1.29E-06	1.74E-08	6.34E-08	1.73E-07	7.40E-09	1.13E-07	1.42E-07	1.23E-07
Acetaldehyde	75-07-0	1.48E-08	2.00E-10	7.27E-10	1.98E-09	8.48E-11	1.30E-09	1.63E-09	1.41E-09
Acetamide	60-35-5	1.36E-09	1.82E-11	6.64E-11	1.81E-10	7.74E-12	1.19E-10	1.49E-10	1.29E-10
Acetic acid	64-19-7	1.67E-08	2.24E-10	8.17E-10	2.22E-09	9.53E-11	1.46E-09	1.83E-09	1.59E-09
Acetic acid ethyl ester	141-78-6	1.32E-07	1.78E-09	6.49E-09	1.77E-08	7.57E-10	1.16E-08	1.46E-08	1.26E-08
Acetic acid n-butyl ester	123-86-4	1.32E-06	1.78E-08	6.49E-08	1.77E-07	7.57E-09	1.16E-07	1.46E-07	1.26E-07
Acetonitrile	75-05-8	1.13E-08	1.52E-10	5.52E-10	1.50E-09	6.44E-11	9.88E-10	1.24E-09	1.07E-09
Acrolein	107-02-8	2.42E-08	3.25E-10	1.18E-09	3.22E-09	1.38E-10	2.12E-09	2.66E-09	2.30E-09

Table C2-4 Bioaccumulation Factors for Accumulation of COPCs and ROPCs from Water by Mammals and Birds

Constituent of Potential Concern	CAS Registry Number	Log K_{ow} [a]	Mammal Ba[b] ([mg/kg tissue] / [mg ingested /day])	Bird Ba[c] ([mg/kg tissue] / [mg ingested /day])	Bioaccumulation Factor (BAF-T_w) ([mg/kg tissue]/[mg/L water])			
					Mule Deer[d]	Mourning Dove[d]	Great Basin Pocket Mouse[d]	Western Meadow-lark[d]
Acrylonitrile	107-13-1	0.25	4.47E-08	3.58E-08	1.31E-07	5.31E-10	0.00E+00	4.37E-10
Bis(isopropyl)ether	108-20-3	1.56	9.12E-07	7.30E-07	2.67E-06	1.08E-08	0.00E+00	8.92E-09
Butane	106-97-8	2.89	1.95E-05	1.56E-05	5.71E-05	2.32E-07	0.00E+00	1.91E-07
Carbon disulfide	75-15-0	2.00	2.51E-06	2.01E-06	7.35E-06	2.98E-08	0.00E+00	2.46E-08
Cyanogen	460-19-5	0.07	2.95E-08	2.36E-08	8.64E-08	3.51E-10	0.00E+00	2.89E-10
Cyclohexane	110-82-7	3.44	6.92E-05	5.53E-05	2.02E-04	8.22E-07	0.00E+00	6.76E-07
Cyclohexanone	108-94-1	0.81	1.62E-07	1.30E-07	4.75E-07	1.93E-09	0.00E+00	1.59E-09
Cyclohexene	110-83-8	2.86	1.82E-05	1.46E-05	5.32E-05	2.16E-07	0.00E+00	1.78E-07
Cyclopentane	287-92-3	3.00	2.51E-05	2.01E-05	7.35E-05	2.98E-07	0.00E+00	2.46E-07
Ethyl alcohol	64-17-5	-0.31	1.23E-08	9.84E-09	3.60E-08	1.46E-10	0.00E+00	1.20E-10
Ethyl ether	60-29-7	0.89	1.95E-07	1.56E-07	5.71E-07	2.32E-09	0.00E+00	1.91E-09
Ethyl methacrylate	97-63-2	1.59	9.77E-07	7.82E-07	2.86E-06	1.16E-08	0.00E+00	9.55E-09
Formaldehyde	50-00-0	0.34	5.56E-08	4.45E-08	1.63E-07	6.60E-10	0.00E+00	5.44E-10
Formamide	75-12-7	-1.51	7.76E-10	6.21E-10	2.27E-09	9.22E-12	0.00E+00	7.59E-12
Formic acid	64-18-6	-0.54	7.28E-09	5.83E-09	2.13E-08	8.65E-11	0.00E+00	7.12E-11
Formic acid, methyl ester	107-31-3	-0.26	1.37E-08	1.09E-08	4.00E-08	1.62E-10	0.00E+00	1.34E-10
Glycidylaldehyde	765-34-4	-0.12	1.91E-08	1.52E-08	5.58E-08	2.26E-10	0.00E+00	1.86E-10
Methyl acetate	79-20-9	0.46	7.24E-08	5.79E-08	2.12E-07	8.60E-10	0.00E+00	7.08E-10
Methyl alcohol	67-56-1	-0.71	4.90E-09	3.92E-09	1.43E-08	5.82E-11	0.00E+00	4.79E-11
Methyl isocyanate	624-83-9	No data	No data	No data	No data	No data	No data	No data
Methyl methacrylate	80-62-6	0.79	1.55E-07	1.24E-07	4.53E-07	1.84E-09	0.00E+00	1.51E-09
Methyl tert-butyl ether	1634-04-4	0.94	2.19E-07	1.75E-07	6.40E-07	2.60E-09	0.00E+00	2.14E-09
Methylacetylene	74-99-7	0.94	2.19E-07	1.75E-07	6.40E-07	2.60E-09	0.00E+00	2.14E-09
Methylcyclohexane	108-87-2	4.10	3.16E-04	2.53E-04	9.25E-04	3.76E-06	0.00E+00	3.09E-06
N,N-Dimethylacetamide	127-19-5	No data	No data	No data	No data	No data	No data	No data
n-Butyl alcohol	71-36-3	0.88	1.91E-07	1.52E-07	5.58E-07	2.26E-09	0.00E+00	1.86E-09

Table C2-4 Bioaccumulation Factors for Accumulation of COPCs and ROPCs from Water by Mammals and Birds

Constituent of Potential Concern	CAS Registry Number	Bioaccumulation Factor (BAF-T_w) ([mg/kg tissue]/[mg/L water])							
		Coyote[d]	Burrowing Owl[d]	Red-tailed Hawk[d]	Canada Goose[d]	Spotted Sandpiper[d]	Great Blue Heron[d]	Bald Eagle[d]	Mink[d]
Acrylonitrile	107-13-1	4.39E-08	5.90E-10	2.15E-09	5.85E-09	2.51E-10	3.85E-09	4.83E-09	4.18E-09
Bis(isopropyl)ether	108-20-3	8.95E-07	1.20E-08	4.39E-08	1.19E-07	5.12E-09	7.85E-08	9.85E-08	8.53E-08
Butane	106-97-8	1.91E-05	2.57E-07	9.38E-07	2.55E-06	1.09E-07	1.68E-06	2.11E-06	1.82E-06
Carbon disulfide	75-15-0	2.47E-06	3.32E-08	1.21E-07	3.29E-07	1.41E-08	2.16E-07	2.71E-07	2.35E-07
Cyanogen	460-19-5	2.90E-08	3.90E-10	1.42E-09	3.86E-09	1.66E-10	2.54E-09	3.19E-09	2.76E-09
Cyclohexane	110-82-7	6.79E-05	9.13E-07	3.33E-06	9.06E-06	3.88E-07	5.95E-06	7.47E-06	6.47E-06
Cyclohexanone	108-94-1	1.59E-07	2.14E-09	7.80E-09	2.12E-08	9.10E-10	1.40E-08	1.75E-08	1.52E-08
Cyclohexene	110-83-8	1.79E-05	2.40E-07	8.75E-07	2.38E-06	1.02E-07	1.57E-06	1.97E-06	1.70E-06
Cyclopentane	287-92-3	2.47E-05	3.32E-07	1.21E-06	3.29E-06	1.41E-07	2.16E-06	2.71E-06	2.35E-06
Ethyl alcohol	64-17-5	1.21E-08	1.62E-10	5.92E-10	1.61E-09	6.90E-11	1.06E-09	1.33E-09	1.15E-09
Ethyl ether	60-29-7	1.91E-07	2.57E-09	9.38E-09	2.55E-08	1.09E-09	1.68E-08	2.11E-08	1.82E-08
Ethyl methacrylate	97-63-2	9.59E-07	1.29E-08	4.70E-08	1.28E-07	5.48E-09	8.41E-08	1.06E-07	9.14E-08
Formaldehyde	50-00-0	5.46E-08	7.34E-10	2.67E-09	7.28E-09	3.12E-10	4.78E-09	6.00E-09	5.20E-09
Formamide	75-12-7	7.62E-10	1.02E-11	3.73E-11	1.02E-10	4.35E-12	6.68E-11	8.38E-11	7.26E-11
Formic acid	64-18-6	7.15E-09	9.62E-11	3.50E-10	9.54E-10	4.09E-11	6.27E-10	7.87E-10	6.81E-10
Formic acid, methyl ester	107-31-3	1.34E-08	1.81E-10	6.58E-10	1.79E-09	7.67E-11	1.18E-09	1.48E-09	1.28E-09
Glycidylaldehyde	765-34-4	1.87E-08	2.52E-10	9.17E-10	2.50E-09	1.07E-10	1.64E-09	2.06E-09	1.78E-09
Methyl acetate	79-20-9	7.11E-08	9.56E-10	3.48E-09	9.48E-09	4.06E-10	6.23E-09	7.82E-09	6.77E-09
Methyl alcohol	67-56-1	4.81E-09	6.47E-11	2.36E-10	6.41E-10	2.75E-11	4.21E-10	5.29E-10	4.58E-10
Methyl isocyanate	624-83-9	No data	No data	No data	No data	No data	No data	No data	No data
Methyl methacrylate	80-62-6	1.52E-07	2.04E-09	7.45E-09	2.03E-08	8.69E-10	1.33E-08	1.67E-08	1.45E-08
Methyl tert-butyl ether	1634-04-4	2.15E-07	2.89E-09	1.05E-08	2.86E-08	1.23E-09	1.88E-08	2.36E-08	2.05E-08
Methylacetylene	74-99-7	2.15E-07	2.89E-09	1.05E-08	2.86E-08	1.23E-09	1.88E-08	2.36E-08	2.05E-08
Methylcyclohexane	108-87-2	3.10E-04	4.17E-06	1.52E-05	4.14E-05	1.77E-06	2.72E-05	3.42E-05	2.96E-05
N,N-Dimethylacetamide	127-19-5	No data	No data	No data	No data	No data	No data	No data	No data
n-Butyl alcohol	71-36-3	1.87E-07	2.52E-09	9.17E-09	2.50E-08	1.07E-09	1.64E-08	2.06E-08	1.78E-08

Table C2-4 Bioaccumulation Factors for Accumulation of COPCs and ROPCs from Water by Mammals and Birds

Constituent of Potential Concern	CAS Registry Number	Log K_{ow} [a]	Mammal Ba[b] ([mg/kg tissue] / [mg ingested /day])	Bird Ba[c] ([mg/kg tissue] / [mg ingested /day])	Bioaccumulation Factor (BAF-T_w) ([mg/kg tissue]/[mg/L water])			
					Mule Deer[d]	Mourning Dove[d]	Great Basin Pocket Mouse[d]	Western Meadow-lark[d]
n-Heptane	142-82-5	4.66	1.15E-03	9.19E-04	3.36E-03	1.36E-05	0.00E+00	1.12E-05
n-Hexane	110-54-3	4.11	3.24E-04	2.59E-04	9.47E-04	3.84E-06	0.00E+00	3.16E-06
Nitromethane	75-52-5	-0.35	1.12E-08	8.98E-09	3.28E-08	1.33E-10	0.00E+00	1.10E-10
n-Nonane	111-84-2	5.65	1.12E-02	8.98E-03	3.28E-02	1.33E-04	0.00E+00	1.10E-04
n-Octane	111-65-9	4.00	2.51E-04	2.01E-04	7.35E-04	2.98E-06	0.00E+00	2.46E-06
n-Pentane	109-66-0	3.21	4.07E-05	3.26E-05	1.19E-04	4.84E-07	0.00E+00	3.98E-07
n-Propionaldehyde	123-38-6	0.59	9.77E-08	7.82E-08	2.86E-07	1.16E-09	0.00E+00	9.55E-10
n-Propyl alcohol	71-23-8	0.25	4.47E-08	3.57E-08	1.31E-07	5.31E-10	0.00E+00	4.37E-10
n-Valeraldehyde	110-62-3	No data	No data	No data	No data	No data	No data	No data
Oxirane	75-21-8	-0.30	1.26E-08	1.01E-08	3.68E-08	1.49E-10	0.00E+00	1.23E-10
p-Cymene	99-87-6	4.10	3.16E-04	2.53E-04	9.25E-04	3.76E-06	0.00E+00	3.09E-06
Phosgene	75-44-5	No data	No data	No data	No data	No data	No data	No data
Propargyl alcohol	107-19-7	-0.38	1.05E-08	8.38E-09	3.06E-08	1.24E-10	0.00E+00	1.02E-10
Propionic acid	79-09-4	0.33	5.37E-08	4.30E-08	1.57E-07	6.38E-10	0.00E+00	5.25E-10
Propionitrile	107-12-0	0.16	3.63E-08	2.90E-08	1.06E-07	4.31E-10	0.00E+00	3.55E-10
Propylene glycol monomethyl ether	107-98-2	-0.49	8.13E-09	6.50E-09	2.38E-08	9.66E-11	0.00E+00	7.95E-11
p-tert-Butyltoluene	98-51-1	No data	No data	No data	No data	No data	No data	No data
Triethylamine	121-44-8	1.45	7.08E-07	5.66E-07	2.07E-06	8.41E-09	0.00E+00	6.92E-09
Trimethylamine	75-50-3	0.16	3.63E-08	2.90E-08	1.06E-07	4.31E-10	0.00E+00	3.55E-10
Vinyl acetate	108-05-4	0.70	1.26E-07	1.00E-07	3.67E-07	1.49E-09	0.00E+00	1.23E-09
Non-aromatic Halogenated Hydrocarbons								
1,1,1,2-Tetrachloro-2,2-difluoroethane	76-11-9	3.41	6.46E-05	5.17E-05	1.89E-04	7.67E-07	0.00E+00	6.31E-07
1,1,1,2-Tetrachloroethane	630-20-6	2.63	1.07E-05	8.58E-06	3.14E-05	1.27E-07	0.00E+00	1.05E-07
1,1,1-Trichloroethane	71-55-6	2.42	6.63E-06	5.31E-06	1.94E-05	7.88E-08	0.00E+00	6.48E-08
1,1,2,2-Tetrachloro-1,2-difluoroethane	76-12-0	3.73	1.35E-04	1.08E-04	3.95E-04	1.60E-06	0.00E+00	1.32E-06
1,1,2,2-Tetrachloroethane	79-34-5	4.64	1.11E-03	8.84E-04	3.23E-03	1.31E-05	0.00E+00	1.08E-05

Table C2-4 Bioaccumulation Factors for Accumulation of COPCs and ROPCs from Water by Mammals and Birds

Constituent of Potential Concern	CAS Registry Number	Bioaccumulation Factor (BAF-T_w) ([mg/kg tissue]/[mg/L water])							
		Coyote[d]	Burrowing Owl[d]	Red-tailed Hawk[d]	Canada Goose[d]	Spotted Sandpiper[d]	Great Blue Heron[d]	Bald Eagle[d]	Mink[d]
n-Heptane	142-82-5	1.13E-03	1.52E-05	5.52E-05	1.50E-04	6.44E-06	9.88E-05	1.24E-04	1.07E-04
n-Hexane	110-54-3	3.18E-04	4.27E-06	1.56E-05	4.24E-05	1.82E-06	2.78E-05	3.49E-05	3.03E-05
Nitromethane	75-52-5	1.10E-08	1.48E-10	5.40E-10	1.47E-09	6.29E-11	9.65E-10	1.21E-09	1.05E-09
n-Nonane	111-84-2	1.10E-02	1.48E-04	5.40E-04	1.47E-03	6.29E-05	9.65E-04	1.21E-03	1.05E-03
n-Octane	111-65-9	2.47E-04	3.32E-06	1.21E-05	3.29E-05	1.41E-06	2.16E-05	2.71E-05	2.35E-05
n-Pentane	109-66-0	4.00E-05	5.38E-07	1.96E-06	5.33E-06	2.29E-07	3.51E-06	4.40E-06	3.81E-06
n-Propionaldehyde	123-38-6	9.59E-08	1.29E-09	4.70E-09	1.28E-08	5.48E-10	8.41E-09	1.06E-08	9.14E-09
n-Propyl alcohol	71-23-8	4.39E-08	5.90E-10	2.15E-09	5.85E-09	2.51E-10	3.84E-09	4.82E-09	4.18E-09
n-Valeraldehyde	110-62-3	No data	No data	No data	No data	No data	No data	No data	No data
Oxirane	75-21-8	1.24E-08	1.66E-10	6.05E-10	1.65E-09	7.06E-11	1.08E-09	1.36E-09	1.18E-09
p-Cymene	99-87-6	3.10E-04	4.17E-06	1.52E-05	4.14E-05	1.77E-06	2.72E-05	3.42E-05	2.96E-05
Phosgene	75-44-5	No data	No data	No data	No data	No data	No data	No data	No data
Propargyl alcohol	107-19-7	1.03E-08	1.38E-10	5.04E-10	1.37E-09	5.87E-11	9.01E-10	1.13E-09	9.79E-10
Propionic acid	79-09-4	5.27E-08	7.09E-10	2.58E-09	7.03E-09	3.01E-10	4.62E-09	5.80E-09	5.02E-09
Propionitrile	107-12-0	3.56E-08	4.79E-10	1.75E-09	4.75E-09	2.04E-10	3.12E-09	3.92E-09	3.39E-09
Propylene glycol monomethyl ether	107-98-2	7.98E-09	1.07E-10	3.91E-10	1.06E-09	4.56E-11	6.99E-10	8.78E-10	7.60E-10
p-tert-Butyltoluene	98-51-1	No data	No data	No data	No data	No data	No data	No data	No data
Triethylamine	121-44-8	6.95E-07	9.34E-09	3.41E-08	9.27E-08	3.97E-09	6.09E-08	7.65E-08	6.62E-08
Trimethylamine	75-50-3	3.56E-08	4.79E-10	1.75E-09	4.75E-09	2.04E-10	3.12E-09	3.92E-09	3.39E-09
Vinyl acetate	108-05-4	1.23E-07	1.66E-09	6.04E-09	1.64E-08	7.05E-10	1.08E-08	1.36E-08	1.17E-08
Non-aromatic Halogenated Hydrocarbons									
1,1,1,2-Tetrachloro-2,2-difluoroethane	76-11-9	6.34E-05	8.52E-07	3.11E-06	8.45E-06	3.62E-07	5.56E-06	6.97E-06	6.04E-06
1,1,1,2-Tetrachloroethane	630-20-6	1.05E-05	1.42E-07	5.16E-07	1.40E-06	6.02E-08	9.23E-07	1.16E-06	1.00E-06
1,1,1-Trichloroethane	71-55-6	6.51E-06	8.75E-08	3.19E-07	8.68E-07	3.72E-08	5.71E-07	7.16E-07	6.20E-07
1,1,2,2-Tetrachloro-1,2-difluoroethane	76-12-0	1.32E-04	1.78E-06	6.49E-06	1.77E-05	7.57E-07	1.16E-05	1.46E-05	1.26E-05
1,1,2,2-Tetrachloroethane	79-34-5	1.09E-03	1.46E-05	5.32E-05	1.45E-04	6.20E-06	9.51E-05	1.19E-04	1.03E-04

Table C2-4 Bioaccumulation Factors for Accumulation of COPCs and ROPCs from Water by Mammals and Birds

Constituent of Potential Concern	CAS Registry Number	Log K_{ow} [a]	Mammal Ba[b] ([mg/kg tissue] / [mg ingested /day])	Bird Ba[c] ([mg/kg tissue] / [mg ingested /day])	Bioaccumulation Factor (BAF-T_w) ([mg/kg tissue]/[mg/L water])			
					Mule Deer[d]	Mourning Dove[d]	Great Basin Pocket Mouse[d]	Western Meadow-lark[d]
1,1,2,2-Tetrachloroethene	127-18-4	2.55	8.82E-06	7.05E-06	2.58E-05	1.05E-07	0.00E+00	8.62E-08
1,1,2-Trichloroethane	79-00-5	2.10	3.14E-06	2.51E-06	9.19E-06	3.73E-08	0.00E+00	3.07E-08
1,1,2-Trichloroethylene	79-01-6	2.43	6.81E-06	5.45E-06	1.99E-05	8.09E-08	0.00E+00	6.65E-08
1,1-Dichloroethane	75-34-3	1.79	1.56E-06	1.25E-06	4.56E-06	1.85E-08	0.00E+00	1.52E-08
1,1-Dichloroethene	75-35-4	2.12	3.32E-06	2.65E-06	9.70E-06	3.94E-08	0.00E+00	3.24E-08
1,2,2-Trichloro-1,1,2-trifluoroethane	76-13-1	3.16	3.63E-05	2.90E-05	1.06E-04	4.31E-07	0.00E+00	3.55E-07
1,2,3-Trichloropropane	96-18-4	2.25	4.47E-06	3.58E-06	1.31E-05	5.31E-08	0.00E+00	4.37E-08
1,2-Dibromo-3-chloropropane	96-12-8	2.34	5.50E-06	4.40E-06	1.61E-05	6.53E-08	0.00E+00	5.38E-08
1,2-Dichloro-1,1,2,2-tetrafluoroethane	76-14-2	2.82	1.66E-05	1.33E-05	4.86E-05	1.97E-07	0.00E+00	1.62E-07
1,2-Dichloroethane	107-06-2	1.46	7.28E-07	5.83E-07	2.13E-06	8.65E-09	0.00E+00	7.12E-09
1,2-Dichloroethylene	540-59-0	2.09	3.09E-06	2.47E-06	9.04E-06	3.67E-08	0.00E+00	3.02E-08
1,2-Dichloropropane	78-87-5	2.25	4.47E-06	3.58E-06	1.31E-05	5.31E-08	0.00E+00	4.37E-08
1,3-Dichloropropene	542-75-6	1.75	1.41E-06	1.13E-06	4.12E-06	1.67E-08	0.00E+00	1.38E-08
1,4-Dichloro-2-butene	764-41-0	0.87	1.87E-07	1.50E-07	5.48E-07	2.23E-09	0.00E+00	1.83E-09
1-Chloroethene	75-01-4	1.15	3.52E-07	2.81E-07	1.03E-06	4.18E-09	0.00E+00	3.44E-09
2,2-Dichloropropionic acid	75-99-0	1.68	1.20E-06	9.62E-07	3.52E-06	1.43E-08	0.00E+00	1.18E-08
2-Chloropropane	75-29-6	1.90	2.00E-06	1.60E-06	5.84E-06	2.37E-08	0.00E+00	1.95E-08
3-Chloropropene (Allyl chloride)	107-05-1	1.93	2.14E-06	1.71E-06	6.26E-06	2.54E-08	0.00E+00	2.09E-08
Bromochloromethane	74-97-5	1.41	6.46E-07	5.17E-07	1.89E-06	7.67E-09	0.00E+00	6.31E-09
Bromodichloromethane	75-27-4	2.03	2.66E-06	2.13E-06	7.79E-06	3.16E-08	0.00E+00	2.60E-08
Bromoethene	593-60-2	1.07	2.93E-07	2.34E-07	8.57E-07	3.48E-09	0.00E+00	2.86E-09
Bromoform	75-25-2	2.35	5.63E-06	4.50E-06	1.65E-05	6.68E-08	0.00E+00	5.50E-08
Bromomethane	74-83-9	1.11	3.27E-07	2.61E-07	9.55E-07	3.88E-09	0.00E+00	3.19E-09
Carbon tetrachloride	56-23-5	2.72	1.31E-05	1.05E-05	3.83E-05	1.55E-07	0.00E+00	1.28E-07
Chlorodibromomethane	124-48-1	2.18	3.77E-06	3.01E-06	1.10E-05	4.48E-08	0.00E+00	3.68E-08
Chlorodifluoromethane	75-45-6	1.08	3.01E-07	2.41E-07	8.82E-07	3.58E-09	0.00E+00	2.95E-09

Table C2-4 Bioaccumulation Factors for Accumulation of COPCs and ROPCs from Water by Mammals and Birds

Constituent of Potential Concern	CAS Registry Number	Bioaccumulation Factor (BAF-T_w) ([mg/kg tissue]/[mg/L water])							
		Coyote[d]	Burrowing Owl[d]	Red-tailed Hawk[d]	Canada Goose[d]	Spotted Sandpiper[d]	Great Blue Heron[d]	Bald Eagle[d]	Mink[d]
1,1,2,2-Tetrachloroethene	127-18-4	8.66E-06	1.16E-07	4.24E-07	1.15E-06	4.95E-08	7.59E-07	9.52E-07	8.24E-07
1,1,2-Trichloroethane	79-00-5	3.08E-06	4.14E-08	1.51E-07	4.11E-07	1.76E-08	2.70E-07	3.39E-07	2.94E-07
1,1,2-Trichloroethylene	79-01-6	6.68E-06	8.99E-08	3.27E-07	8.91E-07	3.82E-08	5.86E-07	7.35E-07	6.36E-07
1,1-Dichloroethane	75-34-3	1.53E-06	2.06E-08	7.49E-08	2.04E-07	8.74E-09	1.34E-07	1.68E-07	1.46E-07
1,1-Dichloroethene	75-35-4	3.26E-06	4.38E-08	1.60E-07	4.34E-07	1.86E-08	2.85E-07	3.58E-07	3.10E-07
1,2,2-Trichloro-1,1,2-trifluoroethane	76-13-1	3.56E-05	4.79E-07	1.75E-06	4.75E-06	2.04E-07	3.12E-06	3.92E-06	3.39E-06
1,2,3-Trichloropropane	96-18-4	4.39E-06	5.90E-08	2.15E-07	5.85E-07	2.51E-08	3.85E-07	4.83E-07	4.18E-07
1,2-Dibromo-3-chloropropane	96-12-8	5.40E-06	7.26E-08	2.65E-07	7.20E-07	3.09E-08	4.73E-07	5.94E-07	5.14E-07
1,2-Dichloro-1,1,2,2-tetrafluoroethane	76-14-2	1.63E-05	2.19E-07	7.98E-07	2.17E-06	9.31E-08	1.43E-06	1.79E-06	1.55E-06
1,2-Dichloroethane	107-06-2	7.15E-07	9.62E-09	3.50E-08	9.54E-08	4.09E-09	6.27E-08	7.87E-08	6.81E-08
1,2-Dichloroethylene	540-59-0	3.03E-06	4.08E-08	1.49E-07	4.05E-07	1.73E-08	2.66E-07	3.34E-07	2.89E-07
1,2-Dichloropropane	78-87-5	4.39E-06	5.90E-08	2.15E-07	5.85E-07	2.51E-08	3.85E-07	4.83E-07	4.18E-07
1,3-Dichloropropene	542-75-6	1.38E-06	1.86E-08	6.77E-08	1.84E-07	7.89E-09	1.21E-07	1.52E-07	1.32E-07
1,4-Dichloro-2-butene	764-41-0	1.84E-07	2.47E-09	9.01E-09	2.45E-08	1.05E-09	1.61E-08	2.02E-08	1.75E-08
1-Chloroethene	75-01-4	3.45E-07	4.64E-09	1.69E-08	4.60E-08	1.97E-09	3.03E-08	3.80E-08	3.29E-08
2,2-Dichloropropionic acid	75-99-0	1.18E-06	1.59E-08	5.78E-08	1.57E-07	6.74E-09	1.03E-07	1.30E-07	1.12E-07
2-Chloropropane	75-29-6	1.96E-06	2.63E-08	9.60E-08	2.61E-07	1.12E-08	1.72E-07	2.15E-07	1.87E-07
3-Chloropropene (Allyl chloride)	107-05-1	2.10E-06	2.82E-08	1.03E-07	2.80E-07	1.20E-08	1.84E-07	2.31E-07	2.00E-07
Bromochloromethane	74-97-5	6.34E-07	8.52E-09	3.11E-08	8.45E-08	3.62E-09	5.56E-08	6.97E-08	6.04E-08
Bromodichloromethane	75-27-4	2.61E-06	3.51E-08	1.28E-07	3.49E-07	1.49E-08	2.29E-07	2.88E-07	2.49E-07
Bromoethene	593-60-2	2.87E-07	3.86E-09	1.41E-08	3.83E-08	1.64E-09	2.52E-08	3.16E-08	2.74E-08
Bromoform	75-25-2	5.52E-06	7.43E-08	2.71E-07	7.37E-07	3.16E-08	4.84E-07	6.08E-07	5.26E-07
Bromomethane	74-83-9	3.21E-07	4.31E-09	1.57E-08	4.28E-08	1.83E-09	2.81E-08	3.53E-08	3.05E-08
Carbon tetrachloride	56-23-5	1.28E-05	1.73E-07	6.30E-07	1.71E-06	7.34E-08	1.13E-06	1.41E-06	1.22E-06
Chlorodibromomethane	124-48-1	3.70E-06	4.97E-08	1.81E-07	4.93E-07	2.11E-08	3.24E-07	4.07E-07	3.52E-07
Chlorodifluoromethane	75-45-6	2.96E-07	3.98E-09	1.45E-08	3.95E-08	1.69E-09	2.59E-08	3.26E-08	2.82E-08

Table C2-4 Bioaccumulation Factors for Accumulation of COPCs and ROPCs from Water by Mammals and Birds

Constituent of Potential Concern	CAS Registry Number	Log K_{ow} [a]	Mammal Ba[b] ([mg/kg tissue] / [mg ingested /day])	Bird Ba[c] ([mg/kg tissue] / [mg ingested /day])	Bioaccumulation Factor (BAF-T_w) ([mg/kg tissue]/[mg/L water])			
					Mule Deer[d]	Mourning Dove[d]	Great Basin Pocket Mouse[d]	Western Meadow-lark[d]
Chloroethane	75-00-3	3.10	3.16E-05	2.53E-05	9.26E-05	3.76E-07	0.00E+00	3.09E-07
Chloroform	67-66-3	1.95	2.24E-06	1.79E-06	6.55E-06	2.66E-08	0.00E+00	2.19E-08
Chloromethane	74-87-3	0.90	2.01E-07	1.61E-07	5.88E-07	2.39E-09	0.00E+00	1.96E-09
Chloropentafluoroethane	76-15-3	2.10	3.16E-06	2.53E-06	9.25E-06	3.76E-08	0.00E+00	3.09E-08
cis-1,2-Dichloroethene	156-59-2	1.98	2.41E-06	1.93E-06	7.06E-06	2.86E-08	0.00E+00	2.36E-08
cis-1,3-Dichloropropene	10061-01-5	No data	No data	No data	No data	No data	No data	No data
Cyanogen bromide	506-68-3	-0.29	1.29E-08	1.03E-08	3.77E-08	1.53E-10	0.00E+00	1.26E-10
Cyanogen chloride	506-77-4	-0.38	1.05E-08	8.38E-09	3.06E-08	1.24E-10	0.00E+00	1.02E-10
Dichlorodifluoromethane	75-71-8	2.16	3.62E-06	2.89E-06	1.06E-05	4.30E-08	0.00E+00	3.54E-08
Dichlorofluoromethane	75-43-4	1.55	8.91E-07	7.13E-07	2.61E-06	1.06E-08	0.00E+00	8.71E-09
Dichloromethane	75-09-2	1.26	4.52E-07	3.62E-07	1.32E-06	5.37E-09	0.00E+00	4.42E-09
Difluorodibromomethane	75-61-6	No data	No data	No data	No data	No data	No data	No data
Hexafluoroacetone	684-16-2	No data	No data	No data	No data	No data	No data	No data
Iodomethane	74-88-4	1.69	1.23E-06	9.84E-07	3.60E-06	1.46E-08	0.00E+00	1.20E-08
Methylene bromide	74-95-3	1.62	1.05E-06	8.38E-07	3.06E-06	1.24E-08	0.00E+00	1.02E-08
Pentachloroethane	76-01-7	3.05	2.82E-05	2.25E-05	8.25E-05	3.35E-07	0.00E+00	2.76E-07
trans-1,2-Dichloroethylene	156-60-5	1.98	2.41E-06	1.93E-06	7.06E-06	2.86E-08	0.00E+00	2.36E-08
trans-1,3-Dichloropropene	10061-02-6	2.06	2.88E-06	2.31E-06	8.44E-06	3.43E-08	0.00E+00	2.82E-08
Trichloroacetic acid	76-03-9	1.33	5.37E-07	4.30E-07	1.57E-06	6.38E-09	0.00E+00	5.25E-09
Trichlorofluoroethane	27154-33-2	No data	No data	No data	No data	No data	No data	No data
Trichlorofluoromethane	75-69-4	2.53	8.54E-06	6.83E-06	2.50E-05	1.01E-07	0.00E+00	8.35E-08
Trifluorobromomethane	75-63-8	1.86	1.82E-06	1.46E-06	5.32E-06	2.16E-08	0.00E+00	1.78E-08
Dioxin and Furan Compounds (PCDDs/PCDFs)								
1,2,3,4,6,7,8-Heptachlorodibenzo(p)dioxin	35822-46-9	8.20	2.77E-03	2.22E-03	8.11E-03	3.29E-05	0.00E+00	2.71E-05
1,2,3,4,6,7,8-Heptachlorodibenzofuran	67562-39-4	7.92	5.98E-04	4.78E-04	1.75E-03	7.10E-06	0.00E+00	5.84E-06
1,2,3,4,7,8,9-Heptachlorodibenzofuran	55673-89-7	7.92	2.12E-02	1.69E-02	6.19E-02	2.51E-04	0.00E+00	2.07E-04

Table C2-4 Bioaccumulation Factors for Accumulation of COPCs and ROPCs from Water by Mammals and Birds

Constituent of Potential Concern	CAS Registry Number	Bioaccumulation Factor (BAF-T_w) ([mg/kg tissue]/[mg/L water])							
		Coyote[d]	Burrowing Owl[d]	Red-tailed Hawk[d]	Canada Goose[d]	Spotted Sandpiper[d]	Great Blue Heron[d]	Bald Eagle[d]	Mink[d]
Chloroethane	75-00-3	3.11E-05	4.18E-07	1.52E-06	4.14E-06	1.78E-07	2.72E-06	3.42E-06	2.96E-06
Chloroform	67-66-3	2.20E-06	2.96E-08	1.08E-07	2.93E-07	1.26E-08	1.93E-07	2.42E-07	2.09E-07
Chloromethane	74-87-3	1.97E-07	2.65E-09	9.67E-09	2.63E-08	1.13E-09	1.73E-08	2.17E-08	1.88E-08
Chloropentafluoroethane	76-15-3	3.10E-06	4.17E-08	1.52E-07	4.14E-07	1.77E-08	2.72E-07	3.42E-07	2.96E-07
cis-1,2-Dichloroethene	156-59-2	2.37E-06	3.18E-08	1.16E-07	3.16E-07	1.35E-08	2.07E-07	2.60E-07	2.25E-07
cis-1,3-Dichloropropene	10061-01-5	No data	No data	No data	No data	No data	No data	No data	No data
Cyanogen bromide	506-68-3	1.26E-08	1.70E-10	6.20E-10	1.69E-09	7.23E-11	1.11E-09	1.39E-09	1.20E-09
Cyanogen chloride	506-77-4	1.03E-08	1.38E-10	5.04E-10	1.37E-09	5.87E-11	9.01E-10	1.13E-09	9.79E-10
Dichlorodifluoromethane	75-71-8	3.55E-06	4.77E-08	1.74E-07	4.74E-07	2.03E-08	3.11E-07	3.91E-07	3.38E-07
Dichlorofluoromethane	75-43-4	8.75E-07	1.18E-08	4.29E-08	1.17E-07	5.00E-09	7.67E-08	9.63E-08	8.33E-08
Dichloromethane	75-09-2	4.44E-07	5.97E-09	2.18E-08	5.92E-08	2.54E-09	3.89E-08	4.88E-08	4.23E-08
Difluorodibromomethane	75-61-6	No data	No data	No data	No data	No data	No data	No data	No data
Hexafluoroacetone	684-16-2	No data	No data	No data	No data	No data	No data	No data	No data
Iodomethane	74-88-4	1.21E-06	1.62E-08	5.92E-08	1.61E-07	6.90E-09	1.06E-07	1.33E-07	1.15E-07
Methylene bromide	74-95-3	1.03E-06	1.38E-08	5.04E-08	1.37E-07	5.88E-09	9.01E-08	1.13E-07	9.79E-08
Pentachloroethane	76-01-7	2.77E-05	3.72E-07	1.36E-06	3.69E-06	1.58E-07	2.42E-06	3.04E-06	2.64E-06
trans-1,2-Dichloroethylene	156-60-5	2.37E-06	3.18E-08	1.16E-07	3.16E-07	1.35E-08	2.07E-07	2.60E-07	2.25E-07
trans-1,3-Dichloropropene	10061-02-6	2.83E-06	3.81E-08	1.39E-07	3.78E-07	1.62E-08	2.48E-07	3.11E-07	2.70E-07
Trichloroacetic acid	76-03-9	5.27E-07	7.09E-09	2.58E-08	7.03E-08	3.01E-09	4.62E-08	5.80E-08	5.02E-08
Trichlorofluoroethane	27154-33-2	No data	No data	No data	No data	No data	No data	No data	No data
Trichlorofluoromethane	75-69-4	8.38E-06	1.13E-07	4.11E-07	1.12E-06	4.79E-08	7.35E-07	9.22E-07	7.99E-07
Trifluorobromomethane	75-63-8	1.79E-06	2.40E-08	8.75E-08	2.38E-07	1.02E-08	1.57E-07	1.97E-07	1.70E-07
Dioxin and Furan Compounds (PCDDs/PCDFs)									
1,2,3,4,6,7,8-Heptachlorodibenzo(p)dioxin	35822-46-9	2.72E-03	3.66E-05	1.33E-04	3.63E-04	1.56E-05	2.39E-04	2.99E-04	2.59E-04
1,2,3,4,6,7,8-Heptachlorodibenzofuran	67562-39-4	5.87E-04	7.89E-06	2.87E-05	7.83E-05	3.35E-06	5.14E-05	6.45E-05	5.59E-05
1,2,3,4,7,8,9-Heptachlorodibenzofuran	55673-89-7	2.08E-02	2.79E-04	1.02E-03	2.77E-03	1.19E-04	1.82E-03	2.29E-03	1.98E-03

Table C2-4 Bioaccumulation Factors for Accumulation of COPCs and ROPCs from Water by Mammals and Birds

Constituent of Potential Concern	CAS Registry Number	Log K_{ow} [a]	Mammal Ba[b] ([mg/kg tissue] / [mg ingested /day])	Bird Ba[c] ([mg/kg tissue] / [mg ingested /day])	Bioaccumulation Factor (BAF-T_w) ([mg/kg tissue]/[mg/L water])			
					Mule Deer[d]	Mourning Dove[d]	Great Basin Pocket Mouse[d]	Western Meadow-lark[d]
1,2,3,4,7,8-Hexachlorodibenzo(p)dioxin	39227-28-6	7.79	1.68E-02	1.35E-02	4.92E-02	2.00E-04	0.00E+00	1.64E-04
1,2,3,4,7,8-Hexachlorodibenzofuran	70648-26-9	7.25	4.13E-03	3.30E-03	1.21E-02	4.90E-05	0.00E+00	4.04E-05
1,2,3,6,7,8-Hexachlorodibenzo(p)dioxin	57653-85-7	7.25	6.52E-03	5.22E-03	1.91E-02	7.74E-05	0.00E+00	6.37E-05
1,2,3,6,7,8-Hexachlorodibenzofuran	57117-44-9	7.25	1.03E-02	8.26E-03	3.02E-02	1.23E-04	0.00E+00	1.01E-04
1,2,3,7,8,9-Hexachlorodibenzo(p)dioxin	19408-74-3	7.25	7.61E-03	6.08E-03	2.23E-02	9.03E-05	0.00E+00	7.43E-05
1,2,3,7,8,9-Hexachlorodibenzofuran	72918-21-9	7.25	3.42E-02	2.74E-02	1.00E-01	4.07E-04	0.00E+00	3.35E-04
1,2,3,7,8-Pentachlorodibenzo(p)dioxin	40321-76-4	6.64	5.00E-02	4.00E-02	1.46E-01	5.93E-04	0.00E+00	4.88E-04
1,2,3,7,8-Pentachlorodibenzofuran	57117-41-6	6.79	1.20E-02	9.56E-03	3.50E-02	1.42E-04	0.00E+00	1.17E-04
2,3,4,6,7,8-Hexachlorodibenzofuran	60851-34-5	7.25	3.64E-02	2.91E-02	1.07E-01	4.32E-04	0.00E+00	3.56E-04
2,3,4,7,8-Pentachlorodibenzofuran	57117-31-4	6.92	8.70E-02	6.96E-02	2.54E-01	1.03E-03	0.00E+00	8.50E-04
2,3,7,8-Tetrachlorodibenzo(p)dioxin	1746-01-6	6.64	5.43E-02	4.35E-02	1.59E-01	6.45E-04	0.00E+00	5.31E-04
2,3,7,8-Tetrachlorodibenzofuran	51207-31-9	6.53	4.34E-02	3.47E-02	1.27E-01	5.16E-04	0.00E+00	4.24E-04
Dibenzofuran	132-64-9	4.33	5.37E-04	4.30E-04	1.57E-03	6.38E-06	0.00E+00	5.25E-06
Octachlorodibenzo(p)dioxin	3268-87-9	7.59	6.52E-04	5.22E-04	1.91E-03	7.74E-06	0.00E+00	6.37E-06
Octachlorodibenzofuran	39001-02-0	8.78	8.70E-04	6.96E-04	2.54E-03	1.03E-05	0.00E+00	8.50E-06
Total dioxins and dibenzofurans	No CAS #	No data	No data	No data	No data	No data	No data	No data
Polychlorinated Biphenyls (PCBs)								
2,2',3,3',4,4',5-Heptachlorobiphenyl	35065-30-6	7.08	3.02E-01	2.42E-01	8.84E-01	3.59E-03	0.00E+00	2.95E-03
2,2',3,4,4',5,5'-Heptachlorobiphenyl	35065-29-3	7.12	3.31E-01	2.65E-01	9.69E-01	3.93E-03	0.00E+00	3.24E-03
2,3,3',4,4',5,5'-Heptachlorobiphenyl	39635-31-9	No data	No data	No data	No data	No data	No data	No data
2,3,3',4,4',5'-Hexachlorobiphenyl	69782-90-7	No data	No data	No data	No data	No data	No data	No data
2,3,3',4,4',5-Hexachlorobiphenyl	38380-08-4	No data	No data	No data	No data	No data	No data	No data
2,3,3',4,4'-Pentachlorobiphenyl	32598-14-4	No data	No data	No data	No data	No data	No data	No data
2,3',4,4',5,5'-Hexachlorobiphenyl	52663-72-6	No data	No data	No data	No data	No data	No data	No data
2,3,4,4',5-Pentachlorobiphenyl	74472-37-0	No data	No data	No data	No data	No data	No data	No data
2',3,4,4',5-Pentachlorobiphenyl	65510-44-3	No data	No data	No data	No data	No data	No data	No data

Table C2-4 Bioaccumulation Factors for Accumulation of COPCs and ROPCs from Water by Mammals and Birds

Constituent of Potential Concern	CAS Registry Number	Bioaccumulation Factor (BAF-T_w) ([mg/kg tissue]/[mg/L water])							
		Coyote[d]	Burrowing Owl[d]	Red-tailed Hawk[d]	Canada Goose[d]	Spotted Sandpiper[d]	Great Blue Heron[d]	Bald Eagle[d]	Mink[d]
1,2,3,4,7,8-Hexachlorodibenzo(p)dioxin	39227-28-6	1.65E-02	2.22E-04	8.09E-04	2.20E-03	9.44E-05	1.45E-03	1.82E-03	1.57E-03
1,2,3,4,7,8-Hexachlorodibenzofuran	70648-26-9	4.05E-03	5.45E-05	1.99E-04	5.41E-04	2.32E-05	3.55E-04	4.46E-04	3.86E-04
1,2,3,6,7,8-Hexachlorodibenzo(p)dioxin	57653-85-7	6.40E-03	8.61E-05	3.14E-04	8.54E-04	3.66E-05	5.61E-04	7.04E-04	6.10E-04
1,2,3,6,7,8-Hexachlorodibenzofuran	57117-44-9	1.01E-02	1.36E-04	4.96E-04	1.35E-03	5.79E-05	8.88E-04	1.11E-03	9.65E-04
1,2,3,7,8,9-Hexachlorodibenzo(p)dioxin	19408-74-3	7.47E-03	1.00E-04	3.66E-04	9.96E-04	4.27E-05	6.54E-04	8.21E-04	7.11E-04
1,2,3,7,8,9-Hexachlorodibenzofuran	72918-21-9	3.36E-02	4.52E-04	1.65E-03	4.48E-03	1.92E-04	2.95E-03	3.70E-03	3.20E-03
1,2,3,7,8-Pentachlorodibenzo(p)dioxin	40321-76-4	4.90E-02	6.59E-04	2.40E-03	6.54E-03	2.80E-04	4.30E-03	5.39E-03	4.67E-03
1,2,3,7,8-Pentachlorodibenzofuran	57117-41-6	1.17E-02	1.58E-04	5.75E-04	1.56E-03	6.70E-05	1.03E-03	1.29E-03	1.12E-03
2,3,4,6,7,8-Hexachlorodibenzofuran	60851-34-5	3.57E-02	4.81E-04	1.75E-03	4.77E-03	2.04E-04	3.13E-03	3.93E-03	3.40E-03
2,3,4,7,8-Pentachlorodibenzofuran	57117-31-4	8.54E-02	1.15E-03	4.18E-03	1.14E-02	4.88E-04	7.48E-03	9.39E-03	8.13E-03
2,3,7,8-Tetrachlorodibenzo(p)dioxin	1746-01-6	5.33E-02	7.17E-04	2.61E-03	7.11E-03	3.05E-04	4.67E-03	5.87E-03	5.08E-03
2,3,7,8-Tetrachlorodibenzofuran	51207-31-9	4.26E-02	5.73E-04	2.09E-03	5.68E-03	2.43E-04	3.73E-03	4.69E-03	4.06E-03
Dibenzofuran	132-64-9	5.27E-04	7.09E-06	2.58E-05	7.03E-05	3.01E-06	4.62E-05	5.80E-05	5.02E-05
Octachlorodibenzo(p)dioxin	3268-87-9	6.40E-04	8.61E-06	3.14E-05	8.54E-05	3.66E-06	5.61E-05	7.04E-05	6.10E-05
Octachlorodibenzofuran	39001-02-0	8.54E-04	1.15E-05	4.18E-05	1.14E-04	4.88E-06	7.48E-05	9.39E-05	8.13E-05
Total dioxins and dibenzofurans	No CAS #	No data	No data	No data	No data	No data	No data	No data	No data
Polychlorinated Biphenyls (PCBs)									
2,2',3,3',4,4',5-Heptachlorobiphenyl	35065-30-6	2.96E-01	3.99E-03	1.45E-02	3.95E-02	1.69E-03	2.60E-02	3.26E-02	2.82E-02
2,2',3,4,4',5,5'-Heptachlorobiphenyl	35065-29-3	3.25E-01	4.37E-03	1.59E-02	4.34E-02	1.86E-03	2.85E-02	3.58E-02	3.10E-02
2,3,3',4,4',5,5'-Heptachlorobiphenyl	39635-31-9	No data	No data	No data	No data	No data	No data	No data	No data
2,3,3',4,4',5'-Hexachlorobiphenyl	69782-90-7	No data	No data	No data	No data	No data	No data	No data	No data
2,3,3',4,4',5-Hexachlorobiphenyl	38380-08-4	No data	No data	No data	No data	No data	No data	No data	No data
2,3,3',4,4'-Pentachlorobiphenyl	32598-14-4	No data	No data	No data	No data	No data	No data	No data	No data
2,3',4,4',5,5'-Hexachlorobiphenyl	52663-72-6	No data	No data	No data	No data	No data	No data	No data	No data
2,3,4,4',5-Pentachlorobiphenyl	74472-37-0	No data	No data	No data	No data	No data	No data	No data	No data
2',3,4,4',5-Pentachlorobiphenyl	65510-44-3	No data	No data	No data	No data	No data	No data	No data	No data

Table C2-4 Bioaccumulation Factors for Accumulation of COPCs and ROPCs from Water by Mammals and Birds

Constituent of Potential Concern	CAS Registry Number	Log K_{ow} [a]	Mammal Ba[b] ([mg/kg tissue] / [mg ingested /day])	Bird Ba[c] ([mg/kg tissue] / [mg ingested /day])	Bioaccumulation Factor (BAF-T_w) ([mg/kg tissue]/[mg/L water])			
					Mule Deer[d]	Mourning Dove[d]	Great Basin Pocket Mouse[d]	Western Meadow-lark[d]
2,3',4,4',5-Pentachlorobiphenyl	31508-00-6	7.12	3.31E-01	2.65E-01	9.69E-01	3.93E-03	0.00E+00	3.24E-03
3,3',4,4',5,5'-Hexachlorobiphenyl	32774-16-6	7.41	6.43E-01	5.14E-01	1.88E+00	7.63E-03	0.00E+00	6.28E-03
3,3',4,4',5-Pentachlorobiphenyl	57465-28-8	No data	No data	No data	No data	No data	No data	No data
3,3',4,4'-Tetrachlorobiphenyl	32598-13-3	No data	No data	No data	No data	No data	No data	No data
3,4,4',5-Tetrachlorobiphenyl	70362-50-4	No data	No data	No data	No data	No data	No data	No data
Polychlorinated biphenyls (PCBs)[e]	1336-36-3	6.29	4.90E-02	3.92E-02	1.43E-01	5.82E-04	0.00E+00	4.79E-04
	Phthalates							
Bis(2-ethylhexyl) phthalate (DEHP)	117-81-7	5.20	4.02E-03	3.22E-03	1.18E-02	4.78E-05	0.00E+00	3.93E-05
Butylbenzyl phthalate	85-68-7	4.41	6.51E-04	5.20E-04	1.90E-03	7.73E-06	0.00E+00	6.36E-06
Dibutyl phthalate	84-74-2	4.72	1.32E-03	1.05E-03	3.86E-03	1.57E-05	0.00E+00	1.29E-05
Diethyl phthalate	84-66-2	4.44	6.86E-04	5.49E-04	2.01E-03	8.15E-06	0.00E+00	6.70E-06
Dimethyl phthalate	131-11-3	1.63	1.08E-06	8.64E-07	3.16E-06	1.28E-08	0.00E+00	1.06E-08
n-Dioctyl phthalate	117-84-0	9.33	5.37E+01	4.29E+01	1.57E+02	6.38E-01	0.00E+00	5.25E-01
	Light Polycyclic Aromatic Hydrocarbons (molecular weight <200 g/mole)							
2-Chloronaphthalene	91-58-7	4.07	2.94E-04	2.35E-04	8.60E-04	3.49E-06	0.00E+00	2.87E-06
2-Methyl naphthalene	91-57-6	3.86	1.82E-04	1.46E-04	5.32E-04	2.16E-06	0.00E+00	1.78E-06
5-Nitroacenaphthene	602-87-9	No data	No data	No data	No data	No data	No data	No data
Acenaphthene	83-32-9	3.96	2.32E-04	1.85E-04	6.78E-04	2.75E-06	0.00E+00	2.26E-06
Acenaphthylene	208-96-8	4.07	2.95E-04	2.36E-04	8.64E-04	3.51E-06	0.00E+00	2.89E-06
Anthracene	120-12-7	4.47	7.41E-04	5.93E-04	2.17E-03	8.80E-06	0.00E+00	7.24E-06
Fluorene	86-73-7	4.17	3.72E-04	2.98E-04	1.09E-03	4.42E-06	0.00E+00	3.64E-06
Indene	95-13-6	No data	No data	No data	No data	No data	No data	No data
Naphthalene	91-20-3	3.37	5.93E-05	4.74E-05	1.73E-04	7.04E-07	0.00E+00	5.80E-07
Phenanthrene	85-01-8	4.55	8.92E-04	7.13E-04	2.61E-03	1.06E-05	0.00E+00	8.72E-06
Pyrene	129-00-0	5.00	2.51E-03	2.01E-03	7.35E-03	2.98E-05	0.00E+00	2.46E-05

Table C2-4 Bioaccumulation Factors for Accumulation of COPCs and ROPCs from Water by Mammals and Birds

Constituent of Potential Concern	CAS Registry Number	Bioaccumulation Factor (BAF-T_w) ([mg/kg tissue]/[mg/L water])							
		Coyote[d]	Burrowing Owl[d]	Red-tailed Hawk[d]	Canada Goose[d]	Spotted Sandpiper[d]	Great Blue Heron[d]	Bald Eagle[d]	Mink[d]
2,3',4,4',5-Pentachlorobiphenyl	31508-00-6	3.25E-01	4.37E-03	1.59E-02	4.34E-02	1.86E-03	2.85E-02	3.58E-02	3.10E-02
3,3',4,4',5,5'-Hexachlorobiphenyl	32774-16-6	6.31E-01	8.48E-03	3.09E-02	8.42E-02	3.61E-03	5.53E-02	6.94E-02	6.01E-02
3,3',4,4',5-Pentachlorobiphenyl	57465-28-8	No data	No data	No data	No data	No data	No data	No data	No data
3,3',4,4'-Tetrachlorobiphenyl	32598-13-3	No data	No data	No data	No data	No data	No data	No data	No data
3,4,4',5-Tetrachlorobiphenyl	70362-50-4	No data	No data	No data	No data	No data	No data	No data	No data
Polychlorinated biphenyls (PCBs)[e]	1336-36-3	4.81E-02	6.47E-04	2.36E-03	6.41E-03	2.75E-04	4.21E-03	5.29E-03	4.58E-03
	Phthalates								
Bis(2-ethylhexyl) phthalate (DEHP)	117-81-7	3.95E-03	5.31E-05	1.93E-04	5.26E-04	2.26E-05	3.46E-04	4.34E-04	3.76E-04
Butylbenzyl phthalate	85-68-7	6.39E-04	8.59E-06	3.13E-05	8.52E-05	3.65E-06	5.60E-05	7.03E-05	6.08E-05
Dibutyl phthalate	84-74-2	1.29E-03	1.74E-05	6.34E-05	1.73E-04	7.40E-06	1.13E-04	1.42E-04	1.23E-04
Diethyl phthalate	84-66-2	6.73E-04	9.05E-06	3.30E-05	8.98E-05	3.85E-06	5.90E-05	7.41E-05	6.41E-05
Dimethyl phthalate	131-11-3	1.06E-06	1.43E-08	5.20E-08	1.41E-07	6.06E-09	9.29E-08	1.17E-07	1.01E-07
n-Dioctyl phthalate	117-84-0	5.27E+01	7.08E-01	2.58E+00	7.03E+00	3.01E-01	4.62E+00	5.80E+00	5.02E+00
	Light Polycyclic Aromatic Hydrocarbons (molecular weight <200 g/mole)								
2-Chloronaphthalene	91-58-7	2.89E-04	3.88E-06	1.41E-05	3.85E-05	1.65E-06	2.53E-05	3.17E-05	2.75E-05
2-Methyl naphthalene	91-57-6	1.79E-04	2.40E-06	8.75E-06	2.38E-05	1.02E-06	1.57E-05	1.97E-05	1.70E-05
5-Nitroacenaphthene	602-87-9	No data	No data	No data	No data	No data	No data	No data	No data
Acenaphthene	83-32-9	2.27E-04	3.06E-06	1.11E-05	3.03E-05	1.30E-06	1.99E-05	2.50E-05	2.17E-05
Acenaphthylene	208-96-8	2.90E-04	3.90E-06	1.42E-05	3.86E-05	1.66E-06	2.54E-05	3.19E-05	2.76E-05
Anthracene	120-12-7	7.27E-04	9.78E-06	3.56E-05	9.70E-05	4.16E-06	6.38E-05	8.00E-05	6.93E-05
Fluorene	86-73-7	3.65E-04	4.91E-06	1.79E-05	4.87E-05	2.09E-06	3.20E-05	4.02E-05	3.48E-05
Indene	95-13-6	No data	No data	No data	No data	No data	No data	No data	No data
Naphthalene	91-20-3	5.82E-05	7.83E-07	2.85E-06	7.76E-06	3.33E-07	5.10E-06	6.40E-06	5.54E-06
Phenanthrene	85-01-8	8.75E-04	1.18E-05	4.29E-05	1.17E-04	5.00E-06	7.67E-05	9.63E-05	8.34E-05
Pyrene	129-00-0	2.47E-03	3.32E-05	1.21E-04	3.29E-04	1.41E-05	2.16E-04	2.71E-04	2.35E-04

Table C2-4 Bioaccumulation Factors for Accumulation of COPCs and ROPCs from Water by Mammals and Birds

Constituent of Potential Concern	CAS Registry Number	Log K_{ow} [a]	Mammal Ba[b] ([mg/kg tissue] / [mg ingested /day])	Bird Ba[c] ([mg/kg tissue] / [mg ingested /day])	Bioaccumulation Factor (BAF-T_w) ([mg/kg tissue]/[mg/L water])			
					Mule Deer[d]	Mourning Dove[d]	Great Basin Pocket Mouse[d]	Western Meadow-lark[d]
Heavy Polycyclic Aromatic Hydrocarbons (molecular weight >200 g/mole)								
3-Methylcholanthrene	56-49-5	7.11	3.24E-01	2.59E-01	9.47E-01	3.84E-03	0.00E+00	3.16E-03
5-Methylchrysene	3697-24-3	No data	No data	No data	No data	No data	No data	No data
Benzo[a]anthracene	56-55-3	5.68	1.20E-02	9.62E-03	3.52E-02	1.43E-04	0.00E+00	1.18E-04
Benzo[a]pyrene	50-32-8	6.13	2.74E-02	2.20E-02	8.03E-02	3.26E-04	0.00E+00	2.68E-04
Benzo(a,i)pyrene	191-30-0	No data	No data	No data	No data	No data	No data	No data
Benzo(b)fluoranthene	205-99-2	6.20	4.00E-02	3.20E-02	1.17E-01	4.75E-04	0.00E+00	3.91E-04
Benzo(e)pyrene	192-97-2	7.40	6.31E-01	5.05E-01	1.85E+00	7.49E-03	0.00E+00	6.17E-03
Benzo(g,h,i)perylene	191-24-2	7.10	3.16E-01	2.53E-01	9.25E-01	3.76E-03	0.00E+00	3.09E-03
Benzo(j)fluoranthene	205-82-3	6.44	6.92E-02	5.53E-02	2.02E-01	8.22E-04	0.00E+00	6.76E-04
Benzo(k)fluoranthene	207-08-9	6.19	3.98E-02	3.18E-02	1.16E-01	4.73E-04	0.00E+00	3.89E-04
Chrysene	218-01-9	5.74	1.38E-02	1.11E-02	4.04E-02	1.64E-04	0.00E+00	1.35E-04
Dibenz[a,h]acridine	226-36-8	No data	No data	No data	No data	No data	No data	No data
Dibenz[a,h]anthracene	53-70-3	6.55	8.86E-02	7.09E-02	2.59E-01	1.05E-03	0.00E+00	8.66E-04
Dibenz[a,j]acridine	224-42-0	No data	No data	No data	No data	No data	No data	No data
Dibenzo[a,e]fluoranthene	5385-75-1	No data	No data	No data	No data	No data	No data	No data
Dibenzo[a,e]pyrene	192-65-4	No data	No data	No data	No data	No data	No data	No data
Dibenzo[a,h]fluoranthene	No CAS #	No data	No data	No data	No data	No data	No data	No data
Dibenzo[a,h]pyrene	189-64-0	No data	No data	No data	No data	No data	No data	No data
Dibenzo[a,i]pyrene	189-55-9	7.29	4.90E-01	3.92E-01	1.43E+00	5.82E-03	0.00E+00	4.79E-03
Fluoranthene	206-44-0	5.08	3.04E-03	2.43E-03	8.89E-03	3.61E-05	0.00E+00	2.97E-05
Hexachloronaphthalene	1335-87-1	7.59	9.77E-01	7.82E-01	2.86E+00	1.16E-02	0.00E+00	9.55E-03
Indeno[1,2,3-cd]pyrene	193-39-5	6.91	2.07E-01	1.66E-01	6.05E-01	2.46E-03	0.00E+00	2.02E-03
Octachloronaphthalene	2234-13-1	6.42	6.61E-02	5.29E-02	1.93E-01	7.85E-04	0.00E+00	6.46E-04
Pentachloronaphthalene	1321-64-8	No data	No data	No data	No data	No data	No data	No data
Tetrachloronaphthalene	1335-88-2	No data	No data	No data	No data	No data	No data	No data

Table C2-4 Bioaccumulation Factors for Accumulation of COPCs and ROPCs from Water by Mammals and Birds

Constituent of Potential Concern	CAS Registry Number	Bioaccumulation Factor (BAF-T_w) ([mg/kg tissue]/[mg/L water])							
		Coyote[d]	Burrowing Owl[d]	Red-tailed Hawk[d]	Canada Goose[d]	Spotted Sandpiper[d]	Great Blue Heron[d]	Bald Eagle[d]	Mink[d]
Heavy Polycyclic Aromatic Hydrocarbons (molecular weight >200 g/mole)									
3-Methylcholanthrene	56-49-5	3.18E-01	4.27E-03	1.56E-02	4.24E-02	1.82E-03	2.78E-02	3.49E-02	3.03E-02
5-Methylchrysene	3697-24-3	No data	No data	No data	No data	No data	No data	No data	No data
Benzo[a]anthracene	56-55-3	1.18E-02	1.59E-04	5.78E-04	1.57E-03	6.74E-05	1.03E-03	1.30E-03	1.12E-03
Benzo[a]pyrene	50-32-8	2.69E-02	3.62E-04	1.32E-03	3.59E-03	1.54E-04	2.36E-03	2.96E-03	2.57E-03
Benzo(a,i)pyrene	191-30-0	No data	No data	No data	No data	No data	No data	No data	No data
Benzo(b)fluoranthene	205-99-2	3.93E-02	5.28E-04	1.93E-03	5.24E-03	2.25E-04	3.44E-03	4.32E-03	3.74E-03
Benzo(e)pyrene	192-97-2	6.19E-01	8.33E-03	3.04E-02	8.26E-02	3.54E-03	5.43E-02	6.81E-02	5.90E-02
Benzo(g,h,i)perylene	191-24-2	3.10E-01	4.17E-03	1.52E-02	4.14E-02	1.77E-03	2.72E-02	3.42E-02	2.96E-02
Benzo(j)fluoranthene	205-82-3	6.79E-02	9.13E-04	3.33E-03	9.06E-03	3.88E-04	5.95E-03	7.47E-03	6.47E-03
Benzo(k)fluoranthene	207-08-9	3.91E-02	5.25E-04	1.92E-03	5.21E-03	2.23E-04	3.43E-03	4.30E-03	3.72E-03
Chrysene	218-01-9	1.36E-02	1.82E-04	6.65E-04	1.81E-03	7.75E-05	1.19E-03	1.49E-03	1.29E-03
Dibenz[a,h]acridine	226-36-8	No data	No data	No data	No data	No data	No data	No data	No data
Dibenz[a,h]anthracene	53-70-3	8.70E-02	1.17E-03	4.26E-03	1.16E-02	4.97E-04	7.62E-03	9.57E-03	8.28E-03
Dibenz[a,j]acridine	224-42-0	No data	No data	No data	No data	No data	No data	No data	No data
Dibenzo[a,e]fluoranthene	5385-75-1	No data	No data	No data	No data	No data	No data	No data	No data
Dibenzo[a,e]pyrene	192-65-4	No data	No data	No data	No data	No data	No data	No data	No data
Dibenzo[a,h]fluoranthene	No CAS #	No data	No data	No data	No data	No data	No data	No data	No data
Dibenzo[a,h]pyrene	189-64-0	No data	No data	No data	No data	No data	No data	No data	No data
Dibenzo[a,i]pyrene	189-55-9	4.81E-01	6.47E-03	2.36E-02	6.41E-02	2.75E-03	4.21E-02	5.29E-02	4.58E-02
Fluoranthene	206-44-0	2.98E-03	4.01E-05	1.46E-04	3.98E-04	1.71E-05	2.62E-04	3.28E-04	2.84E-04
Hexachloronaphthalene	1335-87-1	9.59E-01	1.29E-02	4.70E-02	1.28E-01	5.48E-03	8.41E-02	1.06E-01	9.14E-02
Indeno[1,2,3-cd]pyrene	193-39-5	2.03E-01	2.73E-03	9.95E-03	2.71E-02	1.16E-03	1.78E-02	2.23E-02	1.93E-02
Octachloronaphthalene	2234-13-1	6.49E-02	8.73E-04	3.18E-03	8.66E-03	3.71E-04	5.69E-03	7.14E-03	6.18E-03
Pentachloronaphthalene	1321-64-8	No data	No data	No data	No data	No data	No data	No data	No data
Tetrachloronaphthalene	1335-88-2	No data	No data	No data	No data	No data	No data	No data	No data

Table C2-4 Bioaccumulation Factors for Accumulation of COPCs and ROPCs from Water by Mammals and Birds

Constituent of Potential Concern	CAS Registry Number	Log K_{ow} [a]	Mammal Ba[b] ([mg/kg tissue] / [mg ingested /day])	Bird Ba[c] ([mg/kg tissue] / [mg ingested /day])	Bioaccumulation Factor (BAF-T_w) ([mg/kg tissue]/[mg/L water])			
					Mule Deer[d]	Mourning Dove[d]	Great Basin Pocket Mouse[d]	Western Meadow-lark[d]
Trichloronaphthalene	1321-65-9	No data	No data	No data	No data	No data	No data	No data
Light Substituted Benzene Compounds (molecular weight <200 g/mole)								
1,2,3-Trichlorobenzene	87-61-6	4.05	2.79E-04	2.23E-04	8.16E-04	3.31E-06	0.00E+00	2.73E-06
1,2,4-Trichlorobenzene	120-82-1	3.99	2.44E-04	1.96E-04	7.15E-04	2.90E-06	0.00E+00	2.39E-06
1,2,4-Trimethyl benzene	95-63-6	3.65	1.12E-04	8.98E-05	3.28E-04	1.33E-06	0.00E+00	1.10E-06
1,2-Dichlorobenzene	95-50-1	3.45	7.01E-05	5.61E-05	2.05E-04	8.32E-07	0.00E+00	6.85E-07
1,3,5-Trimethyl benzene	108-67-8	3.42	6.61E-05	5.29E-05	1.93E-04	7.85E-07	0.00E+00	6.46E-07
1,3-Dichlorobenzene	541-73-1	3.53	8.52E-05	6.81E-05	2.49E-04	1.01E-06	0.00E+00	8.32E-07
1,3-Dinitrobenzene	99-65-0	1.49	7.79E-07	6.23E-07	2.28E-06	9.25E-09	0.00E+00	7.62E-09
1,4-Dichlorobenzene	106-46-7	3.41	6.48E-05	5.18E-05	1.90E-04	7.70E-07	0.00E+00	6.34E-07
1,4-Dinitrobenzene	100-25-4	1.50	7.94E-07	6.35E-07	2.32E-06	9.44E-09	0.00E+00	7.77E-09
2,4,5-Trichlorophenol	95-95-4	3.87	1.86E-04	1.49E-04	5.45E-04	2.21E-06	0.00E+00	1.82E-06
2,4,6-Trichlorophenol	88-06-2	3.71	1.29E-04	1.03E-04	3.79E-04	1.54E-06	0.00E+00	1.26E-06
2,4-Dichlorophenol	120-83-2	3.04	2.74E-05	2.19E-05	8.01E-05	3.25E-07	0.00E+00	2.68E-07
2,4-Dimethylphenol	105-67-9	2.36	5.75E-06	4.60E-06	1.68E-05	6.83E-08	0.00E+00	5.62E-08
2,4-Dinitrophenol	51-28-5	1.52	8.29E-07	6.63E-07	2.43E-06	9.85E-09	0.00E+00	8.10E-09
2,4-Dinitrotoluene	121-14-2	2.00	2.49E-06	1.99E-06	7.29E-06	2.96E-08	0.00E+00	2.43E-08
2,6-Dinitrotoluene	606-20-2	1.89	1.93E-06	1.55E-06	5.65E-06	2.30E-08	0.00E+00	1.89E-08
2-Chlorophenol	95-57-8	2.16	3.64E-06	2.91E-06	1.07E-05	4.33E-08	0.00E+00	3.56E-08
2-Chlorotoluene	95-49-8	3.54	8.64E-05	6.91E-05	2.53E-04	1.03E-06	0.00E+00	8.44E-07
2-Nitrophenol	88-75-5	1.79	1.55E-06	1.24E-06	4.53E-06	1.84E-08	0.00E+00	1.52E-08
4,6-Dinitro-o-cresol	534-52-1	2.12	3.31E-06	2.65E-06	9.69E-06	3.93E-08	0.00E+00	3.24E-08
4-Chlorotoluene	106-43-4	3.33	5.37E-05	4.30E-05	1.57E-04	6.38E-07	0.00E+00	5.25E-07
4-Nitrophenol	100-02-7	1.91	2.04E-06	1.63E-06	5.98E-06	2.43E-08	0.00E+00	2.00E-08
alpha-Methylstyrene	98-83-9	3.46	7.30E-05	5.84E-05	2.14E-04	8.68E-07	0.00E+00	7.14E-07
Aniline	62-53-3	0.98	2.40E-07	1.92E-07	7.02E-07	2.85E-09	0.00E+00	2.35E-09

Table C2-4 Bioaccumulation Factors for Accumulation of COPCs and ROPCs from Water by Mammals and Birds

Constituent of Potential Concern	CAS Registry Number	Bioaccumulation Factor (BAF-T_w) ([mg/kg tissue]/[mg/L water])							
		Coyote[d]	Burrowing Owl[d]	Red-tailed Hawk[d]	Canada Goose[d]	Spotted Sandpiper[d]	Great Blue Heron[d]	Bald Eagle[d]	Mink[d]
Trichloronaphthalene	1321-65-9	No data	No data	No data	No data	No data	No data	No data	No data
Light Substituted Benzene Compounds (molecular weight <200 g/mole)									
1,2,3-Trichlorobenzene	87-61-6	2.74E-04	3.68E-06	1.34E-05	3.65E-05	1.56E-06	2.40E-05	3.01E-05	2.61E-05
1,2,4-Trichlorobenzene	120-82-1	2.40E-04	3.23E-06	1.18E-05	3.20E-05	1.37E-06	2.10E-05	2.64E-05	2.29E-05
1,2,4-Trimethyl benzene	95-63-6	1.10E-04	1.48E-06	5.40E-06	1.47E-05	6.29E-07	9.65E-06	1.21E-05	1.05E-05
1,2-Dichlorobenzene	95-50-1	6.88E-05	9.25E-07	3.37E-06	9.18E-06	3.93E-07	6.03E-06	7.57E-06	6.55E-06
1,3,5-Trimethyl benzene	108-67-8	6.49E-05	8.72E-07	3.18E-06	8.65E-06	3.71E-07	5.68E-06	7.13E-06	6.18E-06
1,3-Dichlorobenzene	541-73-1	8.36E-05	1.12E-06	4.10E-06	1.12E-05	4.78E-07	7.33E-06	9.20E-06	7.96E-06
1,3-Dinitrobenzene	99-65-0	7.65E-07	1.03E-08	3.75E-08	1.02E-07	4.37E-09	6.70E-08	8.41E-08	7.28E-08
1,4-Dichlorobenzene	106-46-7	6.36E-05	8.55E-07	3.12E-06	8.49E-06	3.64E-07	5.58E-06	7.00E-06	6.06E-06
1,4-Dinitrobenzene	100-25-4	7.80E-07	1.05E-08	3.82E-08	1.04E-07	4.46E-09	6.83E-08	8.58E-08	7.43E-08
2,4,5-Trichlorophenol	95-95-4	1.83E-04	2.46E-06	8.95E-06	2.44E-05	1.04E-06	1.60E-05	2.01E-05	1.74E-05
2,4,6-Trichlorophenol	88-06-2	1.27E-04	1.71E-06	6.22E-06	1.69E-05	7.26E-07	1.11E-05	1.40E-05	1.21E-05
2,4-Dichlorophenol	120-83-2	2.69E-05	3.61E-07	1.32E-06	3.59E-06	1.54E-07	2.36E-06	2.96E-06	2.56E-06
2,4-Dimethylphenol	105-67-9	5.65E-06	7.59E-08	2.77E-07	7.53E-07	3.23E-08	4.95E-07	6.21E-07	5.38E-07
2,4-Dinitrophenol	51-28-5	8.14E-07	1.09E-08	3.99E-08	1.09E-07	4.65E-09	7.13E-08	8.95E-08	7.75E-08
2,4-Dinitrotoluene	121-14-2	2.45E-06	3.29E-08	1.20E-07	3.26E-07	1.40E-08	2.14E-07	2.69E-07	2.33E-07
2,6-Dinitrotoluene	606-20-2	1.90E-06	2.55E-08	9.30E-08	2.53E-07	1.08E-08	1.66E-07	2.09E-07	1.81E-07
2-Chlorophenol	95-57-8	3.58E-06	4.81E-08	1.75E-07	4.77E-07	2.04E-08	3.13E-07	3.93E-07	3.41E-07
2-Chlorotoluene	95-49-8	8.48E-05	1.14E-06	4.15E-06	1.13E-05	4.84E-07	7.43E-06	9.33E-06	8.07E-06
2-Nitrophenol	88-75-5	1.52E-06	2.05E-08	7.46E-08	2.03E-07	8.69E-09	1.33E-07	1.67E-07	1.45E-07
4,6-Dinitro-o-cresol	534-52-1	3.25E-06	4.37E-08	1.59E-07	4.34E-07	1.86E-08	2.85E-07	3.58E-07	3.10E-07
4-Chlorotoluene	106-43-4	5.27E-05	7.09E-07	2.58E-06	7.03E-06	3.01E-07	4.62E-06	5.80E-06	5.02E-06
4-Nitrophenol	100-02-7	2.00E-06	2.70E-08	9.82E-08	2.67E-07	1.15E-08	1.76E-07	2.21E-07	1.91E-07
alpha-Methylstyrene	98-83-9	7.17E-05	9.64E-07	3.51E-06	9.56E-06	4.10E-07	6.28E-06	7.89E-06	6.83E-06
Aniline	62-53-3	2.36E-07	3.17E-09	1.15E-08	3.14E-08	1.35E-09	2.06E-08	2.59E-08	2.24E-08

Table C2-4 Bioaccumulation Factors for Accumulation of COPCs and ROPCs from Water by Mammals and Birds

Constituent of Potential Concern	CAS Registry Number	Log K_{ow} [a]	Mammal Ba[b] ([mg/kg tissue] / [mg ingested /day])	Bird Ba[c] ([mg/kg tissue] / [mg ingested /day])	Bioaccumulation Factor (BAF-T_w) ([mg/kg tissue]/[mg/L water])			
					Mule Deer[d]	Mourning Dove[d]	Great Basin Pocket Mouse[d]	Western Meadow-lark[d]
Benzotrichloride	98-07-7	2.92	2.09E-05	1.67E-05	6.11E-05	2.48E-07	0.00E+00	2.04E-07
Benzyl chloride	100-44-7	2.30	5.01E-06	4.01E-06	1.47E-05	5.95E-08	0.00E+00	4.90E-08
Bromobenzene	108-86-1	2.99	2.45E-05	1.96E-05	7.18E-05	2.92E-07	0.00E+00	2.40E-07
Chlorobenzene	108-90-7	2.79	1.55E-05	1.24E-05	4.53E-05	1.84E-07	0.00E+00	1.51E-07
Cumene	98-82-8	3.61	1.03E-04	8.24E-05	3.01E-04	1.22E-06	0.00E+00	1.01E-06
m-Cresol	108-39-4	1.96	2.29E-06	1.83E-06	6.69E-06	2.72E-08	0.00E+00	2.23E-08
n-Butyl benzene	104-51-8	4.28	4.79E-04	3.83E-04	1.40E-03	5.69E-06	0.00E+00	4.68E-06
Nitrobenzene	98-95-3	1.83	1.71E-06	1.37E-06	5.01E-06	2.03E-08	0.00E+00	1.67E-08
n-Propyl benzene	103-65-1	3.69	1.23E-04	9.84E-05	3.60E-04	1.46E-06	0.00E+00	1.20E-06
o-Cresol	95-48-7	2.02	2.64E-06	2.11E-06	7.72E-06	3.13E-08	0.00E+00	2.58E-08
o-Dinitrobenzene	528-29-0	1.69	1.23E-06	9.84E-07	3.60E-06	1.46E-08	0.00E+00	1.20E-08
o-Nitroaniline	88-74-4	1.85	1.78E-06	1.42E-06	5.20E-06	2.11E-08	0.00E+00	1.74E-08
o-Toluidine	95-53-4	1.34	5.50E-07	4.40E-07	1.61E-06	6.53E-09	0.00E+00	5.38E-09
p-Chloroaniline	106-47-8	1.87	1.86E-06	1.49E-06	5.44E-06	2.21E-08	0.00E+00	1.82E-08
p-Cresol	106-44-5	1.94	2.19E-06	1.75E-06	6.39E-06	2.60E-08	0.00E+00	2.14E-08
Phenol	108-95-2	1.48	7.54E-07	6.03E-07	2.20E-06	8.95E-09	0.00E+00	7.37E-09
p-Nitrochlorobenzene	100-00-5	2.39	6.17E-06	4.93E-06	1.80E-05	7.32E-08	0.00E+00	6.03E-08
p-Toluidine	106-49-0	1.40	6.31E-07	5.05E-07	1.85E-06	7.49E-09	0.00E+00	6.17E-09
sec-Butyl benzene	135-98-8	No data	No data	No data	No data	No data	No data	No data
tert-Butyl benzene	98-06-6	4.11	3.24E-04	2.59E-04	9.47E-04	3.84E-06	0.00E+00	3.16E-06
Toluene-2,6-diamine	823-40-5	0.16	3.63E-08	2.90E-08	1.06E-07	4.31E-10	0.00E+00	3.55E-10
Trimethyl benzene	25551-13-7	3.42	6.61E-05	5.29E-05	1.93E-04	7.85E-07	0.00E+00	6.46E-07
Other Light Semivolatile Compounds (molecular weight <200 g/mole)								
1,1'-Biphenyl	92-52-4	3.90	2.00E-04	1.60E-04	5.84E-04	2.37E-06	0.00E+00	1.95E-06
1,1-Dimethylhydrazine	57-14-7	-1.19	1.62E-09	1.30E-09	4.75E-09	1.93E-11	0.00E+00	1.59E-11
1,2-Dimethylhydrazine	540-73-8	-1.37	1.08E-09	8.61E-10	3.15E-09	1.28E-11	0.00E+00	1.05E-11

Table C2-4 Bioaccumulation Factors for Accumulation of COPCs and ROPCs from Water by Mammals and Birds

Constituent of Potential Concern	CAS Registry Number	Bioaccumulation Factor (BAF-T_w) ([mg/kg tissue]/[mg/L water])							
		Coyote[d]	Burrowing Owl[d]	Red-tailed Hawk[d]	Canada Goose[d]	Spotted Sandpiper[d]	Great Blue Heron[d]	Bald Eagle[d]	Mink[d]
Benzotrichloride	98-07-7	2.05E-05	2.76E-07	1.01E-06	2.74E-06	1.17E-07	1.80E-06	2.26E-06	1.95E-06
Benzyl chloride	100-44-7	4.92E-06	6.61E-08	2.41E-07	6.56E-07	2.81E-08	4.31E-07	5.41E-07	4.68E-07
Bromobenzene	108-86-1	2.41E-05	3.24E-07	1.18E-06	3.21E-06	1.38E-07	2.11E-06	2.65E-06	2.30E-06
Chlorobenzene	108-90-7	1.52E-05	2.04E-07	7.44E-07	2.03E-06	8.68E-08	1.33E-06	1.67E-06	1.45E-06
Cumene	98-82-8	1.01E-04	1.36E-06	4.95E-06	1.35E-05	5.78E-07	8.86E-06	1.11E-05	9.63E-06
m-Cresol	108-39-4	2.24E-06	3.02E-08	1.10E-07	2.99E-07	1.28E-08	1.97E-07	2.47E-07	2.14E-07
n-Butyl benzene	104-51-8	4.70E-04	6.32E-06	2.30E-05	6.27E-05	2.69E-06	4.12E-05	5.17E-05	4.48E-05
Nitrobenzene	98-95-3	1.68E-06	2.26E-08	8.23E-08	2.24E-07	9.60E-09	1.47E-07	1.85E-07	1.60E-07
n-Propyl benzene	103-65-1	1.21E-04	1.62E-06	5.92E-06	1.61E-05	6.90E-07	1.06E-05	1.33E-05	1.15E-05
o-Cresol	95-48-7	2.59E-06	3.48E-08	1.27E-07	3.45E-07	1.48E-08	2.27E-07	2.85E-07	2.47E-07
o-Dinitrobenzene	528-29-0	1.21E-06	1.62E-08	5.92E-08	1.61E-07	6.90E-09	1.06E-07	1.33E-07	1.15E-07
o-Nitroaniline	88-74-4	1.75E-06	2.35E-08	8.56E-08	2.33E-07	9.98E-09	1.53E-07	1.92E-07	1.66E-07
o-Toluidine	95-53-4	5.40E-07	7.26E-09	2.65E-08	7.20E-08	3.09E-09	4.73E-08	5.94E-08	5.14E-08
p-Chloroaniline	106-47-8	1.82E-06	2.45E-08	8.94E-08	2.43E-07	1.04E-08	1.60E-07	2.01E-07	1.74E-07
p-Cresol	106-44-5	2.15E-06	2.88E-08	1.05E-07	2.86E-07	1.23E-08	1.88E-07	2.36E-07	2.04E-07
Phenol	108-95-2	7.40E-07	9.95E-09	3.63E-08	9.87E-08	4.23E-09	6.48E-08	8.14E-08	7.05E-08
p-Nitrochlorobenzene	100-00-5	6.05E-06	8.14E-08	2.97E-07	8.07E-07	3.46E-08	5.31E-07	6.66E-07	5.77E-07
p-Toluidine	106-49-0	6.19E-07	8.33E-09	3.04E-08	8.26E-08	3.54E-09	5.43E-08	6.81E-08	5.90E-08
sec-Butyl benzene	135-98-8	No data	No data	No data	No data	No data	No data	No data	No data
tert-Butyl benzene	98-06-6	3.18E-04	4.27E-06	1.56E-05	4.24E-05	1.82E-06	2.78E-05	3.49E-05	3.03E-05
Toluene-2,6-diamine	823-40-5	3.56E-08	4.79E-10	1.75E-09	4.75E-09	2.04E-10	3.12E-09	3.92E-09	3.39E-09
Trimethyl benzene	25551-13-7	6.49E-05	8.72E-07	3.18E-06	8.65E-06	3.71E-07	5.68E-06	7.14E-06	6.18E-06
Other Light Semivolatile Compounds (molecular weight <200 g/mole)									
1,1'-Biphenyl	92-52-4	1.96E-04	2.63E-06	9.60E-06	2.61E-05	1.12E-06	1.72E-05	2.15E-05	1.87E-05
1,1-Dimethylhydrazine	57-14-7	1.59E-09	2.14E-11	7.80E-11	2.12E-10	9.10E-12	1.40E-10	1.75E-10	1.52E-10
1,2-Dimethylhydrazine	540-73-8	1.06E-09	1.42E-11	5.18E-11	1.41E-10	6.04E-12	9.26E-11	1.16E-10	1.01E-10

Table C2-4 Bioaccumulation Factors for Accumulation of COPCs and ROPCs from Water by Mammals and Birds

Constituent of Potential Concern	CAS Registry Number	Log K_{ow} [a]	Mammal Ba[b] ([mg/kg tissue] / [mg ingested /day])	Bird Ba[c] ([mg/kg tissue] / [mg ingested /day])	Bioaccumulation Factor (BAF-T_w) ([mg/kg tissue]/[mg/L water])			
					Mule Deer[d]	Mourning Dove[d]	Great Basin Pocket Mouse[d]	Western Meadow-lark[d]
1,2-Diphenylhydrazine	122-66-7	2.94	2.19E-05	1.75E-05	6.40E-05	2.60E-07	0.00E+00	2.14E-07
1,3-Propane sultone	1120-71-4	-0.52	7.53E-09	6.03E-09	2.20E-08	8.95E-11	0.00E+00	7.36E-11
2,4-Toluene diisocyanate	584-84-9	No data	No data	No data	No data	No data	No data	No data
2-Chloroacetophenone	532-27-4	1.93	2.14E-06	1.71E-06	6.26E-06	2.54E-08	0.00E+00	2.09E-08
2-Propenoic acid	79-10-7	0.43	6.76E-08	5.41E-08	1.98E-07	8.03E-10	0.00E+00	6.61E-10
4,4'-Methylenedianiline	101-77-9	1.59	9.77E-07	7.82E-07	2.86E-06	1.16E-08	0.00E+00	9.55E-09
Acetophenone	98-86-2	1.64	1.10E-06	8.78E-07	3.21E-06	1.30E-08	0.00E+00	1.07E-08
Benzoic acid	65-85-0	1.87	1.86E-06	1.49E-06	5.45E-06	2.21E-08	0.00E+00	1.82E-08
bis(2-Chloroethoxy)methane	111-91-1	1.30	5.01E-07	4.01E-07	1.47E-06	5.95E-09	0.00E+00	4.90E-09
bis(2-Chloroethyl) ether	111-44-4	1.30	5.02E-07	4.02E-07	1.47E-06	5.97E-09	0.00E+00	4.91E-09
Chlorocyclopentadiene	41851-50-7	2.43	6.76E-06	5.41E-06	1.98E-05	8.03E-08	0.00E+00	6.61E-08
Cyclohexanol	108-93-0	1.23	4.27E-07	3.41E-07	1.25E-06	5.07E-09	0.00E+00	4.17E-09
Dichloroisopropyl ether	108-60-1	2.58	9.55E-06	7.64E-06	2.79E-05	1.13E-07	0.00E+00	9.34E-08
Dichloromethyl ether	542-88-1	0.58	9.55E-08	7.64E-08	2.79E-07	1.13E-09	0.00E+00	9.34E-10
Dichloropentadiene	61626-71-9	No data	No data	No data	No data	No data	No data	No data
Dimethyl sulfate	77-78-1	0.16	3.63E-08	2.90E-08	1.06E-07	4.31E-10	0.00E+00	3.55E-10
Dimethylaniline	121-69-7	2.31	5.13E-06	4.10E-06	1.50E-05	6.09E-08	0.00E+00	5.01E-08
Di-n-propylnitrosamine	621-64-7	1.38	6.03E-07	4.82E-07	1.76E-06	7.16E-09	0.00E+00	5.89E-09
Diphenyl ether	101-84-8	4.21	4.07E-04	3.26E-04	1.19E-03	4.84E-06	0.00E+00	3.98E-06
Epichlorohydrin	106-89-8	0.25	4.47E-08	3.58E-08	1.31E-07	5.31E-10	0.00E+00	4.37E-10
Ethyl carbamate (Urethane)	51-79-6	-0.15	1.78E-08	1.42E-08	5.20E-08	2.11E-10	0.00E+00	1.74E-10
Ethyl methanesulfonate	62-50-0	0.05	2.81E-08	2.25E-08	8.23E-08	3.34E-10	0.00E+00	2.75E-10
Ethylene dibromide	106-93-4	1.75	1.41E-06	1.13E-06	4.13E-06	1.68E-08	0.00E+00	1.38E-08
Ethylene glycol	107-21-1	-1.36	1.10E-09	8.77E-10	3.21E-09	1.30E-11	0.00E+00	1.07E-11
Ethylene glycol monobutyl ether	111-76-2	0.83	1.70E-07	1.36E-07	4.97E-07	2.02E-09	0.00E+00	1.66E-09
Ethylene glycol monoethyl ether acetate	111-15-9	0.59	9.77E-08	7.82E-08	2.86E-07	1.16E-09	0.00E+00	9.55E-10

Table C2-4 Bioaccumulation Factors for Accumulation of COPCs and ROPCs from Water by Mammals and Birds

Constituent of Potential Concern	CAS Registry Number	Bioaccumulation Factor (BAF-T_w) ([mg/kg tissue]/[mg/L water])							
		Coyote[d]	Burrowing Owl[d]	Red-tailed Hawk[d]	Canada Goose[d]	Spotted Sandpiper[d]	Great Blue Heron[d]	Bald Eagle[d]	Mink[d]
1,2-Diphenylhydrazine	122-66-7	2.15E-05	2.89E-07	1.05E-06	2.86E-06	1.23E-07	1.88E-06	2.36E-06	2.05E-06
1,3-Propane sultone	1120-71-4	7.40E-09	9.94E-11	3.62E-10	9.86E-10	4.23E-11	6.48E-10	8.14E-10	7.04E-10
2,4-Toluene diisocyanate	584-84-9	No data	No data	No data	No data	No data	No data	No data	No data
2-Chloroacetophenone	532-27-4	2.10E-06	2.82E-08	1.03E-07	2.80E-07	1.20E-08	1.84E-07	2.31E-07	2.00E-07
2-Propenoic acid	79-10-7	6.64E-08	8.92E-10	3.25E-09	8.85E-09	3.79E-10	5.82E-09	7.30E-09	6.32E-09
4,4'-Methylenedianiline	101-77-9	9.59E-07	1.29E-08	4.70E-08	1.28E-07	5.48E-09	8.41E-08	1.06E-07	9.14E-08
Acetophenone	98-86-2	1.08E-06	1.45E-08	5.28E-08	1.44E-07	6.16E-09	9.44E-08	1.19E-07	1.03E-07
Benzoic acid	65-85-0	1.83E-06	2.46E-08	8.96E-08	2.44E-07	1.04E-08	1.60E-07	2.01E-07	1.74E-07
bis(2-Chloroethoxy)methane	111-91-1	4.92E-07	6.62E-09	2.41E-08	6.56E-08	2.81E-09	4.31E-08	5.41E-08	4.69E-08
bis(2-Chloroethyl) ether	111-44-4	4.93E-07	6.63E-09	2.42E-08	6.58E-08	2.82E-09	4.32E-08	5.43E-08	4.70E-08
Chlorocyclopentadiene	41851-50-7	6.64E-06	8.92E-08	3.25E-07	8.85E-07	3.79E-08	5.82E-07	7.30E-07	6.32E-07
Cyclohexanol	108-93-0	4.19E-07	5.63E-09	2.05E-08	5.59E-08	2.39E-09	3.67E-08	4.61E-08	3.99E-08
Dichloroisopropyl ether	108-60-1	9.38E-06	1.26E-07	4.59E-07	1.25E-06	5.36E-08	8.22E-07	1.03E-06	8.93E-07
Dichloromethyl ether	542-88-1	9.38E-08	1.26E-09	4.59E-09	1.25E-08	5.36E-10	8.22E-09	1.03E-08	8.93E-09
Dichloropentadiene	61626-71-9	No data	No data	No data	No data	No data	No data	No data	No data
Dimethyl sulfate	77-78-1	3.56E-08	4.79E-10	1.75E-09	4.75E-09	2.04E-10	3.12E-09	3.92E-09	3.39E-09
Dimethylaniline	121-69-7	5.04E-06	6.77E-08	2.47E-07	6.72E-07	2.88E-08	4.41E-07	5.54E-07	4.80E-07
Di-n-propylnitrosamine	621-64-7	5.92E-07	7.96E-09	2.90E-08	7.89E-08	3.38E-09	5.19E-08	6.51E-08	5.64E-08
Diphenyl ether	101-84-8	4.00E-04	5.38E-06	1.96E-05	5.33E-05	2.29E-06	3.51E-05	4.40E-05	3.81E-05
Epichlorohydrin	106-89-8	4.39E-08	5.90E-10	2.15E-09	5.85E-09	2.51E-10	3.85E-09	4.83E-09	4.18E-09
Ethyl carbamate (Urethane)	51-79-6	1.75E-08	2.35E-10	8.55E-10	2.33E-09	9.98E-11	1.53E-09	1.92E-09	1.66E-09
Ethyl methanesulfonate	62-50-0	2.76E-08	3.71E-10	1.35E-09	3.68E-09	1.58E-10	2.42E-09	3.04E-09	2.63E-09
Ethylene dibromide	106-93-4	1.39E-06	1.86E-08	6.79E-08	1.85E-07	7.92E-09	1.21E-07	1.52E-07	1.32E-07
Ethylene glycol	107-21-1	1.08E-09	1.45E-11	5.27E-11	1.44E-10	6.15E-12	9.43E-11	1.18E-10	1.03E-10
Ethylene glycol monobutyl ether	111-76-2	1.67E-07	2.24E-09	8.17E-09	2.22E-08	9.53E-10	1.46E-08	1.83E-08	1.59E-08
Ethylene glycol monoethyl ether acetate	111-15-9	9.59E-08	1.29E-09	4.70E-09	1.28E-08	5.48E-10	8.41E-09	1.06E-08	9.14E-09

Table C2-4 Bioaccumulation Factors for Accumulation of COPCs and ROPCs from Water by Mammals and Birds

Constituent of Potential Concern	CAS Registry Number	Log K_{ow} [a]	Mammal Ba[b] ([mg/kg tissue] / [mg ingested /day])	Bird Ba[c] ([mg/kg tissue] / [mg ingested /day])	Bioaccumulation Factor (BAF-T_w) ([mg/kg tissue]/[mg/L water])			
					Mule Deer[d]	Mourning Dove[d]	Great Basin Pocket Mouse[d]	Western Meadow-lark[d]
Ethylene thiourea	96-45-7	-0.66	5.50E-09	4.40E-09	1.61E-08	6.53E-11	0.00E+00	5.37E-11
Furfural	98-01-1	0.96	2.29E-07	1.83E-07	6.70E-07	2.72E-09	0.00E+00	2.24E-09
Maleic hydrazide	123-33-1	-0.84	3.63E-09	2.90E-09	1.06E-08	4.31E-11	0.00E+00	3.55E-11
Malononitrile	109-77-3	-0.60	6.31E-09	5.05E-09	1.85E-08	7.49E-11	0.00E+00	6.17E-11
Methyl styrene (mixed isomers)	25013-15-4	3.48	7.59E-05	6.07E-05	2.22E-04	9.01E-07	0.00E+00	7.42E-07
Methylhydrazine	60-34-4	-1.05	2.24E-09	1.79E-09	6.55E-09	2.66E-11	0.00E+00	2.19E-11
N,N-Diphenylamine	122-39-4	3.50	7.94E-05	6.35E-05	2.32E-04	9.44E-07	0.00E+00	7.77E-07
Nitric acid, propyl ester	627-13-4	No data	No data	No data	No data	No data	No data	No data
N-Nitrosodi-n-butylamine	924-16-3	2.41	6.46E-06	5.16E-06	1.89E-05	7.67E-08	0.00E+00	6.31E-08
N-Nitrosomorpholine	59-89-2	0.98	2.40E-07	1.92E-07	7.03E-07	2.85E-09	0.00E+00	2.35E-09
N-Nitroso-N,N-dimethylamine	62-75-9	-0.57	6.76E-09	5.41E-09	1.98E-08	8.03E-11	0.00E+00	6.61E-11
o-Anisidine	90-04-0	1.18	3.80E-07	3.04E-07	1.11E-06	4.52E-09	0.00E+00	3.72E-09
Oxalic acid	144-62-7	No data	No data	No data	No data	No data	No data	No data
Phthalic anhydride	85-44-9	-0.60	6.28E-09	5.02E-09	1.84E-08	7.46E-11	0.00E+00	6.14E-11
p-Phthalic acid	100-21-0	2.00	2.51E-06	2.01E-06	7.35E-06	2.98E-08	0.00E+00	2.46E-08
Pyridine	110-86-1	0.67	1.18E-07	9.40E-08	3.44E-07	1.40E-09	0.00E+00	1.15E-09
Quinoline	91-22-5	2.03	2.69E-06	2.15E-06	7.88E-06	3.20E-08	0.00E+00	2.63E-08
Quinone	106-51-4	0.20	3.98E-08	3.18E-08	1.16E-07	4.73E-10	0.00E+00	3.89E-10
Safrole	94-59-7	2.66	1.15E-05	9.18E-06	3.36E-05	1.36E-07	0.00E+00	1.12E-07
Tetrahydrofuran	109-99-9	0.45	7.03E-08	5.63E-08	2.06E-07	8.35E-10	0.00E+00	6.88E-10
Other Heavy Semivolatile Compounds (molecular weight >200 g/mole)								
1,2,4,5-Tetrachlorobenzene	95-94-3	4.64	1.10E-03	8.76E-04	3.20E-03	1.30E-05	0.00E+00	1.07E-05
1,3,5-Trinitrobenzene	99-35-4	1.18	3.79E-07	3.03E-07	1.11E-06	4.51E-09	0.00E+00	3.71E-09
2,6-Bis(tert-butyl)-4-methylphenol	128-37-0	4.17	3.72E-04	2.97E-04	1.09E-03	4.41E-06	0.00E+00	3.63E-06
2-Cyclohexyl-4,6-dinitrophenol	131-89-5	4.54	8.71E-04	6.97E-04	2.55E-03	1.03E-05	0.00E+00	8.51E-06
2-sec-Butyl-4,6-dinitrophenol	88-85-7	3.56	9.12E-05	7.30E-05	2.67E-04	1.08E-06	0.00E+00	8.92E-07

Table C2-4 Bioaccumulation Factors for Accumulation of COPCs and ROPCs from Water by Mammals and Birds

Constituent of Potential Concern	CAS Registry Number	Bioaccumulation Factor (BAF-T_w) ([mg/kg tissue]/[mg/L water])							
		Coyote[d]	Burrowing Owl[d]	Red-tailed Hawk[d]	Canada Goose[d]	Spotted Sandpiper[d]	Great Blue Heron[d]	Bald Eagle[d]	Mink[d]
Ethylene thiourea	96-45-7	5.40E-09	7.25E-11	2.64E-10	7.20E-10	3.08E-11	4.73E-10	5.94E-10	5.14E-10
Furfural	98-01-1	2.25E-07	3.02E-09	1.10E-08	3.00E-08	1.29E-09	1.97E-08	2.47E-08	2.14E-08
Maleic hydrazide	123-33-1	3.56E-09	4.79E-11	1.75E-10	4.75E-10	2.04E-11	3.12E-10	3.92E-10	3.39E-10
Malononitrile	109-77-3	6.19E-09	8.33E-11	3.04E-10	8.26E-10	3.54E-11	5.43E-10	6.81E-10	5.90E-10
Methyl styrene (mixed isomers)	25013-15-4	7.45E-05	1.00E-06	3.65E-06	9.93E-06	4.26E-07	6.53E-06	8.19E-06	7.09E-06
Methylhydrazine	60-34-4	2.20E-09	2.96E-11	1.08E-10	2.93E-10	1.26E-11	1.93E-10	2.42E-10	2.09E-10
N,N-Diphenylamine	122-39-4	7.80E-05	1.05E-06	3.82E-06	1.04E-05	4.46E-07	6.83E-06	8.58E-06	7.43E-06
Nitric acid, propyl ester	627-13-4	No data	No data	No data	No data	No data	No data	No data	No data
N-Nitrosodi-n-butylamine	924-16-3	6.34E-06	8.52E-08	3.11E-07	8.45E-07	3.62E-08	5.55E-07	6.97E-07	6.04E-07
N-Nitrosomorpholine	59-89-2	2.36E-07	3.17E-09	1.16E-08	3.14E-08	1.35E-09	2.07E-08	2.59E-08	2.25E-08
N-Nitroso-N,N-dimethylamine	62-75-9	6.64E-09	8.92E-11	3.25E-10	8.85E-10	3.79E-11	5.82E-10	7.30E-10	6.32E-10
o-Anisidine	90-04-0	3.73E-07	5.02E-09	1.83E-08	4.98E-08	2.13E-09	3.27E-08	4.11E-08	3.55E-08
Oxalic acid	144-62-7	No data	No data	No data	No data	No data	No data	No data	No data
Phthalic anhydride	85-44-9	6.17E-09	8.29E-11	3.02E-10	8.22E-10	3.52E-11	5.40E-10	6.78E-10	5.87E-10
p-Phthalic acid	100-21-0	2.47E-06	3.32E-08	1.21E-07	3.29E-07	1.41E-08	2.16E-07	2.71E-07	2.35E-07
Pyridine	110-86-1	1.15E-07	1.55E-09	5.66E-09	1.54E-08	6.59E-10	1.01E-08	1.27E-08	1.10E-08
Quinoline	91-22-5	2.64E-06	3.55E-08	1.29E-07	3.52E-07	1.51E-08	2.32E-07	2.91E-07	2.52E-07
Quinone	106-51-4	3.91E-08	5.26E-10	1.92E-09	5.21E-09	2.23E-10	3.43E-09	4.30E-09	3.72E-09
Safrole	94-59-7	1.13E-05	1.52E-07	5.52E-07	1.50E-06	6.44E-08	9.88E-07	1.24E-06	1.07E-06
Tetrahydrofuran	109-99-9	6.90E-08	9.28E-10	3.38E-09	9.21E-09	3.95E-10	6.05E-09	7.60E-09	6.58E-09
Other Heavy Semivolatile Compounds (molecular weight >200 g/mole)									
1,2,4,5-Tetrachlorobenzene	95-94-3	1.08E-03	1.45E-05	5.27E-05	1.43E-04	6.14E-06	9.42E-05	1.18E-04	1.02E-04
1,3,5-Trinitrobenzene	99-35-4	3.72E-07	5.01E-09	1.82E-08	4.97E-08	2.13E-09	3.26E-08	4.10E-08	3.55E-08
2,6-Bis(tert-butyl)-4-methylphenol	128-37-0	3.65E-04	4.90E-06	1.79E-05	4.87E-05	2.08E-06	3.20E-05	4.01E-05	3.47E-05
2-Cyclohexyl-4,6-dinitrophenol	131-89-5	8.55E-04	1.15E-05	4.19E-05	1.14E-04	4.89E-06	7.49E-05	9.41E-05	8.14E-05
2-sec-Butyl-4,6-dinitrophenol	88-85-7	8.95E-05	1.20E-06	4.39E-06	1.19E-05	5.12E-07	7.85E-06	9.85E-06	8.53E-06

Table C2-4 Bioaccumulation Factors for Accumulation of COPCs and ROPCs from Water by Mammals and Birds

Constituent of Potential Concern	CAS Registry Number	Log K_{ow} [a]	Mammal Ba[b] ([mg/kg tissue] / [mg ingested /day])	Bird Ba[c] ([mg/kg tissue] / [mg ingested /day])	Bioaccumulation Factor (BAF-T_w) ([mg/kg tissue]/[mg/L water])			
					Mule Deer[d]	Mourning Dove[d]	Great Basin Pocket Mouse[d]	Western Meadow-lark[d]
3,3'-Dichlorobenzidine	91-94-1	3.58	9.44E-05	7.56E-05	2.76E-04	1.12E-06	0.00E+00	9.23E-07
3,3'-Dimethoxybenzidine	119-90-4	1.81	1.62E-06	1.30E-06	4.75E-06	1.93E-08	0.00E+00	1.59E-08
4-Bromophenylphenyl ether	101-55-3	5.04	2.76E-03	2.21E-03	8.08E-03	3.28E-05	0.00E+00	2.70E-05
Ammonium perfluorooctanoate	3825-26-1	No data	No data	No data	No data	No data	No data	No data
Azobenzene	103-33-3	3.82	1.66E-04	1.33E-04	4.86E-04	1.97E-06	0.00E+00	1.62E-06
Bis(3-tert-butyl-4-hydroxy-6-methyl-phenyl)sulfide	96-69-5	No data	No data	No data	No data	No data	No data	No data
Captan	133-06-2	2.35	5.62E-06	4.50E-06	1.65E-05	6.68E-08	0.00E+00	5.50E-08
Chlorobenzilate	510-15-6	4.38	6.03E-04	4.82E-04	1.76E-03	7.16E-06	0.00E+00	5.89E-06
Dibutylphosphate	107-66-4	No data	No data	No data	No data	No data	No data	No data
Dimethyl aminoazobenzene	60-11-7	4.58	9.55E-04	7.64E-04	2.79E-03	1.13E-05	0.00E+00	9.34E-06
Hexachlorobenzene	118-74-1	5.50	7.99E-03	6.39E-03	2.34E-02	9.49E-05	0.00E+00	7.81E-05
Hexachlorobutadiene	87-68-3	4.73	1.35E-03	1.08E-03	3.96E-03	1.61E-05	0.00E+00	1.32E-05
Hexachlorocyclopentadiene	77-47-4	4.91	2.03E-03	1.62E-03	5.94E-03	2.41E-05	0.00E+00	1.98E-05
Hexachloroethane	67-72-1	3.98	2.43E-04	1.94E-04	7.10E-04	2.88E-06	0.00E+00	2.37E-06
Hexachlorophene	70-30-4	7.54	8.72E-01	6.98E-01	2.55E+00	1.04E-02	0.00E+00	8.52E-03
Hexamethylene-1,5-diisocyanate	822-06-0	3.20	3.98E-05	3.18E-05	1.16E-04	4.73E-07	0.00E+00	3.89E-07
Mirex	2385-85-5	6.89	1.95E-01	1.56E-01	5.71E-01	2.32E-03	0.00E+00	1.91E-03
Nitrofen	1836-75-5	5.53	8.51E-03	6.81E-03	2.49E-02	1.01E-04	0.00E+00	8.32E-05
Pentachlorobenzene	608-93-5	5.09	3.08E-03	2.46E-03	9.01E-03	3.66E-05	0.00E+00	3.01E-05
Pentachloronitrobenzene	82-68-8	4.64	1.10E-03	8.81E-04	3.22E-03	1.31E-05	0.00E+00	1.08E-05
Pentachlorophenol	87-86-5	5.08	3.01E-03	2.41E-03	8.82E-03	3.58E-05	0.00E+00	2.95E-05
Picric acid	88-89-1	2.03	2.69E-06	2.15E-06	7.88E-06	3.20E-08	0.00E+00	2.63E-08
Pronamide	23950-58-5	3.51	8.14E-05	6.51E-05	2.38E-04	9.67E-07	0.00E+00	7.96E-07
Strychnine	57-24-9	1.93	2.14E-06	1.71E-06	6.25E-06	2.54E-08	0.00E+00	2.09E-08
Terphenyls	26140-60-3	No data	No data	No data	No data	No data	No data	No data
Tributyl phosphate	126-73-8	4.00	2.51E-04	2.01E-04	7.35E-04	2.98E-06	0.00E+00	2.46E-06

Table C2-4 Bioaccumulation Factors for Accumulation of COPCs and ROPCs from Water by Mammals and Birds

Constituent of Potential Concern	CAS Registry Number	Bioaccumulation Factor (BAF-T_w) ([mg/kg tissue]/[mg/L water])							
		Coyote[d]	Burrowing Owl[d]	Red-tailed Hawk[d]	Canada Goose[d]	Spotted Sandpiper[d]	Great Blue Heron[d]	Bald Eagle[d]	Mink[d]
3,3'-Dichlorobenzidine	91-94-1	9.27E-05	1.25E-06	4.54E-06	1.24E-05	5.30E-07	8.13E-06	1.02E-05	8.83E-06
3,3'-Dimethoxybenzidine	119-90-4	1.59E-06	2.14E-08	7.81E-08	2.12E-07	9.10E-09	1.40E-07	1.75E-07	1.52E-07
4-Bromophenylphenyl ether	101-55-3	2.71E-03	3.64E-05	1.33E-04	3.61E-04	1.55E-05	2.37E-04	2.98E-04	2.58E-04
Ammonium perfluorooctanoate	3825-26-1	No data	No data	No data	No data	No data	No data	No data	No data
Azobenzene	103-33-3	1.63E-04	2.19E-06	7.98E-06	2.17E-05	9.31E-07	1.43E-05	1.79E-05	1.55E-05
Bis(3-tert-butyl-4-hydroxy-6-methyl-phenyl)sulfide	96-69-5	No data	No data	No data	No data	No data	No data	No data	No data
Captan	133-06-2	5.52E-06	7.42E-08	2.71E-07	7.36E-07	3.15E-08	4.84E-07	6.07E-07	5.26E-07
Chlorobenzilate	510-15-6	5.92E-04	7.96E-06	2.90E-05	7.89E-05	3.38E-06	5.19E-05	6.51E-05	5.64E-05
Dibutylphosphate	107-66-4	No data	No data	No data	No data	No data	No data	No data	No data
Dimethyl aminoazobenzene	60-11-7	9.38E-04	1.26E-05	4.59E-05	1.25E-04	5.36E-06	8.22E-05	1.03E-04	8.93E-05
Hexachlorobenzene	118-74-1	7.84E-03	1.05E-04	3.84E-04	1.05E-03	4.48E-05	6.87E-04	8.63E-04	7.47E-04
Hexachlorobutadiene	87-68-3	1.33E-03	1.78E-05	6.50E-05	1.77E-04	7.59E-06	1.16E-04	1.46E-04	1.26E-04
Hexachlorocyclopentadiene	77-47-4	1.99E-03	2.68E-05	9.77E-05	2.66E-04	1.14E-05	1.75E-04	2.19E-04	1.90E-04
Hexachloroethane	67-72-1	2.38E-04	3.20E-06	1.17E-05	3.18E-05	1.36E-06	2.09E-05	2.62E-05	2.27E-05
Hexachlorophene	70-30-4	8.56E-01	1.15E-02	4.20E-02	1.14E-01	4.89E-03	7.50E-02	9.42E-02	8.15E-02
Hexamethylene-1,5-diisocyanate	822-06-0	3.91E-05	5.26E-07	1.92E-06	5.21E-06	2.23E-07	3.43E-06	4.30E-06	3.72E-06
Mirex	2385-85-5	1.91E-01	2.57E-03	9.38E-03	2.55E-02	1.09E-03	1.68E-02	2.11E-02	1.82E-02
Nitrofen	1836-75-5	8.36E-03	1.12E-04	4.09E-04	1.11E-03	4.77E-05	7.32E-04	9.19E-04	7.96E-04
Pentachlorobenzene	608-93-5	3.02E-03	4.07E-05	1.48E-04	4.03E-04	1.73E-05	2.65E-04	3.33E-04	2.88E-04
Pentachloronitrobenzene	82-68-8	1.08E-03	1.45E-05	5.30E-05	1.44E-04	6.18E-06	9.47E-05	1.19E-04	1.03E-04
Pentachlorophenol	87-86-5	2.96E-03	3.98E-05	1.45E-04	3.95E-04	1.69E-05	2.59E-04	3.26E-04	2.82E-04
Picric acid	88-89-1	2.64E-06	3.55E-08	1.29E-07	3.52E-07	1.51E-08	2.32E-07	2.91E-07	2.52E-07
Pronamide	23950-58-5	7.99E-05	1.07E-06	3.92E-06	1.07E-05	4.57E-07	7.00E-06	8.79E-06	7.61E-06
Strychnine	57-24-9	2.10E-06	2.82E-08	1.03E-07	2.80E-07	1.20E-08	1.84E-07	2.31E-07	2.00E-07
Terphenyls	26140-60-3	No data	No data	No data	No data	No data	No data	No data	No data
Tributyl phosphate	126-73-8	2.47E-04	3.32E-06	1.21E-05	3.29E-05	1.41E-06	2.16E-05	2.71E-05	2.35E-05

Table C2-4 Bioaccumulation Factors for Accumulation of COPCs and ROPCs from Water by Mammals and Birds

Constituent of Potential Concern	CAS Registry Number	Log K_{ow} [a]	Mammal Ba[b] ([mg/kg tissue] / [mg ingested /day])	Bird Ba[c] ([mg/kg tissue] / [mg ingested /day])	Bioaccumulation Factor (BAF-T_w) ([mg/kg tissue]/[mg/L water])			
					Mule Deer[d]	Mourning Dove[d]	Great Basin Pocket Mouse[d]	Western Meadow-lark[d]
Trifluralin	1582-09-8	5.34	5.50E-03	4.40E-03	1.61E-02	6.53E-05	0.00E+00	5.37E-05
Triphenylamine	603-34-9	No data	No data	No data	No data	No data	No data	No data
Herbicides and Organochlorinated Pesticides								
2,4,5-T	93-76-5	3.36	5.75E-05	4.60E-05	1.68E-04	6.84E-07	0.00E+00	5.63E-07
2,4-D and esters	94-75-7	2.81	1.62E-05	1.30E-05	4.75E-05	1.93E-07	0.00E+00	1.59E-07
4,4'-DDD	72-54-8	6.12	3.32E-02	2.66E-02	9.71E-02	3.94E-04	0.00E+00	3.25E-04
4,4'-DDE	72-55-9	6.26	4.54E-02	3.63E-02	1.33E-01	5.39E-04	0.00E+00	4.44E-04
4,4'-DDT	50-29-3	6.07	2.95E-02	2.36E-02	8.63E-02	3.50E-04	0.00E+00	2.88E-04
Aldrin	309-00-2	6.18	3.79E-02	3.03E-02	1.11E-01	4.51E-04	0.00E+00	3.71E-04
alpha-BHC	319-84-6	3.80	1.58E-04	1.27E-04	4.63E-04	1.88E-06	0.00E+00	1.55E-06
beta-BHC	319-85-7	3.83	1.71E-04	1.37E-04	5.01E-04	2.03E-06	0.00E+00	1.67E-06
Chlordane	57-74-9	5.94	2.18E-02	1.74E-02	6.36E-02	2.58E-04	0.00E+00	2.13E-04
Delta-BHC	319-86-8	4.14	3.47E-04	2.77E-04	1.01E-03	4.12E-06	0.00E+00	3.39E-06
Dieldrin	60-57-1	5.27	4.67E-03	3.74E-03	1.37E-02	5.55E-05	0.00E+00	4.57E-05
Endothall	145-73-3	-0.87	3.39E-09	2.71E-09	9.91E-09	4.02E-11	0.00E+00	3.31E-11
Endrin	72-20-8	4.89	1.96E-03	1.57E-03	5.73E-03	2.32E-05	0.00E+00	1.91E-05
gamma-BHC (Lindane)	58-89-9	3.72	1.32E-04	1.05E-04	3.86E-04	1.57E-06	0.00E+00	1.29E-06
Heptachlor	76-44-8	5.02	2.60E-03	2.08E-03	7.62E-03	3.09E-05	0.00E+00	2.54E-05
Isodrin	465-73-6	No data	No data	No data	No data	No data	No data	No data
Methoxychlor	72-43-5	4.53	8.44E-04	6.75E-04	2.47E-03	1.00E-05	0.00E+00	8.25E-06
Silvex (2,4,5-TP)	93-72-1	3.80	1.58E-04	1.27E-04	4.64E-04	1.88E-06	0.00E+00	1.55E-06
Toxaphene	8001-35-2	5.50	7.94E-03	6.35E-03	2.32E-02	9.44E-05	0.00E+00	7.77E-05
Inorganic Chemicals and Compounds								
Metals								
Aluminum	7429-90-5	NA	1.50E-03	1.50E-03	4.39E-03	2.23E-05	0.00E+00	1.83E-05
Antimony	7440-36-0	NA	1.00E-03	1.00E-03	2.93E-03	1.48E-05	0.00E+00	1.22E-05

Table C2-4 Bioaccumulation Factors for Accumulation of COPCs and ROPCs from Water by Mammals and Birds

Constituent of Potential Concern	CAS Registry Number	Bioaccumulation Factor (BAF-T_w) ([mg/kg tissue]/[mg/L water])							
		Coyote[d]	Burrowing Owl[d]	Red-tailed Hawk[d]	Canada Goose[d]	Spotted Sandpiper[d]	Great Blue Heron[d]	Bald Eagle[d]	Mink[d]
Trifluralin	1582-09-8	5.40E-03	7.25E-05	2.64E-04	7.20E-04	3.08E-05	4.73E-04	5.94E-04	5.14E-04
Triphenylamine	603-34-9	No data	No data	No data	No data	No data	No data	No data	No data
Herbicides and Organochlorinated Pesticides									
2,4,5-T	93-76-5	5.65E-05	7.60E-07	2.77E-06	7.54E-06	3.23E-07	4.95E-06	6.21E-06	5.38E-06
2,4-D and esters	94-75-7	1.59E-05	2.14E-07	7.80E-07	2.12E-06	9.10E-08	1.40E-06	1.75E-06	1.52E-06
4,4'-DDD	72-54-8	3.26E-02	4.38E-04	1.60E-03	4.35E-03	1.86E-04	2.86E-03	3.59E-03	3.10E-03
4,4'-DDE	72-55-9	4.45E-02	5.99E-04	2.18E-03	5.94E-03	2.55E-04	3.90E-03	4.90E-03	4.24E-03
4,4'-DDT	50-29-3	2.90E-02	3.89E-04	1.42E-03	3.86E-03	1.65E-04	2.54E-03	3.19E-03	2.76E-03
Aldrin	309-00-2	3.72E-02	5.01E-04	1.82E-03	4.97E-03	2.13E-04	3.26E-03	4.10E-03	3.55E-03
alpha-BHC	319-84-6	1.55E-04	2.09E-06	7.61E-06	2.07E-05	8.88E-07	1.36E-05	1.71E-05	1.48E-05
beta-BHC	319-85-7	1.68E-04	2.26E-06	8.23E-06	2.24E-05	9.60E-07	1.47E-05	1.85E-05	1.60E-05
Chlordane	57-74-9	2.14E-02	2.87E-04	1.05E-03	2.85E-03	1.22E-04	1.87E-03	2.35E-03	2.03E-03
Delta-BHC	319-86-8	3.40E-04	4.58E-06	1.67E-05	4.54E-05	1.95E-06	2.98E-05	3.74E-05	3.24E-05
Dieldrin	60-57-1	4.59E-03	6.17E-05	2.25E-04	6.12E-04	2.62E-05	4.02E-04	5.05E-04	4.37E-04
Endothall	145-73-3	3.33E-09	4.47E-11	1.63E-10	4.44E-10	1.90E-11	2.92E-10	3.66E-10	3.17E-10
Endrin	72-20-8	1.92E-03	2.58E-05	9.41E-05	2.56E-04	1.10E-05	1.68E-04	2.11E-04	1.83E-04
gamma-BHC (Lindane)	58-89-9	1.29E-04	1.74E-06	6.34E-06	1.73E-05	7.40E-07	1.13E-05	1.42E-05	1.23E-05
Heptachlor	76-44-8	2.56E-03	3.44E-05	1.25E-04	3.41E-04	1.46E-05	2.24E-04	2.81E-04	2.43E-04
Isodrin	465-73-6	No data	No data	No data	No data	No data	No data	No data	No data
Methoxychlor	72-43-5	8.29E-04	1.11E-05	4.06E-05	1.11E-04	4.73E-06	7.26E-05	9.12E-05	7.89E-05
Silvex (2,4,5-TP)	93-72-1	1.56E-04	2.09E-06	7.62E-06	2.08E-05	8.89E-07	1.36E-05	1.71E-05	1.48E-05
Toxaphene	8001-35-2	7.80E-03	1.05E-04	3.82E-04	1.04E-03	4.46E-05	6.83E-04	8.58E-04	7.43E-04
Inorganic Chemicals and Compounds									
Metals									
Aluminum	7429-90-5	1.47E-03	2.48E-05	9.02E-05	2.46E-04	1.05E-05	1.61E-04	2.03E-04	1.40E-04
Antimony	7440-36-0	9.82E-04	1.65E-05	6.01E-05	1.64E-04	7.01E-06	1.08E-04	1.35E-04	9.35E-05

Table C2-4 Bioaccumulation Factors for Accumulation of COPCs and ROPCs from Water by Mammals and Birds

Constituent of Potential Concern	CAS Registry Number	Log K_{ow} [a]	Mammal Ba[b] ([mg/kg tissue] / [mg ingested /day])	Bird Ba[c] ([mg/kg tissue] / [mg ingested /day])	Bioaccumulation Factor (BAF-T_w) ([mg/kg tissue]/[mg/L water])			
					Mule Deer[d]	Mourning Dove[d]	Great Basin Pocket Mouse[d]	Western Meadow-lark[d]
Arsenic	7440-38-2	NA	2.00E-03	2.00E-03	5.85E-03	2.97E-05	0.00E+00	2.44E-05
Barium	7440-39-3	NA	1.50E-04	1.50E-04	4.39E-04	2.23E-06	0.00E+00	1.83E-06
Beryllium	7440-41-7	NA	1.00E-03	1.00E-03	2.93E-03	1.48E-05	0.00E+00	1.22E-05
Bismuth	7440-69-9	NA	4.00E-04	4.00E-04	1.17E-03	5.94E-06	0.00E+00	4.89E-06
Boron	7440-42-8	NA	8.00E-04	8.00E-04	2.34E-03	1.19E-05	0.00E+00	9.78E-06
Cadmium	7440-43-9	NA	3.40E-03	3.40E-03	9.95E-03	5.05E-05	0.00E+00	4.15E-05
Calcium	7440-70-2	NA	7.00E-04	7.00E-04	2.05E-03	1.04E-05	0.00E+00	8.55E-06
Chromium[f]	18540-29-9	NA	5.51E-03	5.51E-03	1.61E-02	8.18E-05	0.00E+00	6.73E-05
Cobalt	7440-48-4	NA	2.00E-02	2.00E-02	5.85E-02	2.97E-04	0.00E+00	2.44E-04
Copper	7440-50-8	NA	1.00E-02	1.00E-02	2.93E-02	1.48E-04	0.00E+00	1.22E-04
Iron	7439-89-6	NA	2.00E-02	2.00E-02	5.85E-02	2.97E-04	0.00E+00	2.44E-04
Lead	7439-92-1	NA	3.00E-04	3.00E-04	8.78E-04	4.45E-06	0.00E+00	3.67E-06
Lithium	7439-93-2	NA	1.00E-02	1.00E-02	2.93E-02	1.48E-04	0.00E+00	1.22E-04
Magnesium	7439-95-4	NA	5.00E-03	5.00E-03	1.46E-02	7.42E-05	0.00E+00	6.11E-05
Manganese	7439-96-5	NA	4.00E-04	4.00E-04	1.17E-03	5.94E-06	0.00E+00	4.89E-06
Mercury	7439-97-6	NA	NA	No data	No data	No data	No data	No data
Mercury - Hg+2	7487-94-7	NA	5.21E-03	5.21E-03	1.52E-02	7.73E-05	0.00E+00	6.36E-05
Methylmercury	22967-92-6	NA	7.81E-04	7.81E-04	2.28E-03	1.16E-05	0.00E+00	9.54E-06
Molybdenum	7439-98-7	NA	6.00E-03	6.00E-03	1.76E-02	8.91E-05	0.00E+00	7.33E-05
Nickel	7440-02-0	NA	6.00E-03	6.00E-03	1.76E-02	8.91E-05	0.00E+00	7.33E-05
Potassium	7440-09-7	NA	2.00E-02	2.00E-02	5.85E-02	2.97E-04	0.00E+00	2.44E-04
Rhodium	7440-16-6	NA	2.00E-03	2.00E-03	5.85E-03	2.97E-05	0.00E+00	2.44E-05
Selenium	7782-49-2	NA	1.90E-03	1.90E-03	5.56E-03	2.82E-05	0.00E+00	2.32E-05
Silicon	7440-21-3	NA	4.00E-05	4.00E-05	1.17E-04	5.94E-07	0.00E+00	4.89E-07
Silver	7440-22-4	NA	3.00E-03	3.00E-03	8.78E-03	4.45E-05	0.00E+00	3.67E-05
Sodium	7440-23-5	NA	5.50E-02	5.50E-02	1.61E-01	8.17E-04	0.00E+00	6.72E-04

Table C2-4 Bioaccumulation Factors for Accumulation of COPCs and ROPCs from Water by Mammals and Birds

Constituent of Potential Concern	CAS Registry Number	Bioaccumulation Factor (BAF-T_w) ([mg/kg tissue]/[mg/L water])							
		Coyote[d]	Burrowing Owl[d]	Red-tailed Hawk[d]	Canada Goose[d]	Spotted Sandpiper[d]	Great Blue Heron[d]	Bald Eagle[d]	Mink[d]
Arsenic	7440-38-2	1.96E-03	3.30E-05	1.20E-04	3.27E-04	1.40E-05	2.15E-04	2.70E-04	1.87E-04
Barium	7440-39-3	1.47E-04	2.48E-06	9.02E-06	2.46E-05	1.05E-06	1.61E-05	2.03E-05	1.40E-05
Beryllium	7440-41-7	9.82E-04	1.65E-05	6.01E-05	1.64E-04	7.01E-06	1.08E-04	1.35E-04	9.35E-05
Bismuth	7440-69-9	3.93E-04	6.60E-06	2.41E-05	6.55E-05	2.81E-06	4.30E-05	5.40E-05	3.74E-05
Boron	7440-42-8	7.85E-04	1.32E-05	4.81E-05	1.31E-04	5.61E-06	8.60E-05	1.08E-04	7.48E-05
Cadmium	7440-43-9	3.34E-03	5.61E-05	2.04E-04	5.57E-04	2.38E-05	3.66E-04	4.59E-04	3.18E-04
Calcium	7440-70-2	6.87E-04	1.16E-05	4.21E-05	1.15E-04	4.91E-06	7.53E-05	9.45E-05	6.55E-05
Chromium[f]	18540-29-9	5.41E-03	9.09E-05	3.31E-04	9.02E-04	3.86E-05	5.93E-04	7.44E-04	5.15E-04
Cobalt	7440-48-4	1.96E-02	3.30E-04	1.20E-03	3.27E-03	1.40E-04	2.15E-03	2.70E-03	1.87E-03
Copper	7440-50-8	9.82E-03	1.65E-04	6.01E-04	1.64E-03	7.01E-05	1.08E-03	1.35E-03	9.35E-04
Iron	7439-89-6	1.96E-02	3.30E-04	1.20E-03	3.27E-03	1.40E-04	2.15E-03	2.70E-03	1.87E-03
Lead	7439-92-1	2.95E-04	4.95E-06	1.80E-05	4.91E-05	2.10E-06	3.23E-05	4.05E-05	2.81E-05
Lithium	7439-93-2	9.82E-03	1.65E-04	6.01E-04	1.64E-03	7.01E-05	1.08E-03	1.35E-03	9.35E-04
Magnesium	7439-95-4	4.91E-03	8.25E-05	3.01E-04	8.18E-04	3.51E-05	5.38E-04	6.75E-04	4.68E-04
Manganese	7439-96-5	3.93E-04	6.60E-06	2.41E-05	6.55E-05	2.81E-06	4.30E-05	5.40E-05	3.74E-05
Mercury	7439-97-6	No data	No data	No data	No data	No data	No data	No data	No data
Mercury - Hg+2	7487-94-7	5.11E-03	8.59E-05	3.13E-04	8.52E-04	3.65E-05	5.60E-04	7.03E-04	4.87E-04
Methylmercury	22967-92-6	7.67E-04	1.29E-05	4.70E-05	1.28E-04	5.48E-06	8.40E-05	1.05E-04	7.30E-05
Molybdenum	7439-98-7	5.89E-03	9.90E-05	3.61E-04	9.82E-04	4.21E-05	6.45E-04	8.10E-04	5.61E-04
Nickel	7440-02-0	5.89E-03	9.90E-05	3.61E-04	9.82E-04	4.21E-05	6.45E-04	8.10E-04	5.61E-04
Potassium	7440-09-7	1.96E-02	3.30E-04	1.20E-03	3.27E-03	1.40E-04	2.15E-03	2.70E-03	1.87E-03
Rhodium	7440-16-6	1.96E-03	3.30E-05	1.20E-04	3.27E-04	1.40E-05	2.15E-04	2.70E-04	1.87E-04
Selenium	7782-49-2	1.87E-03	3.14E-05	1.14E-04	3.11E-04	1.33E-05	2.04E-04	2.57E-04	1.78E-04
Silicon	7440-21-3	3.93E-05	6.60E-07	2.41E-06	6.55E-06	2.81E-07	4.30E-06	5.40E-06	3.74E-06
Silver	7440-22-4	2.95E-03	4.95E-05	1.80E-04	4.91E-04	2.10E-05	3.23E-04	4.05E-04	2.81E-04
Sodium	7440-23-5	5.40E-02	9.08E-04	3.31E-03	9.00E-03	3.86E-04	5.92E-03	7.43E-03	5.14E-03

Table C2-4 Bioaccumulation Factors for Accumulation of COPCs and ROPCs from Water by Mammals and Birds

Constituent of Potential Concern	CAS Registry Number	Log K_{ow} [a]	Mammal Ba[b] ([mg/kg tissue] / [mg ingested /day])	Bird Ba[c] ([mg/kg tissue] / [mg ingested /day])	Bioaccumulation Factor (BAF-T_w) ([mg/kg tissue]/[mg/L water])			
					Mule Deer[d]	Mourning Dove[d]	Great Basin Pocket Mouse[d]	Western Meadow-lark[d]
Strontium	7440-24-6	NA	3.00E-04	3.00E-04	8.78E-04	4.45E-06	0.00E+00	3.67E-06
Tantalum	7440-25-7	NA	6.00E-04	6.00E-04	1.76E-03	8.91E-06	0.00E+00	7.33E-06
Thallium	7440-28-0	NA	4.00E-02	4.00E-02	1.17E-01	5.94E-04	0.00E+00	4.89E-04
Tin	7440-31-5	NA	8.00E-02	8.00E-02	2.34E-01	1.19E-03	0.00E+00	9.78E-04
Tungsten	7440-33-7	NA	4.50E-02	4.50E-02	1.32E-01	6.68E-04	0.00E+00	5.50E-04
Uranium	7440-61-1	NA	2.00E-04	2.00E-04	5.85E-04	2.97E-06	0.00E+00	2.44E-06
Vanadium	7440-62-2	NA	2.50E-03	2.50E-03	7.32E-03	3.71E-05	0.00E+00	3.06E-05
Yttrium	7440-65-5	NA	3.00E-04	3.00E-04	8.78E-04	4.45E-06	0.00E+00	3.67E-06
Zinc	7440-66-6	NA	1.00E-01	1.00E-01	2.93E-01	1.48E-03	0.00E+00	1.22E-03
Zirconium	7440-67-7	NA	5.50E-03	5.50E-03	1.61E-02	8.17E-05	0.00E+00	6.72E-05
Non-metals and Anions								
Ammonia/Ammonium	7664-41-7	NA	1.95E-02	1.95E-02	5.71E-02	2.90E-04	0.00E+00	2.38E-04
Bromide	24959-67-9	NA	2.50E-02	2.50E-02	7.32E-02	3.71E-04	0.00E+00	3.06E-04
Chloride	16887-00-6	NA	8.00E-02	8.00E-02	2.34E-01	1.19E-03	0.00E+00	9.78E-04
Cyanide	57-12-5	NA	1.95E-02	1.95E-02	5.71E-02	2.90E-04	0.00E+00	2.38E-04
Fluoride	16984-48-8	NA	1.50E-01	1.50E-01	4.39E-01	2.23E-03	0.00E+00	1.83E-03
Hydroxide	14280-30-9	NA	NA	NA	No data	No data	No data	No data
Iodine	7553-56-2	NA	7.00E-03	7.00E-03	2.05E-02	1.04E-04	0.00E+00	8.55E-05
Nitrate	14797-55-8	NA	7.50E-02	7.50E-02	2.19E-01	1.11E-03	0.00E+00	9.17E-04
Nitrite	14797-65-0	NA	7.50E-02	7.50E-02	2.19E-01	1.11E-03	0.00E+00	9.17E-04
Phosphate	14265-44-2	NA	5.50E-02	5.50E-02	1.61E-01	8.17E-04	0.00E+00	6.72E-04
Phosphorus	7723-14-0	NA	5.50E-02	5.50E-02	1.61E-01	8.17E-04	0.00E+00	6.72E-04
Sulfate	14808-79-8	NA	1.00E-01	1.00E-01	2.93E-01	1.48E-03	0.00E+00	1.22E-03
Total Sulfur	63705-05-5	NA	1.00E-01	1.00E-01	2.93E-01	1.48E-03	0.00E+00	1.22E-03
Criteria Pollutants								
Carbon monoxide	630-08-0	NA	1.95E-02	1.95E-02	5.71E-02	2.90E-04	0.00E+00	2.38E-04

Table C2-4 Bioaccumulation Factors for Accumulation of COPCs and ROPCs from Water by Mammals and Birds

Constituent of Potential Concern	CAS Registry Number	Bioaccumulation Factor (BAF-T_w) ([mg/kg tissue]/[mg/L water])							
		Coyote[d]	Burrowing Owl[d]	Red-tailed Hawk[d]	Canada Goose[d]	Spotted Sandpiper[d]	Great Blue Heron[d]	Bald Eagle[d]	Mink[d]
Strontium	7440-24-6	2.95E-04	4.95E-06	1.80E-05	4.91E-05	2.10E-06	3.23E-05	4.05E-05	2.81E-05
Tantalum	7440-25-7	5.89E-04	9.90E-06	3.61E-05	9.82E-05	4.21E-06	6.45E-05	8.10E-05	5.61E-05
Thallium	7440-28-0	3.93E-02	6.60E-04	2.41E-03	6.55E-03	2.81E-04	4.30E-03	5.40E-03	3.74E-03
Tin	7440-31-5	7.85E-02	1.32E-03	4.81E-03	1.31E-02	5.61E-04	8.60E-03	1.08E-02	7.48E-03
Tungsten	7440-33-7	4.42E-02	7.43E-04	2.71E-03	7.37E-03	3.16E-04	4.84E-03	6.08E-03	4.21E-03
Uranium	7440-61-1	1.96E-04	3.30E-06	1.20E-05	3.27E-05	1.40E-06	2.15E-05	2.70E-05	1.87E-05
Vanadium	7440-62-2	2.45E-03	4.13E-05	1.50E-04	4.09E-04	1.75E-05	2.69E-04	3.38E-04	2.34E-04
Yttrium	7440-65-5	2.95E-04	4.95E-06	1.80E-05	4.91E-05	2.10E-06	3.23E-05	4.05E-05	2.81E-05
Zinc	7440-66-6	9.82E-02	1.65E-03	6.01E-03	1.64E-02	7.01E-04	1.08E-02	1.35E-02	9.35E-03
Zirconium	7440-67-7	5.40E-03	9.08E-05	3.31E-04	9.00E-04	3.86E-05	5.92E-04	7.43E-04	5.14E-04
Non-metals and Anions									
Ammonia/Ammonium	7664-41-7	1.91E-02	3.22E-04	1.17E-03	3.19E-03	1.37E-04	2.10E-03	2.63E-03	1.82E-03
Bromide	24959-67-9	2.45E-02	4.13E-04	1.50E-03	4.09E-03	1.75E-04	2.69E-03	3.38E-03	2.34E-03
Chloride	16887-00-6	7.85E-02	1.32E-03	4.81E-03	1.31E-02	5.61E-04	8.60E-03	1.08E-02	7.48E-03
Cyanide	57-12-5	1.91E-02	3.22E-04	1.17E-03	3.19E-03	1.37E-04	2.10E-03	2.63E-03	1.82E-03
Fluoride	16984-48-8	1.47E-01	2.48E-03	9.02E-03	2.46E-02	1.05E-03	1.61E-02	2.03E-02	1.40E-02
Hydroxide	14280-30-9	No data	No data	No data	No data	No data	No data	No data	No data
Iodine	7553-56-2	6.87E-03	1.16E-04	4.21E-04	1.15E-03	4.91E-05	7.53E-04	9.45E-04	6.55E-04
Nitrate	14797-55-8	7.36E-02	1.24E-03	4.51E-03	1.23E-02	5.26E-04	8.07E-03	1.01E-02	7.01E-03
Nitrite	14797-65-0	7.36E-02	1.24E-03	4.51E-03	1.23E-02	5.26E-04	8.07E-03	1.01E-02	7.01E-03
Phosphate	14265-44-2	5.40E-02	9.08E-04	3.31E-03	9.00E-03	3.86E-04	5.92E-03	7.43E-03	5.14E-03
Phosphorus	7723-14-0	5.40E-02	9.08E-04	3.31E-03	9.00E-03	3.86E-04	5.92E-03	7.43E-03	5.14E-03
Sulfate	14808-79-8	9.82E-02	1.65E-03	6.01E-03	1.64E-02	7.01E-04	1.08E-02	1.35E-02	9.35E-03
Total Sulfur	63705-05-5	9.82E-02	1.65E-03	6.01E-03	1.64E-02	7.01E-04	1.08E-02	1.35E-02	9.35E-03
Criteria Pollutants									
Carbon monoxide	630-08-0	1.91E-02	3.22E-04	1.17E-03	3.19E-03	1.37E-04	2.10E-03	2.63E-03	1.82E-03

Table C2-4 Bioaccumulation Factors for Accumulation of COPCs and ROPCs from Water by Mammals and Birds

Constituent of Potential Concern	CAS Registry Number	Log K_{ow} [a]	Mammal Ba[b] ([mg/kg tissue] / [mg ingested /day])	Bird Ba[c] ([mg/kg tissue] / [mg ingested /day])	Bioaccumulation Factor (BAF-T_w) ([mg/kg tissue]/[mg/L water])			
					Mule Deer[d]	Mourning Dove[d]	Great Basin Pocket Mouse[d]	Western Meadow-lark[d]
Nitrogen dioxide	10102-44-0	NA	1.95E-02	1.95E-02	5.71E-02	2.90E-04	0.00E+00	2.38E-04
Ozone	10028-15-6	NA	1.95E-02	1.95E-02	5.71E-02	2.90E-04	0.00E+00	2.38E-04
Particulate matter	No CAS #	NA	NA	NA	No data	No data	No data	No data
Sulfur dioxide	7446-09-5	NA	1.95E-02	1.95E-02	5.71E-02	2.90E-04	0.00E+00	2.38E-04
Radionuclides								
All radionuclides combined (rad/d)i	No CAS #	NA	NA	NA	No data	No data	No data	No data
Actinium-227	14952-40-0	NA	2.50E-03	2.50E-03	7.32E-03	3.71E-05	0.00E+00	3.06E-05
Americium-241	14596-10-2	NA	3.50E-06	3.50E-06	1.02E-05	5.20E-08	0.00E+00	4.28E-08
Americium-243	14993-75-0	NA	3.50E-06	3.50E-06	1.02E-05	5.20E-08	0.00E+00	4.28E-08
Antimony-125	14234-35-6	NA	1.00E-03	1.00E-03	2.93E-03	1.48E-05	0.00E+00	1.22E-05
Barium-137m	13981-97-0	NA	1.50E-04	1.50E-04	4.39E-04	2.23E-06	0.00E+00	1.83E-06
Cadmium-113m	14336-66-4	NA	1.20E-04	1.20E-04	3.51E-04	1.78E-06	0.00E+00	1.47E-06
Carbon-14	14762-75-5	NA	NA	NA	No data	No data	No data	No data
Cesium-134	13967-70-9	NA	2.00E-02	2.00E-02	5.85E-02	2.97E-04	0.00E+00	2.44E-04
Cesium-137	10045-97-3	NA	2.00E-02	2.00E-02	5.85E-02	2.97E-04	0.00E+00	2.44E-04
Cobalt-60	10198-40-0	NA	2.00E-02	2.00E-02	5.85E-02	2.97E-04	0.00E+00	2.44E-04
Curium-242	15510-73-3	NA	3.50E-06	3.50E-06	1.02E-05	5.20E-08	0.00E+00	4.28E-08
Curium-243	15757-87-6	NA	3.50E-06	3.50E-06	1.02E-05	5.20E-08	0.00E+00	4.28E-08
Curium-244	13981-15-2	NA	3.50E-06	3.50E-06	1.02E-05	5.20E-08	0.00E+00	4.28E-08
Europium-152	14683-23-9	NA	5.00E-03	5.00E-03	1.46E-02	7.42E-05	0.00E+00	6.11E-05
Europium-154	15585-10-1	NA	5.00E-03	5.00E-03	1.46E-02	7.42E-05	0.00E+00	6.11E-05
Europium-155	14391-16-3	NA	5.00E-03	5.00E-03	1.46E-02	7.42E-05	0.00E+00	6.11E-05
Iodine-129	15046-84-1	NA	7.00E-03	7.00E-03	2.05E-02	1.04E-04	0.00E+00	8.55E-05
Neptunium-237	13994-20-2	NA	5.50E-03	5.50E-03	1.61E-02	8.17E-05	0.00E+00	6.72E-05
Nickel-59	14336-70-0	NA	6.00E-03	6.00E-03	1.76E-02	8.91E-05	0.00E+00	7.33E-05
Nickel-63	13981-37-8	NA	6.00E-03	6.00E-03	1.76E-02	8.91E-05	0.00E+00	7.33E-05

Table C2-4 Bioaccumulation Factors for Accumulation of COPCs and ROPCs from Water by Mammals and Birds

Constituent of Potential Concern	CAS Registry Number	Bioaccumulation Factor ($BAF\text{-}T_w$) ([mg/kg tissue]/[mg/L water])							
		Coyote[d]	Burrowing Owl[d]	Red-tailed Hawk[d]	Canada Goose[d]	Spotted Sandpiper[d]	Great Blue Heron[d]	Bald Eagle[d]	Mink[d]
Nitrogen dioxide	10102-44-0	1.91E-02	3.22E-04	1.17E-03	3.19E-03	1.37E-04	2.10E-03	2.63E-03	1.82E-03
Ozone	10028-15-6	1.91E-02	3.22E-04	1.17E-03	3.19E-03	1.37E-04	2.10E-03	2.63E-03	1.82E-03
Particulate matter	No CAS #	No data	No data	No data	No data	No data	No data	No data	No data
Sulfur dioxide	7446-09-5	1.91E-02	3.22E-04	1.17E-03	3.19E-03	1.37E-04	2.10E-03	2.63E-03	1.82E-03
Radionuclides									
All radionuclides combined (rad/d)i	No CAS #	No data	No data	No data	No data	No data	No data	No data	No data
Actinium-227	14952-40-0	2.45E-03	4.13E-05	1.50E-04	4.09E-04	1.75E-05	2.69E-04	3.38E-04	2.34E-04
Americium-241	14596-10-2	3.44E-06	5.78E-08	2.10E-07	5.73E-07	2.45E-08	3.76E-07	4.73E-07	3.27E-07
Americium-243	14993-75-0	3.44E-06	5.78E-08	2.10E-07	5.73E-07	2.45E-08	3.76E-07	4.73E-07	3.27E-07
Antimony-125	14234-35-6	9.82E-04	1.65E-05	6.01E-05	1.64E-04	7.01E-06	1.08E-04	1.35E-04	9.35E-05
Barium-137m	13981-97-0	1.47E-04	2.48E-06	9.02E-06	2.46E-05	1.05E-06	1.61E-05	2.03E-05	1.40E-05
Cadmium-113m	14336-66-4	1.18E-04	1.98E-06	7.22E-06	1.96E-05	8.42E-07	1.29E-05	1.62E-05	1.12E-05
Carbon-14	14762-75-5	No data	No data	No data	No data	No data	No data	No data	No data
Cesium-134	13967-70-9	1.96E-02	3.30E-04	1.20E-03	3.27E-03	1.40E-04	2.15E-03	2.70E-03	1.87E-03
Cesium-137	10045-97-3	1.96E-02	3.30E-04	1.20E-03	3.27E-03	1.40E-04	2.15E-03	2.70E-03	1.87E-03
Cobalt-60	10198-40-0	1.96E-02	3.30E-04	1.20E-03	3.27E-03	1.40E-04	2.15E-03	2.70E-03	1.87E-03
Curium-242	15510-73-3	3.44E-06	5.78E-08	2.10E-07	5.73E-07	2.45E-08	3.76E-07	4.73E-07	3.27E-07
Curium-243	15757-87-6	3.44E-06	5.78E-08	2.10E-07	5.73E-07	2.45E-08	3.76E-07	4.73E-07	3.27E-07
Curium-244	13981-15-2	3.44E-06	5.78E-08	2.10E-07	5.73E-07	2.45E-08	3.76E-07	4.73E-07	3.27E-07
Europium-152	14683-23-9	4.91E-03	8.25E-05	3.01E-04	8.18E-04	3.51E-05	5.38E-04	6.75E-04	4.68E-04
Europium-154	15585-10-1	4.91E-03	8.25E-05	3.01E-04	8.18E-04	3.51E-05	5.38E-04	6.75E-04	4.68E-04
Europium-155	14391-16-3	4.91E-03	8.25E-05	3.01E-04	8.18E-04	3.51E-05	5.38E-04	6.75E-04	4.68E-04
Iodine-129	15046-84-1	6.87E-03	1.16E-04	4.21E-04	1.15E-03	4.91E-05	7.53E-04	9.45E-04	6.55E-04
Neptunium-237	13994-20-2	5.40E-03	9.08E-05	3.31E-04	9.00E-04	3.86E-05	5.92E-04	7.43E-04	5.14E-04
Nickel-59	14336-70-0	5.89E-03	9.90E-05	3.61E-04	9.82E-04	4.21E-05	6.45E-04	8.10E-04	5.61E-04
Nickel-63	13981-37-8	5.89E-03	9.90E-05	3.61E-04	9.82E-04	4.21E-05	6.45E-04	8.10E-04	5.61E-04

Table C2-4 Bioaccumulation Factors for Accumulation of COPCs and ROPCs from Water by Mammals and Birds

Constituent of Potential Concern	CAS Registry Number	Log K_{ow} [a]	Mammal Ba[b] ([mg/kg tissue] / [mg ingested /day])	Bird Ba[c] ([mg/kg tissue] / [mg ingested /day])	Bioaccumulation Factor (BAF-T_w) ([mg/kg tissue]/[mg/L water])			
					Mule Deer[d]	Mourning Dove[d]	Great Basin Pocket Mouse[d]	Western Meadow-lark[d]
Niobium-93m	7440-03-1[g]	NA	2.50E-01	2.50E-01	7.32E-01	3.71E-03	0.00E+00	3.06E-03
Plutonium-238	13981-16-3	NA	5.00E-07	5.00E-07	1.46E-06	7.42E-09	0.00E+00	6.11E-09
Plutonium-239	15117-48-3	NA	5.00E-07	5.00E-07	1.46E-06	7.42E-09	0.00E+00	6.11E-09
Plutonium-240	14119-33-6	NA	5.00E-07	5.00E-07	1.46E-06	7.42E-09	0.00E+00	6.11E-09
Plutonium-241	14119-32-5	NA	5.00E-07	5.00E-07	1.46E-06	7.42E-09	0.00E+00	6.11E-09
Plutonium-242	13982-10-0	NA	5.00E-07	5.00E-07	1.46E-06	7.42E-09	0.00E+00	6.11E-09
Protactinium-231	14331-85-2	NA	1.00E-05	1.00E-05	2.93E-05	1.48E-07	0.00E+00	1.22E-07
Radium-226	13982-63-3	NA	2.50E-04	2.50E-04	7.32E-04	3.71E-06	0.00E+00	3.06E-06
Radium-228	15262-20-1	NA	2.50E-04	2.50E-04	7.32E-04	3.71E-06	0.00E+00	3.06E-06
Ruthenium-106	13967-48-1	NA	2.00E-03	2.00E-03	5.85E-03	2.97E-05	0.00E+00	2.44E-05
Samarium-151	15715-94-3	NA	5.00E-03	5.00E-03	1.46E-02	7.42E-05	0.00E+00	6.11E-05
Selenium-79	15758-45-9	NA	1.50E-02	1.50E-02	4.39E-02	2.23E-04	0.00E+00	1.83E-04
Strontium-90	10098-97-2	NA	3.00E-04	3.00E-04	8.78E-04	4.45E-06	0.00E+00	3.67E-06
Technetium-99	14133-76-7	NA	8.50E-03	8.50E-03	2.49E-02	1.26E-04	0.00E+00	1.04E-04
Thorium-229	15594-54-4	NA	6.00E-06	6.00E-06	1.76E-05	8.91E-08	0.00E+00	7.33E-08
Thorium-232	7440-29-1	NA	6.00E-06	6.00E-06	1.76E-05	8.91E-08	0.00E+00	7.33E-08
Tin-126	15832-50-5	NA	8.00E-02	8.00E-02	2.34E-01	1.19E-03	0.00E+00	9.78E-04
Tritium	10028-17-8	NA	NA	NA	No data	No data	No data	No data
Uranium-232	14158-29-3	NA	2.00E-04	2.00E-04	5.85E-04	2.97E-06	0.00E+00	2.44E-06
Uranium-233	13968-55-3	NA	2.00E-04	2.00E-04	5.85E-04	2.97E-06	0.00E+00	2.44E-06
Uranium-234	13966-29-5	NA	2.00E-04	2.00E-04	5.85E-04	2.97E-06	0.00E+00	2.44E-06
Uranium-235	15117-96-1	NA	2.00E-04	2.00E-04	5.85E-04	2.97E-06	0.00E+00	2.44E-06
Uranium-236	13982-70-2	NA	2.00E-04	2.00E-04	5.85E-04	2.97E-06	0.00E+00	2.44E-06
Uranium-238	7440-61-1	NA	2.00E-04	2.00E-04	5.85E-04	2.97E-06	0.00E+00	2.44E-06
Yttrium-90	10098-91-6	NA	3.00E-04	3.00E-04	8.78E-04	4.45E-06	0.00E+00	3.67E-06
Zirconium-93	15751-77-6	NA	5.50E-03	5.50E-03	1.61E-02	8.17E-05	0.00E+00	6.72E-05

Table C2-4 Bioaccumulation Factors for Accumulation of COPCs and ROPCs from Water by Mammals and Birds

Constituent of Potential Concern	CAS Registry Number	Bioaccumulation Factor (BAF-T_w) ([mg/kg tissue]/[mg/L water])							
		Coyote[d]	Burrowing Owl[d]	Red-tailed Hawk[d]	Canada Goose[d]	Spotted Sandpiper[d]	Great Blue Heron[d]	Bald Eagle[d]	Mink[d]
Niobium-93m	7440-03-1[g]	2.45E-01	4.13E-03	1.50E-02	4.09E-02	1.75E-03	2.69E-02	3.38E-02	2.34E-02
Plutonium-238	13981-16-3	4.91E-07	8.25E-09	3.01E-08	8.18E-08	3.51E-09	5.38E-08	6.75E-08	4.68E-08
Plutonium-239	15117-48-3	4.91E-07	8.25E-09	3.01E-08	8.18E-08	3.51E-09	5.38E-08	6.75E-08	4.68E-08
Plutonium-240	14119-33-6	4.91E-07	8.25E-09	3.01E-08	8.18E-08	3.51E-09	5.38E-08	6.75E-08	4.68E-08
Plutonium-241	14119-32-5	4.91E-07	8.25E-09	3.01E-08	8.18E-08	3.51E-09	5.38E-08	6.75E-08	4.68E-08
Plutonium-242	13982-10-0	4.91E-07	8.25E-09	3.01E-08	8.18E-08	3.51E-09	5.38E-08	6.75E-08	4.68E-08
Protactinium-231	14331-85-2	9.82E-06	1.65E-07	6.01E-07	1.64E-06	7.01E-08	1.08E-06	1.35E-06	9.35E-07
Radium-226	13982-63-3	2.45E-04	4.13E-06	1.50E-05	4.09E-05	1.75E-06	2.69E-05	3.38E-05	2.34E-05
Radium-228	15262-20-1	2.45E-04	4.13E-06	1.50E-05	4.09E-05	1.75E-06	2.69E-05	3.38E-05	2.34E-05
Ruthenium-106	13967-48-1	1.96E-03	3.30E-05	1.20E-04	3.27E-04	1.40E-05	2.15E-04	2.70E-04	1.87E-04
Samarium-151	15715-94-3	4.91E-03	8.25E-05	3.01E-04	8.18E-04	3.51E-05	5.38E-04	6.75E-04	4.68E-04
Selenium-79	15758-45-9	1.47E-02	2.48E-04	9.02E-04	2.46E-03	1.05E-04	1.61E-03	2.03E-03	1.40E-03
Strontium-90	10098-97-2	2.95E-04	4.95E-06	1.80E-05	4.91E-05	2.10E-06	3.23E-05	4.05E-05	2.81E-05
Technetium-99	14133-76-7	8.34E-03	1.40E-04	5.11E-04	1.39E-03	5.96E-05	9.14E-04	1.15E-03	7.95E-04
Thorium-229	15594-54-4	5.89E-06	9.90E-08	3.61E-07	9.82E-07	4.21E-08	6.45E-07	8.10E-07	5.61E-07
Thorium-232	7440-29-1	5.89E-06	9.90E-08	3.61E-07	9.82E-07	4.21E-08	6.45E-07	8.10E-07	5.61E-07
Tin-126	15832-50-5	7.85E-02	1.32E-03	4.81E-03	1.31E-02	5.61E-04	8.60E-03	1.08E-02	7.48E-03
Tritium	10028-17-8	No data	No data	No data	No data	No data	No data	No data	No data
Uranium-232	14158-29-3	1.96E-04	3.30E-06	1.20E-05	3.27E-05	1.40E-06	2.15E-05	2.70E-05	1.87E-05
Uranium-233	13968-55-3	1.96E-04	3.30E-06	1.20E-05	3.27E-05	1.40E-06	2.15E-05	2.70E-05	1.87E-05
Uranium-234	13966-29-5	1.96E-04	3.30E-06	1.20E-05	3.27E-05	1.40E-06	2.15E-05	2.70E-05	1.87E-05
Uranium-235	15117-96-1	1.96E-04	3.30E-06	1.20E-05	3.27E-05	1.40E-06	2.15E-05	2.70E-05	1.87E-05
Uranium-236	13982-70-2	1.96E-04	3.30E-06	1.20E-05	3.27E-05	1.40E-06	2.15E-05	2.70E-05	1.87E-05
Uranium-238	7440-61-1	1.96E-04	3.30E-06	1.20E-05	3.27E-05	1.40E-06	2.15E-05	2.70E-05	1.87E-05
Yttrium-90	10098-91-6	2.95E-04	4.95E-06	1.80E-05	4.91E-05	2.10E-06	3.23E-05	4.05E-05	2.81E-05
Zirconium-93	15751-77-6	5.40E-03	9.08E-05	3.31E-04	9.00E-04	3.86E-05	5.92E-04	7.43E-04	5.14E-04

Table C2-4 Bioaccumulation Factors for Accumulation of COPCs and ROPCs from Water by Mammals and Birds

Notes/Sources

NA = Not applicable.

[a] From Appendix B, Table B-1.

[b] Ingestion-to-tissue transfer factor (mg/kgBW per mg/d); from Table C2-1.

[c] Bird Ba is the same as the Mammal Ba multiplied by 0.8 for organic COPCs, and the same as Mammal Ba for inorganic COPCs and ROPCs.

[d] $Ba \times IR_W \times BW$ for each receptor, where IR_W is the daily water ingestion rate (L/kgBW/d) and BW is the body weight (kg) of the receptor (Risk Assessment Work Plan section 8.1.3.3).

[e] Values for Aroclor-1254 were used for polychlorinated biphenyl mixtures.

[f] Values for Cr(VI) were used for calculations.

[g] Chemical Abstracts Service Registry number for niobium metal.

Table C2-5 Food Chain Multipliers for Bioaccumulation of COPCs and ROPCs by Mammals and Birds

Constituent of Potential Concern	CAS Registry Number	Log K_{ow} [a]	FCM, Level 2[b]	FCM, Level 3[c]	FCM, Level 4[d]
Organic Compounds					
Aromatic Halogenated Hydrocarbons					
2,3,4,6-Tetrachlorophenol	58-90-2	4.30	1.00E+00	1.50E+00	1.20E+00
4-Chloro-3-methylphenol	59-50-7	3.10	1.00E+00	1.00E+00	1.00E+00
Aromatic Nonhalogenated Hydrocarbons					
2-Nitrotoluene	88-72-2	2.30	1.00E+00	1.00E+00	1.00E+00
4-Nitrobiphenyl	92-93-3	3.77	1.00E+00	1.20E+00	1.00E+00
Benzaldehyde	100-52-7	1.48	1.00E+00	1.00E+00	1.00E+00
Benzene	71-43-2	2.14	1.00E+00	1.00E+00	1.00E+00
Benzyl alcohol	100-51-6	1.10	1.00E+00	1.00E+00	1.00E+00
Ethyl benzene	100-41-4	3.12	1.00E+00	1.00E+00	1.00E+00
m-Xylene	108-38-3	3.20	1.00E+00	1.00E+00	1.00E+00
o-Xylene	95-47-6	3.13	1.00E+00	1.00E+00	1.00E+00
p-Xylene	106-42-3	3.17	1.00E+00	1.00E+00	1.00E+00
Styrene	100-42-5	2.93	1.00E+00	1.00E+00	1.00E+00
Toluene	108-88-3	2.67	1.00E+00	1.00E+00	1.00E+00
Non-aromatic Nonhalogenated Hydrocarbons					
1,2-Epoxybutane	106-88-7	0.86	1.00E+00	1.00E+00	1.00E+00
1,3-Butadiene	106-99-0	1.99	1.00E+00	1.00E+00	1.00E+00
1,4-Dioxane	123-91-1	-0.27	1.00E+00	1.00E+00	1.00E+00
1-Methylpropyl alcohol	78-92-2	0.61	1.00E+00	1.00E+00	1.00E+00
1-Nitropropane	108-03-2	0.87	1.00E+00	1.00E+00	1.00E+00
2,2,4-Trimethylpentane	540-84-1	5.02	1.00E+00	3.20E+00	2.60E+00
2-Butanone	78-93-3	0.28	1.00E+00	1.00E+00	1.00E+00
2-Butenaldehyde (2-Butenal)	4170-30-3	0.55	1.00E+00	1.00E+00	1.00E+00
2-Ethoxyethanol	110-80-5	-0.10	1.00E+00	1.00E+00	1.00E+00
2-Heptanone	110-43-0	1.98	1.00E+00	1.00E+00	1.00E+00
2-Hexanone	591-78-6	1.38	1.00E+00	1.00E+00	1.00E+00
2-Methoxyethanol	109-86-4	-0.77	1.00E+00	1.00E+00	1.00E+00
2-Methyl-2-propanol	75-65-0	0.35	1.00E+00	1.00E+00	1.00E+00
2-Methyl-2-propenenitrile	126-98-7	0.54	1.00E+00	1.00E+00	1.00E+00
2-Methylaziridine	75-55-8	-0.60	1.00E+00	1.00E+00	1.00E+00
2-Methylpropyl alcohol	78-83-1	0.76	1.00E+00	1.00E+00	1.00E+00
2-Pentanone	107-87-9	0.91	1.00E+00	1.00E+00	1.00E+00
2-Propanone (Acetone)	67-64-1	-0.22	1.00E+00	1.00E+00	1.00E+00
2-Propene-1-ol	107-18-6	0.17	1.00E+00	1.00E+00	1.00E+00
2-Propyl alcohol	67-63-0	0.05	1.00E+00	1.00E+00	1.00E+00
3-Heptanone	106-35-4	No data	1.00E+00	No data	No data
3-Methyl-1-butanol	123-51-3	No data	1.00E+00	No data	No data
3-Methyl-2-butanone	563-80-4	No data	1.00E+00	No data	No data
3-Pentanone	96-22-0	0.99	1.00E+00	1.00E+00	1.00E+00
4-Heptanone	123-19-3	No data	1.00E+00	No data	No data

Table C2-5 Food Chain Multipliers for Bioaccumulation of COPCs and ROPCs by Mammals and Birds

Constituent of Potential Concern	CAS Registry Number	Log K_{ow} [a]	FCM, Level 2[b]	FCM, Level 3[c]	FCM, Level 4[d]
4-Methyl-2-pentanone	108-10-1	1.19	1.00E+00	1.00E+00	1.00E+00
4-Methyl-3-penten-2-one	141-79-7	NA	1.00E+00	No data	No data
5-Methyl-2-hexanone	110-12-3	1.72	1.00E+00	1.00E+00	1.00E+00
Acetaldehyde	75-07-0	-0.22	1.00E+00	1.00E+00	1.00E+00
Acetamide	60-35-5	-1.26	1.00E+00	1.00E+00	1.00E+00
Acetic acid	64-19-7	-0.17	1.00E+00	1.00E+00	1.00E+00
Acetic acid ethyl ester	141-78-6	0.73	1.00E+00	1.00E+00	1.00E+00
Acetic acid n-butyl ester	123-86-4	1.73	1.00E+00	1.00E+00	1.00E+00
Acetonitrile	75-05-8	-0.34	1.00E+00	1.00E+00	1.00E+00
Acrolein	107-02-8	-0.01	1.00E+00	1.00E+00	1.00E+00
Acrylonitrile	107-13-1	0.25	1.00E+00	1.00E+00	1.00E+00
Bis(isopropyl)ether	108-20-3	1.56	1.00E+00	1.00E+00	1.00E+00
Butane	106-97-8	2.89	1.00E+00	1.00E+00	1.00E+00
Carbon disulfide	75-15-0	2.00	1.00E+00	1.00E+00	1.00E+00
Cyanogen	460-19-5	0.07	1.00E+00	1.00E+00	1.00E+00
Cyclohexane	110-82-7	3.44	1.00E+00	1.10E+00	1.00E+00
Cyclohexanone	108-94-1	0.81	1.00E+00	1.00E+00	1.00E+00
Cyclohexene	110-83-8	2.86	1.00E+00	1.00E+00	1.00E+00
Cyclopentane	287-92-3	3.00	1.00E+00	1.00E+00	1.00E+00
Ethyl alcohol	64-17-5	-0.31	1.00E+00	1.00E+00	1.00E+00
Ethyl ether	60-29-7	0.89	1.00E+00	1.00E+00	1.00E+00
Ethyl methacrylate	97-63-2	1.59	1.00E+00	1.00E+00	1.00E+00
Formaldehyde	50-00-0	0.34	1.00E+00	1.00E+00	1.00E+00
Formamide	75-12-7	-1.51	1.00E+00	1.00E+00	1.00E+00
Formic acid	64-18-6	-0.54	1.00E+00	1.00E+00	1.00E+00
Formic acid, methyl ester	107-31-3	-0.26	1.00E+00	1.00E+00	1.00E+00
Glycidylaldehyde	765-34-4	-0.12	1.00E+00	1.00E+00	1.00E+00
Methyl acetate	79-20-9	0.46	1.00E+00	1.00E+00	1.00E+00
Methyl alcohol	67-56-1	-0.71	1.00E+00	1.00E+00	1.00E+00
Methyl isocyanate	624-83-9	No data	1.00E+00	No data	No data
Methyl methacrylate	80-62-6	0.79	1.00E+00	1.00E+00	1.00E+00
Methyl tert-butyl ether	1634-04-4	0.94	1.00E+00	1.00E+00	1.00E+00
Methylacetylene	74-99-7	0.94	1.00E+00	1.00E+00	1.00E+00
Methylcyclohexane	108-87-2	4.10	1.00E+00	1.30E+00	1.10E+00
N,N-Dimethylacetamide	127-19-5	No data	1.00E+00	No data	No data
n-Butyl alcohol	71-36-3	0.88	1.00E+00	1.00E+00	1.00E+00
n-Heptane	142-82-5	4.66	1.00E+00	2.20E+00	1.60E+00
n-Hexane	110-54-3	4.11	1.00E+00	1.30E+00	1.10E+00
Nitromethane	75-52-5	-0.35	1.00E+00	1.00E+00	1.00E+00
n-Nonane	111-84-2	5.65	1.00E+00	8.00E+00	1.00E+01
n-Octane	111-65-9	4.00	1.00E+00	1.30E+00	1.10E+00
n-Pentane	109-66-0	3.21	1.00E+00	1.00E+00	1.00E+00

Table C2-5 Food Chain Multipliers for Bioaccumulation of COPCs and ROPCs by Mammals and Birds

Constituent of Potential Concern	CAS Registry Number	Log K_{ow} [a]	FCM, Level 2[b]	FCM, Level 3[c]	FCM, Level 4[d]
n-Propionaldehyde	123-38-6	0.59	1.00E+00	1.00E+00	1.00E+00
n-Propyl alcohol	71-23-8	0.25	1.00E+00	1.00E+00	1.00E+00
n-Valeraldehyde	110-62-3	No data	1.00E+00	No data	No data
Oxirane	75-21-8	-0.30	1.00E+00	1.00E+00	1.00E+00
p-Cymene	99-87-6	4.10	1.00E+00	1.30E+00	1.10E+00
Phosgene	75-44-5	No data	1.00E+00	No data	No data
Propargyl alcohol	107-19-7	-0.38	1.00E+00	1.00E+00	1.00E+00
Propionic acid	79-09-4	0.33	1.00E+00	1.00E+00	1.00E+00
Propionitrile	107-12-0	0.16	1.00E+00	1.00E+00	1.00E+00
Propylene glycol monomethyl ether	107-98-2	-0.49	1.00E+00	1.00E+00	1.00E+00
p-tert-Butyltoluene	98-51-1	No data	1.00E+00	No data	No data
Triethylamine	121-44-8	1.45	1.00E+00	1.00E+00	1.00E+00
Trimethylamine	75-50-3	0.16	1.00E+00	1.00E+00	1.00E+00
Vinyl acetate	108-05-4	0.70	1.00E+00	1.00E+00	1.00E+00
Non-aromatic Halogenated Hydrocarbons					
1,1,1,2-Tetrachloro-2,2-difluoroethane	76-11-9	3.41	1.00E+00	1.10E+00	1.00E+00
1,1,1,2-Tetrachloroethane	630-20-6	2.63	1.00E+00	1.00E+00	1.00E+00
1,1,1-Trichloroethane	71-55-6	2.42	1.00E+00	1.00E+00	1.00E+00
1,1,2,2-Tetrachloro-1,2-difluoroethane	76-12-0	3.73	1.00E+00	1.10E+00	1.00E+00
1,1,2,2-Tetrachloroethane	79-34-5	4.64	1.00E+00	2.00E+00	1.50E+00
1,1,2,2-Tetrachloroethene	127-18-4	2.55	1.00E+00	1.00E+00	1.00E+00
1,1,2-Trichloroethane	79-00-5	2.10	1.00E+00	1.00E+00	1.00E+00
1,1,2-Trichloroethylene	79-01-6	2.43	1.00E+00	1.00E+00	1.00E+00
1,1-Dichloroethane	75-34-3	1.79	1.00E+00	1.00E+00	1.00E+00
1,1-Dichloroethene	75-35-4	2.12	1.00E+00	1.00E+00	1.00E+00
1,2,2-Trichloro-1,1,2-trifluoroethane	76-13-1	3.16	1.00E+00	1.00E+00	1.00E+00
1,2,3-Trichloropropane	96-18-4	2.25	1.00E+00	1.00E+00	1.00E+00
1,2-Dibromo-3-chloropropane	96-12-8	2.34	1.00E+00	1.00E+00	1.00E+00
1,2-Dichloro-1,1,2,2-tetrafluoroethane	76-14-2	2.82	1.00E+00	1.00E+00	1.00E+00
1,2-Dichloroethane	107-06-2	1.46	1.00E+00	1.00E+00	1.00E+00
1,2-Dichloroethylene	540-59-0	2.09	1.00E+00	1.00E+00	1.00E+00
1,2-Dichloropropane	78-87-5	2.25	1.00E+00	1.00E+00	1.00E+00
1,3-Dichloropropene	542-75-6	1.75	1.00E+00	1.00E+00	1.00E+00
1,4-Dichloro-2-butene	764-41-0	0.87	1.00E+00	1.00E+00	1.00E+00
1-Chloroethene	75-01-4	1.15	1.00E+00	1.00E+00	1.00E+00
2,2-Dichloropropionic acid	75-99-0	1.68	1.00E+00	1.00E+00	1.00E+00
2-Chloropropane	75-29-6	1.90	1.00E+00	1.00E+00	1.00E+00
3-Chloropropene (Allyl chloride)	107-05-1	1.93	1.00E+00	1.00E+00	1.00E+00
Bromochloromethane	74-97-5	1.41	1.00E+00	1.00E+00	1.00E+00
Bromodichloromethane	75-27-4	2.03	1.00E+00	1.00E+00	1.00E+00
Bromoethene	593-60-2	1.07	1.00E+00	1.00E+00	1.00E+00
Bromoform	75-25-2	2.35	1.00E+00	1.00E+00	1.00E+00

Table C2-5 Food Chain Multipliers for Bioaccumulation of COPCs and ROPCs by Mammals and Birds

Constituent of Potential Concern	CAS Registry Number	Log K_{ow} [a]	FCM, Level 2[b]	FCM, Level 3[c]	FCM, Level 4[d]
Bromomethane	74-83-9	1.11	1.00E+00	1.00E+00	1.00E+00
Carbon tetrachloride	56-23-5	2.72	1.00E+00	1.00E+00	1.00E+00
Chlorodibromomethane	124-48-1	2.18	1.00E+00	1.00E+00	1.00E+00
Chlorodifluoromethane	75-45-6	1.08	1.00E+00	1.00E+00	1.00E+00
Chloroethane	75-00-3	3.10	1.00E+00	1.00E+00	1.00E+00
Chloroform	67-66-3	1.95	1.00E+00	1.00E+00	1.00E+00
Chloromethane	74-87-3	0.90	1.00E+00	1.00E+00	1.00E+00
Chloropentafluoroethane	76-15-3	2.10	1.00E+00	1.00E+00	1.00E+00
cis-1,2-Dichloroethene	156-59-2	1.98	1.00E+00	1.00E+00	1.00E+00
cis-1,3-Dichloropropene	10061-01-5	No data	1.00E+00	No data	No data
Cyanogen bromide	506-68-3	-0.29	1.00E+00	1.00E+00	1.00E+00
Cyanogen chloride	506-77-4	-0.38	1.00E+00	1.00E+00	1.00E+00
Dichlorodifluoromethane	75-71-8	2.16	1.00E+00	1.00E+00	1.00E+00
Dichlorofluoromethane	75-43-4	1.55	1.00E+00	1.00E+00	1.00E+00
Dichloromethane	75-09-2	1.26	1.00E+00	1.00E+00	1.00E+00
Difluorodibromomethane	75-61-6	No data	1.00E+00	No data	No data
Hexafluoroacetone	684-16-2	No data	1.00E+00	No data	No data
Iodomethane	74-88-4	1.69	1.00E+00	1.00E+00	1.00E+00
Methylene bromide	74-95-3	1.62	1.00E+00	1.00E+00	1.00E+00
Pentachloroethane	76-01-7	3.05	1.00E+00	1.00E+00	1.00E+00
trans-1,2-Dichloroethylene	156-60-5	1.98	1.00E+00	1.00E+00	1.00E+00
trans-1,3-Dichloropropene	10061-02-6	2.06	1.00E+00	1.00E+00	1.00E+00
Trichloroacetic acid	76-03-9	1.33	1.00E+00	1.00E+00	1.00E+00
Trichlorofluoroethane	27154-33-2	No data	1.00E+00	No data	No data
Trichlorofluoromethane	75-69-4	2.53	1.00E+00	1.00E+00	1.00E+00
Trifluorobromomethane	75-63-8	1.86	1.00E+00	1.00E+00	1.00E+00
Dioxin and Furan Compounds (PCDDs/PCDFs)					
1,2,3,4,6,7,8-Heptachlorodibenzo(p)dioxin	35822-46-9	8.20	1.00E+00	6.40E+00	4.50E+00
1,2,3,4,6,7,8-Heptachlorodibenzofuran	67562-39-4	7.92	1.00E+00	9.20E+00	9.80E+00
1,2,3,4,7,8,9-Heptachlorodibenzofuran	55673-89-7	7.92	1.00E+00	9.20E+00	9.80E+00
1,2,3,4,7,8-Hexachlorodibenzo(p)dioxin	39227-28-6	7.79	1.00E+00	1.00E+01	1.20E+01
1,2,3,4,7,8-Hexachlorodibenzofuran	70648-26-9	7.25	1.00E+00	1.30E+01	2.30E+01
1,2,3,6,7,8-Hexachlorodibenzo(p)dioxin	57653-85-7	7.25	1.00E+00	1.30E+01	2.30E+01
1,2,3,6,7,8-Hexachlorodibenzofuran	57117-44-9	7.25	1.00E+00	1.30E+01	2.30E+01
1,2,3,7,8,9-Hexachlorodibenzo(p)dioxin	19408-74-3	7.25	1.00E+00	1.30E+01	2.30E+01
1,2,3,7,8,9-Hexachlorodibenzofuran	72918-21-9	7.25	1.00E+00	1.30E+01	2.30E+01
1,2,3,7,8-Pentachlorodibenzo(p)dioxin	40321-76-4	6.64	1.00E+00	1.40E+01	2.60E+01
1,2,3,7,8-Pentachlorodibenzofuran	57117-41-6	6.79	1.00E+00	1.40E+01	2.70E+01
2,3,4,6,7,8-Hexachlorodibenzofuran	60851-34-5	7.25	1.00E+00	1.30E+01	2.30E+01
2,3,4,7,8-Pentachlorodibenzofuran	57117-31-4	6.92	1.00E+00	1.40E+01	2.70E+01
2,3,7,8-Tetrachlorodibenzo(p)dioxin	1746-01-6	6.64	1.00E+00	1.40E+01	2.60E+01
2,3,7,8-Tetrachlorodibenzofuran	51207-31-9	6.53	1.00E+00	1.40E+01	2.50E+01

Table C2-5 Food Chain Multipliers for Bioaccumulation of COPCs and ROPCs by Mammals and Birds

Constituent of Potential Concern	CAS Registry Number	Log K_{ow} [a]	FCM, Level 2[b]	FCM, Level 3[c]	FCM, Level 4[d]
Dibenzofuran	132-64-9	4.33	1.00E+00	1.50E+00	1.20E+00
Octachlorodibenzo(p)dioxin	3268-87-9	7.59	1.00E+00	1.20E+01	1.70E+01
Octachlorodibenzofuran	39001-02-0	8.78	1.00E+00	2.20E+00	5.20E-01
Total dioxins and dibenzofurans	No CAS #	No data	1.00E+00	No data	No data
Polychlorinated Biphenyls (PCBs)					
2,2',3,3',4,4',5-Heptachlorobiphenyl	35065-30-6	7.08	1.00E+00	1.40E+01	2.50E+01
2,2',3,4,4',5,5'-Heptachlorobiphenyl	35065-29-3	7.12	1.00E+00	1.40E+01	2.50E+01
2,3,3',4,4',5,5'-Heptachlorobiphenyl	39635-31-9	No data	1.00E+00	No data	No data
2,3,3',4,4',5'-Hexachlorobiphenyl	69782-90-7	No data	1.00E+00	No data	No data
2,3,3',4,4',5-Hexachlorobiphenyl	38380-08-4	No data	1.00E+00	No data	No data
2,3,3',4,4'-Pentachlorobiphenyl	32598-14-4	No data	1.00E+00	No data	No data
2,3',4,4',5,5'-Hexachlorobiphenyl	52663-72-6	No data	1.00E+00	No data	No data
2,3,4,4',5-Pentachlorobiphenyl	74472-37-0	No data	1.00E+00	No data	No data
2',3,4,4',5-Pentachlorobiphenyl	65510-44-3	No data	1.00E+00	No data	No data
2,3',4,4',5-Pentachlorobiphenyl	31508-00-6	7.12	1.00E+00	1.40E+01	2.50E+01
3,3',4,4',5,5'-Hexachlorobiphenyl	32774-16-6	7.41	1.00E+00	1.30E+01	2.10E+01
3,3',4,4',5-Pentachlorobiphenyl	57465-28-8	No data	1.00E+00	No data	No data
3,3',4,4'-Tetrachlorobiphenyl	32598-13-3	No data	1.00E+00	No data	No data
3,4,4',5-Tetrachlorobiphenyl	70362-50-4	No data	1.00E+00	No data	No data
Polychlorinated biphenyls (PCBs)[e]	1336-36-3	6.29	1.00E+00	1.30E+01	2.20E+01
Phthalates					
Bis(2-ethylhexyl) phthalate (DEHP)	117-81-7	5.20	1.00E+00	4.20E+00	3.90E+00
Butylbenzyl phthalate	85-68-7	4.41	1.00E+00	1.60E+00	1.20E+00
Dibutyl phthalate	84-74-2	4.72	1.00E+00	2.20E+00	1.60E+00
Diethyl phthalate	84-66-2	4.44	1.00E+00	1.60E+00	1.20E+00
Dimethyl phthalate	131-11-3	1.63	1.00E+00	1.00E+00	1.00E+00
n-Dioctyl phthalate	117-84-0	9.33	1.00E+00	1.50E+00	2.30E-01
Light Polycyclic Aromatic Hydrocarbons (molecular weight <200 g/mole)					
2-Chloronaphthalene	91-58-7	4.07	1.00E+00	1.30E+00	1.10E+00
2-Methyl naphthalene	91-57-6	3.86	1.00E+00	1.20E+00	1.10E+00
5-Nitroacenaphthene	602-87-9	No data	1.00E+00	No data	No data
Acenaphthene	83-32-9	3.96	1.00E+00	1.30E+00	1.10E+00
Acenaphthylene	208-96-8	4.07	1.00E+00	1.30E+00	1.10E+00
Anthracene	120-12-7	4.47	1.00E+00	1.80E+00	1.30E+00
Fluorene	86-73-7	4.17	1.00E+00	1.40E+00	1.10E+00
Indene	95-13-6	No data	1.00E+00	No data	No data
Naphthalene	91-20-3	3.37	1.00E+00	1.10E+00	1.00E+00
Phenanthrene	85-01-8	4.55	1.00E+00	2.00E+00	1.50E+00
Pyrene	129-00-0	5.00	1.00E+00	3.20E+00	2.60E+00

Table C2-5 Food Chain Multipliers for Bioaccumulation of COPCs and ROPCs by Mammals and Birds

Constituent of Potential Concern	CAS Registry Number	Log K_{ow} [a]	FCM, Level 2[b]	FCM, Level 3[c]	FCM, Level 4[d]
	Heavy Polycyclic Aromatic Hydrocarbons (molecular weight >200 g/mole)				
3-Methylcholanthrene	56-49-5	7.11	1.00E+00	1.40E+01	2.50E+01
5-Methylchrysene	3697-24-3	No data	1.00E+00	No data	No data
Benzo[a]anthracene	56-55-3	5.68	1.00E+00	8.00E+00	1.00E+01
Benzo[a]pyrene	50-32-8	6.13	1.00E+00	1.10E+01	1.80E+01
Benzo[a,i]pyrene	191-30-0	No data	1.00E+00	No data	No data
Benzo[b]fluoranthene	205-99-2	6.20	1.00E+00	1.20E+01	2.00E+01
Benzo[e]pyrene	192-97-2	7.40	1.00E+00	1.30E+01	2.10E+01
Benzo[g,h,i]perylene	191-24-2	7.10	1.00E+00	1.40E+01	2.50E+01
Benzo[j]fluoranthene	205-82-3	6.44	1.00E+00	1.30E+01	2.30E+01
Benzo[k]fluoranthene	207-08-9	6.19	1.00E+00	1.20E+01	2.00E+01
Chrysene	218-01-9	5.74	1.00E+00	8.00E+00	1.00E+01
Dibenz[a,h]acridine	226-36-8	No data	1.00E+00	No data	No data
Dibenz[a,h]anthracene	53-70-3	6.55	1.00E+00	1.40E+01	2.50E+01
Dibenz[a,j]acridine	224-42-0	No data	1.00E+00	No data	No data
Dibenzo[a,e]fluoranthene	5385-75-1	No data	1.00E+00	No data	No data
Dibenzo[a,e]pyrene	192-65-4	No data	1.00E+00	No data	No data
Dibenzo[a,h]fluoranthene	No CAS #	No data	1.00E+00	No data	No data
Dibenzo[a,h]pyrene	189-64-0	No data	1.00E+00	No data	No data
Dibenzo[a,i]pyrene	189-55-9	7.29	1.00E+00	1.30E+01	2.30E+01
Fluoranthene	206-44-0	5.08	1.00E+00	3.60E+00	3.20E+00
Hexachloronaphthalene	1335-87-1	7.59	1.00E+00	1.20E+01	1.70E+01
Indeno[1,2,3-cd]pyrene	193-39-5	6.91	1.00E+00	1.40E+01	2.70E+01
Octachloronaphthalene	2234-13-1	6.42	1.00E+00	1.30E+01	2.30E+01
Pentachloronaphthalene	1321-64-8	No data	1.00E+00	No data	No data
Tetrachloronaphthalene	1335-88-2	No data	1.00E+00	No data	No data
Trichloronaphthalene	1321-65-9	No data	1.00E+00	No data	No data
	Light Substituted Benzene Compounds (molecular weight <200 g/mole)				
1,2,3-Trichlorobenzene	87-61-6	4.05	1.00E+00	1.30E+00	1.10E+00
1,2,4-Trichlorobenzene	120-82-1	3.99	1.00E+00	1.30E+00	1.10E+00
1,2,4-Trimethyl benzene	95-63-6	3.65	1.00E+00	1.10E+00	1.00E+00
1,2-Dichlorobenzene	95-50-1	3.45	1.00E+00	1.10E+00	1.00E+00
1,3,5-Trimethyl benzene	108-67-8	3.42	1.00E+00	1.10E+00	1.00E+00
1,3-Dichlorobenzene	541-73-1	3.53	1.00E+00	1.10E+00	1.00E+00
1,3-Dinitrobenzene	99-65-0	1.49	1.00E+00	1.00E+00	1.00E+00
1,4-Dichlorobenzene	106-46-7	3.41	1.00E+00	1.10E+00	1.00E+00
1,4-Dinitrobenzene	100-25-4	1.50	1.00E+00	1.00E+00	1.00E+00
2,4,5-Trichlorophenol	95-95-4	3.87	1.00E+00	1.20E+00	1.10E+00
2,4,6-Trichlorophenol	88-06-2	3.71	1.00E+00	1.10E+00	1.00E+00
2,4-Dichlorophenol	120-83-2	3.04	1.00E+00	1.00E+00	1.00E+00

Table C2-5 Food Chain Multipliers for Bioaccumulation of COPCs and ROPCs by Mammals and Birds

Constituent of Potential Concern	CAS Registry Number	Log K_{ow} [a]	FCM, Level 2[b]	FCM, Level 3[c]	FCM, Level 4[d]
2,4-Dimethylphenol	105-67-9	2.36	1.00E+00	1.00E+00	1.00E+00
2,4-Dinitrophenol	51-28-5	1.52	1.00E+00	1.00E+00	1.00E+00
2,4-Dinitrotoluene	121-14-2	2.00	1.00E+00	1.00E+00	1.00E+00
2,6-Dinitrotoluene	606-20-2	1.89	1.00E+00	1.00E+00	1.00E+00
2-Chlorophenol	95-57-8	2.16	1.00E+00	1.00E+00	1.00E+00
2-Chlorotoluene	95-49-8	3.54	1.00E+00	1.10E+00	1.00E+00
2-Nitrophenol	88-75-5	1.79	1.00E+00	1.00E+00	1.00E+00
4,6-Dinitro-o-cresol	534-52-1	2.12	1.00E+00	1.00E+00	1.00E+00
4-Chlorotoluene	106-43-4	3.33	1.00E+00	1.10E+00	1.00E+00
4-Nitrophenol	100-02-7	1.91	1.00E+00	1.00E+00	1.00E+00
alpha-Methylstyrene	98-83-9	3.46	1.00E+00	1.10E+00	1.00E+00
Aniline	62-53-3	0.98	1.00E+00	1.00E+00	1.00E+00
Benzotrichloride	98-07-7	2.92	1.00E+00	1.00E+00	1.00E+00
Benzyl chloride	100-44-7	2.30	1.00E+00	1.00E+00	1.00E+00
Bromobenzene	108-86-1	2.99	1.00E+00	1.00E+00	1.00E+00
Chlorobenzene	108-90-7	2.79	1.00E+00	1.00E+00	1.00E+00
Cumene	98-82-8	3.61	1.00E+00	1.10E+00	1.00E+00
m-Cresol	108-39-4	1.96	1.00E+00	1.00E+00	1.00E+00
n-Butyl benzene	104-51-8	4.28	1.00E+00	1.50E+00	1.20E+00
Nitrobenzene	98-95-3	1.83	1.00E+00	1.00E+00	1.00E+00
n-Propyl benzene	103-65-1	3.69	1.00E+00	1.10E+00	1.00E+00
o-Cresol	95-48-7	2.02	1.00E+00	1.00E+00	1.00E+00
o-Dinitrobenzene	528-29-0	1.69	1.00E+00	1.00E+00	1.00E+00
o-Nitroaniline	88-74-4	1.85	1.00E+00	1.00E+00	1.00E+00
o-Toluidine	95-53-4	1.34	1.00E+00	1.00E+00	1.00E+00
p-Chloroaniline	106-47-8	1.87	1.00E+00	1.00E+00	1.00E+00
p-Cresol	106-44-5	1.94	1.00E+00	1.00E+00	1.00E+00
Phenol	108-95-2	1.48	1.00E+00	1.00E+00	1.00E+00
p-Nitrochlorobenzene	100-00-5	2.39	1.00E+00	1.00E+00	1.00E+00
p-Toluidine	106-49-0	1.40	1.00E+00	1.00E+00	1.00E+00
sec-Butyl benzene	135-98-8	No data	1.00E+00	1.00E+00	1.00E+00
tert-Butyl benzene	98-06-6	4.11	1.00E+00	1.30E+00	1.10E+00
Toluene-2,6-diamine	823-40-5	0.16	1.00E+00	1.00E+00	1.00E+00
Trimethyl benzene	25551-13-7	3.42	1.00E+00	1.10E+00	1.00E+00
	Other Light Semivolatile Compounds (molecular weight <200 g/mole)				
1,1'-Biphenyl	92-52-4	3.90	1.00E+00	1.20E+00	1.10E+00
1,1-Dimethylhydrazine	57-14-7	-1.19	1.00E+00	1.00E+00	1.00E+00
1,2-Dimethylhydrazine	540-73-8	-1.37	1.00E+00	1.00E+00	1.00E+00
1,2-Diphenylhydrazine	122-66-7	2.94	1.00E+00	1.00E+00	1.00E+00
1,3-Propane sultone	1120-71-4	-0.52	1.00E+00	1.00E+00	1.00E+00
2,4-Toluene diisocyanate	584-84-9	No data	1.00E+00	No data	No data

Table C2-5 Food Chain Multipliers for Bioaccumulation of COPCs and ROPCs by Mammals and Birds

Constituent of Potential Concern	CAS Registry Number	Log K_{ow} [a]	FCM, Level 2[b]	FCM, Level 3[c]	FCM, Level 4[d]
2-Chloroacetophenone	532-27-4	1.93	1.00E+00	1.00E+00	1.00E+00
2-Propenoic acid	79-10-7	0.43	1.00E+00	1.00E+00	1.00E+00
4,4'-Methylenedianiline	101-77-9	1.59	1.00E+00	1.10E+00	1.00E+00
Acetophenone	98-86-2	1.64	1.00E+00	1.00E+00	1.00E+00
Benzoic acid	65-85-0	1.87	1.00E+00	1.00E+00	1.00E+00
bis(2-Chloroethoxy)methane	111-91-1	1.30	1.00E+00	1.00E+00	1.00E+00
bis(2-Chloroethyl) ether	111-44-4	1.30	1.00E+00	1.00E+00	1.00E+00
Chlorocyclopentadiene	41851-50-7	2.43	1.00E+00	1.00E+00	1.00E+00
Cyclohexanol	108-93-0	1.23	1.00E+00	1.00E+00	1.00E+00
Dichloroisopropyl ether	108-60-1	2.58	1.00E+00	1.00E+00	1.00E+00
Dichloromethyl ether	542-88-1	0.58	1.00E+00	1.00E+00	1.00E+00
Dichloropentadiene	61626-71-9	No data	1.00E+00	No data	No data
Dimethyl sulfate	77-78-1	0.16	1.00E+00	1.00E+00	1.00E+00
Dimethylaniline	121-69-7	2.31	1.00E+00	1.00E+00	1.00E+00
Di-n-propylnitrosamine	621-64-7	1.38	1.00E+00	1.00E+00	1.00E+00
Diphenyl ether	101-84-8	4.21	1.00E+00	1.40E+00	1.10E+00
Epichlorohydrin	106-89-8	0.25	1.00E+00	1.00E+00	1.00E+00
Ethyl carbamate (Urethane)	51-79-6	-0.15	1.00E+00	1.00E+00	1.00E+00
Ethyl methanesulfonate	62-50-0	0.05	1.00E+00	1.00E+00	1.00E+00
Ethylene dibromide	106-93-4	1.75	1.00E+00	1.00E+00	1.00E+00
Ethylene glycol	107-21-1	-1.36	1.00E+00	1.00E+00	1.00E+00
Ethylene glycol monobutyl ether	111-76-2	0.83	1.00E+00	1.00E+00	1.00E+00
Ethylene glycol monoethyl ether acetate	111-15-9	0.59	1.00E+00	1.00E+00	1.00E+00
Ethylene thiourea	96-45-7	-0.66	1.00E+00	1.00E+00	1.00E+00
Furfural	98-01-1	0.96	1.00E+00	1.00E+00	1.00E+00
Maleic hydrazide	123-33-1	-0.84	1.00E+00	1.00E+00	1.00E+00
Malononitrile	109-77-3	-0.60	1.00E+00	1.00E+00	1.00E+00
Methyl styrene (mixed isomers)	25013-15-4	3.48	1.00E+00	1.10E+00	1.00E+00
Methylhydrazine	60-34-4	-1.05	1.00E+00	1.00E+00	1.00E+00
N,N-Diphenylamine	122-39-4	3.50	1.00E+00	1.10E+00	1.00E+00
Nitric acid, propyl ester	627-13-4	No data	1.00E+00	No data	No data
N-Nitrosodi-n-butylamine	924-16-3	2.41	1.00E+00	1.00E+00	1.00E+00
N-Nitrosomorpholine	59-89-2	0.98	1.00E+00	1.00E+00	1.00E+00
N-Nitroso-N,N-dimethylamine	62-75-9	-0.57	1.00E+00	1.00E+00	1.00E+00
o-Anisidine	90-04-0	1.18	1.00E+00	1.00E+00	1.00E+00
Oxalic acid	144-62-7	No data	1.00E+00	No data	No data
Phthalic anhydride	85-44-9	-0.60	1.00E+00	1.00E+00	1.00E+00
p-Phthalic acid	100-21-0	2.00	1.00E+00	1.00E+00	1.00E+00
Pyridine	110-86-1	0.67	1.00E+00	1.00E+00	1.00E+00
Quinoline	91-22-5	2.03	1.00E+00	1.00E+00	1.00E+00
Quinone	106-51-4	0.20	1.00E+00	1.00E+00	1.00E+00
Safrole	94-59-7	2.66	1.00E+00	1.00E+00	1.00E+00

Table C2-5 Food Chain Multipliers for Bioaccumulation of COPCs and ROPCs by Mammals and Birds

Constituent of Potential Concern	CAS Registry Number	Log K_{ow} [a]	FCM, Level 2[b]	FCM, Level 3[c]	FCM, Level 4[d]
Tetrahydrofuran	109-99-9	0.45	1.00E+00	1.00E+00	1.00E+00
Other Heavy Semivolatile Compounds (molecular weight >200 g/mole)					
1,2,4,5-Tetrachlorobenzene	95-94-3	4.64	1.00E+00	2.00E+00	1.50E+00
1,3,5-Trinitrobenzene	99-35-4	1.18	1.00E+00	1.00E+00	1.00E+00
2,6-Bis(tert-butyl)-4-methylphenol	128-37-0	4.17	1.00E+00	1.40E+00	1.10E+00
2-Cyclohexyl-4,6-dinitrophenol	131-89-5	4.5	1.00E+00	1.80E+00	1.30E+00
2-sec-Butyl-4,6-dinitrophenol	88-85-7	3.56	1.00E+00	1.10E+00	1.00E+00
3,3'-Dichlorobenzidine	91-94-1	3.58	1.00E+00	1.10E+00	1.00E+00
3,3'-Dimethoxybenzidine	119-90-4	1.81	1.00E+00	1.00E+00	1.00E+00
4-Bromophenylphenyl ether	101-55-3	5.04	1.00E+00	3.20E+00	2.60E+00
Ammonium perfluorooctanoate	3825-26-1	No data	1.00E+00	No data	No data
Azobenzene	103-33-3	3.82	1.00E+00	1.20E+00	1.00E+00
Bis(3-tert-butyl-4-hydroxy-6-methyl-phenyl)sulfide	96-69-5	NA	1.00E+00	No data	No data
Captan	133-06-2	2.35	1.00E+00	1.00E+00	1.00E+00
Chlorobenzilate	510-15-6	4.38	1.00E+00	1.60E+00	1.20E+00
Dibutylphosphate	107-66-4	No data	1.00E+00	No data	No data
Dimethyl aminoazobenzene	60-11-7	4.58	1.00E+00	2.00E+00	1.50E+00
Hexachlorobenzene	118-74-1	5.50	1.00E+00	6.30E+00	7.10E+00
Hexachlorobutadiene	87-68-3	4.73	1.00E+00	2.20E+00	1.60E+00
Hexachlorocyclopentadiene	77-47-4	4.91	1.00E+00	2.80E+00	2.20E+00
Hexachloroethane	67-72-1	3.98	1.00E+00	1.30E+00	1.10E+00
Hexachlorophene	70-30-4	7.54	1.00E+00	1.30E+01	1.90E+01
Hexamethylene-1,5-diisocyanate	822-06-0	3.20	1.00E+00	1.00E+00	1.00E+00
Mirex	2385-85-5	6.89	1.00E+00	1.40E+01	2.70E+01
Nitrofen	1836-75-5	5.53	1.00E+00	6.30E+00	7.10E+00
Pentachlorobenzene	608-93-5	5.09	1.00E+00	3.60E+00	3.20E+00
Pentachloronitrobenzene	82-68-8	4.64	1.00E+00	2.00E+00	1.50E+00
Pentachlorophenol	87-86-5	5.08	1.00E+00	3.60E+00	3.20E+00
Picric acid	88-89-1	2.03	1.00E+00	1.00E+00	1.00E+00
Pronamide	23950-58-5	3.51	1.00E+00	1.10E+00	1.00E+00
Strychnine	57-24-9	1.93	1.00E+00	1.00E+00	1.00E+00
Terphenyls	26140-60-3	No data	1.00E+00	No data	No data
Tributyl phosphate	126-73-8	4.00	1.00E+00	1.30E+00	1.10E+00
Trifluralin	1582-09-8	5.34	1.00E+00	4.80E+00	4.70E+00
Triphenylamine	603-34-9	No data	1.00E+00	No data	No data
Herbicides and Organochlorinated Pesticides					
2,4,5-T	93-76-5	3.36	1.00E+00	1.10E+00	1.00E+00
2,4-D and esters	94-75-7	2.81	1.00E+00	1.00E+00	1.00E+00
4,4'-DDD	72-54-8	6.12	1.00E+00	1.10E+01	1.80E+01
4,4'-DDE	72-55-9	6.26	1.00E+00	1.30E+01	2.20E+01
4,4'-DDT	50-29-3	6.07	1.00E+00	1.10E+01	1.80E+01

Table C2-5 Food Chain Multipliers for Bioaccumulation of COPCs and ROPCs by Mammals and Birds

Constituent of Potential Concern	CAS Registry Number	Log K_{ow} [a]	FCM, Level 2[b]	FCM, Level 3[c]	FCM, Level 4[d]
Aldrin	309-00-2	6.18	1.00E+00	1.20E+01	2.00E+01
alpha-BHC	319-84-6	3.80	1.00E+00	1.20E+00	1.00E+00
beta-BHC	319-85-7	3.83	1.00E+00	1.20E+00	1.00E+00
Chlordane	57-74-9	5.94	1.00E+00	9.70E+00	1.40E+01
Delta-BHC	319-86-8	4.14	1.00E+00	1.30E+00	1.10E+00
Dieldrin	60-57-1	5.27	1.00E+00	4.80E+00	4.70E+00
Endothall	145-73-3	-0.87	1.00E+00	1.00E+00	1.00E+00
Endrin	72-20-8	4.89	1.00E+00	2.80E+00	2.20E+00
gamma-BHC (Lindane)	58-89-9	3.72	1.00E+00	1.10E+00	1.00E+00
Heptachlor	76-44-8	5.02	1.00E+00	3.20E+00	2.60E+00
Isodrin	465-73-6	No data	1.00E+00	1.00E+00	1.00E+00
Methoxychlor	72-43-5	4.53	1.00E+00	1.80E+00	1.30E+00
Silvex (2,4,5-TP)	93-72-1	3.80	1.00E+00	1.20E+00	1.00E+00
Toxaphene	8001-35-2	5.50	1.00E+00	6.30E+00	7.10E+00
Inorganic Chemicals and Compounds [f]					
	Metals				
Aluminum	7429-90-5	NA	1.00E+00	1.00E+00	1.00E+00
Antimony	7440-36-0	NA	1.00E+00	1.00E+00	1.00E+00
Arsenic	7440-38-2	NA	1.00E+00	1.00E+00	1.00E+00
Barium	7440-39-3	NA	1.00E+00	1.00E+00	1.00E+00
Beryllium	7440-41-7	NA	1.00E+00	1.00E+00	1.00E+00
Bismuth	7440-69-9	NA	1.00E+00	1.00E+00	1.00E+00
Boron	7440-42-8	NA	1.00E+00	1.00E+00	1.00E+00
Cadmium	7440-43-9	NA	1.00E+00	1.00E+00	1.00E+00
Calcium	7440-70-2	NA	1.00E+00	1.00E+00	1.00E+00
Chromium[g]	18540-29-9	NA	1.00E+00	1.00E+00	1.00E+00
Cobalt	7440-48-4	NA	1.00E+00	1.00E+00	1.00E+00
Copper	7440-50-8	NA	1.00E+00	1.00E+00	1.00E+00
Iron	7439-89-6	NA	1.00E+00	1.00E+00	1.00E+00
Lead	7439-92-1	NA	1.00E+00	1.00E+00	1.00E+00
Lithium	7439-93-2	NA	1.00E+00	1.00E+00	1.00E+00
Magnesium	7439-95-4	NA	1.00E+00	1.00E+00	1.00E+00
Manganese	7439-96-5	NA	1.00E+00	1.00E+00	1.00E+00
Mercury	7439-97-6	NA	NA	NA	NA
Mercury - Hg+2	7487-94-7	NA	1.00E+00	1.00E+00	1.00E+00
Methylmercury	22967-92-6	NA	1.00E+00	1.00E+00	1.00E+00
Molybdenum	7439-98-7	NA	1.00E+00	1.00E+00	1.00E+00
Nickel	7440-02-0	NA	1.00E+00	1.00E+00	1.00E+00
Potassium	7440-09-7	NA	1.00E+00	1.00E+00	1.00E+00
Rhodium	7440-16-6	NA	1.00E+00	1.00E+00	1.00E+00
Selenium	7782-49-2	NA	1.00E+00	1.00E+00	1.00E+00

Table C2-5 Food Chain Multipliers for Bioaccumulation of COPCs and ROPCs by Mammals and Birds

Constituent of Potential Concern	CAS Registry Number	Log K_{ow} [a]	FCM, Level 2[b]	FCM, Level 3[c]	FCM, Level 4[d]
Silicon	7440-21-3	NA	1.00E+00	1.00E+00	1.00E+00
Silver	7440-22-4	NA	1.00E+00	1.00E+00	1.00E+00
Sodium	7440-23-5	NA	1.00E+00	1.00E+00	1.00E+00
Strontium	7440-24-6	NA	1.00E+00	1.00E+00	1.00E+00
Tantalum	7440-25-7	NA	1.00E+00	1.00E+00	1.00E+00
Thallium	7440-28-0	NA	1.00E+00	1.00E+00	1.00E+00
Tin	7440-31-5	NA	1.00E+00	1.00E+00	1.00E+00
Tungsten	7440-33-7	NA	1.00E+00	1.00E+00	1.00E+00
Uranium	7440-61-1	NA	1.00E+00	1.00E+00	1.00E+00
Vanadium	7440-62-2	NA	1.00E+00	1.00E+00	1.00E+00
Yttrium	7440-65-5	NA	1.00E+00	1.00E+00	1.00E+00
Zinc	7440-66-6	NA	1.00E+00	1.00E+00	1.00E+00
Zirconium	7440-67-7	NA	1.00E+00	1.00E+00	1.00E+00
Non-metals and Anions					
Ammonia/Ammonium	7664-41-7	NA	1.00E+00	1.00E+00	1.00E+00
Bromide	24959-67-9	NA	1.00E+00	1.00E+00	1.00E+00
Chloride	16887-00-6	NA	1.00E+00	1.00E+00	1.00E+00
Cyanide	57-12-5	NA	1.00E+00	1.00E+00	1.00E+00
Fluoride	16984-48-8	NA	1.00E+00	1.00E+00	1.00E+00
Hydroxide	14280-30-9	NA	1.00E+00	1.00E+00	1.00E+00
Iodine	7553-56-2	NA	1.00E+00	1.00E+00	1.00E+00
Nitrate	14797-55-8	NA	1.00E+00	1.00E+00	1.00E+00
Nitrite	14797-65-0	NA	1.00E+00	1.00E+00	1.00E+00
Phosphate	14265-44-2	NA	1.00E+00	1.00E+00	1.00E+00
Phosphorus	7723-14-0	NA	1.00E+00	1.00E+00	1.00E+00
Sulfate	14808-79-8	NA	1.00E+00	1.00E+00	1.00E+00
Total Sulfur	63705-05-5	NA	1.00E+00	1.00E+00	1.00E+00
Criteria Pollutants					
Carbon monoxide	630-08-0	NA	1.00E+00	1.00E+00	1.00E+00
Nitrogen dioxide	10102-44-0	NA	1.00E+00	1.00E+00	1.00E+00
Ozone	10028-15-6	NA	1.00E+00	1.00E+00	1.00E+00
Particulate matter	No CAS #	NA	1.00E+00	1.00E+00	1.00E+00
Sulfur dioxide	7446-09-5	NA	1.00E+00	1.00E+00	1.00E+00
Radionuclides					
All radionuclides combined (rad/d)	No CAS #	NA	1.00E+00	1.00E+00	1.00E+00
Actinium-227	14952-40-0	NA	1.00E+00	1.00E+00	1.00E+00
Americium-241	14596-10-2	NA	1.00E+00	1.00E+00	1.00E+00
Americium-243	14993-75-0	NA	1.00E+00	1.00E+00	1.00E+00
Antimony-125	14234-35-6	NA	1.00E+00	1.00E+00	1.00E+00
Barium-137m	13981-97-0	NA	1.00E+00	1.00E+00	1.00E+00
Cadmium-113m	14336-66-4	NA	1.00E+00	1.00E+00	1.00E+00
Carbon-14	14762-75-5	NA	1.00E+00	1.00E+00	1.00E+00

Table C2-5 Food Chain Multipliers for Bioaccumulation of COPCs and ROPCs by Mammals and Birds

Constituent of Potential Concern	CAS Registry Number	Log K_{ow} [a]	FCM, Level 2[b]	FCM, Level 3[c]	FCM, Level 4[d]
Cesium-134	13967-70-9	NA	1.00E+00	1.00E+00	1.00E+00
Cesium-137	10045-97-3	NA	1.00E+00	1.00E+00	1.00E+00
Cobalt-60	10198-40-0	NA	1.00E+00	1.00E+00	1.00E+00
Curium-242	15510-73-3	NA	1.00E+00	1.00E+00	1.00E+00
Curium-243	15757-87-6	NA	1.00E+00	1.00E+00	1.00E+00
Curium-244	13981-15-2	NA	1.00E+00	1.00E+00	1.00E+00
Europium-152	14683-23-9	NA	1.00E+00	1.00E+00	1.00E+00
Europium-154	15585-10-1	NA	1.00E+00	1.00E+00	1.00E+00
Europium-155	14391-16-3	NA	1.00E+00	1.00E+00	1.00E+00
Iodine-129	15046-84-1	NA	1.00E+00	1.00E+00	1.00E+00
Neptunium-237	13994-20-2	NA	1.00E+00	1.00E+00	1.00E+00
Nickel-59	14336-70-0	NA	1.00E+00	1.00E+00	1.00E+00
Nickel-63	13981-37-8	NA	1.00E+00	1.00E+00	1.00E+00
Niobium-93m	7440-03-1[h]	NA	1.00E+00	1.00E+00	1.00E+00
Plutonium-238	13981-16-3	NA	1.00E+00	1.00E+00	1.00E+00
Plutonium-239	15117-48-3	NA	1.00E+00	1.00E+00	1.00E+00
Plutonium-240	14119-33-6	NA	1.00E+00	1.00E+00	1.00E+00
Plutonium-241	14119-32-5	NA	1.00E+00	1.00E+00	1.00E+00
Plutonium-242	13982-10-0	NA	1.00E+00	1.00E+00	1.00E+00
Protactinium-231	14331-85-2	NA	1.00E+00	1.00E+00	1.00E+00
Radium-226	13982-63-3	NA	1.00E+00	1.00E+00	1.00E+00
Radium-228	15262-20-1	NA	1.00E+00	1.00E+00	1.00E+00
Ruthenium-106	13967-48-1	NA	1.00E+00	1.00E+00	1.00E+00
Samarium-151	15715-94-3	NA	1.00E+00	1.00E+00	1.00E+00
Selenium-79	15758-45-9	NA	1.00E+00	1.00E+00	1.00E+00
Strontium-90	10098-97-2	NA	1.00E+00	1.00E+00	1.00E+00
Technetium-99	14133-76-7	NA	1.00E+00	1.00E+00	1.00E+00
Thorium-229	15594-54-4	NA	1.00E+00	1.00E+00	1.00E+00
Thorium-232	7440-29-1	NA	1.00E+00	1.00E+00	1.00E+00
Tin-126	15832-50-5	NA	1.00E+00	1.00E+00	1.00E+00
Tritium	10028-17-8	NA	1.00E+00	1.00E+00	1.00E+00
Uranium-232	14158-29-3	NA	1.00E+00	1.00E+00	1.00E+00
Uranium-233	13968-55-3	NA	1.00E+00	1.00E+00	1.00E+00
Uranium-234	13966-29-5	NA	1.00E+00	1.00E+00	1.00E+00
Uranium-235	15117-96-1	NA	1.00E+00	1.00E+00	1.00E+00
Uranium-236	13982-70-2	NA	1.00E+00	1.00E+00	1.00E+00
Uranium-238	7440-61-1	NA	1.00E+00	1.00E+00	1.00E+00
Yttrium-90	10098-91-6	NA	1.00E+00	1.00E+00	1.00E+00
Zirconium-93	15751-77-6	NA	1.00E+00	1.00E+00	1.00E+00

Table C2-5 Food Chain Multipliers for Bioaccumulation of COPCs and ROPCs by Mammals and Birds

NA = Not applicable.

FCM = Food chain multiplier.

[a] From Appendix B, Table B-1.

[b] Level 2 food chain multiplier from *Screening Level Ecological Risk Assessment Protocol for Hazardous Waste Combustion Facilities* (EPA 1999) (SLERAP) Table 5-2, used for bioaccumulation from media to animals by consumption of plants.

[c] Level 3 food chain multiplier from SLERAP Table 5-2, used for omnivores (trophic level 3).

[d] Level 4 food chain multiplier from SLERAP Table 5-2, used for carnivores (trophic level 4).

[e] Values for Aroclor-1254 were used for polychlorinated biphenyl mixtures.

[f] Food chain multipliers for inorganic compounds are assumed to be 1.0, as specified in Final Water Quality Guidance for the Great Lakes System (40 FR 132, Appendix A).

[g] Values for Cr(VI) were used for calculations.

[h] Chemical Abstracts Service Registry number for niobium metal.

Table C2-6 Dose Conversion Factors, Decay Energies, Absorption Factors, and Radiation Dose Factors for ROPCs

Radionuclide of Potential Concern	CAS Registry Number	External DCF[a]		Internal				
				Decay Energies and Absorption Factors				
		Untilled Soil[b]	Air[c]	$E_\alpha n_\alpha$[d]	Φ_α[e]	$E_\beta n_\beta$[f]	Φ_β[g]	$E_\gamma n_\gamma$[h]
Actinium-227	14952-40-0	7.70E-22	5.82E-18	6.80E-02	1.00E+00	1.60E-02	1.00E+00	0.00E+00
Americium-241	14596-10-2	1.15E-19	8.18E-16	5.48E+00	1.00E+00	5.20E-02	1.00E+00	3.30E-02
Americium-243	14993-75-0	2.96E-19	2.18E-15	5.27E+00	1.00E+00	2.20E-02	1.00E+00	5.60E-02
Antimony-125	14234-35-6	2.67E-18	2.02E-14	0.00E+00	1.00E+00	1.00E-01	1.00E+00	4.31E-01
Barium-137m	13981-97-0	3.76E-18	2.88E-14	0.00E+00	1.00E+00	6.50E-02	1.00E+00	5.97E-01
Cadmium-113m	14336-66-4	2.62E-22	1.45E-18	0.00E+00	1.00E+00	9.30E-02	1.00E+00	0.00E+00
Carbon-14	14762-75-5	4.30E-23	2.24E-19	0.00E+00	1.00E+00	4.90E-02	1.00E+00	0.00E+00
Cesium-134	13967-70-9	9.78E-18	7.57E-14	0.00E+00	1.00E+00	1.64E-01	1.00E+00	1.56E+00
Cesium-137	10045-97-3	1.34E-21	7.74E-18	0.00E+00	1.00E+00	1.87E-01	1.00E+00	0.00E+00
Cobalt-60	10198-40-0	1.52E-17	1.26E-13	0.00E+00	1.00E+00	9.70E-02	1.00E+00	2.50E+00
Curium-242	15510-73-3	7.59E-22	5.69E-18	6.10E+00	1.00E+00	1.00E-02	1.00E+00	2.00E-03
Curium-243	15757-87-6	7.79E-19	5.88E-15	5.80E+00	1.00E+00	1.38E-01	1.00E+00	1.34E-01
Curium-244	13981-15-2	6.54E-22	4.91E-18	5.80E+00	1.00E+00	9.00E-03	1.00E+00	2.00E-03
Europium-152	14683-23-9	7.03E-18	5.65E-14	0.00E+00	1.00E+00	1.39E-01	1.00E+00	1.16E+00
Europium-154	15585-10-1	7.62E-18	6.14E-14	0.00E+00	1.00E+00	2.92E-01	1.00E+00	1.24E+00
Europium-155	14391-16-3	3.37E-19	2.49E-15	0.00E+00	1.00E+00	6.30E-02	1.00E+00	6.10E-02
Iodine-129	15046-84-1	5.95E-20	3.80E-16	0.00E+00	1.00E+00	6.40E-02	1.00E+00	2.50E-02
Neptunium-237	13994-20-2	1.38E-19	1.03E-15	4.77E+00	1.00E+00	7.00E-02	1.00E+00	3.50E-02
Nickel-59	14336-70-0	0.00E+00	0.00E+00	0.00E+00	1.00E+00	5.00E-03	1.00E+00	2.00E-03
Nickel-63	13981-37-8	0.00E+00	0.00E+00	0.00E+00	1.00E+00	1.70E-02	1.00E+00	0.00E+00
Niobium-93m	4440-03-01[n]	5.59E-22	4.44E-18	0.00E+00	1.00E+00	2.80E-02	1.00E+00	2.00E-03
Plutonium-238	13981-16-3	6.34E-22	4.88E-18	5.49E+00	1.00E+00	1.10E-02	1.00E+00	2.00E-03
Plutonium-239	15117-48-3	5.61E-22	4.24E-18	5.15E+00	1.00E+00	7.00E-03	1.00E+00	0.00E+00
Plutonium-240	14119-33-6	6.20E-22	4.75E-18	5.16E+00	1.00E+00	1.10E-02	1.00E+00	2.00E-03
Plutonium-241	14119-32-5	9.60E-24	7.25E-20	0.00E+00	1.00E+00	5.00E-03	1.00E+00	0.00E+00

Table C2-6 Dose Conversion Factors, Decay Energies, Absorption Factors, and Radiation Dose Factors for ROPCs

Radionuclide of Potential Concern	CAS Registry Number	Internal							
		Gamma Absorption Factors Φ_γ^g							
		Plants	Soil Invertebrates	Mule Deer	Mourning Dove	Great Basin Pocket Mouse	Meadow-lark	Coyote	Burrowing Owl
Actinium-227	14952-40-0	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00
Americium-241	14596-10-2	2.70E-02	2.70E-02	3.00E-01	5.00E-02	5.00E-02	5.00E-02	3.40E-01	1.30E-01
Americium-243	14993-75-0	1.20E-02	1.20E-02	1.90E-01	1.60E+00	1.60E+00	1.60E+00	1.43E-01	6.50E-02
Antimony-125	14234-35-6	1.10E-02	1.10E-02	1.55E-01	1.50E-02	1.50E-02	1.50E-02	9.00E-02	4.00E-02
Barium-137m	13981-97-0	1.10E-02	1.10E-02	1.60E-01	1.60E-02	1.60E-02	1.60E-02	9.80E-02	4.00E-02
Cadmium-113m	14336-66-4	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00
Carbon-14	14762-75-5	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00
Cesium-134	13967-70-9	8.80E-03	8.80E-03	1.40E-01	1.10E-02	1.10E-02	1.10E-02	8.00E-02	3.40E-02
Cesium-137	10045-97-3	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00
Cobalt-60	10198-40-0	8.30E-03	8.30E-03	1.15E-01	1.00E-02	1.00E-02	1.00E-02	7.00E-02	1.00E-02
Curium-242	15510-73-3	6.30E-01	6.30E-01	9.40E-01	7.90E-01	7.90E-01	7.90E-01	9.40E-01	9.40E-01
Curium-243	15757-87-6	8.00E-03	8.00E-03	1.65E-01	1.20E-02	1.20E-02	1.20E-02	9.95E-02	4.00E-02
Curium-244	13981-15-2	6.30E-01	6.30E-01	9.40E-01	7.90E-01	7.90E-01	7.90E-01	9.40E-01	9.40E-01
Europium-152	14683-23-9	9.60E-02	9.60E-02	1.40E-01	1.30E-02	1.30E-02	1.30E-02	8.28E-02	3.90E-02
Europium-154	15585-10-1	9.40E-03	9.40E-03	1.35E-01	1.30E-02	1.30E-02	1.30E-02	1.00E-01	3.80E-02
Europium-155	14391-16-3	1.05E-02	1.05E-02	9.00E-02	1.60E-02	1.60E-02	1.60E-02	9.00E-02	5.30E-02
Iodine-129	15046-84-1	9.00E-02	9.00E-02	3.70E-01	1.30E-01	1.30E-01	1.30E-01	2.79E-01	1.70E-01
Neptunium-237	13994-20-2	2.75E-02	2.75E-02	2.95E-01	4.00E-02	4.00E-02	4.00E-02	3.00E-01	1.10E-01
Nickel-59	14336-70-0	6.30E-01	6.30E-01	9.40E-01	7.90E-01	7.90E-01	7.90E-01	9.40E-01	9.40E-01
Nickel-63	13981-37-8	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00
Niobium-93m	4440-03-01[n]	6.30E-01	6.30E-01	9.40E-01	7.90E-01	7.90E-01	7.90E-01	9.40E-01	9.40E-01
Plutonium-238	13981-16-3	6.30E-01	6.30E-01	9.40E-01	7.90E-01	7.90E-01	7.90E-01	9.40E-01	9.40E-01
Plutonium-239	15117-48-3	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00
Plutonium-240	14119-33-6	6.30E-01	6.30E-01	9.40E-01	7.90E-01	7.90E-01	7.90E-01	9.40E-01	9.40E-01
Plutonium-241	14119-32-5	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00

Table C2-6 Dose Conversion Factors, Decay Energies, Absorption Factors, and Radiation Dose Factors for ROPCs

Radionuclide of Potential Concern	CAS Registry Number	Internal							
		Gamma Absorption Factors Φ_γ^g							
		Red-tailed Hawk	Benthic Invertebrates	Chinook Salmon	Canada Goose	Spotted Sandpiper	Great Blue Heron	Bald Eagle	Mink
Actinium-227	14952-40-0	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00
Americium-241	14596-10-2	1.30E-01	2.70E-02	3.40E-01	1.70E-01	5.00E-02	1.70E-01	1.70E-01	1.30E-01
Americium-243	14993-75-0	6.50E-02	1.20E-02	1.43E-01	9.50E-02	1.60E-02	9.50E-02	9.50E-02	6.50E-02
Antimony-125	14234-35-6	4.00E-02	1.10E-02	9.00E-02	6.00E-02	1.50E-02	6.00E-02	6.00E-02	4.00E-02
Barium-137m	13981-97-0	4.00E-02	1.20E-02	9.80E-02	6.00E-02	1.60E-02	6.00E-02	6.00E-02	4.00E-02
Cadmium-113m	14336-66-4	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00
Carbon-14	14762-75-5	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00
Cesium-134	13967-70-9	3.40E-02	8.80E-03	8.00E-02	5.00E-02	1.10E-02	5.00E-02	5.00E-02	3.40E-02
Cesium-137	10045-97-3	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00
Cobalt-60	10198-40-0	1.00E-02	8.30E-03	7.00E-02	3.00E-02	1.00E-02	3.00E-02	3.00E-02	1.00E-02
Curium-242	15510-73-3	9.40E-01	6.30E-01	9.40E-01	9.40E-01	7.90E-01	9.40E-01	9.40E-01	9.40E-01
Curium-243	15757-87-6	4.00E-02	8.00E-03	9.95E-02	6.00E-02	1.20E-02	6.00E-02	6.00E-02	4.00E-02
Curium-244	13981-15-2	9.40E-01	6.30E-01	9.40E-01	9.40E-01	7.90E-01	9.40E-01	9.40E-01	9.40E-01
Europium-152	14683-23-9	3.90E-02	9.60E-02	8.28E-02	4.90E-02	1.30E-02	4.90E-02	4.90E-02	3.90E-02
Europium-154	15585-10-1	3.80E-02	9.40E-03	1.00E-01	4.80E-02	1.30E-02	4.80E-02	4.80E-02	3.80E-02
Europium-155	14391-16-3	5.30E-02	1.05E-02	9.00E-02	8.00E-02	1.60E-02	8.00E-02	8.00E-02	5.30E-02
Iodine-129	15046-84-1	1.70E-01	9.00E-02	2.79E-01	2.10E-01	1.30E-01	2.10E-01	2.10E-01	1.70E-01
Neptunium-237	13994-20-2	1.10E-01	2.75E-02	3.00E-01	1.55E-01	4.00E-02	1.55E-01	1.55E-01	1.10E-01
Nickel-59	14336-70-0	9.40E-01	6.30E-01	9.40E-01	9.40E-01	7.90E-01	9.40E-01	9.40E-01	9.40E-01
Nickel-63	13981-37-8	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00
Niobium-93m	4440-03-01[n]	9.40E-01	6.30E-01	9.40E-01	9.40E-01	7.90E-01	9.40E-01	9.40E-01	9.40E-01
Plutonium-238	13981-16-3	9.40E-01	6.30E-01	9.40E-01	9.40E-01	7.90E-01	9.40E-01	9.40E-01	9.40E-01
Plutonium-239	15117-48-3	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00
Plutonium-240	14119-33-6	9.40E-01	6.30E-01	9.40E-01	9.40E-01	7.90E-01	9.40E-01	9.40E-01	9.40E-01
Plutonium-241	14119-32-5	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00

Table C2-6 Dose Conversion Factors, Decay Energies, Absorption Factors, and Radiation Dose Factors for ROPCs

Radionuclide of Potential Concern	CAS Registry Number	Dose Factors								
		Plants			Soil Invertebrates			Mule Deer		
		External Soil[i]	External Air[j]	Internal[k]	External Soil[i]	External Air[j]	Internal[k]	External Soil[i]	External Air[j]	Internal[k]
Actinium-227	14952-40-0	2.76E-10	1.86E-12	1.82E-05	2.76E-10	1.86E-12	1.82E-05	2.76E-10	1.86E-12	1.82E-05
Americium-241	14596-10-2	5.65E-06	2.62E-10	1.40E-03	5.65E-06	2.62E-10	1.40E-03	4.12E-08	2.62E-10	1.40E-03
Americium-243	14993-75-0	4.34E-06	6.98E-10	1.35E-03	4.34E-06	6.98E-10	1.35E-03	1.06E-07	6.98E-10	1.35E-03
Antimony-125	14234-35-6	3.08E-05	6.46E-09	5.35E-06	3.08E-05	6.46E-09	5.35E-06	9.57E-07	6.46E-09	8.52E-06
Barium-137m	13981-97-0	4.27E-05	9.22E-09	3.66E-06	4.27E-05	9.22E-09	3.66E-06	1.35E-06	9.22E-09	8.20E-06
Cadmium-113m	14336-66-4	9.39E-11	4.64E-13	4.75E-06	9.39E-11	4.64E-13	4.75E-06	9.39E-11	4.64E-13	4.75E-06
Carbon-14	14762-75-5	1.54E-11	7.17E-14	2.50E-06	1.54E-11	7.17E-14	2.50E-06	1.54E-11	7.17E-14	2.50E-06
Cesium-134	13967-70-9	8.97E-05	2.42E-08	9.08E-06	8.97E-05	2.42E-08	9.08E-06	3.51E-06	2.42E-08	1.95E-05
Cesium-137	10045-97-3	4.80E-10	2.48E-12	9.56E-06	4.80E-10	2.48E-12	9.56E-06	4.80E-10	2.48E-12	9.56E-06
Cobalt-60	10198-40-0	1.36E-04	4.03E-08	6.02E-06	1.36E-04	4.03E-08	6.02E-06	5.45E-06	4.03E-08	1.97E-05
Curium-242	15510-73-3	7.94E-06	1.82E-12	1.56E-03	7.94E-06	1.82E-12	1.56E-03	2.72E-10	1.82E-12	1.56E-03
Curium-243	15757-87-6	7.03E-06	1.88E-09	1.49E-03	7.03E-06	1.88E-09	1.49E-03	2.79E-07	1.88E-09	1.49E-03
Curium-244	13981-15-2	7.94E-06	1.57E-12	1.48E-03	7.94E-06	1.57E-12	1.48E-03	2.34E-10	1.57E-12	1.48E-03
Europium-152	14683-23-9	7.01E-04	1.81E-08	1.28E-05	7.01E-04	1.81E-08	1.28E-05	2.52E-06	1.81E-08	1.54E-05
Europium-154	15585-10-1	7.62E-05	1.96E-08	1.55E-05	7.62E-05	1.96E-08	1.55E-05	2.73E-06	1.96E-08	2.35E-05
Europium-155	14391-16-3	4.16E-06	7.97E-10	3.25E-06	4.16E-06	7.97E-10	3.25E-06	1.21E-07	7.97E-10	3.50E-06
Iodine-129	15046-84-1	1.42E-05	1.22E-10	3.39E-06	1.42E-05	1.22E-10	3.39E-06	2.13E-08	1.22E-10	3.74E-06
Neptunium-237	13994-20-2	6.11E-06	3.30E-10	1.22E-03	6.11E-06	3.30E-10	1.22E-03	4.95E-08	3.30E-10	1.22E-03
Nickel-59	14336-70-0	7.94E-06	0.00E+00	3.20E-07	7.94E-06	0.00E+00	3.20E-07	0.00E+00	0.00E+00	3.52E-07
Nickel-63	13981-37-8	0.00E+00	0.00E+00	8.69E-07	0.00E+00	0.00E+00	8.69E-07	0.00E+00	0.00E+00	8.69E-07
Niobium-93m	4440-03-01[n]	7.94E-06	1.42E-12	1.50E-06	7.94E-06	1.42E-12	1.50E-06	2.00E-10	1.42E-12	1.53E-06
Plutonium-238	13981-16-3	7.94E-06	1.56E-12	1.40E-03	7.94E-06	1.56E-12	1.40E-03	2.27E-10	1.56E-12	1.40E-03
Plutonium-239	15117-48-3	2.01E-10	1.36E-12	1.32E-03	2.01E-10	1.36E-12	1.32E-03	2.01E-10	1.36E-12	1.32E-03
Plutonium-240	14119-33-6	7.94E-06	1.52E-12	1.32E-03	7.94E-06	1.52E-12	1.32E-03	2.22E-10	1.52E-12	1.32E-03
Plutonium-241	14119-32-5	3.44E-12	2.32E-14	2.56E-07	3.44E-12	2.32E-14	2.56E-07	3.44E-12	2.32E-14	2.56E-07

Table C2-6 Dose Conversion Factors, Decay Energies, Absorption Factors, and Radiation Dose Factors for ROPCs

Radionuclide of Potential Concern	CAS Registry Number	Dose Factors								
		Mourning Dove			Great Basin Pocket Mouse			Meadowlark		
		External Soil[i]	External Air[j]	Internal[k]	External Soil[i]	External Air[j]	Internal[k]	External Soil[i]	External Air[j]	Internal[k]
Actinium-227	14952-40-0	5.52E-10	1.86E-12	1.82E-05	1.66E-10	1.86E-12	1.82E-05	5.52E-10	1.86E-12	1.82E-05
Americium-241	14596-10-2	8.24E-08	2.62E-10	1.40E-03	1.46E-05	2.62E-10	1.40E-03	8.24E-08	2.62E-10	1.40E-03
Americium-243	14993-75-0	2.12E-07	6.98E-10	1.35E-03	7.90E-04	6.98E-10	1.35E-03	2.12E-07	6.98E-10	1.35E-03
Antimony-125	14234-35-6	1.91E-06	6.46E-09	5.44E-06	5.76E-05	6.46E-09	5.44E-06	1.91E-06	6.46E-09	5.44E-06
Barium-137m	13981-97-0	2.70E-06	9.22E-09	3.81E-06	8.51E-05	9.22E-09	3.81E-06	2.70E-06	9.22E-09	3.81E-06
Cadmium-113m	14336-66-4	1.88E-10	4.64E-13	4.75E-06	5.63E-11	4.64E-13	4.75E-06	1.88E-10	4.64E-13	4.75E-06
Carbon-14	14762-75-5	3.08E-11	7.17E-14	2.50E-06	9.25E-12	7.17E-14	2.50E-06	3.08E-11	7.17E-14	2.50E-06
Cesium-134	13967-70-9	7.01E-06	2.42E-08	9.25E-06	1.53E-04	2.42E-08	9.25E-06	7.01E-06	2.42E-08	9.25E-06
Cesium-137	10045-97-3	9.61E-10	2.48E-12	9.56E-06	2.88E-10	2.48E-12	9.56E-06	9.61E-10	2.48E-12	9.56E-06
Cobalt-60	10198-40-0	1.09E-05	4.03E-08	6.24E-06	2.24E-04	4.03E-08	6.24E-06	1.09E-05	4.03E-08	6.24E-06
Curium-242	15510-73-3	5.44E-10	1.82E-12	1.56E-03	1.39E-05	1.82E-12	1.56E-03	5.44E-10	1.82E-12	1.56E-03
Curium-243	15757-87-6	5.58E-07	1.88E-09	1.49E-03	1.44E-05	1.88E-09	1.49E-03	5.58E-07	1.88E-09	1.49E-03
Curium-244	13981-15-2	4.69E-10	1.57E-12	1.48E-03	1.39E-05	1.57E-12	1.48E-03	4.69E-10	1.57E-12	1.48E-03
Europium-152	14683-23-9	5.04E-06	1.81E-08	7.87E-06	1.34E-04	1.81E-08	7.87E-06	5.04E-06	1.81E-08	7.87E-06
Europium-154	15585-10-1	5.46E-06	1.96E-08	1.57E-05	1.44E-04	1.96E-08	1.57E-05	5.46E-06	1.96E-08	1.57E-05
Europium-155	14391-16-3	2.42E-07	7.97E-10	3.27E-06	8.68E-06	7.97E-10	3.27E-06	2.42E-07	7.97E-10	3.27E-06
Iodine-129	15046-84-1	4.26E-08	1.22E-10	3.44E-06	2.87E-05	1.22E-10	3.44E-06	4.26E-08	1.22E-10	3.44E-06
Neptunium-237	13994-20-2	9.89E-08	3.30E-10	1.22E-03	1.24E-05	3.30E-10	1.22E-03	9.89E-08	3.30E-10	1.22E-03
Nickel-59	14336-70-0	0.00E+00	0.00E+00	3.36E-07	1.39E-05	0.00E+00	3.36E-07	0.00E+00	0.00E+00	3.36E-07
Nickel-63	13981-37-8	0.00E+00	0.00E+00	8.69E-07	0.00E+00	0.00E+00	8.69E-07	0.00E+00	0.00E+00	8.69E-07
Niobium-93m	4440-03-01[n]	4.01E-10	1.42E-12	1.51E-06	1.39E-05	1.42E-12	1.51E-06	4.01E-10	1.42E-12	1.51E-06
Plutonium-238	13981-16-3	4.54E-10	1.56E-12	1.40E-03	1.39E-05	1.56E-12	1.40E-03	4.54E-10	1.56E-12	1.40E-03
Plutonium-239	15117-48-3	4.02E-10	1.36E-12	1.32E-03	1.21E-10	1.36E-12	1.32E-03	4.02E-10	1.36E-12	1.32E-03
Plutonium-240	14119-33-6	4.44E-10	1.52E-12	1.32E-03	1.39E-05	1.52E-12	1.32E-03	4.44E-10	1.52E-12	1.32E-03
Plutonium-241	14119-32-5	6.88E-12	2.32E-14	2.56E-07	2.06E-12	2.32E-14	2.56E-07	6.88E-12	2.32E-14	2.56E-07

Table C2-6 Dose Conversion Factors, Decay Energies, Absorption Factors, and Radiation Dose Factors for ROPCs

Radionuclide of Potential Concern	CAS Registry Number	Dose Factors								
		Coyote			Burrowing Owl			Red-tailed Hawk		
		External Soil[i]	External Air[j]	Internal[k]	External Soil[i]	External Air[j]	Internal[k]	External Soil[i]	External Air[j]	Internal[k]
Actinium-227	14952-40-0	3.86E-10	1.86E-12	1.82E-05	2.76E-10	1.86E-12	1.82E-05	2.76E-11	1.86E-12	1.82E-05
Americium-241	14596-10-2	4.25E-05	2.62E-10	1.40E-03	2.71E-05	2.62E-10	1.40E-03	4.12E-09	2.62E-10	1.40E-03
Americium-243	14993-75-0	3.04E-05	6.98E-10	1.35E-03	2.30E-05	6.98E-10	1.35E-03	1.06E-08	6.98E-10	1.35E-03
Antimony-125	14234-35-6	1.48E-04	6.46E-09	7.09E-06	1.10E-04	6.46E-09	5.99E-06	9.57E-08	6.46E-09	5.99E-06
Barium-137m	13981-97-0	2.23E-04	9.22E-09	6.31E-06	1.52E-04	9.22E-09	4.54E-06	1.35E-07	9.22E-09	4.54E-06
Cadmium-113m	14336-66-4	1.31E-10	4.64E-13	4.75E-06	9.39E-11	4.64E-13	4.75E-06	9.39E-12	4.64E-13	4.75E-06
Carbon-14	14762-75-5	2.16E-11	7.17E-14	2.50E-06	1.54E-11	7.17E-14	2.50E-06	1.54E-12	7.17E-14	2.50E-06
Cesium-134	13967-70-9	4.75E-04	2.42E-08	1.47E-05	3.37E-04	2.42E-08	1.11E-05	3.51E-07	2.42E-08	1.11E-05
Cesium-137	10045-97-3	6.72E-10	2.48E-12	9.56E-06	4.80E-10	2.48E-12	9.56E-06	4.80E-11	2.48E-12	9.56E-06
Cobalt-60	10198-40-0	6.70E-04	4.03E-08	1.39E-05	1.63E-04	4.03E-08	6.24E-06	5.45E-07	4.03E-08	6.24E-06
Curium-242	15510-73-3	7.11E-06	1.82E-12	1.56E-03	1.18E-05	1.82E-12	1.56E-03	2.72E-11	1.82E-12	1.56E-03
Curium-243	15757-87-6	5.08E-05	1.88E-09	1.49E-03	3.40E-05	1.88E-09	1.49E-03	2.79E-08	1.88E-09	1.49E-03
Curium-244	13981-15-2	7.11E-06	1.57E-12	1.48E-03	1.18E-05	1.57E-12	1.48E-03	2.34E-11	1.57E-12	1.48E-03
Europium-152	14683-23-9	3.65E-04	1.81E-08	1.20E-05	2.86E-04	1.81E-08	9.40E-06	2.52E-07	1.81E-08	9.40E-06
Europium-154	15585-10-1	4.73E-04	1.96E-08	2.13E-05	3.00E-04	1.96E-08	1.73E-05	2.73E-07	1.96E-08	1.73E-05
Europium-155	14391-16-3	2.09E-05	7.97E-10	3.50E-06	2.05E-05	7.97E-10	3.38E-06	1.21E-08	7.97E-10	3.38E-06
Iodine-129	15046-84-1	2.64E-05	1.22E-10	3.63E-06	2.68E-05	1.22E-10	3.49E-06	2.13E-09	1.22E-10	3.49E-06
Neptunium-237	13994-20-2	3.98E-05	3.30E-10	1.22E-03	2.43E-05	3.30E-10	1.22E-03	4.95E-09	3.30E-10	1.22E-03
Nickel-59	14336-70-0	7.11E-06	0.00E+00	3.52E-07	1.18E-05	0.00E+00	3.52E-07	0.00E+00	0.00E+00	3.52E-07
Nickel-63	13981-37-8	0.00E+00	0.00E+00	8.69E-07	0.00E+00	0.00E+00	8.69E-07	0.00E+00	0.00E+00	8.69E-07
Niobium-93m	4440-03-01[n]	7.11E-06	1.42E-12	1.53E-06	1.18E-05	1.42E-12	1.53E-06	2.00E-11	1.42E-12	1.53E-06
Plutonium-238	13981-16-3	7.11E-06	1.56E-12	1.40E-03	1.18E-05	1.56E-12	1.40E-03	2.27E-11	1.56E-12	1.40E-03
Plutonium-239	15117-48-3	2.81E-10	1.36E-12	1.32E-03	2.01E-10	1.36E-12	1.32E-03	2.01E-11	1.36E-12	1.32E-03
Plutonium-240	14119-33-6	7.11E-06	1.52E-12	1.32E-03	1.18E-05	1.52E-12	1.32E-03	2.22E-11	1.52E-12	1.32E-03
Plutonium-241	14119-32-5	4.82E-12	2.32E-14	2.56E-07	3.44E-12	2.32E-14	2.56E-07	3.44E-13	2.32E-14	2.56E-07

Table C2-6 Dose Conversion Factors, Decay Energies, Absorption Factors, and Radiation Dose Factors for ROPCs

Radionuclide of Potential Concern	CAS Registry Number	Dose Factors								
		Benthic Invertebrates			Aquatic Biota, Including Salmonids			Canada Goose		
		External Water[l]	External Sediment[m]	Internal[k]	External Water[l]	External Sediment[m]	Internal[k]	External Water[l]	External Air[j]	Internal[k]
Actinium-227	14952-40-0	0.00E+00	0.00E+00	1.82E-05	0.00E+00	0.00E+00	1.82E-05	0.00E+00	1.86E-12	1.82E-05
Americium-241	14596-10-2	1.64E-10	1.48E-06	1.40E-03	1.00E-09	5.58E-08	1.40E-03	7.01E-10	2.62E-10	1.40E-03
Americium-243	14993-75-0	2.83E-10	2.55E-06	1.35E-03	2.21E-09	1.23E-07	1.35E-03	1.30E-09	6.98E-10	1.35E-03
Antimony-125	14234-35-6	2.18E-09	1.96E-05	5.35E-06	1.81E-08	1.00E-06	7.09E-06	1.04E-08	6.46E-09	6.43E-06
Barium-137m	13981-97-0	3.02E-09	2.72E-05	3.69E-06	2.48E-08	1.38E-06	6.31E-06	1.44E-08	9.22E-09	5.15E-06
Cadmium-113m	14336-66-4	0.00E+00	0.00E+00	4.75E-06	0.00E+00	0.00E+00	4.75E-06	0.00E+00	4.64E-13	4.75E-06
Carbon-14	14762-75-5	0.00E+00	0.00E+00	2.50E-06	0.00E+00	0.00E+00	2.50E-06	0.00E+00	7.17E-14	2.50E-06
Cesium-134	13967-70-9	7.89E-09	7.10E-05	9.08E-06	6.59E-08	3.66E-06	1.47E-05	3.78E-08	2.42E-08	1.24E-05
Cesium-137	10045-97-3	0.00E+00	0.00E+00	9.56E-06	0.00E+00	0.00E+00	9.56E-06	0.00E+00	2.48E-12	9.56E-06
Cobalt-60	10198-40-0	1.27E-08	1.14E-04	6.02E-06	1.07E-07	5.96E-06	1.39E-05	6.22E-08	4.03E-08	8.80E-06
Curium-242	15510-73-3	3.79E-12	3.41E-08	1.56E-03	5.53E-12	3.07E-10	1.56E-03	3.07E-12	1.82E-12	1.56E-03
Curium-243	15757-87-6	6.81E-10	6.13E-06	1.49E-03	5.56E-09	3.09E-07	1.49E-03	3.22E-09	1.88E-09	1.49E-03
Curium-244	13981-15-2	3.79E-12	3.41E-08	1.48E-03	5.53E-12	3.07E-10	1.48E-03	3.07E-12	1.57E-12	1.48E-03
Europium-152	14683-23-9	5.35E-09	4.81E-05	1.28E-05	4.88E-08	2.71E-06	1.20E-05	2.81E-08	1.81E-08	9.99E-06
Europium-154	15585-10-1	6.29E-09	5.66E-05	1.55E-05	5.15E-08	2.86E-06	2.13E-05	3.02E-08	1.96E-08	1.80E-05
Europium-155	14391-16-3	3.09E-10	2.78E-06	3.25E-06	2.56E-09	1.42E-07	3.50E-06	1.44E-09	7.97E-10	3.47E-06
Iodine-129	15046-84-1	1.16E-10	1.05E-06	3.39E-06	8.31E-10	4.62E-08	3.63E-06	5.06E-10	1.22E-10	3.54E-06
Neptunium-237	13994-20-2	1.74E-10	1.57E-06	1.22E-03	1.13E-09	6.27E-08	1.22E-03	7.57E-10	3.30E-10	1.22E-03
Nickel-59	14336-70-0	3.79E-12	3.41E-08	3.20E-07	5.53E-12	3.07E-10	3.52E-07	3.07E-12	0.00E+00	3.52E-07
Nickel-63	13981-37-8	0.00E+00	0.00E+00	8.69E-07	0.00E+00	0.00E+00	8.69E-07	0.00E+00	0.00E+00	8.69E-07
Niobium-93m	4440-03-01[n]	3.79E-12	3.41E-08	1.50E-06	5.53E-12	3.07E-10	1.53E-06	3.07E-12	1.42E-12	1.53E-06
Plutonium-238	13981-16-3	3.79E-12	3.41E-08	1.40E-03	5.53E-12	3.07E-10	1.40E-03	3.07E-12	1.56E-12	1.40E-03
Plutonium-239	15117-48-3	0.00E+00	0.00E+00	1.32E-03	0.00E+00	0.00E+00	1.32E-03	0.00E+00	1.36E-12	1.32E-03
Plutonium-240	14119-33-6	3.79E-12	3.41E-08	1.32E-03	5.53E-12	3.07E-10	1.32E-03	3.07E-12	1.52E-12	1.32E-03
Plutonium-241	14119-32-5	0.00E+00	0.00E+00	2.56E-07	0.00E+00	0.00E+00	2.56E-07	0.00E+00	2.32E-14	2.56E-07

Table C2-6 Dose Conversion Factors, Decay Energies, Absorption Factors, and Radiation Dose Factors for ROPCs

Radionuclide of Potential Concern	CAS Registry Number	Dose Factors										
		Spotted Sandpiper				Great Blue Heron				Bald Eagle		
		External Water[l]	External Sediment[m]	External Air[j]	Internal[k]	External Water[l]	External Sediment[m]	External Air[j]	Internal[k]	External Water[l]	External Air[j]	Internal[k]
Actinium-227	14952-40-0	0.00E+00	0.00E+00	1.86E-12	1.82E-05	0.00E+00	0.00E+00	1.86E-12	1.82E-05	0.00E+00	1.86E-12	1.82E-05
Americium-241	14596-10-2	8.03E-10	4.82E-07	2.62E-10	1.40E-03	7.01E-10	2.80E-07	2.62E-10	1.40E-03	7.01E-11	2.62E-10	1.40E-03
Americium-243	14993-75-0	1.41E-09	8.46E-07	6.98E-10	1.35E-03	1.30E-09	5.19E-07	6.98E-10	1.35E-03	1.30E-10	6.98E-10	1.35E-03
Antimony-125	14234-35-6	1.09E-08	6.52E-06	6.46E-09	5.44E-06	1.04E-08	4.15E-06	6.46E-09	6.43E-06	1.04E-09	6.46E-09	6.43E-06
Barium-137m	13981-97-0	1.50E-08	9.02E-06	9.22E-09	3.81E-06	1.44E-08	5.75E-06	9.22E-09	5.15E-06	1.44E-09	9.22E-09	5.15E-06
Cadmium-113m	14336-66-4	0.00E+00	0.00E+00	4.64E-13	4.75E-06	0.00E+00	0.00E+00	4.64E-13	4.75E-06	0.00E+00	4.64E-13	4.75E-06
Carbon-14	14762-75-5	0.00E+00	0.00E+00	7.17E-14	2.50E-06	0.00E+00	0.00E+00	7.17E-14	2.50E-06	0.00E+00	7.17E-14	2.50E-06
Cesium-134	13967-70-9	3.94E-08	2.36E-05	2.42E-08	9.25E-06	3.78E-08	1.51E-05	2.42E-08	1.24E-05	3.78E-09	2.42E-08	1.24E-05
Cesium-137	10045-97-3	0.00E+00	0.00E+00	2.48E-12	9.56E-06	0.00E+00	0.00E+00	2.48E-12	9.56E-06	0.00E+00	2.48E-12	9.56E-06
Cobalt-60	10198-40-0	6.35E-08	3.81E-05	4.03E-08	6.24E-06	6.22E-08	2.49E-05	4.03E-08	8.80E-06	6.22E-09	4.03E-08	8.80E-06
Curium-242	15510-73-3	1.08E-11	6.45E-09	1.82E-12	1.56E-03	3.07E-12	1.23E-09	1.82E-12	1.56E-03	3.07E-13	1.82E-12	1.56E-03
Curium-243	15757-87-6	3.39E-09	2.03E-06	1.88E-09	1.49E-03	3.22E-09	1.29E-06	1.88E-09	1.49E-03	3.22E-10	1.88E-09	1.49E-03
Curium-244	13981-15-2	1.08E-11	6.45E-09	1.57E-12	1.48E-03	3.07E-12	1.23E-09	1.57E-12	1.48E-03	3.07E-13	1.57E-12	1.48E-03
Europium-152	14683-23-9	2.92E-08	1.75E-05	1.81E-08	7.87E-06	2.81E-08	1.12E-05	1.81E-08	9.99E-06	2.81E-09	1.81E-08	9.99E-06
Europium-154	15585-10-1	3.14E-08	1.88E-05	1.96E-08	1.57E-05	3.02E-08	1.21E-05	1.96E-08	1.80E-05	3.02E-09	1.96E-08	1.80E-05
Europium-155	14391-16-3	1.54E-09	9.22E-07	7.97E-10	3.27E-06	1.44E-09	5.75E-07	7.97E-10	3.47E-06	1.44E-10	7.97E-10	3.47E-06
Iodine-129	15046-84-1	5.57E-10	3.34E-07	1.22E-10	3.44E-06	5.06E-10	2.02E-07	1.22E-10	3.54E-06	5.06E-11	1.22E-10	3.54E-06
Neptunium-237	13994-20-2	8.60E-10	5.16E-07	3.30E-10	1.22E-03	7.57E-10	3.03E-07	3.30E-10	1.22E-03	7.57E-11	3.30E-10	1.22E-03
Nickel-59	14336-70-0	1.08E-11	6.45E-09	0.00E+00	3.36E-07	3.07E-12	1.23E-09	0.00E+00	3.52E-07	3.07E-13	0.00E+00	3.52E-07
Nickel-63	13981-37-8	0.00E+00	0.00E+00	0.00E+00	8.69E-07	0.00E+00	0.00E+00	0.00E+00	8.69E-07	0.00E+00	0.00E+00	8.69E-07
Niobium-93m	4440-03-01[n]	1.08E-11	6.45E-09	1.42E-12	1.51E-06	3.07E-12	1.23E-09	1.42E-12	1.53E-06	3.07E-13	1.42E-12	1.53E-06
Plutonium-238	13981-16-3	1.08E-11	6.45E-09	1.56E-12	1.40E-03	3.07E-12	1.23E-09	1.56E-12	1.40E-03	3.07E-13	1.56E-12	1.40E-03
Plutonium-239	15117-48-3	0.00E+00	0.00E+00	1.36E-12	1.32E-03	0.00E+00	0.00E+00	1.36E-12	1.32E-03	0.00E+00	1.36E-12	1.32E-03
Plutonium-240	14119-33-6	1.08E-11	6.45E-09	1.52E-12	1.32E-03	3.07E-12	1.23E-09	1.52E-12	1.32E-03	3.07E-13	1.52E-12	1.32E-03
Plutonium-241	14119-32-5	0.00E+00	0.00E+00	2.32E-14	2.56E-07	0.00E+00	0.00E+00	2.32E-14	2.56E-07	0.00E+00	2.32E-14	2.56E-07

Table C2-6 Dose Conversion Factors, Decay Energies, Absorption Factors, and Radiation Dose Factors for ROPCs

Radionuclide of Potential Concern	CAS Registry Number	Dose Factors		
		Mink		
		External Water[l]	External Air[j]	Internal[k]
Actinium-227	14952-40-0	0.00E+00	1.86E-12	1.82E-05
Americium-241	14596-10-2	2.94E-10	2.62E-10	1.40E-03
Americium-243	14993-75-0	5.36E-10	6.98E-10	1.35E-03
Antimony-125	14234-35-6	4.24E-09	6.46E-09	5.99E-06
Barium-137m	13981-97-0	5.87E-09	9.22E-09	4.54E-06
Cadmium-113m	14336-66-4	0.00E+00	4.64E-13	4.75E-06
Carbon-14	14762-75-5	0.00E+00	7.17E-14	2.50E-06
Cesium-134	13967-70-9	1.54E-08	2.42E-08	1.11E-05
Cesium-137	10045-97-3	0.00E+00	2.48E-12	9.56E-06
Cobalt-60	10198-40-0	2.54E-08	4.03E-08	6.24E-06
Curium-242	15510-73-3	1.23E-12	1.82E-12	1.56E-03
Curium-243	15757-87-6	1.32E-09	1.88E-09	1.49E-03
Curium-244	13981-15-2	1.23E-12	1.57E-12	1.48E-03
Europium-152	14683-23-9	1.14E-08	1.81E-08	9.40E-06
Europium-154	15585-10-1	1.22E-08	1.96E-08	1.73E-05
Europium-155	14391-16-3	5.92E-10	7.97E-10	3.38E-06
Iodine-129	15046-84-1	2.12E-10	1.22E-10	3.49E-06
Neptunium-237	13994-20-2	3.19E-10	3.30E-10	1.22E-03
Nickel-59	14336-70-0	1.23E-12	0.00E+00	3.52E-07
Nickel-63	13981-37-8	0.00E+00	0.00E+00	8.69E-07
Niobium-93m	4440-03-01[n]	1.23E-12	1.42E-12	1.53E-06
Plutonium-238	13981-16-3	1.23E-12	1.56E-12	1.40E-03
Plutonium-239	15117-48-3	0.00E+00	1.36E-12	1.32E-03
Plutonium-240	14119-33-6	1.23E-12	1.52E-12	1.32E-03
Plutonium-241	14119-32-5	0.00E+00	2.32E-14	2.56E-07

Table C2-6 Dose Conversion Factors, Decay Energies, Absorption Factors, and Radiation Dose Factors for ROPCs

Radionuclide of Potential Concern	CAS Registry Number	External DCF[a]		Internal				
				Decay Energies and Absorption Factors				
		Untilled Soil[b]	Air[c]	$E_\alpha n_\alpha$[d]	Φ_α[e]	$E_\beta n_\beta$[f]	Φ_β[g]	$E_\gamma n_\gamma$[h]
Plutonium-242	13982-10-0	5.23E-22	4.01E-18	4.89E+00	1.00E+00	9.00E-03	1.00E+00	1.00E-03
Protactinium-231	14331-85-2	2.30E-19	1.72E-15	4.97E+00	1.00E+00	6.50E-02	1.00E+00	4.80E-02
Radium-226	13982-63-3	4.15E-20	3.15E-16	4.77E+00	1.00E+00	4.00E-03	1.00E+00	7.00E-03
Radium-228	15262-20-1	0.00E+00	0.00E+00	0.00E+00	1.00E+00	1.70E-02	1.00E+00	0.00E+00
Ruthenium-106	13967-48-1	0.00E+00	0.00E+00	0.00E+00	1.00E+00	1.00E-02	1.00E+00	0.00E+00
Samarium-151	15715-94-3	5.22E-24	3.61E-20	0.00E+00	1.00E+00	2.00E-02	1.00E+00	0.00E+00
Selenium-79	15758-45-9	5.77E-23	3.03E-19	0.00E+00	1.00E+00	5.60E-02	1.00E+00	0.00E+00
Strontium-90	10098-97-2	1.31E-21	7.53E-18	0.00E+00	1.00E+00	1.96E-01	1.00E+00	0.00E+00
Technetium-99	14133-79-7	2.92E-22	1.62E-18	0.00E+00	1.00E+00	1.01E-01	1.00E+00	0.00E+00
Thorium-229	15594-54-4	5.09E-19	3.83E-15	4.87E+00	1.00E+00	1.16E-01	1.00E+00	9.60E-02
Thorium-232	7440-29-1	1.16E-21	8.72E-18	4.00E+00	1.00E+00	1.20E-02	1.00E+00	1.00E-03
Tin-126	15832-50-5	2.85E-19	2.11E-15	0.00E+00	1.00E+00	1.72E-01	1.00E+00	5.70E-02
Tritium	10028-17-8	0.00E+00	3.31E-19	0.00E+00	1.00E+00	6.00E-03	1.00E+00	0.00E+00
Uranium-232	14158-29-3	1.88E-21	1.42E-17	5.30E+00	1.00E+00	1.70E-02	1.00E+00	2.00E-03
Uranium-233	13968-55-3	2.16E-21	1.63E-17	4.82E+00	1.00E+00	6.00E-03	1.00E+00	1.00E-03
Uranium-234	13966-29-5	1.01E-21	7.63E-18	4.76E+00	1.00E+00	1.30E-02	1.00E+00	2.00E-03
Uranium-235	15117-96-1	9.49E-19	7.20E-15	4.40E+00	1.00E+00	4.90E-02	1.00E+00	1.56E-01
Uranium-236	13982-70-2	6.53E-22	5.01E-18	4.51E+00	1.00E+00	1.10E-02	1.00E+00	2.00E-03
Uranium-238	7440-61-1	4.42E-22	3.41E-18	4.19E+00	1.00E+00	1.00E-02	1.00E+00	1.00E-03
Yttrium-90	10098-91-6	3.10E-20	1.90E-16	0.00E+00	1.00E+00	9.35E-01	1.00E+00	0.00E+00
Zirconium-93	15751-77-6	0.00E+00	0.00E+00	0.00E+00	1.00E+00	2.00E-02	1.00E+00	0.00E+00

Table C2-6 Dose Conversion Factors, Decay Energies, Absorption Factors, and Radiation Dose Factors for ROPCs

Radionuclide of Potential Concern	CAS Registry Number	Internal							
		Gamma Absorption Factors Φ_γ^g							
		Plants	Soil Invertebrates	Mule Deer	Mourning Dove	Great Basin Pocket Mouse	Meadow-lark	Coyote	Burrowing Owl
Plutonium-242	13982-10-0	6.30E-01	6.30E-01	9.40E-01	7.90E-01	7.90E-01	7.90E-01	9.40E-01	9.40E-01
Protactinium-231	14331-85-2	1.30E-02	1.30E-02	2.00E-01	1.85E-02	1.85E-02	1.85E-02	1.80E-01	6.00E-02
Radium-226	13982-63-3	6.30E-01	6.30E-01	9.30E-01	7.90E-01	7.90E-01	7.90E-01	9.40E-01	9.30E-01
Radium-228	15262-20-1	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00
Ruthenium-106	13967-48-1	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00
Samarium-151	15715-94-3	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00
Selenium-79	15758-45-9	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00
Strontium-90	10098-97-2	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00
Technetium-99	14133-79-7	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00
Thorium-229	15594-54-4	8.50E-03	8.50E-03	1.70E-01	1.35E-02	1.35E-02	1.35E-02	8.00E-02	4.40E-02
Thorium-232	7440-29-1	6.30E-01	6.30E-01	9.40E-01	7.90E-01	7.90E-01	7.90E-01	9.40E-01	9.40E-01
Tin-126	15832-50-5	1.20E-02	1.20E-02	1.90E-01	1.65E-02	1.65E-02	1.65E-02	1.27E-01	5.50E-02
Tritium	10028-17-8	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00
Uranium-232	14158-29-3	6.30E-01	6.30E-01	9.40E-01	7.90E-01	7.90E-01	7.90E-01	9.40E-01	9.40E-01
Uranium-233	13968-55-3	6.30E-01	6.30E-01	9.40E-01	7.90E-01	7.90E-01	7.90E-01	9.40E-01	9.40E-01
Uranium-234	13966-29-5	6.30E-01	6.30E-01	9.40E-01	7.90E-01	7.90E-01	7.90E-01	9.40E-01	9.40E-01
Uranium-235	15117-96-1	8.00E-03	8.00E-03	1.50E-01	1.15E-02	1.15E-02	1.15E-02	9.49E-02	4.00E-02
Uranium-236	13982-70-2	6.30E-01	6.30E-01	9.40E-01	7.90E-01	7.90E-01	7.90E-01	9.40E-01	9.40E-01
Uranium-238	7440-61-1	6.30E-01	6.30E-01	9.40E-01	7.90E-01	7.90E-01	7.90E-01	9.40E-01	9.40E-01
Yttrium-90	10098-91-6	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00
Zirconium-93	15751-77-6	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00

Table C2-6 Dose Conversion Factors, Decay Energies, Absorption Factors, and Radiation Dose Factors for ROPCs

Radionuclide of Potential Concern	CAS Registry Number	Internal							
		Gamma Absorption Factors Φ_γ^g							
		Red-tailed Hawk	Benthic Invertebrates	Chinook Salmon	Canada Goose	Spotted Sandpiper	Great Blue Heron	Bald Eagle	Mink
Plutonium-242	13982-10-0	9.40E-01	6.30E-01	9.40E-01	9.40E-01	7.90E-01	9.40E-01	9.40E-01	9.40E-01
Protactinium-231	14331-85-2	6.00E-02	1.30E-02	1.80E-01	9.00E-02	1.85E-02	9.00E-02	9.00E-02	6.00E-02
Radium-226	13982-63-3	9.30E-01	6.30E-01	9.40E-01	9.30E-01	7.90E-01	9.30E-01	9.30E-01	9.30E-01
Radium-228	15262-20-1	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00
Ruthenium-106	13967-48-1	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00
Samarium-151	15715-94-3	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00
Selenium-79	15758-45-9	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00
Strontium-90	10098-97-2	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00
Technetium-99	14133-79-7	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00
Thorium-229	15594-54-4	4.40E-02	8.50E-03	8.00E-02	6.60E-02	1.35E-02	6.60E-02	6.60E-02	4.40E-02
Thorium-232	7440-29-1	9.40E-01	6.30E-01	9.40E-01	9.40E-01	7.90E-01	9.40E-01	9.40E-01	9.40E-01
Tin-126	15832-50-5	5.50E-02	1.20E-02	1.27E-01	8.50E-02	1.65E-02	8.50E-02	8.50E-02	5.50E-02
Tritium	10028-17-8	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00
Uranium-232	14158-29-3	9.40E-01	6.30E-01	9.40E-01	9.40E-01	7.90E-01	9.40E-01	9.40E-01	9.40E-01
Uranium-233	13968-55-3	9.40E-01	6.30E-01	9.40E-01	9.40E-01	7.90E-01	9.40E-01	9.40E-01	9.40E-01
Uranium-234	13966-29-5	9.40E-01	6.30E-01	9.40E-01	9.40E-01	7.90E-01	9.40E-01	9.40E-01	9.40E-01
Uranium-235	15117-96-1	4.00E-02	8.00E-03	9.49E-02	6.00E-02	1.15E-02	6.00E-02	6.00E-02	4.00E-02
Uranium-236	13982-70-2	9.40E-01	6.30E-01	9.40E-01	9.40E-01	7.90E-01	9.40E-01	9.40E-01	9.40E-01
Uranium-238	7440-61-1	9.40E-01	6.30E-01	9.40E-01	9.40E-01	7.90E-01	9.40E-01	9.40E-01	9.40E-01
Yttrium-90	10098-91-6	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00
Zirconium-93	15751-77-6	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00

Table C2-6 Dose Conversion Factors, Decay Energies, Absorption Factors, and Radiation Dose Factors for ROPCs

Radionuclide of Potential Concern	CAS Registry Number	Dose Factors								
		Plants			Soil Invertebrates			Mule Deer		
		External Soil[i]	External Air[j]	Internal[k]	External Soil[i]	External Air[j]	Internal[k]	External Soil[i]	External Air[j]	Internal[k]
Plutonium-242	13982-10-0	3.97E-06	1.28E-12	1.25E-03	3.97E-06	1.28E-12	1.25E-03	1.87E-10	1.28E-12	1.25E-03
Protactinium-231	14331-85-2	4.01E-06	5.50E-10	1.27E-03	4.01E-06	5.50E-10	1.27E-03	8.24E-08	5.50E-10	1.27E-03
Radium-226	13982-63-3	2.78E-05	1.01E-10	1.22E-03	2.78E-05	1.01E-10	1.22E-03	1.49E-08	1.01E-10	1.22E-03
Radium-228	15262-20-1	0.00E+00	0.00E+00	8.69E-07	0.00E+00	0.00E+00	8.69E-07	0.00E+00	0.00E+00	8.69E-07
Ruthenium-106	13967-48-1	0.00E+00	0.00E+00	5.11E-07	0.00E+00	0.00E+00	5.11E-07	0.00E+00	0.00E+00	5.11E-07
Samarium-151	15715-94-3	1.87E-12	1.16E-14	1.02E-06	1.87E-12	1.16E-14	1.02E-06	1.87E-12	1.16E-14	1.02E-06
Selenium-79	15758-45-9	2.07E-11	9.70E-14	2.86E-06	2.07E-11	9.70E-14	2.86E-06	2.07E-11	9.70E-14	2.86E-06
Strontium-90	10098-97-2	4.70E-10	2.41E-12	1.00E-05	4.70E-10	2.41E-12	1.00E-05	4.70E-10	2.41E-12	1.00E-05
Technetium-99	14133-79-7	1.05E-10	5.18E-13	5.16E-06	1.05E-10	5.18E-13	5.16E-06	1.05E-10	5.18E-13	5.16E-06
Thorium-229	15594-54-4	5.32E-06	1.23E-09	1.25E-03	5.32E-06	1.23E-09	1.25E-03	1.82E-07	1.23E-09	1.25E-03
Thorium-232	7440-29-1	3.97E-06	2.79E-12	1.02E-03	3.97E-06	2.79E-12	1.02E-03	4.16E-10	2.79E-12	1.02E-03
Tin-126	15832-50-5	4.41E-06	6.75E-10	8.82E-06	4.41E-06	6.75E-10	8.82E-06	1.02E-07	6.75E-10	9.34E-06
Tritium	10028-17-8	0.00E+00	1.06E-13	3.07E-07	0.00E+00	1.06E-13	3.07E-07	0.00E+00	1.06E-13	3.07E-07
Uranium-232	14158-29-3	7.94E-06	4.54E-12	1.36E-03	7.94E-06	4.54E-12	1.36E-03	6.74E-10	4.54E-12	1.36E-03
Uranium-233	13968-55-3	3.97E-06	5.22E-12	1.23E-03	3.97E-06	5.22E-12	1.23E-03	7.74E-10	5.22E-12	1.23E-03
Uranium-234	13966-29-5	7.94E-06	2.44E-12	1.22E-03	7.94E-06	2.44E-12	1.22E-03	3.62E-10	2.44E-12	1.22E-03
Uranium-235	15117-96-1	8.20E-06	2.30E-09	1.13E-03	8.20E-06	2.30E-09	1.13E-03	3.40E-07	2.30E-09	1.13E-03
Uranium-236	13982-70-2	7.94E-06	1.60E-12	1.15E-03	7.94E-06	1.60E-12	1.15E-03	2.34E-10	1.60E-12	1.15E-03
Uranium-238	7440-61-1	3.97E-06	1.09E-12	1.07E-03	3.97E-06	1.09E-12	1.07E-03	1.58E-10	1.09E-12	1.07E-03
Yttrium-90	10098-91-6	1.11E-08	6.08E-11	4.78E-05	1.11E-08	6.08E-11	4.78E-05	1.11E-08	6.08E-11	4.78E-05
Zirconium-93	15751-77-6	0.00E+00	0.00E+00	1.02E-06	0.00E+00	0.00E+00	1.02E-06	0.00E+00	0.00E+00	1.02E-06

Table C2-6 Dose Conversion Factors, Decay Energies, Absorption Factors, and Radiation Dose Factors for ROPCs

Radionuclide of Potential Concern	CAS Registry Number	Dose Factors								
		Mourning Dove			Great Basin Pocket Mouse			Meadowlark		
		External Soil[i]	External Air[j]	Internal[k]	External Soil[i]	External Air[j]	Internal[k]	External Soil[i]	External Air[j]	Internal[k]
Plutonium-242	13982-10-0	3.75E-10	1.28E-12	1.25E-03	6.97E-06	1.28E-12	1.25E-03	3.75E-10	1.28E-12	1.25E-03
Protactinium-231	14331-85-2	1.65E-07	5.50E-10	1.27E-03	7.88E-06	5.50E-10	1.27E-03	1.65E-07	5.50E-10	1.27E-03
Radium-226	13982-63-3	2.97E-08	1.01E-10	1.22E-03	4.88E-05	1.01E-10	1.22E-03	2.97E-08	1.01E-10	1.22E-03
Radium-228	15262-20-1	0.00E+00	0.00E+00	8.69E-07	0.00E+00	0.00E+00	8.69E-07	0.00E+00	0.00E+00	8.69E-07
Ruthenium-106	13967-48-1	0.00E+00	0.00E+00	5.11E-07	0.00E+00	0.00E+00	5.11E-07	0.00E+00	0.00E+00	5.11E-07
Samarium-151	15715-94-3	3.74E-12	1.16E-14	1.02E-06	1.12E-12	1.16E-14	1.02E-06	3.74E-12	1.16E-14	1.02E-06
Selenium-79	15758-45-9	4.14E-11	9.70E-14	2.86E-06	1.24E-11	9.70E-14	2.86E-06	4.14E-11	9.70E-14	2.86E-06
Strontium-90	10098-97-2	9.39E-10	2.41E-12	1.00E-05	2.82E-10	2.41E-12	1.00E-05	9.39E-10	2.41E-12	1.00E-05
Technetium-99	14133-79-7	2.09E-10	5.18E-13	5.16E-06	6.28E-11	5.18E-13	5.16E-06	2.09E-10	5.18E-13	5.16E-06
Thorium-229	15594-54-4	3.65E-07	1.23E-09	1.25E-03	1.15E-05	1.23E-09	1.25E-03	3.65E-07	1.23E-09	1.25E-03
Thorium-232	7440-29-1	8.31E-10	2.79E-12	1.02E-03	6.97E-06	2.79E-12	1.02E-03	8.31E-10	2.79E-12	1.02E-03
Tin-126	15832-50-5	2.04E-07	6.75E-10	8.84E-06	8.36E-06	6.75E-10	8.84E-06	2.04E-07	6.75E-10	8.84E-06
Tritium	10028-17-8	0.00E+00	1.06E-13	3.07E-07	0.00E+00	1.06E-13	3.07E-07	0.00E+00	1.06E-13	3.07E-07
Uranium-232	14158-29-3	1.35E-09	4.54E-12	1.36E-03	1.39E-05	4.54E-12	1.36E-03	1.35E-09	4.54E-12	1.36E-03
Uranium-233	13968-55-3	1.55E-09	5.22E-12	1.23E-03	6.97E-06	5.22E-12	1.23E-03	1.55E-09	5.22E-12	1.23E-03
Uranium-234	13966-29-5	7.24E-10	2.44E-12	1.22E-03	1.39E-05	2.44E-12	1.22E-03	7.24E-10	2.44E-12	1.22E-03
Uranium-235	15117-96-1	6.80E-07	2.30E-09	1.13E-03	1.60E-05	2.30E-09	1.13E-03	6.80E-07	2.30E-09	1.13E-03
Uranium-236	13982-70-2	4.68E-10	1.60E-12	1.15E-03	1.39E-05	1.60E-12	1.15E-03	4.68E-10	1.60E-12	1.15E-03
Uranium-238	7440-61-1	3.17E-10	1.09E-12	1.07E-03	6.97E-06	1.09E-12	1.07E-03	3.17E-10	1.09E-12	1.07E-03
Yttrium-90	10098-91-6	2.22E-08	6.08E-11	4.78E-05	6.67E-09	6.08E-11	4.78E-05	2.22E-08	6.08E-11	4.78E-05
Zirconium-93	15751-77-6	0.00E+00	0.00E+00	1.02E-06	0.00E+00	0.00E+00	1.02E-06	0.00E+00	0.00E+00	1.02E-06

Table C2-6 Dose Conversion Factors, Decay Energies, Absorption Factors, and Radiation Dose Factors for ROPCs

Radionuclide of Potential Concern	CAS Registry Number	Dose Factors								
		Coyote			Burrowing Owl			Red-tailed Hawk		
		External Soil[i]	External Air[j]	Internal[k]	External Soil[i]	External Air[j]	Internal[k]	External Soil[i]	External Air[j]	Internal[k]
Plutonium-242	13982-10-0	3.55E-06	1.28E-12	1.25E-03	5.92E-06	1.28E-12	1.25E-03	1.87E-11	1.28E-12	1.25E-03
Protactinium-231	14331-85-2	3.28E-05	5.50E-10	1.27E-03	1.82E-05	5.50E-10	1.27E-03	8.24E-09	5.50E-10	1.27E-03
Radium-226	13982-63-3	2.49E-05	1.01E-10	1.22E-03	4.10E-05	1.01E-10	1.22E-03	1.49E-09	1.01E-10	1.22E-03
Radium-228	15262-20-1	0.00E+00	0.00E+00	8.69E-07	0.00E+00	0.00E+00	8.69E-07	0.00E+00	0.00E+00	8.69E-07
Ruthenium-106	13967-48-1	0.00E+00	0.00E+00	5.11E-07	0.00E+00	0.00E+00	5.11E-07	0.00E+00	0.00E+00	5.11E-07
Samarium-151	15715-94-3	2.62E-12	1.16E-14	1.02E-06	1.87E-12	1.16E-14	1.02E-06	1.87E-13	1.16E-14	1.02E-06
Selenium-79	15758-45-9	2.90E-11	9.70E-14	2.86E-06	2.07E-11	9.70E-14	2.86E-06	2.07E-12	9.70E-14	2.86E-06
Strontium-90	10098-97-2	6.57E-10	2.41E-12	1.00E-05	4.70E-10	2.41E-12	1.00E-05	4.70E-11	2.41E-12	1.00E-05
Technetium-99	14133-79-7	1.47E-10	5.18E-13	5.16E-06	1.05E-10	5.18E-13	5.16E-06	1.05E-11	5.18E-13	5.16E-06
Thorium-229	15594-54-4	2.93E-05	1.23E-09	1.25E-03	2.68E-05	1.23E-09	1.25E-03	1.82E-08	1.23E-09	1.25E-03
Thorium-232	7440-29-1	3.55E-06	2.79E-12	1.02E-03	5.92E-06	2.79E-12	1.02E-03	4.16E-11	2.79E-12	1.02E-03
Tin-126	15832-50-5	2.75E-05	6.75E-10	9.16E-06	1.99E-05	6.75E-10	8.95E-06	1.02E-08	6.75E-10	8.95E-06
Tritium	10028-17-8	0.00E+00	1.06E-13	3.07E-07	0.00E+00	1.06E-13	3.07E-07	0.00E+00	1.06E-13	3.07E-07
Uranium-232	14158-29-3	7.11E-06	4.54E-12	1.36E-03	1.18E-05	4.54E-12	1.36E-03	6.74E-11	4.54E-12	1.36E-03
Uranium-233	13968-55-3	3.55E-06	5.22E-12	1.23E-03	5.92E-06	5.22E-12	1.23E-03	7.74E-11	5.22E-12	1.23E-03
Uranium-234	13966-29-5	7.11E-06	2.44E-12	1.22E-03	1.18E-05	2.44E-12	1.22E-03	3.62E-11	2.44E-12	1.22E-03
Uranium-235	15117-96-1	5.64E-05	2.30E-09	1.13E-03	3.97E-05	2.30E-09	1.13E-03	3.40E-08	2.30E-09	1.13E-03
Uranium-236	13982-70-2	7.11E-06	1.60E-12	1.15E-03	1.18E-05	1.60E-12	1.15E-03	2.34E-11	1.60E-12	1.15E-03
Uranium-238	7440-61-1	3.55E-06	1.09E-12	1.07E-03	5.92E-06	1.09E-12	1.07E-03	1.58E-11	1.09E-12	1.07E-03
Yttrium-90	10098-91-6	1.56E-08	6.08E-11	4.78E-05	1.11E-08	6.08E-11	4.78E-05	1.11E-09	6.08E-11	4.78E-05
Zirconium-93	15751-77-6	0.00E+00	0.00E+00	1.02E-06	0.00E+00	0.00E+00	1.02E-06	0.00E+00	0.00E+00	1.02E-06

Table C2-6 Dose Conversion Factors, Decay Energies, Absorption Factors, and Radiation Dose Factors for ROPCs

Radionuclide of Potential Concern	CAS Registry Number	Dose Factors								
		Benthic Invertebrates			Aquatic Biota, Including Salmonids			Canada Goose		
		External Water[l]	External Sediment[m]	Internal[k]	External Water[l]	External Sediment[m]	Internal[k]	External Water[l]	External Air[j]	Internal[k]
Plutonium-242	13982-10-0	1.89E-12	1.70E-08	1.25E-03	2.76E-12	1.54E-10	1.25E-03	1.54E-12	1.28E-12	1.25E-03
Protactinium-231	14331-85-2	2.43E-10	2.18E-06	1.27E-03	1.81E-09	1.01E-07	1.27E-03	1.12E-09	5.50E-10	1.27E-03
Radium-226	13982-63-3	1.33E-11	1.19E-07	1.22E-03	1.94E-11	1.08E-09	1.22E-03	1.25E-11	1.01E-10	1.22E-03
Radium-228	15262-20-1	0.00E+00	0.00E+00	8.69E-07	0.00E+00	0.00E+00	8.69E-07	0.00E+00	0.00E+00	8.69E-07
Ruthenium-106	13967-48-1	0.00E+00	0.00E+00	5.11E-07	0.00E+00	0.00E+00	5.11E-07	0.00E+00	0.00E+00	5.11E-07
Samarium-151	15715-94-3	0.00E+00	0.00E+00	1.02E-06	0.00E+00	0.00E+00	1.02E-06	0.00E+00	1.16E-14	1.02E-06
Selenium-79	15758-45-9	0.00E+00	0.00E+00	2.86E-06	0.00E+00	0.00E+00	2.86E-06	0.00E+00	9.70E-14	2.86E-06
Strontium-90	10098-97-2	0.00E+00	0.00E+00	1.00E-05	0.00E+00	0.00E+00	1.00E-05	0.00E+00	2.41E-12	1.00E-05
Technetium-99	14133-79-7	0.00E+00	0.00E+00	5.16E-06	0.00E+00	0.00E+00	5.16E-06	0.00E+00	5.18E-13	5.16E-06
Thorium-229	15594-54-4	4.87E-10	4.39E-06	1.25E-03	4.07E-09	2.26E-07	1.25E-03	2.30E-09	1.23E-09	1.25E-03
Thorium-232	7440-29-1	1.89E-12	1.70E-08	1.02E-03	2.76E-12	1.54E-10	1.02E-03	1.54E-12	2.79E-12	1.02E-03
Tin-126	15832-50-5	2.88E-10	2.60E-06	8.82E-06	2.29E-09	1.27E-07	9.16E-06	1.34E-09	6.75E-10	9.04E-06
Tritium	10028-17-8	0.00E+00	0.00E+00	3.07E-07	0.00E+00	0.00E+00	3.07E-07	0.00E+00	1.06E-13	3.07E-07
Uranium-232	14158-29-3	3.79E-12	3.41E-08	1.36E-03	5.53E-12	3.07E-10	1.36E-03	3.07E-12	4.54E-12	1.36E-03
Uranium-233	13968-55-3	1.89E-12	1.70E-08	1.23E-03	2.76E-12	1.54E-10	1.23E-03	1.54E-12	5.22E-12	1.23E-03
Uranium-234	13966-29-5	3.79E-12	3.41E-08	1.22E-03	5.53E-12	3.07E-10	1.22E-03	3.07E-12	2.44E-12	1.22E-03
Uranium-235	15117-96-1	7.92E-10	7.13E-06	1.13E-03	6.51E-09	3.61E-07	1.13E-03	3.75E-09	2.30E-09	1.13E-03
Uranium-236	13982-70-2	3.79E-12	3.41E-08	1.15E-03	5.53E-12	3.07E-10	1.15E-03	3.07E-12	1.60E-12	1.15E-03
Uranium-238	7440-61-1	1.89E-12	1.70E-08	1.07E-03	2.76E-12	1.54E-10	1.07E-03	1.54E-12	1.09E-12	1.07E-03
Yttrium-90	10098-91-6	0.00E+00	0.00E+00	4.78E-05	0.00E+00	0.00E+00	4.78E-05	0.00E+00	6.08E-11	4.78E-05
Zirconium-93	15751-77-6	0.00E+00	0.00E+00	1.02E-06	0.00E+00	0.00E+00	1.02E-06	0.00E+00	0.00E+00	1.02E-06

Table C2-6 Dose Conversion Factors, Decay Energies, Absorption Factors, and Radiation Dose Factors for ROPCs

Radionuclide of Potential Concern	CAS Registry Number	Dose Factors										
		Spotted Sandpiper				Great Blue Heron				Bald Eagle		
		External Water[l]	External Sediment[m]	External Air[j]	Internal[k]	External Water[l]	External Sediment[m]	External Air[j]	Internal[k]	External Water[l]	External Air[j]	Internal[k]
Plutonium-242	13982-10-0	5.38E-12	3.23E-09	1.28E-12	1.25E-03	1.54E-12	6.14E-10	1.28E-12	1.25E-03	1.54E-13	1.28E-12	1.25E-03
Protactinium-231	14331-85-2	1.21E-09	7.24E-07	5.50E-10	1.27E-03	1.12E-09	4.47E-07	5.50E-10	1.27E-03	1.12E-10	5.50E-10	1.27E-03
Radium-226	13982-63-3	3.76E-11	2.26E-08	1.01E-10	1.22E-03	1.25E-11	5.02E-09	1.01E-10	1.22E-03	1.25E-12	1.01E-10	1.22E-03
Radium-228	15262-20-1	0.00E+00	0.00E+00	0.00E+00	8.69E-07	0.00E+00	0.00E+00	0.00E+00	8.69E-07	0.00E+00	0.00E+00	8.69E-07
Ruthenium-106	13967-48-1	0.00E+00	0.00E+00	0.00E+00	5.11E-07	0.00E+00	0.00E+00	0.00E+00	5.11E-07	0.00E+00	0.00E+00	5.11E-07
Samarium-151	15715-94-3	0.00E+00	0.00E+00	1.16E-14	1.02E-06	0.00E+00	0.00E+00	1.16E-14	1.02E-06	0.00E+00	1.16E-14	1.02E-06
Selenium-79	15758-45-9	0.00E+00	0.00E+00	9.70E-14	2.86E-06	0.00E+00	0.00E+00	9.70E-14	2.86E-06	0.00E+00	9.70E-14	2.86E-06
Strontium-90	10098-97-2	0.00E+00	0.00E+00	2.41E-12	1.00E-05	0.00E+00	0.00E+00	2.41E-12	1.00E-05	0.00E+00	2.41E-12	1.00E-05
Technetium-99	14133-79-7	0.00E+00	0.00E+00	5.18E-13	5.16E-06	0.00E+00	0.00E+00	5.18E-13	5.16E-06	0.00E+00	5.18E-13	5.16E-06
Thorium-229	15594-54-4	2.42E-09	1.45E-06	1.23E-09	1.25E-03	2.30E-09	9.18E-07	1.23E-09	1.25E-03	2.30E-10	1.23E-09	1.25E-03
Thorium-232	7440-29-1	5.38E-12	3.23E-09	2.79E-12	1.02E-03	1.54E-12	6.14E-10	2.79E-12	1.02E-03	1.54E-13	2.79E-12	1.02E-03
Tin-126	15832-50-5	1.44E-09	8.61E-07	6.75E-10	8.84E-06	1.34E-09	5.34E-07	6.75E-10	9.04E-06	1.34E-10	6.75E-10	9.04E-06
Tritium	10028-17-8	0.00E+00	0.00E+00	1.06E-13	3.07E-07	0.00E+00	0.00E+00	1.06E-13	3.07E-07	0.00E+00	1.06E-13	3.07E-07
Uranium-232	14158-29-3	1.08E-11	6.45E-09	4.54E-12	1.36E-03	3.07E-12	1.23E-09	4.54E-12	1.36E-03	3.07E-13	4.54E-12	1.36E-03
Uranium-233	13968-55-3	5.38E-12	3.23E-09	5.22E-12	1.23E-03	1.54E-12	6.14E-10	5.22E-12	1.23E-03	1.54E-13	5.22E-12	1.23E-03
Uranium-234	13966-29-5	1.08E-11	6.45E-09	2.44E-12	1.22E-03	3.07E-12	1.23E-09	2.44E-12	1.22E-03	3.07E-13	2.44E-12	1.22E-03
Uranium-235	15117-96-1	3.95E-09	2.37E-06	2.30E-09	1.13E-03	3.75E-09	1.50E-06	2.30E-09	1.13E-03	3.75E-10	2.30E-09	1.13E-03
Uranium-236	13982-70-2	1.08E-11	6.45E-09	1.60E-12	1.15E-03	3.07E-12	1.23E-09	1.60E-12	1.15E-03	3.07E-13	1.60E-12	1.15E-03
Uranium-238	7440-61-1	5.38E-12	3.23E-09	1.09E-12	1.07E-03	1.54E-12	6.14E-10	1.09E-12	1.07E-03	1.54E-13	1.09E-12	1.07E-03
Yttrium-90	10098-91-6	0.00E+00	0.00E+00	6.08E-11	4.78E-05	0.00E+00	0.00E+00	6.08E-11	4.78E-05	0.00E+00	6.08E-11	4.78E-05
Zirconium-93	15751-77-6	0.00E+00	0.00E+00	0.00E+00	1.02E-06	0.00E+00	0.00E+00	0.00E+00	1.02E-06	0.00E+00	0.00E+00	1.02E-06

Table C2-6 Dose Conversion Factors, Decay Energies, Absorption Factors, and Radiation Dose Factors for ROPCs

Radionuclide of Potential Concern	CAS Registry Number	Dose Factors		
		Mink		
		External Water[l]	External Air[j]	Internal[k]
Plutonium-242	13982-10-0	6.14E-13	1.28E-12	1.25E-03
Protactinium-231	14331-85-2	4.62E-10	5.50E-10	1.27E-03
Radium-226	13982-63-3	5.02E-12	1.01E-10	1.22E-03
Radium-228	15262-20-1	0.00E+00	0.00E+00	8.69E-07
Ruthenium-106	13967-48-1	0.00E+00	0.00E+00	5.11E-07
Samarium-151	15715-94-3	0.00E+00	1.16E-14	1.02E-06
Selenium-79	15758-45-9	0.00E+00	9.70E-14	2.86E-06
Strontium-90	10098-97-2	0.00E+00	2.41E-12	1.00E-05
Technetium-99	14133-79-7	0.00E+00	5.18E-13	5.16E-06
Thorium-229	15594-54-4	9.40E-10	1.23E-09	1.25E-03
Thorium-232	7440-29-1	6.14E-13	2.79E-12	1.02E-03
Tin-126	15832-50-5	5.52E-10	6.75E-10	8.95E-06
Tritium	10028-17-8	0.00E+00	1.06E-13	3.07E-07
Uranium-232	14158-29-3	1.23E-12	4.54E-12	1.36E-03
Uranium-233	13968-55-3	6.14E-13	5.22E-12	1.23E-03
Uranium-234	13966-29-5	1.23E-12	2.44E-12	1.22E-03
Uranium-235	15117-96-1	1.53E-09	2.30E-09	1.13E-03
Uranium-236	13982-70-2	1.23E-12	1.60E-12	1.15E-03
Uranium-238	7440-61-1	6.14E-13	1.09E-12	1.07E-03
Yttrium-90	10098-91-6	0.00E+00	6.08E-11	4.78E-05
Zirconium-93	15751-77-6	0.00E+00	0.00E+00	1.02E-06

Table C2-6 Dose Conversion Factors, Decay Energies, Absorption Factors, and Radiation Dose Daughter Radionuclides in Sediment

Notes/Sources

[a] Dose conversion factor (DCF) for external radiation.

[b] DCF for soil contaminated to a depth of 1 cm (Eckerman and Ryman 1993, Table III.4).

[c] DCF for immersion in air (Eckerman and Ryman 1993, Table III.1).

[d] Alpha energy of the radionuclide (MeV) × proportion of disintegrations producing an α-particle (Eckerman and Ryman 1993, Table A.1).

[e] Absorbed fraction of energy $E_\alpha n_\alpha$ (assumed to be 1.0 for alpha radiations).

[f] Beta energy of the radionuclide (MeV) × proportion of disintegrations producing a β-particle (Eckerman and Ryman 1993, Table A.1).

[g] Absorbed fraction of energy $E_\beta n_\beta$ or $E_\gamma n_\gamma$ (Blaylock, Frank, and O'Neal 1993; DOE 1997).

[h] Photon energy emitted during transition from a higher to a lower energy state (MeV) × proportion of disintegrations producing a γ-particle (Eckerman and Ryman 1993, Table A.1).

[i] Factor that, when multiplied by concentration of radionuclide in soil, gives the external dose from soil.

$DF_{soil} = F_{above} \times F_{ruf} \times DCF \times CFb \times ECF + 1.05 \times F_{below} \times E_\gamma n_\gamma \times \Phi_\gamma \times CFa$ (Sample and others 1997);

F_{above} = fraction of time spent above ground (unitless),

F_{ruf} = dose rate reduction factor accounting for ground roughness (unitless),

CFb = conversion factor to change Sv/s per Bq/m^3 to mrad g/pCi-d (5.12×10^{14}),

ECF = elevation correction factor to adjust dose coefficients to value representative of effective height of animal above ground,

1.05 = conversion factor to account for immersion in soil rather than water,

F_{below} = fraction of time spent below ground surface, and

CFa = conversion factor to go from MeV/nt to g-rad/pCi-d (5.12×10^{-5}).

[j] Factor that, when multiplied by concentration of radionuclide in air, gives the external dose from air.

$DF_{air} = 3.20 \times 10^5 \times DCF$ (Eckerman and Ryman 1993).

[k] Factor that, when multiplied by concentration of radionuclide in tissue, gives the internal dose from food and soil ingestion (Equation 8-28).

$DF_{int} = (QF \times E_\alpha n_\alpha \times \Phi_\alpha + E_\beta n_\beta \times \Phi_\beta + E_\gamma n_\gamma \times \Phi_\gamma) \times CFa$ (Sample and others 1997);

QF = quality factor to account for greater biological effectiveness of alpha particles (5 for alpha particles).

[l] Factor that, when multiplied by concentration of radionuclide in water, gives the external dose from immersion in water (Equation 8-55).

$DF_{water,\ imm} = (1-F_s-F_{in}) \times 0.001 \times CFa \times [(1-\Phi_\beta) \times E_\beta n_\beta + (1-\Phi_\gamma) \times E_\gamma n_\gamma]$ (Blaylock, Frank, and O'Neal 1993);

F_s = fraction of time receptor spends at the sediment-water interface (unitless),

Table C2-6 Dose Conversion Factors, Decay Energies, Absorption Factors, and Radiation Dose Daughter Radionuclides in Sediment

Notes/Sources

F_{in} = fraction of time receptor spends buried in sediment (unitless), and

0.001 = factor to convert liters to grams (L/g).

[m] Factor that, when multiplied by concentration of radionuclide in sediment, gives the external dose from sediment (Equation 8-56).

$DF_{sediment} = (0.5 \times F_s + F_{in}) \times CFa \times [(1-\Phi_\beta) \times E_\beta n_\beta + (1-\Phi_\gamma) \times E_\gamma n_\gamma]$ (Blaylock, Frank, and O'Neal 1993).

[n] Chemical Abstracts Service Registry number for niobium metal.

Table C2-7 Dose Conversion Factors, Decay Energies, Absorption Factors, and Radiation Dose Factors for Non-ROPC Daughter Radionuclides in Sediment

Parent ROPC	Daughter Radionuclides[b]	CAS Registry Number	Half-life (years)	Decay Energies and Absorption Factors				
				$E_\alpha n_\alpha$[c]	Φ_α[d]	$E_\beta n_\beta$[e]	Φ_β[f]	$E_\gamma n_\gamma$[g]
Actinium-227	Thorium-227 (98.62 %)	15623-47-9	5.12E-02	5.88E+00	1.00E+00	5.30E-02	1.00E+00	1.10E-01
	Francium-223 (1.38 %)	15756-98-6	4.14E-05	0.00E+00	1.00E+00	4.00E-01	1.00E+00	5.90E-02
	Radium-223	15623-45-7	3.13E-02	5.67E+00	1.00E+00	7.60E-02	1.00E+00	1.34E-01
	Radon-219	14835-02-0	1.25E-07	6.76E+00	1.00E+00	6.00E-03	1.00E+00	5.60E-02
	Polonium-215	15706-52-2	5.64E-11	7.39E+00	1.00E+00	0.00E+00	1.00E+00	0.00E+00
	Lead-211	15816-77-0	6.86E-05	0.00E+00	1.00E+00	4.56E-01	1.00E+00	5.10E-02
	Bismuth-211	15229-37-5	4.07E-06	6.55E+00	1.00E+00	1.00E-02	1.00E+00	4.70E-02
	Thallium-207 (99.72%)	14133-67-6	9.07E-06	0.00E+00	1.00E+00	4.93E-01	1.00E+00	2.00E-03
	Polonium-211 (0.27 %)	No CAS#	1.64E-08	7.44E+00	1.00E+00	0.00E+00	1.00E+00	8.00E-03
	Sum	NA	NA	NA	NA	NA	NA	NA
Americium-243	Neptunium-239	13968-59-7	6.45E-03	0.00E+00	1.00E+00	2.60E-01	1.00E+00	1.73E-01
Antimony-125	Tellurium-125m	14390-73-9	1.59E-01	0.00E+00	1.00E+00	1.09E-01	1.00E+00	3.60E-02
Cesium-137	Barium-137m	7440-39-3	4.85E-06	0.00E+00	1.00E+00	6.50E-02	1.00E+00	5.97E-01
Europium-152	Gadolinium-152	No CAS #	1.08E+14	2.15E+00	1.00E+00	0.00E+00	1.00E+00	0.00E+00
Neptunium-237	Protactinium-233	13981-14-1	7.39E-02	0.00E+00	1.00E+00	1.96E-01	1.00E+00	2.04E-01
Radium-226	Radon-222	14859-67-7	1.05E-02	5.49E+00	1.00E+00	0.00E+00	1.00E+00	0.00E+00
	Polonium-218	15422-74-9	5.80E-06	6.00E+00	1.00E+00	0.00E+00	1.00E+00	0.00E+00
	Lead-214	15067-28-4	5.10E-05	0.00E+00	1.00E+00	2.93E-01	1.00E+00	2.50E-01
	Bismuth-214	14733-03-0	3.78E-05	0.00E+00	1.00E+00	6.59E-01	1.00E+00	1.51E+00
	Polonium-214	15735-68-8	5.21E-12	7.69E+00	1.00E+00	0.00E+00	1.00E+00	0.00E+00
	Sum	NA	NA	NA	NA	NA	NA	NA

Table C2-7 Dose Conversion Factors, Decay Energies, Absorption Factors, and Radiation Dose Factors for Non-ROPC Daughter Radionuclides in Sediment

Parent ROPC	Daughter Radionuclides[b]	Internal Gamma Absorption Factors Φ_γ^f							
		Plants	Benthic Inverte-brates	Aquatic Biota, Including Salmonids	Canada Goose	Spotted Sandpiper	Great Blue Heron	Bald Eagle	Mink
Actinium-227	Thorium-227 (98.62 %)	8.10E-03	8.10E-03	1.09E-01	6.20E-02	1.25E-02	6.20E-02	6.20E-02	4.20E-02
	Francium-223 (1.38 %)	1.05E-02	1.05E-02	1.32E-01	8.00E-02	1.50E-02	8.00E-02	8.00E-02	5.30E-02
	Radium-223	8.00E-03	8.00E-03	1.03E-01	6.00E-02	1.17E-02	6.00E-02	6.00E-02	4.00E-02
	Radon-219	1.08E-02	1.08E-02	1.34E-01	8.20E-02	1.58E-02	8.20E-02	8.20E-02	5.40E-02
	Polonium-215	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00
	Lead-211	1.15E-02	1.15E-02	1.41E-01	8.70E-02	1.64E-02	8.70E-02	8.70E-02	5.70E-02
	Bismuth-211	1.25E-02	1.25E-02	1.46E-01	9.20E-02	1.75E-02	9.20E-02	9.20E-02	6.00E-02
	Thallium-207 (99.72%)	6.30E-01	6.30E-01	9.30E-01	9.30E-01	7.90E-01	9.30E-01	9.30E-01	9.30E-01
	Polonium-211 (0.27 %)	6.30E-01	6.30E-01	9.30E-01	9.30E-02	7.90E-01	9.30E-02	9.30E-02	9.30E-01
	Sum	NA	NA	NA	NA	NA	NA	NA	NA
Americium-243	Neptunium-239	8.40E-03	8.40E-03	9.20E-02	6.00E-02	1.13E-02	6.00E-02	6.00E-02	4.00E-02
Antimony-125	Tellurium-125m	2.70E-02	2.70E-02	2.05E-01	1.50E-01	4.00E-02	1.50E-01	1.50E-01	1.10E-01
Cesium-137	Barium-137m	1.10E-02	1.10E-02	1.03E-01	6.00E-02	1.46E-02	6.00E-02	6.00E-02	4.00E-02
Europium-152	Gadolinium-152	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00
Neptunium-237	Protactinium-233	9.00E-03	9.00E-03	9.20E-02	6.00E-02	1.00E-02	6.00E-02	6.00E-02	4.00E-02
Radium-226	Radon-222	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00
	Polonium-218	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00
	Lead-214	9.40E-03	9.40E-03	1.00E-01	6.00E-02	1.05E-02	6.00E-02	6.00E-02	4.00E-02
	Bismuth-214	8.80E-03	8.80E-03	8.90E-02	5.20E-02	1.25E-02	5.20E-02	5.20E-02	3.30E-02
	Polonium-214	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00
	Sum	NA	NA	NA	NA	NA	NA	NA	NA

Table C2-7 Dose Conversion Factors, Decay Energies, Absorption Factors, and Radiation Dose Factors for Non-ROPC Daughter Radionuclides in Sediment

Parent ROPC	Daughter Radionuclides[b]	Dose Factors										
		Benthic Invertebrates		Aquatic Biota, Including Salmonids		Canada Goose	Spotted Sandpiper		Great Blue Heron		Bald Eagle	Mink
		External Sediment[h]	Internal[i]	External Sediment[h]	Internal[i]	Internal[i]	External Sediment[h]	Internal[i]	External Sediment[h]	Internal[i]	Internal[i]	Internal[i]
Actinium-227	Thorium-227 (98.62 %)	5.03E-06	1.51E-03	2.51E-07	1.51E-03	1.51E-03	1.67E-06	1.51E-03	1.06E-06	1.51E-03	1.51E-03	1.51E-03
	Francium-223 (1.38 %)	2.69E-06	2.05E-05	1.31E-07	2.08E-05	2.07E-05	8.93E-07	2.05E-05	5.56E-07	2.07E-05	2.07E-05	2.06E-05
	Radium-223	6.13E-06	1.45E-03	3.08E-07	1.45E-03	1.45E-03	2.03E-06	1.45E-03	1.29E-06	1.45E-03	1.45E-03	1.45E-03
	Radon-219	2.55E-06	1.73E-03	1.24E-07	1.73E-03	1.73E-03	8.47E-07	1.73E-03	5.26E-07	1.73E-03	1.73E-03	1.73E-03
	Polonium-215	0.00E+00	1.89E-03	0.00E+00	1.89E-03	1.89E-03	0.00E+00	1.89E-03	0.00E+00	1.89E-03	1.89E-03	1.89E-03
	Lead-211	2.32E-06	2.33E-05	1.12E-07	2.37E-05	2.35E-05	7.71E-07	2.33E-05	4.77E-07	2.35E-05	2.35E-05	2.35E-05
	Bismuth-211	2.14E-06	1.67E-03	1.03E-07	1.67E-03	1.67E-03	7.09E-07	1.67E-03	4.37E-07	1.67E-03	1.67E-03	1.67E-03
	Thallium-207 (99.72%)	3.41E-08	2.53E-05	3.58E-10	2.53E-05	2.53E-05	6.45E-09	2.53E-05	1.43E-09	2.53E-05	2.53E-05	2.53E-05
	Polonium-211 (0.27 %)	1.36E-07	1.90E-03	1.43E-09	1.90E-03	1.90E-03	2.58E-08	1.90E-03	7.43E-08	1.90E-03	1.90E-03	1.90E-03
	Sum	1.82E-05	8.28E-03	8.97E-07	8.28E-03	8.28E-03	6.02E-06	8.28E-03	3.78E-06	8.28E-03	8.28E-03	8.28E-03
Americium-243	Neptunium-239	7.90E-06	1.34E-05	4.02E-07	1.41E-05	1.38E-05	2.63E-06	1.34E-05	1.67E-06	1.38E-05	1.38E-05	1.36E-05
Antimony-125	Tellurium-125m	1.61E-06	5.62E-06	7.33E-08	5.95E-06	5.85E-06	5.31E-07	5.64E-06	3.13E-07	5.85E-06	5.85E-06	5.77E-06
Cesium-137	Barium-137m	2.72E-05	3.66E-06	1.37E-06	6.46E-06	5.15E-06	9.04E-06	3.77E-06	5.75E-06	5.15E-06	5.15E-06	4.54E-06
Europium-152	Gadolinium-152	0.00E+00	5.49E-04	0.00E+00	5.49E-04	5.49E-04	0.00E+00	5.49E-04	0.00E+00	5.49E-04	5.49E-04	5.49E-04
Neptunium-237	Protactinium-233	9.32E-06	1.01E-05	4.74E-07	1.10E-05	1.06E-05	3.10E-06	1.01E-05	1.96E-06	1.06E-05	1.06E-05	1.04E-05
Radium-226	Radon-222	0.00E+00	1.40E-03	0.00E+00	1.40E-03	1.40E-03	0.00E+00	1.40E-03	0.00E+00	1.40E-03	1.40E-03	1.40E-03
	Polonium-218	0.00E+00	1.53E-03	0.00E+00	1.53E-03	1.53E-03	0.00E+00	1.53E-03	0.00E+00	1.53E-03	1.53E-03	1.53E-03
	Lead-214	1.14E-05	1.51E-05	5.76E-07	1.62E-05	1.57E-05	3.80E-06	1.51E-05	2.41E-06	1.57E-05	1.57E-05	1.55E-05
	Bismuth-214	6.89E-05	3.44E-05	3.52E-06	4.05E-05	3.77E-05	2.29E-05	3.46E-05	1.46E-05	3.77E-05	3.77E-05	3.62E-05
	Polonium-214	0.00E+00	1.96E-03	0.00E+00	1.96E-03	1.96E-03	0.00E+00	1.96E-03	0.00E+00	1.96E-03	1.96E-03	1.96E-03
	Sum	8.03E-05	4.95E-03	4.09E-06	4.96E-03	4.95E-03	2.67E-05	4.95E-03	1.70E-05	4.95E-03	4.95E-03	4.95E-03

Table C2-7 Dose Conversion Factors, Decay Energies, Absorption Factors, and Radiation Dose Factors for Non-ROPC Daughter Radionuclides in Sediment

Parent ROPC	Daughter Radionuclides[b]	CAS Registry Number	Half-life (years)	Decay Energies and Absorption Factors				
				$E_\alpha n_\alpha$[c]	Φ_α[d]	$E_\beta n_\beta$[e]	Φ_β[f]	$E_\gamma n_\gamma$[g]
Radium-228	Actinium-228	14331-83-0	6.99E-04	0.00E+00	1.00E+00	4.75E-01	1.00E+00	9.71E-01
Ruthenium-106	Rhodium-106	14234-34-5	9.47E-07	0.00E+00	1.00E+00	1.41E+00	1.00E+00	2.05E-01
Strontium-90	Yttrium-90	10098-91-6	7.30E-03	0.00E+00	1.00E+00	9.35E-01	1.00E+00	0.00E+00
	Niobium-90	No CAS #	1.67E-03	0.00E+00	1.00E+00	4.03E-01	1.00E+00	4.22E+00
Thorium-229	Radium-225	13981-53-8	4.05E-02	0.00E+00	1.00E+00	1.07E-01	1.00E+00	1.40E-02
	Actinium-225	14265-85-1	2.74E-02	5.79E+00	1.00E+00	2.20E-02	1.00E+00	1.80E-02
	Francium-221	15756-41-9	9.13E-06	6.30E+00	1.00E+00	1.00E-02	1.00E+00	3.10E-02
	Astatine-217	17239-90-6	1.02E-09	7.07E+00	1.00E+00	0.00E+00	1.00E+00	0.00E+00
	Bismuth-213	15776-20-2	8.68E-05	1.26E-01	1.00E+00	4.42E-01	1.00E+00	1.33E-01
	Polonium-213 (97.84 %)	15756-57-7	1.33E-13	8.38E+00	1.00E+00	0.00E+00	1.00E+00	0.00E+00
	Thallium-209 (2.16 %)	15690-73-0	4.18E-06	0.00E+00	1.00E+00	6.88E-01	1.00E+00	2.03E+00
	Lead-209	14119-30-3	3.71E-04	0.00E+00	1.00E+00	1.98E-01	1.00E+00	0.00E+00
	Sum	NA	NA	NA	NA	NA	NA	NA
Tin-126	Antimony-126	15756-32-8	3.39E-02	0.00E+00	1.00E+00	2.83E-01	1.00E+00	2.83E+00
Uranium-235	Thorium-231	14932-40-2	2.91E-03	0.00E+00	1.00E+00	1.65E-01	1.00E+00	2.60E-02
Uranium-238	Thorium-234	15605-10-8	6.60E-02	0.00E+00	1.00E+00	6.00E-02	1.00E+00	9.00E-03
	Protactinium-234m	1510-28-4m	2.22E-06	0.00E+00	1.00E+00	8.22E-01	1.00E+00	1.20E-02
	Protactinium-234	15100-28-4	7.64E-04	0.00E+00	1.00E+00	4.94E-01	1.00E+00	1.92E+00
Yttrium-90	Niobium-90	No CAS #	1.67E-03	0.00E+00	1.00E+00	4.03E-01	1.00E+00	4.22E+00
Zirconium-93	Niobium-93m	7440-03-1	1.36E+01	0.00E+00	1.00E+00	2.80E-02	1.00E+00	2.00E-03

Table C2-7 Dose Conversion Factors, Decay Energies, Absorption Factors, and Radiation Dose Factors for Non-ROPC Daughter Radionuclides in Sediment

Parent ROPC	Daughter Radionuclides[b]	Internal Gamma Absorption Factors Φ_γ^f							
		Plants	Benthic Inverte-brates	Aquatic Biota, Including Salmonids	Canada Goose	Spotted Sandpiper	Great Blue Heron	Bald Eagle	Mink
Radium-228	Actinium-228	1.00E-02	1.00E-02	9.20E-02	6.00E-02	1.30E-02	6.00E-02	6.00E-02	4.00E-02
Ruthenium-106	Rhodium-106	9.00E-03	9.00E-03	9.20E-02	6.00E-02	1.00E-02	6.00E-02	6.00E-02	4.00E-02
Strontium-90	Yttrium-90	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00
	Niobium-90	7.60E-03	7.60E-03	7.25E-02	4.00E-02	9.00E-03	4.00E-02	4.00E-02	3.00E-02
Thorium-229	Radium-225	3.90E-01	3.90E-01	7.50E-01	7.00E-01	4.48E-01	7.00E-01	7.00E-01	7.00E-01
	Actinium-225	2.37E-01	2.37E-01	5.20E-01	4.45E-01	3.00E-01	4.45E-01	4.45E-01	4.00E-01
	Francium-221	4.00E-02	4.00E-02	2.26E-01	1.65E-01	5.00E-02	1.65E-01	1.65E-01	1.30E-01
	Astatine-217	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00
	Bismuth-213	8.00E-03	8.00E-03	9.50E-02	6.00E-02	1.10E-02	6.00E-02	6.00E-02	4.00E-02
	Polonium-213 (97.84 %)	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00
	Thallium-209 (2.16 %)	8.40E-03	8.40E-03	8.30E-02	4.80E-02	1.10E-02	4.80E-02	4.80E-02	3.00E-02
	Lead-209	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00
	Sum	NA	NA	NA	NA	NA	NA	NA	NA
Tin-126	Antimony-126	8.30E-03	8.30E-03	6.60E-02	4.00E-02	1.05E-02	4.00E-02	4.00E-02	3.00E-02
Uranium-235	Thorium-231	9.00E-02	9.00E-02	3.34E-01	2.10E-01	1.26E-01	2.10E-01	2.10E-01	1.60E-01
Uranium-238	Thorium-234	6.30E-01	6.30E-01	9.30E-01	9.30E-01	7.90E-01	9.30E-01	9.30E-01	9.30E-01
	Protactinium-234m	5.50E-01	5.50E-01	9.30E-01	9.30E-01	6.30E-01	9.30E-01	9.30E-01	9.30E-01
	Protactinium-234	8.40E-03	8.40E-03	8.00E-02	4.00E-02	1.15E-02	4.00E-02	4.00E-02	3.00E-02
Yttrium-90	Niobium-90	7.60E-03	7.60E-03	7.25E-02	4.00E-02	9.00E-03	4.00E-02	4.00E-02	3.00E-02
Zirconium-93	Niobium-93m	6.30E-01	6.30E-01	9.30E-01	9.30E-01	7.90E-01	9.30E-01	9.30E-01	9.30E-01

Table C2-7 Dose Conversion Factors, Decay Energies, Absorption Factors, and Radiation Dose Factors for Non-ROPC Daughter Radionuclides in Sediment

		Dose Factors										
		Benthic Invertebrates		Aquatic Biota, Including Salmonids		Canada Goose	Spotted Sandpiper		Great Blue Heron		Bald Eagle	Mink
Parent ROPC	Daughter Radionuclides[b]	External Sediment[h]	Internal[i]	External Sediment[h]	Internal[i]	Internal[i]	External Sediment[h]	Internal[i]	External Sediment[h]	Internal[i]	Internal[i]	Internal[i]
Radium-228	Actinium-228	4.43E-05	2.48E-05	2.26E-06	2.88E-05	2.72E-05	1.47E-05	2.49E-05	9.35E-06	2.72E-05	2.72E-05	2.63E-05
Ruthenium-106	Rhodium-106	9.36E-06	7.23E-05	4.77E-07	7.32E-05	7.28E-05	3.12E-06	7.23E-05	1.97E-06	7.28E-05	7.28E-05	7.26E-05
Strontium-90	Yttrium-90	0.00E+00	4.78E-05	0.00E+00	4.78E-05	4.78E-05	0.00E+00	4.78E-05	0.00E+00	4.78E-05	4.78E-05	4.78E-05
	Niobium-90	1.93E-04	2.22E-05	1.00E-05	3.62E-05	2.92E-05	6.43E-05	2.25E-05	4.15E-05	2.92E-05	2.92E-05	2.71E-05
Thorium-229	Radium-225	3.94E-07	5.75E-06	8.96E-09	6.00E-06	5.97E-06	1.19E-07	5.79E-06	4.30E-08	5.97E-06	5.97E-06	5.97E-06
	Actinium-225	6.33E-07	1.48E-03	2.21E-08	1.48E-03	1.48E-03	1.94E-07	1.48E-03	1.02E-07	1.48E-03	1.48E-03	1.48E-03
	Francium-221	1.37E-06	1.61E-03	6.14E-08	1.61E-03	1.61E-03	4.52E-07	1.61E-03	2.65E-07	1.61E-03	1.61E-03	1.61E-03
	Astatine-217	0.00E+00	1.81E-03	0.00E+00	1.81E-03	1.81E-03	0.00E+00	1.81E-03	0.00E+00	1.81E-03	1.81E-03	1.81E-03
	Bismuth-213	6.08E-06	5.48E-05	3.08E-07	5.54E-05	5.52E-05	2.02E-06	5.49E-05	1.28E-06	5.52E-05	5.52E-05	5.51E-05
	Polonium-213 (97.84 %)	0.00E+00	2.14E-03	0.00E+00	2.14E-03	2.14E-03	0.00E+00	2.14E-03	0.00E+00	2.14E-03	2.14E-03	2.14E-03
	Thallium-209 (2.16 %)	9.28E-05	3.60E-05	4.77E-06	4.38E-05	4.01E-05	3.09E-05	3.63E-05	1.98E-05	4.01E-05	4.01E-05	3.83E-05
	Lead-209	0.00E+00	1.01E-05	0.00E+00	1.01E-05	1.01E-05	0.00E+00	1.01E-05	0.00E+00	1.01E-05	1.01E-05	1.01E-05
	Sum	1.05E-05	7.06E-03	5.04E-07	7.06E-03	7.06E-03	3.45E-06	7.06E-03	2.12E-06	7.06E-03	7.06E-03	7.06E-03
Tin-126	Antimony-126	1.30E-04	1.57E-05	6.78E-06	2.40E-05	2.03E-05	4.31E-05	1.60E-05	2.79E-05	2.03E-05	2.03E-05	1.88E-05
Uranium-235	Thorium-231	1.09E-06	8.55E-06	4.43E-08	8.88E-06	8.71E-06	3.49E-07	8.60E-06	2.10E-07	8.71E-06	8.71E-06	8.64E-06
Uranium-238	Thorium-234	1.53E-07	3.36E-06	1.61E-09	3.49E-06	3.49E-06	2.90E-08	3.43E-06	6.45E-09	3.49E-06	3.49E-06	3.49E-06
	Protactinium-234m	2.49E-07	4.23E-05	2.15E-09	4.26E-05	4.26E-05	6.82E-08	4.24E-05	8.60E-09	4.26E-05	4.26E-05	4.26E-05
	Protactinium-234	8.77E-05	2.61E-05	4.52E-06	3.31E-05	2.92E-05	2.91E-05	2.64E-05	1.89E-05	2.92E-05	2.92E-05	2.82E-05
Yttrium-90	Niobium-90	1.93E-04	2.22E-05	1.00E-05	3.62E-05	2.92E-05	6.43E-05	2.25E-05	4.15E-05	2.92E-05	2.92E-05	2.71E-05
Zirconium-93	Niobium-93m	3.41E-08	1.50E-06	3.58E-10	1.53E-06	1.53E-06	6.45E-09	1.51E-06	1.43E-09	1.53E-06	1.53E-06	1.53E-06

Table C2-7 Dose Conversion Factors, Decay Energies, Absorption Factors, and Radiation Dose Factors for Non-ROPC Daughter Radionuclides in Sediment[a]

Notes/Source

NA = Not applicable.

[a] Exposure to daughter radionuclides was evaluated for Columbia River sediment only.

[b] Daughter radionuclide designations are taken from Table 4-3.

[c] Alpha energy of the radionuclide (MeV) × proportion of disintegrations producing an α-particle (Eckerman and Ryman 1993, Table A.1).

[d] Absorbed fraction of energy E_α (assumed to be 1.0 for alpha radiations).

[e] Beta energy of the radionuclide (MeV) × proportion of disintegrations producing a β-particle (Eckerman and Ryman 1993, Table A.1).

[f] Absorbed fraction of energy E_β or E_γ (Blaylock, Frank, and O'Neal 1993; DOE 1997).

[g] Photon energy emitted during transition from a higher to a lower energy state (MeV) × proportion of disintegrations producing a γ-particle (Table A.1, Eckerman and Ryman 1993).

[h] Factor that, when multiplied by concentration of radionuclide in sediment, gives the external dose from sediment (Equation 8-56).

$DF_{sediment} = (0.5 \times Fs + Fin) \times CFa \times [(1 - \Phi_\beta) \times E_\beta n_\beta + (1 - \Phi_\gamma) \times E_\gamma n_\gamma]$ (Blaylock, Frank, and O'Neal 1993).

F_s = fraction of time receptor spends at the sediment-water interface (unitless),

F_{in} = fraction of time receptor spends buried in sediment (unitless), and

CFa = conversion factor to go from MeV/nt to g-rad/pCi-d (5.12×10^{-5}).

[i] Factor that, when multiplied by concentration of radionuclide in tissue, gives the internal dose from food and soil ingestion (Equation 8-28).

$DF_{int} = (QF \times E_\alpha n_\alpha \times \Phi_\alpha + E_\beta n_\beta \times \Phi_\beta + E_\gamma n_\gamma \times \Phi_\gamma) \times CFa$ (Sample and others 1997);

QF = quality factor to account for greater biological effectiveness of alpha particles (5 for alpha particles).

Appendix C-3

Toxicity Reference Values for Plants, Terrestrial Invertebrates, Mammals, Birds, Surface Water Organisms and Sediment-Dwelling Biota

Appendix C-3
Toxicity Reference Values for Plants, Terrestrial Invertebrates, Mammals, Birds, Surface Water Organisms and Sediment-Dwelling Biota

Contents

Acronyms and Terms used in Appendix C-3 ..... **C3-iii**

References for Appendix C-3 ..... **C3-v**

- **Project Documents** **C3-v**
- **Codes and Standards** **C3-v**
- **Other Documents** **C3-v**

Hierarchy of References for Toxicity Data **C3-vii**

Tables

Table C3-1 **Derivation of Soil Toxicity Reference Values (TRVs) for Exposure of Plants to COPCs and ROPCs** **C3-1**

Table C3-2 **Derivation of Soil Toxicity Reference Values (TRVs) for Exposure of Terrestrial Invertebrates to COPCs and ROPCs** **C3-13**

Table C3-3 **Derivation of Toxicity Reference Values (TRVs) for Exposure of Mammal Species to COPCs and ROPCs** **C3-31**

Table C3-4 **Derivation of Toxicity Reference Values (TRVs) for Exposure of Bird Species to COPCs and ROPCs** **C3-46**

Table C3-5 **Derivation of Surface Water Toxicity Reference Values (TRVs) for Exposure of Aquatic Biota to COPCs and ROPCs** **C3-58**

Table C3-6 **Derivation of Surface Water Toxicity Reference Values (TRVs) from Data for Sensitive Species for Exposure of Chinook Salmon and Other Salmonids to COPCs and ROPCs** **C3-72**

Table C3-7 **Derivation of Sediment Toxicity Reference Values (TRVs) for Exposure of Sediment-Dwelling Invertebrates to COPCs and ROPCs** **C3-87**

Table C3-8 **Toxicity Reference Values (TRVs) for COPCs and ROPCs** **C3-101**

Acronyms and Terms used in Appendix C-3

AET	Washington State Department of Ecology apparent effects threshold (Ecology 1994; Ecology 1997)
CAS	Chemical Abstracts Service
COPC	chemical of potential concern
DCF	duration conversion factor; 1 if chronic, 0.1 if subchronic (Sample and others 1996) or inferred from information presented in EPA (1999), Table E-5
DEHP	Bis (2-ethylhexyl) phthalate
EC	concentration that caused the reported effect
EC20	concentration at which an effect was observed in 20 % of tested individuals
EC50	concentration at which an effect was observed in 50 % of tested individuals
ECF	endpoint conversion factor; 1 if NOAEL, 0.1 if LOAEL (Sample and others 1996) or inferred from information presented in EPA (1999), Table E-5
ED	dose that caused the reported effect
EqP	equilibrium partitioning, assumes: 1 toxicity of sediment is due to COPC dissolved in porewater 2 toxicity in porewater is the same as toxicity in surface water 3 concentration of COPC in porewater is equal to concentration in sediment divided by K_{oc} (Jones and others 1997) The sediment TRV is calculated by multiplying the freshwater TRV by K_{oc} and TOC.
ER-L	National Oceanic and Atmospheric Administration effects range-low (Long and others 1995; Ingersoll and others 1996)
K_{oc}	soil carbon partition coefficient
LC50	concentration lethal to 50 % of tested individuals
LC100	concentration lethal to 100 % of tested individuals
LCV	lowest chronic value
LEL	Ontario Ministry of the Interior lowest effect level (Persaud and others 1993)
LOEC	lowest concentration at which an effect was observed
LOEL	lowest exposure level at which an effect was observed
LOAEL	lowest observed adverse effects level
NAWQC	National Ambient Water Quality Criteria
NOAEL	no observed adverse effects level
NOEC	highest concentration at which an effect was not observed

PCDD	Polychlorinated dibenzo-p-dioxin
ROPC	radionuclide of potential concern
Tier II SCV	secondary chronic value calculated according to Great Lakes Initiative methods
TOC	total organic carbon
TRV	toxicity reference value

References for Appendix C-3

Project Documents

None

Codes and Standards

None

Other Documents

AQUIRE (Aquatic Information Retrieval). 2002. Chemical Information Systems, Inc., Baltimore, Maryland. (URL http://www.epa.gov/med/databases/databases.html#aquire).

Clayton GD and Clayton FE. 1981. *Patty's Industrial Hygiene and Toxicology, Vol. 2A: Toxicology*, 3rd Revised Edition. John Wiley & Sons, New York, New York, USA.

Ecology. 1994. *Creation of Freshwater Sediment Quality Database and Preliminary Analysis of Freshwater Apparent Effects Thresholds*, June 1994. Washington State Department of Ecology, Olympia, Washington, USA.

Ecology. 1997. *1997 Model Toxics Control Act Annual Report*, Publication 97-606. Washington State Department of Ecology, Olympia, Washington, USA.

Ecology. 2001. Cleanup Levels and Risk Calculations under the Model Toxics Control Act (MTCA) Cleanup Regulation (CLARC) Version 3.1, pp. 94–145, February 2001. Washington State Department of Ecology, Olympia, Washington, USA.

Efroymson RA, Will ME, Suter GW II, and Wooten AC. 1997a. *Toxicological Benchmarks for Screening Contaminants of Potential Concern for Effects on Terrestrial Plants: 1997 Revision*. ES/ER/TM-85/R3. Lockheed Martin Energy Systems, Inc., Oak Ridge National Laboratory, Oak Ridge, Tennessee, USA.

Efroymson RA, Will ME, and Suter GW II. 1997b. *Toxicological Benchmarks for Contaminants of Potential Concern for Effects on Soil and Litter Invertebrates and Heterotrophic Processes. 1997 Revision*. ES/ER/TM-126/R2. Oak Ridge National Laboratory, Oak Ridge, Tennessee, USA.

EPA. 1987. Quality criteria for water 1986 and update No. 1 and update No. 2 (May 1, 1987), EPA-440/5-86-001. US Environmental Protection Agency, Washington, DC, USA.

EPA. 1995. *Great Lakes Water Quality Initiative Technical Support Document for Wildlife Criteria*, EPA-820-B-95-009. Office of Water, US Environmental Protection Agency, Washington, DC, USA.

EPA. 1999. *Screening Level Ecological Risk Assessment Protocol for Hazardous Waste Combustion Facilities. Volume 3*. EPA/530/D-99/1001C. US Environmental Protection Agency, Washington, DC, USA.

EPA. 2002. *ECOTOXicology Database System*. US Environmental Protection Agency. Available at http://www.epa.gov/ecotox.

Ingersoll CG, Haverland PS, Brunson EL, Canfield TJ, Dwyer FJ, and others. 1996. "Calculation and Evaluation of Sediment Effect Concentrations," *J. Great Lakes Res*., Volume 22, p 602–623.

IAEA. 1992. "Effects of Ionizing Radiation on Plants and Animals at Levels Implied by Current Radiation Protection Standards," *IAEA Technical Report Series 332*. International Commission on Radiological Protection, Vienna, Austria.

IRIS (Integrated Risk Information System). 2002. Online database. http://www.epa.gov/iris/. Office of Environmental Criteria and Assessment, Cincinnati, Ohio.

Jones DS, Suter II GW, and Hull RN. 1997. *Toxicological Benchmarks for Screening Contaminants of Potential Concern for Effects on Sediment-Associated Biota: 1997 Revision*, ES/ER/TM-95/R4. Lockheed Martin Energy Systems, Inc., Oak Ridge National Laboratory, Oak Ridge, Tennessee, USA.

Long ER, MacDonald DD, Smith SL, and Calder FD. 1995. "Incidence of Adverse Biological Effects within Ranges of Chemical Concentrations in Marine and Estuarine Sediments", *Environmental Management*, Volume 19, Issue 1, 81–97.

National Council on Radiation Protection (NCRP). 1991, *Effects of Ionizing Radiation on Aquatic Organisms, NCRP Report No. 109*. National Council on Radiation Protection and Measurements, Bethesda, Maryland, USA.

Persaud D, Jaagumagi R, and Hayton A. 1993. *Guidelines for the Protection and Management of Aquatic Sediment Quality in Ontario*. Ontario Ministry of the Environment and Energy, Ontario, Canada.

Sample BE, Opresko DM, and Suter II GW. 1996. *Toxicological Benchmarks for Wildlife: 1996 Revision*, ES/ER/TM-86/R3. Lockheed Martin Energy Systems, Inc., Oak Ridge National Laboratory, Oak Ridge, Tennessee, USA.

Suter II GW and Tsao CL. 1996. *Toxicological Benchmarks for Screening Potential Contaminants of Concern for Effects on Aquatic Biota: 1996 Revision*, ES/ER/TM-96/R2. Lockheed Martin Energy Systems, Inc., Oak Ridge National Laboratory, Oak Ridge, Tennessee, USA.

Hierarchy of References for Toxicity Data

Table C3-1, Terrestrial plants (section 8.3.1.1) - the hierarchy of choices is: 1) EPA (1999), 2) Model Toxics Control Act (MTCA) (Ecology 2001), 3) Efroymson and others (1997a), and 4) the Phytotox database.

Table C3-2, Terrestrial invertebrates (section 8.3.1.1) - the hierarchy of choices is: 1) EPA (1999), 2) MTCA (Ecology 2001), 3) Efroymson and others (1997b), and 4) other published literature.

Table C3-3, Ingestion TRVs for terrestrial mammals (sections 8.3.1.2 and 8.3.2.2) - the hierarchy of choices is: 1) EPA (1999), 2) Sample and others (1996), and 3) ECOTOXicology database system (EPA 2002).

Table C3-4, Ingestion TRVs for terrestrial birds (section 8.3.1.2 and 8.3.2.2) - the hiearchy of choices is: 1) EPA (1999), 2) Sample and others (1996), and 3) ECOTOXicology database system (EPA 2002).

Table C3-5, Aquatic biota (section 8.3.2.1) - the hierarchy of choices is: 1) EPA (1999), 2) MTCA (Ecology 2001), 3) National Ambient Water Quality Criteria, (NAWQC) (tabulated by Suter and Tsao 1996), 4) final chronic values (tabulated by Suter and Tsao 1996), 5) Tier II secondary chronic values (SCV) (tabulated by Suter and Tsao 1996), and 6) other published data. Methods to calculate NAWQC and Tier II SCV values are presented in Suter and Tsao (1996).

Table C3-6, Chinook salmon and other salmonids (section 8.3.2.1) - the hierarchy of choices is: 1) sensitive species EC20 from Suter and Tsao (1996), 2) other published data in which salmonid TRVs are lower than general aquatic TRVs, 3) EPA (1999), 4) NAWQC, 5) Tier II chronic values, and 6) other published data. Methods to calculate NAWQC and Tier II SCV values are presented in Suter and Tsao (1996).

Table C3-7, Benthic invertebrates (section 8.3.2.1) - the hierarchy of choices is: 1) EPA (1999), 2) no effect levels and lowest effect levels from Persaud and others (1993), 3) apparent effects thresholds (Ecology 1994), and 4) values published by Ingersoll and others (1996). For values not found in those sources, an equilibrium partitioning approach was used as described by Jones, Suter, and Hull (1997).

Values for hexavalent chromium, which is more toxic than trivalent chromium, were used for all receptors.

Data for Aroclor-1254 was used as representative of polychlorinated biphenyl mixtures.

Table C3-1 Derivation of Soil Toxicity Reference Values (TRVs) for Exposure of Plants to COPCs and ROPCs

Constituent of Potential Concern	CAS Registry Number	Test Duration	Endpoint	Test species	Endpoint concen-tration (EC)	Duration conversion factor (DCF)	Endpoint conversion factor (ECF)	Effect	TRV (EC × DCF × ECF)	Source
Organic Compounds					(µg/kg)				(µg/kg)	
Aromatic Halogenated Hydrocarbons										
2,3,4,6-Tetrachlorophenol	58-90-2	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
4-Chloro-3-methylphenol	59-50-7	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Aromatic Nonhalogenated Hydrocarbons										
2-Nitrotoluene	88-72-2	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
4-Nitrobiphenyl	92-93-3	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Benzaldehyde	100-52-7	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Benzene	71-43-2	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Benzyl alcohol	100-51-6	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Ethyl benzene	100-41-4	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
m-Xylene	108-38-3	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
o-Xylene	95-47-6	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
p-Xylene	106-42-3	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Styrene	100-42-5	Chronic (14 days)	EC50	Lettuce	3.20E+05	No data	No data	Reduced growth from seed	3.00E+05	Hulzebos and others (1993) in Efroymson and others (1997a)
Toluene	108-88-3	No data	LOAEL	Soybean	2.00E+05	No data	No data	Reduced growth from seed	2.00E+05	Overcash and others (1982) in Efroymson and others (1997a)
Non-aromatic Nonhalogenated Hydrocarbons										
1,2-Epoxybutane	106-88-7	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
1,3-Butadiene	106-99-0	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
1,4-Dioxane	123-91-1	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
1-Methylpropyl alcohol	78-92-2	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
1-Nitropropane	108-03-2	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
2,2,4-Trimethylpentane	540-84-1	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
2-Butanone	78-93-3	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
2-Butenaldehyde (2-Butenal)	4170-30-3	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
2-Ethoxyethanol	110-80-5	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
2-Heptanone	110-43-0	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
2-Hexanone	591-78-6	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
2-Methoxyethanol	109-86-4	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
2-Methyl-2-propanol	75-65-0	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
2-Methyl-2-propenenitrile	126-98-7	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
2-Methylaziridine	75-55-8	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
2-Methylpropyl alcohol	78-83-1	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
2-Pentanone	107-87-9	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
2-Propanone (Acetone)	67-64-1	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
2-Propene-1-ol	107-18-6	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
2-Propyl alcohol	67-63-0	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
3-Heptanone	106-35-4	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
3-Methyl-1-butanol	123-51-3	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
3-Methyl-2-butanone	563-80-4	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
3-Pentanone	96-22-0	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
4-Heptanone	123-19-3	No data	No data	No data	No data	No data	No data	No data	No TRV	No data

Table C3-1 Derivation of Soil Toxicity Reference Values (TRVs) for Exposure of Plants to COPCs and ROPCs

Constituent of Potential Concern	CAS Registry Number	Test Duration	Endpoint	Test species	Endpoint concen-tration (EC)	Duration conversion factor (DCF)	Endpoint conversion factor (ECF)	Effect	TRV (EC × DCF × ECF)	Source
4-Methyl-2-pentanone	108-10-1	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
4-Methyl-3-penten-2-one	141-79-7	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
5-Methyl-2-hexanone	110-12-3	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Acetaldehyde	75-07-0	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Acetamide	60-35-5	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Acetic acid	64-19-7	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Acetic acid ethyl ester	141-78-6	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Acetic acid n-butyl ester	123-86-4	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Acetonitrile	75-05-8	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Acrolein	107-02-8	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Acrylonitrile	107-13-1	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Bis(isopropyl)ether	108-20-3	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Butane	106-97-8	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Carbon disulfide	75-15-0	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Cyanogen	460-19-5	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Cyclohexane	110-82-7	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Cyclohexanone	108-94-1	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Cyclohexene	110-83-8	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Cyclopentane	287-92-3	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Ethyl alcohol	64-17-5	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Ethyl ether	60-29-7	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Ethyl methacrylate	97-63-2	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Formaldehyde	50-00-0	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Formamide	75-12-7	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Formic acid	64-18-6	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Formic acid, methyl ester	107-31-3	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Glycidylaldehyde	765-34-4	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Methyl acetate	79-20-9	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Methyl alcohol	67-56-1	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Methyl isocyanate	624-83-9	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Methyl methacrylate	80-62-6	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Methyl tert-butyl ether	1634-04-4	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Methylacetylene	74-99-7	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Methylcyclohexane	108-87-2	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
N,N-Dimethylacetamide	127-19-5	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
n-Butyl alcohol	71-36-3	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
n-Heptane	142-82-5	Chronic (14 days)	EC50	Lettuce	>1.00E+06	No data	No data	Reduced growth from seed	1.00E+06	Hulzebos and others (1993) in Efroymson and others (1997a)
n-Hexane	110-54-3	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Nitromethane	75-52-5	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
n-Nonane	111-84-2	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
n-Octane	111-65-9	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
n-Pentane	109-66-0	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
n-Propionaldehyde	123-38-6	No data	No data	No data	No data	No data	No data	No data	No TRV	No data

Table C3-1 Derivation of Soil Toxicity Reference Values (TRVs) for Exposure of Plants to COPCs and ROPCs

Constituent of Potential Concern	CAS Registry Number	Test Duration	Endpoint	Test species	Endpoint concen-tration (EC)	Duration conversion factor (DCF)	Endpoint conversion factor (ECF)	Effect	TRV (EC × DCF × ECF)	Source
n-Propyl alcohol	71-23-8	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
n-Valeraldehyde	110-62-3	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Oxirane	75-21-8	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
p-Cymene	99-87-6	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Phosgene	75-44-5	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Propargyl alcohol	107-19-7	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Propionic acid	79-09-4	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Propionitrile	107-12-0	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Propylene glycol monomethyl ether	107-98-2	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
p-tert-Butyltoluene	98-51-1	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Triethylamine	121-44-8	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Trimethylamine	75-50-3	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Vinyl acetate	108-05-4	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Non-aromatic Halogenated Hydrocarbons										
1,1,1,2-Tetrachloro-2,2-difluoroethane	76-11-9	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
1,1,1,2-Tetrachloroethane	630-20-6	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
1,1,1-Trichloroethane	71-55-6	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
1,1,2,2-Tetrachloro-1,2-difluoroethane	76-12-0	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
1,1,2,2-Tetrachloroethane	79-34-5	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
1,1,2,2-Tetrachloroethene	127-18-4	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
1,1,2-Trichloroethane	79-00-5	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
1,1,2-Trichloroethylene	79-01-6	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
1,1-Dichloroethane	75-34-3	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
1,1-Dichloroethene	75-35-4	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
1,2,2-Trichloro-1,1,2-trifluoroethane	76-13-1	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
1,2,3-Trichloropropane	96-18-4	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
1,2-Dibromo-3-chloropropane	96-12-8	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
1,2-Dichloro-1,1,2,2-tetrafluoroethane	76-14-2	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
1,2-Dichloroethane	107-06-2	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
1,2-Dichloroethylene	540-59-0	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
1,2-Dichloropropane	78-87-5	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
1,3-Dichloropropene	542-75-6	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
1,4-Dichloro-2-butene	764-41-0	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
1-Chloroethene	75-01-4	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
2,2-Dichloropropionic acid	75-99-0	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
2-Chloropropane	75-29-6	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
3-Chloropropene (Allyl chloride)	107-05-1	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Bromochloromethane	74-97-5	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Bromodichloromethane	75-27-4	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Bromoethene	593-60-2	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Bromoform	75-25-2	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Bromomethane	74-83-9	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Carbon tetrachloride	56-23-5	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Chlorodibromomethane	124-48-1	No data	No data	No data	No data	No data	No data	No data	No TRV	No data

Table C3-1 Derivation of Soil Toxicity Reference Values (TRVs) for Exposure of Plants to COPCs and ROPCs

Constituent of Potential Concern	CAS Registry Number	Test Duration	Endpoint	Test species	Endpoint concen-tration (EC)	Duration conversion factor (DCF)	Endpoint conversion factor (ECF)	Effect	TRV (EC × DCF × ECF)	Source
Chlorodifluoromethane	75-45-6	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Chloroethane	75-00-3	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Chloroform	67-66-3	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Chloromethane	74-87-3	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Chloropentafluoroethane	76-15-3	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
cis-1,2-Dichloroethene	156-59-2	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
cis-1,3-Dichloropropene	10061-01-5	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Cyanogen bromide	506-68-3	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Cyanogen chloride	506-77-4	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Dichlorodifluoromethane	75-71-8	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Dichlorofluoromethane	75-43-4	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Dichloromethane	75-09-2	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Difluorodibromomethane	75-61-6	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Hexafluoroacetone	684-16-2	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Iodomethane	74-88-4	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Methylene bromide	74-95-3	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Pentachloroethane	76-01-7	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
trans-1,2-Dichloroethylene	156-60-5	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
trans-1,3-Dichloropropene	10061-02-6	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Trichloroacetic acid	76-03-9	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Trichlorofluoroethane	27154-33-2	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Trichlorofluoromethane	75-69-4	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Trifluorobromomethane	75-63-8	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Dioxin and Furan Compounds (PCDDs/PCDFs)										
1,2,3,4,6,7,8-Heptachlorodibenzo(p)dioxin	35822-46-9	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
1,2,3,4,6,7,8-Heptachlorodibenzofuran	67562-39-4	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
1,2,3,4,7,8,9-Heptachlorodibenzofuran	55673-89-7	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
1,2,3,4,7,8-Hexachlorodibenzo(p)dioxin	39227-28-6	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
1,2,3,4,7,8-Hexachlorodibenzofuran	70648-26-9	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
1,2,3,6,7,8-Hexachlorodibenzo(p)dioxin	57653-85-7	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
1,2,3,6,7,8-Hexachlorodibenzofuran	57117-44-9	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
1,2,3,7,8,9-Hexachlorodibenzo(p)dioxin	19408-74-3	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
1,2,3,7,8,9-Hexachlorodibenzofuran	72918-21-9	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
1,2,3,7,8-Pentachlorodibenzo(p)dioxin	40321-76-4	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
1,2,3,7,8-Pentachlorodibenzofuran	57117-41-6	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
2,3,4,6,7,8-Hexachlorodibenzofuran	60851-34-5	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
2,3,4,7,8-Pentachlorodibenzofuran	57117-31-4	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
2,3,7,8-Tetrachlorodibenzo(p)dioxin	1746-01-6	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
2,3,7,8-Tetrachlorodibenzofuran	51207-31-9	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Dibenzofuran	132-64-9	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Octachlorodibenzo(p)dioxin	3268-87-9	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Octachlorodibenzofuran	39001-02-0	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Total dioxins and dibenzofurans	No CAS #	No data	No data	No data	No data	No data	No data	No data	No TRV	No data

Table C3-1 Derivation of Soil Toxicity Reference Values (TRVs) for Exposure of Plants to COPCs and ROPCs

Constituent of Potential Concern	CAS Registry Number	Test Duration	Endpoint	Test species	Endpoint concen-tration (EC)	Duration conversion factor (DCF)	Endpoint conversion factor (ECF)	Effect	TRV (EC × DCF × ECF)	Source
Polychlorinated Biphenyls (PCBs)										
2,2',3,3',4,4',5-Heptachlorobiphenyl	35065-30-6	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
2,2',3,4,4',5,5'-Heptachlorobiphenyl	35065-29-3	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
2,3,3',4,4',5,5'-Heptachlorobiphenyl	39635-31-9	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
2,3,3',4,4',5'-Hexachlorobiphenyl	69782-90-7	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
2,3,3',4,4',5-Hexachlorobiphenyl	38380-08-4	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
2,3,3',4,4'-Pentachlorobiphenyl	32598-14-4	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
2,3',4,4',5,5'-Hexachlorobiphenyl	52663-72-6	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
2,3,4,4',5-Pentachlorobiphenyl	74472-37-0	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
2',3,4,4',5-Pentachlorobiphenyl	65510-44-3	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
2,3',4,4',5-Pentachlorobiphenyl	31508-00-6	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
3,3',4,4',5,5'-Hexachlorobiphenyl	32774-16-6	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
3,3',4,4',5-Pentachlorobiphenyl	57465-28-8	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
3,3',4,4'-Tetrachlorobiphenyl	32598-13-3	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
3,4,4',5-Tetrachlorobiphenyl	70362-50-4	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Polychlorinated biphenyls (PCBs)[a]	1336-36-3	Chronic	NOAEL	Soybean	1.00E+04	No data	No data	Shoot weight reduced	1.00E+04	Weber and Mrozek (1979) in EPA (1999)
Phthalates										
Bis(2-ethylhexyl) phthalate (DEHP)	117-81-7	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Butylbenzyl phthalate	85-68-7	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Dibutyl phthalate	84-74-2	Subchronic	LOAEL	Corn and soybean	2.00E+05	No data	No data	Fresh weight reduced	2.00E+05	Overcash and others (1982) in Efroymson and others (1997a)
Diethyl phthalate	84-66-2	Subchronic	EC50	Lettuce	1.34E+05	No data	No data	No data	1.00E+05	Hulzebos and others (1993) in Efroymson and others (1997a)
Dimethyl phthalate	131-11-3	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
n-Dioctyl phthalate	117-84-0	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Light Polycyclic Aromatic Hydrocarbons (molecular weight <200 g/mole)										
2-Chloronaphthalene	91-58-7	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
2-Methyl naphthalene	91-57-6	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
5-Nitroacenaphthene	602-87-9	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Acenaphthene	83-32-9	Chronic (14 days)	EC50	Lettuce	2.50E+04	No data	No data	Reduced growth from seed	2.00E+04	Hulzebos and others (1993) in Efroymson and others (1997a)
Acenaphthylene	208-96-8	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Anthracene	120-12-7	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Fluorene	86-73-7	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Indene	95-13-6	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Naphthalene	91-20-3	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Phenanthrene	85-01-8	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Pyrene	129-00-0	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Heavy Polycyclic Aromatic Hydrocarbons (molecular weight >200 g/mole)										
3-Methylcholanthrene	56-49-5	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
5-Methylchrysene	3697-24-3	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Benzo[a]anthracene	56-55-3	NA	NA	NA	NA	NA	NA	NA	1.20E+03	TRV for benzo(a)pyrene used as surrogate (EPA 1999)

Table C3-1 Derivation of Soil Toxicity Reference Values (TRVs) for Exposure of Plants to COPCs and ROPCs

Constituent of Potential Concern	CAS Registry Number	Test Duration	Endpoint	Test species	Endpoint concen-tration (EC)	Duration conversion factor (DCF)	Endpoint conversion factor (ECF)	Effect	TRV (EC × DCF × ECF)	Source
Benzo[a]pyrene	50-32-8	Chronic	NOAEL	Wheat	1.20E+03	No data	No data	No data	1.20E+03	Sims and Overcash (1983) in EPA (1999)
Benzo[a,i]pyrene	191-30-0	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Benzo[b]fluoranthene	205-99-2	Chronic	NOAEL	Wheat	1.20E+03	No data	No data	No data	1.20E+03	Sims and Overcash (1983) in EPA (1999)
Benzo[e]pyrene	192-97-2	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Benzo[g,h,i]perylene	191-24-2	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Benzo[j]fluoranthene	205-82-3	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Benzo[k]fluoranthene	207-08-9	NA	NA	NA	NA	NA	NA	NA	1.20E+03	TRV for benzo(a)pyrene used as surrogate (EPA 1999)
Chrysene	218-01-9	NA	NA	NA	NA	NA	NA	NA	1.20E+03	TRV for benzo(a)pyrene used as surrogate (EPA 1999)
Dibenz[a,h]acridine	226-36-8	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Dibenz[a,h]anthracene	53-70-3	NA	NA	NA	NA	NA	NA	NA	1.20E+03	TRV for benzo(a)pyrene used as surrogate (EPA 1999)
Dibenz[a,j]acridine	224-42-0	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Dibenzo[a,e]fluoranthene	5385-75-1	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Dibenzo[a,e]pyrene	192-65-4	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Dibenzo[a,h]fluoranthene	No CAS #	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Dibenzo[a,h]pyrene	189-64-0	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Dibenzo[a,i]pyrene	189-55-9	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Fluoranthene	206-44-0	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Hexachloronaphthalene	1335-87-1	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Indeno[1,2,3-cd]pyrene	193-39-5	NA	NA	NA	NA	NA	NA	NA	1.20E+03	TRV for benzo(a)pyrene used as surrogate (EPA 1999)
Octachloronaphthalene	2234-13-1	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Pentachloronaphthalene	1321-64-8	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Tetrachloronaphthalene	1335-88-2	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Trichloronaphthalene	1321-65-9	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Light Substituted Benzene Compounds (molecular weight <200 g/mole)										
1,2,3-Trichlorobenzene	87-61-6	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
1,2,4-Trichlorobenzene	120-82-1	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
1,2,4-Trimethyl benzene	95-63-6	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
1,2-Dichlorobenzene	95-50-1	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
1,3,5-Trimethyl benzene	108-67-8	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
1,3-Dichlorobenzene	541-73-1	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
1,3-Dinitrobenzene	99-65-0	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
1,4-Dichlorobenzene	106-46-7	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
1,4-Dinitrobenzene	100-25-4	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
2,4,5-Trichlorophenol	95-95-4	Chronic (14 days)	EC50	Lettuce	4.30E+03	No data	No data	Reduced growth from seed	4.00E+03	van Gestel and others (1996) in Efroymson and others (1997a)
2,4,6-Trichlorophenol	88-06-2	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
2,4-Dichlorophenol	120-83-2	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
2,4-Dimethylphenol	105-67-9	No data	No data	No data	No data	No data	No data	No data	No TRV	No data

Table C3-1 Derivation of Soil Toxicity Reference Values (TRVs) for Exposure of Plants to COPCs and ROPCs

Constituent of Potential Concern	CAS Registry Number	Test Duration	Endpoint	Test species	Endpoint concen-tration (EC)	Duration conversion factor (DCF)	Endpoint conversion factor (ECF)	Effect	TRV (EC × DCF × ECF)	Source
2,4-Dinitrophenol	51-28-5	Chronic (21 days)	LOEC	Soybean	2.00E+04	No data	No data	Reduced growth from seed	2.00E+04	Overcash and others (1982) in Efroymson and others (1997a)
2,4-Dinitrotoluene	121-14-2	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
2,6-Dinitrotoluene	606-20-2	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
2-Chlorophenol	95-57-8	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
2-Chlorotoluene	95-49-8	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
2-Nitrophenol	88-75-5	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
4,6-Dinitro-o-cresol	534-52-1	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
4-Chlorotoluene	106-43-4	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
4-Nitrophenol	100-02-7	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
alpha-Methylstyrene	98-83-9	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Aniline	62-53-3	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Benzotrichloride	98-07-7	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Benzyl chloride	100-44-7	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Bromobenzene	108-86-1	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Chlorobenzene	108-90-7	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Cumene	98-82-8	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
m-Cresol	108-39-4	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
n-Butyl benzene	104-51-8	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Nitrobenzene	98-95-3	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
n-Propyl benzene	103-65-1	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
o-Cresol	95-48-7	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
o-Dinitrobenzene	528-29-0	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
o-Nitroaniline	88-74-4	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
o-Toluidine	95-53-4	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
p-Chloroaniline	106-47-8	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
p-Cresol	106-44-5	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Phenol	108-95-2	Chronic (14 days)	EC50	Lettuce	7.90E+04	No data	No data	Reduced growth from seed	7.00E+04	Hulzebos and others (1993) in Efroymson and others (1997a)
p-Nitrochlorobenzene	100-00-5	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
p-Toluidine	106-49-0	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
sec-Butyl benzene	135-98-8	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
tert-Butyl benzene	98-06-6	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Toluene-2,6-diamine	823-40-5	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Trimethyl benzene	25551-13-7	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Other Light Semivolatile Compounds (molecular weight <200 g/mole)										
1,1'-Biphenyl	92-52-4	Chronic (14 days)	EC50	Lettuce	6.80E+04	No data	No data	Reduced growth from seed	6.00E+04	Hulzebos and others (1993) in Efroymson and others (1997a)
1,1-Dimethylhydrazine	57-14-7	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
1,2-Dimethylhydrazine	540-73-8	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
1,2-Diphenylhydrazine	122-66-7	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
1,3-Propane sultone	1120-71-4	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
2,4-Toluene diisocyanate	584-84-9	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
2-Chloroacetophenone	532-27-4	No data	No data	No data	No data	No data	No data	No data	No TRV	No data

Table C3-1 Derivation of Soil Toxicity Reference Values (TRVs) for Exposure of Plants to COPCs and ROPCs

Constituent of Potential Concern	CAS Registry Number	Test Duration	Endpoint	Test species	Endpoint concen-tration (EC)	Duration conversion factor (DCF)	Endpoint conversion factor (ECF)	Effect	TRV (EC × DCF × ECF)	Source
2-Propenoic acid	79-10-7	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
4,4'-Methylenedianiline	101-77-9	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Acetophenone	98-86-2	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Benzoic acid	65-85-0	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
bis(2-Chloroethoxy)methane	111-91-1	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
bis(2-Chloroethyl) ether	111-44-4	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Chlorocyclopentadiene	41851-50-7	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Cyclohexanol	108-93-0	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Dichloroisopropyl ether	108-60-1	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Dichloromethyl ether	542-88-1	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Dichloropentadiene	61626-71-9	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Dimethyl sulfate	77-78-1	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Dimethylaniline	121-69-7	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Di-n-propylnitrosamine	621-64-7	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Diphenyl ether	101-84-8	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Epichlorohydrin	106-89-8	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Ethyl carbamate (urethane)	51-79-6	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Ethyl methanesulfonate	62-50-0	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Ethylene dibromide	106-93-4	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Ethylene glycol	107-21-1	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Ethylene glycol monobutyl ether	111-76-2	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Ethylene glycol monoethyl ether acetate	111-15-9	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Ethylene thiourea	96-45-7	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Furfural	98-01-1	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Maleic hydrazide	123-33-1	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Malononitrile	109-77-3	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Methyl styrene (mixed isomers)	25013-15-4	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Methylhydrazine	60-34-4	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
N,N-Diphenylamine	122-39-4	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Nitric acid, propyl ester	627-13-4	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
N-Nitrosodi-n-butylamine	924-16-3	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
N-Nitrosomorpholine	59-89-2	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
N-Nitroso-N,N-dimethylamine	62-75-9	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
o-Anisidine	90-04-0	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Oxalic acid	144-62-7	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Phthalic anhydride	85-44-9	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
p-Phthalic acid	100-21-0	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Pyridine	110-86-1	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Quinoline	91-22-5	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Quinone	106-51-4	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Safrole	94-59-7	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Tetrahydrofuran	109-99-9	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Other Heavy Semivolatile Compounds (molecular weight >200 g/mole)										
1,2,4,5-Tetrachlorobenzene	95-94-3	No data	No data	No data	No data	No data	No data	No data	No TRV	No data

Table C3-1 Derivation of Soil Toxicity Reference Values (TRVs) for Exposure of Plants to COPCs and ROPCs

Constituent of Potential Concern	CAS Registry Number	Test Duration	Endpoint	Test species	Endpoint concen-tration (EC)	Duration conversion factor (DCF)	Endpoint conversion factor (ECF)	Effect	TRV (EC × DCF × ECF)	Source
1,3,5-Trinitrobenzene	99-35-4	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
2,6-Bis(tert-butyl)-4-methylphenol	128-37-0	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
2-Cyclohexyl-4,6-dinitrophenol	131-89-5	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
2-sec-Butyl-4,6-dinitrophenol	88-85-7	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
3,3'-Dichlorobenzidine	91-94-1	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
3,3'-Dimethoxybenzidine	119-90-4	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
4-Bromophenylphenyl ether	101-55-3	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Ammonium perfluorooctanoate	3825-26-1	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Azobenzene	103-33-3	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Bis(3-tert-butyl-4-hydroxy-6-methyl-phenyl)sulfide	96-69-5	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Captan	133-06-2	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Chlorobenzilate	510-15-6	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Dibutylphosphate	107-66-4	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Dimethyl aminoazobenzene	60-11-7	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Hexachlorobenzene	118-74-1	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Hexachlorobutadiene	87-68-3	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Hexachlorocyclopentadiene	77-47-4	Acute	EC50	Lettuce	1.00E+04	1.0E-01	1.0E-01	No data	1.00E+02	Hulzebos and others (1993) in EPA (1999)
Hexachloroethane	67-72-1	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Hexachlorophene	70-30-4	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Hexamethylene-1,5-diisocyanate	822-06-0	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Mirex	2385-85-5	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Nitrofen	1836-75-5	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Pentachlorobenzene	608-93-5	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Pentachloronitrobenzene	82-68-8	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Pentachlorophenol	87-86-5	Chronic	LOAEL	Rice	1.73E+04	1.0E+00	1.0E-01	No data	1.73E+03	Nagasawa and others (1981) in EPA (1999)
Picric acid	88-89-1	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Pronamide	23950-58-5	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Strychnine	57-24-9	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Terphenyls	26140-60-3	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Tributyl phosphate	126-73-8	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Trifluralin	1582-09-8	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Triphenylamine	603-34-9	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Herbicides and Organochlorinated Pesticides										
2,4,5-T	93-76-5	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
2,4-D and esters	94-75-7	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
4,4'-DDD	72-54-8	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
4,4'-DDE	72-55-9	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
4,4'-DDT	50-29-3	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Aldrin	309-00-2	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
alpha-BHC	319-84-6	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
beta-BHC	319-85-7	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Chlordane	57-74-9	No data	No data	No data	No data	No data	No data	No data	No TRV	No data

Table C3-1 Derivation of Soil Toxicity Reference Values (TRVs) for Exposure of Plants to COPCs and ROPCs

Constituent of Potential Concern	CAS Registry Number	Test Duration	Endpoint	Test species	Endpoint concen-tration (EC)	Duration conversion factor (DCF)	Endpoint conversion factor (ECF)	Effect	TRV (EC × DCF × ECF)	Source
Delta-BHC	319-86-8	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Dieldrin	60-57-1	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Endothall	145-73-3	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Endrin	72-20-8	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
gamma-BHC (Lindane)	58-89-9	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Heptachlor	76-44-8	Chronic	NOAEL	Carrot	1.00E+03	No data	No data	No data	1.00E+03	Ahrens and Kring (1968) in EPA (1999)
Isodrin	465-73-6	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Methoxychlor	72-43-5	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Silvex (2,4,5-TP)	93-72-1	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Toxaphene	8001-35-2	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Inorganic Chemicals and Compounds					(mg/kg)				(mg/kg)	
	Metals									
Aluminum	7429-90-5	Subchronic	NOAEL	White clover	5.00E+01	1.0E-01	1.0E+00	Reduced seedling establishment	5.00E+00	Mackay and others (1990) in EPA (1999)
Antimony	7440-36-0	Not specified	Not specified	Not specified	5.00E+00	1.0E+00	1.0E-01	No data	5.00E-01	Kabata-Pendias and Pendias (1992) in EPA (1999)
Arsenic	7440-38-2	Chronic	LOAEL	Corn	1.00E+01	1.0E+00	1.0E-01	Reduced yield	1.00E+00	Woolson and others (1971) in EPA (1999)
Barium	7440-39-3	Chronic	LOAEL	Barley	5.00E+02	1.0E+00	1.0E-02	Reduced shoot growth	5.00E+00	Chaudry and others (1977) in EPA (1999)
Beryllium	7440-41-7	Not specified	Not specified	Not specified	1.00E+01	1.0E-01	1.0E-01	No data	1.00E-01	Kabata-Pendias and Pendias (1992) in EPA (1999)
Bismuth	7440-69-9	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Boron	7440-42-8	Chronic	LOAEL	Corn seedlings	5.00E-01	No data	No data	Reduced seedling growth	5.00E-01	John and others (1977) in Efroymson and others (1997a)
Cadmium	7440-43-9	Chronic	LOAEL	Spruce seedlings	2.00E+00	1.0E+00	1.0E-01	Reduced seedling growth	2.00E-01	Burton and others (1984) in EPA (1999)
Calcium	7440-70-2	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Chromium[b]	18540-29-9	Subchronic	EC50	Lettuce	1.80E+00	1.0E-01	1.0E-01	Reduced growth	1.80E-02	Adema and Hazen (1989) in EPA (1999)
Cobalt	7440-48-4	Not specified	Not specified	Not specified	2.00E+01	No data	No data	Unspecified toxic effects	2.00E+01	Kabata-Pendias and Pendias (1984) in Efroymson and others (1997a)
Copper	7440-50-8	Chronic	LOAEL	Barley	1.00E+01	1.0E+00	1.0E-01	No data	1.00E+00	Toivonem and Hofstra (1979) in EPA (1999)
Iron	7439-89-6	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Lead	7439-92-1	Chronic	LOAEL	Senna	4.60E+01	1.0E+00	1.0E-01	No data	4.60E+00	Krishnayya and Bedi (1986) in EPA (1999)
Lithium	7439-93-2	Subchronic	LOAEL	Orange seedlings	2.00E+00	No data	No data	Unspecified toxic effects	2.00E+00	Aldrich and others (1951) in Efroymson and others (1997a)
Magnesium	7439-95-4	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Manganese	7439-96-5	Chronic (17 days)	LOEC	Bush beans	5.00E+02	No data	No data	Stem weight reduced	5.00E+02	Wallace and others (1977) in Efroymson and others (1997a)

Table C3-1 Derivation of Soil Toxicity Reference Values (TRVs) for Exposure of Plants to COPCs and ROPCs

Constituent of Potential Concern	CAS Registry Number	Test Duration	Endpoint	Test species	Endpoint concen-tration (EC)	Duration conversion factor (DCF)	Endpoint conversion factor (ECF)	Effect	TRV (EC × DCF × ECF)	Source
Mercury	7439-97-6	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Mercury - Hg+2	7487-94-7	Acute	NOEC	Barley	3.49E+01	1.0E-01	1.0E-01	No data	3.49E-01	Lenka and others (1992) in EPA (1999)
Methylmercury	22967-92-6	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Molybdenum	7439-98-7	Not specified	Not specified	Not specified	2.00E+00	No data	No data	Unspecified toxic effects	2.00E+00	Kabata-Pendias and Pendias (1984) in Efroymson and others (1997a)
Nickel	7440-02-0	Chronic	NOAEL	Bush bean	2.50E+01	No data	No data	Reduced shoot growth	2.50E+01	Wallace and others (1977) in EPA (1999)
Potassium	7440-09-7	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Rhodium	7440-16-6	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Selenium	7782-49-2	Subchronic	NOAEL	Alfalfa	5.00E-01	1.0E-01	1.0E+00	Shoot weight reduced	5.00E-02	Wan and others (1988) in EPA (1999)
Silicon	7440-21-3	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Silver	7440-22-4	Not specified	Not specified	Not specified	2.00E+00	1.0E-01	1.0E-01	No data	2.00E-02	Kabata-Pendias and Pendias (1992) in EPA (1999)
Sodium	7440-23-5	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Strontium	7440-24-6	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Tantalum	7440-25-7	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Thallium	7440-28-0	Not specified	Not specified	Not specified	1.00E+00	1.0E-01	1.0E-01	No data	1.00E-02	Kabata-Pendias and Pendias (1992) in EPA (1999)
Tin	7440-31-5	Chronic (17 days)	NOEC	Bush beans	5.00E+01	No data	No data	Shoot weight reduced	5.00E+01	Romney and others (1975) in Efroymson and others (1997a)
Tungsten	7440-33-7	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Uranium	7440-61-1	No data	LOEC	Swiss chard	5.00E+00	No data	No data	Reduction in root weight	5.00E+00	Sheppard and others (1983) in Efroymson and others (1997a)
Vanadium	7440-62-2	No data	No data	Unspecified plants	2.00E+00	No data	No data	Unspecified toxic effects	2.00E+00	EPA (1980) in Efroymson and others (1997a)
Yttrium	7440-65-5	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Zinc	7440-66-6	Chronic	LOAEL	Spring barley	9.00E+00	1.0E+00	1.0E-01	No data	9.00E-01	Davis, Beckett, and Wollan (1978) in EPA (1999)
Zirconium	7440-67-7	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Non-metals and Anions										
Ammonia/Ammonium	7664-41-7	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Bromide	24959-67-9	Chronic	LOAEL	Unspecified plants	1.00E+01	No data	No data	Unspecified toxic effects	1.00E+01	Kabata-Pendias and Pendias (1984) in Efroymson and others (1997a)
Chloride	16887-00-6	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Cyanide	57-12-5	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Fluoride	16984-48-8	Not specified	No data	Unspecified plants	2.00E+02	No data	No data	Reduction in growth	2.00E+02	Kabata-Pendias and Pendias (1984) in Efroymson and others (1997a)
Hydroxide	14280-30-9	No data	No data	No data	No data	No data	No data	No data	No TRV	No data

Table C3-1 Derivation of Soil Toxicity Reference Values (TRVs) for Exposure of Plants to COPCs and ROPCs

Constituent of Potential Concern	CAS Registry Number	Test Duration	Endpoint	Test species	Endpoint concen-tration (EC)	Duration conversion factor (DCF)	Endpoint conversion factor (ECF)	Effect	TRV (EC × DCF × ECF)	Source
Iodine	7553-56-2	Chronic (97 days)	LOEC	Tomatoes grown from seed	4.00E+00	No data	No data	Reduction in top weight	4.00E+00	Newton and Toth (1952) in Efroymson and others (1997a)
Nitrate	14797-55-8	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Nitrite	14797-65-0	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Phosphate	14265-44-2	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Phosphorus	7723-14-0	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Sulfate	14808-79-8	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Total Sulfur	63705-05-5	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Criteria Pollutants										
Carbon monoxide	630-08-0	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Nitrogen dioxide	10102-44-0	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Ozone	10028-15-6	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Particulate matter	No CAS #	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Sulfur dioxide	7446-09-5	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Radionuclides										
All radionuclides combined (rad/d)[c]	No CAS #	Chronic	Adverse effects	Plants	NA	NA	NA	Population effects	1.00E+00	IAEA (1992)

Notes/Sources

No data = No data available.
NA = Not applicable.
CAS = Chemical Abstracts Service.
EC = Concentration that caused the reported effect.
DCF = Duration conversion factor; 1 if chronic, 0.1 if subchronic (Sample and others 1996) or inferred from information presented in EPA (1999) Table E-5.
ECF = Endpoint conversion factor; 1 if NOAEL, 0.1 if LOAEL (Sample and others 1996) or inferred from information presented in EPA (1999) Table E-5.
TRV = Toxicity reference value.
LC50 = Concentration lethal to 50 % of tested individuals.
LOAEL = Lowest observed adverse effect level.
NOAEL = No observed adverse effects level.
LOEC = Lowest concentration at which an effect was observed.
NOEC = Highest concentration at which an effect was not observed.

[a] Data for Aroclor-1254 used as representative of polychlorinated biphenyl mixtures.

[b] Values for hexavalent chromium, which is more toxic than trivalent chromium.

[c] TRV is not applicable to single radionuclides. Combined external and internal radiation exposure for plants from all radionuclides combined cannot exceed 1.0 rad/d.

Table C3-2 Derivation of Soil Toxicity Reference Values (TRVs) for Exposure of Terrestrial Invertebrates to COPCs and ROPCs

Constituent of Potential Concern	CAS Registry Number	Effect	TRV (EC × DCF × ECF)	Source
Organic Compounds			(µg/kg)	
Aromatic Halogenated Hydrocarbons				
2,3,4,6-Tetrachlorophenol	58-90-2	No data	No TRV	No data
4-Chloro-3-methylphenol	59-50-7	No data	No TRV	No data
Aromatic Nonhalogenated Hydrocarbons				
2-Nitrotoluene	88-72-2	No data	No TRV	No data
4-Nitrobiphenyl	92-93-3	No data	No TRV	No data
Benzaldehyde	100-52-7	No data	No TRV	No data
Benzene	71-43-2	No data	No TRV	No data
Benzyl alcohol	100-51-6	No data	No TRV	No data
Ethyl benzene	100-41-4	No data	No TRV	No data
m-Xylene	108-38-3	No data	No TRV	No data
o-Xylene	95-47-6	No data	No TRV	No data
p-Xylene	106-42-3	No data	No TRV	No data
Styrene	100-42-5	No data	No TRV	No data
Toluene	108-88-3	No data	No TRV	No data
Non-aromatic Nonhalogenated Hydrocarbons				
1,2-Epoxybutane	106-88-7	No data	No TRV	No data
1,3-Butadiene	106-99-0	No data	No TRV	No data
1,4-Dioxane	123-91-1	No data	No TRV	No data
1-Methylpropyl alcohol	78-92-2	No data	No TRV	No data
1-Nitropropane	108-03-2	No data	No TRV	No data
2,2,4-Trimethylpentane	540-84-1	No data	No TRV	No data
2-Butanone	78-93-3	No data	No TRV	No data
2-Butenaldehyde (2-Butenal)	4170-30-3	No data	No TRV	No data
2-Ethoxyethanol	110-80-5	No data	No TRV	No data
2-Heptanone	110-43-0	No data	No TRV	No data
2-Hexanone	591-78-6	No data	No TRV	No data
2-Methoxyethanol	109-86-4	No data	No TRV	No data
2-Methyl-2-propanol	75-65-0	No data	No TRV	No data

Table C3-2 Derivation of Soil Toxicity Reference Values (TRVs) for Exposure of Terrestrial Invertebrates to COPCs and ROPCs

Constituent of Potential Concern	CAS Registry Number	Effect	TRV (EC × DCF × ECF)	Source
2-Methyl-2-propenenitrile	126-98-7	No data	No TRV	No data
2-Methylaziridine	75-55-8	No data	No TRV	No data
2-Methylpropyl alcohol	78-83-1	No data	No TRV	No data
2-Pentanone	107-87-9	No data	No TRV	No data
2-Propanone (Acetone)	67-64-1	No data	No TRV	No data
2-Propene-1-ol	107-18-6	No data	No TRV	No data
2-Propyl alcohol	67-63-0	No data	No TRV	No data
3-Heptanone	106-35-4	No data	No TRV	No data
3-Methyl-1-butanol	123-51-3	No data	No TRV	No data
3-Methyl-2-butanone	563-80-4	No data	No TRV	No data
3-Pentanone	96-22-0	No data	No TRV	No data
4-Heptanone	123-19-3	No data	No TRV	No data
4-Methyl-2-pentanone	108-10-1	No data	No TRV	No data
4-Methyl-3-penten-2-one	141-79-7	No data	No TRV	No data
5-Methyl-2-hexanone	110-12-3	No data	No TRV	No data
Acetaldehyde	75-07-0	No data	No TRV	No data
Acetamide	60-35-5	No data	No TRV	No data
Acetic acid	64-19-7	No data	No TRV	No data
Acetic acid ethyl ester	141-78-6	No data	No TRV	No data
Acetic acid n-butyl ester	123-86-4	No data	No TRV	No data
Acetonitrile	75-05-8	No data	No TRV	No data
Acrolein	107-02-8	No data	No TRV	No data
Acrylonitrile	107-13-1	No data	No TRV	No data
Bis(isopropyl)ether	108-20-3	No data	No TRV	No data
Butane	106-97-8	No data	No TRV	No data
Carbon disulfide	75-15-0	No data	No TRV	No data
Cyanogen	460-19-5	No data	No TRV	No data
Cyclohexane	110-82-7	No data	No TRV	No data
Cyclohexanone	108-94-1	No data	No TRV	No data
Cyclohexene	110-83-8	No data	No TRV	No data
Cyclopentane	287-92-3	No data	No TRV	No data

Table C3-2 Derivation of Soil Toxicity Reference Values (TRVs) for Exposure of Terrestrial Invertebrates to COPCs and ROPCs

Constituent of Potential Concern	CAS Registry Number	Effect	TRV (EC × DCF × ECF)	Source
Ethyl alcohol	64-17-5	No data	No TRV	No data
Ethyl ether	60-29-7	No data	No TRV	No data
Ethyl methacrylate	97-63-2	No data	No TRV	No data
Formaldehyde	50-00-0	No data	No TRV	No data
Formamide	75-12-7	No data	No TRV	No data
Formic acid	64-18-6	No data	No TRV	No data
Formic acid, methyl ester	107-31-3	No data	No TRV	No data
Glycidylaldehyde	765-34-4	No data	No TRV	No data
Methyl acetate	79-20-9	No data	No TRV	No data
Methyl alcohol	67-56-1	No data	No TRV	No data
Methyl isocyanate	624-83-9	No data	No TRV	No data
Methyl methacrylate	80-62-6	No data	No TRV	No data
Methyl tert-butyl ether	1634-04-4	No data	No TRV	No data
Methylacetylene	74-99-7	No data	No TRV	No data
Methylcyclohexane	108-87-2	No data	No TRV	No data
N,N-Dimethylacetamide	127-19-5	No data	No TRV	No data
n-Butyl alcohol	71-36-3	No data	No TRV	No data
n-Heptane	142-82-5	No data	No TRV	No data
n-Hexane	110-54-3	No data	No TRV	No data
Nitromethane	75-52-5	No data	No TRV	No data
n-Nonane	111-84-2	No data	No TRV	No data
n-Octane	111-65-9	No data	No TRV	No data
n-Pentane	109-66-0	No data	No TRV	No data
n-Propionaldehyde	123-38-6	No data	No TRV	No data
n-Propyl alcohol	71-23-8	No data	No TRV	No data
n-Valeraldehyde	110-62-3	No data	No TRV	No data
Oxirane	75-21-8	No data	No TRV	No data
p-Cymene	99-87-6	No data	No TRV	No data
Phosgene	75-44-5	No data	No TRV	No data
Propargyl alcohol	107-19-7	No data	No TRV	No data
Propionic acid	79-09-4	No data	No TRV	No data

Table C3-2 Derivation of Soil Toxicity Reference Values (TRVs) for Exposure of Terrestrial Invertebrates to COPCs and ROPCs

Constituent of Potential Concern	CAS Registry Number	Effect	TRV (EC × DCF × ECF)	Source
Propionitrile	107-12-0	No data	No TRV	No data
Propylene glycol monomethyl ether	107-98-2	No data	No TRV	No data
p-tert-Butyltoluene	98-51-1	No data	No TRV	No data
Triethylamine	121-44-8	No data	No TRV	No data
Trimethylamine	75-50-3	No data	No TRV	No data
Vinyl acetate	108-05-4	No data	No TRV	No data
Non-aromatic Halogenated Hydrocarbons				
1,1,1,2-Tetrachloro-2,2-difluoroethane	76-11-9	No data	No TRV	No data
1,1,1,2-Tetrachloroethane	630-20-6	No data	No TRV	No data
1,1,1-Trichloroethane	71-55-6	No data	No TRV	No data
1,1,2,2-Tetrachloro-1,2-difluoroethane	76-12-0	No data	No TRV	No data
1,1,2,2-Tetrachloroethane	79-34-5	No data	No TRV	No data
1,1,2,2-Tetrachloroethene	127-18-4	No data	No TRV	No data
1,1,2-Trichloroethane	79-00-5	No data	No TRV	No data
1,1,2-Trichloroethylene	79-01-6	No data	No TRV	No data
1,1-Dichloroethane	75-34-3	No data	No TRV	No data
1,1-Dichloroethene	75-35-4	No data	No TRV	No data
1,2,2-Trichloro-1,1,2-trifluoroethane	76-13-1	No data	No TRV	No data
1,2,3-Trichloropropane	96-18-4	No data	No TRV	No data
1,2-Dibromo-3-chloropropane	96-12-8	No data	No TRV	No data
1,2-Dichloro-1,1,2,2-tetrafluoroethane	76-14-2	No data	No TRV	No data
1,2-Dichloroethane	107-06-2	No data	No TRV	No data
1,2-Dichloroethylene	540-59-0	No data	No TRV	No data
1,2-Dichloropropane	78-87-5	Mortality	7.00E+05	Neuhauser and others (1986) in Efroymson and others (1997b)
1,3-Dichloropropene	542-75-6	No data	No TRV	No data
1,4-Dichloro-2-butene	764-41-0	No data	No TRV	No data
1-Chloroethene	75-01-4	No data	No TRV	No data
2,2-Dichloropropionic acid	75-99-0	No data	No TRV	No data

Table C3-2 Derivation of Soil Toxicity Reference Values (TRVs) for Exposure of Terrestrial Invertebrates to COPCs and ROPCs

Constituent of Potential Concern	CAS Registry Number	Effect	TRV (EC × DCF × ECF)	Source
2-Chloropropane	75-29-6	No data	No TRV	No data
3-Chloropropene (Allyl chloride)	107-05-1	No data	No TRV	No data
Bromochloromethane	74-97-5	No data	No TRV	No data
Bromodichloromethane	75-27-4	No data	No TRV	No data
Bromoethene	593-60-2	No data	No TRV	No data
Bromoform	75-25-2	No data	No TRV	No data
Bromomethane	74-83-9	No data	No TRV	No data
Carbon tetrachloride	56-23-5	No data	No TRV	No data
Chlorodibromomethane	124-48-1	No data	No TRV	No data
Chlorodifluoromethane	75-45-6	No data	No TRV	No data
Chloroethane	75-00-3	No data	No TRV	No data
Chloroform	67-66-3	No data	No TRV	No data
Chloromethane	74-87-3	No data	No TRV	No data
Chloropentafluoroethane	76-15-3	No data	No TRV	No data
cis-1,2-Dichloroethene	156-59-2	No data	No TRV	No data
cis-1,3-Dichloropropene	10061-01-5	No data	No TRV	No data
Cyanogen bromide	506-68-3	No data	No TRV	No data
Cyanogen chloride	506-77-4	No data	No TRV	No data
Dichlorodifluoromethane	75-71-8	No data	No TRV	No data
Dichlorofluoromethane	75-43-4	No data	No TRV	No data
Dichloromethane	75-09-2	No data	No TRV	No data
Difluorodibromomethane	75-61-6	No data	No TRV	No data
Hexafluoroacetone	684-16-2	No data	No TRV	No data
Iodomethane	74-88-4	No data	No TRV	No data
Methylene bromide	74-95-3	No data	No TRV	No data
Pentachloroethane	76-01-7	No data	No TRV	No data
trans-1,2-Dichloroethylene	156-60-5	No data	No TRV	No data
trans-1,3-Dichloropropene	10061-02-6	No data	No TRV	No data
Trichloroacetic acid	76-03-9	No data	No TRV	No data
Trichlorofluoroethane	27154-33-2	No data	No TRV	No data
Trichlorofluoromethane	75-69-4	No data	No TRV	No data

Table C3-2 Derivation of Soil Toxicity Reference Values (TRVs) for Exposure of Terrestrial Invertebrates to COPCs and ROPCs

Constituent of Potential Concern	CAS Registry Number	Effect	TRV (EC × DCF × ECF)	Source
Trifluorobromomethane	75-63-8	No data	No TRV	No data
Dioxin and Furan Compounds (PCDDs/PCDFs)				
1,2,3,4,6,7,8-Heptachlorodibenzo(p)dioxin	35822-46-9	No data	No TRV	No data
1,2,3,4,6,7,8-Heptachlorodibenzofuran	67562-39-4	No data	No TRV	No data
1,2,3,4,7,8,9-Heptachlorodibenzofuran	55673-89-7	No data	No TRV	No data
1,2,3,4,7,8-Hexachlorodibenzo(p)dioxin	39227-28-6	No data	No TRV	No data
1,2,3,4,7,8-Hexachlorodibenzofuran	70648-26-9	No data	No TRV	No data
1,2,3,6,7,8-Hexachlorodibenzo(p)dioxin	57653-85-7	No data	No TRV	No data
1,2,3,6,7,8-Hexachlorodibenzofuran	57117-44-9	No data	No TRV	No data
1,2,3,7,8,9-Hexachlorodibenzo(p)dioxin	19408-74-3	No data	No TRV	No data
1,2,3,7,8,9-Hexachlorodibenzofuran	72918-21-9	No data	No TRV	No data
1,2,3,7,8-Pentachlorodibenzo(p)dioxin	40321-76-4	No data	No TRV	No data
1,2,3,7,8-Pentachlorodibenzofuran	57117-41-6	No data	No TRV	No data
2,3,4,6,7,8-Hexachlorodibenzofuran	60851-34-5	No data	No TRV	No data
2,3,4,7,8-Pentachlorodibenzofuran	57117-31-4	No data	No TRV	No data
2,3,7,8-Tetrachlorodibenzo(p)dioxin	1746-01-6	Mortality	5.00E+02	Reinecke and Nash (1984) in EPA (1999)
2,3,7,8-Tetrachlorodibenzofuran	51207-31-9	No data	No TRV	No data
Dibenzofuran	132-64-9	No data	No TRV	No data
Octachlorodibenzo(p)dioxin	3268-87-9	No data	No TRV	No data
Octachlorodibenzofuran	39001-02-0	No data	No TRV	No data
Total dioxins and dibenzofurans	No CAS #	No data	No TRV	No data
Polychlorinated Biphenyls (PCBs)				
2,2',3,3',4,4',5-Heptachlorobiphenyl	35065-30-6	No data	No TRV	No data
2,2',3,4,4',5,5'-Heptachlorobiphenyl	35065-29-3	No data	No TRV	No data
2,3,3',4,4',5,5'-Heptachlorobiphenyl	39635-31-9	No data	No TRV	No data
2,3,3',4,4',5'-Hexachlorobiphenyl	69782-90-7	No data	No TRV	No data
2,3,3',4,4',5-Hexachlorobiphenyl	38380-08-4	No data	No TRV	No data
2,3,3',4,4'-Pentachlorobiphenyl	32598-14-4	No data	No TRV	No data
2,3',4,4',5,5'-Hexachlorobiphenyl	52663-72-6	No data	No TRV	No data

Table C3-2 Derivation of Soil Toxicity Reference Values (TRVs) for Exposure of Terrestrial Invertebrates to COPCs and ROPCs

Constituent of Potential Concern	CAS Registry Number	Effect	TRV (EC × DCF × ECF)	Source
2,3,4,4',5-Pentachlorobiphenyl	74472-37-0	No data	No TRV	No data
2',3,4,4',5-Pentachlorobiphenyl	65510-44-3	No data	No TRV	No data
2,3',4,4',5-Pentachlorobiphenyl	31508-00-6	No data	No TRV	No data
3,3',4,4',5,5'-Hexachlorobiphenyl	32774-16-6	No data	No TRV	No data
3,3',4,4',5-Pentachlorobiphenyl	57465-28-8	No data	No TRV	No data
3,3',4,4'-Tetrachlorobiphenyl	32598-13-3	No data	No TRV	No data
3,4,4',5-Tetrachlorobiphenyl	70362-50-4	No data	No TRV	No data
Polychlorinated biphenyls (PCBs)[a]	1336-36-3	Mortality	2.51E+03	Rhett and others (1989) in EPA (1999)
	Phthalates			
Bis(2-ethylhexyl) phthalate (DEHP)	117-81-7	No data	No TRV	No data
Butylbenzyl phthalate	85-68-7	No data	No TRV	No data
Dibutyl phthalate	84-74-2	No data	No TRV	No data
Diethyl phthalate	84-66-2	No data	No TRV	No data
Dimethyl phthalate	131-11-3	Mortality	2.00E+05	Neuhauser and others (1986) in Efroymson and others (1997b)
n-Dioctyl phthalate	117-84-0	No data	No TRV	No data
	Light Polycyclic Aromatic Hydrocarbons (molecular weight <200 g/mole)			
2-Chloronaphthalene	91-58-7	No data	No TRV	No data
2-Methyl naphthalene	91-57-6	No data	No TRV	No data
5-Nitroacenaphthene	602-87-9	No data	No TRV	No data
Acenaphthene	83-32-9	No data	No TRV	No data
Acenaphthylene	208-96-8	No data	No TRV	No data
Anthracene	120-12-7	No data	No TRV	No data
Fluorene	86-73-7	Mortality	3.00E+04	Neuhauser and others (1986) in Efroymson and others (1997b)
Indene	95-13-6	No data	No TRV	No data
Naphthalene	91-20-3	No data	No TRV	No data

Table C3-2 Derivation of Soil Toxicity Reference Values (TRVs) for Exposure of Terrestrial Invertebrates to COPCs and ROPCs

Constituent of Potential Concern	CAS Registry Number	Effect	TRV (EC × DCF × ECF)	Source
Phenanthrene	85-01-8	No data	No TRV	No data
Pyrene	129-00-0	No data	No TRV	No data
Heavy Polycyclic Aromatic Hydrocarbons (molecular weight >200 g/mole)				
3-Methylcholanthrene	56-49-5	No data	No TRV	No data
5-Methylchrysene	3697-24-3	No data	No TRV	No data
Benzo[a]anthracene	56-55-3	NA	2.50E+04	TRV for benzo(a)pyrene used as surrogate (EPA 1999)
Benzo[a]pyrene	50-32-8	Reduced growth	2.50E+04	van Brummelen and Stuijfzand (1993) in EPA (1999)
Benzo[a,i]pyrene	191-30-0	No data	No TRV	No data
Benzo[b]fluoranthene	205-99-2	NA	2.50E+04	TRV for benzo(a)pyrene used as surrogate (EPA 1999)
Benzo[e]pyrene	192-97-2	No data	No TRV	No data
Benzo[g,h,i]perylene	191-24-2	No data	No TRV	No data
Benzo[j]fluoranthene	205-82-3	No data	No TRV	No data
Benzo[k]fluoranthene	207-08-9	NA	2.50E+04	TRV for benzo(a)pyrene used as surrogate (EPA 1999)
Chrysene	218-01-9	NA	2.50E+04	TRV for benzo(a)pyrene used as surrogate (EPA 1999)
Dibenz[a,h]acridine	226-36-8	No data	No TRV	EPA (1999)
Dibenz[a,h]anthracene	53-70-3	NA	2.50E+04	TRV for benzo(a)pyrene used as surrogate (EPA 1999)
Dibenz[a,j]acridine	224-42-0	No data	No TRV	No data
Dibenzo[a,e]fluoranthene	5385-75-1	No data	No TRV	No data
Dibenzo[a,e]pyrene	192-65-4	No data	No TRV	No data

Table C3-2 Derivation of Soil Toxicity Reference Values (TRVs) for Exposure of Terrestrial Invertebrates to COPCs and ROPCs

Constituent of Potential Concern	CAS Registry Number	Effect	TRV (EC × DCF × ECF)	Source
Dibenzo[a,h]fluoranthene	No CAS #	No data	No TRV	No data
Dibenzo[a,h]pyrene	189-64-0	No data	No TRV	No data
Dibenzo[a,i]pyrene	189-55-9	No data	No TRV	No data
Fluoranthene	206-44-0	No data	No TRV	No data
Hexachloronaphthalene	1335-87-1	No data	No TRV	No data
Indeno[1,2,3-cd]pyrene	193-39-5	NA	2.50E+04	TRV for benzo(a)pyrene used as surrogate (EPA 1999)
Octachloronaphthalene	2234-13-1	No data	No TRV	No data
Pentachloronaphthalene	1321-64-8	No data	No TRV	No data
Tetrachloronaphthalene	1335-88-2	No data	No TRV	No data
Trichloronaphthalene	1321-65-9	No data	No TRV	No data
Light Substituted Benzene Compounds (molecular weight <200 g/mole)				
1,2,3-Trichlorobenzene	87-61-6	Mortality	2.00E+04	van Gestel and Ma (1990) in Efroymson and others (1997b)
1,2,4-Trichlorobenzene	120-82-1	Mortality	2.00E+04	Neuhauser and others (1986) in Efroymson and others (1997b)
1,2,4-Trimethyl benzene	95-63-6	No data	No TRV	No data
1,2-Dichlorobenzene	95-50-1	No data	No TRV	No data
1,3,5-Trimethyl benzene	108-67-8	No data	No TRV	No data
1,3-Dichlorobenzene	541-73-1	No data	No TRV	No data
1,3-Dinitrobenzene	99-65-0	NA	2.26E+03	TRV for nitrobenzene used as surrogate (EPA 1999)
1,4-Dichlorobenzene	106-46-7	Mortality	2.00E+04	van Gestel and others (1991) in Efroymson and others (1997b)
1,4-Dinitrobenzene	100-25-4	No data	No TRV	No data

Table C3-2 Derivation of Soil Toxicity Reference Values (TRVs) for Exposure of Terrestrial Invertebrates to COPCs and ROPCs

Constituent of Potential Concern	CAS Registry Number	Effect	TRV (EC × DCF × ECF)	Source
2,4,5-Trichlorophenol	95-95-4	Mortality	9.00E+03	van Gestel and Ma (1990) in Efroymson and others (1997b)
2,4,6-Trichlorophenol	88-06-2	Reduced cocoon production	1.00E+04	Neuhauser and others (1986) in Efroymson and others (1997b)
2,4-Dichlorophenol	120-83-2	No data	No TRV	No data
2,4-Dimethylphenol	105-67-9	No data	No TRV	No data
2,4-Dinitrophenol	51-28-5	No data	No TRV	No data
2,4-Dinitrotoluene	121-14-2	No data	No TRV	No data
2,6-Dinitrotoluene	606-20-2	No data	No TRV	No data
2-Chlorophenol	95-57-8	No data	No TRV	No data
2-Chlorotoluene	95-49-8	No data	No TRV	No data
2-Nitrophenol	88-75-5	No data	No TRV	No data
4,6-Dinitro-o-cresol	534-52-1	No data	No TRV	No data
4-Chlorotoluene	106-43-4	No data	No TRV	No data
4-Nitrophenol	100-02-7	Reduced cocoon production	7.00E+03	Neuhauser and others (1986) in Efroymson and others (1997b)
alpha-Methylstyrene	98-83-9	No data	No TRV	No data
Aniline	62-53-3	No data	No TRV	No data
Benzotrichloride	98-07-7	No data	No TRV	No data
Benzyl chloride	100-44-7	No data	No TRV	No data
Bromobenzene	108-86-1	No data	No TRV	No data
Chlorobenzene	108-90-7	Mortality	4.00E+04	van Gestel and others (1991) in Efroymson and others (1997b)
Cumene	98-82-8	No data	No TRV	No data
m-Cresol	108-39-4	No data	No TRV	No data

Table C3-2 Derivation of Soil Toxicity Reference Values (TRVs) for Exposure of Terrestrial Invertebrates to COPCs and ROPCs

Constituent of Potential Concern	CAS Registry Number	Effect	TRV (EC × DCF × ECF)	Source
n-Butyl benzene	104-51-8	No data	No TRV	No data
Nitrobenzene	98-95-3	Mortality	2.26E+03	Neuhauser and others (1986) in EPA (1999)
n-Propyl benzene	103-65-1	No data	No TRV	No data
o-Cresol	95-48-7	No data	No TRV	No data
o-Dinitrobenzene	528-29-0	No data	No TRV	No data
o-Nitroaniline	88-74-4	No data	No TRV	No data
o-Toluidine	95-53-4	No data	No TRV	No data
p-Chloroaniline	106-47-8	Mortality	3.00E+04	van Gestel and Ma (1993) in Efroymson and others (1997b)
p-Cresol	106-44-5	No data	No TRV	No data
Phenol	108-95-2	Mortality	3.00E+04	Neuhauser and others (1986) in Efroymson and others (1997b)
p-Nitrochlorobenzene	100-00-5	No data	No TRV	No data
p-Toluidine	106-49-0	No data	No TRV	No data
sec-Butyl benzene	135-98-8	No data	No TRV	No data
tert-Butyl benzene	98-06-6	No data	No TRV	No data
Toluene-2,6-diamine	823-40-5	No data	No TRV	No data
Trimethyl benzene	25551-13-7	No data	No TRV	No data
Other Light Semivolatile Compounds (molecular weight <200 g/mole)				
1,1'-Biphenyl	92-52-4	No data	No TRV	No data
1,1-Dimethylhydrazine	57-14-7	No data	No TRV	No data
1,2-Dimethylhydrazine	540-73-8	No data	No TRV	No data
1,2-Diphenylhydrazine	122-66-7	No data	No TRV	No data
1,3-Propane sultone	1120-71-4	No data	No TRV	No data
2,4-Toluene diisocyanate	584-84-9	No data	No TRV	No data
2-Chloroacetophenone	532-27-4	No data	No TRV	No data

Table C3-2 Derivation of Soil Toxicity Reference Values (TRVs) for Exposure of Terrestrial Invertebrates to COPCs and ROPCs

Constituent of Potential Concern	CAS Registry Number	Effect	TRV (EC × DCF × ECF)	Source
2-Propenoic acid	79-10-7	No data	No TRV	No data
4,4'-Methylenedianiline	101-77-9	No data	No TRV	No data
Acetophenone	98-86-2	No data	No TRV	No data
Benzoic acid	65-85-0	No data	No TRV	No data
bis(2-Chloroethoxy)methane	111-91-1	No data	No TRV	No data
bis(2-Chloroethyl) ether	111-44-4	No data	No TRV	No data
Chlorocyclopentadiene	41851-50-7	No data	No TRV	No data
Cyclohexanol	108-93-0	No data	No TRV	No data
Dichloroisopropyl ether	108-60-1	No data	No TRV	No data
Dichloromethyl ether	542-88-1	No data	No TRV	No data
Dichloropentadiene	61626-71-9	No data	No TRV	No data
Dimethyl sulfate	77-78-1	No data	No TRV	No data
Dimethylaniline	121-69-7	No data	No TRV	No data
Di-n-propylnitrosamine	621-64-7	No data	No TRV	No data
Diphenyl ether	101-84-8	No data	No TRV	No data
Epichlorohydrin	106-89-8	No data	No TRV	No data
Ethyl carbamate (urethane)	51-79-6	No data	No TRV	No data
Ethyl methanesulfonate	62-50-0	No data	No TRV	No data
Ethylene dibromide	106-93-4	No data	No TRV	No data
Ethylene glycol	107-21-1	No data	No TRV	No data
Ethylene glycol monobutyl ether	111-76-2	No data	No TRV	No data
Ethylene glycol monoethyl ether acetate	111-15-9	No data	No TRV	No data
Ethylene thiourea	96-45-7	No data	No TRV	No data
Furfural	98-01-1	No data	No TRV	No data
Maleic hydrazide	123-33-1	No data	No TRV	No data
Malononitrile	109-77-3	No data	No TRV	No data
Methyl styrene (mixed isomers)	25013-15-4	No data	No TRV	No data
Methylhydrazine	60-34-4	No data	No TRV	No data
N,N-Diphenylamine	122-39-4	No data	No TRV	No data
Nitric acid, propyl ester	627-13-4	No data	No TRV	No data
N-Nitrosodi-n-butylamine	924-16-3	No data	No TRV	No data

Table C3-2 Derivation of Soil Toxicity Reference Values (TRVs) for Exposure of Terrestrial Invertebrates to COPCs and ROPCs

Constituent of Potential Concern	CAS Registry Number	Effect	TRV (EC × DCF × ECF)	Source
N-Nitrosomorpholine	59-89-2	No data	No TRV	No data
N-Nitroso-N,N-dimethylamine	62-75-9	No data	No TRV	No data
o-Anisidine	90-04-0	No data	No TRV	No data
Oxalic acid	144-62-7	No data	No TRV	No data
Phthalic anhydride	85-44-9	No data	No TRV	No data
p-Phthalic acid	100-21-0	No data	No TRV	No data
Pyridine	110-86-1	No data	No TRV	No data
Quinoline	91-22-5	No data	No TRV	No data
Quinone	106-51-4	No data	No TRV	No data
Safrole	94-59-7	No data	No TRV	No data
Tetrahydrofuran	109-99-9	No data	No TRV	No data
Other Heavy Semivolatile Compounds (molecular weight >200 g/mole)				
1,2,4,5-Tetrachlorobenzene	95-94-3	No data	No TRV	No data
1,3,5-Trinitrobenzene	99-35-4	No data	No TRV	No data
2,6-Bis(tert-butyl)-4-methylphenol	128-37-0	No data	No TRV	No data
2-Cyclohexyl-4,6-dinitrophenol	131-89-5	No data	No TRV	No data
2-sec-Butyl-4,6-dinitrophenol	88-85-7	No data	No TRV	No data
3,3'-Dichlorobenzidine	91-94-1	No data	No TRV	No data
3,3'-Dimethoxybenzidine	119-90-4	No data	No TRV	No data
4-Bromophenylphenyl ether	101-55-3	No data	No TRV	No data
Ammonium perfluorooctanoate	3825-26-1	No data	No TRV	No data
Azobenzene	103-33-3	No data	No TRV	No data
Bis(3-tert-butyl-4-hydroxy-6-methyl-phenyl)sulfide	96-69-5	No data	No TRV	No data
Captan	133-06-2	No data	No TRV	No data
Chlorobenzilate	510-15-6	No data	No TRV	No data
Dibutylphosphate	107-66-4	No data	No TRV	No data
Dimethyl aminoazobenzene	60-11-7	No data	No TRV	No data
Hexachlorobenzene	118-74-1	No data	No TRV	No data
Hexachlorobutadiene	87-68-3	No data	No TRV	No data
Hexachlorocyclopentadiene	77-47-4	No data	No TRV	No data

Table C3-2 Derivation of Soil Toxicity Reference Values (TRVs) for Exposure of Terrestrial Invertebrates to COPCs and ROPCs

Constituent of Potential Concern	CAS Registry Number	Effect	TRV (EC × DCF × ECF)	Source
Hexachloroethane	67-72-1	No data	No TRV	No data
Hexachlorophene	70-30-4	No data	No TRV	No data
Hexamethylene-1,5-diisocyanate	822-06-0	No data	No TRV	No data
Mirex	2385-85-5	No data	No TRV	No data
Nitrofen	1836-75-5	No data	No TRV	No data
Pentachlorobenzene	608-93-5	Mortality	1.15E+03	van Gestel and others (1991) in EPA (1999)
Pentachloronitrobenzene	82-68-8	No data	No TRV	No data
Pentachlorophenol	87-86-5	Reduced hatching success	1.00E+04	van Gestel and others (1988) in EPA (1999)
Picric acid	88-89-1	No data	No TRV	No data
Pronamide	23950-58-5	No data	No TRV	No data
Strychnine	57-24-9	No data	No TRV	No data
Terphenyls	26140-60-3	No data	No TRV	No data
Tributyl phosphate	126-73-8	No data	No TRV	No data
Trifluralin	1582-09-8	No data	No TRV	No data
Triphenylamine	603-34-9	No data	No TRV	No data
Herbicides and Organochlorinated Pesticides				
2,4,5-T	93-76-5	No data	No TRV	No data
2,4-D and esters	94-75-7	No data	No TRV	No data
4,4'-DDD	72-54-8	No data	No TRV	No data
4,4'-DDE	72-55-9	No data	No TRV	No data
4,4'-DDT	50-29-3	No data	No TRV	No data
Aldrin	309-00-2	No data	No TRV	No data
alpha-BHC	319-84-6	No data	No TRV	No data
beta-BHC	319-85-7	No data	No TRV	No data
Chlordane	57-74-9	No data	No TRV	No data
Delta-BHC	319-86-8	No data	No TRV	No data
Dieldrin	60-57-1	No data	No TRV	No data
Endothall	145-73-3	No data	No TRV	No data

Table C3-2 Derivation of Soil Toxicity Reference Values (TRVs) for Exposure of Terrestrial Invertebrates to COPCs and ROPCs

Constituent of Potential Concern	CAS Registry Number	Effect	TRV (EC × DCF × ECF)	Source
Endrin	72-20-8	No data	No TRV	No data
gamma-BHC (Lindane)	58-89-9	No data	No TRV	No data
Heptachlor	76-44-8	No data	No TRV	No data
Isodrin	465-73-6	No data	No TRV	No data
Methoxychlor	72-43-5	No data	No TRV	No data
Silvex (2,4,5-TP)	93-72-1	No data	No TRV	No data
Toxaphene	8001-35-2	No data	No TRV	No data
Inorganic Chemicals and Compounds			(mg/kg)	
	Metals			
Aluminum	7429-90-5	No data	No TRV	No data
Antimony	7440-36-0	No data	No TRV	No data
Arsenic	7440-38-2	Reduced cocoon production	2.50E-01	Fischer and Koszorus (1992) in EPA (1999)
Barium	7440-39-3	No data	No TRV	No data
Beryllium	7440-41-7	No data	No TRV	No data
Bismuth	7440-69-9	No data	No TRV	No data
Boron	7440-42-8	No data	No TRV	No data
Cadmium	7440-43-9	Reduced cocoon production	1.00E+01	Bengtsson and others (1986) in EPA (1999)
Calcium	7440-70-2	No data	No TRV	No data
Chromium[b]	18540-29-9	Mortality	2.00E-01	Abbasi and Soni (1983) in EPA (1999)
Cobalt	7440-48-4	No data	No TRV	No data
Copper	7440-50-8	Reduced cocoon production	3.20E+01	Spurgeon and others (1994) in EPA (1999)
Iron	7439-89-6	No data	No TRV	No data
Lead	7439-92-1	Cocoon production	1.00E+02	Bengtsson and others (1986) in EPA (1999)
Lithium	7439-93-2	No data	No TRV	No data
Magnesium	7439-95-4	No data	No TRV	No data

Table C3-2 Derivation of Soil Toxicity Reference Values (TRVs) for Exposure of Terrestrial Invertebrates to COPCs and ROPCs

Constituent of Potential Concern	CAS Registry Number	Effect	TRV (EC × DCF × ECF)	Source
Manganese	7439-96-5	No data	No TRV	No data
Mercury	7439-97-6	No data	No TRV	No data
Mercury - Hg+2	7487-94-7	No data	2.50E+00	TRV for methyl mercury used as surrogate (EPA 1999)
Methylmercury	22967-92-6	Reduced segment regeneration and	2.50E+00	Beyer and others (1985) in EPA (1999)
Molybdenum	7439-98-7	No data	No TRV	No data
Nickel	7440-02-0	Reduced cocoon production	1.00E+02	Malecki and others (1982) in EPA (1999)
Potassium	7440-09-7	No data	No TRV	No data
Rhodium	7440-16-6	No data	No TRV	No data
Selenium	7782-49-2	Reduced cocoon production	7.70E+00	Fischer and Koszorus (1992) in EPA (1999)
Silicon	7440-21-3	No data	No TRV	No data
Silver	7440-22-4	No data	No TRV	No data
Sodium	7440-23-5	No data	No TRV	No data
Strontium	7440-24-6	No data	No TRV	No data
Tantalum	7440-25-7	No data	No TRV	No data
Thallium	7440-28-0	No data	No TRV	No data
Tin	7440-31-5	No data	No TRV	No data
Tungsten	7440-33-7	No data	No TRV	No data
Uranium	7440-61-1	No data	No TRV	No data
Vanadium	7440-62-2	No data	No TRV	No data
Yttrium	7440-65-5	No data	No TRV	No data
Zinc	7440-66-6	Reduced cocoon production	1.99E+02	Spurgeon and others (1994) in EPA (1999)
Zirconium	7440-67-7	No data	No TRV	No data
Non-metals and Anions				
Ammonia/Ammonium	7664-41-7	No data	No TRV	No data

Table C3-2 Derivation of Soil Toxicity Reference Values (TRVs) for Exposure of Terrestrial Invertebrates to COPCs and ROPCs

Constituent of Potential Concern	CAS Registry Number	Effect	TRV (EC × DCF × ECF)	Source
Bromide	24959-67-9	No data	No TRV	No data
Chloride	16887-00-6	No data	No TRV	No data
Cyanide	57-12-5	No data	No TRV	No data
Fluoride	16984-48-8	No data	No TRV	No data
Hydroxide	14280-30-9	No data	No TRV	No data
Iodine	7553-56-2	No data	No TRV	No data
Nitrate	14797-55-8	No data	No TRV	No data
Nitrite	14797-65-0	No data	No TRV	No data
Phosphate	14265-44-2	No data	No TRV	No data
Phosphorus	7723-14-0	No data	No TRV	No data
Sulfate	14808-79-8	No data	No TRV	No data
Total Sulfur	63705-05-5	No data	No TRV	No data
Criteria Pollutants				
Carbon monoxide	630-08-0	No data	No TRV	No data
Nitrogen dioxide	10102-44-0	No data	No TRV	No data
Ozone	10028-15-6	No data	No TRV	No data
Particulate matter	No CAS #	No data	No TRV	No data
Sulfur dioxide	7446-09-5	No data	No TRV	No data
Radionuclides				
All radionuclides combined (rad/d)[c]	No CAS #	Population effects	1.00E+00	IAEA (1992)

Table C3-2 Derivation of Soil Toxicity Reference Values (TRVs) for Exposure of Terrestrial Invertebrates to COPCs and ROPCs

Notes/Sources

No data = No data available.
NA = Not applicable.
CAS = Chemical Abstracts Service.
EC = Concentration that caused the reported effect.
DCF = Duration conversion factor; 1 if chronic, 0.1 if subchronic (Sample and others 1996).
ECF = Endpoint conversion factor; 1 if NOAEL, 0.1 if LOAEL (Sample and others 1996) or inferred from data presented by Efroymson and others (1997b).
NOAEL = No observed adverse effect level.
TRV = Toxicity reference value.
[a] Data for Aroclor-1254 used as representative of polychlorinated biphenyl mixtures.
[b] Values for hexavalent chromium, which is more toxic than trivalent chromium.
[c] TRV is not applicable to single radionuclides. Combined external and internal radiation exposure for terrestrial invertebrates from all radionuclides combined cannot exceed 1 rad/d.

Table C3-3 Derivation of Toxicity Reference Values (TRVs) for Exposure of Mammal Species to COPCs and ROPCs

Constituent of Potential Concern	CAS Registry Number	Test duration	Endpoint	Test species	Test species body weight (kg) BWt	Endpoint dose (ED)	Duration conversion factor (DCF)	Endpoint conversion factor (ECF)	Effect	NOAEL TRV (ED × DCF × ECF)	Source
Organic Compounds						(µg/kgBW/d)				(µg/kgBW/d)	
Aromatic Halogenated Hydrocarbons											
2,3,4,6-Tetrachlorophenol	58-90-2	Subchronic	NOAEL	Rat	3.50E-01	2.50E+04	1.0E-01	1.0E+00	Reduced organ weight	2.50E+03	EPA (1986a) in IRIS (2002)
4-Chloro-3-methylphenol	59-50-7	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Aromatic Nonhalogenated Hydrocarbons											
2-Nitrotoluene	88-72-2	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
4-Nitrobiphenyl	92-93-3	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Benzaldehyde	100-52-7	Subchronic	NOAEL	Rat	3.50E-01	1.43E+05	1.0E-01	1.0E+00	Forestomach lesions, kidney toxicity	1.43E+04	Kluwe and others (1983) in IRIS (2002)
Benzene	71-43-2	Chronic	LOAEL	Mouse	3.00E-02	2.64E+05	1.0E+00	1.0E-01	Impaired reproduction	2.64E+04	Nawrot and Staples (1979) in Sample and others (1996)
Benzyl alcohol	100-51-6	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Ethyl benzene	100-41-4	Subchronic	NOAEL	Rat	3.50E-01	9.71E+04	1.0E-01	1.0E+00	Liver and kidney toxicity	9.71E+03	Wolf and others (1956) in IRIS (2002)
m-Xylene	108-38-3	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
o-Xylene	95-47-6	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
p-Xylene	106-42-3	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Styrene	100-42-5	Subchronic	NOAEL	Dog	1.00E+01	2.00E+05	1.0E-01	1.0E+00	Liver toxicity	2.00E+04	Quast and others (1979) in IRIS (2002)
Toluene	108-88-3	Chronic	LOAEL	Mouse	3.00E-02	2.60E+05	1.0E+00	1.0E-01	Impaired reproduction	2.60E+04	Nawrot and Staples (1979) in Sample and others (1996)
Non-aromatic Nonhalogenated Hydrocarbons											
1,2-Epoxybutane	106-88-7	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
1,3-Butadiene	106-99-0	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
1,4-Dioxane	123-91-1	Chronic	LOAEL	Guinea pig	No data	1.06E+06	1.0E+00	1.0E-01	Lung tumors	1.06E+05	Hoch-Ligeti and Argus (1970) in EPA (1999)
1-Methylpropyl alcohol	78-92-2	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
1-Nitropropane	108-03-2	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
2,2,4-Trimethylpentane	540-84-1	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
2-Butanone	78-93-3	Chronic	NOAEL	Rat	3.50E-01	1.77E+06	1.0E+00	1.0E+00	Decreased fetal birth weight	1.77E+06	Cox and others (1975) in IRIS (2002)
2-Butenaldehyde (2-Butenal)	4170-30-3	Acute	LD50	Rat	3.50E-01	8.00E+03	1.0E-01	1.0E-01	Mortality	8.00E+01	Rinehart (1967) in EPA (1999)
2-Ethoxyethanol	110-80-5	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
2-Heptanone	110-43-0	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
2-Hexanone	591-78-6	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
2-Methoxyethanol	109-86-4	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
2-Methyl-2-propanol	75-65-0	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
2-Methyl-2-propenenitrile	126-98-7	Subchronic	NOAEL	Dog	1.00E+01	3.40E+02	1.0E-01	1.0E+00	Increased liver enzyme levels	3.40E+01	Pozzani and others (1968) in IRIS (2002)
2-Methylaziridine	75-55-8	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
2-Methylpropyl alcohol	78-83-1	Subchronic	NOAEL	Rat	3.50E-01	3.16E+05	1.0E-01	1.0E+00	Hypoactivity and ataxia	3.16E+04	US EPA (1986b) in IRIS (2002)
2-Pentanone	107-87-9	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data

Table C3-3 Derivation of Toxicity Reference Values (TRVs) for Exposure of Mammal Species to COPCs and ROPCs

Constituent of Potential Concern	CAS Registry Number	Test duration	Endpoint	Test species	Test species body weight (kg) BWt	Endpoint dose (ED)	Duration conversion factor (DCF)	Endpoint conversion factor (ECF)	Effect	NOAEL TRV (ED × DCF × ECF)	Source
2-Propanone (Acetone)	67-64-1	Subchronic	NOAEL	Rat	3.50E-01	1.00E+05	1.0E-01	1.0E+00	Liver and kidney toxicity	1.00E+04	EPA (1986g) in EPA (1999)
2-Propene-1-ol	107-18-6	Subchronic	NOAEL	Rat	3.50E-01	4.80E+03	1.0E-01	1.0E+00	Increased liver and kidney weights	4.80E+02	Carpanini and others (1978) in IRIS (2002)
2-Propyl alcohol	67-63-0	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
3-Heptanone	106-35-4	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
3-Methyl-1-butanol	123-51-3	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
3-Methyl-2-butanone	563-80-4	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
3-Pentanone	96-22-0	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
4-Heptanone	123-19-3	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
4-Methyl-2-pentanone	108-10-1	Subchronic	NOAEL	Rat	3.50E-01	2.50E+05	1.0E-01	1.0E+00	Liver/kidney abnormalities	2.50E+04	Microbiological Associates (1986) in Sample and others (1996)
4-Methyl-3-penten-2-one	141-79-7	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
5-Methyl-2-hexanone	110-12-3	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Acetaldehyde	75-07-0	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Acetamide	60-35-5	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Acetic acid	64-19-7	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Acetic acid ethyl ester	141-78-6	Subchronic	NOAEL	Rat	3.50E-01	9.00E+05	1.0E-01	1.0E+00	Mortality	9.00E+04	US EPA (1986c) in IRIS (2002)
Acetic acid n-butyl ester	123-86-4	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Acetonitrile	75-05-8	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Acrolein	107-02-8	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Acrylonitrile	107-13-1	Chronic	LOAEL	Rat	3.50E-01	4.60E+03	1.0E+00	1.0E-01	Lesions and organ effects	4.60E+02	Quast and others (1980) in EPA (1999)
Bis(isopropyl)ether	108-20-3	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Butane	106-97-8	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Carbon disulfide	75-15-0	Chronic	NOAEL	Rabbit	No data	1.10E+04	1.0E+00	1.0E+00	Fetal toxicity/ malformations	1.10E+04	Hardin and others (1981) in IRIS (2002)
Cyanogen	460-19-5	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Cyclohexane	110-82-7	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Cyclohexanone	108-94-1	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Cyclohexene	110-83-8	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Cyclopentane	287-92-3	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Ethyl alcohol	64-17-5	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Ethyl ether	60-29-7	Subchronic	NOAEL	Rat	3.50E-01	5.00E+05	1.0E-01	1.0E+00	Depressed body weights	5.00E+04	US EPA (1986d) in IRIS (2002)
Ethyl methacrylate	97-63-2	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Formaldehyde	50-00-0	Acute	LOAEL	Rat	3.50E-01	2.30E+05	1.0E-01	1.0E-01	Mortality	2.30E+03	Tsuchiya and others (1975) in EPA (1999)
Formamide	75-12-7	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Formic acid	64-18-6	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Formic acid, methyl ester	107-31-3	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data

Table C3-3 Derivation of Toxicity Reference Values (TRVs) for Exposure of Mammal Species to COPCs and ROPCs

Constituent of Potential Concern	CAS Registry Number	Test duration	Endpoint	Test species	Test species body weight (kg) BWt	Endpoint dose (ED)	Duration conversion factor (DCF)	Endpoint conversion factor (ECF)	Effect	NOAEL TRV (ED × DCF × ECF)	Source
Glycidylaldehyde	765-34-4	Subchronic	NOAEL	Rat	3.50E-01	1.09E+03	1.0E-01	1.0E+00	Retardation, enlarged adrenals, hydropic renal pelvis, and hematopoietic effects	1.09E+02	Hine and others (1961) in IRIS (2002)
Methyl acetate	79-20-9	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Methyl alcohol	67-56-1	Subchronic	NOAEL	Rat	3.50E-01	5.00E+05	1.0E-01	1.0E+00	Abnormal liver enzymes and decreased brain weight	5.00E+04	US EPA (1986e) in IRIS (2002)
Methyl isocyanate	624-83-9	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Methyl methacrylate	80-62-6	Chronic	NOAEL	Rat	3.50E-01	1.36E+05	1.0E+00	1.0E+00	No data	1.36E+05	Borzelleca and others (1964) in IRIS (2002)
Methyl tert-butyl ether	1634-04-4	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Methylacetylene	74-99-7	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Methylcyclohexane	108-87-2	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
N,N-Dimethylacetamide	127-19-5	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
n-Butyl alcohol	71-36-3	Subchronic	NOAEL	Rat	3.50E-01	1.25E+05	1.0E-01	1.0E+00	Hypoactivity and ataxia	1.25E+04	US EPA (1986f) in IRIS (2002)
n-Heptane	142-82-5	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
n-Hexane	110-54-3	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Nitromethane	75-52-5	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
n-Nonane	111-84-2	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
n-Octane	111-65-9	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
n-Pentane	109-66-0	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
n-Propionaldehyde	123-38-6	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
n-Propyl alcohol	71-23-8	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
n-Valeraldehyde	110-62-3	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Oxirane	75-21-8	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
p-Cymene	99-87-6	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Phosgene	75-44-5	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Propargyl alcohol	107-19-7	Subchronic	NOAEL	Rat	3.50E-01	5.00E+03	1.0E-01	1.0E+00	Renal and hepatotoxicity	5.00E+02	US EPA (1987a) in IRIS (2002)
Propionic acid	79-09-4	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Propionitrile	107-12-0	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Propylene glycol monomethyl ether	107-98-2	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
p-tert-Butyltoluene	98-51-1	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Triethylamine	121-44-8	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Trimethylamine	75-50-3	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Vinyl acetate	108-05-4	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data

Table C3-3 Derivation of Toxicity Reference Values (TRVs) for Exposure of Mammal Species to COPCs and ROPCs

Constituent of Potential Concern	CAS Registry Number	Test duration	Endpoint	Test species	Test species body weight (kg) BWt	Endpoint dose (ED)	Duration conversion factor (DCF)	Endpoint conversion factor (ECF)	Effect	NOAEL TRV (ED × DCF × ECF)	Source
Non-aromatic Halogenated Hydrocarbons											
1,1,1,2-Tetrachloro-2,2-difluoroethane	76-11-9	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
1,1,1,2-Tetrachloroethane	630-20-6	Chronic	LOAEL	No data	No data	8.93E+04	1.0E+00	1.0E-01	Mineralization of the kidneys in males, hepatic clear cell change in females	8.93E+03	NTP (1983a) in IRIS (2002)
1,1,1-Trichloroethane	71-55-6	Chronic	NOAEL	Mouse	3.50E-02	1.00E+06	1.0E+00	1.0E+00	Impaired reproduction	1.00E+06	Lane and others (1982) in Sample and others (1996)
1,1,2,2-Tetrachloro-1,2-difluoroethane	76-12-0	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
1,1,2,2-Tetrachloroethane	79-34-5	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
1,1,2,2-Tetrachloroethene	127-18-4	Chronic	NOAEL	Mouse	3.00E-02	1.40E+04	1.0E+00	1.0E-01	Hepatotoxicity	1.40E+03	Buben and O'Flaherty (1985) in IRIS (2002)
1,1,2-Trichloroethane	79-00-5	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
1,1,2-Trichloroethylene	79-01-6	Subchronic	LOAEL	Mouse	3.00E-02	1.00E+05	0.07[a]	1.0E-01	Hepatotoxicity	7.00E+02	Buben and O'Flaherty (1985) in IRIS (2002)
1,1-Dichloroethane	75-34-3	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
1,1-Dichloroethene	75-35-4	Chronic	NOAEL	Rat	3.50E-01	3.00E+04	1.0E+00	1.0E+00	Mortality	3.00E+04	Quast and others (1983) in Sample and others (1996)
1,2,2-Trichloro-1,1,2-trifluoroethane	76-13-1	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
1,2,3-Trichloropropane	96-18-4	Subchronic	NOAEL	Rat	3.50E-01	5.71E+03	1.0E-01	1.0E+00	Alterations in clinical chemistry and reduction in red cell mass	5.71E+02	NTP (1983b) in IRIS (2002)
1,2-Dibromo-3-chloropropane	96-12-8	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
1,2-Dichloro-1,1,2,2-tetrafluoroethane	76-14-2	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
1,2-Dichloroethane	107-06-2	Chronic	NOAEL	Mouse	3.50E-02	5.00E+04	1.0E+00	1.0E+00	Impaired reproduction	5.00E+04	Lane and others (1982) in Sample and others (1996)]
1,2-Dichloroethylene	540-59-0	Subchronic	NOAEL	Mouse	3.00E-02	4.52E+05	1.0E-01	1.0E+00	Reduced body weight	4.52E+04	Palmer and others (1979) in Sample and others (1996)
1,2-Dichloropropane	78-87-5	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
1,3-Dichloropropene	542-75-6	Chronic	NOAEL	Rat	3.50E-01	2.50E+03	1.0E+00	1.0E+00	Stomach lesions	2.50E+03	Stott and others (1995) in IRIS (2002)
1,4-Dichloro-2-butene	764-41-0	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
1-Chloroethene	75-01-4	Chronic	NOAEL	Rat	3.50E-01	1.70E+03	1.0E+00	1.0E-01	No data	1.70E+02	Feron and others (1981) in EPA (1999)
2,2-Dichloropropionic acid	75-99-0	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
2-Chloropropane	75-29-6	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
3-Chloropropene (Allyl chloride)	107-05-1	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Bromochloromethane	74-97-5	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Bromodichloromethane	75-27-4	Chronic	LOAEL	Mouse	3.00E-02	1.79E+04	1.0E+00	1.0E-01	Renal cytomegaly	1.79E+03	NTP (1986) in IRIS (2002)
Bromoethene	593-60-2	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Bromoform	75-25-2	Subchronic	NOAEL	Rat	3.50E-01	1.79E+04	1.0E-01	1.0E+00	Hepatic lesions	1.79E+03	NTP (1989) in IRIS (2002)
Bromomethane	74-83-9	Subchronic	NOAEL	Rat	3.50E-01	1.40E+03	1.0E-01	1.0E+00	Epithelial hyperplasia of the forestomach	1.40E+02	Danse and others (1984) in IRIS (2002)

Table C3-3 Derivation of Toxicity Reference Values (TRVs) for Exposure of Mammal Species to COPCs and ROPCs

Constituent of Potential Concern	CAS Registry Number	Test duration	Endpoint	Test species	Test species body weight (kg) BWt	Endpoint dose (ED)	Duration conversion factor (DCF)	Endpoint conversion factor (ECF)	Effect	NOAEL TRV (ED × DCF × ECF)	Source
Carbon tetrachloride	56-23-5	Subchronic	NOAEL	Rat	3.50E-01	7.10E+02	1.0E-01	1.0E+00	Liver lesions	7.10E+01	Bruckner and others (1986) in IRIS (2002)
Chlorodibromomethane	124-48-1	Subchronic	NOAEL	Rat	3.50E-01	2.14E+04	1.0E-01	1.0E+00	Hepatic lesions	2.14E+03	NTP (1985a) in IRIS (2002)
Chlorodifluoromethane	75-45-6	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Chloroethane	75-00-3	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Chloroform	67-66-3	Chronic	NOAEL	Mouse	3.00E-02	6.00E+04	1.0E+00	1.0E+00	Liver degeneration	6.00E+04	Roe and others (1979) in EPA (1999)
Chloromethane	74-87-3	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Chloropentafluoroethane	76-15-3	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
cis-1,2-Dichloroethene	156-59-2	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
cis-1,3-Dichloropropene	10061-01-5	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Cyanogen bromide	506-68-3	Chronic	NOAEL	Rat	3.50E-01	4.40E+04	1.0E+00	1.0E-01	Thyroid effects and myelin degeneration	4.40E+03	Howard and Hanzal (1955) in IRIS (2002)[a]
Cyanogen chloride	506-77-4	Chronic	NOAEL	Rat	3.50E-01	2.53E+04	1.0E+00	1.0E-01	Thyroid effects and myelin degeneration	2.53E+03	Howard and Hanzal (1955) in IRIS (2002)[a]
Dichlorodifluoromethane	75-71-8	Chronic	NOAEL	Rat	3.50E-01	1.50E+04	1.0E+00	1.0E+00	Reduced body weight	1.50E+04	Sherman (1974) in IRIS (2002)
Dichlorofluoromethane	75-43-4	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Dichloromethane	75-09-2	Chronic	NOAEL	Rat	3.50E-01	6.16E+03	1.0E+00	1.0E+00	Liver toxicity	6.16E+03	National Coffee Association (1982) in IRIS (2002)
Difluorodibromomethane	75-61-6	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Hexafluoroacetone	684-16-2	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Iodomethane	74-88-4	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Methylene bromide	74-95-3	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Pentachloroethane	76-01-7	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
trans-1,2-Dichloroethylene	156-60-5	Chronic	NOAEL	Mouse	3.00E-02	1.70E+04	1.0E+00	1.0E-01	Increased serum alkaline phosphatase in male mice	1.70E+03	Barnes and others (1985) in IRIS (2002)
trans-1,3-Dichloropropene	10061-02-6	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Trichloroacetic acid	76-03-9	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Trichlorofluoroethane	27154-33-2	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Trichlorofluoromethane	75-69-4	Chronic	LOAEL	Rat	3.50E-01	3.49E+05	1.0E+00	1.0E-01	Survival and histopathology	3.49E+04	NCI (1978) in IRIS (2002)
Trifluorobromomethane	75-63-8	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Dioxin and Furan Compounds (PCDDs/PCDFs)											
1,2,3,4,6,7,8-Heptachlorodibenzo(p)dioxin	35822-46-9	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
1,2,3,4,6,7,8-Heptachlorodibenzofuran	67562-39-4	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
1,2,3,4,7,8,9-Heptachlorodibenzofuran	55673-89-7	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
1,2,3,4,7,8-Hexachlorodibenzo(p)dioxin	39227-28-6	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
1,2,3,4,7,8-Hexachlorodibenzofuran	70648-26-9	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
1,2,3,6,7,8-Hexachlorodibenzo(p)dioxin	57653-85-7	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
1,2,3,6,7,8-Hexachlorodibenzofuran	57117-44-9	Subchronic	NOAEL	Rat	3.50E-01	1.60E+00	1.0E-01	1.0E+00	Abnormal organ weight	1.60E-01	Poiger and others (1989) in Sample and others (1996)
1,2,3,7,8,9-Hexachlorodibenzo(p)dioxin	19408-74-3	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data

Table C3-3 Derivation of Toxicity Reference Values (TRVs) for Exposure of Mammal Species to COPCs and ROPCs

Constituent of Potential Concern	CAS Registry Number	Test duration	Endpoint	Test species	Test species body weight (kg) BWt	Endpoint dose (ED)	Duration conversion factor (DCF)	Endpoint conversion factor (ECF)	Effect	NOAEL TRV (ED × DCF × ECF)	Source
1,2,3,7,8,9-Hexachlorodibenzofuran	72918-21-9	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
1,2,3,7,8-Pentachlorodibenzo(p)dioxin	40321-76-4	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
1,2,3,7,8-Pentachlorodibenzofuran	57117-41-6	Subchronic	NOAEL	Rat	3.50E-01	1.60E+00	1.0E-01	1.0E+00	Abnormal organ weight	1.60E-01	Poiger and others (1989) in Sample and others (1996)
2,3,4,6,7,8-Hexachlorodibenzofuran	60851-34-5	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
2,3,4,7,8-Pentachlorodibenzofuran	57117-31-4	Subchronic	NOAEL	Rat	3.50E-01	1.60E-01	1.0E-01	1.0E+00	Abnormal organ weight	1.60E-02	Poiger and others (1989) in Sample and others (1996)
2,3,7,8-Tetrachlorodibenzo(p)dioxin	1746-01-6	Chronic	NOAEL	Rat	3.50E-01	1.00E-03	1.0E+00	1.0E+00	Impaired reproduction	1.00E-03	Murray and others (1979) in Sample and others (1996)
2,3,7,8-Tetrachlorodibenzofuran	51207-31-9	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Dibenzofuran	132-64-9	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Octachlorodibenzo(p)dioxin	3268-87-9	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Octachlorodibenzofuran	39001-02-0	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Total dioxins and dibenzofurans	No CAS#	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Polychlorinated Biphenyls (PCBs)											
2,2',3,3',4,4',5-Heptachlorobiphenyl	35065-30-6	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
2,2',3,4,4',5,5'-Heptachlorobiphenyl	35065-29-3	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
2,3,3',4,4',5,5'-Heptachlorobiphenyl	39635-31-9	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
2,3,3',4,4',5'-Hexachlorobiphenyl	69782-90-7	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
2,3,3',4,4',5-Hexachlorobiphenyl	38380-08-4	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
2,3,3',4,4'-Pentachlorobiphenyl	32598-14-4	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
2,3',4,4',5,5'-Hexachlorobiphenyl	52663-72-6	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
2,3,4,4',5-Pentachlorobiphenyl	74472-37-0	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
2',3,4,4',5-Pentachlorobiphenyl	65510-44-3	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
2,3',4,4',5-Pentachlorobiphenyl	31508-00-6	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
3,3',4,4',5,5'-Hexachlorobiphenyl	32774-16-6	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
3,3',4,4',5-Pentachlorobiphenyl	57465-28-8	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
3,3',4,4'-Tetrachlorobiphenyl	32598-13-3	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
3,4,4',5-Tetrachlorobiphenyl	70362-50-4	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Polychlorinated biphenyls (PCBs)[b]	1336-36-3	Subchronic	LOAEL	Mink	1.00E+00	2.06E+01	1.0E-01	1.0E-01	Mortality	2.06E-01	Aulerich and others (1985) in EPA (1999)
Phthalates											
Bis(2-ethylhexyl) phthalate (DEHP)	117-81-7	Chronic	NOAEL	Rat	3.50E-01	6.00E+04	1.0E+00	1.0E+00	Reduced growth rate, abnormal organ weight	6.00E+04	Carpenter and others (1953) in EPA (1999)
Butylbenzyl phthalate	85-68-7	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Dibutyl phthalate	84-74-2	Chronic	NOAEL	Mouse	3.00E-02	5.50E+05	1.0E+00	1.0E+00	Impaired reproduction	5.50E+05	Lamb and others (1987) in Sample and others (1996)
Diethyl phthalate	84-66-2	Chronic	NOAEL	Mouse	3.00E-02	4.58E+06	1.0E+00	1.0E+00	Impaired reproduction	4.58E+06	Lamb and others (1987) in Sample and others (1996)
Dimethyl phthalate	131-11-3	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
n-Dioctyl phthalate	117-84-0	Chronic	NOAEL	Mouse	3.00E-02	7.50E+06	1.0E+00	1.0E+00	No data	7.50E+06	Heindel and others (1989) in EPA (1999)
Light Polycyclic Aromatic Hydrocarbons (molecular weight <200 g/mole)											

Table C3-3 Derivation of Toxicity Reference Values (TRVs) for Exposure of Mammal Species to COPCs and ROPCs

Constituent of Potential Concern	CAS Registry Number	Test duration	Endpoint	Test species	Test species body weight (kg) BWt	Endpoint dose (ED)	Duration conversion factor (DCF)	Endpoint conversion factor (ECF)	Effect	NOAEL TRV (ED × DCF × ECF)	Source
2-Chloronaphthalene	91-58-7	Chronic	NOAEL	Mouse	3.00E-02	2.50E+05	1.0E+00	1.0E+00	Dyspnea, abnormal appearance, liver enlargement	2.50E+05	US EPA (1989a) in IRIS (2002)
2-Methyl naphthalene	91-57-6	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
5-Nitroacenaphthene	602-87-9	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Acenaphthene	83-32-9	Subchronic	NOAEL	Mouse	3.00E-02	1.75E+05	1.0E-01	1.0E+00	Hepatotoxicity	1.75E+04	US EPA (1989b) in IRIS (2002)
Acenaphthylene	208-96-8	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Anthracene	120-12-7	Subchronic	NOAEL	Mouse	3.00E-02	1.00E+06	1.0E-01	1.0E+00	No data	1.00E+05	US EPA (1989c) in IRIS (2002)
Fluorene	86-73-7	Subchronic	NOAEL	No data	No data	1.25E+05	1.0E-01	1.0E+00	Blood abnormalities	1.25E+04	US EPA (1989d) in IRIS (2002)
Indene	95-13-6	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Naphthalene	91-20-3	Subchronic	NOAEL	No data	No data	7.10E+04	1.0E-01	1.0E+00	Decreased body weights in males	7.10E+03	BCL (1980) in IRIS (2002)
Phenanthrene	85-01-8	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Pyrene	129-00-0	Subchronic	NOAEL	No data	No data	7.50E+04	1.0E-01	1.0E+00	Kidney effects	7.50E+03	US EPA (1989e) in IRIS (2002)
Heavy Polycyclic Aromatic Hydrocarbons (molecular weight >200 g/mole)											
3-Methylcholanthrene	56-49-5	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
5-Methylchrysene	3697-24-3	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Benzo[a]anthracene	56-55-3	Acute	LOAEL	Mouse	3.00E-02	1.67E+04	1.0E-01	1.0E-01	Gastrointestinal effects	1.67E+02	Bock and King (1959) in EPA (1999)
Benzo[a]pyrene	50-32-8	Chronic	LOAEL	Mouse	3.00E-02	1.00E+04	1.0E-01	1.0E-01	Impaired reproduction	1.00E+02	Mackenzie and Angevine (1981) in EPA (1999a)
Benzo[a,i]pyrene	191-30-0	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Benzo[b]fluoranthene	205-99-2	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Benzo[e]pyrene	192-97-2	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Benzo[g,h,i]perylene	191-24-2	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Benzo[j]fluoranthene	205-82-3	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Benzo[k]fluoranthene	207-08-9	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Chrysene	218-01-9	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Dibenz[a,h]acridine	226-36-8	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Dibenz[a,h]anthracene	53-70-3	Subchronic	LOAEL	Rat	3.50E-01	2.00E+02	1.0E-01	1.0E-01	Reduced growth rate	2.00E+00	Haddow and others (1937) in EPA (1999)
Dibenz[a,j]acridine	224-42-0	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Dibenzo[a,e]fluoranthene	5385-75-1	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Dibenzo[a,e]pyrene	192-65-4	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Dibenzo[a,h]fluoranthene	No CAS#	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Dibenzo[a,h]pyrene	189-64-0	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Dibenzo[a,i]pyrene	189-55-9	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Fluoranthene	206-44-0	Subchronic	NOAEL	Mouse	3.00E-02	1.25E+05	1.0E-01	1.0E+00	Nephropathy, hematological alterations, and clinical effects	1.25E+04	US EPA (1988a) in IRIS (2002)

Table C3-3 Derivation of Toxicity Reference Values (TRVs) for Exposure of Mammal Species to COPCs and ROPCs

Constituent of Potential Concern	CAS Registry Number	Test duration	Endpoint	Test species	Test species body weight (kg) BWt	Endpoint dose (ED)	Duration conversion factor (DCF)	Endpoint conversion factor (ECF)	Effect	NOAEL TRV (ED × DCF × ECF)	Source
Hexachloronaphthalene	1335-87-1	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Indeno[1,2,3-cd]pyrene	193-39-5	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Octachloronaphthalene	2234-13-1	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Pentachloronaphthalene	1321-64-8	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Tetrachloronaphthalene	1335-88-2	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Trichloronaphthalene	1321-65-9	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Light Substituted Benzene Compounds (molecular weight <200 g/mole)											
1,2,3-Trichlorobenzene	87-61-6	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
1,2,4-Trichlorobenzene	120-82-1	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
1,2,4-Trimethyl benzene	95-63-6	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
1,2-Dichlorobenzene	95-50-1	Chronic	NOAEL	Rat	3.50E-01	8.57E+04	1.0E+00	1.0E+00	No adverse effects observed	8.57E+04	NTP (1985b) in IRIS (2002)
1,3,5-Trimethyl benzene	108-67-8	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
1,3-Dichlorobenzene	541-73-1	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
1,3-Dinitrobenzene	99-65-0	Chronic	NOAEL	Rat	3.50E-01	1.05E+03	1.0E+00	1.0E+00	Impaired reproduction	1.05E+03	Cody and others (1981) in EPA (1999)
1,4-Dichlorobenzene	106-46-7	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
1,4-Dinitrobenzene	100-25-4	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
2,4,5-Trichlorophenol	95-95-4	Subchronic	NOAEL	Rat	3.50E-01	1.00E+05	1.0E-01	1.0E+00	Liver and kidney pathology	1.00E+04	McCollister and others (1961) in IRIS (2002)
2,4,6-Trichlorophenol	88-06-2	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
2,4-Dichlorophenol	120-83-2	Subchronic	NOAEL	Rat	3.50E-01	3.00E+02	1.0E-01	1.0E+00	Decreased delayed hypersensitivity response	3.00E+01	Exon and Koller (1985) in IRIS (2002)
2,4-Dimethylphenol	105-67-9	Subchronic	NOAEL	Mouse	3.00E-02	5.00E+04	1.0E-01	1.0E+00	Lethargy, prostration, and ataxia	5.00E+03	US EPA (1989f) in IRIS (2002)
2,4-Dinitrophenol	51-28-5	Chronic	LOAEL	Human	7.00E+01	2.00E+03	1.0E+00	1.0E-01	Cataract formation	2.00E+02	Horner (1942) in IRIS (2002)
2,4-Dinitrotoluene	121-14-2	Chronic	NOAEL	Dog	No data	3.50E+04	1.0E+00	1.0E+00	Impaired reproduction	3.50E+04	Ellis and others (1979) in EPA (1999)
2,6-Dinitrotoluene	606-20-2	Acute	LOAEL	Dog	No data	4.00E+03	1.0E-01	1.0E-01	Mortality	4.00E+01	Lee and others (1976) in EPA (1999)
2-Chlorophenol	95-57-8	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
2-Chlorotoluene	95-49-8	Chronic	NOAEL	Rat	3.50E-01	2.00E+04	1.0E+00	1.0E+00	Decrease in body weight gain	2.00E+04	Gibson and others (1974) in IRIS (2002)
2-Nitrophenol	88-75-5	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
4,6-Dinitro-o-cresol	534-52-1	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
4-Chlorotoluene	106-43-4	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
4-Nitrophenol	100-02-7	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
alpha-Methylstyrene	98-83-9	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Aniline	62-53-3	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Benzotrichloride	98-07-7	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Benzyl chloride	100-44-7	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Bromobenzene	108-86-1	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data

Table C3-3 Derivation of Toxicity Reference Values (TRVs) for Exposure of Mammal Species to COPCs and ROPCs

Constituent of Potential Concern	CAS Registry Number	Test duration	Endpoint	Test species	Test species body weight (kg) BWt	Endpoint dose (ED)	Duration conversion factor (DCF)	Endpoint conversion factor (ECF)	Effect	NOAEL TRV (ED × DCF × ECF)	Source
Chlorobenzene	108-90-7	Chronic	NOAEL	Dog	1.00E+01	1.90E+04	1.0E+00	1.0E+00	Histopathologic changes in liver	1.90E+04	Monsanto Co. (1967); Knapp and others (1971) in IRIS (2002)
Cumene	98-82-8	Chronic	NOAEL	Rat	3.50E-01	1.10E+05	1.0E+00	1.0E+00	Increased average kidney weight in females	1.10E+05	Wolf and others (1956) in IRIS (2002)
m-Cresol	108-39-4	Subchronic	NOAEL	Rat	3.50E-01	5.00E+04	1.0E-01	1.0E+00	Decreased body weights and neurotoxicity	5.00E+03	US EPA (1986g, 1987b) in IRIS (2002)
n-Butyl benzene	104-51-8	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Nitrobenzene	98-95-3	Subchronic	LOAEL	Rat/Mouse	3.50E-01	4.60E+03	1.0E-01	1.0E-01	Hematologic, adrenal, renal and hepatic lesions	4.60E+01	CIIT (1984) in IRIS (2002)
n-Propyl benzene	103-65-1	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
o-Cresol	95-48-7	Subchronic	NOAEL	Rat	3.50E-01	5.00E+04	1.0E-01	1.0E+00	Decreased body weights and neurotoxicity	5.00E+03	US EPA (1986g, 1987b) in IRIS (2002)
o-Dinitrobenzene	528-29-0	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
o-Nitroaniline	88-74-4	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
o-Toluidine	95-53-4	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
p-Chloroaniline	106-47-8	Chronic	LOAEL	Rat	3.50E-01	1.25E+04	1.0E+00	1.0E-01	Nonneoplastic lesions of splenic capsule	1.25E+03	NCI (1979a) in IRIS (2002)
p-Cresol	106-44-5	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Phenol	108-95-2	Chronic	NOAEL	Rat	3.50E-01	6.00E+04	1.0E+00	1.0E+00	Reduced fetal body weight	6.00E+04	NTP (1983c) in IRIS (2002)
p-Nitrochlorobenzene	100-00-5	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
p-Toluidine	106-49-0	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
sec-Butyl benzene	135-98-8	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
tert-Butyl benzene	98-06-6	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Toluene-2,6-diamine	823-40-5	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Trimethyl benzene	25551-13-7	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Other Light Semivolatile Compounds (molecular weight <200 g/mole)											
1,1'-Biphenyl	92-52-4	Chronic	NOAEL	Rat	3.50E-01	5.00E+04	1.0E+00	1.0E+00	Kidney damage	5.00E+04	Ambrose and others (1960) in IRIS (2002)
1,1-Dimethylhydrazine	57-14-7	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
1,2-Dimethylhydrazine	540-73-8	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
1,2-Diphenylhydrazine	122-66-7	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
1,3-Propane sultone	1120-71-4	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
2,4-Toluene diisocyanate	584-84-9	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
2-Chloroacetophenone	532-27-4	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
2-Propenoic acid	79-10-7	Chronic	NOAEL	Rat	3.50E-01	5.30E+04	1.0E+00	1.0E-01	Reduced pup weight	5.30E+03	BASF (1993) in IRIS (2002)
4,4'-Methylenedianiline	101-77-9	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Acetophenone	98-86-2	Subchronic	NOAEL	Rat	3.50E-01	4.23E+05	1.0E-01	1.0E+00	General toxicity	4.23E+04	Hagen and others (1967) in IRIS (2002)

Table C3-3 Derivation of Toxicity Reference Values (TRVs) for Exposure of Mammal Species to COPCs and ROPCs

Constituent of Potential Concern	CAS Registry Number	Test duration	Endpoint	Test species	Test species body weight (kg) BWt	Endpoint dose (ED)	Duration conversion factor (DCF)	Endpoint conversion factor (ECF)	Effect	NOAEL TRV (ED × DCF × ECF)	Source
Benzoic acid	65-85-0	Chronic	LOAEL	Mouse	3.00E-02	4.00E+04	1.0E+00	1.0E-01	Unknown	4.00E+03	Shtenberg and Ignat'ev (1970) in IRIS (2002)
Bis(2-chloroethoxy)methane	111-91-1	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Bis(2-chloroethyl) ether	111-44-4	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Chlorocyclopentadiene	41851-50-7	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Cyclohexanol	108-93-0	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Dichloroisopropyl ether	108-60-1	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Dichloromethyl ether	542-88-1	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Dichloropentadiene	61626-71-9	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Dimethyl sulfate	77-78-1	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Dimethylaniline	121-69-7	Subchronic	LOAEL	Mouse	3.00E-02	2.23E+04	1.0E-01	1.0E-01	Splenomegaly and hematopoiesis	2.23E+02	Abdo and others (1984b) in IRIS (2002)
di-n-Propylnitrosamine	621-64-7	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Diphenyl ether	101-84-8	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Epichlorohydrin	106-89-8	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Ethyl Carbamate (Urethane)	51-79-6	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Ethyl methanesulfonate	62-50-0	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Ethylene dibromide	106-93-4	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Ethylene glycol	107-21-1	Chronic	NOAEL	Rat	3.50E-01	2.00E+05	1.0E+00	1.0E-01	Kidney toxicity	2.00E+04	DePass and others (1986) in IRIS (2002)
Ethylene glycol monobutyl ether	111-76-2	Subchronic	NOAEL	Rat/Mouse	3.50E-01	5.10E+03	1.0E-01	1.0E+00	Changes in mean corpuscular volume	5.10E+02	NTP (1993) in IRIS (2002)
Ethylene glycol monoethyl ether acetate	111-15-9	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Ethylene thiourea	96-45-7	Chronic	LOAEL	Rat	3.50E-01	2.50E+02	1.0E+00	1.0E-01	Increased incidence of thyroid hyperplasia	2.50E+01	Graham and others (1975) in IRIS (2002)
Furfural	98-01-1	Subchronic	LOAEL	Rat	3.50E-01	7.90E+03	1.0E-01	1.0E-01	Mild hepatocellular vacuolization	7.90E+01	NTP (1981) in IRIS (2002)
Maleic hydrazide	123-33-1	Chronic	LOAEL	Rat	3.50E-01	5.00E+05	1.0E+00	1.0E-01	Renal dysfunction	5.00E+04	Uniroyal Chemical Co. (1981) in IRIS (2002)
Malononitrile	109-77-3	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Methyl styrene (mixed isomers)	25013-15-4	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Methylhydrazine	60-34-4	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
N,N-Diphenylamine	122-39-4	Chronic	NOAEL	Dog	1.00E+01	2.50E+03	1.0E+00	1.0E-01	Increased liver and kidney weights	2.50E+02	Thomas and others (1967) in IRIS (2002)
Nitric acid, propyl ester	627-13-4	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
N-Nitrosodi-n-butylamine	924-16-3	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
N-Nitrosomorpholine	59-89-2	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
N-Nitroso-N,N-dimethylamine	62-75-9	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
o-Anisidine	90-04-0	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Oxalic acid	144-62-7	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Phthalic anhydride	85-44-9	Chronic	LOAEL	Mouse	3.00E-02	1.56E+06	1.0E+00	1.0E-01	Lung and kidney histopathology	1.56E+05	NCI (1979b) in IRIS (2002)
p-Phthalic acid	100-21-0	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data

Table C3-3 Derivation of Toxicity Reference Values (TRVs) for Exposure of Mammal Species to COPCs and ROPCs

Constituent of Potential Concern	CAS Registry Number	Test duration	Endpoint	Test species	Test species body weight (kg) BWt	Endpoint dose (ED)	Duration conversion factor (DCF)	Endpoint conversion factor (ECF)	Effect	NOAEL TRV (ED × DCF × ECF)	Source
Pyridine	110-86-1	Chronic	NOAEL	Rat	3.50E-01	1.00E+03	1.0E+00	1.0E-01	Increased liver weight	1.00E+02	US EPA (1986h) in IRIS (2002)
Quinoline	91-22-5	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Quinone	106-51-4	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Safrole	94-59-7	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Tetrahydrofuran	109-99-9	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Other Heavy Semivolatile Compounds (molecular weight >200 g/mole)											
1,2,4,5-Tetrachlorobenzene	95-94-3	Subchronic	NOAEL	Rat	3.50E-01	3.40E+02	1.0E-01	1.0E+00	Kidney lesions	3.40E+01	Chu and others (1984) in IRIS (2002)
1,3,5-Trinitrobenzene	99-35-4	Chronic	NOAEL	Rat	3.50E-01	2.68E+03	1.0E+00	1.0E+00	Abnormal hematology	2.68E+03	Reddy and others (1997) in IRIS (2002)
2,6-Bis(tert-butyl)-4-methylphenol	128-37-0	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
2-Cyclohexyl-4,6-dinitrophenol	131-89-5	Subchronic	LOAEL	Human	7.00E+01	2.00E+03	1.0E-01	1.0E-01	Cataract formation	2.00E+01	Horner (1942) in IRIS (2002)
2-sec-Butyl-4,6-dinitrophenol	88-85-7	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
3,3'-Dichlorobenzidine	91-94-1	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
3,3'-Dimethoxybenzidine	119-90-4	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
4-Bromophenylphenyl ether	101-55-3	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Ammonium perfluorooctanoate	3825-26-1	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Azobenzene	103-33-3	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Bis(3-tert-butyl-4-hydroxy-6-methyl-phenyl)sulfide	96-69-5	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Captan	133-06-2	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Chlorobenzilate	510-15-6	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Dibutylphosphate	107-66-4	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Dimethyl aminoazobenzene	60-11-7	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Hexachlorobenzene	118-74-1	Chronic	NOAEL	Rat	3.50E-01	1.60E+03	1.0E+00	1.0E+00	No data	1.60E+03	Grant and others (1977) in EPA (1999)
Hexachlorobutadiene	87-68-3	Chronic	NOAEL	Rat	3.50E-01	2.00E+02	1.0E+00	1.0E+00	Kidney neoplasms	2.00E+02	Kociba and others (1977) in EPA (1999)
Hexachlorocyclopentadiene	77-47-4	Subchronic	NOAEL	Rat	3.50E-01	3.80E+04	1.0E-01	1.0E+00	Stomach lesions	3.80E+03	Abdo and others (1984a) in EPA (1999)
Hexachloroethane	67-72-1	Subchronic	NOAEL	Rat	3.50E-01	1.00E+03	1.0E-01	1.0E+00	Atrophy and degeneration of renal tubules	1.00E+02	Gorzinski and others (1985) in IRIS (2002)
Hexachlorophene	70-30-4	Acute	LD50	Rat	3.50E-01	5.60E+05	1.0E-01	1.0E-01	Mortality	5.60E+03	Meister (1994) in EPA (1999)
Hexamethylene-1,5-diisocyanate	822-06-0	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Mirex	2385-85-5	Chronic	NOAEL	Rat	3.50E-01	7.00E+01	1.0E+00	1.0E+00	Liver cytomegaly	7.00E+01	NTP (1990) in IRIS (2002)
Nitrofen	1836-75-5	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Pentachlorobenzene	608-93-5	Chronic	NOAEL	Rat	3.50E-01	7.25E+03	1.0E+00	1.0E+00	Abnormal organ weight	7.25E+03	Linder and others (1980) in EPA (1999)
Pentachloronitrobenzene	82-68-8	Chronic	NOAEL	Mouse	3.00E-02	4.58E+05	1.0E+00	1.0E+00	No data	4.58E+05	National Toxiciolgy Program (1987) in EPA (1999)
Pentachlorophenol	87-86-5	Subchronic	NOAEL	Rat	3.50E-01	3.00E+03	1.0E-01	1.0E+00	Impaired reproduction	3.00E+02	Schwetz and others (1978) in EPA (1999)
Picric acid	88-89-1	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data

Table C3-3 Derivation of Toxicity Reference Values (TRVs) for Exposure of Mammal Species to COPCs and ROPCs

Constituent of Potential Concern	CAS Registry Number	Test duration	Endpoint	Test species	Test species body weight (kg) BWt	Endpoint dose (ED)	Duration conversion factor (DCF)	Endpoint conversion factor (ECF)	Effect	NOAEL TRV (ED × DCF × ECF)	Source
Pronamide	23950-58-5	Chronic	NOAEL	Dog	1.00E+01	7.50E+03	1.0E+00	1.0E-01	No effects	7.50E+02	Rohm & Hass, Co. (1970) in IRIS (2002)
Strychnine	57-24-9	Subchronic	LOAEL	Rat	3.50E-01	2.50E+03	1.0E-01	1.0E-01	Toxicity/ histopathology	2.50E+01	Seidl and Zbinden (1982) in IRIS (2002)
Terphenyls	26140-60-3	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Tributyl phosphate	126-73-8	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Trifluralin	1582-09-8	Chronic	NOAEL	Dog	1.00E+01	7.50E+02	1.0E-01	1.0E+00	Increased liver weights	7.50E+01	Hoechst Aktiengesellschaft (1984) in IRIS (2002)
Triphenylamine	603-34-9	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Herbicides and Organochlorinated Pesticides											
2,4,5-T	93-76-5	Chronic	NOAEL	Rat	3.50E-01	3.00E+03	1.0E+00	1.0E+00	Increased urinary coproporphyrins	3.00E+03	Smith and others (1981) in IRIS (2002)
2,4-D and esters	94-75-7	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
4,4'-DDD	72-54-8	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
4,4'-DDE	72-55-9	Subchronic	NOAEL	Rat	3.50E-01	1.00E+04	1.0E-01	1.0E+00	No data	1.00E+03	Kornburst and others (1986) in EPA (1999)
4,4'-DDT	50-29-3	Chronic	NOAEL	Rat	3.50E-01	8.00E+02	1.0E+00	1.0E+00	Impaired reproduction	8.00E+02	Fitzhugh (1948) in Sample and others (1996)
Aldrin	309-00-2	Chronic	NOAEL	Rat	3.50E-01	2.00E+02	1.0E+00	1.0E+00	Impaired reproduction	2.00E+02	Treon and Cleveland (1955) in Sample and others (1996)
alpha-BHC	319-84-6	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
beta-BHC	319-85-7	Subchronic	NOAEL	Rat	3.50E-01	4.00E+00	1.0E-01	1.0E+00	Reduced growth	4.00E-01	Van Velsen and others (1986) in Sample and others (1996)
Chlordane	57-74-9	Chronic	NOAEL	Mouse	3.00E-02	4.58E+03	1.0E+00	1.0E+00	Impaired reproduction	4.58E+03	Keplinger and others (1968) in Sample and others (1996)
delta-BHC	319-86-8	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Dieldrin	60-57-1	Chronic	Loael	Rat	3.50E-01	2.00E+02	1.0E+00	1.0E-01	Impaired reproduction	2.00E+01	Treon and Cleveland (1955) in Sample and others (1996)
Endothall	145-73-3	Chronic	NOAEL	Dog	1.00E+01	2.00E+03	1.0E+00	1.0E+00	Increased weight of stomach and small intestine	2.00E+03	Pennwalt Agchem. (1965) in IRIS (2002)
Endrin	72-20-8	Chronic	LOAEL	Mouse	3.00E-02	9.20E+02	1.0E+00	1.0E-01	Impaired reproduction	9.20E+01	Good and Ware (1969) in Sample and others (1996)
gamma-BHC (Lindane)	58-89-9	Chronic	NOAEL	Rat	3.50E-01	8.00E+03	1.0E+00	1.0E+00	Impaired reproduction	8.00E+03	Palmer and others (1978) in Sample and others (1996)
Heptachlor	76-44-8	Subchronic	LOAEL	Rat	3.50E-01	2.50E+02	1.0E-01	1.0E-01	Mortality	2.50E+00	Green (1970) in EPA (1999)
Isodrin	465-73-6	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Methoxychlor	72-43-5	Chronic	NOAEL	No data	No data	5.01E+03	1.0E+00	1.0E+00	Excessive loss of litters	5.01E+03	Kincaid Enterprises (1986) in IRIS (2002)
Silvex (2,4,5-TP)	93-72-1	Chronic	NOAEL	Dog	1.00E+01	7.50E+02	1.0E+00	1.0E+00	Liver abnormalities	7.50E+02	Mullison (1966), Gehring and Betso (1978) in IRIS (2002)

Table C3-3 Derivation of Toxicity Reference Values (TRVs) for Exposure of Mammal Species to COPCs and ROPCs

Constituent of Potential Concern	CAS Registry Number	Test duration	Endpoint	Test species	Test species body weight (kg) BWt	Endpoint dose (ED)	Duration conversion factor (DCF)	Endpoint conversion factor (ECF)	Effect	NOAEL TRV (ED × DCF × ECF)	Source
Toxaphene	8001-35-2	Chronic	NOAEL	Rat	3.50E-01	8.00E+03	1.0E+00	1.0E+00	Impaired reproduction	8.00E+03	Kennedy and others (1973) in Sample and others (1996)
Inorganic Chemicals and Compounds						(mg/kgBW/d)				(mg/kgBW/d)	
	Metals										
Aluminum	7429-90-5	Chronic	LOAEL	Rat	3.50E-01	1.93E+01	1.0E+00	1.0E-01	Reduced growth	1.93E+00	Ondreicka and others (1966) in EPA (1999)
Antimony	7440-36-0	Chronic	LOAEL	Rat	3.50E-01	6.60E-01	1.0E+00	1.0E-01	Mortality	6.60E-02	Schroeder and others (1970) in EPA (1999)
Arsenic	7440-38-2	Chronic	NOAEL	Dog	No data	1.25E+00	1.0E+00	1.0E+00	Impaired reproduction	1.25E+00	Byron and others (1967) in EPA (1999)
Barium	7440-39-3	Chronic	NOAEL	Rat	4.35E-01	5.10E-01	1.0E+00	1.0E+00	Reduced growth	5.10E-01	Perry and others (1983) in EPA (1999)
Beryllium	7440-41-7	Chronic	NOAEL	Rat	3.50E-01	6.60E-01	1.0E+00	1.0E+00	Reduced longevity	6.60E-01	Schroeder and Mitchner (1975) in EPA (1999)
Bismuth	7440-69-9	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Boron	7440-42-8	Chronic	NOAEL	Rat	3.50E-01	2.80E+01	1.0E+00	1.0E+00	Impaired reproduction	2.80E+01	Weir and Fisher (1972) in Sample and others (1996)
Cadmium	7440-43-9	Chronic	LOAEL	Mouse	3.00E-02	2.52E+00	1.0E+00	1.0E-02	Impaired reproduction	2.52E-02	Schroeder and Mitchner (1971) in EPA (1999)
Calcium	7440-70-2	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Chromium[c]	18540-29-9	Chronic	NOAEL	Rat	3.50E-01	3.50E+00	1.0E+00	1.0E+00	No data	3.50E+00	MacKenzie and others (1958) in EPA (1999)
Cobalt	7440-48-4	Subchronic	NOAEL	Rat	3.50E-01	2.86E+00	1.0E-01	1.0E+00	Mortality	2.86E-01	Underhill and others (1931) in Clayton and Clayton (1981)
Copper	7440-50-8	Chronic	NOAEL	Mink	1.00E+00	1.20E+01	1.0E+00	1.0E+00	Impaired reproduction	1.20E+01	Aulerich and others (1982) in EPA (1999)
Iron	7439-89-6	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Lead	7439-92-1	Chronic	LOAEL	Rat	3.50E-01	3.75E+00	1.0E+00	1.0E-02	Mortality	3.75E-02	Schroeder and Mitchner (1971) in EPA (1999)
Lithium	7439-93-2	Chronic	NOAEL	Rat	3.50E-01	9.39E+00	1.0E+00	1.0E+00	Impaired reproduction	9.39E+00	Marathe and Thomas (1986) in Sample and others (1996)
Magnesium	7439-95-4	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Manganese	7439-96-5	Chronic	NOAEL	Rat	3.50E-01	8.80E+01	1.0E+00	1.0E+00	Impaired reproduction	8.80E+01	Laskey and others (1982) in Sample and others (1996)
Mercury	7439-97-6	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Mercury - Hg+2	7487-94-7	Chronic	NOAEL	Mink	1.00E+00	1.01E+00	1.0E+00	1.0E+00	Impaired reproduction	1.01E+00	Aulerich and others (1974) in EPA (1999)
Methylmercury	22967-92-6	Subchronic	NOAEL	Rat	3.50E-01	3.20E-02	1.0E+00	1.0E+00	Impaired reproduction	3.20E-02	Verschuuren and others (1976a, 1976b) in EPA (1999)
Molybdenum	7439-98-7	Chronic	LOAEL	Mouse	3.00E-02	2.58E+00	1.0E+00	1.0E-01	Impaired reproduction	2.58E-01	Schroeder and Mitchner (1971) in Sample and others (1996)

Table C3-3 Derivation of Toxicity Reference Values (TRVs) for Exposure of Mammal Species to COPCs and ROPCs

Constituent of Potential Concern	CAS Registry Number	Test duration	Endpoint	Test species	Test species body weight (kg) BWt	Endpoint dose (ED)	Duration conversion factor (DCF)	Endpoint conversion factor (ECF)	Effect	NOAEL TRV (ED × DCF × ECF)	Source
Nickel	7440-02-0	Chronic	NOAEL	Rat	3.50E-01	5.00E+01	1.0E+00	1.0E+00	Impaired reproduction	5.00E+01	Ambrose and others (1976) in EPA (1999)
Potassium	7440-09-7	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Rhodium	7440-16-6	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Selenium	7782-49-2	Chronic	LOAEL	Mouse	3.00E-02	7.60E-01	1.0E+00	1.0E-01	Mortality	7.60E-02	Schroeder and Mitchner (1971) in EPA (1999)
Silicon	7440-21-3	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Silver	7440-22-4	Chronic	LOAEL	Mouse	3.00E-02	3.75E+00	1.0E+00	1.0E-01	Hypoactivity	3.75E-01	Rungby and Danscher (1984) in EPA (1999)
Sodium	7440-23-5	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Strontium	7440-24-6	Chronic	NOAEL	Rat	3.50E-01	2.63E+02	1.0E+00	1.0E+00	Reduced body weight	2.63E+02	Skoryna (1981) in Sample and others (1996)
Tantalum	7440-25-7	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Thallium	7440-28-0	Subchronic	LOAEL	Rat	3.65E-01	1.31E+00	1.0E-01	1.0E-01	Impaired reproduction	1.31E-02	Formigli and others (1986) in EPA (1999)
Tin	7440-31-5	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Tungsten	7440-33-7	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Uranium	7440-61-1	Chronic	NOAEL	Mouse	3.00E-02	3.07E+00	1.0E+00	1.0E+00	Impaired reproduction	3.07E+00	Paternain and others (1989) in Sample and others (1996)
Vanadium	7440-62-2	Chronic	LOAEL	Rat	2.60E-01	2.10E+00	1.0E+00	1.0E-01	Impaired reproduction	2.10E-01	Domingo and others (1986) in Sample and others (1996)
Yttrium	7440-65-5	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Zinc	7440-66-6	Subchronic	NOAEL	Mouse	3.00E-02	1.04E+02	1.0E-01	1.0E+00	No data	1.04E+01	Maita and others (1981) in EPA (1999)
Zirconium	7440-67-7	Chronic	NOAEL	Mouse	3.00E-02	1.74E+00	1.0E+00	1.0E+00	No adverse effects observed	1.74E+00	Schroeder and others (1968) in Sample and others (1996)
Non-metals and Anions											
Ammonia/Ammonium	7664-41-7	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Bromide	24959-67-9	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Chloride	16887-00-6	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Cyanide	57-12-5	Chronic	NOAEL	Rat	3.50E-01	2.40E+01	1.0E+00	1.0E+00	No data	2.40E+01	Howard and Hanzal (1955) in EPA (1999)
Fluoride	16984-48-8	Chronic	NOAEL	Mink	1.00E+00	3.14E+01	1.0E+00	1.0E+00	Impaired reproduction	3.14E+01	Aulerich and others (1987) in Sample and others (1996)
Hydroxide	14280-30-9	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Iodine	7553-56-2	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Nitrate	14797-55-8	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Nitrite	14797-65-0	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Phosphate	14265-44-2	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Phosphorus	7723-14-0	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Sulfate	14808-79-8	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Total Sulfur	63705-05-5	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Criteria Pollutants											
Carbon monoxide	630-08-0	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Nitrogen dioxide	10102-44-0	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data

Table C3-3 Derivation of Toxicity Reference Values (TRVs) for Exposure of Mammal Species to COPCs and ROPCs

Constituent of Potential Concern	CAS Registry Number	Test duration	Endpoint	Test species	Test species body weight (kg) BWt	Endpoint dose (ED)	Duration conversion factor (DCF)	Endpoint conversion factor (ECF)	Effect	NOAEL TRV (ED × DCF × ECF)	Source
Ozone	10028-15-6	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Particulate matter	No CAS#	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Sulfur dioxide	7446-09-5	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Radionuclides											
All radionuclides combined (rad/d)[d]	No CAS #	Chronic	Adverse effects	Mammals	NA	NA	NA	NA	Population effects	1.00E-01	IAEA (1992)

Notes/Sources

No data = No data available.
NA = Not applicable.
CAS = Chemical Abstracts Service.
ED = Dose that caused the reported effect.
DCF = Duration conversion factor; 1 if chronic, 0.1 if subchronic (Sample and others 1996) or inferred from information presented in EPA (1999) Table E-7.
ECF = Endpoint conversion factor; 1 if NOAEL, 0.1 if LOAEL (Sample and others 1996) or inferred from information presented in EPA (1999) Table E-7.
TRV = Toxicity reference value.
LOAEL = Lowest observed adverse effect level.
NOAEL = No observed adverse effect level.

[a] Subchronic-to-chronic conversion factor of 0.1 multiplied by 0.7 to adjust for 5 d/wk exposure.

[b] Data for Aroclor-1254 used as representative of polychlorinated biphenyl mixtures.

[c] Values for hexavalent chromium, which is more toxic than trivalent chromium.

[d] TRV is not applicable to single radionuclides. Combined external and internal radiation exposure for mammals from all radionuclides combined cannot exceed 0.1 rad/d.

Table C3-4 Derivation of Toxicity Reference Values (TRVs) for Exposure of Bird Species to COPCs and ROPCs

Constituent of Potential Concern	CAS Registry Number	Test duration	Endpoint	Test species	Test species body weight (kg) BWt	Endpoint dose (ED)	Duration conversion factor (DCF)	Endpoint conversion factor (ECF)	Effect	NOAEL TRV (ED × DCF × ECF)	Source
Organic Compounds						(µg/kgBW/d)				(µg/kgBW/d)	
	Aromatic Halogenated Hydrocarbons										
2,3,4,6-Tetrachlorophenol	58-90-2	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
4-Chloro-3-methylphenol	59-50-7	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
	Aromatic Nonhalogenated Hydrocarbons										
2-Nitrotoluene	88-72-2	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
4-Nitrobiphenyl	92-93-3	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Benzaldehyde	100-52-7	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Benzene	71-43-2	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Benzyl alcohol	100-51-6	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Ethyl benzene	100-41-4	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
m-Xylene	108-38-3	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
o-Xylene	95-47-6	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
p-Xylene	106-42-3	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Styrene	100-42-5	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Toluene	108-88-3	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
	Non-aromatic Nonhalogenated Hydrocarbons										
1,2-Epoxybutane	106-88-7	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
1,3-Butadiene	106-99-0	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
1,4-Dioxane	123-91-1	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
1-Methylpropyl alcohol	78-92-2	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
1-Nitropropane	108-03-2	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
2,2,4-Trimethylpentane	540-84-1	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
2-Butanone	78-93-3	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
2-Butenaldehyde (2-Butenal)	4170-30-3	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
2-Ethoxyethanol	110-80-5	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
2-Heptanone	110-43-0	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
2-Hexanone	591-78-6	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
2-Methoxyethanol	109-86-4	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
2-Methyl-2-propanol	75-65-0	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
2-Methyl-2-propenenitrile	126-98-7	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
2-Methylaziridine	75-55-8	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
2-Methylpropyl alcohol	78-83-1	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
2-Pentanone	107-87-9	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
2-Propanone (Acetone)	67-64-1	Acute	No data	Japanese quail	No data	5.20E+06	1.0E-02	1.0E+00	No data	5.20E+04	Hill and Camardese (1986) in EPA (1999)
2-Propene-1-ol	107-18-6	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
2-Propyl alcohol	67-63-0	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
3-Heptanone	106-35-4	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
3-Methyl-1-butanol	123-51-3	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
3-Methyl-2-butanone	563-80-4	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
3-Pentanone	96-22-0	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
4-Heptanone	123-19-3	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
4-Methyl-2-pentanone	108-10-1	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data

Table C3-4 Derivation of Toxicity Reference Values (TRVs) for Exposure of Bird Species to COPCs and ROPCs

Constituent of Potential Concern	CAS Registry Number	Test duration	Endpoint	Test species	Test species body weight (kg) BWt	Endpoint dose (ED)	Duration conversion factor (DCF)	Endpoint conversion factor (ECF)	Effect	NOAEL TRV (ED × DCF × ECF)	Source
4-Methyl-3-penten-2-one	141-79-7	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
5-Methyl-2-hexanone	110-12-3	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Acetaldehyde	75-07-0	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Acetamide	60-35-5	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Acetic acid	64-19-7	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Acetic acid ethyl ester	141-78-6	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Acetic acid n-butyl ester	123-86-4	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Acetonitrile	75-05-8	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Acrolein	107-02-8	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Acrylonitrile	107-13-1	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Bis(isopropyl)ether	108-20-3	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Butane	106-97-8	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Carbon disulfide	75-15-0	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Cyanogen	460-19-5	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Cyclohexane	110-82-7	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Cyclohexanone	108-94-1	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Cyclohexene	110-83-8	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Cyclopentane	287-92-3	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Ethyl alcohol	64-17-5	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Ethyl ether	60-29-7	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Ethyl methacrylate	97-63-2	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Formaldehyde	50-00-0	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Formamide	75-12-7	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Formic acid	64-18-6	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Formic acid, methyl ester	107-31-3	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Glycidylaldehyde	765-34-4	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Methyl acetate	79-20-9	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Methyl alcohol	67-56-1	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Methyl isocyanate	624-83-9	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Methyl methacrylate	80-62-6	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Methyl tert-butyl ether	1634-04-4	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Methylacetylene	74-99-7	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Methylcyclohexane	108-87-2	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
N,N-Dimethylacetamide	127-19-5	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
n-Butyl alcohol	71-36-3	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
n-Heptane	142-82-5	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
n-Hexane	110-54-3	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Nitromethane	75-52-5	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
n-Nonane	111-84-2	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
n-Octane	111-65-9	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
n-Pentane	109-66-0	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
n-Propionaldehyde	123-38-6	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
n-Propyl alcohol	71-23-8	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
n-Valeraldehyde	110-62-3	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data

Table C3-4 Derivation of Toxicity Reference Values (TRVs) for Exposure of Bird Species to COPCs and ROPCs

Constituent of Potential Concern	CAS Registry Number	Test duration	Endpoint	Test species	Test species body weight (kg) BWt	Endpoint dose (ED)	Duration conversion factor (DCF)	Endpoint conversion factor (ECF)	Effect	NOAEL TRV (ED × DCF × ECF)	Source
Oxirane	75-21-8	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
p-Cymene	99-87-6	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Phosgene	75-44-5	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Propargyl alcohol	107-19-7	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Propionic acid	79-09-4	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Propionitrile	107-12-0	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Propylene glycol monomethyl ether	107-98-2	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
p-tert-Butyltoluene	98-51-1	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Triethylamine	121-44-8	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Trimethylamine	75-50-3	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Vinyl acetate	108-05-4	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Non-aromatic Halogenated Hydrocarbons											
1,1,1,2-Tetrachloro-2,2-difluoroethane	76-11-9	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
1,1,1,2-Tetrachloroethane	630-20-6	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
1,1,1-Trichloroethane	71-55-6	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
1,1,2,2-Tetrachloro-1,2-difluoroethane	76-12-0	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
1,1,2,2-Tetrachloroethane	79-34-5	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
1,1,2,2-Tetrachloroethene	127-18-4	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
1,1,2-Trichloroethane	79-00-5	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
1,1,2-Trichloroethylene	79-01-6	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
1,1-Dichloroethane	75-34-3	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
1,1-Dichloroethene	75-35-4	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
1,2,2-Trichloro-1,1,2-trifluoroethane	76-13-1	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
1,2,3-Trichloropropane	96-18-4	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
1,2-Dibromo-3-chloropropane	96-12-8	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
1,2-Dichloro-1,1,2,2-tetrafluoroethane	76-14-2	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
1,2-Dichloroethane	107-06-2	Chronic	NOAEL	Chicken	1.60E+00	1.72E+04	1.0E+00	1.0E+00	Impaired reproduction	1.72E+04	Alumot and others (1976) in Sample and others (1996)
1,2-Dichloroethylene	540-59-0	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
1,2-Dichloropropane	78-87-5	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
1,3-Dichloropropene	542-75-6	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
1,4-Dichloro-2-butene	764-41-0	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
1-Chloroethene	75-01-4	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
2,2-Dichloropropionic acid	75-99-0	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
2-Chloropropane	75-29-6	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
3-Chloropropene (Allyl chloride)	107-05-1	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Bromochloromethane	74-97-5	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Bromodichloromethane	75-27-4	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Bromoethene	593-60-2	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Bromoform	75-25-2	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Bromomethane	74-83-9	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Carbon tetrachloride	56-23-5	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Chlorodibromomethane	124-48-1	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Chlorodifluoromethane	75-45-6	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data

Table C3-4 Derivation of Toxicity Reference Values (TRVs) for Exposure of Bird Species to COPCs and ROPCs

Constituent of Potential Concern	CAS Registry Number	Test duration	Endpoint	Test species	Test species body weight (kg) BWt	Endpoint dose (ED)	Duration conversion factor (DCF)	Endpoint conversion factor (ECF)	Effect	NOAEL TRV (ED × DCF × ECF)	Source
Chloroethane	75-00-3	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Chloroform	67-66-3	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Chloromethane	74-87-3	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Chloropentafluoroethane	76-15-3	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
cis-1,2-Dichloroethene	156-59-2	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
cis-1,3-Dichloropropene	10061-01-5	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Cyanogen bromide	506-68-3	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Cyanogen chloride	506-77-4	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Dichlorodifluoromethane	75-71-8	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Dichlorofluoromethane	75-43-4	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Dichloromethane	75-09-2	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Difluorodibromomethane	75-61-6	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Hexafluoroacetone	684-16-2	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Iodomethane	74-88-4	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Methylene bromide	74-95-3	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Pentachloroethane	76-01-7	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
trans-1,2-Dichloroethylene	156-60-5	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
trans-1,3-Dichloropropene	10061-02-6	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Trichloroacetic acid	76-03-9	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Trichlorofluoroethane	27154-33-2	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Trichlorofluoromethane	75-69-4	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Trifluorobromomethane	75-63-8	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Dioxin and Furan Compounds (PCDDs/PCDFs)											
1,2,3,4,6,7,8-Heptachlorodibenzo(p)dioxin	35822-46-9	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
1,2,3,4,6,7,8-Heptachlorodibenzofuran	67562-39-4	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
1,2,3,4,7,8,9-Heptachlorodibenzofuran	55673-89-7	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
1,2,3,4,7,8-Hexachlorodibenzo(p)dioxin	39227-28-6	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
1,2,3,4,7,8-Hexachlorodibenzofuran	70648-26-9	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
1,2,3,6,7,8-Hexachlorodibenzo(p)dioxin	57653-85-7	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
1,2,3,6,7,8-Hexachlorodibenzofuran	57117-44-9	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
1,2,3,7,8,9-Hexachlorodibenzo(p)dioxin	19408-74-3	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
1,2,3,7,8,9-Hexachlorodibenzofuran	72918-21-9	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
1,2,3,7,8-Pentachlorodibenzo(p)dioxin	40321-76-4	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
1,2,3,7,8-Pentachlorodibenzofuran	57117-41-6	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
2,3,4,6,7,8-Hexachlorodibenzofuran	60851-34-5	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
2,3,4,7,8-Pentachlorodibenzofuran	57117-31-4	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
2,3,7,8-Tetrachlorodibenzo(p)dioxin	1746-01-6	Subchronic	NOAEL	Ring-necked Pheasant	1.00E+00	1.00E-02	1.0E+00	1.0E+00	Impaired reproduction	1.00E-02	Nosek and others (1992) in EPA (1999)
2,3,7,8-Tetrachlorodibenzofuran	51207-31-9	Subchronic	LOAEL	Chick (1 day old)	1.21E-01	1.00E-01	1.0E-01	1.0E-01	Mortality	1.00E-03	McKinney and others (1976) in Sample and others (1996)
Dibenzofuran	132-64-9	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Octachlorodibenzo(p)dioxin	3268-87-9	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Octachlorodibenzofuran	39001-02-0	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Total dioxins and dibenzofurans	No CAS#	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data

Table C3-4 Derivation of Toxicity Reference Values (TRVs) for Exposure of Bird Species to COPCs and ROPCs

Constituent of Potential Concern	CAS Registry Number	Test duration	Endpoint	Test species	Test species body weight (kg) BWt	Endpoint dose (ED)	Duration conversion factor (DCF)	Endpoint conversion factor (ECF)	Effect	NOAEL TRV (ED × DCF × ECF)	Source
Polychlorinated Biphenyls (PCBs)											
2,2',3,3',4,4',5-Heptachlorobiphenyl	35065-30-6	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
2,2',3,4,4',5,5'-Heptachlorobiphenyl	35065-29-3	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
2,3,3',4,4',5,5'-Heptachlorobiphenyl	39635-31-9	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
2,3,3',4,4',5'-Hexachlorobiphenyl	69782-90-7	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
2,3,3',4,4',5-Hexachlorobiphenyl	38380-08-4	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
2,3,3',4,4'-Pentachlorobiphenyl	32598-14-4	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
2,3',4,4',5,5'-Hexachlorobiphenyl	52663-72-6	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
2,3,4,4',5-Pentachlorobiphenyl	74472-37-0	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
2',3,4,4',5-Pentachlorobiphenyl	65510-44-3	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
2,3',4,4',5-Pentachlorobiphenyl	31508-00-6	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
3,3',4,4',5,5'-Hexachlorobiphenyl	32774-16-6	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
3,3',4,4',5-Pentachlorobiphenyl	57465-28-8	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
3,3',4,4'-Tetrachlorobiphenyl	32598-13-3	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
3,4,4',5-Tetrachlorobiphenyl	70362-50-4	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Polychlorinated biphenyls (PCBs)[a]	1336-36-3	Chronic	LOAEL	Ringed dove	1.55E-01	7.20E+02	1.0E+00	1.0E-01	Impaired reproduction	7.20E+01	Peakall and others (1972) in EPA (1999)
Phthalates											
Bis(2-ethylhexyl) phthalate (DEHP)	117-81-7	Subchronic	NOAEL	Ringed dove	1.55E-01	1.11E+03	1.0E-01	1.0E+00	Impaired reproduction	1.11E+02	Peakall (1974) in EPA (1999)
Butylbenzyl phthalate	85-68-7	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Dibutyl phthalate	84-74-2	Chronic	LOAEL	Ringed dove	1.55E-01	1.11E+03	1.0E-01	1.0E+00	Impaired reproduction	1.11E+02	Peakall (1974) in Sample and others (1996)
Diethyl phthalate	84-66-2	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Dimethyl phthalate	131-11-3	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
n-Dioctyl phthalate	117-84-0	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Light Polycyclic Aromatic Hydrocarbons (molecular weight <200 g/mole)											
2-Chloronaphthalene	91-58-7	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
2-Methyl naphthalene	91-57-6	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
5-Nitroacenaphthene	602-87-9	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Acenaphthene	83-32-9	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Acenaphthylene	208-96-8	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Anthracene	120-12-7	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Fluorene	86-73-7	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Indene	95-13-6	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Naphthalene	91-20-3	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Phenanthrene	85-01-8	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Pyrene	129-00-0	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data

Table C3-4 Derivation of Toxicity Reference Values (TRVs) for Exposure of Bird Species to COPCs and ROPCs

Constituent of Potential Concern	CAS Registry Number	Test duration	Endpoint	Test species	Test species body weight (kg) BWt	Endpoint dose (ED)	Duration conversion factor (DCF)	Endpoint conversion factor (ECF)	Effect	NOAEL TRV (ED × DCF × ECF)	Source
Heavy Polycyclic Aromatic Hydrocarbons (molecular weight >200 g/mole)											
3-Methylcholanthrene	56-49-5	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
5-Methylchrysene	3697-24-3	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Benzo[a]anthracene	56-55-3	Acute	LD50	Chicken (embryo)	No data	7.90E+01	1.0E-02	1.0E+00	Mortality	7.90E-01	Brunström and others (1991) in EPA (1999)
Benzo[a]pyrene	50-32-8	Acute	NOAEL	Chicken (embryo)	No data	1.00E+02	1.0E-02	1.0E+00	Mortality	1.00E+00	Brunström and others (1991) in EPA (1999)
Benzo[a,i]pyrene	191-30-0	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Benzo[b]fluoranthene	205-99-2	NA	NA	NA	NA	NA	NA	NA	NA	1.40E-01	TRV for benzo[k]fluoranthene used as surrogate (EPA 1999)
Benzo[e]pyrene	192-97-2	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Benzo[g,h,i]perylene	191-24-2	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Benzo[j]fluoranthene	205-82-3	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Benzo[k]fluoranthene	207-08-9	Acute	LD50	Chicken (embryo)	No data	1.40E+01	1.0E-02	1.0E+00	Mortality	1.40E-01	Brunström and others (1991) in EPA (1999)
Chrysene	218-01-9	Acute	LOAEL	Chicken (embryo)	No data	1.00E+02	1.0E-02	1.0E+00	Mortality	1.00E+00	Brunström and others (1991) in EPA (1999)
Dibenz[a,h]acridine	226-36-8	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Dibenz[a,h]anthracene	53-70-3	Acute	LD50	Chicken (embryo)	No data	3.90E+01	1.0E-02	1.0E+00	Mortality	3.90E-01	Brunström and others (1991) in EPA (1999)
Dibenz[a,j]acridine	224-42-0	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Dibenzo[a,e]fluoranthene	5385-75-1	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Dibenzo[a,e]pyrene	192-65-4	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Dibenzo[a,h]fluoranthene	No CAS#	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Dibenzo[a,h]pyrene	189-64-0	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Dibenzo[a,i]pyrene	189-55-9	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Fluoranthene	206-44-0	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Hexachloronaphthalene	1335-87-1	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Indeno[1,2,3-cd]pyrene	193-39-5	Acute	LOAEL	Chicken (embryo)	No data	1.00E+02	1.0E-02	1.0E+00	Mortality	1.00E+00	Brunström and others (1991) in EPA (1999)
Octachloronaphthalene	2234-13-1	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Pentachloronaphthalene	1321-64-8	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Tetrachloronaphthalene	1335-88-2	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Trichloronaphthalene	1321-65-9	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Light Substituted Benzene Compounds (molecular weight <200 g/mole)											
1,2,3-Trichlorobenzene	87-61-6	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
1,2,4-Trichlorobenzene	120-82-1	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
1,2,4-Trimethyl benzene	95-63-6	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
1,2-Dichlorobenzene	95-50-1	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
1,3,5-Trimethyl benzene	108-67-8	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
1,3-Dichlorobenzene	541-73-1	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
1,3-Dinitrobenzene	99-65-0	Acute	LD50	Red-winged blackbird	No data	4.20E+01	1.0E-02	1.0E+00	Mortality	4.22E-01	Schafer (1972) in EPA (1999)
1,4-Dichlorobenzene	106-46-7	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data

Table C3-4 Derivation of Toxicity Reference Values (TRVs) for Exposure of Bird Species to COPCs and ROPCs

Constituent of Potential Concern	CAS Registry Number	Test duration	Endpoint	Test species	Test species body weight (kg) BWt	Endpoint dose (ED)	Duration conversion factor (DCF)	Endpoint conversion factor (ECF)	Effect	NOAEL TRV (ED × DCF × ECF)	Source
1,4-Dinitrobenzene	100-25-4	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
2,4,5-Trichlorophenol	95-95-4	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
2,4,6-Trichlorophenol	88-06-2	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
2,4-Dichlorophenol	120-83-2	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
2,4-Dimethylphenol	105-67-9	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
2,4-Dinitrophenol	51-28-5	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
2,4-Dinitrotoluene	121-14-2	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
2,6-Dinitrotoluene	606-20-2	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
2-Chlorophenol	95-57-8	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
2-Chlorotoluene	95-49-8	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
2-Nitrophenol	88-75-5	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
4,6-Dinitro-o-cresol	534-52-1	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
4-Chlorotoluene	106-43-4	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
4-Nitrophenol	100-02-7	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
alpha-Methylstyrene	98-83-9	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Aniline	62-53-3	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Benzotrichloride	98-07-7	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Benzyl chloride	100-44-7	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Bromobenzene	108-86-1	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Chlorobenzene	108-90-7	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Cumene	98-82-8	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
m-Cresol	108-39-4	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
n-Butyl benzene	104-51-8	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Nitrobenzene	98-95-3	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
n-Propyl benzene	103-65-1	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
o-Cresol	95-48-7	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
o-Dinitrobenzene	528-29-0	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
o-Nitroaniline	88-74-4	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
o-Toluidine	95-53-4	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
p-Chloroaniline	106-47-8	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
p-Cresol	106-44-5	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Phenol	108-95-2	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
p-Nitrochlorobenzene	100-00-5	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
p-Toluidine	106-49-0	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
sec-Butyl benzene	135-98-8	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
tert-Butyl benzene	98-06-6	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Toluene-2,6-diamine	823-40-5	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Trimethyl benzene	25551-13-7	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Other Light Semivolatile Compounds (molecular weight <200 g/mole)											
1,1'-Biphenyl	92-52-4	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
1,1-Dimethylhydrazine	57-14-7	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
1,2-Dimethylhydrazine	540-73-8	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
1,2-Diphenylhydrazine	122-66-7	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
1,3-Propane sultone	1120-71-4	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data

Table C3-4 Derivation of Toxicity Reference Values (TRVs) for Exposure of Bird Species to COPCs and ROPCs

Constituent of Potential Concern	CAS Registry Number	Test duration	Endpoint	Test species	Test species body weight (kg) BWt	Endpoint dose (ED)	Duration conversion factor (DCF)	Endpoint conversion factor (ECF)	Effect	NOAEL TRV (ED × DCF × ECF)	Source
2,4-Toluene diisocyanate	584-84-9	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
2-Chloroacetophenone	532-27-4	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
2-Propenoic acid	79-10-7	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
4,4'-Methylenedianiline	101-77-9	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Acetophenone	98-86-2	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Benzoic acid	65-85-0	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Bis(2-chloroethoxy)methane	111-91-1	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Bis(2-chloroethyl) ether	111-44-4	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Chlorocyclopentadiene	41851-50-7	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Cyclohexanol	108-93-0	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Dichloroisopropyl ether	108-60-1	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Dichloromethyl ether	542-88-1	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Dichloropentadiene	61626-71-9	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Dimethyl sulfate	77-78-1	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Dimethylaniline	121-69-7	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
di-n-Propylnitrosamine	621-64-7	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Diphenyl ether	101-84-8	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Epichlorohydrin	106-89-8	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Ethyl Carbamate (Urethane)	51-79-6	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Ethyl methanesulfonate	62-50-0	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Ethylene dibromide	106-93-4	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Ethylene glycol	107-21-1	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Ethylene glycol monobutyl ether	111-76-2	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Ethylene glycol monoethyl ether acetate	111-15-9	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Ethylene thiourea	96-45-7	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Furfural	98-01-1	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Maleic hydrazide	123-33-1	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Malononitrile	109-77-3	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Methyl styrene (mixed isomers)	25013-15-4	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Methylhydrazine	60-34-4	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
N,N-Diphenylamine	122-39-4	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Nitric acid, propyl ester	627-13-4	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
N-Nitrosodi-n-butylamine	924-16-3	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
N-Nitrosomorpholine	59-89-2	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
N-Nitroso-N,N-dimethylamine	62-75-9	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
o-Anisidine	90-04-0	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Oxalic acid	144-62-7	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Phthalic anhydride	85-44-9	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
p-Phthalic acid	100-21-0	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Pyridine	110-86-1	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Quinoline	91-22-5	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Quinone	106-51-4	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Safrole	94-59-7	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Tetrahydrofuran	109-99-9	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data

Table C3-4 Derivation of Toxicity Reference Values (TRVs) for Exposure of Bird Species to COPCs and ROPCs

Constituent of Potential Concern	CAS Registry Number	Test duration	Endpoint	Test species	Test species body weight (kg) BWt	Endpoint dose (ED)	Duration conversion factor (DCF)	Endpoint conversion factor (ECF)	Effect	NOAEL TRV (ED × DCF × ECF)	Source
Other Heavy Semivolatile Compounds (molecular weight >200 g/mole)											
1,2,4,5-Tetrachlorobenzene	95-94-3	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
1,3,5-Trinitrobenzene	99-35-4	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
2,6-Bis(tert-butyl)-4-methylphenol	128-37-0	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
2-Cyclohexyl-4,6-dinitrophenol	131-89-5	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
2-sec-Butyl-4,6-dinitrophenol	88-85-7	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
3,3'-Dichlorobenzidine	91-94-1	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
3,3'-Dimethoxybenzidine	119-90-4	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
4-Bromophenylphenyl ether	101-55-3	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Ammonium perfluorooctanoate	3825-26-1	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Azobenzene	103-33-3	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Bis(3-tert-butyl-4-hydroxy-6-methyl-phenyl)sulfide	96-69-5	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Captan	133-06-2	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Chlorobenzilate	510-15-6	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Dibutylphosphate	107-66-4	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Dimethyl aminoazobenzene	60-11-7	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Hexachlorobenzene	118-74-1	Acute	NOAEL	Japanese quail	No data	2.25E+04	1.0E-02	1.0E+00	No data	2.25E+02	Hill and Camardese (1986) in EPA (1999)
Hexachlorobutadiene	87-68-3	Chronic	NOAEL	Japanese quail	No data	3.19E+03	1.0E+00	1.0E+00	No data	3.19E+03	Schwetz and others (1974) in EPA (1999)
Hexachlorocyclopentadiene	77-47-4	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Hexachloroethane	67-72-1	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Hexachlorophene	70-30-4	Acute	LD50	Bobwhite quail	No data	5.75E+05	1.0E-02	1.0E+00	Mortality	5.75E+03	Meister (1994) in EPA (1999)
Hexamethylene-1,5-diisocyanate	822-06-0	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Mirex	2385-85-5	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Nitrofen	1836-75-5	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Pentachlorobenzene	608-93-5	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Pentachloronitrobenzene	82-68-8	Chronic	NOAEL	Chicken	1.50E+00	6.88E+04	1.0E+00	1.0E+00	No data	6.88E+04	Dunn and others (1979) in EPA (1999)
Pentachlorophenol	87-86-5	Acute	NOAEL	Japanese quail	No data	4.03E+05	1.0E-02	1.0E+00	No data	4.03E+03	Hill and Camardese (1986) in EPA (1999)
Picric acid	88-89-1	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Pronamide	23950-58-5	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Strychnine	57-24-9	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Terphenyls	26140-60-3	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Tributyl phosphate	126-73-8	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Trifluralin	1582-09-8	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Triphenylamine	603-34-9	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Herbicides and Organochlorinated Pesticides											
2,4,5-T	93-76-5	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
2,4-D and esters	94-75-7	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
4,4'-DDD	72-54-8	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
4,4'-DDE	72-55-9	Acute	LOAEL	Japanese quail	No data	8.45E+04	1.0E-01	1.0E-01	Mortality	8.45E+02	Hill and Camardese (1986) in EPA (1999)

Table C3-4 Derivation of Toxicity Reference Values (TRVs) for Exposure of Bird Species to COPCs and ROPCs

Constituent of Potential Concern	CAS Registry Number	Test duration	Endpoint	Test species	Test species body weight (kg) BWt	Endpoint dose (ED)	Duration conversion factor (DCF)	Endpoint conversion factor (ECF)	Effect	NOAEL TRV (ED × DCF × ECF)	Source
4,4'-DDT	50-29-3	Chronic	LOAEL	Brown pelican	3.50E+00	2.80E+01	1.0E+00	1.0E-01	Impaired reproduction	2.80E+00	Anderson and others (1975) in Sample and others (1996)
Aldrin	309-00-2	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
alpha-BHC	319-84-6	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
beta-BHC	319-85-7	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Chlordane	57-74-9	Chronic	NOAEL	Red-winged blackbird	6.40E-02	2.14E+03	1.0E+00	1.0E+00	Mortality	2.14E+03	Stickel and others (1983) in Sample and others (1996)
delta-BHC	319-86-8	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Dieldrin	60-57-1	Chronic	NOAEL	Barn owl	4.66E-01	7.70E+01	1.0E+00	1.0E+00	Impaired reproduction	7.70E+01	Mendenhall and others (1983) in Sample and others (1996)
Endothall	145-73-3	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Endrin	72-20-8	Chronic	NOAEL	Mallard duck	1.15E+00	3.00E+02	1.0E+00	1.0E+00	Impaired reproduction	3.00E+02	Spann and others (1986) in Sample and others (1996)
gamma-BHC (Lindane)	58-89-9	Chronic	NOAEL	Mallard duck	1.00E+00	2.00E+03	1.0E+00	1.0E+00	Impaired reproduction	2.00E+03	Chakravarty and Lahiri (1986) in Sample and others (1996)
Heptachlor	76-44-8	Acute	LOAEL	Japanese quail	No data	6.50E+03	1.0E-01	1.0E-01	Mortality	6.50E+01	Hill and Camardese (1986) in EPA (1999)
Isodrin	465-73-6	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Methoxychlor	72-43-5	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Silvex (2,4,5-TP)	93-72-1	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Toxaphene	8001-35-2	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Inorganic Chemicals and Compounds						(mg/kgBW/d)				(mg/kgBW/d)	
	Metals										
Aluminum	7429-90-5	Chronic	NOAEL	Ringed dove	1.55E-01	1.10E+02	1.0E+00	1.0E+00	Impaired reproduction	1.00E+02	Carriere and others (1986) in EPA (1999)
Antimony	7440-36-0	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Arsenic	7440-38-2	Chronic	NOAEL	Brown-headed cowbird	No data	2.46E+00	1.0E+00	1.0E+00	Mortality	2.46E+00	USFWS (1969) in EPA (1999)
Barium	7440-39-3	Subchronic	NOAEL	Chick (14 day old)	1.21E-01	2.08E+02	1.0E-01	1.0E+00	Mortality	2.08E+01	Johnson and others (1960) in EPA (1999)
Beryllium	7440-41-7	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Bismuth	7440-69-9	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Boron	7440-42-8	Chronic	NOAEL	Mallard duck	1.00E+00	2.88E+01	1.0E+00	1.0E+00	Impaired reproduction	2.88E+01	Smith and Anders (1989) in Sample and others (1996)
Cadmium	7440-43-9	Chronic	NOAEL	Mallard duck	1.15E+00	1.45E+00	1.0E+00	1.0E+00	Impaired reproduction	1.45E+00	White and Finley (1978) in EPA (1999)
Calcium	7440-70-2	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Chromium[b]	18540-29-9	Chronic	NOAEL	Black duck	1.25E+00	1.00E+00	1.0E+00	1.0E+00	Impaired reproduction	1.00E+00	Haseltine and others (1985) in EPA (1999)
Cobalt	7440-48-4	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Copper	7440-50-8	Chronic	NOAEL	Chick (5 week old)	5.34E-01	4.70E+01	1.0E+00	1.0E+00	Mortality	4.70E+01	Mehring and others (1960) in EPA (1999)
Iron	7439-89-6	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data

Table C3-4 Derivation of Toxicity Reference Values (TRVs) for Exposure of Bird Species to COPCs and ROPCs

Constituent of Potential Concern	CAS Registry Number	Test duration	Endpoint	Test species	Test species body weight (kg) BWt	Endpoint dose (ED)	Duration conversion factor (DCF)	Endpoint conversion factor (ECF)	Effect	NOAEL TRV (ED × DCF × ECF)	Source
Lead	7439-92-1	Acute	LOAEL	Ringed dove	No data	2.50E+01	1.0E-02	1.0E-01	Abnormal enzyme levels	2.50E-02	Kendall and Scanlon (1982) in EPA (1999)
Lithium	7439-93-2	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Magnesium	7439-95-4	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Manganese	7439-96-5	Chronic	NOAEL	Quail	7.20E-02	9.77E+02	1.0E+00	1.0E+00	Reduced growth	9.77E+02	Laskey and Edens (1985) in Sample and others (1996)
Mercury	7439-97-6	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Mercury - Hg+2	7487-94-7	Acute	LOAEL	Japanese quail	No data	3.25E+02	1.0E-01	1.0E-01	Mortality	3.25E+00	Hill and Camardese (1986) in EPA (1999)a
Methylmercury	22967-92-6	Chronic	LOAEL	Mallard duck	No data	6.40E-02	1.0E+00	1.0E-01	Mortality	6.40E-03	Heinz (1979) in EPA (1999)
Molybdenum	7439-98-7	Chronic	LOAEL	Chicken	1.50E+00	3.53E+01	1.0E+00	1.0E-01	Impaired reproduction	3.53E+00	Lepore and Miller (1965) in Sample and others (1996)
Nickel	7440-02-0	Subchronic	NOAEL	Japanese quail	No data	6.50E+02	1.0E-01	1.0E+00	No data	6.50E+01	Hill and Camardese (1986) in EPA (1999)a
Potassium	7440-09-7	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Rhodium	7440-16-6	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Selenium	7782-49-2	Chronic	NOAEL	Mallard duck	1.00E+00	5.00E-01	1.0E+00	1.0E+00	Impaired reproduction	5.00E-01	Heinz and others (1987) in EPA (1999)
Silicon	7440-21-3	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Silver	7440-22-4	Subchronic	NOAEL	Mallard	1.00E+00	1.78E+03	1.0E-01	1.0E+00	No data	1.78E+02	EPA (1997) in EPA (1999)
Sodium	7440-23-5	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Strontium	7440-24-6	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Tantalum	7440-25-7	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Thallium	7440-28-0	Acute	LD50	Starling	No data	3.50E+01	1.0E-02	1.0E+00	Mortality	3.50E-01	Schafer (1972) in EPA (1999)
Tin	7440-31-5	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Tungsten	7440-33-7	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Uranium	7440-61-1	Subchronic	NOAEL	Black duck	1.25E+00	1.60E+02	1.0E-01	1.0E+00	Metabolic	1.60E+01	Haseltine and Sileo (1983) in Sample and others (1996)
Vanadium	7440-62-2	Chronic	NOAEL	Mallard duck	1.17E+00	1.14E+01	1.0E+00	1.0E+00	Mortality	1.14E+01	White and Dieter (1978) in Sample and others (1996)
Yttrium	7440-65-5	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Zinc	7440-66-6	Chronic	NOAEL	Leghorn chicken	1.94E+00	1.31E+02	1.0E+00	1.0E+00	Impaired reproduction	1.31E+02	Stahl and others (1990) in EPA (1999)
Zirconium	7440-67-7	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Non-metals and Anions											
Ammonia/Ammonium	7664-41-7	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Bromide	24959-67-9	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Chloride	16887-00-6	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Cyanide	57-12-5	Acute	LD50	American kestrel	No data	4.00E+00	1.0E-01	1.0E-01	Mortality	4.00E-02	Wiemeyer and others (1986) in EPA (1999)
Fluoride	16984-48-8	Chronic	NOAEL	Screech owl	1.81E-01	7.80E+00	1.0E+00	1.0E+00	Impaired reproduction	7.80E+00	Pattee and others (1988) in Sample and others (1996)
Hydroxide	14280-30-9	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Iodine	7553-56-2	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data

Table C3-4 Derivation of Toxicity Reference Values (TRVs) for Exposure of Bird Species to COPCs and ROPCs

Constituent of Potential Concern	CAS Registry Number	Test duration	Endpoint	Test species	Test species body weight (kg) BWt	Endpoint dose (ED)	Duration conversion factor (DCF)	Endpoint conversion factor (ECF)	Effect	NOAEL TRV (ED × DCF × ECF)	Source
Nitrate	14797-55-8	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Nitrite	14797-65-0	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Phosphate	14265-44-2	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Phosphorus	7723-14-0	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Sulfate	14808-79-8	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Total Sulfur	63705-05-5	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Criteria Pollutants											
Carbon monoxide	630-08-0	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Nitrogen dioxide	10102-44-0	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Ozone	10028-15-6	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Particulate matter	No CAS#	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Sulfur dioxide	7446-09-5	No data	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Radionuclides											
All radionuclides combined (rad/d)[c]	No CAS #	Chronic	Adverse effects	Birds	NA	NA	NA	NA	Population effects	1.00E-01	IAEA (1992)

Notes/Sources

No data = No data available.

NA = Not applicable.

CAS = Chemical Abstracts Service.

ED = Dose that caused the reported effect.

DCF = Duration conversion factor; 1 if chronic, 0.1 if subchronic (Sample and others 1996) or inferred from information presented in EPA (1999) Table E-8.

ECF = Endpoint conversion factor; 1 if NOAEL, 0.1 if LOAEL (Sample and others 1996) or inferred from information presented in EPA (1999) Table E-8.

TRV = Toxicity reference value.

LOAEL = Lowest observed adverse effect level.

NOAEL = No observed adverse effect level.

[a] Data for Aroclor-1254 used as representative of polychlorinated biphenyl mixtures.

[b] Values for hexavalent chromium, which is more toxic than trivalent chromium.

[c] TRV is not applicable to single radionuclides. Combined external and internal radiation exposure for birds from all radionuclides combined cannot exceed 0.1 rad/d.

Table C3-5 Derivation of Surface Water Toxicity Reference Values (TRVs) for Exposure of Aquatic Biota to COPCs and ROPCs

Constituent of Potential Concern	CAS Registry Number	Test duration	Endpoint	Test species	Endpoint Concen-tration (EC)	Duration conversion factor (DCF)[a]	Endpoint conversion factor (ECF)[a]	Effect	TRV (EC × DCF × ECF)	Source[b]
Organic Compounds					(µg/L)				(µg/L)	
Aromatic Halogenated Hydrocarbons										
2,3,4,6-Tetrachlorophenol	58-90-2	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
4-Chloro-3-methylphenol	59-50-7	Acute	LOEL	Aquatic biota	3.00E+01	1.0E-01	1.0E-01	Mortality	3.00E-01	EPA (1987)
Aromatic Nonhalogenated Hydrocarbons										
2-Nitrotoluene	88-72-2	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
4-Nitrobiphenyl	92-93-3	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Benzaldehyde	100-52-7	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Benzene	71-43-2	Chronic	LC50	Aquatic biota	Various	No data	No data	Mortality	1.30E+02	Tier II SCV in Suter and Tsao (1996)
Benzyl alcohol	100-51-6	Chronic	LC50	Aquatic biota	Various	No data	No data	Mortality	8.60E+00	Tier II SCV in Suter and Tsao (1996)
Ethyl benzene	100-41-4	Chronic	LC50	Aquatic biota	Various	No data	No data	Mortality	7.30E+00	Tier II SCV in Suter and Tsao (1996)
m-Xylene	108-38-3	Chronic	LC50	Aquatic biota	Various	No data	No data	Mortality	1.80E+00	Tier II SCV in Suter and Tsao (1996)
o-Xylene	95-47-6	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
p-Xylene	106-42-3	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Styrene	100-42-5	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Toluene	108-88-3	Chronic	LC50	Aquatic biota	Various	No data	No data	Mortality	9.80E+00	Tier II SCV in Suter and Tsao (1996)
Non-aromatic Nonhalogenated Hydrocarbons										
1,2-Epoxybutane	106-88-7	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
1,3-Butadiene	106-99-0	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
1,4-Dioxane	123-91-1	Acute	EC20	*Daphnia magna*	6.21E+06	1.0E-01	1.0E-01	Mortality	6.21E+04	Bringmann and Kuehn (1982) in EPA (1999)
1-Methylpropyl alcohol	78-92-2	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
1-Nitropropane	108-03-2	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
2,2,4-Trimethylpentane	540-84-1	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
2-Butanone	78-93-3	Chronic	LC50	Aquatic biota	Various	No data	No data	Mortality	1.40E+04	Tier II SCV in Suter and Tsao (1996)
2-Butenaldehyde (2-Butenal)	4170-30-3	Acute	LC50	*Lepomis macrochirus*	3.50E+03	1.0E-01	1.0E-01	No data	3.50E+01	Dawson and others (1977) in EPA (1999)
2-Ethoxyethanol	110-80-5	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
2-Heptanone	110-43-0	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
2-Hexanone	591-78-6	Chronic	LC50	Aquatic biota	Various	No data	No data	Mortality	9.90E+01	Tier II SCV in Suter and Tsao (1996)
2-Methoxyethanol	109-86-4	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
2-Methyl-2-propanol	75-65-0	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
2-Methyl-2-propenenitrile	126-98-7	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
2-Methylaziridine	75-55-8	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
2-Methylpropyl alcohol	78-83-1	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
2-Pentanone	107-87-9	No data	No data	No data	No data	No data	No data	No data	No TRV	No data

Table C3-5 Derivation of Surface Water Toxicity Reference Values (TRVs) for Exposure of Aquatic Biota to COPCs and ROPCs

Constituent of Potential Concern	CAS Registry Number	Test duration	Endpoint	Test species	Endpoint Concen-tration (EC)	Duration conversion factor (DCF)[a]	Endpoint conversion factor (ECF)[a]	Effect	TRV (EC × DCF × ECF)	Source[b]
2-Propanone (Acetone)	67-64-1	Chronic	No data	Aquatic biota	1.50E+03	No data	No data	Tier II SCV	1.50E+03	Tier II SCV from Suter and Tsao (1996) in EPA (1999)
2-Propene-1-ol	107-18-6	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
2-Propyl alcohol	67-63-0	Chronic	LC50	Aquatic biota	Various	No data	No data	Mortality	7.50E+00	Tier II SCV in Suter and Tsao (1996)
3-Heptanone	106-35-4	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
3-Methyl-1-butanol	123-51-3	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
3-Methyl-2-butanone	563-80-4	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
3-Pentanone	96-22-0	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
4-Heptanone	123-19-3	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
4-Methyl-2-pentanone	108-10-1	Chronic	LC50	Aquatic biota	Various	No data	No data	Mortality	1.70E+02	Tier II SCV in Suter and Tsao (1996)
4-Methyl-3-penten-2-one	141-79-7	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
5-Methyl-2-hexanone	110-12-3	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Acetaldehyde	75-07-0	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Acetamide	60-35-5	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Acetic acid	64-19-7	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Acetic acid ethyl ester	141-78-6	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Acetic acid n-butyl ester	123-86-4	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Acetonitrile	75-05-8	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Acrolein	107-02-8	Chronic	LOEL	Aquatic biota	2.10E+01	1.0E+00	1.0E-01	Mortality	2.10E+00	EPA (1987)
Acrylonitrile	107-13-1	Chronic	LOEL	Aquatic biota	2.60E+03	1.0E+00	1.0E-01	Mortality	2.60E+02	EPA (1987) in EPA (1999)
Bis(isopropyl)ether	108-20-3	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Butane	106-97-8	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Carbon disulfide	75-15-0	Chronic	LC50	Aquatic biota	Various	No data	No data	Mortality	9.20E-01	Tier II SCV in Suter and Tsao (1996)
Cyanogen	460-19-5	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Cyclohexane	110-82-7	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Cyclohexanone	108-94-1	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Cyclohexene	110-83-8	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Cyclopentane	287-92-3	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Ethyl alcohol	64-17-5	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Ethyl ether	60-29-7	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Ethyl methacrylate	97-63-2	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Formaldehyde	50-00-0	Acute	LC50	No data	4.96E+03	1.0E-01	1.0E-01	No data	4.96E+01	TRV for formalin (Reardon and Harrell 1990) used as surrogate (EPA 1999)
Formamide	75-12-7	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Formic acid	64-18-6	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Formic acid, methyl ester	107-31-3	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Glycidylaldehyde	765-34-4	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Methyl acetate	79-20-9	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Methyl alcohol	67-56-1	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Methyl isocyanate	624-83-9	No data	No data	No data	No data	No data	No data	No data	No TRV	No data

Table C3-5 Derivation of Surface Water Toxicity Reference Values (TRVs) for Exposure of Aquatic Biota to COPCs and ROPCs

Constituent of Potential Concern	CAS Registry Number	Test duration	Endpoint	Test species	Endpoint Concen-tration (EC)	Duration conversion factor (DCF)[a]	Endpoint conversion factor (ECF)[a]	Effect	TRV (EC × DCF × ECF)	Source[b]
Methyl methacrylate	80-62-6	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Methyl tert-butyl ether	1634-04-4	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Methylacetylene	74-99-7	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Methylcyclohexane	108-87-2	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
N,N-Dimethylacetamide	127-19-5	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
n-Butyl alcohol	71-36-3	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
n-Heptane	142-82-5	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
n-Hexane	110-54-3	Chronic	LC50	Aquatic biota	Various	No data	No data	Mortality	5.80E-01	Tier II SCV in Suter and Tsao (1996)
Nitromethane	75-52-5	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
n-Nonane	111-84-2	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
n-Octane	111-65-9	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
n-Pentane	109-66-0	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
n-Propionaldehyde	123-38-6	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
n-Propyl alcohol	71-23-8	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
n-Valeraldehyde	110-62-3	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Oxirane	75-21-8	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
p-Cymene	99-87-6	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Phosgene	75-44-5	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Propargyl alcohol	107-19-7	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Propionic acid	79-09-4	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Propionitrile	107-12-0	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Propylene glycol monomethyl ether	107-98-2	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
p-tert-Butyltoluene	98-51-1	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Triethylamine	121-44-8	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Trimethylamine	75-50-3	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Vinyl acetate	108-05-4	Chronic	LC50	Aquatic biota	Various	No data	No data	Mortality	1.60E+01	Tier II SCV in Suter and Tsao (1996)
Non-aromatic Halogenated Hydrocarbons										
1,1,1,2-Tetrachloro-2,2-difluoroethane	76-11-9	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
1,1,1,2-Tetrachloroethane	630-20-6	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
1,1,1-Trichloroethane	71-55-6	Chronic	LC50	Aquatic biota	Various	No data	No data	Mortality	1.10E+01	Tier II SCV in Suter and Tsao (1996)
1,1,2,2-Tetrachloro-1,2-difluoroethane	76-12-0	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
1,1,2,2-Tetrachloroethane	79-34-5	Chronic	LC50	Aquatic biota	Various	No data	No data	Mortality	6.10E+02	Tier II SCV in Suter and Tsao (1996)
1,1,2,2-Tetrachloroethene	127-18-4	Chronic	LC50	Aquatic biota	Various	No data	No data	Mortality	9.80E+01	Tier II SCV in Suter and Tsao (1996)
1,1,2-Trichloroethane	79-00-5	Chronic	LC50	Aquatic biota	Various	No data	No data	Mortality	1.20E+03	Tier II SCV in Suter and Tsao (1996)
1,1,2-Trichloroethylene	79-01-6	Chronic	LC50	Aquatic biota	Various	No data	No data	Mortality	4.70E+01	Tier II SCV in Suter and Tsao (1996)
1,1-Dichloroethane	75-34-3	Chronic	LC50	Aquatic biota	Various	No data	No data	Mortality	4.70E+01	Tier II SCV in Suter and Tsao (1996)

Table C3-5 Derivation of Surface Water Toxicity Reference Values (TRVs) for Exposure of Aquatic Biota to COPCs and ROPCs

Constituent of Potential Concern	CAS Registry Number	Test duration	Endpoint	Test species	Endpoint Concen-tration (EC)	Duration conversion factor (DCF)[a]	Endpoint conversion factor (ECF)[a]	Effect	TRV (EC × DCF × ECF)	Source[b]
1,1-Dichloroethene	75-35-4	Chronic	LC50	Aquatic biota	Various	No data	No data	Mortality	2.50E+01	Tier II SCV in Suter and Tsao (1996)
1,2,2-Trichloro-1,1,2-trifluoroethane	76-13-1	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
1,2,3-Trichloropropane	96-18-4	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
1,2-Dibromo-3-chloropropane	96-12-8	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
1,2-Dichloro-1,1,2,2-tetrafluoroethane	76-14-2	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
1,2-Dichloroethane	107-06-2	Chronic	LC50	Aquatic biota	Various	No data	No data	Mortality	9.10E+02	Tier II SCV in Suter and Tsao (1996)
1,2-Dichloroethylene	540-59-0	Chronic	LC50	Aquatic biota	Various	No data	No data	Mortality	5.90E+02	Tier II SCV in Suter and Tsao (1996)
1,2-Dichloropropane	78-87-5	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
1,3-Dichloropropene	542-75-6	Chronic	LC50	Aquatic biota	Various	No data	No data	Mortality	5.50E-02	Tier II SCV in Suter and Tsao (1996)
1,4-Dichloro-2-butene	764-41-0	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
1-Chloroethene	75-01-4	Subchronic	LC100	No data	3.88E+05	1.0E-01	1.0E-01	No data	3.88E+03	Brown and others (1977) in EPA (1999)
2,2-Dichloropropionic acid	75-99-0	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
2-Chloropropane	75-29-6	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
3-Chloropropene (Allyl chloride)	107-05-1	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Bromochloromethane	74-97-5	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Bromodichloromethane	75-27-4	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Bromoethene	593-60-2	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Bromoform	75-25-2	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Bromomethane	74-83-9	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Carbon tetrachloride	56-23-5	Chronic	LC50	Aquatic biota	Various	No data	No data	Mortality	9.80E+00	Tier II SCV in Suter and Tsao (1996)
Chlorodibromomethane	124-48-1	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Chlorodifluoromethane	75-45-6	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Chloroethane	75-00-3	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Chloroform	67-66-3	Chronic	LC50	Aquatic biota	Various	No data	No data	Mortality	2.80E+01	Tier II SCV from Suter and Tsao (1996) in EPA (1999)
Chloromethane	74-87-3	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Chloropentafluoroethane	76-15-3	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
cis-1,2-Dichloroethene	156-59-2	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
cis-1,3-Dichloropropene	10061-01-5	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Cyanogen bromide	506-68-3	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Cyanogen chloride	506-77-4	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Dichlorodifluoromethane	75-71-8	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Dichlorofluoromethane	75-43-4	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Dichloromethane	75-09-2	Chronic	No data	Aquatic biota	2.20E+03	No data	No data	Tier II SCV	2.20E+03	Tier II SCV in Suter and Tsao (1996)
Difluorodibromomethane	75-61-6	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Hexafluoroacetone	684-16-2	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Iodomethane	74-88-4	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Methylene bromide	74-95-3	No data	No data	No data	No data	No data	No data	No data	No TRV	No data

Table C3-5 Derivation of Surface Water Toxicity Reference Values (TRVs) for Exposure of Aquatic Biota to COPCs and ROPCs

Constituent of Potential Concern	CAS Registry Number	Test duration	Endpoint	Test species	Endpoint Concen-tration (EC)	Duration conversion factor (DCF)[a]	Endpoint conversion factor (ECF)[a]	Effect	TRV (EC × DCF × ECF)	Source[b]
Pentachloroethane	76-01-7	Chronic	LOEL	Aquatic biota	3.90E+02	1.0E+00	1.0E-01	Mortality	3.90E+01	EPA (1987)
trans-1,2-Dichloroethylene	156-60-5	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
trans-1,3-Dichloropropene	10061-02-6	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Trichloroacetic acid	76-03-9	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Trichlorofluoroethane	27154-33-2	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Trichlorofluoromethane	75-69-4	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Trifluorobromomethane	75-63-8	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Dioxin and Furan Compounds (PCDDs/PCDFs)										
1,2,3,4,6,7,8-Heptachlorodibenzo(p)dioxin	35822-46-9	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
1,2,3,4,6,7,8-Heptachlorodibenzofuran	67562-39-4	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
1,2,3,4,7,8,9-Heptachlorodibenzofuran	55673-89-7	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
1,2,3,4,7,8-Hexachlorodibenzo(p)dioxin	39227-28-6	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
1,2,3,4,7,8-Hexachlorodibenzofuran	70648-26-9	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
1,2,3,6,7,8-Hexachlorodibenzo(p)dioxin	57653-85-7	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
1,2,3,6,7,8-Hexachlorodibenzofuran	57117-44-9	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
1,2,3,7,8,9-Hexachlorodibenzo(p)dioxin	19408-74-3	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
1,2,3,7,8,9-Hexachlorodibenzofuran	72918-21-9	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
1,2,3,7,8-Pentachlorodibenzo(p)dioxin	40321-76-4	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
1,2,3,7,8-Pentachlorodibenzofuran	57117-41-6	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
2,3,4,6,7,8-Hexachlorodibenzofuran	60851-34-5	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
2,3,4,7,8-Pentachlorodibenzofuran	57117-31-4	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
2,3,7,8-Tetrachlorodibenzo(p)dioxin	1746-01-6	Chronic	LOEL	*Onchorynchus mykiss*	3.80E-05	1.0E+00	1.0E-01	Mortality	3.80E-06	Mehrle and others (1988) in EPA (1999)
2,3,7,8-Tetrachlorodibenzofuran	51207-31-9	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Dibenzofuran	132-64-9	Chronic	LC50	Aquatic biota	Various	No data	No data	Mortality	3.70E+00	Tier II SCV in Suter and Tsao (1996)
Octachlorodibenzo(p)dioxin	3268-87-9	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Octachlorodibenzofuran	39001-02-0	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Total dioxins and dibenzofurans	No CAS #	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Polychlorinated Biphenyls (PCBs)										
2,2',3,3',4,4',5-Heptachlorobiphenyl	35065-30-6	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
2,2',3,4,4',5,5'-Heptachlorobiphenyl	35065-29-3	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
2,3,3',4,4',5,5'-Heptachlorobiphenyl	39635-31-9	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
2,3,3',4,4',5'-Hexachlorobiphenyl	69782-90-7	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
2,3,3',4,4',5-Hexachlorobiphenyl	38380-08-4	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
2,3,3',4,4'-Pentachlorobiphenyl	32598-14-4	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
2,3',4,4',5,5'-Hexachlorobiphenyl	52663-72-6	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
2,3,4,4',5-Pentachlorobiphenyl	74472-37-0	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
2',3,4,4',5-Pentachlorobiphenyl	65510-44-3	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
2,3',4,4',5-Pentachlorobiphenyl	31508-00-6	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
3,3',4,4',5,5'-Hexachlorobiphenyl	32774-16-6	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
3,3',4,4',5-Pentachlorobiphenyl	57465-28-8	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
3,3',4,4'-Tetrachlorobiphenyl	32598-13-3	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
3,4,4',5-Tetrachlorobiphenyl	70362-50-4	No data	No data	No data	No data	No data	No data	No data	No TRV	No data

Table C3-5 Derivation of Surface Water Toxicity Reference Values (TRVs) for Exposure of Aquatic Biota to COPCs and ROPCs

Constituent of Potential Concern	CAS Registry Number	Test duration	Endpoint	Test species	Endpoint Concen-tration (EC)	Duration conversion factor (DCF)[a]	Endpoint conversion factor (ECF)[a]	Effect	TRV (EC × DCF × ECF)	Source[b]
Polychlorinated biphenyls (PCBs)[c]	1336-36-3	Chronic	LC50	Aquatic biota	Various	No data	No data	Mortality	1.40E-01	Tier II SCV in Suter and Tsao (1996)
Phthalates										
Bis(2-ethylhexyl) phthalate (DEHP)	117-81-7	Chronic	LC50	Aquatic biota	Various	No data	No data	Mortality	3.00E+00	Tier II SCV from Suter and Tsao (1996) in EPA (1999)
Butylbenzyl phthalate	85-68-7	Chronic	LC50	Aquatic biota	Various	No data	No data	Mortality	1.90E+01	Tier II SCV in Suter and Tsao (1996)
Dibutyl phthalate	84-74-2	Chronic	LC50	Aquatic biota	Various	No data	No data	Mortality	3.50E+01	Tier II SCV in Suter and Tsao (1996)
Diethyl phthalate	84-66-2	Chronic	LC50	Aquatic biota	Various	No data	No data	Mortality	2.10E+02	Tier II SCV in Suter and Tsao (1996)
Dimethyl phthalate	131-11-3	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
n-Dioctyl phthalate	117-84-0	Chronic	LOEL	*Daphnia magna*	3.20E+02	1.0E+00	1.0E+00	Mortality	3.20E+02	McCarthy and Whitmore (1985) in EPA (1999)
Light Polycyclic Aromatic Hydrocarbons (molecular weight <200 g/mole)										
2-Chloronaphthalene	91-58-7	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
2-Methyl naphthalene	91-57-6	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
5-Nitroacenaphthene	602-87-9	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Acenaphthene	83-32-9	Chronic	LC50	Aquatic biota	Various	No data	No data	Mortality	2.30E+01	Chronic NAWQC in Suter and Tsao (1996)
Acenaphthylene	208-96-8	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Anthracene	120-12-7	Chronic	LC50	Aquatic biota	Various	No data	No data	Mortality	7.30E-01	Tier II SCV in Suter and Tsao (1996)
Fluorene	86-73-7	Chronic	LC50	Aquatic biota	Various	No data	No data	Mortality	3.90E+00	Tier II SCV in Suter and Tsao (1996)
Indene	95-13-6	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Naphthalene	91-20-3	Chronic	LC50	Aquatic biota	Various	No data	No data	Mortality	1.20E+01	Tier II SCV in Suter and Tsao (1996)
Phenanthrene	85-01-8	Chronic	LC50	Aquatic biota	Various	No data	No data	Mortality	6.30E+00	Chronic NAWQC in Suter and Tsao (1996)
Pyrene	129-00-0	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Heavy Polycyclic Aromatic Hydrocarbons (molecular weight >200 g/mole)										
3-Methylcholanthrene	56-49-5	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
5-Methylchrysene	3697-24-3	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Benzo[a]anthracene	56-55-3	Chronic	LC50	Aquatic biota	Various	No data	No data	Mortality	2.70E-02	Tier II SCV from Suter and Tsao (1996) in EPA (1999)
Benzo[a]pyrene	50-32-8	Chronic	LC50	Aquatic biota	Various	No data	No data	Mortality	1.40E-02	Tier II SCV from EPA (1996) in EPA (1999)
Benzo[a,i]pyrene	191-30-0	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Benzo[b]fluoranthene	205-99-2	NA	NA	NA	NA	NA	NA	NA	2.70E-02	TRV for benzo[a]anthracene used as surrogate; EPA (1999)
Benzo[e]pyrene	192-97-2	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Benzo[g,h,i]perylene	191-24-2	No data	No data	No data	No data	No data	No data	No data	No TRV	No data

Table C3-5 Derivation of Surface Water Toxicity Reference Values (TRVs) for Exposure of Aquatic Biota to COPCs and ROPCs

Constituent of Potential Concern	CAS Registry Number	Test duration	Endpoint	Test species	Endpoint Concen-tration (EC)	Duration conversion factor (DCF)[a]	Endpoint conversion factor (ECF)[a]	Effect	TRV (EC × DCF × ECF)	Source[b]
Benzo[j]fluoranthene	205-82-3	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Benzo[k]fluoranthene	207-08-9	NA	NA	NA	NA	NA	NA	NA	2.70E-02	TRV for benzo[a]anthracene used as surrogate; EPA (1999)
Chrysene	218-01-9	NA	NA	NA	NA	NA	NA	NA	2.70E-02	TRV for benzo[a]anthracene used as surrogate; EPA (1999)
Dibenz[a,h]acridine	226-36-8	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Dibenz[a,h]anthracene	53-70-3	NA	NA	NA	NA	NA	NA	NA	2.70E-02	TRV for benzo[a]anthracene used as surrogate; EPA (1999)
Dibenz[a,j]acridine	224-42-0	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Dibenzo[a,e]fluoranthene	5385-75-1	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Dibenzo[a,e]pyrene	192-65-4	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Dibenzo[a,h]fluoranthene	No CAS #	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Dibenzo[a,h]pyrene	189-64-0	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Dibenzo[a,i]pyrene	189-55-9	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Fluoranthene	206-44-0	Chronic	LC50	Aquatic biota	Various	No data	No data	Mortality	6.16E+00	Chronic NAWQC in Suter and Tsao (1996)
Hexachloronaphthalene	1335-87-1	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Indeno[1,2,3-cd]pyrene	193-39-5	NA	NA	NA	NA	NA	NA	NA	2.70E-02	TRV for benzo[a]anthracene used as surrogate; EPA (1999)
Octachloronaphthalene	2234-13-1	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Pentachloronaphthalene	1321-64-8	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Tetrachloronaphthalene	1335-88-2	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Trichloronaphthalene	1321-65-9	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Light Substituted Benzene Compounds (molecular weight <200 g/mole)										
1,2,3-Trichlorobenzene	87-61-6	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
1,2,4-Trichlorobenzene	120-82-1	Chronic	LC50	Aquatic biota	Various	No data	No data	Mortality	1.10E+02	Tier II SCV in Suter and Tsao (1996)
1,2,4-Trimethyl benzene	95-63-6	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
1,2-Dichlorobenzene	95-50-1	Chronic	LC50	Aquatic biota	Various	No data	No data	Mortality	1.40E+01	Tier II SCV in Suter and Tsao (1996)
1,3,5-Trimethyl benzene	108-67-8	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
1,3-Dichlorobenzene	541-73-1	Chronic	LC50	Aquatic biota	Various	No data	No data	Mortality	7.10E+01	Tier II SCV in Suter and Tsao (1996)
1,3-Dinitrobenzene	99-65-0	Subchronic	NOEC	*Selanastrum capricornutum*	2.60E+02	1.0E-01	1.0E+00	Reduced growth	2.60E+01	van der Schalie (1983) in EPA (1999)
1,4-Dichlorobenzene	106-46-7	Chronic	LC50	Aquatic biota	Various	No data	No data	Mortality	1.50E+01	Tier II SCV in Suter and Tsao (1996)
1,4-Dinitrobenzene	100-25-4	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
2,4,5-Trichlorophenol	95-95-4	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
2,4,6-Trichlorophenol	88-06-2	Acute	LOEL	Aquatic biota	9.70E+02	1.0E-01	1.0E-01	Mortality	9.70E+00	EPA (1987)
2,4-Dichlorophenol	120-83-2	Chronic	LOEL	Aquatic biota	3.65E+02	1.0E+00	1.0E-01	Mortality	3.65E+01	EPA (1987)

Table C3-5 Derivation of Surface Water Toxicity Reference Values (TRVs) for Exposure of Aquatic Biota to COPCs and ROPCs

Constituent of Potential Concern	CAS Registry Number	Test duration	Endpoint	Test species	Endpoint Concen-tration (EC)	Duration conversion factor (DCF)[a]	Endpoint conversion factor (ECF)[a]	Effect	TRV (EC × DCF × ECF)	Source[b]
2,4-Dimethylphenol	105-67-9	Acute	LOEL	Aquatic biota	2.12E+03	1.0E-01	1.0E-01	Mortality	2.12E+01	EPA (1987)
2,4-Dinitrophenol	51-28-5	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
2,4-Dinitrotoluene	121-14-2	Chronic	LOEL	Aquatic biota	2.30E+02	1.0E+00	1.0E-01	Mortality	2.30E+01	EPA (1987) in EPA (1999)
2,6-Dinitrotoluene	606-20-2	Chronic	NOEC	*Daphnia magna*	6.00E+01	1.0E+00	1.0E+00	Mortality	6.00E+01	Kuhn and others (1989) in EPA (1999)
2-Chlorophenol	95-57-8	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
2-Chlorotoluene	95-49-8	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
2-Nitrophenol	88-75-5	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
4,6-Dinitro-o-cresol	534-52-1	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
4-Chlorotoluene	106-43-4	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
4-Nitrophenol	100-02-7	Chronic	LC50	Aquatic biota	Various	No data	No data	Mortality	3.00E+02	Tier II SCV in Suter and Tsao (1996)
alpha-Methylstyrene	98-83-9	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Aniline	62-53-3	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Benzotrichloride	98-07-7	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Benzyl chloride	100-44-7	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Bromobenzene	108-86-1	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Chlorobenzene	108-90-7	Chronic	LC50	Aquatic biota	Various	No data	No data	Mortality	6.40E+01	Tier II SCV in Suter and Tsao (1996)
Cumene	98-82-8	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
m-Cresol	108-39-4	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
n-Butyl benzene	104-51-8	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Nitrobenzene	98-95-3	Acute	LOEL	Aquatic biota	2.70E+04	1.0E-01	1.0E-01	Mortality	2.70E+02	EPA (1987) in EPA (1999)
n-Propyl benzene	103-65-1	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
o-Cresol	95-48-7	Chronic	No data	Aquatic biota	1.30E+01	No data	No data	Tier II SCV	1.30E+01	Tier II SCV in Suter and Tsao (1996)
o-Dinitrobenzene	528-29-0	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
o-Nitroaniline	88-74-4	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
o-Toluidine	95-53-4	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
p-Chloroaniline	106-47-8	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
p-Cresol	106-44-5	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Phenol	108-95-2	Chronic	LC50	Aquatic biota	Various	No data	No data	Mortality	1.10E+02	Chronic NAWQC in Suter and Tsao (1996)
p-Nitrochlorobenzene	100-00-5	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
p-Toluidine	106-49-0	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
sec-Butyl benzene	135-98-8	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
tert-Butyl benzene	98-06-6	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Toluene-2,6-diamine	823-40-5	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Trimethyl benzene	25551-13-7	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Other Light Semivolatile Compounds (molecular weight <200 g/mole)										
1,1'-Biphenyl	92-52-4	Chronic	LC50	Aquatic biota	Various	No data	No data	Mortality	1.40E+01	Tier II SCV in Suter and Tsao (1996)
1,1-Dimethylhydrazine	57-14-7	No data	No data	No data	No data	No data	No data	No data	No TRV	No data

Table C3-5 Derivation of Surface Water Toxicity Reference Values (TRVs) for Exposure of Aquatic Biota to COPCs and ROPCs

Constituent of Potential Concern	CAS Registry Number	Test duration	Endpoint	Test species	Endpoint Concen-tration (EC)	Duration conversion factor (DCF)[a]	Endpoint conversion factor (ECF)[a]	Effect	TRV (EC × DCF × ECF)	Source[b]
1,2-Dimethylhydrazine	540-73-8	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
1,2-Diphenylhydrazine	122-66-7	Acute	LOEL	Aquatic biota	2.70E+02	1.0E-01	1.0E-01	Mortality	2.70E+00	EPA (1987)
1,3-Propane sultone	1120-71-4	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
2,4-Toluene diisocyanate	584-84-9	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
2-Chloroacetophenone	532-27-4	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
2-Propenoic acid	79-10-7	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
4,4'-Methylenedianiline	101-77-9	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Acetophenone	98-86-2	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Benzoic acid	65-85-0	Chronic	LC50	Aquatic biota	Various	No data	No data	Mortality	4.20E+01	Tier II SCV in Suter and Tsao (1996)
Bis(2-chloroethoxy)methane	111-91-1	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Bis(2-chloroethyl) ether	111-44-4	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Chlorocyclopentadiene	41851-50-7	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Cyclohexanol	108-93-0	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Dichloroisopropyl ether	108-60-1	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Dichloromethyl ether	542-88-1	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Dichloropentadiene	61626-71-9	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Dimethyl sulfate	77-78-1	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Dimethylaniline	121-69-7	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
di-n-Propylnitrosamine	621-64-7	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Diphenyl ether	101-84-8	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Epichlorohydrin	106-89-8	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Ethyl carbamate (Urethane)	51-79-6	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Ethyl methanesulfonate	62-50-0	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Ethylene dibromide	106-93-4	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Ethylene glycol	107-21-1	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Ethylene glycol monobutyl ether	111-76-2	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Ethylene glycol monoethyl ether acetate	111-15-9	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Ethylene thiourea	96-45-7	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Furfural	98-01-1	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Maleic hydrazide	123-33-1	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Malononitrile	109-77-3	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Methyl styrene (mixed isomers)	25013-15-4	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Methylhydrazine	60-34-4	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
N,N-Diphenylamine	122-39-4	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Nitric acid, propyl ester	627-13-4	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
N-Nitrosodi-n-butylamine	924-16-3	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
N-Nitrosomorpholine	59-89-2	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
N-Nitroso-N,N-dimethylamine	62-75-9	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
o-Anisidine	90-04-0	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Oxalic acid	144-62-7	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Phthalic anhydride	85-44-9	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
p-Phthalic acid	100-21-0	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Pyridine	110-86-1	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Quinoline	91-22-5	No data	No data	No data	No data	No data	No data	No data	No TRV	No data

Table C3-5 Derivation of Surface Water Toxicity Reference Values (TRVs) for Exposure of Aquatic Biota to COPCs and ROPCs

Constituent of Potential Concern	CAS Registry Number	Test duration	Endpoint	Test species	Endpoint Concen-tration (EC)	Duration conversion factor (DCF)[a]	Endpoint conversion factor (ECF)[a]	Effect	TRV (EC × DCF × ECF)	Source[b]
Quinone	106-51-4	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Safrole	94-59-7	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Tetrahydrofuran	109-99-9	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Other Heavy Semivolatile Compounds (molecular weight >200 g/mole)										
1,2,4,5-Tetrachlorobenzene	95-94-3	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
1,3,5-Trinitrobenzene	99-35-4	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
2,6-Bis(tert-butyl)-4-methylphenol	128-37-0	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
2-Cyclohexyl-4,6-dinitrophenol	131-89-5	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
2-sec-Butyl-4,6-dinitrophenol	88-85-7	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
3,3'-Dichlorobenzidine	91-94-1	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
3,3'-Dimethoxybenzidine	119-90-4	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
4-Bromophenylphenyl ether	101-55-3	Chronic	LC50	Aquatic biota	Various	No data	No data	Mortality	1.50E+00	Tier II SCV in Suter and Tsao (1996)
Ammonium perfluorooctanoate	3825-26-1	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Azobenzene	103-33-3	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Bis(3-tert-butyl-4-hydroxy-6-methyl-phenyl)sulfide	96-69-5	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Captan	133-06-2	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Chlorobenzilate	510-15-6	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Dibutylphosphate	107-66-4	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Dimethyl aminoazobenzene	60-11-7	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Hexachlorobenzene	118-74-1	Chronic	No data	No data	3.68E+00	No data	No data	No data	3.68E+00	EPA (1987) in EPA (1999)
Hexachlorobutadiene	87-68-3	Chronic	LOEL	No data	9.30E+00	1.0E+00	1.0E-01	No data	9.30E-01	EPA (1987) in EPA (1999)
Hexachlorocyclopentadiene	77-47-4	Chronic	LOEL	Aquatic biota	5.20E+00	1.0E+00	1.0E-01	Mortality	5.20E-01	EPA (1987) in EPA (1999)
Hexachloroethane	67-72-1	Chronic	LC50	Aquatic biota	Various	No data	No data	Mortality	1.20E+01	Tier II SCV in Suter and Tsao (1996)
Hexachlorophene	70-30-4	Subchronic	NOEC	*Pimphales promelas*	8.80E+00	1.0E-01	1.0E+00	Mortality	8.80E-01	Call and others (1989) in EPA (1999)
Hexamethylene-1,5-diisocyanate	822-06-0	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Mirex	2385-85-5	No data	No data	No data	1.00E-03	No data	No data	No data	1.00E-03	Freshwater criterion in EPA (1987)
Nitrofen	1836-75-5	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Pentachlorobenzene	608-93-5	Chronic	No data	No data	4.70E-01	No data	No data	No data	4.70E-01	EPA (1996) in EPA (1999)
Pentachloronitrobenzene	82-68-8	Acute	LC50	*Cyprinus carpio*	1.00E+03	1.0E-01	1.0E-01	Mortality	1.00E+01	Hashimoto and Nishiuchi (1981) in EPA (1999)
Pentachlorophenol	87-86-5	Chronic	No data	No data	1.50E+01	No data	No data	No data	1.50E+01	EPA (1999b) in EPA (1999)
Picric acid	88-89-1	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Pronamide	23950-58-5	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Strychnine	57-24-9	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Terphenyls	26140-60-3	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Tributyl phosphate	126-73-8	No data	No data	No data	No data	No data	No data	No data	No TRV	No data

Table C3-5 Derivation of Surface Water Toxicity Reference Values (TRVs) for Exposure of Aquatic Biota to COPCs and ROPCs

Constituent of Potential Concern	CAS Registry Number	Test duration	Endpoint	Test species	Endpoint Concen-tration (EC)	Duration conversion factor (DCF)[a]	Endpoint conversion factor (ECF)[a]	Effect	TRV (EC × DCF × ECF)	Source[b]
Trifluralin	1582-09-8	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Triphenylamine	603-34-9	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Herbicides and Organochlorinated Pesticides										
2,4,5-T	93-76-5	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
2,4-D and esters	94-75-7	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
4,4'-DDD	72-54-8	Chronic	LC50	Aquatic biota	Various	No data	No data	Mortality	1.10E-02	Tier II SCV in Suter and Tsao (1996)
4,4'-DDE	72-55-9	Acute	LOEL	No data	1.05E+03	1.0E-01	1.0E-01	Mortality	1.05E+01	EPA (1987) in EPA (1999)
4,4'-DDT	50-29-3	Chronic	LC50	Aquatic biota	Various	No data	No data	Mortality	1.30E-02	Tier II SCV in Suter and Tsao (1996)
Aldrin	309-00-2	Chronic	No data	Aquatic biota	No data	No data	No data	Toxic effects	3.00E+00	EPA (1987)
alpha-BHC	319-84-6	Chronic	LC50	Aquatic biota	Various	No data	No data	Mortality	2.20E+00	Tier II SCV in Suter and Tsao (1996)
beta-BHC	319-85-7	Chronic	LC50	Aquatic biota	Various	No data	No data	Mortality	2.20E+00	Tier II SCV in Suter and Tsao (1996)
Chlordane	57-74-9	Chronic	LC50	Aquatic biota	Various	No data	No data	Mortality	1.70E-01	Chronic NAWQC in Suter and Tsao (1996)
delta-BHC	319-86-8	Chronic	LC50	Aquatic biota	Various	No data	No data	Mortality	2.20E+00	Tier II SCV in Suter and Tsao (1996)
Dieldrin	60-57-1	Chronic	LC50	Aquatic biota	Various	No data	No data	Mortality	6.20E-02	Chronic NAWQC in Suter and Tsao (1996)
Endothall	145-73-3	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Endrin	72-20-8	Chronic	LC50	Aquatic biota	Various	No data	No data	Mortality	6.10E-02	Chronic NAWQC in Suter and Tsao (1996)
gamma-BHC (Lindane)	58-89-9	Chronic	LC50	Aquatic biota	Various	No data	No data	Mortality	8.00E-02	Chronic NAWQC in Suter and Tsao (1996)
Heptachlor	76-44-8	Chronic	No data	Aquatic biota	3.80E-03	No data	No data	No data	3.80E-03	EPA (1987) in EPA (1999)
Isodrin	465-73-6	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Methoxychlor	72-43-5	Chronic	LC50	Aquatic biota	Various	No data	No data	Mortality	1.90E-02	Tier II SCV in Suter and Tsao (1996)
Silvex (2,4,5-TP)	93-72-1	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Toxaphene	8001-35-2	Acute	LOEL	Aquatic biota	1.75E+04	1.0E-01	1.0E-01	Mortality	1.75E+02	EPA (1987)
Inorganic Chemicals and Compounds					(mg/L)				(mg/L)	
Metals										
Aluminum	7429-90-5	Chronic	LC50	Aquatic biota	Various	No data	No data	Mortality	8.70E-02	Chronic NAWQC from EPA (1988b) in EPA (1999)
Antimony	7440-36-0	Chronic	LC50	Aquatic biota	Various	No data	No data	No data	3.00E-02	Proposed chronic criterion from EPA (1987) in EPA (1999)
Arsenic	7440-38-2	Chronic	No data	No data	1.50E-01	No data	No data	No data	1.50E-01	Chronic criterion from EPA (1999b) in EPA (1999)

Table C3-5 Derivation of Surface Water Toxicity Reference Values (TRVs) for Exposure of Aquatic Biota to COPCs and ROPCs

Constituent of Potential Concern	CAS Registry Number	Test duration	Endpoint	Test species	Endpoint Concen-tration (EC)	Duration conversion factor (DCF)[a]	Endpoint conversion factor (ECF)[a]	Effect	TRV (EC × DCF × ECF)	Source[b]
Barium	7440-39-3	Chronic	LC50	Aquatic biota	Various	No data	No data	Mortality	4.00E-03	Tier II SCV in Suter and Tsao (1996)
Beryllium	7440-41-7	Chronic	LC50	Aquatic biota	Various	No data	No data	Mortality	6.60E-04	Tier II SCV from Suter and Tsao (1996) in EPA (1999)
Bismuth	7440-69-9	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Boron	7440-42-8	Chronic	LC50	Aquatic biota	Various	No data	No data	Mortality	1.60E-03	Tier II SCV in Suter and Tsao (1996)
Cadmium	7440-43-9	Chronic	No data	No data	2.20E-03	No data	No data	No data	2.20E-03	Chronic criterion from EPA (1999b) in EPA (1999)
Calcium	7440-70-2	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Chromium[d]	18540-29-9	Chronic	LC50	Aquatic biota	Various	No data	No data	Mortality	1.10E-02	Chronic criterion from EPA (1999b) in EPA (1999)
Cobalt	7440-48-4	Chronic	LC50	Aquatic biota	Various	No data	No data	Mortality	2.30E-02	Tier II SCV in Suter and Tsao (1996)
Copper	7440-50-8	Chronic	No data	No data	9.00E-03	No data	No data	No data	9.00E-03	Chronic criterion from EPA (1999b) in EPA (1999)
Iron	7439-89-6	Chronic	LC50	Aquatic biota	Various	No data	No data	Mortality	1.00E+00	Tier II SCV in Suter and Tsao (1996)
Lead	7439-92-1	Chronic	No data	Aquatic biota	2.50E-03	No data	No data	No data	2.50E-03	Chronic criterion from EPA (1999b) in EPA (1999)
Lithium	7439-93-2	Chronic	LC50	Aquatic biota	Various	No data	No data	Mortality	1.40E-02	Tier II SCV in Suter and Tsao (1996)
Magnesium	7439-95-4	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Manganese	7439-96-5	Chronic	LC50	Aquatic biota	Various	No data	No data	Mortality	1.20E-01	Tier II SCV in Suter and Tsao (1996)
Mercury	7439-97-6	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Mercury - Hg+2	7487-94-7	Chronic	No data	No data	7.70E-04	No data	No data	No data	7.70E-04	Chronic criterion from EPA (1999b) in EPA (1999)
Methylmercury	22967-92-6	Chronic	LC50	Aquatic biota	Various	No data	No data	Mortality	2.80E-06	Tier II SCV from Suter and Tsao (1996) in EPA (1999)
Molybdenum	7439-98-7	Chronic	LC50	Aquatic biota	Various	No data	No data	Mortality	3.70E-01	Tier II SCV in Suter and Tsao (1996)
Nickel	7440-02-0	Chronic	No data	Aquatic biota	5.20E-02	No data	No data	No data	5.20E-02	Chronic criterion from EPA (1999b) in EPA (1999)
Potassium	7440-09-7	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Rhodium	7440-16-6	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Selenium	7782-49-2	Chronic	LC50	Aquatic biota	Various	No data	No data	Mortality	5.00E-03	Chronic NAWQC from EPA (1999b) in EPA (1999)
Silicon	7440-21-3	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Silver	7440-22-4	Chronic	No data	*Onchorynchus mykiss*	1.20E-04	No data	No data	No data	1.20E-04	Proposed Chronic Criterion from EPA (1987) in EPA (1999)
Sodium	7440-23-5	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Strontium	7440-24-6	Chronic	LC50	Aquatic biota	Various	No data	No data	Mortality	1.50E+00	Tier II SCV in Suter and Tsao (1996)

Table C3-5 Derivation of Surface Water Toxicity Reference Values (TRVs) for Exposure of Aquatic Biota to COPCs and ROPCs

Constituent of Potential Concern	CAS Registry Number	Test duration	Endpoint	Test species	Endpoint Concen-tration (EC)	Duration conversion factor (DCF)[a]	Endpoint conversion factor (ECF)[a]	Effect	TRV (EC × DCF × ECF)	Source[b]
Tantalum	7440-25-7	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Thallium	7440-28-0	Chronic	LOEL	No data	4.00E-02	No data	1.0E-01	No data	4.00E-03	EPA (1987) in EPA (1999)
Tin	7440-31-5	Chronic	LC50	Aquatic biota	Various	No data	No data	Mortality	7.30E-02	Tier II SCV in Suter and Tsao (1996)
Tungsten	7440-33-7	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Uranium	7440-61-1	Chronic	LC50	Aquatic biota	Various	No data	No data	Mortality	2.60E-03	Tier II SCV in Suter and Tsao (1996)
Vanadium	7440-62-2	Chronic	LC50	Aquatic biota	Various	No data	No data	Mortality	2.00E-02	Tier II SCV in Suter and Tsao (1996)
Yttrium	7440-65-5	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Zinc	7440-66-6	Chronic	LC50	Aquatic biota	Various	No data	No data	Mortality	1.18E-01	Chronic NAWQC from EPA (1999b) in EPA (1999)
Zirconium	7440-67-7	Chronic	LC50	Aquatic biota	Various	No data	No data	Mortality	1.70E-02	Tier II SCV in Suter and Tsao (1996)
Non-metals and Anions										
Ammonia/Ammonium	7664-41-7	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Bromide	24959-67-9	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Chloride	16887-00-6	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Cyanide	57-12-5	Chronic	LC50	Aquatic biota	Various	No data	No data	Mortality	5.20E-03	Chronic NAWQC from EPA (1999b) in EPA (1999)
Fluoride	16984-48-8	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Hydroxide	14280-30-9	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Iodine	7553-56-2	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Nitrate	14797-55-8	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Nitrite	14797-65-0	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Phosphate	14265-44-2	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Phosphorus	7723-14-0	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Sulfate	14808-79-8	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Total sulfur	63705-05-5	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Criteria Pollutants										
Carbon monoxide	630-08-0	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Nitrogen dioxide	10102-44-0	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Ozone	10028-15-6	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Particulate matter	No CAS #	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Sulfur dioxide	7446-09-5	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Radionuclides										
All radionuclides combined (rad/d)[c]	No CAS #	Chronic	Adverse effects	Aquatic biota	NA	NA	NA	Population effects	1.00E+00	NCRP (1991)

Table C3-5 Derivation of Surface Water Toxicity Reference Values (TRVs) for Exposure of Aquatic Biota to COPCs and ROPCs

Notes/Sources

No data = No data available.
NA = Not applicable.
CAS = Chemical Abstracts Service.
EC = Concentration that caused the reported effect.
DCF = Duration conversion factor; 1 if chronic, 0.1 if subchronic (Sample and others 1996).
ECF = Endpoint conversion factor; 1 if NOAEL, 0.1 if LOAEL (Sample and others 1996).
TRV = Toxicity reference value.
LOAEL = Lowest observed adverse effect level.
LOEL = Lowest exposure level at which an effect was observed.
Tier II SCV = Secondary Chronic Value calculated according to Great Lakes Initiative methods.
LC50 = Concentration lethal to 50 % of tested individuals.
EC20 = Concentration at which an effect was observed in 20 % of tested individuals.
LC100 = Concentration lethal to 100 % of tested individuals.
Chronic NAWQC = Chronic National Ambient Water Quality Criterion.
NOEC = Highest concentration at which an effect was not observed.
EC50 = Concentration at which an effect was observed in 50 % of tested individuals.

[a] Methods to calculate NAWQC and Tier II SCV values are presented in Suter and Tsao (1996).

[b] Order of preference is: EPA (1999), then NAWQC, then Tier II chronic value, then other published data.

[c] Data for Aroclor-1254 used as representative of polychlorinated biphenyl mixtures.

[d] Values for hexavalent chromium, which is more toxic than trivalent chromium.

[e] TRV is not applicable to single radionuclides. Combined external and internal radiation exposure for aquatic biota from all radionuclides combined cannot exceed 1 rad/d.

Table C3-6 Derivation of Surface Water Toxicity Reference Values (TRVs) from Data for Sensitive Species for Exposure of Chinook Salmon and Other Salmonids to COPCs and ROPCs

Constituent of Potential Concern	CAS Registry Number	Test duration	Endpoint	Test species	Endpoint Concen-tration (EC)	Duration conversion factor (DCF)[a]	Endpoint conversion factor (ECF)[a]	Effect	TRV (EC × DCF × ECF)	Source[b]
Organic Compounds					(µg/L)				(µg/L)	
Aromatic Halogenated Hydrocarbons										
2,3,4,6-Tetrachlorophenol	58-90-2	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
4-Chloro-3-methylphenol	59-50-7	Acute	LOEL	Aquatic biota	3.00E+01	1.0E-01	1.0E-01	Mortality	3.00E-01	EPA (1987)
Aromatic Nonhalogenated Hydrocarbons										
2-Nitrotoluene	88-72-2	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
4-Nitrobiphenyl	92-93-3	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Benzaldehyde	100-52-7	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Benzene	71-43-2	Acute	LOAEL	*Onchorynchus mykiss*	3.16E+00	1.0E-01	1.0E-01	Mortality	3.16E-02	Suter and Tsao (1996)
Benzyl alcohol	100-51-6	Chronic	LC50	Aquatic biota	Various	No data	No data	Mortality	8.60E+00	Tier II SCV in Suter and Tsao (1996)
Ethyl benzene	100-41-4	Chronic	LC50	Aquatic biota	Various	No data	No data	Mortality	7.30E+00	Tier II SCV in Suter and Tsao (1996)
m-Xylene	108-38-3	Chronic	LC50	Aquatic biota	Various	No data	No data	Mortality	1.80E+00	Tier II SCV in Suter and Tsao (1996)
o-Xylene	95-47-6	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
p-Xylene	106-42-3	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Styrene	100-42-5	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Toluene	108-88-3	Chronic	LC50	Aquatic biota	Various	No data	No data	Mortality	9.80E+00	Tier II SCV in Suter and Tsao (1996)
Non-aromatic Nonhalogenated Hydrocarbons										
1,2-Epoxybutane	106-88-7	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
1,3-Butadiene	106-99-0	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
1,4-Dioxane	123-91-1	Acute	EC20	*Daphnia magna*	6.21E+06	1.0E-01	1.0E-01	Mortality	6.21E+04	Bringmann and Kuehn (1982) in EPA (1999)
1-Methylpropyl alcohol	78-92-2	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
1-Nitropropane	108-03-2	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
2,2,4-Trimethylpentane	540-84-1	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
2-Butanone	78-93-3	Chronic	LC50	Aquatic biota	Various	No data	No data	Mortality	1.40E+04	Tier II SCV in Suter and Tsao (1996)
2-Butenaldehyde (2-Butenal)	4170-30-3	Acute	LC50	*Lepomis macrochirus*	3.50E+03	1.0E-01	1.0E-01	No data	3.50E+01	Dawson and others (1977) in EPA (1999)
2-Ethoxyethanol	110-80-5	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
2-Heptanone	110-43-0	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
2-Hexanone	591-78-6	Chronic	LC50	Aquatic biota	Various	No data	No data	Mortality	9.90E+01	Tier II SCV in Suter and Tsao (1996)
2-Methoxyethanol	109-86-4	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
2-Methyl-2-propanol	75-65-0	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
2-Methyl-2-propenenitrile	126-98-7	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
2-Methylaziridine	75-55-8	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
2-Methylpropyl alcohol	78-83-1	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
2-Pentanone	107-87-9	No data	No data	No data	No data	No data	No data	No data	No TRV	No data

Table C3-6 Derivation of Surface Water Toxicity Reference Values (TRVs) from Data for Sensitive Species for Exposure of Chinook Salmon and Other Salmonids to COPCs and ROPCs

Constituent of Potential Concern	CAS Registry Number	Test duration	Endpoint	Test species	Endpoint Concen-tration (EC)	Duration conversion factor (DCF)[a]	Endpoint conversion factor (ECF)[a]	Effect	TRV (EC × DCF × ECF)	Source[b]
2-Propanone (Acetone)	67-64-1	Acute	LOAEL	*Onchorynchus mykiss*	1.26E+03	1.0E-01	1.0E-01	No data	1.26E+01	AQUIRE
2-Propene-1-ol	107-18-6	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
2-Propyl alcohol	67-63-0	Chronic	LC50	Aquatic biota	Various	No data	No data	Mortality	7.50E+00	Tier II SCV in Suter and Tsao (1996)
3-Heptanone	106-35-4	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
3-Methyl-1-butanol	123-51-3	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
3-Methyl-2-butanone	563-80-4	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
3-Pentanone	96-22-0	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
4-Heptanone	123-19-3	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
4-Methyl-2-pentanone	108-10-1	Chronic	LC50	Aquatic biota	Various	No data	No data	Mortality	1.70E+02	Tier II SCV in Suter and Tsao (1996)
4-Methyl-3-penten-2-one	141-79-7	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
5-Methyl-2-hexanone	110-12-3	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Acetaldehyde	75-07-0	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Acetamide	60-35-5	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Acetic acid	64-19-7	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Acetic acid ethyl ester	141-78-6	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Acetic acid n-butyl ester	123-86-4	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Acetonitrile	75-05-8	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Acrolein	107-02-8	Chronic	LOEL	Aquatic biota	2.10E+01	1.0E+00	1.0E-01	Mortality	2.10E+00	EPA (1987)
Acrylonitrile	107-13-1	Chronic	LOEL	Aquatic biota	2.60E+03	1.0E+00	1.0E-01	Mortality	2.60E+02	EPA (1987c) in EPA (1999)
Bis(isopropyl)ether	108-20-3	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Butane	106-97-8	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Carbon disulfide	75-15-0	Chronic	LC50	Aquatic biota	Various	No data	No data	Mortality	9.20E-01	Tier II SCV in Suter and Tsao (1996)
Cyanogen	460-19-5	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Cyclohexane	110-82-7	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Cyclohexanone	108-94-1	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Cyclohexene	110-83-8	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Cyclopentane	287-92-3	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Ethyl alcohol	64-17-5	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Ethyl ether	60-29-7	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Ethyl methacrylate	97-63-2	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Formaldehyde	50-00-0	Acute	LC50	No data	4.96E+03	1.0E-01	1.0E-01	No data	4.96E+01	TRV for formalin (Reardon and Harrell 1990) used as surrogate (EPA 1999)
Formamide	75-12-7	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Formic acid	64-18-6	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Formic acid, methyl ester	107-31-3	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Glycidylaldehyde	765-34-4	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Methyl acetate	79-20-9	No data	No data	No data	No data	No data	No data	No data	No TRV	No data

Table C3-6 Derivation of Surface Water Toxicity Reference Values (TRVs) from Data for Sensitive Species for Exposure of Chinook Salmon and Other Salmonids to COPCs and ROPCs

Constituent of Potential Concern	CAS Registry Number	Test duration	Endpoint	Test species	Endpoint Concen-tration (EC)	Duration conversion factor (DCF)[a]	Endpoint conversion factor (ECF)[a]	Effect	TRV (EC × DCF × ECF)	Source[b]
Methyl alcohol	67-56-1	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Methyl isocyanate	624-83-9	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Methyl methacrylate	80-62-6	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Methyl tert-butyl ether	1634-04-4	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Methylacetylene	74-99-7	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Methylcyclohexane	108-87-2	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
N,N-Dimethylacetamide	127-19-5	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
n-Butyl alcohol	71-36-3	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
n-Heptane	142-82-5	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
n-Hexane	110-54-3	Chronic	LC50	Aquatic biota	Various	No data	No data	Mortality	5.80E-01	Tier II SCV in Suter and Tsao (1996)
Nitromethane	75-52-5	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
n-Nonane	111-84-2	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
n-Octane	111-65-9	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
n-Pentane	109-66-0	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
n-Propionaldehyde	123-38-6	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
n-Propyl alcohol	71-23-8	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
n-Valeraldehyde	110-62-3	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Oxirane	75-21-8	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
p-Cymene	99-87-6	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Phosgene	75-44-5	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Propargyl alcohol	107-19-7	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Propionic acid	79-09-4	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Propionitrile	107-12-0	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Propylene glycol monomethyl ether	107-98-2	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
p-tert-Butyltoluene	98-51-1	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Triethylamine	121-44-8	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Trimethylamine	75-50-3	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Vinyl acetate	108-05-4	Chronic	LC50	Aquatic biota	Various	No data	No data	Mortality	1.60E+01	Tier II SCV in Suter and Tsao (1996)
Non-aromatic Halogenated Hydrocarbons										
1,1,1,2-Tetrachloro-2,2-difluoroethane	76-11-9	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
1,1,1,2-Tetrachloroethane	630-20-6	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
1,1,1-Trichloroethane	71-55-6	Chronic	LC50	Aquatic biota	Various	No data	No data	Mortality	1.10E+01	Tier II SCV in Suter and Tsao (1996)
1,1,2,2-Tetrachloro-1,2-difluoroethane	76-12-0	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
1,1,2,2-Tetrachloroethane	79-34-5	Chronic	LC50	Aquatic biota	Various	No data	No data	Mortality	6.10E+02	Tier II SCV in Suter and Tsao (1996)
1,1,2,2-Tetrachloroethene	127-18-4	Acute	LOAEL	*Onchorynchus mykiss*	3.16E+00	1.0E-01	1.0E-01	No data	3.16E-02	Suter and Tsao (1996)
1,1,2-Trichloroethane	79-00-5	Chronic	LC50	Aquatic biota	Various	No data	No data	Mortality	1.20E+03	Tier II SCV in Suter and Tsao (1996)

Table C3-6 Derivation of Surface Water Toxicity Reference Values (TRVs) from Data for Sensitive Species for Exposure of Chinook Salmon and Other Salmonids to COPCs and ROPCs

Constituent of Potential Concern	CAS Registry Number	Test duration	Endpoint	Test species	Endpoint Concen-tration (EC)	Duration conversion factor (DCF)[a]	Endpoint conversion factor (ECF)[a]	Effect	TRV (EC × DCF × ECF)	Source[b]
1,1,2-Trichloroethylene	79-01-6	Chronic	LC50	Aquatic biota	Various	No data	No data	Mortality	4.70E+01	Tier II SCV in Suter and Tsao (1996)
1,1-Dichloroethane	75-34-3	Chronic	LC50	Aquatic biota	Various	No data	No data	Mortality	4.70E+01	Tier II SCV in Suter and Tsao (1996)
1,1-Dichloroethene	75-35-4	Chronic	LC50	Aquatic biota	Various	No data	No data	Mortality	2.50E+01	Tier II SCV in Suter and Tsao (1996)
1,2,2-Trichloro-1,1,2-trifluoroethane	76-13-1	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
1,2,3-Trichloropropane	96-18-4	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
1,2-Dibromo-3-chloropropane	96-12-8	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
1,2-Dichloro-1,1,2,2-tetrafluoroethane	76-14-2	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
1,2-Dichloroethane	107-06-2	Chronic	LC50	Aquatic biota	Various	No data	No data	Mortality	9.10E+02	Tier II SCV in Suter and Tsao (1996)
1,2-Dichloroethylene	540-59-0	Chronic	LC50	Aquatic biota	Various	No data	No data	Mortality	5.90E+02	Tier II SCV in Suter and Tsao (1996)
1,2-Dichloropropane	78-87-5	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
1,3-Dichloropropene	542-75-6	Chronic	LC50	Aquatic biota	Various	No data	No data	Mortality	5.50E-02	Tier II SCV in Suter and Tsao (1996)
1,4-Dichloro-2-butene	764-41-0	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
1-Chloroethene	75-01-4	Subchronic	LC100	No data	3.88E+05	1.0E-01	1.0E-01	No data	3.88E+03	Brown and others (1977) in EPA (1999)
2,2-Dichloropropionic acid	75-99-0	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
2-Chloropropane	75-29-6	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
3-Chloropropene (Allyl chloride)	107-05-1	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Bromochloromethane	74-97-5	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Bromodichloromethane	75-27-4	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Bromoethene	593-60-2	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Bromoform	75-25-2	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Bromomethane	74-83-9	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Carbon tetrachloride	56-23-5	Chronic	LC50	Aquatic biota	Various	No data	No data	Mortality	9.80E+00	Tier II SCV in Suter and Tsao (1996)
Chlorodibromomethane	124-48-1	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Chlorodifluoromethane	75-45-6	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Chloroethane	75-00-3	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Chloroform	67-66-3	Chronic	LC50	Aquatic biota	Various	No data	No data	Mortality	2.80E+01	Tier II SCV from Suter and Tsao (1996) in EPA (1999)
Chloromethane	74-87-3	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Chloropentafluoroethane	76-15-3	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
cis-1,2-Dichloroethene	156-59-2	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
cis-1,3-Dichloropropene	10061-01-5	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Cyanogen bromide	506-68-3	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Cyanogen chloride	506-77-4	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Dichlorodifluoromethane	75-71-8	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Dichlorofluoromethane	75-43-4	No data	No data	No data	No data	No data	No data	No data	No TRV	No data

Table C3-6 Derivation of Surface Water Toxicity Reference Values (TRVs) from Data for Sensitive Species for Exposure of Chinook Salmon and Other Salmonids to COPCs and ROPCs

Constituent of Potential Concern	CAS Registry Number	Test duration	Endpoint	Test species	Endpoint Concen-tration (EC)	Duration conversion factor (DCF)[a]	Endpoint conversion factor (ECF)[a]	Effect	TRV (EC × DCF × ECF)	Source[b]
Dichloromethane	75-09-2	Chronic	No data	Aquatic biota	2.20E+03	No data	No data	Tier II SCV	2.20E+03	Tier II SCV in Suter and Tsao (1996)
Difluorodibromomethane	75-61-6	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Hexafluoroacetone	684-16-2	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Iodomethane	74-88-4	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Methylene bromide	74-95-3	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Pentachloroethane	76-01-7	Chronic	LOEL	Aquatic biota	3.90E+02	1.0E+00	1.0E-01	Mortality	3.90E+01	EPA (1987)
trans-1,2-Dichloroethylene	156-60-5	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
trans-1,3-Dichloropropene	10061-02-6	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Trichloroacetic acid	76-03-9	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Trichlorofluoroethane	27154-33-2	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Trichlorofluoromethane	75-69-4	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Trifluorobromomethane	75-63-8	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Dioxin and Furan Compounds (PCDDs/PCDFs)										
1,2,3,4,6,7,8-Heptachlorodibenzo(p)dioxin	35822-46-9	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
1,2,3,4,6,7,8-Heptachlorodibenzofuran	67562-39-4	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
1,2,3,4,7,8,9-Heptachlorodibenzofuran	55673-89-7	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
1,2,3,4,7,8-Hexachlorodibenzo(p)dioxin	39227-28-6	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
1,2,3,4,7,8-Hexachlorodibenzofuran	70648-26-9	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
1,2,3,6,7,8-Hexachlorodibenzo(p)dioxin	57653-85-7	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
1,2,3,6,7,8-Hexachlorodibenzofuran	57117-44-9	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
1,2,3,7,8,9-Hexachlorodibenzo(p)dioxin	19408-74-3	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
1,2,3,7,8,9-Hexachlorodibenzofuran	72918-21-9	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
1,2,3,7,8-Pentachlorodibenzo(p)dioxin	40321-76-4	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
1,2,3,7,8-Pentachlorodibenzofuran	57117-41-6	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
2,3,4,6,7,8-Hexachlorodibenzofuran	60851-34-5	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
2,3,4,7,8-Pentachlorodibenzofuran	57117-31-4	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
2,3,7,8-Tetrachlorodibenzo(p)dioxin	1746-01-6	Chronic	LOEL	*Onchorynchus mykiss*	3.80E-05	1.0E+00	1.0E-01	Mortality	3.80E-06	Mehrle and others (1988) in EPA (1999)
2,3,7,8-Tetrachlorodibenzofuran	51207-31-9	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Dibenzofuran	132-64-9	Chronic	LC50	Aquatic biota	Various	No data	No data	Mortality	3.70E+00	Tier II SCV in Suter and Tsao (1996)
Octachlorodibenzo(p)dioxin	3268-87-9	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Octachlorodibenzofuran	39001-02-0	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Total dioxins and dibenzofurans	No CAS #	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Polychlorinated Biphenyls (PCBs)										
2,2',3,3',4,4',5-Heptachlorobiphenyl	35065-30-6	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
2,2',3,4,4',5,5'-Heptachlorobiphenyl	35065-29-3	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
2,3,3',4,4',5,5'-Heptachlorobiphenyl	39635-31-9	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
2,3,3',4,4',5'-Hexachlorobiphenyl	69782-90-7	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
2,3,3',4,4',5-Hexachlorobiphenyl	38380-08-4	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
2,3,3',4,4'-Pentachlorobiphenyl	32598-14-4	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
2,3',4,4',5,5'-Hexachlorobiphenyl	52663-72-6	No data	No data	No data	No data	No data	No data	No data	No TRV	No data

Table C3-6 Derivation of Surface Water Toxicity Reference Values (TRVs) from Data for Sensitive Species for Exposure of Chinook Salmon and Other Salmonids to COPCs and ROPCs

Constituent of Potential Concern	CAS Registry Number	Test duration	Endpoint	Test species	Endpoint Concen-tration (EC)	Duration conversion factor (DCF)[a]	Endpoint conversion factor (ECF)[a]	Effect	TRV (EC × DCF × ECF)	Source[b]
2,3,4,4',5-Pentachlorobiphenyl	74472-37-0	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
2',3,4,4',5-Pentachlorobiphenyl	65510-44-3	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
2,3',4,4',5-Pentachlorobiphenyl	31508-00-6	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
3,3',4,4',5,5'-Hexachlorobiphenyl	32774-16-6	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
3,3',4,4',5-Pentachlorobiphenyl	57465-28-8	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
3,3',4,4'-Tetrachlorobiphenyl	32598-13-3	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
3,4,4',5-Tetrachlorobiphenyl	70362-50-4	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Polychlorinated biphenyls (PCBs)[c]	1336-36-3	Chronic	LC50	Aquatic biota	Various	No data	No data	Mortality	1.40E-01	Tier II SCV in Suter and Tsao (1996)
Phthalates										
Bis(2-ethylhexyl) phthalate (DEHP)	117-81-7	Chronic	LC50	Aquatic biota	Various	No data	No data	Mortality	3.00E+00	Tier II SCV from Suter and Tsao (1996) in EPA (1999)
Butylbenzyl phthalate	85-68-7	Chronic	LC50	Aquatic biota	Various	No data	No data	Mortality	1.90E+01	Tier II SCV in Suter and Tsao (1996)
Dibutyl phthalate	84-74-2	Chronic	LC50	Aquatic biota	Various	No data	No data	Mortality	3.50E+01	Tier II SCV in Suter and Tsao (1996)
Diethyl phthalate	84-66-2	Chronic	LC50	Aquatic biota	Various	No data	No data	Mortality	2.10E+02	Tier II SCV in Suter and Tsao (1996)
Dimethyl phthalate	131-11-3	Chronic	LOAEL	*Onchorynchus mykiss*	4.00E-03	1.0E+00	1.0E-01	No data	4.00E-04	Suter and Tsao (1996)
n-Dioctyl phthalate	117-84-0	Chronic	LOEL	*Daphnia magna*	3.20E+02	1.0E+00	1.0E+00	Mortality	3.20E+02	McCarthy and Whitmore (1985) in EPA (1999)
Light Polycyclic Aromatic Hydrocarbons (molecular weight <200 g/mole)										
2-Chloronaphthalene	91-58-7	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
2-Methyl naphthalene	91-57-6	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
5-Nitroacenaphthene	602-87-9	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Acenaphthene	83-32-9	Chronic	LC50	Aquatic biota	Various	No data	No data	Mortality	2.30E+01	Chronic NAWQC in Suter and Tsao (1996)
Acenaphthylene	208-96-8	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Anthracene	120-12-7	Chronic	LC50	Aquatic biota	Various	No data	No data	Mortality	7.30E-01	Tier II SCV in Suter and Tsao (1996)
Fluorene	86-73-7	Chronic	LC50	Aquatic biota	Various	No data	No data	Mortality	3.90E+00	Tier II SCV in Suter and Tsao (1996)
Indene	95-13-6	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Naphthalene	91-20-3	Chronic	LC50	Aquatic biota	Various	No data	No data	Mortality	1.20E+01	Tier II SCV in Suter and Tsao (1996)
Phenanthrene	85-01-8	Chronic	LC50	Aquatic biota	Various	No data	No data	Mortality	6.30E+00	Chronic NAWQC in Suter and Tsao (1996)
Pyrene	129-00-0	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Heavy Polycyclic Aromatic Hydrocarbons (molecular weight >200 g/mole)										
3-Methylcholanthrene	56-49-5	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
5-Methylchrysene	3697-24-3	No data	No data	No data	No data	No data	No data	No data	No TRV	No data

Table C3-6 Derivation of Surface Water Toxicity Reference Values (TRVs) from Data for Sensitive Species for Exposure of Chinook Salmon and Other Salmonids to COPCs and ROPCs

Constituent of Potential Concern	CAS Registry Number	Test duration	Endpoint	Test species	Endpoint Concen-tration (EC)	Duration conversion factor (DCF)[a]	Endpoint conversion factor (ECF)[a]	Effect	TRV (EC × DCF × ECF)	Source[b]
Benzo[a]anthracene	56-55-3	Chronic	LC50	Aquatic biota	Various	No data	No data	Mortality	2.70E-02	Tier II SCV from Suter and Tsao (1996) in EPA (1999)
Benzo[a]pyrene	50-32-8	Chronic	LC50	Aquatic biota	Various	No data	No data	Mortality	1.40E-02	Tier II SCV from EPA (1996) in EPA (1999)
Benzo[a,i]pyrene	191-30-0	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Benzo[b]fluoranthene	205-99-2	NA	NA	NA	NA	NA	NA	NA	2.70E-02	TRV for benzo[a]anthracene used as surrogate; EPA (1999)
Benzo[e]pyrene	192-97-2	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Benzo[g,h,i]perylene	191-24-2	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Benzo[j]fluoranthene	205-82-3	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Benzo[k]fluoranthene	207-08-9	NA	NA	NA	NA	NA	NA	NA	2.70E-02	TRV for benzo[a]anthracene used as surrogate; EPA (1999)
Chrysene	218-01-9	NA	NA	NA	NA	NA	NA	NA	2.70E-02	TRV for benzo[a]anthracene used as surrogate; EPA (1999)
Dibenz[a,h]acridine	226-36-8	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Dibenz[a,h]anthracene	53-70-3	NA	NA	NA	NA	NA	NA	NA	2.70E-02	TRV for benzo[a]anthracene used as surrogate; EPA (1999)
Dibenz[a,j]acridine	224-42-0	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Dibenzo[a,e]fluoranthene	5385-75-1	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Dibenzo[a,e]pyrene	192-65-4	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Dibenzo[a,h]fluoranthene	No CAS #	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Dibenzo[a,h]pyrene	189-64-0	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Dibenzo[a,i]pyrene	189-55-9	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Fluoranthene	206-44-0	Chronic	LC50	Aquatic biota	Various	No data	No data	Mortality	6.16E+00	Chronic NAWQC in Suter and Tsao (1996)
Hexachloronaphthalene	1335-87-1	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Indeno[1,2,3-cd]pyrene	193-39-5	No data	No data	No data	No data	No data	No data	No data	2.70E-02	TRV for benzo[a]anthracene used as surrogate; EPA (1999)
Octachloronaphthalene	2234-13-1	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Pentachloronaphthalene	1321-64-8	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Tetrachloronaphthalene	1335-88-2	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Trichloronaphthalene	1321-65-9	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Light Substituted Benzene Compounds (molecular weight <200 g/mole)										
1,2,3-Trichlorobenzene	87-61-6	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
1,2,4-Trichlorobenzene	120-82-1	Chronic	LC50	Aquatic biota	Various	No data	No data	Mortality	1.10E+02	Tier II SCV in Suter and Tsao (1996)
1,2,4-Trimethyl benzene	95-63-6	No data	No data	No data	No data	No data	No data	No data	No TRV	No data

Table C3-6 Derivation of Surface Water Toxicity Reference Values (TRVs) from Data for Sensitive Species for Exposure of Chinook Salmon and Other Salmonids to COPCs and ROPCs

Constituent of Potential Concern	CAS Registry Number	Test duration	Endpoint	Test species	Endpoint Concen-tration (EC)	Duration conversion factor (DCF)[a]	Endpoint conversion factor (ECF)[a]	Effect	TRV (EC × DCF × ECF)	Source[b]
1,2-Dichlorobenzene	95-50-1	Chronic	LC50	Aquatic biota	Various	No data	No data	Mortality	1.40E+01	Tier II SCV in Suter and Tsao (1996)
1,3,5-Trimethyl benzene	108-67-8	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
1,3-Dichlorobenzene	541-73-1	Chronic	LC50	Aquatic biota	Various	No data	No data	Mortality	7.10E+01	Tier II SCV in Suter and Tsao (1996)
1,3-Dinitrobenzene	99-65-0	Subchronic	NOEC	*Selanastrum capricornutum*	2.60E+02	1.0E-01	1.0E+00	Reduced growth	2.60E+01	van der Schalie (1983) in EPA (1999)
1,4-Dichlorobenzene	106-46-7	Chronic	LC50	Aquatic biota	Various	No data	No data	Mortality	1.50E+01	Tier II SCV in Suter and Tsao (1996)
1,4-Dinitrobenzene	100-25-4	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
2,4,5-Trichlorophenol	95-95-4	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
2,4,6-Trichlorophenol	88-06-2	Acute	LOEL	Aquatic biota	9.70E+02	1.0E-01	1.0E-01	Mortality	9.70E+00	EPA (1987)
2,4-Dichlorophenol	120-83-2	Chronic	LOEL	Aquatic biota	3.65E+02	1.0E+00	1.0E-01	Mortality	3.65E+01	EPA (1987)
2,4-Dimethylphenol	105-67-9	Acute	LOEL	Aquatic biota	2.12E+03	1.0E-01	1.0E-01	Mortality	2.12E+01	EPA (1987)
2,4-Dinitrophenol	51-28-5	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
2,4-Dinitrotoluene	121-14-2	Chronic	LOEL	Aquatic biota	2.30E+02	1.0E+00	1.0E-01	Mortality	2.30E+01	EPA (1987c) in EPA (1999)
2,6-Dinitrotoluene	606-20-2	Chronic	NOEC	*Daphnia magna*	6.00E+01	1.0E+00	1.0E+00	Mortality	6.00E+01	Kuhn and others (1989) in EPA (1999)
2-Chlorophenol	95-57-8	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
2-Chlorotoluene	95-49-8	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
2-Nitrophenol	88-75-5	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
4,6-Dinitro-o-cresol	534-52-1	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
4-Chlorotoluene	106-43-4	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
4-Nitrophenol	100-02-7	Acute	LOAEL	*Onchorynchus mykiss*	6.31E+00	1.0E-01	1.0E-01	No data	6.31E-02	AQUIRE (2002)
alpha-Methylstyrene	98-83-9	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Aniline	62-53-3	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Benzotrichloride	98-07-7	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Benzyl chloride	100-44-7	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Bromobenzene	108-86-1	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Chlorobenzene	108-90-7	Chronic	LC50	Aquatic biota	Various	No data	No data	Mortality	6.40E+01	Tier II SCV in Suter and Tsao (1996)
Cumene	98-82-8	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
m-Cresol	108-39-4	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
n-Butyl benzene	104-51-8	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Nitrobenzene	98-95-3	Acute	LOEL	Aquatic biota	2.70E+04	1.0E-01	1.0E-01	Mortality	2.70E+02	EPA (1987c) in EPA (1999)
n-Propyl benzene	103-65-1	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
o-Cresol	95-48-7	Acute	LOAEL	*Onchorynchus mykiss*	6.31E+00	1.0E-01	1.0E-01	No data	6.31E-02	AQUIRE (2002)
o-Dinitrobenzene	528-29-0	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
o-Nitroaniline	88-74-4	No data	No data	No data	No data	No data	No data	No data	No TRV	No data

Table C3-6 Derivation of Surface Water Toxicity Reference Values (TRVs) from Data for Sensitive Species for Exposure of Chinook Salmon and Other Salmonids to COPCs and ROPCs

Constituent of Potential Concern	CAS Registry Number	Test duration	Endpoint	Test species	Endpoint Concen-tration (EC)	Duration conversion factor (DCF)[a]	Endpoint conversion factor (ECF)[a]	Effect	TRV (EC × DCF × ECF)	Source[b]
o-Toluidine	95-53-4	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
p-Chloroaniline	106-47-8	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
p-Cresol	106-44-5	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Phenol	108-95-2	Chronic	LC50	Aquatic biota	Various	No data	No data	Mortality	1.10E+02	Chronic NAWQC in Suter and Tsao (1996)
p-Nitrochlorobenzene	100-00-5	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
p-Toluidine	106-49-0	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
sec-Butyl benzene	135-98-8	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
tert-Butyl benzene	98-06-6	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Toluene-2,6-diamine	823-40-5	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Trimethyl benzene	25551-13-7	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Other Light Semivolatile Compounds (molecular weight <200 g/mole)										
1,1'-Biphenyl	92-52-4	Chronic	LC50	Aquatic biota	Various	No data	No data	Mortality	1.40E+01	Tier II SCV in Suter and Tsao (1996)
1,1-Dimethylhydrazine	57-14-7	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
1,2-Dimethylhydrazine	540-73-8	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
1,2-Diphenylhydrazine	122-66-7	Acute	LOEL	Aquatic biota	2.70E+02	1.0E-01	1.0E-01	Mortality	2.70E+00	EPA (1987)
1,3-Propane sultone	1120-71-4	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
2,4-Toluene diisocyanate	584-84-9	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
2-Chloroacetophenone	532-27-4	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
2-Propenoic acid	79-10-7	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
4,4'-Methylenedianiline	101-77-9	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Acetophenone	98-86-2	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Benzoic acid	65-85-0	Chronic	LC50	Aquatic biota	Various	No data	No data	Mortality	4.20E+01	Tier II SCV in Suter and Tsao (1996)
Bis(2-chloroethoxy)methane	111-91-1	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Bis(2-chloroethyl) ether	111-44-4	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Chlorocyclopentadiene	41851-50-7	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Cyclohexanol	108-93-0	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Dichloroisopropyl ether	108-60-1	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Dichloromethyl ether	542-88-1	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Dichloropentadiene	61626-71-9	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Dimethyl sulfate	77-78-1	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Dimethylaniline	121-69-7	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
di-n-Propylnitrosamine	621-64-7	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Diphenyl ether	101-84-8	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Epichlorohydrin	106-89-8	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Ethyl carbamate (Urethane)	51-79-6	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Ethyl methanesulfonate	62-50-0	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Ethylene dibromide	106-93-4	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Ethylene glycol	107-21-1	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Ethylene glycol monobutyl ether	111-76-2	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Ethylene glycol monoethyl ether acetate	111-15-9	No data	No data	No data	No data	No data	No data	No data	No TRV	No data

Table C3-6 Derivation of Surface Water Toxicity Reference Values (TRVs) from Data for Sensitive Species for Exposure of Chinook Salmon and Other Salmonids to COPCs and ROPCs

Constituent of Potential Concern	CAS Registry Number	Test duration	Endpoint	Test species	Endpoint Concen-tration (EC)	Duration conversion factor (DCF)[a]	Endpoint conversion factor (ECF)[a]	Effect	TRV (EC × DCF × ECF)	Source[b]
Ethylene thiourea	96-45-7	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Furfural	98-01-1	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Maleic hydrazide	123-33-1	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Malononitrile	109-77-3	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Methyl styrene (mixed isomers)	25013-15-4	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Methylhydrazine	60-34-4	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
N,N-Diphenylamine	122-39-4	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Nitric acid, propyl ester	627-13-4	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
N-Nitrosodi-n-butylamine	924-16-3	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
N-Nitrosomorpholine	59-89-2	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
N-Nitroso-N,N-dimethylamine	62-75-9	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
o-Anisidine	90-04-0	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Oxalic acid	144-62-7	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Phthalic anhydride	85-44-9	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
p-Phthalic acid	100-21-0	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Pyridine	110-86-1	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Quinoline	91-22-5	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Quinone	106-51-4	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Safrole	94-59-7	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Tetrahydrofuran	109-99-9	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Other Heavy Semivolatile Compounds (molecular weight >200 g/mole)										
1,2,4,5-Tetrachlorobenzene	95-94-3	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
1,3,5-Trinitrobenzene	99-35-4	Chronic	LOAEL	*Onchorynchus mykiss*	1.30E+01	1.0E+00	1.0E-01	No data	1.30E+00	Suter and Tsao (1996)
2,6-Bis(tert-butyl)-4-methylphenol	128-37-0	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
2-Cyclohexyl-4,6-dinitrophenol	131-89-5	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
2-sec-Butyl-4,6-dinitrophenol	88-85-7	Chronic	LOAEL	*Pimphales promelas*	1.30E-01	1.0E+00	1.0E-01	No data	1.30E-02	Suter and Tsao (1996)
3,3'-Dichlorobenzidine	91-94-1	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
3,3'-Dimethoxybenzidine	119-90-4	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
4-Bromophenylphenyl ether	101-55-3	Chronic	LC50	Aquatic biota	Various	No data	No data	Mortality	1.50E+00	Tier II SCV in Suter and Tsao (1996)
Ammonium perfluorooctanoate	3825-26-1	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Azobenzene	103-33-3	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Bis(3-tert-butyl-4-hydroxy-6-methyl-phenyl)sulfide	96-69-5	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Captan	133-06-2	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Chlorobenzilate	510-15-6	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Dibutylphosphate	107-66-4	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Dimethyl aminoazobenzene	60-11-7	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Hexachlorobenzene	118-74-1	Chronic	No data	No data	3.68E+00	No data	No data	No data	3.68E+00	EPA (1987c) in EPA (1999)
Hexachlorobutadiene	87-68-3	Chronic	LOEL	No data	9.30E+00	1.0E+00	1.0E-01	No data	9.30E-01	EPA (1987c) in EPA (1999)

Table C3-6 Derivation of Surface Water Toxicity Reference Values (TRVs) from Data for Sensitive Species for Exposure of Chinook Salmon and Other Salmonids to COPCs and ROPCs

Constituent of Potential Concern	CAS Registry Number	Test duration	Endpoint	Test species	Endpoint Concen-tration (EC)	Duration conversion factor (DCF)[a]	Endpoint conversion factor (ECF)[a]	Effect	TRV (EC × DCF × ECF)	Source[b]
Hexachlorocyclopentadiene	77-47-4	Chronic	LOEL	Aquatic biota	5.20E+00	1.0E+00	1.0E-01	Mortality	5.20E-01	EPA (1987c) in EPA (1999)
Hexachloroethane	67-72-1	Chronic	LC50	Aquatic biota	Various	No data	No data	Mortality	1.20E+01	Tier II SCV in Suter and Tsao (1996)
Hexachlorophene	70-30-4	Subchronic	NOEC	*Pimphales promelas*	8.80E+00	1.0E-01	1.0E+00	Mortality	8.80E-01	Call and others (1989) in EPA (1999)
Hexamethylene-1,5-diisocyanate	822-06-0	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Mirex	2385-85-5	No data	No data	No data	1.00E-03	No data	No data	Freshwater criterion	1.00E-03	EPA (1987)
Nitrofen	1836-75-5	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Pentachlorobenzene	608-93-5	Chronic	No data	No data	4.70E-01	No data	No data	No data	4.70E-01	EPA (1996) in EPA (1999)
Pentachloronitrobenzene	82-68-8	Acute	LC50	*Cyprinus carpio*	1.00E+03	1.0E-01	1.0E-01	Mortality	1.00E+01	Hashimoto and Nishiuchi (1981) in EPA (1999)
Pentachlorophenol	87-86-5	Chronic	EC50	*Onchohynchus nerka*	1.74E+00	No data	Eq. 2	Growth	5.59E-02	AQUIRE (2002)
Picric acid	88-89-1	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Pronamide	23950-58-5	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Strychnine	57-24-9	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Terphenyls	26140-60-3	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Tributyl phosphate	126-73-8	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Trifluralin	1582-09-8	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Triphenylamine	603-34-9	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Herbicides and Organochlorinated Pesticides										
2,4,5-T	93-76-5	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
2,4-D and esters	94-75-7	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
4,4'-DDD	72-54-8	Acute	LOAEL	*Onchorynchus mykiss*	2.00E-02	1.0E-01	1.0E-01	Mortality	2.00E-04	Suter and Tsao (1996)
4,4'-DDE	72-55-9	Acute	LOEL	No data	1.05E+03	1.0E-01	1.0E-01	No data	1.05E+01	EPA (1987c) in EPA (1999)
4,4'-DDT	50-29-3	Chronic	No data	Aquatic biota	8.00E-03	No data	No data	Sensitive species EC20	8.00E-03	Suter and Tsao (1996)
Aldrin	309-00-2	Chronic	No data	Aquatic biota	No data	No data	No data	Toxic effects	3.00E+00	EPA (1987)
alpha-BHC	319-84-6	Chronic	LC50	Aquatic biota	Various	No data	No data	Mortality	2.20E+00	Tier II SCV in Suter and Tsao (1996)
beta-BHC	319-85-7	Chronic	LC50	Aquatic biota	Various	No data	No data	Mortality	2.20E+00	Tier II SCV in Suter and Tsao (1996)
Chlordane	57-74-9	Chronic	LOAEL	Brook trout	2.00E-01	1.0E+00	1.0E-01	Mortality	2.00E-02	Suter and Tsao (1996) Table C-1
delta-BHC	319-86-8	Chronic	LC50	Aquatic biota	Various	No data	No data	Mortality	2.20E+00	Tier II SCV in Suter and Tsao (1996)
Dieldrin	60-57-1	Chronic	LC50	Aquatic biota	Various	No data	No data	Mortality	6.20E-02	Chronic NAWQC in Suter and Tsao (1996)

Table C3-6 Derivation of Surface Water Toxicity Reference Values (TRVs) from Data for Sensitive Species for Exposure of Chinook Salmon and Other Salmonids to COPCs and ROPCs

Constituent of Potential Concern	CAS Registry Number	Test duration	Endpoint	Test species	Endpoint Concen-tration (EC)	Duration conversion factor (DCF)[a]	Endpoint conversion factor (ECF)[a]	Effect	TRV (EC × DCF × ECF)	Source[b]
Endothall	145-73-3	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Endrin	72-20-8	Chronic	No data	No data	6.10E-02	No data	No data	Chronic NAWQC	6.10E-02	Suter and Tsao (1996)
gamma-BHC (Lindane)	58-89-9	Chronic	No data	Aquatic biota	8.00E-02	No data	No data	Chronic NAWQC	8.00E-02	Suter and Tsao (1996)
Heptachlor	76-44-8	Chronic	No data	Aquatic biota	3.80E-03	No data	No data	No data	3.80E-03	EPA (1987c) in EPA (1999)
Isodrin	465-73-6	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Methoxychlor	72-43-5	Chronic	LC50	Aquatic biota	Various	No data	No data	Mortality	1.90E-02	Tier II SCV in Suter and Tsao (1996)
Silvex (2,4,5-TP)	93-72-1	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Toxaphene	8001-35-2	Chronic	LOAEL	*Salmo trutta*	2.00E-01	1.0E+00	1.0E-01	No data	1.00E-03	Suter and Tsao (1996)
Inorganic Chemicals and Compounds					(mg/L)				(mg/L)	
	Metals									
Aluminum	7429-90-5	Chronic	EC20	Aquatic biota	7.50E-02	No data	No data	Sensitive species EC20	7.50E-02	Suter and Tsao (1996)
Antimony	7440-36-0	Chronic	LC50	Aquatic biota	Various	No data	No data	No data	3.00E-02	Proposed chronic criterion from EPA (1987c) in EPA (1999)
Arsenic	7440-38-2	Chronic	EC20	Aquatic biota	5.50E-02	No data	No data	Sensitive species EC20	5.50E-02	Suter and Tsao (1996)
Barium	7440-39-3	Chronic	LC50	Aquatic biota	Various	No data	No data	Mortality	4.00E-03	Tier II SCV in Suter and Tsao (1996)
Beryllium	7440-41-7	Chronic	LC50	Aquatic biota	Various	No data	No data	Mortality	6.60E-04	Tier II SCV from Suter and Tsao (1996) in EPA (1999)
Bismuth	7440-69-9	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Boron	7440-42-8	Chronic	LC50	Aquatic biota	Various	No data	No data	Mortality	1.60E-03	Tier II SCV in Suter and Tsao (1996)
Cadmium	7440-43-9	Chronic	EC20	Aquatic biota	1.30E-05	No data	No data	Sensitive species EC20	1.30E-05	Suter and Tsao (1996)
Calcium	7440-70-2	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Chromium[d]	18540-29-9	Chronic	EC20	Aquatic biota	2.66E-04	No data	No data	Sensitive species EC20	2.66E-04	Suter and Tsao (1996)
Cobalt	7440-48-4	Chronic	LC50	Aquatic biota	Various	No data	No data	Mortality	2.30E-02	Tier II SCV in Suter and Tsao (1996)
Copper	7440-50-8	Chronic	EC20	Aquatic biota	2.60E-04	No data	No data	Sensitive species EC20	2.60E-04	Suter and Tsao (1996)
Iron	7439-89-6	Chronic	LC50	Aquatic biota	Various	No data	No data	Mortality	1.00E+00	Tier II SCV in Suter and Tsao (1996)
Lead	7439-92-1	Chronic	EC20	Aquatic biota	3.50E-04	No data	No data	Sensitive species EC20	3.50E-04	Suter and Tsao (1996)
Lithium	7439-93-2	Chronic	LC50	Aquatic biota	Various	No data	No data	Mortality	1.40E-02	Tier II SCV in Suter and Tsao (1996)

Table C3-6 Derivation of Surface Water Toxicity Reference Values (TRVs) from Data for Sensitive Species for Exposure of Chinook Salmon and Other Salmonids to COPCs and ROPCs

Constituent of Potential Concern	CAS Registry Number	Test duration	Endpoint	Test species	Endpoint Concen-tration (EC)	Duration conversion factor (DCF)[a]	Endpoint conversion factor (ECF)[a]	Effect	TRV (EC × DCF × ECF)	Source[b]
Magnesium	7439-95-4	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Manganese	7439-96-5	Chronic	LC50	Aquatic biota	Various	No data	No data	Mortality	1.20E-01	Tier II SCV in Suter and Tsao (1996)
Mercury	7439-97-6	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Mercury - Hg+2	7487-94-7	Chronic	EC20	Aquatic biota	1.80E-04	No data	No data	Sensitive species EC20	1.80E-04	Suter and Tsao (1996)
Methylmercury	22967-92-6	Chronic	LC50	Aquatic biota	Various	No data	No data	Mortality	2.80E-06	Tier II SCV from Suter and Tsao (1996) in EPA (1999)
Molybdenum	7439-98-7	Chronic	LC50	Aquatic biota	Various	No data	No data	Mortality	3.70E-01	Tier II SCV in Suter and Tsao (1996)
Nickel	7440-02-0	Chronic	EC20	Aquatic biota	1.10E-02	No data	No data	Sensitive species EC20	1.10E-02	Suter and Tsao (1996)
Potassium	7440-09-7	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Rhodium	7440-16-6	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Selenium	7782-49-2	Chronic	EC20	Aquatic biota	2.60E-03	No data	No data	Sensitive species EC20	2.60E-03	Suter and Tsao (1996)
Silicon	7440-21-3	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Silver	7440-22-4	Chronic	No data	*Onchorynchus mykiss*	1.20E-04	No data	No data	No data	1.20E-04	Proposed Chronic Criterion from EPA (1987c) in EPA (1999)
Sodium	7440-23-5	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Strontium	7440-24-6	Chronic	LC50	Aquatic biota	Various	No data	No data	Mortality	1.50E+00	Tier II SCV in Suter and Tsao (1996)
Tantalum	7440-25-7	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Thallium	7440-28-0	Chronic	LOEL	No data	4.00E-02	No data	1.0E-01	No data	4.00E-03	EPA (1987c) in EPA (1999)
Tin	7440-31-5	Chronic	LC50	Aquatic biota	Various	No data	No data	Mortality	7.30E-02	Tier II SCV in Suter and Tsao (1996)
Tungsten	7440-33-7	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Uranium	7440-61-1	Chronic	LC50	Aquatic biota	Various	No data	No data	Mortality	2.60E-03	Tier II SCV in Suter and Tsao (1996)
Vanadium	7440-62-2	Chronic	LC50	Aquatic biota	Various	No data	No data	Mortality	2.00E-02	Tier II SCV in Suter and Tsao (1996)
Yttrium	7440-65-5	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Zinc	7440-66-6	Chronic	EC20	Aquatic biota	2.10E-02	No data	No data	Sensitive species EC20	2.10E-02	Suter and Tsao (1996)
Zirconium	7440-67-7	Chronic	LC50	Aquatic biota	Various	No data	No data	Mortality	1.70E-02	Tier II SCV in Suter and Tsao (1996)
	Non-metals and Anions									
Ammonia/Ammonium	7664-41-7	Chronic	No data	*Onchorynchus gorbuscha*	1.70E-03	No data	No data	LCV	1.70E-03	Rice and Bailey (1980) in Suter and Tsao (1996)
Bromide	24959-67-9	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Chloride	16887-00-6	No data	No data	No data	No data	No data	No data	No data	No TRV	No data

Table C3-6 Derivation of Surface Water Toxicity Reference Values (TRVs) from Data for Sensitive Species for Exposure of Chinook Salmon and Other Salmonids to COPCs and ROPCs

Constituent of Potential Concern	CAS Registry Number	Test duration	Endpoint	Test species	Endpoint Concen-tration (EC)	Duration conversion factor (DCF)[a]	Endpoint conversion factor (ECF)[a]	Effect	TRV (EC × DCF × ECF)	Source[b]
Cyanide	57-12-5	Chronic	EC20	Aquatic biota	1.17E-03	No data	No data	Sensitive species EC20	1.17E-03	Suter and Tsao (1996)
Fluoride	16984-48-8	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Hydroxide	14280-30-9	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Iodine	7553-56-2	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Nitrate	14797-55-8	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Nitrite	14797-65-0	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Phosphate	14265-44-2	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Phosphorus	7723-14-0	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Sulfate	14808-79-8	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Total sulfur	63705-05-5	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Criteria Pollutants										
Carbon monoxide	630-08-0	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Nitrogen dioxide	10102-44-0	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Ozone	10028-15-6	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Particulate matter	No CAS #	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Sulfur dioxide	7446-09-5	No data	No data	No data	No data	No data	No data	No data	No TRV	No data
Radionuclides										
All radionuclides combined (rad/d)[c]	No CAS #	Chronic	Adverse effects	Aquatic biota	NA	NA	NA	Population effects	1.00E+00	NCRP (1991)

Table C3-6 Derivation of Surface Water Toxicity Reference Values (TRVs) from Data for Sensitive Species for Exposure of Chinook Salmon and Other Salmonids to COPCs and ROPCs

Notes/Sources

No data = No data available.
NA = Not applicable.
CAS = Chemical Abstracts Service.
EC = Concentration that caused the reported effect.
DCF = Duration conversion factor; 1 if chronic, 0.1 if subchronic (Sample and others 1996).
ECF = Endpoint conversion factor; 1 if NOAEL, 0.1 if LOAEL (Sample and others 1996).
TRV = Toxicity reference value.
Tier II SCV = Secondary Chronic Value calculated according to Great Lakes Initiative methods.
Chronic NAWQC = Chronic National Ambient Water Quality Criterion.
LC50 = Concentration lethal to 50 % of tested individuals.
LC100 = Concentration lethal to 100 % of tested individuals.
EC20 = Concentration at which an effect was observed in 20 % of tested individuals.
EC50 = Concentration at which an effect was observed in 50 % of tested individuals.
LOAEL = Lowest observed adverse effect level.
LOEL = Lowest exposure level at which an effect was observed.
NOEC = Highest concentration at which an effect was not observed.
LCV = Lowest Chronic Value.

[a] Methods to calculate NAWQC and Tier II SCV values are presented in Suter and Tsao (1996).

[b] Order of preference is: sensitive species EC20 from Suter and Tsao (1996), then other published data in which salmonid TRVs are lower than general aquatic TRVs, then EPA (1999), then NAWQC, then Tier II chronic value, then other published data.

[c] Data for Aroclor-1254 used as representative of polychlorinated biphenyl mixtures.

[d] Values for hexavalent chromium, which is more toxic than trivalent chromium.

[e] TRV is not applicable to single radionuclides. Combined external and internal radiation exposure for aquatic biota from all radionuclides combined cannot exceed 1 rad/d.

Table C3-7 Derivation of Sediment Toxicity Reference Values (TRVs) for Exposure of Sediment-Dwelling Invertebrates to COPCs and ROPCs

Constituent of Potential Concern	CAS Registry Number	Test duration	Endpoint	Test species	Endpoint Concen-tration (EC)	Duration conversion factor (DCF)	Endpoint conversion factor (ECF)	Effect	TRV (EC × DCF × ECF)	Source
Organic Compounds									(µg/kg)	
Aromatic Halogenated Hydrocarbons										
2,3,4,6-Tetrachlorophenol	58-90-2	No data	No data	No data	No data	NA	No data	No data	No TRV	No data
4-Chloro-3-methylphenol	59-50-7	Chronic	NOAEL	Aquatic biota	3.00E-01 µg/L	NA	371 × 0.04 (Koc × TOC)	Not specified	4.45E+00	EqP[a] method (Jones and others 1997)
Aromatic Nonhalogenated Hydrocarbons										
2-Nitrotoluene	88-72-2	No data	No data	No data	No data	NA	No data	No data	No TRV	No data
4-Nitrobiphenyl	92-93-3	No data	No data	No data	No data	NA	No data	No data	No TRV	No data
Benzaldehyde	100-52-7	No data	No data	No data	No data	NA	No data	No data	No TRV	No data
Benzene	71-43-2	Chronic	NOAEL	Aquatic biota	1.30E+02 µg/L	NA	62 × 0.04 (Koc × TOC)	Not specified	3.22E+02	EqP[a] method (Jones and others 1997)
Benzyl alcohol	100-51-6	Chronic	NOAEL	Aquatic biota	8.60E+00 µg/L	NA	10.2 × 0.04 (Koc × TOC)	Not specified	3.51E+00	EqP[a] method (Jones and others 1997)
Ethyl benzene	100-41-4	Chronic	NOAEL	Aquatic biota	7.30E+00 µg/L	NA	204 × 0.04 (Koc × TOC)	Not specified	5.96E+01	EqP[a] method (Jones and others 1997)
m-Xylene	108-38-3	Chronic	NOAEL	Aquatic biota	1.80E+00 µg/L	NA	196 × 0.04 (Koc × TOC)	Not specified	1.41E+01	EqP[a] method (Jones and others 1997)
o-Xylene	95-47-6	No data	No data	No data	No data	NA	No data	No data	No TRV	No data
p-Xylene	106-42-3	No data	No data	No data	No data	NA	No data	No data	No TRV	No data
Styrene	100-42-5	No data	No data	No data	No data	NA	No data	No data	No TRV	No data
Toluene	108-88-3	Chronic	NOAEL	Aquatic biota	9.80E+00 µg/L	NA	140 × 0.04 (Koc × TOC)	Not specified	5.49E+01	EqP[a] method (Jones and others 1997)
Non-aromatic Nonhalogenated Hydrocarbons										
1,2-Epoxybutane	106-88-7	No data	No data	No data	No data	NA	No data	No data	No TRV	No data
1,3-Butadiene	106-99-0	No data	No data	No data	No data	NA	No data	No data	No TRV	No data
1,4-Dioxane	123-91-1	Chronic	NOAEL	Aquatic biota	6.21E+04 µg/L	NA	0.876 × 0.04 (Koc × TOC)	Not specified	2.17E+03	EqP[a] method (EPA 1999)
1-Methylpropyl alcohol	78-92-2	No data	No data	No data	No data	NA	No data	No data	No TRV	No data
1-Nitropropane	108-03-2	No data	No data	No data	No data	NA	No data	No data	No TRV	No data
2,2,4-Trimethylpentane	540-84-1	No data	No data	No data	No data	NA	No data	No data	No TRV	No data
2-Butanone	78-93-3	Chronic	NOAEL	Aquatic biota	1.40E+04 µg/L	NA	2.34 × 0.04 (Koc × TOC)	Not specified	1.31E+03	EqP[a] method (Jones and others 1997)
2-Butenaldehyde (2-Butenal)	4170-30-3	No data	No data	No data	No data	NA	No data	No data	No TRV	No data
2-Ethoxyethanol	110-80-5	No data	No data	No data	No data	NA	No data	No data	No TRV	No data
2-Heptanone	110-43-0	No data	No data	No data	No data	NA	No data	No data	No TRV	No data
2-Hexanone	591-78-6	Chronic	NOAEL	Aquatic biota	9.90E+01 µg/L	NA	2.13 × 0.04 (Koc × TOC)	Not specified	8.42E+00	EqP[a] method (Jones and others 1997)
2-Methoxyethanol	109-86-4	No data	No data	No data	No data	NA	No data	No data	No TRV	No data
2-Methyl-2-propanol	75-65-0	No data	No data	No data	No data	NA	No data	No data	No TRV	No data
2-Methyl-2-propenenitrile	126-98-7	No data	No data	No data	No data	NA	No data	No data	No TRV	No data
2-Methylaziridine	75-55-8	No data	No data	No data	No data	NA	No data	No data	No TRV	No data

Table C3-7 Derivation of Sediment Toxicity Reference Values (TRVs) for Exposure of Sediment-Dwelling Invertebrates to COPCs and ROPCs

Constituent of Potential Concern	CAS Registry Number	Test duration	Endpoint	Test species	Endpoint Concen-tration (EC)	Duration conversion factor (DCF)	Endpoint conversion factor (ECF)	Effect	TRV (EC × DCF × ECF)	Source
2-Methylpropyl alcohol	78-83-1	No data	No data	No data	No data	NA	No data	No data	No TRV	No data
2-Pentanone	107-87-9	No data	No data	No data	No data	NA	No data	No data	No TRV	No data
2-Propanone (Acetone)	67-64-1	Chronic	NOAEL	Aquatic biota	1.50E+03 µg/L	NA	0.951 × 0.04 (Koc × TOC)	Not specified	5.71E+01	EqP[a] method (Jones and others 1997)
2-Propene-1-ol	107-18-6	No data	No data	No data	No data	NA	No data	No data	No TRV	No data
2-Propyl alcohol	67-63-0	No data	No data	No data	No data	NA	No data	No data	No TRV	No data
3-Heptanone	106-35-4	No data	No data	No data	No data	NA	No data	No data	No TRV	No data
3-Methyl-1-butanol	123-51-3	No data	No data	No data	No data	NA	No data	No data	No TRV	No data
3-Methyl-2-butanone	563-80-4	No data	No data	No data	No data	NA	No data	No data	No TRV	No data
3-Pentanone	96-22-0	No data	No data	No data	No data	NA	No data	No data	No TRV	No data
4-Heptanone	123-19-3	No data	No data	No data	No data	NA	No data	No data	No TRV	No data
4-Methyl-2-pentanone	108-10-1	Chronic	NOAEL	Aquatic biota	1.70E+02 µg/L	NA	12 × 0.04 (Koc × TOC)	Not specified	8.16E+01	EqP[a] method (Jones and others 1997)
4-Methyl-3-penten-2-one	141-79-7	No data	No data	No data	No data	NA	No data	No data	No TRV	No data
5-Methyl-2-hexanone	110-12-3	No data	No data	No data	No data	NA	No data	No data	No TRV	No data
Acetaldehyde	75-07-0	No data	No data	No data	No data	NA	No data	No data	No TRV	No data
Acetamide	60-35-5	No data	No data	No data	No data	NA	No data	No data	No TRV	No data
Acetic acid	64-19-7	No data	No data	No data	No data	NA	No data	No data	No TRV	No data
Acetic acid ethyl ester	141-78-6	No data	No data	No data	No data	NA	No data	No data	No TRV	No data
Acetic acid n-butyl ester	123-86-4	No data	No data	No data	No data	NA	No data	No data	No TRV	No data
Acetonitrile	75-05-8	No data	No data	No data	No data	NA	No data	No data	No TRV	No data
Acrolein	107-02-8	Chronic	NOAEL	Aquatic biota	2.10E+00 µg/L	NA	1.39 × 0.04 (Koc × TOC)	Not specified	1.17E-01	EqP[a] method (Jones and others 1997)
Acrylonitrile	107-13-1	Chronic	NOAEL	Aquatic biota	2.60E+02 µg/L	NA	2.22 × 0.04 (Koc × TOC)	Not specified	2.31E+01	EqP[a] method (EPA 1999)
Bis(isopropyl)ether	108-20-3	No data	No data	No data	No data	NA	No data	No data	No TRV	No data
Butane	106-97-8	No data	No data	No data	No data	NA	No data	No data	No TRV	No data
Carbon disulfide	75-15-0	Chronic	NOAEL	Aquatic biota	9.20E-01 µg/L	NA	51.4 × 0.04 (Koc × TOC)	Not specified	1.89E+00	EqP[a] method (Jones and others 1997)
Cyanogen	460-19-5	No data	No data	No data	No data	NA	No data	No data	No TRV	No data
Cyclohexane	110-82-7	No data	No data	No data	No data	NA	No data	No data	No TRV	No data
Cyclohexanone	108-94-1	No data	No data	No data	No data	NA	No data	No data	No TRV	No data
Cyclohexene	110-83-8	No data	No data	No data	No data	NA	No data	No data	No TRV	No data
Cyclopentane	287-92-3	No data	No data	No data	No data	NA	No data	No data	No TRV	No data
Ethyl alcohol	64-17-5	No data	No data	No data	No data	NA	No data	No data	No TRV	No data
Ethyl ether	60-29-7	No data	No data	No data	No data	NA	No data	No data	No TRV	No data
Ethyl methacrylate	97-63-2	No data	No data	No data	No data	NA	No data	No data	No TRV	No data
Formaldehyde	50-00-0	Chronic	NOAEL	Aquatic biota	4.96E+01 µg/L	NA	2.62 × 0.04 (Koc × TOC)	Not specified	5.20E+00	EqP[a] method (EPA 1999)
Formamide	75-12-7	No data	No data	No data	No data	NA	No data	No data	No TRV	No data
Formic acid	64-18-6	No data	No data	No data	No data	NA	No data	No data	No TRV	No data
Formic acid, methyl ester	107-31-3	No data	No data	No data	No data	NA	No data	No data	No TRV	No data

Table C3-7 Derivation of Sediment Toxicity Reference Values (TRVs) for Exposure of Sediment-Dwelling Invertebrates to COPCs and ROPCs

Constituent of Potential Concern	CAS Registry Number	Test duration	Endpoint	Test species	Endpoint Concen-tration (EC)	Duration conversion factor (DCF)	Endpoint conversion factor (ECF)	Effect	TRV (EC × DCF × ECF)	Source
Glycidylaldehyde	765-34-4	No data	No data	No data	No data	NA	No data	No data	No TRV	No data
Methyl acetate	79-20-9	No data	No data	No data	No data	NA	No data	No data	No TRV	No data
Methyl alcohol	67-56-1	No data	No data	No data	No data	NA	No data	No data	No TRV	No data
Methyl isocyanate	624-83-9	No data	No data	No data	No data	NA	No data	No data	No TRV	No data
Methyl methacrylate	80-62-6	No data	No data	No data	No data	NA	No data	No data	No TRV	No data
Methyl tert-butyl ether	1634-04-4	No data	No data	No data	No data	NA	No data	No data	No TRV	No data
Methylacetylene	74-99-7	No data	No data	No data	No data	NA	No data	No data	No TRV	No data
Methylcyclohexane	108-87-2	No data	No data	No data	No data	NA	No data	No data	No TRV	No data
N,N-Dimethylacetamide	127-19-5	No data	No data	No data	No data	NA	No data	No data	No TRV	No data
n-Butyl alcohol	71-36-3	No data	No data	No data	No data	NA	No data	No data	No TRV	No data
n-Heptane	142-82-5	No data	No data	No data	No data	NA	No data	No data	No TRV	No data
n-Hexane	110-54-3	No data	No data	No data	No data	NA	No data	No data	No TRV	No data
Nitromethane	75-52-5	No data	No data	No data	No data	NA	No data	No data	No TRV	No data
n-Nonane	111-84-2	No data	No data	No data	No data	NA	No data	No data	No TRV	No data
n-Octane	111-65-9	No data	No data	No data	No data	NA	No data	No data	No TRV	No data
n-Pentane	109-66-0	No data	No data	No data	No data	NA	No data	No data	No TRV	No data
n-Propionaldehyde	123-38-6	No data	No data	No data	No data	NA	No data	No data	No TRV	No data
n-Propyl alcohol	71-23-8	No data	No data	No data	No data	NA	No data	No data	No TRV	No data
n-Valeraldehyde	110-62-3	No data	No data	No data	No data	NA	No data	No data	No TRV	No data
Oxirane	75-21-8	No data	No data	No data	No data	NA	No data	No data	No TRV	No data
p-Cymene	99-87-6	No data	No data	No data	No data	NA	No data	No data	No TRV	No data
Phosgene	75-44-5	No data	No data	No data	No data	NA	No data	No data	No TRV	No data
Propargyl alcohol	107-19-7	No data	No data	No data	No data	NA	No data	No data	No TRV	No data
Propionic acid	79-09-4	No data	No data	No data	No data	NA	No data	No data	No TRV	No data
Propionitrile	107-12-0	No data	No data	No data	No data	NA	No data	No data	No TRV	No data
Propylene glycol monomethyl ether	107-98-2	No data	No data	No data	No data	NA	No data	No data	No TRV	No data
p-tert-Butyltoluene	98-51-1	No data	No data	No data	No data	NA	No data	No data	No TRV	No data
Triethylamine	121-44-8	No data	No data	No data	No data	NA	No data	No data	No TRV	No data
Trimethylamine	75-50-3	No data	No data	No data	No data	NA	No data	No data	No TRV	No data
Vinyl acetate	108-05-4	Chronic	NOAEL	Aquatic biota	1.60E+01 µg/L	NA	4.97 × 0.04 (Koc × TOC)	Not specified	3.18E+00	EqP[a] method (Jones and others 1997)
Non-aromatic Halogenated Hydrocarbons										
1,1,1,2-Tetrachloro-2,2-difluoroethane	76-11-9	No data	No data	No data	No data	NA	No data	No data	No TRV	No data
1,1,1,2-Tetrachloroethane	630-20-6	No data	No data	No data	No data	NA	No data	No data	No TRV	No data
1,1,1-Trichloroethane	71-55-6	Chronic	NOAEL	Aquatic biota	1.10E+01 µg/L	NA	135,000 × 0.04 (Koc × TOC)	Not specified	5.94E+04	EqP[a] method (Jones and others 1997)
1,1,2,2-Tetrachloro-1,2-difluoroethane	76-12-0	No data	No data	No data	No data	NA	No data	No data	No TRV	No data
1,1,2,2-Tetrachloroethane	79-34-5	Chronic	NOAEL	Aquatic biota	6.10E+02 µg/L	NA	79 × 0.04 (Koc × TOC)	Not specified	1.93E+03	EqP[a] method (Jones and others 1997)
1,1,2,2-Tetrachloroethene	127-18-4	Chronic	NOAEL	Aquatic biota	9.80E+01 µg/L	NA	265 × 0.04 (Koc × TOC)	Not specified	1.04E+03	EqP[a] method (Jones and others 1997)

Table C3-7 Derivation of Sediment Toxicity Reference Values (TRVs) for Exposure of Sediment-Dwelling Invertebrates to COPCs and ROPCs

Constituent of Potential Concern	CAS Registry Number	Test duration	Endpoint	Test species	Endpoint Concen-tration (EC)	Duration conversion factor (DCF)	Endpoint conversion factor (ECF)	Effect	TRV (EC × DCF × ECF)	Source
1,1,2-Trichloroethane	79-00-5	Chronic	NOAEL	Aquatic biota	1.20E+03 µg/L	NA	75 × 0.04 (Koc × TOC)	Not specified	3.60E+03	EqP[a] method (Jones and others 1997)
1,1,2-Trichloroethylene	79-01-6	Chronic	NOAEL	Aquatic biota	4.70E+01 µg/L	NA	94 × 0.04 (Koc × TOC)	Not specified	1.77E+02	EqP[a] method (Jones and others 1997)
1,1-Dichloroethane	75-34-3	Chronic	NOAEL	Aquatic biota	4.70E+01 µg/L	NA	53 × 0.04 (Koc × TOC)	Not specified	9.96E+01	EqP[a] method (Jones and others 1997)
1,1-Dichloroethene	75-35-4	Chronic	NOAEL	Aquatic biota	2.50E+01 µg/L	NA	65 × 0.04 (Koc × TOC)	Not specified	6.50E+01	EqP[a] method (Jones and others 1997)
1,2,2-Trichloro-1,1,2-trifluoroethane	76-13-1	No data	No data	No data	No data	NA	No data	No data	No TRV	No data
1,2,3-Trichloropropane	96-18-4	No data	No data	No data	No data	NA	No data	No data	No TRV	No data
1,2-Dibromo-3-chloropropane	96-12-8	No data	No data	No data	No data	NA	No data	No data	No TRV	No data
1,2-Dichloro-1,1,2,2-tetrafluoroethane	76-14-2	No data	No data	No data	No data	NA	No data	No data	No TRV	No data
1,2-Dichloroethane	107-06-2	Chronic	NOAEL	Aquatic biota	9.10E+02 µg/L	NA	19.6 × 0.04 (Koc × TOC)	Not specified	7.13E+02	EqP[a] method (Jones and others 1997)
1,2-Dichloroethylene	540-59-0	Chronic	NOAEL	Aquatic biota	5.90E+02 µg/L	NA	2.87 × 0.04 (Koc × TOC)	Not specified	6.78E+01	EqP[a] method (Jones and others 1997)
1,2-Dichloropropane	78-87-5	No data	No data	No data	No data	NA	No data	No data	No TRV	No data
1,3-Dichloropropene	542-75-6	Chronic	NOAEL	Aquatic biota	5.50E-02 µg/L	NA	27 × 0.04 (Koc × TOC)	Not specified	5.94E-02	EqP[a] method (Jones and others 1997)
1,4-Dichloro-2-butene	764-41-0	No data	No data	No data	No data	NA	No data	No data	No TRV	No data
1-Chloroethene	75-01-4	Chronic	NOAEL	Aquatic biota	3.88E+03 µg/L	NA	11.1 × 0.04 (Koc × TOC)	Not specified	1.72E+03	EqP[a] method (EPA 1999)
2,2-Dichloropropionic acid	75-99-0	No data	No data	No data	No data	NA	No data	No data	No TRV	No data
2-Chloropropane	75-29-6	No data	No data	No data	No data	NA	No data	No data	No TRV	No data
3-Chloropropene (Allyl chloride)	107-05-1	No data	No data	No data	No data	NA	No data	No data	No TRV	No data
Bromochloromethane	74-97-5	No data	No data	No data	No data	NA	No data	No data	No TRV	No data
Bromodichloromethane	75-27-4	No data	No data	No data	No data	NA	No data	No data	No TRV	No data
Bromoethene	593-60-2	No data	No data	No data	No data	NA	No data	No data	No TRV	No data
Bromoform	75-25-2	No data	No data	No data	No data	NA	No data	No data	No TRV	No data
Bromomethane	74-83-9	No data	No data	No data	No data	NA	No data	No data	No TRV	No data
Carbon tetrachloride	56-23-5	Chronic	NOAEL	Aquatic biota	9.80E+00 µg/L	NA	152 × 0.04 (Koc × TOC)	Not specified	5.96E+01	EqP[a] method (Jones and others 1997)
Chlorodibromomethane	124-48-1	No data	No data	No data	No data	NA	No data	No data	No TRV	No data
Chlorodifluoromethane	75-45-6	No data	No data	No data	No data	NA	No data	No data	No TRV	No data
Chloroethane	75-00-3	No data	No data	No data	No data	NA	No data	No data	No TRV	No data
Chloroform	67-66-3	Chronic	NOAEL	Aquatic biota	2.80E+01 µg/L	NA	53.0 × 0.04 (Koc × TOC)	Not specified	5.94E+01	EqP[a] method (EPA 1999)
Chloromethane	74-87-3	No data	No data	No data	No data	NA	No data	No data	No TRV	No data
Chloropentafluoroethane	76-15-3	No data	No data	No data	No data	NA	No data	No data	No TRV	No data
cis-1,2-Dichloroethene	156-59-2	No data	No data	No data	No data	NA	No data	No data	No TRV	No data
cis-1,3-Dichloropropene	10061-01-5	No data	No data	No data	No data	NA	No data	No data	No TRV	No data

Table C3-7 Derivation of Sediment Toxicity Reference Values (TRVs) for Exposure of Sediment-Dwelling Invertebrates to COPCs and ROPCs

Constituent of Potential Concern	CAS Registry Number	Test duration	Endpoint	Test species	Endpoint Concen-tration (EC)	Duration conversion factor (DCF)	Endpoint conversion factor (ECF)	Effect	TRV (EC × DCF × ECF)	Source
Cyanogen bromide	506-68-3	No data	No data	No data	No data	NA	No data	No data	No TRV	No data
Cyanogen chloride	506-77-4	No data	No data	No data	No data	NA	No data	No data	No TRV	No data
Dichlorodifluoromethane	75-71-8	No data	No data	No data	No data	NA	No data	No data	No TRV	No data
Dichlorofluoromethane	75-43-4	No data	No data	No data	No data	NA	No data	No data	No TRV	No data
Dichloromethane	75-09-2	Chronic	NOAEL	Aquatic biota	2.20E+03 µg/L	NA	10 × 0.04 (Koc × TOC)	Not specified	8.80E+02	EqP[a] method (Jones and others 1997)
Difluorodibromomethane	75-61-6	No data	No data	No data	No data	NA	No data	No data	No TRV	No data
Hexafluoroacetone	684-16-2	No data	No data	No data	No data	NA	No data	No data	No TRV	No data
Iodomethane	74-88-4	No data	No data	No data	No data	NA	No data	No data	No TRV	No data
Methylene bromide	74-95-3	No data	No data	No data	No data	NA	No data	No data	No TRV	No data
Pentachloroethane	76-01-7	No data	No data	No data	No data	NA	No data	No data	No TRV	No data
trans-1,2-Dichloroethylene	156-60-5	No data	No data	No data	No data	NA	No data	No data	No TRV	No data
trans-1,3-Dichloropropene	10061-02-6	No data	No data	No data	No data	NA	No data	No data	No TRV	No data
Trichloroacetic acid	76-03-9	No data	No data	No data	No data	NA	No data	No data	No TRV	No data
Trichlorofluoroethane	27154-33-2	No data	No data	No data	No data	NA	No data	No data	No TRV	No data
Trichlorofluoromethane	75-69-4	No data	No data	No data	No data	NA	No data	No data	No TRV	No data
Trifluorobromomethane	75-63-8	No data	No data	No data	No data	NA	No data	No data	No TRV	No data
Dioxin and Furan Compounds (PCDDs/PCDFs)										
1,2,3,4,6,7,8-Heptachlorodibenzo(p)dioxin	35822-46-9	No data	No data	No data	No data	NA	No data	No data	No TRV	No data
1,2,3,4,6,7,8-Heptachlorodibenzofuran	67562-39-4	No data	No data	No data	No data	NA	No data	No data	No TRV	No data
1,2,3,4,7,8,9-Heptachlorodibenzofuran	55673-89-7	No data	No data	No data	No data	NA	No data	No data	No TRV	No data
1,2,3,4,7,8-Hexachlorodibenzo(p)dioxin	39227-28-6	No data	No data	No data	No data	NA	No data	No data	No TRV	No data
1,2,3,4,7,8-Hexachlorodibenzofuran	70648-26-9	No data	No data	No data	No data	NA	No data	No data	No TRV	No data
1,2,3,6,7,8-Hexachlorodibenzo(p)dioxin	57653-85-7	No data	No data	No data	No data	NA	No data	No data	No TRV	No data
1,2,3,6,7,8-Hexachlorodibenzofuran	57117-44-9	No data	No data	No data	No data	NA	No data	No data	No TRV	No data
1,2,3,7,8,9-Hexachlorodibenzo(p)dioxin	19408-74-3	No data	No data	No data	No data	NA	No data	No data	No TRV	No data
1,2,3,7,8,9-Hexachlorodibenzofuran	72918-21-9	No data	No data	No data	No data	NA	No data	No data	No TRV	No data
1,2,3,7,8-Pentachlorodibenzo(p)dioxin	40321-76-4	No data	No data	No data	No data	NA	No data	No data	No TRV	No data
1,2,3,7,8-Pentachlorodibenzofuran	57117-41-6	No data	No data	No data	No data	NA	No data	No data	No TRV	No data
2,3,4,6,7,8-Hexachlorodibenzofuran	60851-34-5	No data	No data	No data	No data	NA	No data	No data	No TRV	No data
2,3,4,7,8-Pentachlorodibenzofuran	57117-31-4	No data	No data	No data	No data	NA	No data	No data	No TRV	No data
2,3,7,8-Tetrachlorodibenzo(p)dioxin	1746-01-6	Chronic	NOAEL	Aquatic biota	3.80E-06 µg/L	NA	2.69E+06 × 0.04 (Koc × TOC)	Not specified	4.10E-01	EqP[a] method (EPA 1999)
2,3,7,8-Tetrachlorodibenzofuran	51207-31-9	No data	No data	No data	No data	NA	No data	No data	No TRV	No data
Dibenzofuran	132-64-9	Chronic	No data	*Hyalella azteca*	3.20E+04 µg/kg	NA	No data	AET	3.20E+04	Ecology (1994) in EPA (1999)
Octachlorodibenzo(p)dioxin	3268-87-9	No data	No data	No data	No data	NA	No data	No data	No TRV	No data
Octachlorodibenzofuran	39001-02-0	No data	No data	No data	No data	NA	No data	No data	No TRV	No data
Total dioxins and dibenzofurans	No CAS #	No data	No data	No data	No data	NA	No data	No data	No TRV	No data
Polychlorinated Biphenyls (PCBs)										
2,2',3,3',4,4',5-Heptachlorobiphenyl	35065-30-6	No data	No data	No data	No data	NA	No data	No data	No TRV	No data
2,2',3,4,4',5,5'-Heptachlorobiphenyl	35065-29-3	No data	No data	No data	No data	NA	No data	No data	No TRV	No data

Table C3-7 Derivation of Sediment Toxicity Reference Values (TRVs) for Exposure of Sediment-Dwelling Invertebrates to COPCs and ROPCs

Constituent of Potential Concern	CAS Registry Number	Test duration	Endpoint	Test species	Endpoint Concen-tration (EC)	Duration conversion factor (DCF)	Endpoint conversion factor (ECF)	Effect	TRV (EC × DCF × ECF)	Source
2,3,3',4,4',5,5'-Heptachlorobiphenyl	39635-31-9	No data	No data	No data	No data	NA	No data	No data	No TRV	No data
2,3,3',4,4',5'-Hexachlorobiphenyl	69782-90-7	No data	No data	No data	No data	NA	No data	No data	No TRV	No data
2,3,3',4,4',5-Hexachlorobiphenyl	38380-08-4	No data	No data	No data	No data	NA	No data	No data	No TRV	No data
2,3,3',4,4'-Pentachlorobiphenyl	32598-14-4	No data	No data	No data	No data	NA	No data	No data	No TRV	No data
2,3',4,4',5,5'-Hexachlorobiphenyl	52663-72-6	No data	No data	No data	No data	NA	No data	No data	No TRV	No data
2,3,4,4',5-Pentachlorobiphenyl	74472-37-0	No data	No data	No data	No data	NA	No data	No data	No TRV	No data
2',3,4,4',5-Pentachlorobiphenyl	65510-44-3	No data	No data	No data	No data	NA	No data	No data	No TRV	No data
2,3',4,4',5-Pentachlorobiphenyl	31508-00-6	No data	No data	No data	No data	NA	No data	No data	No TRV	No data
3,3',4,4',5,5'-Hexachlorobiphenyl	32774-16-6	No data	No data	No data	No data	NA	No data	No data	No TRV	No data
3,3',4,4',5-Pentachlorobiphenyl	57465-28-8	No data	No data	No data	No data	NA	No data	No data	No TRV	No data
3,3',4,4'-Tetrachlorobiphenyl	32598-13-3	No data	No data	No data	No data	NA	No data	No data	No TRV	No data
3,4,4',5-Tetrachlorobiphenyl	70362-50-4	No data	No data	No data	No data	NA	No data	No data	No TRV	No data
Polychlorinated biphenyls (PCBs)[b]	1336-36-3	Chronic	No data	Sediment biota	7.00E+01 µg/kg	NA	No data	LEL	7.00E+01	Persaud and others (1993)
Phthalates										
Bis(2-ethylhexyl) phthalate (DEHP)	117-81-7	Chronic	NOAEL	Aquatic biota	3.00E+00 µg/L	NA	111,000 × 0.04 (Koc × TOC)	Not specified	1.33E+04	EqP[a] method (EPA 1999)
Butylbenzyl phthalate	85-68-7	Chronic	NOAEL	Aquatic biota	1.90+01 µg/L	NA	13,700 × 0.04 (Koc × TOC)	Not specified	1.04E+04	EqP[a] method (Jones and others 1997)
Dibutyl phthalate	84-74-2	Chronic	NOAEL	Aquatic biota	3.50+01 µg/L	NA	1570 × 0.04 (Koc × TOC)	Not specified	2.20E+03	EqP[a] method (EPA 1999)
Diethyl phthalate	84-66-2	Chronic	NOAEL	Aquatic biota	2.10E+02 µg/L	NA	82 × 0.04 (Koc × TOC)	Not specified	6.89E+02	EqP[a] method (Jones and others 1997)
Dimethyl phthalate	131-11-3	No data	No data	No data	No data	NA	No data	No data	No TRV	No data
n-Dioctyl phthalate	117-84-0	Chronic	NOAEL	Aquatic biota	3.20E+02 µg/L	NA	9.03E+08 × 0.04 (Koc × TOC)	Not specified	1.16E+10	EqP[a] method (EPA 1999)
Light Polycyclic Aromatic Hydrocarbons (molecular weight <200 g/mole)										
2-Chloronaphthalene	91-58-7	No data	No data	No data	No data	NA	No data	No data	No TRV	No data
2-Methyl naphthalene	91-57-6	Chronic	No data	Sediment biota	7.00E+01 µg/kg	NA	No data	ER-L	7.00E+01	Long and others (1995) in Jones and others (1997)
5-Nitroacenaphthene	602-87-9	No data	No data	No data	No data	NA	No data	No data	No TRV	No data
Acenaphthene	83-32-9	Chronic	No data	Sediment biota	4.60E+01 µg/kg	NA	No data	ER-L	4.60E+01	Long and others (1995) in Jones and others (1997)
Acenaphthylene	208-96-8	Chronic	No data	Sediment biota	4.40E+01 µg/kg	NA	No data	ER-L	4.40E+01	Long and others (1995) in Jones and others (1997)
Anthracene	120-12-7	Chronic	No data	Sediment biota	2.20E+02 µg/kg	NA	No data	LEL	2.20E+02	Persaud and others (1993)
Fluorene	86-73-7	Chronic	No data	Sediment biota	1.90E+02 µg/kg	NA	No data	LEL	1.90E+02	Persaud and others (1993)

Table C3-7 Derivation of Sediment Toxicity Reference Values (TRVs) for Exposure of Sediment-Dwelling Invertebrates to COPCs and ROPCs

Constituent of Potential Concern	CAS Registry Number	Test duration	Endpoint	Test species	Endpoint Concen-tration (EC)	Duration conversion factor (DCF)	Endpoint conversion factor (ECF)	Effect	TRV (EC × DCF × ECF)	Source
Indene	95-13-6	No data	No data	No data	No data	NA	No data	No data	No TRV	No data
Naphthalene	91-20-3	Chronic	No data	Sediment biota	1.60E+02 µg/kg	NA	No data	ER-L	1.60E+02	Long and others (1995) in Jones and others (1997)
Phenanthrene	85-01-8	Chronic	No data	Sediment biota	5.60E+02 µg/kg	NA	No data	LEL	5.60E+02	Persaud and others (1993)
Pyrene	129-00-0	Chronic	No data	Sediment biota	4.90E+02 µg/kg	NA	No data	LEL	4.90E+02	Persaud and others (1993)
Heavy Polycyclic Aromatic Hydrocarbons (molecular weight >200 g/mole)										
3-Methylcholanthrene	56-49-5	No data	No data	No data	No data	NA	No data	No data	No TRV	No data
5-Methylchrysene	3697-24-3	No data	No data	No data	No data	NA	No data	No data	No TRV	No data
Benzo[a]anthracene	56-55-3	Chronic	No data	*Hyalella azteca*	1.90E+01 µg/kg	NA	No data	ER-L	1.90E+01	Ingersoll and others (1996) in EPA (1999)
Benzo[a]pyrene	50-32-8	Chronic	No data	*Hyalella azteca*	8.40E+01 µg/kg	NA	No data	ER-L	8.40E+01	Ingersoll and others (1996) in EPA (1999)
Benzo[a,i]pyrene	191-30-0	No data	No data	No data	No data	NA	No data	No data	No TRV	No data
Benzo[b]fluoranthene	205-99-2	Chronic	No data	*Hyalella azteca*	3.70E+01 µg/kg	NA	No data	ER-L	3.70E+01	Ingersoll and others (1996) in EPA (1999)
Benzo[e]pyrene	192-97-2	No data	No data	No data	No data	NA	No data	No data	No TRV	No data
Benzo[g,h,i]perylene	191-24-2	Chronic	No data	Sediment biota	1.70E+02 µg/kg	NA	No data	LEL	1.70E+02	Persaud and others (1993)
Benzo[j]fluoranthene	205-82-3	No data	No data	No data	No data	NA	No data	No data	No TRV	No data
Benzo[k]fluoranthene	207-08-9	Chronic	No data	*Hyalella azteca*	3.70E+01 µg/kg	NA	No data	ER-L	3.70E+01	Ingersoll and others (1996) in EPA (1999)
Chrysene	218-01-9	Chronic	No data	*Hyalella azteca*	3.00E+01 µg/kg	NA	No data	ER-L	3.00E+01	Ingersoll and others (1996) in EPA (1999)
Dibenz[a,h]acridine	226-36-8	No data	No data	No data	No data	NA	No data	No data	No TRV	No data
Dibenz[a,h]anthracene	53-70-3	Chronic	No data	*Hyalella azteca*	1.00E+01 µg/kg	NA	No data	ER-L	1.00E+01	Ingersoll and others (1996) in EPA (1999)
Dibenz[a,j]acridine	224-42-0	No data	No data	No data	No data	NA	No data	No data	No TRV	No data
Dibenzo[a,e]fluoranthene	5385-75-1	No data	No data	No data	No data	NA	No data	No data	No TRV	No data
Dibenzo[a,e]pyrene	192-65-4	No data	No data	No data	No data	NA	No data	No data	No TRV	No data
Dibenzo[a,h]fluoranthene	No CAS #	No data	No data	No data	No data	NA	No data	No data	No TRV	No data
Dibenzo[a,h]pyrene	189-64-0	No data	No data	No data	No data	NA	No data	No data	No TRV	No data
Dibenzo[a,i]pyrene	189-55-9	No data	No data	No data	No data	NA	No data	No data	No TRV	No data
Fluoranthene	206-44-0	No data	No data	No data	7.50E+02 µg/kg	NA	No data	LEL	7.50E+02	Persaud and others (1993)
Hexachloronaphthalene	1335-87-1	No data	No data	No data	No data	NA	No data	No data	No TRV	No data
Indeno[1,2,3-cd]pyrene	193-39-5	Chronic	No data	*Hyalella azteca*	3.00E+01 µg/kg	NA	No data	ER-L	3.00E+01	Ingersoll and others (1996) in EPA (1999)
Octachloronaphthalene	2234-13-1	No data	No data	No data	No data	NA	No data	No data	No TRV	No data
Pentachloronaphthalene	1321-64-8	No data	No data	No data	No data	NA	No data	No data	No TRV	No data
Tetrachloronaphthalene	1335-88-2	No data	No data	No data	No data	NA	No data	No data	No TRV	No data
Trichloronaphthalene	1321-65-9	No data	No data	No data	No data	NA	No data	No data	No TRV	No data

Table C3-7 Derivation of Sediment Toxicity Reference Values (TRVs) for Exposure of Sediment-Dwelling Invertebrates to COPCs and ROPCs

Constituent of Potential Concern	CAS Registry Number	Test duration	Endpoint	Test species	Endpoint Concen-tration (EC)	Duration conversion factor (DCF)	Endpoint conversion factor (ECF)	Effect	TRV (EC × DCF × ECF)	Source
Light Substituted Benzene Compounds (molecular weight <200 g/mole)										
1,2,3-Trichlorobenzene	87-61-6	No data	No data	No data	No data	NA	No data	No data	No TRV	No data
1,2,4-Trichlorobenzene	120-82-1	Chronic	NOAEL	Aquatic biota	1.10E+02 µg/L	NA	1660 × 0.04 (Koc × TOC)	Not specified	7.30E+03	EqP[a] method (Jones and others 1997)
1,2,4-Trimethyl benzene	95-63-6	No data	No data	No data	No data	NA	No data	No data	No TRV	No data
1,2-Dichlorobenzene	95-50-1	Chronic	NOAEL	Aquatic biota	1.40E+01 µg/L	NA	379 × 0.04 (Koc × TOC)	Not specified	2.12E+02	EqP[a] method (Jones and others 1997)
1,3,5-Trimethyl benzene	108-67-8	No data	No data	No data	No data	NA	No data	No data	No TRV	No data
1,3-Dichlorobenzene	541-73-1	Chronic	NOAEL	Aquatic biota	7.10E+01 µg/L	NA	803 × 0.04 (Koc × TOC)	Not specified	2.28E+03	EqP[a] method (Jones and others 1997)
1,3-Dinitrobenzene	99-65-0	Chronic	NOAEL	Aquatic biota	2.60E+01 µg/L	NA	20.6 × 0.04 (Koc × TOC)	Not specified	2.14E+01	EqP[a] method (EPA 1999)
1,4-Dichlorobenzene	106-46-7	Chronic	NOAEL	Aquatic biota	1.50E+01 µg/L	NA	616 × 0.04 (Koc × TOC)	Not specified	3.70E+02	EqP[a] method (Jones and others 1997)
1,4-Dinitrobenzene	100-25-4	No data	No data	No data	No data	NA	No data	No data	No TRV	No data
2,4,5-Trichlorophenol	95-95-4	No data	No data	No data	No data	NA	No data	No data	No TRV	No data
2,4,6-Trichlorophenol	88-06-2	No data	No data	No data	No data	NA	No data	No data	No TRV	No data
2,4-Dichlorophenol	120-83-2	No data	No data	No data	No data	NA	No data	No data	No TRV	No data
2,4-Dimethylphenol	105-67-9	No data	No data	No data	No data	NA	No data	No data	No TRV	No data
2,4-Dinitrophenol	51-28-5	No data	No data	No data	No data	NA	No data	No data	No TRV	No data
2,4-Dinitrotoluene	121-14-2	Chronic	NOAEL	Aquatic biota	2.30E+01 µg/L	NA	51 × 0.04 (Koc × TOC)	Not specified	4.69E+01	EqP[a] method (EPA 1999)
2,6-Dinitrotoluene	606-20-2	Chronic	NOAEL	Aquatic biota	6.00E+01 µg/L	NA	41.9 × 0.04 (Koc × TOC)	Not specified	1.01E+02	EqP[a] method (EPA 1999)
2-Chlorophenol	95-57-8	No data	No data	No data	No data	NA	No data	No data	No TRV	No data
2-Chlorotoluene	95-49-8	No data	No data	No data	No data	NA	No data	No data	No TRV	No data
2-Nitrophenol	88-75-5	No data	No data	No data	No data	NA	No data	No data	No TRV	No data
4,6-Dinitro-o-cresol	534-52-1	No data	No data	No data	No data	NA	No data	No data	No TRV	No data
4-Chlorotoluene	106-43-4	No data	No data	No data	No data	NA	No data	No data	No TRV	No data
4-Nitrophenol	100-02-7	Chronic	NOAEL	Aquatic biota	3.00E+02 µg/L	NA	43.7 × 0.04 (Koc × TOC)	Not specified	5.24E+02	EqP[a] method (Jones and others 1997)
alpha-Methylstyrene	98-83-9	No data	No data	No data	No data	NA	No data	No data	No TRV	No data
Aniline	62-53-3	No data	No data	No data	No data	NA	No data	No data	No TRV	No data
Benzotrichloride	98-07-7	No data	No data	No data	No data	NA	No data	No data	No TRV	No data
Benzyl chloride	100-44-7	No data	No data	No data	No data	NA	No data	No data	No TRV	No data
Bromobenzene	108-86-1	No data	No data	No data	No data	NA	No data	No data	No TRV	No data
Chlorobenzene	108-90-7	Chronic	NOAEL	Aquatic biota	6.40E+01 µg/L	NA	224 × 0.04 (Koc × TOC)	Not specified	5.73E+02	EqP[a] method (Jones and others 1997)
Cumene	98-82-8	No data	No data	No data	No data	NA	No data	No data	No TRV	No data
m-Cresol	108-39-4	No data	No data	No data	No data	NA	No data	No data	No TRV	No data

Table C3-7 Derivation of Sediment Toxicity Reference Values (TRVs) for Exposure of Sediment-Dwelling Invertebrates to COPCs and ROPCs

Constituent of Potential Concern	CAS Registry Number	Test duration	Endpoint	Test species	Endpoint Concen-tration (EC)	Duration conversion factor (DCF)	Endpoint conversion factor (ECF)	Effect	TRV (EC × DCF × ECF)	Source
n-Butyl benzene	104-51-8	No data	No data	No data	No data	NA	No data	No data	No TRV	No data
Nitrobenzene	98-95-3	Chronic	NOAEL	Aquatic biota	2.70E+02 µg/L	NA	119 × 0.04 (Koc × TOC)	Not specified	1.28E+03	EqP[a] method (EPA 1999)
n-Propyl benzene	103-65-1	No data	No data	No data	No data	NA	No data	No data	No TRV	No data
o-Cresol	95-48-7	Chronic	NOAEL	Aquatic biota	1.30E+01 µg/L	NA	53.4 × 0.04 (Koc × TOC)	Not specified	2.78E+01	EqP[a] method (Jones and others 1997)
o-Dinitrobenzene	528-29-0	No data	No data	No data	No data	NA	No data	No data	No TRV	No data
o-Nitroaniline	88-74-4	No data	No data	No data	No data	NA	No data	No data	No TRV	No data
o-Toluidine	95-53-4	No data	No data	No data	No data	NA	No data	No data	No TRV	No data
p-Chloroaniline	106-47-8	No data	No data	No data	No data	NA	No data	No data	No TRV	No data
p-Cresol	106-44-5	No data	No data	No data	No data	NA	No data	No data	No TRV	No data
Phenol	108-95-2	Chronic	No data	*Hyalella azteca*	4.80E+01 µg/kg	NA	No data	AET	4.80E+01	Ecology (1994)
p-Nitrochlorobenzene	100-00-5	No data	No data	No data	No data	NA	No data	No data	No TRV	No data
p-Toluidine	106-49-0	No data	No data	No data	No data	NA	No data	No data	No TRV	No data
sec-Butyl benzene	135-98-8	No data	No data	No data	No data	NA	No data	No data	No TRV	No data
tert-Butyl benzene	98-06-6	No data	No data	No data	No data	NA	No data	No data	No TRV	No data
Toluene-2,6-diamine	823-40-5	No data	No data	No data	No data	NA	No data	No data	No TRV	No data
Trimethyl benzene	25551-13-7	No data	No data	No data	No data	NA	No data	No data	No TRV	No data
Other Light Semivolatile Compounds (molecular weight <200 g/mole)										
1,1'-Biphenyl	92-52-4	No data	No data	No data	No data	NA	No data	No data	No TRV	No data
1,1-Dimethylhydrazine	57-14-7	No data	No data	No data	No data	NA	No data	No data	No TRV	No data
1,2-Dimethylhydrazine	540-73-8	No data	No data	No data	No data	NA	No data	No data	No TRV	No data
1,2-Diphenylhydrazine	122-66-7	No data	No data	No data	No data	NA	No data	No data	No TRV	No data
1,3-Propane sultone	1120-71-4	No data	No data	No data	No data	NA	No data	No data	No TRV	No data
2,4-Toluene diisocyanate	584-84-9	No data	No data	No data	No data	NA	No data	No data	No TRV	No data
2-Chloroacetophenone	532-27-4	No data	No data	No data	No data	NA	No data	No data	No TRV	No data
2-Propenoic acid	79-10-7	No data	No data	No data	No data	NA	No data	No data	No TRV	No data
4,4'-Methylenedianiline	101-77-9	No data	No data	No data	No data	NA	No data	No data	No TRV	No data
Acetophenone	98-86-2	No data	No data	No data	No data	NA	No data	No data	No TRV	No data
Benzoic acid	65-85-0	No data	No data	No data	No data	NA	No data	No data	No TRV	No data
Bis(2-chloroethoxy)methane	111-91-1	No data	No data	No data	No data	NA	No data	No data	No TRV	No data
Bis(2-chloroethyl) ether	111-44-4	No data	No data	No data	No data	NA	No data	No data	No TRV	No data
Chlorocyclopentadiene	41851-50-7	No data	No data	No data	No data	NA	No data	No data	No TRV	No data
Cyclohexanol	108-93-0	No data	No data	No data	No data	NA	No data	No data	No TRV	No data
Dichloroisopropyl ether	108-60-1	No data	No data	No data	No data	NA	No data	No data	No TRV	No data
Dichloromethyl ether	542-88-1	No data	No data	No data	No data	NA	No data	No data	No TRV	No data
Dichloropentadiene	61626-71-9	No data	No data	No data	No data	NA	No data	No data	No TRV	No data
Dimethyl sulfate	77-78-1	No data	No data	No data	No data	NA	No data	No data	No TRV	No data
Dimethylaniline	121-69-7	No data	No data	No data	No data	NA	No data	No data	No TRV	No data
di-n-Propylnitrosamine	621-64-7	No data	No data	No data	No data	NA	No data	No data	No TRV	No data
Diphenyl ether	101-84-8	No data	No data	No data	No data	NA	No data	No data	No TRV	No data
Epichlorohydrin	106-89-8	No data	No data	No data	No data	NA	No data	No data	No TRV	No data

Table C3-7 Derivation of Sediment Toxicity Reference Values (TRVs) for Exposure of Sediment-Dwelling Invertebrates to COPCs and ROPCs

Constituent of Potential Concern	CAS Registry Number	Test duration	Endpoint	Test species	Endpoint Concen-tration (EC)	Duration conversion factor (DCF)	Endpoint conversion factor (ECF)	Effect	TRV (EC × DCF × ECF)	Source
Ethyl carbamate (Urethane)	51-79-6	No data	No data	No data	No data	NA	No data	No data	No TRV	No data
Ethyl methanesulfonate	62-50-0	No data	No data	No data	No data	NA	No data	No data	No TRV	No data
Ethylene dibromide	106-93-4	No data	No data	No data	No data	NA	No data	No data	No TRV	No data
Ethylene glycol	107-21-1	No data	No data	No data	No data	NA	No data	No data	No TRV	No data
Ethylene glycol monobutyl ether	111-76-2	No data	No data	No data	No data	NA	No data	No data	No TRV	No data
Ethylene glycol monoethyl ether acetate	111-15-9	No data	No data	No data	No data	NA	No data	No data	No TRV	No data
Ethylene thiourea	96-45-7	No data	No data	No data	No data	NA	No data	No data	No TRV	No data
Furfural	98-01-1	No data	No data	No data	No data	NA	No data	No data	No TRV	No data
Maleic hydrazide	123-33-1	No data	No data	No data	No data	NA	No data	No data	No TRV	No data
Malononitrile	109-77-3	No data	No data	No data	No data	NA	No data	No data	No TRV	No data
Methyl styrene (mixed isomers)	25013-15-4	No data	No data	No data	No data	NA	No data	No data	No TRV	No data
Methylhydrazine	60-34-4	No data	No data	No data	No data	NA	No data	No data	No TRV	No data
N,N-Diphenylamine	122-39-4	No data	No data	No data	No data	NA	No data	No data	No TRV	No data
Nitric acid, propyl ester	627-13-4	No data	No data	No data	No data	NA	No data	No data	No TRV	No data
N-Nitrosodi-n-butylamine	924-16-3	No data	No data	No data	No data	NA	No data	No data	No TRV	No data
N-Nitrosomorpholine	59-89-2	No data	No data	No data	No data	NA	No data	No data	No TRV	No data
N-Nitroso-N,N-dimethylamine	62-75-9	No data	No data	No data	No data	NA	No data	No data	No TRV	No data
o-Anisidine	90-04-0	No data	No data	No data	No data	NA	No data	No data	No TRV	No data
Oxalic acid	144-62-7	No data	No data	No data	No data	NA	No data	No data	No TRV	No data
Phthalic anhydride	85-44-9	No data	No data	No data	No data	NA	No data	No data	No TRV	No data
p-Phthalic acid	100-21-0	No data	No data	No data	No data	NA	No data	No data	No TRV	No data
Pyridine	110-86-1	No data	No data	No data	No data	NA	No data	No data	No TRV	No data
Quinoline	91-22-5	No data	No data	No data	No data	NA	No data	No data	No TRV	No data
Quinone	106-51-4	No data	No data	No data	No data	NA	No data	No data	No TRV	No data
Safrole	94-59-7	No data	No data	No data	No data	NA	No data	No data	No TRV	No data
Tetrahydrofuran	109-99-9	No data	No data	No data	No data	NA	No data	No data	No TRV	No data
Other Heavy Semivolatile Compounds (molecular weight >200 g/mole)										
1,2,4,5-Tetrachlorobenzene	95-94-3	No data	No data	No data	No data	NA	No data	No data	No TRV	No data
1,3,5-Trinitrobenzene	99-35-4	No data	No data	No data	No data	NA	No data	No data	No TRV	No data
2,6-Bis(tert-butyl)-4-methylphenol	128-37-0	No data	No data	No data	No data	NA	No data	No data	No TRV	No data
2-Cyclohexyl-4,6-dinitrophenol	131-89-5	No data	No data	No data	No data	NA	No data	No data	No TRV	No data
2-sec-Butyl-4,6-dinitrophenol	88-85-7	No data	No data	No data	No data	NA	No data	No data	No TRV	No data
3,3'-Dichlorobenzidine	91-94-1	No data	No data	No data	No data	NA	No data	No data	No TRV	No data
3,3'-Dimethoxybenzidine	119-90-4	No data	No data	No data	No data	NA	No data	No data	No TRV	No data
4-Bromophenylphenyl ether	101-55-3	No data	No data	No data	No data	NA	No data	No data	No TRV	No data
Ammonium perfluorooctanoate	3825-26-1	No data	No data	No data	No data	NA	No data	No data	No TRV	No data
Azobenzene	103-33-3	No data	No data	No data	No data	NA	No data	No data	No TRV	No data
Bis(3-tert-butyl-4-hydroxy-6-methyl-phenyl)sulfide	96-69-5	No data	No data	No data	No data	NA	No data	No data	No TRV	No data
Captan	133-06-2	No data	No data	No data	No data	NA	No data	No data	No TRV	No data
Chlorobenzilate	510-15-6	No data	No data	No data	No data	NA	No data	No data	No TRV	No data
Dibutylphosphate	107-66-4	No data	No data	No data	No data	NA	No data	No data	No TRV	No data
Dimethyl aminoazobenzene	60-11-7	No data	No data	No data	No data	NA	No data	No data	No TRV	No data

Table C3-7 Derivation of Sediment Toxicity Reference Values (TRVs) for Exposure of Sediment-Dwelling Invertebrates to COPCs and ROPCs

Constituent of Potential Concern	CAS Registry Number	Test duration	Endpoint	Test species	Endpoint Concen-tration (EC)	Duration conversion factor (DCF)	Endpoint conversion factor (ECF)	Effect	TRV (EC × DCF × ECF)	Source
Hexachlorobenzene	118-74-1	Chronic	No data	Sediment biota	2.00E+01 µg/kg	NA	No data	LEL	2.00E+01	Persaud and others (1993) in EPA (1999)
Hexachlorobutadiene	87-68-3	Chronic	NOAEL	Aquatic biota	9.30E-01 µg/L	NA	6940 × 0.04 (Koc × TOC)	Not specified	2.58E+02	EqP[a] method (EPA 1999)
Hexachlorocyclopentadiene	77-47-4	Chronic	NOAEL	Aquatic biota	5.20E-01 µg/L	NA	9510 × 0.04 (Koc × TOC)	Not specified	1.98E+02	EqP[a] method (EPA 1999)
Hexachloroethane	67-72-1	Chronic	NOAEL	Aquatic biota	1.20E+01 µg/L	NA	1820 × 0.04 (Koc × TOC)	Not specified	8.74E+02	EqP[a] method (Jones and others 1997)
Hexachlorophene	70-30-4	Chronic	NOAEL	Aquatic biota	8.80E-01 µg/L	NA	1.80E+06 × 0.04 (Koc × TOC)	Not specified	6.34E+04	EqP[a] method (EPA 1999)
Hexamethylene-1,5-diisocyanate	822-06-0	No data	No data	No data	No data	NA	No data	No data	No TRV	No data
Mirex	2385-85-5	Chronic	No data	Sediment biota	2.00E+01 µg/kg	NA	No data	LEL	7.00E+00	Persaud and others (1993)
Nitrofen	1836-75-5	No data	No data	No data	No data	NA	No data	No data	No TRV	No data
Pentachlorobenzene	608-93-5	Chronic	NOAEL	Aquatic biota	4.70E-01 µg/L	NA	32,100 × 0.04 (Koc × TOC)	K_{oc} × TOC	6.04E+02	EqP[a] method (EPA 1999)
Pentachloronitrobenzene	82-68-8	Chronic	NOAEL	Aquatic biota	1.00E+01 µg/L	NA	5890 × 0.04 (Koc × TOC)	K_{oc} × TOC	2.36E+03	EqP[a] method (EPA 1999)
Pentachlorophenol	87-86-5	Chronic	No data	*Hyalella azteca*	7.00E+03 µg/kg	NA	No data	AET	7.00E+03	EPA (1999)
Picric acid	88-89-1	No data	No data	No data	No data	NA	No data	No data	No TRV	No data
Pronamide	23950-58-5	No data	No data	No data	No data	NA	No data	No data	No TRV	No data
Strychnine	57-24-9	No data	No data	No data	No data	NA	No data	No data	No TRV	No data
Terphenyls	26140-60-3	No data	No data	No data	No data	NA	No data	No data	No TRV	No data
Tributyl phosphate	126-73-8	No data	No data	No data	No data	NA	No data	No data	No TRV	No data
Trifluralin	1582-09-8	No data	No data	No data	No data	NA	No data	No data	No TRV	No data
Triphenylamine	603-34-9	No data	No data	No data	No data	NA	No data	No data	No TRV	No data
Herbicides and Organochlorinated Pesticides										
2,4,5-T	93-76-5	No data	No data	No data	No data	NA	No data	No data	No TRV	No data
2,4-D and esters	94-75-7	No data	No data	No data	No data	NA	No data	No data	No TRV	No data
4,4'-DDD	72-54-8	Chronic	No data	Sediment biota	8.00E+00 µg/kg	NA	No data	LEL	8.00E+00	Persaud and others (1993)
4,4'-DDE	72-55-9	Chronic	No data	Sediment biota	5.00E+00 µg/kg	NA	No data	LEL	5.00E+00	Persaud and others (1993) in EPA (1999)
4,4'-DDT	50-29-3	Chronic	No data	Sediment biota	8.00E+00 µg/kg	NA	No data	LEL	8.00E+00	Persaud and others (1993)
Aldrin	309-00-2	Chronic	No data	Sediment biota	2.00E+00 µg/kg	NA	No data	LEL	2.00E+00	Persaud and others (1993)
alpha-BHC	319-84-6	Chronic	No data	Sediment biota	6.00E+00 µg/kg	NA	No data	LEL	6.00E+00	Persaud and others (1993)

Table C3-7 Derivation of Sediment Toxicity Reference Values (TRVs) for Exposure of Sediment-Dwelling Invertebrates to COPCs and ROPCs

Constituent of Potential Concern	CAS Registry Number	Test duration	Endpoint	Test species	Endpoint Concen-tration (EC)	Duration conversion factor (DCF)	Endpoint conversion factor (ECF)	Effect	TRV (EC × DCF × ECF)	Source
beta-BHC	319-85-7	Chronic	No data	Sediment biota	5.00E+00 µg/kg	NA	No data	LEL	5.00E+00	Persaud and others (1993)
Chlordane	57-74-9	Chronic	No data	Sediment biota	7.00E+00 µg/kg	NA	No data	LEL	7.00E+00	Persaud and others (1993)
delta-BHC	319-86-8	Chronic	NOAEL	Aquatic biota	2.20E+00 µg/L	NA	2.82 × 0.04 (Koc × TOC)	Not specified	2.48E-01	EqP[a] method (Jones and others 1997)
Dieldrin	60-57-1	Chronic	No data	Sediment biota	2.00E+00 µg/kg	NA	No data	LEL	2.00E+00	Persaud and others (1993)
Endothall	145-73-3	No data	No data	No data	No data	NA	No data	No data	No TRV	No data
Endrin	72-20-8	Chronic	No data	Sediment biota	3.00E+00 µg/kg	NA	No data	LEL	3.00E+00	Persaud and others (1993)
gamma-BHC (Lindane)	58-89-9	Chronic	No data	Sediment biota	3.00E+00 µg/kg	NA	No data	LEL	3.00E+00	Persaud and others (1993)
Heptachlor	76-44-8	Chronic	No data	Sediment biota	8.80E-01 µg/kg	NA	No data	NEL	3.08E-01	EPA (1999)
Isodrin	465-73-6	No data	No data	No data	No data	NA	No data	No data	No TRV	No data
Methoxychlor	72-43-5	Chronic	NOAEL	Aquatic biota	1.90E-02 µg/L	NA	80,000 × 0.04 (Koc × TOC)	Not specified	6.08E+01	EqP[a] method (Jones and others 1997)
Silvex (2,4,5-TP)	93-72-1	No data	No data	No data	No data	NA	No data	No data	No TRV	No data
Toxaphene	8001-35-2	Chronic	NOAEL	Aquatic biota	1.75E+02 µg/L	NA	5 × 0.04 (Koc × TOC)	Not specified	3.50E+01	EqP[a] method (Jones and others 1997)
Inorganic Chemicals and Compounds					(mg/kg)				(mg/kg)	
	Metals									
Aluminum	7429-90-5	Chronic	No data	*Hyalella azteca*	1.40E+04	NA	No data	ER-L	1.40E+04	Ingersoll and others (1996) in EPA (1999)
Antimony	7440-36-0	Chronic	No data	*Hyalella azteca*	6.40E+01	NA	No data	AET	6.40E+01	Ecology (1994) in EPA (1999)
Arsenic	7440-38-2	Chronic	No data	Sediment biota	6.00E+00	NA	No data	LEL	6.00E+00	Persaud and others (1993) in EPA (1999)
Barium	7440-39-3	Chronic	No data	Sediment biota	2.00E+01	NA	No data	No data	2.00E+01	EPA Region 5 guideline (Hull and Suter 1994 in EPA 1999)
Beryllium	7440-41-7	No data	No data	No data	No data	NA	No data	No data	No TRV	No data
Bismuth	7440-69-9	No data	No data	No data	No data	NA	No data	No data	No TRV	No data
Boron	7440-42-8	No data	No data	No data	No data	NA	No data	No data	No TRV	No data
Cadmium	7440-43-9	Chronic	No data	Sediment biota	6.00E-01	NA	No data	LEL	6.00E-01	Persaud and others (1993) in EPA (1999)
Calcium	7440-70-2	No data	No data	No data	No data	NA	No data	No data	No TRV	No data
Chromium[c]	18540-29-9	Chronic	No data	Sediment biota	2.60E+01	NA	No data	LEL	2.60E+01	Persaud and others (1993) in EPA (1999)
Cobalt	7440-48-4	No data	No data	No data	No data	NA	No data	No data	No TRV	No data
Copper	7440-50-8	Chronic	No data	Sediment biota	1.60E+01	NA	No data	LEL	1.60E+01	Persaud and others (1993) in EPA (1999)

Table C3-7 Derivation of Sediment Toxicity Reference Values (TRVs) for Exposure of Sediment-Dwelling Invertebrates to COPCs and ROPCs

Constituent of Potential Concern	CAS Registry Number	Test duration	Endpoint	Test species	Endpoint Concen-tration (EC)	Duration conversion factor (DCF)	Endpoint conversion factor (ECF)	Effect	TRV (EC × DCF × ECF)	Source
Iron	7439-89-6	Chronic	No data	Sediment biota	2.00E+04	NA	No data	LEL	2.00E+04	Persaud and others (1993)
Lead	7439-92-1	Chronic	No data	Sediment biota	3.10E+01	NA	No data	LEL	3.10E+01	Persaud and others (1993) in EPA (1999)
Lithium	7439-93-2	No data	No data	No data	No data	NA	No data	No data	No TRV	No data
Magnesium	7439-95-4	No data	No data	No data	No data	NA	No data	No data	No TRV	No data
Manganese	7439-96-5	Chronic	No data	Sediment biota	4.60E+02	NA	No data	LEL	4.60E+02	Persaud and others (1993)
Mercury	7439-97-6	NA	NA	NA	NA	NA	NA	NA	NA	NA
Mercury - Hg+2	7487-94-7	Chronic	NA	NA	NA	NA	NA	NA	2.00E-01	LEL for total mercury used as surrogate (EPA 1999)
Methylmercury	22967-92-6	Chronic	NA	NA	NA	NA	NA	NA	2.00E-01	LEL for total mercury used as surrogate (EPA 1999)
Molybdenum	7439-98-7	No data	No data	No data	No data	NA	No data	No data	No TRV	No data
Nickel	7440-02-0	Chronic	No data	Sediment biota	1.60E+01	NA	No data	LEL	1.60E+01	Persaud and others (1993) in EPA (1999)
Potassium	7440-09-7	No data	No data	No data	No data	NA	No data	No data	No TRV	No data
Rhodium	7440-16-6	No data	No data	No data	No data	NA	No data	No data	No TRV	No data
Selenium	7782-49-2	Chronic	No data	*Hyalella azteca*	1.00E-01	NA	No data	AET	1.00E-01	Ecology (1994) in EPA (1999)
Silicon	7440-21-3	No data	No data	No data	No data	NA	No data	No data	No TRV	No data
Silver	7440-22-4	Chronic	No data	*Hyalella azteca*	4.50E+00	NA	No data	AET	4.50E+00	Ecology (1994) in EPA (1999)
Sodium	7440-23-5	No data	No data	No data	No data	NA	No data	No data	No TRV	No data
Strontium	7440-24-6	No data	No data	No data	No data	NA	No data	No data	No TRV	No data
Tantalum	7440-25-7	No data	No data	No data	No data	NA	No data	No data	No TRV	No data
Thallium	7440-28-0	No data	No data	No data	No data	NA	No data	No data	No TRV	No data
Tin	7440-31-5	No data	No data	No data	No data	NA	No data	No data	No TRV	No data
Tungsten	7440-33-7	No data	No data	No data	No data	NA	No data	No data	No TRV	No data
Uranium	7440-61-1	No data	No data	No data	No data	NA	No data	No data	No TRV	No data
Vanadium	7440-62-2	No data	No data	No data	No data	NA	No data	No data	No TRV	No data
Yttrium	7440-65-5	No data	No data	No data	No data	NA	No data	No data	No TRV	No data
Zinc	7440-66-6	Chronic	No data	*Hyalella azteca*	1.10E+02	NA	No data	ER-L	1.10E+02	Ingersoll and others (1996) in EPA (1999)
Zirconium	7440-67-7	No data	No data	No data	No data	NA	No data	No data	No TRV	No data
	Non-metals and Anions									
Ammonia/Ammonium	7664-41-7	Chronic	No data	*Hyalella azteca*	9.30E+02	NA	No data	AET	9.30E+02	Ecology (1997)
Bromide	24959-67-9	No data	No data	No data	No data	NA	No data	No data	No TRV	No data
Chloride	16887-00-6	No data	No data	No data	No data	NA	No data	No data	No TRV	No data
Cyanide	57-12-5	Chronic	No data	Sediment biota	1.00E-01	NA	No data	No data	1.00E-01	EPA Region 5 guideline (Hull and Suter 1994 in EPA 1999)
Fluoride	16984-48-8	No data	No data	No data	No data	NA	No data	No data	No TRV	No data
Hydroxide	14280-30-9	No data	No data	No data	No data	NA	No data	No data	No TRV	No data
Iodine	7553-56-2	No data	No data	No data	No data	NA	No data	No data	No TRV	No data

Table C3-7 Derivation of Sediment Toxicity Reference Values (TRVs) for Exposure of Sediment-Dwelling Invertebrates to COPCs and ROPCs

Constituent of Potential Concern	CAS Registry Number	Test duration	Endpoint	Test species	Endpoint Concen-tration (EC)	Duration conversion factor (DCF)	Endpoint conversion factor (ECF)	Effect	TRV (EC × DCF × ECF)	Source
Nitrate	14797-55-8	No data	No data	No data	No data	NA	No data	No data	No TRV	No data
Nitrite	14797-65-0	No data	No data	No data	No data	NA	No data	No data	No TRV	No data
Phosphate	14265-44-2	No data	No data	No data	No data	NA	No data	No data	No TRV	No data
Phosphorus	7723-14-0	No data	No data	No data	No data	NA	No data	No data	No TRV	No data
Sulfate	14808-79-8	No data	No data	No data	No data	NA	No data	No data	No TRV	No data
Total sulfur	63705-05-5	No data	No data	No data	No data	NA	No data	No data	No TRV	No data
Criteria Pollutants										
Carbon monoxide	630-08-0	No data	No data	No data	No data	NA	No data	No data	No TRV	No data
Nitrogen dioxide	10102-44-0	No data	No data	No data	No data	NA	No data	No data	No TRV	No data
Ozone	10028-15-6	No data	No data	No data	No data	NA	No data	No data	No TRV	No data
Particulate matter	No CAS #	No data	No data	No data	No data	NA	No data	No data	No TRV	No data
Sulfur dioxide	7446-09-5	No data	No data	No data	No data	NA	No data	No data	No TRV	No data
Radionuclides										
All radionuclides combined (rad/d)[d]	No CAS #	Chronic	Adverse effects	Sediment biota	NA	NA	NA	Population effects	1.00E+00	NCRP (1991)

Notes/Sources

No data = No data available.
NA = Not applicable.
CAS = Chemical Abstracts Service.
EC = Concentration that caused the reported effect.
DCF = Duration conversion factor; not applicable for sediment toxicity derivation.
ECF = Endpoint conversion factor; for sediment, used to convert aquatic TRV to sediment TRV by equilibrium partitioning[a].
TRV = Toxicity reference value.
NOAEL = No observed adverse effect level.
K_{oc} = Soil carbon partition coefficient.
TOC = Total organic carbon, assumed to be 4 % (EPA 1999).
LEL = Ontario Ministry of the Interior Lowest Effect Level (Persaud and others 1993).
ER-L = National Oceanic and Atmospheric Administration Effects Range-Low (Long and others 1995; Ingersoll and others 1996).
AET = Washington State Department of Ecology Apparent Effects Threshold (Ecology 1994; Ecology 1997).

[a] EqP - Equilibrium partitioning, assumes
1) toxicity of sediment is due to COPC dissolved in porewater,
2) toxicity in porewater is the same as toxicity in surface water, and
3) concentration of COPC in porewater is equal to concentration in sediment divided by K_{oc}
The sediment TRV is calculated by multiplying the freshwater TRV by K_{oc} and TOC.

[b] Data for Aroclor-1254 used as representative of polychlorinated biphenyl mixtures.

[c] Values for hexavalent chromium, which is more toxic than trivalent chromium.

[d] TRV is not applicable to single radionuclides. Combined external and internal radiation exposure for sediment biota from all radionuclides combined cannot exceed 1 rad/d.

Table C3-8 Toxicity Reference Values (TRVs) for COPCs and ROPCs

Constituent of Potential Concern	CAS Registry Number	Direct Exposure, Terrestrial Receptors			
		Plant		Terrestrial Invertebrate	
		TRV	Source	TRV	Source
Organic Compounds		(µg/kg)		(µg/kg)	
Aromatic Halogenated Hydrocarbons					
2,3,4,6-Tetrachlorophenol	58-90-2	No TRV		No TRV	
4-Chloro-3-methylphenol	59-50-7	No TRV		No TRV	
Aromatic Nonhalogenated Hydrocarbons					
2-Nitrotoluene	88-72-2	No TRV		No TRV	
4-Nitrobiphenyl	92-93-3	No TRV		No TRV	
Benzaldehyde	100-52-7	No TRV		No TRV	
Benzene	71-43-2	No TRV		No TRV	
Benzyl alcohol	100-51-6	No TRV		No TRV	
Ethyl benzene	100-41-4	No TRV		No TRV	
m-Xylene	108-38-3	No TRV		No TRV	
o-Xylene	95-47-6	No TRV		No TRV	
p-Xylene	106-42-3	No TRV		No TRV	
Styrene	100-42-5	3.00E+05	Efroymson and others (1997a)[e]	No TRV	
Toluene	108-88-3	2.00E+05	Efroymson and others (1997a)[e]	No TRV	
Non-aromatic Nonhalogenated Hydrocarbons					
1,2-Epoxybutane	106-88-7	No TRV		No TRV	
1,3-Butadiene	106-99-0	No TRV		No TRV	
1,4-Dioxane	123-91-1	No TRV		No TRV	
1-Methylpropyl alcohol	78-92-2	No TRV		No TRV	
1-Nitropropane	108-03-2	No TRV		No TRV	
2,2,4-Trimethylpentane	540-84-1	No TRV		No TRV	
2-Butanone	78-93-3	No TRV		No TRV	
2-Butenaldehyde (2-Butenal)	4170-30-3	No TRV		No TRV	
2-Ethoxyethanol	110-80-5	No TRV		No TRV	
2-Heptanone	110-43-0	No TRV		No TRV	

Table C3-8 Toxicity Reference Values (TRVs) for COPCs and ROPCs

Constituent of Potential Concern	CAS Registry Number	Ingestion, Terrestrial Exposures			
		Mule Deer		Mourning Dove	
		NOAEL TRV	Source	NOAEL TRV	Source
Organic Compounds		(µg/kg BW/d)		(µg/kg BW/d)	
Aromatic Halogenated Hydrocarbons					
2,3,4,6-Tetrachlorophenol	58-90-2	2.50E+03	US EPA (1986a) in IRIS (2002)[a]	No TRV	
4-Chloro-3-methylphenol	59-50-7	No TRV		No TRV	
Aromatic Nonhalogenated Hydrocarbons					
2-Nitrotoluene	88-72-2	No TRV		No TRV	
4-Nitrobiphenyl	92-93-3	No TRV		No TRV	
Benzaldehyde	100-52-7	1.43E+04	Kluwe and others (1983) in IRIS (2002)[a]	No TRV	
Benzene	71-43-2	2.64E+04	Nawrot and Staples (1979) in Sample and others (1996)[c]	No TRV	
Benzyl alcohol	100-51-6	No TRV		No TRV	
Ethyl benzene	100-41-4	9.71E+03	Wolf and others (1956) in IRIS (2002)[a]	No TRV	
m-Xylene	108-38-3	No TRV		No TRV	
o-Xylene	95-47-6	No TRV		No TRV	
p-Xylene	106-42-3	No TRV		No TRV	
Styrene	100-42-5	2.00E+04	Quast and others (1979) in IRIS (2002)[a]	No TRV	
Toluene	108-88-3	2.60E+04	Nawrot and Staples (1979) in Sample and others (1996)[c]	No TRV	
Non-aromatic Nonhalogenated Hydrocarbons					
1,2-Epoxybutane	106-88-7	No TRV		No TRV	
1,3-Butadiene	106-99-0	No TRV		No TRV	
1,4-Dioxane	123-91-1	1.06E+05	EPA 1999[f]	No TRV	
1-Methylpropyl alcohol	78-92-2	No TRV		No TRV	
1-Nitropropane	108-03-2	No TRV		No TRV	
2,2,4-Trimethylpentane	540-84-1	No TRV		No TRV	
2-Butanone	78-93-3	1.77E+06	Cox and others (1975) in IRIS (2002)[a]	No TRV	
2-Butenaldehyde (2-Butenal)	4170-30-3	8.00E+01	EPA 1999[f]	No TRV	
2-Ethoxyethanol	110-80-5	No TRV		No TRV	
2-Heptanone	110-43-0	No TRV		No TRV	

Table C3-8 Toxicity Reference Values (TRVs) for COPCs and ROPCs

Constituent of Potential Concern	CAS Registry Number	Ingestion, Terrestrial Exposures			
		Great Basin Pocket Mouse		Western Meadowlark	
		NOAEL TRV	Source	NOAEL TRV	Source
Organic Compounds		(µg/kg BW/d)		(µg/kg BW/d)	
Aromatic Halogenated Hydrocarbons					
2,3,4,6-Tetrachlorophenol	58-90-2	2.50E+03	US EPA (1986a) in IRIS (2002)[a]	No TRV	
4-Chloro-3-methylphenol	59-50-7	No TRV		No TRV	
Aromatic Nonhalogenated Hydrocarbons					
2-Nitrotoluene	88-72-2	No TRV		No TRV	
4-Nitrobiphenyl	92-93-3	No TRV		No TRV	
Benzaldehyde	100-52-7	1.43E+04	Kluwe and others (1983) in IRIS (2002)[a]	No TRV	
Benzene	71-43-2	2.64E+04	Nawrot and Staples (1979) in Sample and others (1996)[c]	No TRV	
Benzyl alcohol	100-51-6	No TRV		No TRV	
Ethyl benzene	100-41-4	9.71E+03	Wolf and others (1956) in IRIS (2002)$_a$	No TRV	
m-Xylene	108-38-3	No TRV		No TRV	
o-Xylene	95-47-6	No TRV		No TRV	
p-Xylene	106-42-3	No TRV		No TRV	
Styrene	100-42-5	2.00E+04	Quast and others (1979) in IRIS (2002)[a]	No TRV	
Toluene	108-88-3	2.60E+04	Nawrot and Staples (1979) in Sample and others (1996)[c]	No TRV	
Non-aromatic Nonhalogenated Hydrocarbons					
1,2-Epoxybutane	106-88-7	No TRV		No TRV	
1,3-Butadiene	106-99-0	No TRV		No TRV	
1,4-Dioxane	123-91-1	1.06E+05	EPA 1999[f]	No TRV	
1-Methylpropyl alcohol	78-92-2	No TRV		No TRV	
1-Nitropropane	108-03-2	No TRV		No TRV	
2,2,4-Trimethylpentane	540-84-1	No TRV		No TRV	
2-Butanone	78-93-3	1.77E+06	Cox and others (1975) in IRIS (2002)[a]	No TRV	
2-Butenaldehyde (2-Butenal)	4170-30-3	8.00E+01	EPA 1999[f]	No TRV	
2-Ethoxyethanol	110-80-5	No TRV		No TRV	
2-Heptanone	110-43-0	No TRV		No TRV	

Table C3-8 Toxicity Reference Values (TRVs) for COPCs and ROPCs

Constituent of Potential Concern	CAS Registry Number	Ingestion, Terrestrial Exposures			
		Coyote		Burrowing Owl	
		NOAEL TRV	Source	NOAEL TRV	Source
Organic Compounds		(µg/kg BW/d)		(µg/kg BW/d)	
Aromatic Halogenated Hydrocarbons					
2,3,4,6-Tetrachlorophenol	58-90-2	2.50E+03	US EPA (1986a) in IRIS (2002)[a]	No TRV	
4-Chloro-3-methylphenol	59-50-7	No TRV		No TRV	
Aromatic Nonhalogenated Hydrocarbons					
2-Nitrotoluene	88-72-2	No TRV		No TRV	
4-Nitrobiphenyl	92-93-3	No TRV		No TRV	
Benzaldehyde	100-52-7	1.43E+04	Kluwe and others (1983) in IRIS (2002)[a]	No TRV	
Benzene	71-43-2	2.64E+04	Nawrot and Staples (1979) in Sample and others (1996)[c]	No TRV	
Benzyl alcohol	100-51-6	No TRV		No TRV	
Ethyl benzene	100-41-4	9.71E+03	Wolf and others (1956) in IRIS (2002)[a]	No TRV	
m-Xylene	108-38-3	No TRV		No TRV	
o-Xylene	95-47-6	No TRV		No TRV	
p-Xylene	106-42-3	No TRV		No TRV	
Styrene	100-42-5	2.00E+04	Quast and others (1979) in IRIS (2002)[a]	No TRV	
Toluene	108-88-3	2.60E+04	Nawrot and Staples (1979) in Sample and others (1996)[c]	No TRV	
Non-aromatic Nonhalogenated Hydrocarbons					
1,2-Epoxybutane	106-88-7	No TRV		No TRV	
1,3-Butadiene	106-99-0	No TRV		No TRV	
1,4-Dioxane	123-91-1	1.06E+05	EPA 1999[f]	No TRV	
1-Methylpropyl alcohol	78-92-2	No TRV		No TRV	
1-Nitropropane	108-03-2	No TRV		No TRV	
2,2,4-Trimethylpentane	540-84-1	No TRV		No TRV	
2-Butanone	78-93-3	1.77E+06	Cox and others (1975) in IRIS (2002)[a]	No TRV	
2-Butenaldehyde (2-Butenal)	4170-30-3	8.00E+01	EPA 1999[f]	No TRV	
2-Ethoxyethanol	110-80-5	No TRV		No TRV	
2-Heptanone	110-43-0	No TRV		No TRV	

Table C3-8 Toxicity Reference Values (TRVs) for COPCs and ROPCs

Constituent of Potential Concern	CAS Registry Number	Ingestion, Terrestrial Exposures		Ingestion, Aquatic Exposures	
		Red-tailed Hawk		Canada Goose	
		NOAEL TRV	Source	NOAEL TRV	Source
Organic Compounds		(µg/kg BW/d)		(µg/kg BW/d)	
Aromatic Halogenated Hydrocarbons					
2,3,4,6-Tetrachlorophenol	58-90-2	No TRV		No TRV	
4-Chloro-3-methylphenol	59-50-7	No TRV		No TRV	
Aromatic Nonhalogenated Hydrocarbons					
2-Nitrotoluene	88-72-2	No TRV		No TRV	
4-Nitrobiphenyl	92-93-3	No TRV		No TRV	
Benzaldehyde	100-52-7	No TRV		No TRV	
Benzene	71-43-2	No TRV		No TRV	
Benzyl alcohol	100-51-6	No TRV		No TRV	
Ethyl benzene	100-41-4	No TRV		No TRV	
m-Xylene	108-38-3	No TRV		No TRV	
o-Xylene	95-47-6	No TRV		No TRV	
p-Xylene	106-42-3	No TRV		No TRV	
Styrene	100-42-5	No TRV		No TRV	
Toluene	108-88-3	No TRV		No TRV	
Non-aromatic Nonhalogenated Hydrocarbons					
1,2-Epoxybutane	106-88-7	No TRV		No TRV	
1,3-Butadiene	106-99-0	No TRV		No TRV	
1,4-Dioxane	123-91-1	No TRV		No TRV	
1-Methylpropyl alcohol	78-92-2	No TRV		No TRV	
1-Nitropropane	108-03-2	No TRV		No TRV	
2,2,4-Trimethylpentane	540-84-1	No TRV		No TRV	
2-Butanone	78-93-3	No TRV		No TRV	
2-Butenaldehyde (2-Butenal)	4170-30-3	No TRV		No TRV	
2-Ethoxyethanol	110-80-5	No TRV		No TRV	
2-Heptanone	110-43-0	No TRV		No TRV	

Table C3-8 Toxicity Reference Values (TRVs) for COPCs and ROPCs

Constituent of Potential Concern	CAS Registry Number	Ingestion, Aquatic Exposures			
		Spotted Sandpiper		Great Blue Heron	
		NOAEL TRV	Source	NOAEL TRV	Source
Organic Compounds		(µg/kg BW/d)		(µg/kg BW/d)	
Aromatic Halogenated Hydrocarbons					
2,3,4,6-Tetrachlorophenol	58-90-2	No TRV		No TRV	
4-Chloro-3-methylphenol	59-50-7	No TRV		No TRV	
Aromatic Nonhalogenated Hydrocarbons					
2-Nitrotoluene	88-72-2	No TRV		No TRV	
4-Nitrobiphenyl	92-93-3	No TRV		No TRV	
Benzaldehyde	100-52-7	No TRV		No TRV	
Benzene	71-43-2	No TRV		No TRV	
Benzyl alcohol	100-51-6	No TRV		No TRV	
Ethyl benzene	100-41-4	No TRV		No TRV	
m-Xylene	108-38-3	No TRV		No TRV	
o-Xylene	95-47-6	No TRV		No TRV	
p-Xylene	106-42-3	No TRV		No TRV	
Styrene	100-42-5	No TRV		No TRV	
Toluene	108-88-3	No TRV		No TRV	
Non-aromatic Nonhalogenated Hydrocarbons					
1,2-Epoxybutane	106-88-7	No TRV		No TRV	
1,3-Butadiene	106-99-0	No TRV		No TRV	
1,4-Dioxane	123-91-1	No TRV		No TRV	
1-Methylpropyl alcohol	78-92-2	No TRV		No TRV	
1-Nitropropane	108-03-2	No TRV		No TRV	
2,2,4-Trimethylpentane	540-84-1	No TRV		No TRV	
2-Butanone	78-93-3	No TRV		No TRV	
2-Butenaldehyde (2-Butenal)	4170-30-3	No TRV		No TRV	
2-Ethoxyethanol	110-80-5	No TRV		No TRV	
2-Heptanone	110-43-0	No TRV		No TRV	

Table C3-8 Toxicity Reference Values (TRVs) for COPCs and ROPCs

Constituent of Potential Concern	CAS Registry Number	Ingestion, Aquatic Exposures			
		Bald Eagle		Mink	
		NOAEL TRV	Source	NOAEL TRV	Source
Organic Compounds		(µg/kg BW/d)		(µg/kg BW/d)	
Aromatic Halogenated Hydrocarbons					
2,3,4,6-Tetrachlorophenol	58-90-2	No TRV		2.50E+03	US EPA (1986a) in IRIS (2002)[a]
4-Chloro-3-methylphenol	59-50-7	No TRV		No TRV	
Aromatic Nonhalogenated Hydrocarbons					
2-Nitrotoluene	88-72-2	No TRV		No TRV	
4-Nitrobiphenyl	92-93-3	No TRV		No TRV	
Benzaldehyde	100-52-7	No TRV		1.43E+04	Kluwe and others (1983) in IRIS (2002)[a]
Benzene	71-43-2	No TRV		2.64E+04	Nawrot and Staples (1979) in Sample and others (1996)[c]
Benzyl alcohol	100-51-6	No TRV		No TRV	
Ethyl benzene	100-41-4	No TRV		9.71E+03	Wolf and others (1956) in IRIS (2002)[a]
m-Xylene	108-38-3	No TRV		No TRV	
o-Xylene	95-47-6	No TRV		No TRV	
p-Xylene	106-42-3	No TRV		No TRV	
Styrene	100-42-5	No TRV		2.00E+04	Quast and others (1979) in IRIS (2002)[a]
Toluene	108-88-3	No TRV		2.60E+04	Nawrot and Staples (1979) in Sample and others (1996)[c]
Non-aromatic Nonhalogenated Hydrocarbons					
1,2-Epoxybutane	106-88-7	No TRV		No TRV	
1,3-Butadiene	106-99-0	No TRV		No TRV	
1,4-Dioxane	123-91-1	No TRV		1.06E+05	EPA 1999[f]
1-Methylpropyl alcohol	78-92-2	No TRV		No TRV	
1-Nitropropane	108-03-2	No TRV		No TRV	
2,2,4-Trimethylpentane	540-84-1	No TRV		No TRV	
2-Butanone	78-93-3	No TRV		1.77E+06	Cox and others (1975) in IRIS (2002)[a]
2-Butenaldehyde (2-Butenal)	4170-30-3	No TRV		8.00E+01	EPA 1999[f]
2-Ethoxyethanol	110-80-5	No TRV		No TRV	
2-Heptanone	110-43-0	No TRV		No TRV	

Table C3-8 Toxicity Reference Values (TRVs) for COPCs and ROPCs

Constituent of Potential Concern	CAS Registry Number	Direct Contact, Aquatic Receptors			
		Aquatic Biota		Chinook Salmon and Other Salmonids	
		NOAEL TRV	Source	NOAEL TRV	Source
Organic Compounds		(µg/L)		(µg/L)	
Aromatic Halogenated Hydrocarbons					
2,3,4,6-Tetrachlorophenol	58-90-2	No TRV		No TRV	
4-Chloro-3-methylphenol	59-50-7	3.00E-01	EPA 1987[b]	3.00E-01	EPA 1987[b]
Aromatic Nonhalogenated Hydrocarbons					
2-Nitrotoluene	88-72-2	No TRV		No TRV	
4-Nitrobiphenyl	92-93-3	No TRV		No TRV	
Benzaldehyde	100-52-7	No TRV		No TRV	
Benzene	71-43-2	1.30E+02	Tier II Chronic (Suter & Tsao 1996)[d]	3.16E-02	Acute LOAEL for rainbow trout (Suter and Tsao 1996[d] Table C-1) × 0.1 for LOAEL-to-NOAEL conversion × 0.1 for acute-to-chronic conversion
Benzyl alcohol	100-51-6	8.60E+00	Tier II Chronic (Suter & Tsao 1996)[d]	8.60E+00	Tier II Chronic (Suter & Tsao 1996)[d]
Ethyl benzene	100-41-4	7.30E+00	Tier II Chronic (Suter & Tsao 1996)[d]	7.30E+00	Tier II Chronic (Suter & Tsao 1996)[d]
m-Xylene	108-38-3	1.80E+00	Tier II Chronic (Suter & Tsao 1996)[d]	1.80E+00	Tier II Chronic (Suter & Tsao 1996)[d]
o-Xylene	95-47-6	No TRV		No TRV	
p-Xylene	106-42-3	No TRV		No TRV	
Styrene	100-42-5	No TRV		No TRV	
Toluene	108-88-3	9.80E+00	Tier II Chronic (Suter & Tsao 1996)[d]	9.80E+00	Tier II Chronic (Suter & Tsao 1996)[d]
Non-aromatic Nonhalogenated Hydrocarbons					
1,2-Epoxybutane	106-88-7	No TRV		No TRV	
1,3-Butadiene	106-99-0	No TRV		No TRV	
1,4-Dioxane	123-91-1	6.21E+04	EPA 1999[f]	6.21E+04	EPA 1999[f]
1-Methylpropyl alcohol	78-92-2	No TRV		No TRV	
1-Nitropropane	108-03-2	No TRV		No TRV	
2,2,4-Trimethylpentane	540-84-1	No TRV		No TRV	
2-Butanone	78-93-3	1.40E+04	Tier II Chronic (Suter & Tsao 1996)[d]	1.40E+04	Tier II Chronic (Suter & Tsao 1996)[d]
2-Butenaldehyde (2-Butenal)	4170-30-3	3.50E+01	EPA 1999[f]	3.50E+01	EPA 1999[f]
2-Ethoxyethanol	110-80-5	No TRV		No TRV	
2-Heptanone	110-43-0	No TRV		No TRV	

Table C3-8 Toxicity Reference Values (TRVs) for COPCs and ROPCs

Constituent of Potential Concern	CAS Registry Number	Direct Contact, Aquatic Receptors	
		Benthic Organisms	
		NOAEL TRV	Source
Organic Compounds		(µg/kg)	
Aromatic Halogenated Hydrocarbons			
2,3,4,6-Tetrachlorophenol	58-90-2	No TRV	
4-Chloro-3-methylphenol	59-50-7	4.45E+00	EqP method (Jones and others 1997)[i]
Aromatic Nonhalogenated Hydrocarbons			
2-Nitrotoluene	88-72-2	No TRV	
4-Nitrobiphenyl	92-93-3	No TRV	
Benzaldehyde	100-52-7	No TRV	
Benzene	71-43-2	3.22E+02	EqP method (Jones and others 1997)[i]
Benzyl alcohol	100-51-6	3.51E+00	EqP method (Jones and others 1997)[i]
Ethyl benzene	100-41-4	5.96E+01	EqP method (Jones and others 1997)[i]
m-Xylene	108-38-3	1.41E+01	EqP method (Jones and others 1997)[i]
o-Xylene	95-47-6	No TRV	
p-Xylene	106-42-3	No TRV	
Styrene	100-42-5	No TRV	
Toluene	108-88-3	5.49E+01	EqP method (Jones and others 1997)[i]
Non-aromatic Nonhalogenated Hydrocarbons			
1,2-Epoxybutane	106-88-7	No TRV	
1,3-Butadiene	106-99-0	No TRV	
1,4-Dioxane	123-91-1	2.17E+03	EPA 1999[f]
1-Methylpropyl alcohol	78-92-2	No TRV	
1-Nitropropane	108-03-2	No TRV	
2,2,4-Trimethylpentane	540-84-1	No TRV	
2-Butanone	78-93-3	1.31E+03	EqP method (Jones and others 1997)[i]
2-Butenaldehyde (2-Butenal)	4170-30-3	No TRV	
2-Ethoxyethanol	110-80-5	No TRV	
2-Heptanone	110-43-0	No TRV	

Table C3-8 Toxicity Reference Values (TRVs) for COPCs and ROPCs

Constituent of Potential Concern	CAS Registry Number	Direct Exposure, Terrestrial Receptors			
		Plant		Terrestrial Invertebrate	
		TRV	Source	TRV	Source
2-Hexanone	591-78-6	No TRV		No TRV	
2-Methoxyethanol	109-86-4	No TRV		No TRV	
2-Methyl-2-propanol	75-65-0	No TRV		No TRV	
2-Methyl-2-propenenitrile	126-98-7	No TRV		No TRV	
2-Methylaziridine	75-55-8	No TRV		No TRV	
2-Methylpropyl alcohol	78-83-1	No TRV		No TRV	
2-Pentanone	107-87-9	No TRV		No TRV	
2-Propanone (Acetone)	67-64-1	No TRV		No TRV	
2-Propene-1-ol	107-18-6	No TRV		No TRV	
2-Propyl alcohol	67-63-0	No TRV		No TRV	
3-Heptanone	106-35-4	No TRV		No TRV	
3-Methyl-1-butanol	123-51-3	No TRV		No TRV	
3-Methyl-2-butanone	563-80-4	No TRV		No TRV	
3-Pentanone	96-22-0	No TRV		No TRV	
4-Heptanone	123-19-3	No TRV		No TRV	
4-Methyl-2-pentanone	108-10-1	No TRV		No TRV	
4-Methyl-3-penten-2-one	141-79-7	No TRV		No TRV	
5-Methyl-2-hexanone	110-12-3	No TRV		No TRV	
Acetaldehyde	75-07-0	No TRV		No TRV	
Acetamide	60-35-5	No TRV		No TRV	
Acetic acid	64-19-7	No TRV		No TRV	
Acetic acid ethyl ester	141-78-6	No TRV		No TRV	
Acetic acid n-butyl ester	123-86-4	No TRV		No TRV	
Acetonitrile	75-05-8	No TRV		No TRV	
Acrolein	107-02-8	No TRV		No TRV	
Acrylonitrile	107-13-1	No TRV		No TRV	
Bis(isopropyl)ether	108-20-3	No TRV		No TRV	

Table C3-8 Toxicity Reference Values (TRVs) for COPCs and ROPCs

Constituent of Potential Concern	CAS Registry Number	Ingestion, Terrestrial Exposures			
		Mule Deer		Mourning Dove	
		NOAEL TRV	Source	NOAEL TRV	Source
2-Hexanone	591-78-6	No TRV		No TRV	
2-Methoxyethanol	109-86-4	No TRV		No TRV	
2-Methyl-2-propanol	75-65-0	No TRV		No TRV	
2-Methyl-2-propenenitrile	126-98-7	3.40E+01	Pozzani and others (1968) in IRIS (2002)[a]	No TRV	
2-Methylaziridine	75-55-8	No TRV		No TRV	
2-Methylpropyl alcohol	78-83-1	3.16E+04	US EPA (1986b) in IRIS (2002)[a]	No TRV	
2-Pentanone	107-87-9	No TRV		No TRV	
2-Propanone (Acetone)	67-64-1	1.00E+04	EPA 1999[f]	5.20E+04	EPA 1999[f]
2-Propene-1-ol	107-18-6	4.80E+02	Carpanini and others (1978) in IRIS (2002)[a]	No TRV	
2-Propyl alcohol	67-63-0	No TRV		No TRV	
3-Heptanone	106-35-4	No TRV		No TRV	
3-Methyl-1-butanol	123-51-3	No TRV		No TRV	
3-Methyl-2-butanone	563-80-4	No TRV		No TRV	
3-Pentanone	96-22-0	No TRV		No TRV	
4-Heptanone	123-19-3	No TRV		No TRV	
4-Methyl-2-pentanone	108-10-1	2.50E+04	Microbiological Associates (1986) in Sample and others (1996)[c]	No TRV	
4-Methyl-3-penten-2-one	141-79-7	No TRV		No TRV	
5-Methyl-2-hexanone	110-12-3	No TRV		No TRV	
Acetaldehyde	75-07-0	No TRV		No TRV	
Acetamide	60-35-5	No TRV		No TRV	
Acetic acid	64-19-7	No TRV		No TRV	
Acetic acid ethyl ester	141-78-6	9.00E+04	US EPA (1986c) in IRIS (2002)[a]	No TRV	
Acetic acid n-butyl ester	123-86-4	No TRV		No TRV	
Acetonitrile	75-05-8	No TRV		No TRV	
Acrolein	107-02-8	No TRV		No TRV	
Acrylonitrile	107-13-1	4.60E+02	EPA 1999[f]	No TRV	
Bis(isopropyl)ether	108-20-3	No TRV		No TRV	

Table C3-8 Toxicity Reference Values (TRVs) for COPCs and ROPCs

Constituent of Potential Concern	CAS Registry Number	Ingestion, Terrestrial Exposures			
		Great Basin Pocket Mouse		Western Meadowlark	
		NOAEL TRV	Source	NOAEL TRV	Source
2-Hexanone	591-78-6	No TRV		No TRV	
2-Methoxyethanol	109-86-4	No TRV		No TRV	
2-Methyl-2-propanol	75-65-0	No TRV		No TRV	
2-Methyl-2-propenenitrile	126-98-7	3.40E+01	Pozzani and others (1968) in IRIS (2002)[a]	No TRV	
2-Methylaziridine	75-55-8	No TRV		No TRV	
2-Methylpropyl alcohol	78-83-1	3.16E+04	US EPA (1986b) in IRIS (2002)[a]	No TRV	
2-Pentanone	107-87-9	No TRV		No TRV	
2-Propanone (Acetone)	67-64-1	1.00E+04	EPA 1999[f]	5.20E+04	EPA 1999[f]
2-Propene-1-ol	107-18-6	4.80E+02	Carpanini and others (1978) in IRIS (2002)[a]	No TRV	
2-Propyl alcohol	67-63-0	No TRV		No TRV	
3-Heptanone	106-35-4	No TRV		No TRV	
3-Methyl-1-butanol	123-51-3	No TRV		No TRV	
3-Methyl-2-butanone	563-80-4	No TRV		No TRV	
3-Pentanone	96-22-0	No TRV		No TRV	
4-Heptanone	123-19-3	No TRV		No TRV	
4-Methyl-2-pentanone	108-10-1	2.50E+04	Microbiological Associates (1986) in Sample and others (1996)[c]	No TRV	
4-Methyl-3-penten-2-one	141-79-7	No TRV		No TRV	
5-Methyl-2-hexanone	110-12-3	No TRV		No TRV	
Acetaldehyde	75-07-0	No TRV		No TRV	
Acetamide	60-35-5	No TRV		No TRV	
Acetic acid	64-19-7	No TRV		No TRV	
Acetic acid ethyl ester	141-78-6	9.00E+04	US EPA (1986c) in IRIS (2002)[a]	No TRV	
Acetic acid n-butyl ester	123-86-4	No TRV		No TRV	
Acetonitrile	75-05-8	No TRV		No TRV	
Acrolein	107-02-8	No TRV		No TRV	
Acrylonitrile	107-13-1	4.60E+02	EPA 1999[f]	No TRV	
Bis(isopropyl)ether	108-20-3	No TRV		No TRV	

Table C3-8 Toxicity Reference Values (TRVs) for COPCs and ROPCs

Constituent of Potential Concern	CAS Registry Number	Ingestion, Terrestrial Exposures			
		Coyote		Burrowing Owl	
		NOAEL TRV	Source	NOAEL TRV	Source
2-Hexanone	591-78-6	No TRV		No TRV	
2-Methoxyethanol	109-86-4	No TRV		No TRV	
2-Methyl-2-propanol	75-65-0	No TRV		No TRV	
2-Methyl-2-propenenitrile	126-98-7	3.40E+01	Pozzani and others (1968) in IRIS (2002)[a]	No TRV	
2-Methylaziridine	75-55-8	No TRV		No TRV	
2-Methylpropyl alcohol	78-83-1	3.16E+04	US EPA (1986b) in IRIS (2002)[a]	No TRV	
2-Pentanone	107-87-9	No TRV		No TRV	
2-Propanone (Acetone)	67-64-1	1.00E+04	EPA 1999[f]	5.20E+04	EPA 1999[f]
2-Propene-1-ol	107-18-6	4.80E+02	Carpanini and others (1978) in IRIS (2002)[a]	No TRV	
2-Propyl alcohol	67-63-0	No TRV		No TRV	
3-Heptanone	106-35-4	No TRV		No TRV	
3-Methyl-1-butanol	123-51-3	No TRV		No TRV	
3-Methyl-2-butanone	563-80-4	No TRV		No TRV	
3-Pentanone	96-22-0	No TRV		No TRV	
4-Heptanone	123-19-3	No TRV		No TRV	
4-Methyl-2-pentanone	108-10-1	2.50E+04	Microbiological Associates (1986) in Sample and others (1996)[c]	No TRV	
4-Methyl-3-penten-2-one	141-79-7	No TRV		No TRV	
5-Methyl-2-hexanone	110-12-3	No TRV		No TRV	
Acetaldehyde	75-07-0	No TRV		No TRV	
Acetamide	60-35-5	No TRV		No TRV	
Acetic acid	64-19-7	No TRV		No TRV	
Acetic acid ethyl ester	141-78-6	9.00E+04	US EPA (1986c) in IRIS (2002)[a]	No TRV	
Acetic acid n-butyl ester	123-86-4	No TRV		No TRV	
Acetonitrile	75-05-8	No TRV		No TRV	
Acrolein	107-02-8	No TRV		No TRV	
Acrylonitrile	107-13-1	4.60E+02	EPA 1999[f]	No TRV	
Bis(isopropyl)ether	108-20-3	No TRV		No TRV	

Table C3-8 Toxicity Reference Values (TRVs) for COPCs and ROPCs

Constituent of Potential Concern	CAS Registry Number	Ingestion, Terrestrial Exposures		Ingestion, Aquatic Exposures	
		Red-tailed Hawk		Canada Goose	
		NOAEL TRV	Source	NOAEL TRV	Source
2-Hexanone	591-78-6	No TRV		No TRV	
2-Methoxyethanol	109-86-4	No TRV		No TRV	
2-Methyl-2-propanol	75-65-0	No TRV		No TRV	
2-Methyl-2-propenenitrile	126-98-7	No TRV		No TRV	
2-Methylaziridine	75-55-8	No TRV		No TRV	
2-Methylpropyl alcohol	78-83-1	No TRV		No TRV	
2-Pentanone	107-87-9	No TRV		No TRV	
2-Propanone (Acetone)	67-64-1	5.20E+04	EPA 1999[f]	5.20E+04	EPA 1999[f]
2-Propene-1-ol	107-18-6	No TRV		No TRV	
2-Propyl alcohol	67-63-0	No TRV		No TRV	
3-Heptanone	106-35-4	No TRV		No TRV	
3-Methyl-1-butanol	123-51-3	No TRV		No TRV	
3-Methyl-2-butanone	563-80-4	No TRV		No TRV	
3-Pentanone	96-22-0	No TRV		No TRV	
4-Heptanone	123-19-3	No TRV		No TRV	
4-Methyl-2-pentanone	108-10-1	No TRV		No TRV	
4-Methyl-3-penten-2-one	141-79-7	No TRV		No TRV	
5-Methyl-2-hexanone	110-12-3	No TRV		No TRV	
Acetaldehyde	75-07-0	No TRV		No TRV	
Acetamide	60-35-5	No TRV		No TRV	
Acetic acid	64-19-7	No TRV		No TRV	
Acetic acid ethyl ester	141-78-6	No TRV		No TRV	
Acetic acid n-butyl ester	123-86-4	No TRV		No TRV	
Acetonitrile	75-05-8	No TRV		No TRV	
Acrolein	107-02-8	No TRV		No TRV	
Acrylonitrile	107-13-1	No TRV		No TRV	
Bis(isopropyl)ether	108-20-3	No TRV		No TRV	

Table C3-8 Toxicity Reference Values (TRVs) for COPCs and ROPCs

Constituent of Potential Concern	CAS Registry Number	Ingestion, Aquatic Exposures			
		Spotted Sandpiper		Great Blue Heron	
		NOAEL TRV	Source	NOAEL TRV	Source
2-Hexanone	591-78-6	No TRV		No TRV	
2-Methoxyethanol	109-86-4	No TRV		No TRV	
2-Methyl-2-propanol	75-65-0	No TRV		No TRV	
2-Methyl-2-propenenitrile	126-98-7	No TRV		No TRV	
2-Methylaziridine	75-55-8	No TRV		No TRV	
2-Methylpropyl alcohol	78-83-1	No TRV		No TRV	
2-Pentanone	107-87-9	No TRV		No TRV	
2-Propanone (Acetone)	67-64-1	5.20E+04	EPA 1999[f]	5.20E+04	EPA 1999[f]
2-Propene-1-ol	107-18-6	No TRV		No TRV	
2-Propyl alcohol	67-63-0	No TRV		No TRV	
3-Heptanone	106-35-4	No TRV		No TRV	
3-Methyl-1-butanol	123-51-3	No TRV		No TRV	
3-Methyl-2-butanone	563-80-4	No TRV		No TRV	
3-Pentanone	96-22-0	No TRV		No TRV	
4-Heptanone	123-19-3	No TRV		No TRV	
4-Methyl-2-pentanone	108-10-1	No TRV		No TRV	
4-Methyl-3-penten-2-one	141-79-7	No TRV		No TRV	
5-Methyl-2-hexanone	110-12-3	No TRV		No TRV	
Acetaldehyde	75-07-0	No TRV		No TRV	
Acetamide	60-35-5	No TRV		No TRV	
Acetic acid	64-19-7	No TRV		No TRV	
Acetic acid ethyl ester	141-78-6	No TRV		No TRV	
Acetic acid n-butyl ester	123-86-4	No TRV		No TRV	
Acetonitrile	75-05-8	No TRV		No TRV	
Acrolein	107-02-8	No TRV		No TRV	
Acrylonitrile	107-13-1	No TRV		No TRV	
Bis(isopropyl)ether	108-20-3	No TRV		No TRV	

Table C3-8 Toxicity Reference Values (TRVs) for COPCs and ROPCs

Constituent of Potential Concern	CAS Registry Number	Ingestion, Aquatic Exposures			
		Bald Eagle		Mink	
		NOAEL TRV	Source	NOAEL TRV	Source
2-Hexanone	591-78-6	No TRV		No TRV	
2-Methoxyethanol	109-86-4	No TRV		No TRV	
2-Methyl-2-propanol	75-65-0	No TRV		No TRV	
2-Methyl-2-propenenitrile	126-98-7	No TRV		3.40E+01	Pozzani and others (1968) in IRIS (2002)[a]
2-Methylaziridine	75-55-8	No TRV		No TRV	
2-Methylpropyl alcohol	78-83-1	No TRV		3.16E+04	US EPA (1986b) in IRIS (2002)[a]
2-Pentanone	107-87-9	No TRV		No TRV	
2-Propanone (Acetone)	67-64-1	5.20E+04	EPA 1999[f]	1.00E+04	EPA 1999[f]
2-Propene-1-ol	107-18-6	No TRV		4.80E+02	Carpanini and others (1978) in IRIS (2002)[a]
2-Propyl alcohol	67-63-0	No TRV		No TRV	
3-Heptanone	106-35-4	No TRV		No TRV	
3-Methyl-1-butanol	123-51-3	No TRV		No TRV	
3-Methyl-2-butanone	563-80-4	No TRV		No TRV	
3-Pentanone	96-22-0	No TRV		No TRV	
4-Heptanone	123-19-3	No TRV		No TRV	
4-Methyl-2-pentanone	108-10-1	No TRV		2.50E+04	Microbiological Associates (1986) in Sample and others (1996)[c]
4-Methyl-3-penten-2-one	141-79-7	No TRV		No TRV	
5-Methyl-2-hexanone	110-12-3	No TRV		No TRV	
Acetaldehyde	75-07-0	No TRV		No TRV	
Acetamide	60-35-5	No TRV		No TRV	
Acetic acid	64-19-7	No TRV		No TRV	
Acetic acid ethyl ester	141-78-6	No TRV		9.00E+04	US EPA (1986c) in IRIS (2002)[a]
Acetic acid n-butyl ester	123-86-4	No TRV		No TRV	
Acetonitrile	75-05-8	No TRV		No TRV	
Acrolein	107-02-8	No TRV		No TRV	
Acrylonitrile	107-13-1	No TRV		4.60E+02	EPA 1999[f]
Bis(isopropyl)ether	108-20-3	No TRV		No TRV	

Table C3-8 Toxicity Reference Values (TRVs) for COPCs and ROPCs

Constituent of Potential Concern	CAS Registry Number	Direct Contact, Aquatic Receptors			
		Aquatic Biota		Chinook Salmon and Other Salmonids	
		NOAEL TRV	Source	NOAEL TRV	Source
2-Hexanone	591-78-6	9.90E+01	Tier II Chronic (Suter & Tsao 1996)[d]	9.90E+01	Tier II Chronic (Suter & Tsao 1996)[d]
2-Methoxyethanol	109-86-4	No TRV		No TRV	
2-Methyl-2-propanol	75-65-0	No TRV		No TRV	
2-Methyl-2-propenenitrile	126-98-7	No TRV		No TRV	
2-Methylaziridine	75-55-8	No TRV		No TRV	
2-Methylpropyl alcohol	78-83-1	No TRV		No TRV	
2-Pentanone	107-87-9	No TRV		No TRV	
2-Propanone (Acetone)	67-64-1	1.50E+03	EPA 1999[f]	1.26E+01	Acute LOAEL for rainbow trout (AQUIRE[g]) × 0.1 for LOAEL-to-NOAEL conversion × 0.1 for acute-to-chronic conversion
2-Propene-1-ol	107-18-6	No TRV		No TRV	
2-Propyl alcohol	67-63-0	7.50E+00	Tier II Chronic (Suter & Tsao 1996)[d]	7.50E+00	Tier II Chronic (Suter & Tsao 1996)[d]
3-Heptanone	106-35-4	No TRV		No TRV	
3-Methyl-1-butanol	123-51-3	No TRV		No TRV	
3-Methyl-2-butanone	563-80-4	No TRV		No TRV	
3-Pentanone	96-22-0	No TRV		No TRV	
4-Heptanone	123-19-3	No TRV		No TRV	
4-Methyl-2-pentanone	108-10-1	1.70E+02	Tier II Chronic (Suter & Tsao 1996)[d]	1.70E+02	Tier II Chronic (Suter & Tsao 1996)[d]
4-Methyl-3-penten-2-one	141-79-7	No TRV		No TRV	
5-Methyl-2-hexanone	110-12-3	No TRV		No TRV	
Acetaldehyde	75-07-0	No TRV		No TRV	
Acetamide	60-35-5	No TRV		No TRV	
Acetic acid	64-19-7	No TRV		No TRV	
Acetic acid ethyl ester	141-78-6	No TRV		No TRV	
Acetic acid n-butyl ester	123-86-4	No TRV		No TRV	
Acetonitrile	75-05-8	No TRV		No TRV	
Acrolein	107-02-8	2.10E+00	EPA 1987[b]	2.10E+00	EPA 1987[b]
Acrylonitrile	107-13-1	2.60E+02	EPA 1999[f]	2.60E+02	EPA 1999[f]
Bis(isopropyl)ether	108-20-3	No TRV		No TRV	

Table C3-8 Toxicity Reference Values (TRVs) for COPCs and ROPCs

Constituent of Potential Concern	CAS Registry Number	Direct Contact, Aquatic Receptors	
		Benthic Organisms	
		NOAEL TRV	Source
2-Hexanone	591-78-6	8.42E+00	EqP method (Jones and others 1997)[i]
2-Methoxyethanol	109-86-4	No TRV	
2-Methyl-2-propanol	75-65-0	No TRV	
2-Methyl-2-propenenitrile	126-98-7	No TRV	
2-Methylaziridine	75-55-8	No TRV	
2-Methylpropyl alcohol	78-83-1	No TRV	
2-Pentanone	107-87-9	No TRV	
2-Propanone (Acetone)	67-64-1	5.71E+01	EPA 1999[f]
2-Propene-1-ol	107-18-6	No TRV	
2-Propyl alcohol	67-63-0	No TRV	
3-Heptanone	106-35-4	No TRV	
3-Methyl-1-butanol	123-51-3	No TRV	
3-Methyl-2-butanone	563-80-4	No TRV	
3-Pentanone	96-22-0	No TRV	
4-Heptanone	123-19-3	No TRV	
4-Methyl-2-pentanone	108-10-1	8.16E+01	EqP method (Jones and others 1997)[i]
4-Methyl-3-penten-2-one	141-79-7	No TRV	
5-Methyl-2-hexanone	110-12-3	No TRV	
Acetaldehyde	75-07-0	No TRV	
Acetamide	60-35-5	No TRV	
Acetic acid	64-19-7	No TRV	
Acetic acid ethyl ester	141-78-6	No TRV	
Acetic acid n-butyl ester	123-86-4	No TRV	
Acetonitrile	75-05-8	No TRV	
Acrolein	107-02-8	1.17E-01	EqP method (Jones and others 1997)[i]
Acrylonitrile	107-13-1	2.31E+01	EPA 1999[f]
Bis(isopropyl)ether	108-20-3	No TRV	

Table C3-8 Toxicity Reference Values (TRVs) for COPCs and ROPCs

Constituent of Potential Concern	CAS Registry Number	Direct Exposure, Terrestrial Receptors			
		Plant		Terrestrial Invertebrate	
		TRV	Source	TRV	Source
Butane	106-97-8	No TRV		No TRV	
Carbon disulfide	75-15-0	No TRV		No TRV	
Cyanogen	460-19-5	No TRV		No TRV	
Cyclohexane	110-82-7	No TRV		No TRV	
Cyclohexanone	108-94-1	No TRV		No TRV	
Cyclohexene	110-83-8	No TRV		No TRV	
Cyclopentane	287-92-3	No TRV		No TRV	
Ethyl alcohol	64-17-5	No TRV		No TRV	
Ethyl ether	60-29-7	No TRV		No TRV	
Ethyl methacrylate	97-63-2	No TRV		No TRV	
Formaldehyde	50-00-0	No TRV		No TRV	
Formamide	75-12-7	No TRV		No TRV	
Formic acid	64-18-6	No TRV		No TRV	
Formic acid, methyl ester	107-31-3	No TRV		No TRV	
Glycidylaldehyde	765-34-4	No TRV		No TRV	
Methyl acetate	79-20-9	No TRV		No TRV	
Methyl alcohol	67-56-1	No TRV		No TRV	
Methyl isocyanate	624-83-9	No TRV		No TRV	
Methyl methacrylate	80-62-6	No TRV		No TRV	
Methyl tert-butyl ether	1634-04-4	No TRV		No TRV	
Methylacetylene	74-99-7	No TRV		No TRV	
Methylcyclohexane	108-87-2	No TRV		No TRV	
N,N-Dimethylacetamide	127-19-5	No TRV		No TRV	
n-Butyl alcohol	71-36-3	No TRV		No TRV	
n-Heptane	142-82-5	1.00E+06	Efroymson and others (1997a)[e]	No TRV	
n-Hexane	110-54-3	No TRV		No TRV	
Nitromethane	75-52-5	No TRV		No TRV	
n-Nonane	111-84-2	No TRV		No TRV	
n-Octane	111-65-9	No TRV		No TRV	
n-Pentane	109-66-0	No TRV		No TRV	
n-Propionaldehyde	123-38-6	No TRV		No TRV	

Table C3-8 Toxicity Reference Values (TRVs) for COPCs and ROPCs

Constituent of Potential Concern	CAS Registry Number	Ingestion, Terrestrial Exposures			
		Mule Deer		Mourning Dove	
		NOAEL TRV	Source	NOAEL TRV	Source
Butane	106-97-8	No TRV		No TRV	
Carbon disulfide	75-15-0	1.10E+04	Hardin and others (1981) in IRIS (2002)[a]	No TRV	
Cyanogen	460-19-5	No TRV		No TRV	
Cyclohexane	110-82-7	No TRV		No TRV	
Cyclohexanone	108-94-1	No TRV		No TRV	
Cyclohexene	110-83-8	No TRV		No TRV	
Cyclopentane	287-92-3	No TRV		No TRV	
Ethyl alcohol	64-17-5	No TRV		No TRV	
Ethyl ether	60-29-7	5.00E+04	US EPA (1986d) in IRIS (2002)[a]	No TRV	
Ethyl methacrylate	97-63-2	No TRV		No TRV	
Formaldehyde	50-00-0	2.30E+03	EPA 1999[f]	No TRV	
Formamide	75-12-7	No TRV		No TRV	
Formic acid	64-18-6	No TRV		No TRV	
Formic acid, methyl ester	107-31-3	No TRV		No TRV	
Glycidylaldehyde	765-34-4	1.09E+02	Hine and others (1961) in IRIS (2002)[a]	No TRV	
Methyl acetate	79-20-9	No TRV		No TRV	
Methyl alcohol	67-56-1	5.00E+04	US EPA (1986e) in IRIS (2002)[a]	No TRV	
Methyl isocyanate	624-83-9	No TRV		No TRV	
Methyl methacrylate	80-62-6	1.36E+05	Borzelleca and others (1964) IRIS (2002)[a]	No TRV	
Methyl tert-butyl ether	1634-04-4	No TRV		No TRV	
Methylacetylene	74-99-7	No TRV		No TRV	
Methylcyclohexane	108-87-2	No TRV		No TRV	
N,N-Dimethylacetamide	127-19-5	No TRV		No TRV	
n-Butyl alcohol	71-36-3	1.25E+04	US EPA (1986f) in IRIS (2002)[a]	No TRV	
n-Heptane	142-82-5	No TRV		No TRV	
n-Hexane	110-54-3	No TRV		No TRV	
Nitromethane	75-52-5	No TRV		No TRV	
n-Nonane	111-84-2	No TRV		No TRV	
n-Octane	111-65-9	No TRV		No TRV	
n-Pentane	109-66-0	No TRV		No TRV	
n-Propionaldehyde	123-38-6	No TRV		No TRV	

Table C3-8 Toxicity Reference Values (TRVs) for COPCs and ROPCs

Constituent of Potential Concern	CAS Registry Number	Ingestion, Terrestrial Exposures			
		Great Basin Pocket Mouse		Western Meadowlark	
		NOAEL TRV	Source	NOAEL TRV	Source
Butane	106-97-8	No TRV		No TRV	
Carbon disulfide	75-15-0	1.10E+04	Hardin and others (1981) in IRIS (2002)[a]	No TRV	
Cyanogen	460-19-5	No TRV		No TRV	
Cyclohexane	110-82-7	No TRV		No TRV	
Cyclohexanone	108-94-1	No TRV		No TRV	
Cyclohexene	110-83-8	No TRV		No TRV	
Cyclopentane	287-92-3	No TRV		No TRV	
Ethyl alcohol	64-17-5	No TRV		No TRV	
Ethyl ether	60-29-7	5.00E+04	US EPA (1986d) in IRIS (2002)[a]	No TRV	
Ethyl methacrylate	97-63-2	No TRV		No TRV	
Formaldehyde	50-00-0	2.30E+03	EPA 1999[f]	No TRV	
Formamide	75-12-7	No TRV		No TRV	
Formic acid	64-18-6	No TRV		No TRV	
Formic acid, methyl ester	107-31-3	No TRV		No TRV	
Glycidylaldehyde	765-34-4	1.09E+02	Hine and others (1961) in IRIS (2002)[a]	No TRV	
Methyl acetate	79-20-9	No TRV		No TRV	
Methyl alcohol	67-56-1	5.00E+04	US EPA (1986e) in IRIS (2002)[a]	No TRV	
Methyl isocyanate	624-83-9	No TRV		No TRV	
Methyl methacrylate	80-62-6	1.36E+05	Borzelleca and others (1964) IRIS (2002)[a]	No TRV	
Methyl tert-butyl ether	1634-04-4	No TRV		No TRV	
Methylacetylene	74-99-7	No TRV		No TRV	
Methylcyclohexane	108-87-2	No TRV		No TRV	
N,N-Dimethylacetamide	127-19-5	No TRV		No TRV	
n-Butyl alcohol	71-36-3	1.25E+04	US EPA (1986f) in IRIS (2002)[a]	No TRV	
n-Heptane	142-82-5	No TRV		No TRV	
n-Hexane	110-54-3	No TRV		No TRV	
Nitromethane	75-52-5	No TRV		No TRV	
n-Nonane	111-84-2	No TRV		No TRV	
n-Octane	111-65-9	No TRV		No TRV	
n-Pentane	109-66-0	No TRV		No TRV	
n-Propionaldehyde	123-38-6	No TRV		No TRV	

Table C3-8 Toxicity Reference Values (TRVs) for COPCs and ROPCs

Constituent of Potential Concern	CAS Registry Number	Ingestion, Terrestrial Exposures			
		Coyote		Burrowing Owl	
		NOAEL TRV	Source	NOAEL TRV	Source
Butane	106-97-8	No TRV		No TRV	
Carbon disulfide	75-15-0	1.10E+04	Hardin and others (1981) in IRIS (2002)[a]	No TRV	
Cyanogen	460-19-5	No TRV		No TRV	
Cyclohexane	110-82-7	No TRV		No TRV	
Cyclohexanone	108-94-1	No TRV		No TRV	
Cyclohexene	110-83-8	No TRV		No TRV	
Cyclopentane	287-92-3	No TRV		No TRV	
Ethyl alcohol	64-17-5	No TRV		No TRV	
Ethyl ether	60-29-7	5.00E+04	US EPA (1986d) in IRIS (2002)[a]	No TRV	
Ethyl methacrylate	97-63-2	No TRV		No TRV	
Formaldehyde	50-00-0	2.30E+03	EPA 1999[f]	No TRV	
Formamide	75-12-7	No TRV		No TRV	
Formic acid	64-18-6	No TRV		No TRV	
Formic acid, methyl ester	107-31-3	No TRV		No TRV	
Glycidylaldehyde	765-34-4	1.09E+02	Hine and others (1961) in IRIS (2002)[a]	No TRV	
Methyl acetate	79-20-9	No TRV		No TRV	
Methyl alcohol	67-56-1	5.00E+04	US EPA (1986e) in IRIS (2002)[a]	No TRV	
Methyl isocyanate	624-83-9	No TRV		No TRV	
Methyl methacrylate	80-62-6	1.36E+05	Borzelleca and others (1964) IRIS (2002)[a]	No TRV	
Methyl tert-butyl ether	1634-04-4	No TRV	Borzelleca and others (1964) IRIS (2002)[a]	No TRV	
Methylacetylene	74-99-7	No TRV	Borzelleca and others (1964) IRIS (2002)[a]	No TRV	
Methylcyclohexane	108-87-2	No TRV	Borzelleca and others (1964) IRIS (2002)[a]	No TRV	
N,N-Dimethylacetamide	127-19-5	No TRV	Borzelleca and others (1964) IRIS (2002)[a]	No TRV	
n-Butyl alcohol	71-36-3	1.25E+04	US EPA (1986f) in IRIS (2002)[a]	No TRV	
n-Heptane	142-82-5	No TRV		No TRV	
n-Hexane	110-54-3	No TRV		No TRV	
Nitromethane	75-52-5	No TRV		No TRV	
n-Nonane	111-84-2	No TRV		No TRV	
n-Octane	111-65-9	No TRV		No TRV	
n-Pentane	109-66-0	No TRV		No TRV	
n-Propionaldehyde	123-38-6	No TRV		No TRV	

Table C3-8 Toxicity Reference Values (TRVs) for COPCs and ROPCs

Constituent of Potential Concern	CAS Registry Number	Ingestion, Terrestrial Exposures		Ingestion, Aquatic Exposures	
		Red-tailed Hawk		Canada Goose	
		NOAEL TRV	Source	NOAEL TRV	Source
Butane	106-97-8	No TRV		No TRV	
Carbon disulfide	75-15-0	No TRV		No TRV	
Cyanogen	460-19-5	No TRV		No TRV	
Cyclohexane	110-82-7	No TRV		No TRV	
Cyclohexanone	108-94-1	No TRV		No TRV	
Cyclohexene	110-83-8	No TRV		No TRV	
Cyclopentane	287-92-3	No TRV		No TRV	
Ethyl alcohol	64-17-5	No TRV		No TRV	
Ethyl ether	60-29-7	No TRV		No TRV	
Ethyl methacrylate	97-63-2	No TRV		No TRV	
Formaldehyde	50-00-0	No TRV		No TRV	
Formamide	75-12-7	No TRV		No TRV	
Formic acid	64-18-6	No TRV		No TRV	
Formic acid, methyl ester	107-31-3	No TRV		No TRV	
Glycidylaldehyde	765-34-4	No TRV		No TRV	
Methyl acetate	79-20-9	No TRV		No TRV	
Methyl alcohol	67-56-1	No TRV		No TRV	
Methyl isocyanate	624-83-9	No TRV		No TRV	
Methyl methacrylate	80-62-6	No TRV		No TRV	
Methyl tert-butyl ether	1634-04-4	No TRV		No TRV	
Methylacetylene	74-99-7	No TRV		No TRV	
Methylcyclohexane	108-87-2	No TRV		No TRV	
N,N-Dimethylacetamide	127-19-5	No TRV		No TRV	
n-Butyl alcohol	71-36-3	No TRV		No TRV	
n-Heptane	142-82-5	No TRV		No TRV	
n-Hexane	110-54-3	No TRV		No TRV	
Nitromethane	75-52-5	No TRV		No TRV	
n-Nonane	111-84-2	No TRV		No TRV	
n-Octane	111-65-9	No TRV		No TRV	
n-Pentane	109-66-0	No TRV		No TRV	
n-Propionaldehyde	123-38-6	No TRV		No TRV	

Table C3-8 Toxicity Reference Values (TRVs) for COPCs and ROPCs

Constituent of Potential Concern	CAS Registry Number	Ingestion, Aquatic Exposures			
		Spotted Sandpiper		Great Blue Heron	
		NOAEL TRV	Source	NOAEL TRV	Source
Butane	106-97-8	No TRV		No TRV	
Carbon disulfide	75-15-0	No TRV		No TRV	
Cyanogen	460-19-5	No TRV		No TRV	
Cyclohexane	110-82-7	No TRV		No TRV	
Cyclohexanone	108-94-1	No TRV		No TRV	
Cyclohexene	110-83-8	No TRV		No TRV	
Cyclopentane	287-92-3	No TRV		No TRV	
Ethyl alcohol	64-17-5	No TRV		No TRV	
Ethyl ether	60-29-7	No TRV		No TRV	
Ethyl methacrylate	97-63-2	No TRV		No TRV	
Formaldehyde	50-00-0	No TRV		No TRV	
Formamide	75-12-7	No TRV		No TRV	
Formic acid	64-18-6	No TRV		No TRV	
Formic acid, methyl ester	107-31-3	No TRV		No TRV	
Glycidylaldehyde	765-34-4	No TRV		No TRV	
Methyl acetate	79-20-9	No TRV		No TRV	
Methyl alcohol	67-56-1	No TRV		No TRV	
Methyl isocyanate	624-83-9	No TRV		No TRV	
Methyl methacrylate	80-62-6	No TRV		No TRV	
Methyl tert-butyl ether	1634-04-4	No TRV		No TRV	
Methylacetylene	74-99-7	No TRV		No TRV	
Methylcyclohexane	108-87-2	No TRV		No TRV	
N,N-Dimethylacetamide	127-19-5	No TRV		No TRV	
n-Butyl alcohol	71-36-3	No TRV		No TRV	
n-Heptane	142-82-5	No TRV		No TRV	
n-Hexane	110-54-3	No TRV		No TRV	
Nitromethane	75-52-5	No TRV		No TRV	
n-Nonane	111-84-2	No TRV		No TRV	
n-Octane	111-65-9	No TRV		No TRV	
n-Pentane	109-66-0	No TRV		No TRV	
n-Propionaldehyde	123-38-6	No TRV		No TRV	

Table C3-8 Toxicity Reference Values (TRVs) for COPCs and ROPCs

Constituent of Potential Concern	CAS Registry Number	Ingestion, Aquatic Exposures			
		Bald Eagle		Mink	
		NOAEL TRV	Source	NOAEL TRV	Source
Butane	106-97-8	No TRV		No TRV	
Carbon disulfide	75-15-0	No TRV		1.10E+04	Hardin and others (1981) in IRIS (2002)[a]
Cyanogen	460-19-5	No TRV		No TRV	
Cyclohexane	110-82-7	No TRV		No TRV	
Cyclohexanone	108-94-1	No TRV		No TRV	
Cyclohexene	110-83-8	No TRV		No TRV	
Cyclopentane	287-92-3	No TRV		No TRV	
Ethyl alcohol	64-17-5	No TRV		No TRV	
Ethyl ether	60-29-7	No TRV		5.00E+04	US EPA (1986d) in IRIS (2002)[a]
Ethyl methacrylate	97-63-2	No TRV		No TRV	
Formaldehyde	50-00-0	No TRV		2.30E+03	EPA 1999[f]
Formamide	75-12-7	No TRV		No TRV	
Formic acid	64-18-6	No TRV		No TRV	
Formic acid, methyl ester	107-31-3	No TRV		No TRV	
Glycidylaldehyde	765-34-4	No TRV		1.09E+02	Hine and others (1961) in IRIS (2002)[a]
Methyl acetate	79-20-9	No TRV		No TRV	
Methyl alcohol	67-56-1	No TRV		5.00E+04	US EPA (1986e) in IRIS (2002)[a]
Methyl isocyanate	624-83-9	No TRV		No TRV	
Methyl methacrylate	80-62-6	No TRV		1.36E+05	Borzelleca and others (1964) IRIS (2002)[a]
Methyl tert-butyl ether	1634-04-4	No TRV		No TRV	
Methylacetylene	74-99-7	No TRV		No TRV	
Methylcyclohexane	108-87-2	No TRV		No TRV	
N,N-Dimethylacetamide	127-19-5	No TRV		No TRV	
n-Butyl alcohol	71-36-3	No TRV		1.25E+04	US EPA (1986f) in IRIS (2002)[a]
n-Heptane	142-82-5	No TRV		No TRV	
n-Hexane	110-54-3	No TRV		No TRV	
Nitromethane	75-52-5	No TRV		No TRV	
n-Nonane	111-84-2	No TRV		No TRV	
n-Octane	111-65-9	No TRV		No TRV	
n-Pentane	109-66-0	No TRV		No TRV	
n-Propionaldehyde	123-38-6	No TRV		No TRV	

Table C3-8 Toxicity Reference Values (TRVs) for COPCs and ROPCs

Constituent of Potential Concern	CAS Registry Number	Direct Contact, Aquatic Receptors			
		Aquatic Biota		Chinook Salmon and Other Salmonids	
		NOAEL TRV	Source	NOAEL TRV	Source
Butane	106-97-8	No TRV		No TRV	
Carbon disulfide	75-15-0	9.20E-01	Tier II Chronic (Suter & Tsao 1996)[d]	9.20E-01	Tier II Chronic (Suter & Tsao 1996)[d]
Cyanogen	460-19-5	No TRV		No TRV	
Cyclohexane	110-82-7	No TRV		No TRV	
Cyclohexanone	108-94-1	No TRV		No TRV	
Cyclohexene	110-83-8	No TRV		No TRV	
Cyclopentane	287-92-3	No TRV		No TRV	
Ethyl alcohol	64-17-5	No TRV		No TRV	
Ethyl ether	60-29-7	No TRV		No TRV	
Ethyl methacrylate	97-63-2	No TRV		No TRV	
Formaldehyde	50-00-0	4.96E+01	EPA 1999[f]	4.96E+01	EPA 1999[f]
Formamide	75-12-7	No TRV		No TRV	
Formic acid	64-18-6	No TRV		No TRV	
Formic acid, methyl ester	107-31-3	No TRV		No TRV	
Glycidylaldehyde	765-34-4	No TRV		No TRV	
Methyl acetate	79-20-9	No TRV		No TRV	
Methyl alcohol	67-56-1	No TRV		No TRV	
Methyl isocyanate	624-83-9	No TRV		No TRV	
Methyl methacrylate	80-62-6	No TRV		No TRV	
Methyl tert-butyl ether	1634-04-4	No TRV		No TRV	
Methylacetylene	74-99-7	No TRV		No TRV	
Methylcyclohexane	108-87-2	No TRV		No TRV	
N,N-Dimethylacetamide	127-19-5	No TRV		No TRV	
n-Butyl alcohol	71-36-3	No TRV		No TRV	
n-Heptane	142-82-5	No TRV		No TRV	
n-Hexane	110-54-3	5.80E-01	Tier II Chronic (Suter & Tsao 1996)[d]	5.80E-01	Tier II Chronic (Suter & Tsao 1996)[d]
Nitromethane	75-52-5	No TRV		No TRV	
n-Nonane	111-84-2	No TRV		No TRV	
n-Octane	111-65-9	No TRV		No TRV	
n-Pentane	109-66-0	No TRV		No TRV	
n-Propionaldehyde	123-38-6	No TRV		No TRV	

Table C3-8 Toxicity Reference Values (TRVs) for COPCs and ROPCs

Constituent of Potential Concern	CAS Registry Number	Direct Contact, Aquatic Receptors	
		Benthic Organisms	
		NOAEL TRV	Source
Butane	106-97-8	No TRV	
Carbon disulfide	75-15-0	1.89E+00	EqP method (Jones and others 1997)[i]
Cyanogen	460-19-5	No TRV	
Cyclohexane	110-82-7	No TRV	
Cyclohexanone	108-94-1	No TRV	
Cyclohexene	110-83-8	No TRV	
Cyclopentane	287-92-3	No TRV	
Ethyl alcohol	64-17-5	No TRV	
Ethyl ether	60-29-7	No TRV	
Ethyl methacrylate	97-63-2	No TRV	
Formaldehyde	50-00-0	5.20E+00	EPA 1999[f]
Formamide	75-12-7	No TRV	
Formic acid	64-18-6	No TRV	
Formic acid, methyl ester	107-31-3	No TRV	
Glycidylaldehyde	765-34-4	No TRV	
Methyl acetate	79-20-9	No TRV	
Methyl alcohol	67-56-1	No TRV	
Methyl isocyanate	624-83-9	No TRV	
Methyl methacrylate	80-62-6	No TRV	
Methyl tert-butyl ether	1634-04-4	No TRV	
Methylacetylene	74-99-7	No TRV	
Methylcyclohexane	108-87-2	No TRV	
N,N-Dimethylacetamide	127-19-5	No TRV	
n-Butyl alcohol	71-36-3	No TRV	
n-Heptane	142-82-5	No TRV	
n-Hexane	110-54-3	No TRV	
Nitromethane	75-52-5	No TRV	
n-Nonane	111-84-2	No TRV	
n-Octane	111-65-9	No TRV	
n-Pentane	109-66-0	No TRV	
n-Propionaldehyde	123-38-6	No TRV	

Table C3-8 Toxicity Reference Values (TRVs) for COPCs and ROPCs

Constituent of Potential Concern	CAS Registry Number	Direct Exposure, Terrestrial Receptors			
		Plant		Terrestrial Invertebrate	
		TRV	Source	TRV	Source
n-Propyl alcohol	71-23-8	No TRV		No TRV	
n-Valeraldehyde	110-62-3	No TRV		No TRV	
Oxirane	75-21-8	No TRV		No TRV	
p-Cymene	99-87-6	No TRV		No TRV	
Phosgene	75-44-5	No TRV		No TRV	
Propargyl alcohol	107-19-7	No TRV		No TRV	
Propionic acid	79-09-4	No TRV		No TRV	
Propionitrile	107-12-0	No TRV		No TRV	
Propylene glycol monomethyl ether	107-98-2	No TRV		No TRV	
p-tert-Butyltoluene	98-51-1	No TRV		No TRV	
Triethylamine	121-44-8	No TRV		No TRV	
Trimethylamine	75-50-3	No TRV		No TRV	
Vinyl acetate	108-05-4	No TRV		No TRV	
Non-aromatic Halogenated Hydrocarbons					
1,1,1,2-Tetrachloro-2,2-difluoroethane	76-11-9	No TRV		No TRV	
1,1,1,2-Tetrachloroethane	630-20-6	No TRV		No TRV	
1,1,1-Trichloroethane	71-55-6	No TRV		No TRV	
1,1,2,2-Tetrachloro-1,2-difluoroethane	76-12-0	No TRV		No TRV	
1,1,2,2-Tetrachloroethane	79-34-5	No TRV		No TRV	
1,1,2,2-Tetrachloroethene	127-18-4	No TRV		No TRV	
1,1,2-Trichloroethane	79-00-5	No TRV		No TRV	
1,1,2-Trichloroethylene	79-01-6	No TRV		No TRV	
1,1-Dichloroethane	75-34-3	No TRV		No TRV	
1,1-Dichloroethene	75-35-4	No TRV		No TRV	
1,2,2-Trichloro-1,1,2-trifluoroethane	76-13-1	No TRV		No TRV	

Table C3-8 Toxicity Reference Values (TRVs) for COPCs and ROPCs

Constituent of Potential Concern	CAS Registry Number	Ingestion, Terrestrial Exposures			
		Mule Deer		Mourning Dove	
		NOAEL TRV	Source	NOAEL TRV	Source
n-Propyl alcohol	71-23-8	No TRV		No TRV	
n-Valeraldehyde	110-62-3	No TRV		No TRV	
Oxirane	75-21-8	No TRV		No TRV	
p-Cymene	99-87-6	No TRV		No TRV	
Phosgene	75-44-5	No TRV		No TRV	
Propargyl alcohol	107-19-7	5.00E+02	US EPA (1987a) in IRIS (2002)[a]	No TRV	
Propionic acid	79-09-4	No TRV		No TRV	
Propionitrile	107-12-0	No TRV		No TRV	
Propylene glycol monomethyl ether	107-98-2	No TRV		No TRV	
p-tert-Butyltoluene	98-51-1	No TRV		No TRV	
Triethylamine	121-44-8	No TRV		No TRV	
Trimethylamine	75-50-3	No TRV		No TRV	
Vinyl acetate	108-05-4	No TRV		No TRV	
Non-aromatic Halogenated Hydrocarbons					
1,1,1,2-Tetrachloro-2,2-difluoroethane	76-11-9	No TRV		No TRV	
1,1,1,2-Tetrachloroethane	630-20-6	8.93E+03	NTP (1983a) in IRIS (2002)[a]	No TRV	
1,1,1-Trichloroethane	71-55-6	1.00E+06	Lane and others (1982) in Sample and others (1996)[c]	No TRV	
1,1,2,2-Tetrachloro-1,2-difluoroethane	76-12-0	No TRV		No TRV	
1,1,2,2-Tetrachloroethane	79-34-5	No TRV		No TRV	
1,1,2,2-Tetrachloroethene	127-18-4	1.40E+03	Buben and O'Flaherty (1985) in IRIS (2002)[a]	No TRV	
1,1,2-Trichloroethane	79-00-5	No TRV		No TRV	
1,1,2-Trichloroethylene	79-01-6	7.00E+02	Buben and O'Flaherty (1985) in IRIS (2002)[a]	No TRV	
1,1-Dichloroethane	75-34-3	No TRV		No TRV	
1,1-Dichloroethene	75-35-4	3.00E+04	Quast and others (1983) in Sample and others (1996)[c]	No TRV	
1,2,2-Trichloro-1,1,2-trifluoroethane	76-13-1	No TRV		No TRV	

Table C3-8 Toxicity Reference Values (TRVs) for COPCs and ROPCs

Constituent of Potential Concern	CAS Registry Number	Ingestion, Terrestrial Exposures			
		Great Basin Pocket Mouse		Western Meadowlark	
		NOAEL TRV	Source	NOAEL TRV	Source
n-Propyl alcohol	71-23-8	No TRV		No TRV	
n-Valeraldehyde	110-62-3	No TRV		No TRV	
Oxirane	75-21-8	No TRV		No TRV	
p-Cymene	99-87-6	No TRV		No TRV	
Phosgene	75-44-5	No TRV		No TRV	
Propargyl alcohol	107-19-7	5.00E+02	US EPA (1987a) in IRIS (2002)[a]	No TRV	
Propionic acid	79-09-4	No TRV		No TRV	
Propionitrile	107-12-0	No TRV		No TRV	
Propylene glycol monomethyl ether	107-98-2	No TRV		No TRV	
p-tert-Butyltoluene	98-51-1	No TRV		No TRV	
Triethylamine	121-44-8	No TRV		No TRV	
Trimethylamine	75-50-3	No TRV		No TRV	
Vinyl acetate	108-05-4	No TRV		No TRV	
Non-aromatic Halogenated Hydrocarbons					
1,1,1,2-Tetrachloro-2,2-difluoroethane	76-11-9	No TRV		No TRV	
1,1,1,2-Tetrachloroethane	630-20-6	8.93E+03	NTP (1983a) in IRIS (2002)[a]	No TRV	
1,1,1-Trichloroethane	71-55-6	1.00E+06	Lane and others (1982) in Sample and others (1996)[c]	No TRV	
1,1,2,2-Tetrachloro-1,2-difluoroethane	76-12-0	No TRV		No TRV	
1,1,2,2-Tetrachloroethane	79-34-5	No TRV		No TRV	
1,1,2,2-Tetrachloroethene	127-18-4	1.40E+03	Buben and O'Flaherty (1985) in IRIS (2002)[a]	No TRV	
1,1,2-Trichloroethane	79-00-5	No TRV		No TRV	
1,1,2-Trichloroethylene	79-01-6	7.00E+02	Buben and O'Flaherty (1985) in Sample and others (1996)[c]	No TRV	
1,1-Dichloroethane	75-34-3	No TRV		No TRV	
1,1-Dichloroethene	75-35-4	3.00E+04	Quast and others (1983) in Sample and others (1996)[c]	No TRV	
1,2,2-Trichloro-1,1,2-trifluoroethane	76-13-1	No TRV		No TRV	

Table C3-8 Toxicity Reference Values (TRVs) for COPCs and ROPCs

Constituent of Potential Concern	CAS Registry Number	Ingestion, Terrestrial Exposures			
		Coyote		Burrowing Owl	
		NOAEL TRV	Source	NOAEL TRV	Source
n-Propyl alcohol	71-23-8	No TRV		No TRV	
n-Valeraldehyde	110-62-3	No TRV		No TRV	
Oxirane	75-21-8	No TRV		No TRV	
p-Cymene	99-87-6	No TRV		No TRV	
Phosgene	75-44-5	No TRV		No TRV	
Propargyl alcohol	107-19-7	5.00E+02	US EPA (1987a) in IRIS (2002)[a]	No TRV	
Propionic acid	79-09-4	No TRV		No TRV	
Propionitrile	107-12-0	No TRV		No TRV	
Propylene glycol monomethyl ether	107-98-2	No TRV		No TRV	
p-tert-Butyltoluene	98-51-1	No TRV		No TRV	
Triethylamine	121-44-8	No TRV		No TRV	
Trimethylamine	75-50-3	No TRV		No TRV	
Vinyl acetate	108-05-4	No TRV		No TRV	
Non-aromatic Halogenated Hydrocarbons					
1,1,1,2-Tetrachloro-2,2-difluoroethane	76-11-9	No TRV		No TRV	
1,1,1,2-Tetrachloroethane	630-20-6	8.93E+03	NTP (1983a) in IRIS (2002)[a]	No TRV	
1,1,1-Trichloroethane	71-55-6	1.00E+06	Lane and others (1982) in Sample and others (1996)[c]	No TRV	
1,1,2,2-Tetrachloro-1,2-difluoroethane	76-12-0	No TRV		No TRV	
1,1,2,2-Tetrachloroethane	79-34-5	No TRV		No TRV	
1,1,2,2-Tetrachloroethene	127-18-4	1.40E+03	Buben and O'Flaherty (1985) in IRIS (2002)[a]	No TRV	
1,1,2-Trichloroethane	79-00-5	No TRV		No TRV	
1,1,2-Trichloroethylene	79-01-6	7.00E+02	Buben and O'Flaherty (1985) in Sample and others (1996)[c]	No TRV	
1,1-Dichloroethane	75-34-3	No TRV		No TRV	
1,1-Dichloroethene	75-35-4	3.00E+04	Quast and others (1983) in Sample and others (1996)[c]	No TRV	
1,2,2-Trichloro-1,1,2-trifluoroethane	76-13-1	No TRV		No TRV	

Table C3-8 Toxicity Reference Values (TRVs) for COPCs and ROPCs

Constituent of Potential Concern	CAS Registry Number	Ingestion, Terrestrial Exposures		Ingestion, Aquatic Exposures	
		Red-tailed Hawk		Canada Goose	
		NOAEL TRV	Source	NOAEL TRV	Source
n-Propyl alcohol	71-23-8	No TRV		No TRV	
n-Valeraldehyde	110-62-3	No TRV		No TRV	
Oxirane	75-21-8	No TRV		No TRV	
p-Cymene	99-87-6	No TRV		No TRV	
Phosgene	75-44-5	No TRV		No TRV	
Propargyl alcohol	107-19-7	No TRV		No TRV	
Propionic acid	79-09-4	No TRV		No TRV	
Propionitrile	107-12-0	No TRV		No TRV	
Propylene glycol monomethyl ether	107-98-2	No TRV		No TRV	
p-tert-Butyltoluene	98-51-1	No TRV		No TRV	
Triethylamine	121-44-8	No TRV		No TRV	
Trimethylamine	75-50-3	No TRV		No TRV	
Vinyl acetate	108-05-4	No TRV		No TRV	
Non-aromatic Halogenated Hydrocarbons					
1,1,1,2-Tetrachloro-2,2-difluoroethane	76-11-9	No TRV		No TRV	
1,1,1,2-Tetrachloroethane	630-20-6	No TRV		No TRV	
1,1,1-Trichloroethane	71-55-6	No TRV		No TRV	
1,1,2,2-Tetrachloro-1,2-difluoroethane	76-12-0	No TRV		No TRV	
1,1,2,2-Tetrachloroethane	79-34-5	No TRV		No TRV	
1,1,2,2-Tetrachloroethene	127-18-4	No TRV		No TRV	
1,1,2-Trichloroethane	79-00-5	No TRV		No TRV	
1,1,2-Trichloroethylene	79-01-6	No TRV		No TRV	
1,1-Dichloroethane	75-34-3	No TRV		No TRV	
1,1-Dichloroethene	75-35-4	No TRV		No TRV	
1,2,2-Trichloro-1,1,2-trifluoroethane	76-13-1	No TRV		No TRV	

Table C3-8 Toxicity Reference Values (TRVs) for COPCs and ROPCs

Constituent of Potential Concern	CAS Registry Number	Ingestion, Aquatic Exposures			
		Spotted Sandpiper		Great Blue Heron	
		NOAEL TRV	Source	NOAEL TRV	Source
n-Propyl alcohol	71-23-8	No TRV		No TRV	
n-Valeraldehyde	110-62-3	No TRV		No TRV	
Oxirane	75-21-8	No TRV		No TRV	
p-Cymene	99-87-6	No TRV		No TRV	
Phosgene	75-44-5	No TRV		No TRV	
Propargyl alcohol	107-19-7	No TRV		No TRV	
Propionic acid	79-09-4	No TRV		No TRV	
Propionitrile	107-12-0	No TRV		No TRV	
Propylene glycol monomethyl ether	107-98-2	No TRV		No TRV	
p-tert-Butyltoluene	98-51-1	No TRV		No TRV	
Triethylamine	121-44-8	No TRV		No TRV	
Trimethylamine	75-50-3	No TRV		No TRV	
Vinyl acetate	108-05-4	No TRV		No TRV	
Non-aromatic Halogenated Hydrocarbons					
1,1,1,2-Tetrachloro-2,2-difluoroethane	76-11-9	No TRV		No TRV	
1,1,1,2-Tetrachloroethane	630-20-6	No TRV		No TRV	
1,1,1-Trichloroethane	71-55-6	No TRV		No TRV	
1,1,2,2-Tetrachloro-1,2-difluoroethane	76-12-0	No TRV		No TRV	
1,1,2,2-Tetrachloroethane	79-34-5	No TRV		No TRV	
1,1,2,2-Tetrachloroethene	127-18-4	No TRV		No TRV	
1,1,2-Trichloroethane	79-00-5	No TRV		No TRV	
1,1,2-Trichloroethylene	79-01-6	No TRV		No TRV	
1,1-Dichloroethane	75-34-3	No TRV		No TRV	
1,1-Dichloroethene	75-35-4	No TRV		No TRV	
1,2,2-Trichloro-1,1,2-trifluoroethane	76-13-1	No TRV		No TRV	

Table C3-8 Toxicity Reference Values (TRVs) for COPCs and ROPCs

Constituent of Potential Concern	CAS Registry Number	Ingestion, Aquatic Exposures			
		Bald Eagle		Mink	
		NOAEL TRV	Source	NOAEL TRV	Source
n-Propyl alcohol	71-23-8	No TRV		No TRV	
n-Valeraldehyde	110-62-3	No TRV		No TRV	
Oxirane	75-21-8	No TRV		No TRV	
p-Cymene	99-87-6	No TRV		No TRV	
Phosgene	75-44-5	No TRV		No TRV	
Propargyl alcohol	107-19-7	No TRV		5.00E+02	US EPA (1987a) in IRIS (2002)[a]
Propionic acid	79-09-4	No TRV		No TRV	
Propionitrile	107-12-0	No TRV		No TRV	
Propylene glycol monomethyl ether	107-98-2	No TRV		No TRV	
p-tert-Butyltoluene	98-51-1	No TRV		No TRV	
Triethylamine	121-44-8	No TRV		No TRV	
Trimethylamine	75-50-3	No TRV		No TRV	
Vinyl acetate	108-05-4	No TRV		No TRV	
Non-aromatic Halogenated Hydrocarbons					
1,1,1,2-Tetrachloro-2,2-difluoroethane	76-11-9	No TRV		No TRV	
1,1,1,2-Tetrachloroethane	630-20-6	No TRV		8.93E+03	NTP (1983a) in IRIS (2002)[a]
1,1,1-Trichloroethane	71-55-6	No TRV		1.00E+06	Lane and others (1982) in Sample and others (1996)[c]
1,1,2,2-Tetrachloro-1,2-difluoroethane	76-12-0	No TRV		No TRV	
1,1,2,2-Tetrachloroethane	79-34-5	No TRV		No TRV	
1,1,2,2-Tetrachloroethene	127-18-4	No TRV		1.40E+03	Buben and O'Flaherty (1985) in IRIS (2002)[a]
1,1,2-Trichloroethane	79-00-5	No TRV		No TRV	
1,1,2-Trichloroethylene	79-01-6	No TRV		7.00E+02	Buben and O'Flaherty (1985) in Sample and others (1996)[c]
1,1-Dichloroethane	75-34-3	No TRV		No TRV	
1,1-Dichloroethene	75-35-4	No TRV		3.00E+04	Quast and others (1983) in Sample and others (1996)[c]
1,2,2-Trichloro-1,1,2-trifluoroethane	76-13-1	No TRV		No TRV	

Table C3-8 Toxicity Reference Values (TRVs) for COPCs and ROPCs

Constituent of Potential Concern	CAS Registry Number	Direct Contact, Aquatic Receptors			
		Aquatic Biota		Chinook Salmon and Other Salmonids	
		NOAEL TRV	Source	NOAEL TRV	Source
n-Propyl alcohol	71-23-8	No TRV		No TRV	
n-Valeraldehyde	110-62-3	No TRV		No TRV	
Oxirane	75-21-8	No TRV		No TRV	
p-Cymene	99-87-6	No TRV		No TRV	
Phosgene	75-44-5	No TRV		No TRV	
Propargyl alcohol	107-19-7	No TRV		No TRV	
Propionic acid	79-09-4	No TRV		No TRV	
Propionitrile	107-12-0	No TRV		No TRV	
Propylene glycol monomethyl ether	107-98-2	No TRV		No TRV	
p-tert-Butyltoluene	98-51-1	No TRV		No TRV	
Triethylamine	121-44-8	No TRV		No TRV	
Trimethylamine	75-50-3	No TRV		No TRV	
Vinyl acetate	108-05-4	1.60E+01	Tier II Chronic (Suter & Tsao 1996)[d]	1.60E+01	Tier II Chronic (Suter & Tsao 1996)[d]
Non-aromatic Halogenated Hydrocarbons					
1,1,1,2-Tetrachloro-2,2-difluoroethane	76-11-9	No TRV		No TRV	
1,1,1,2-Tetrachloroethane	630-20-6	No TRV		No TRV	
1,1,1-Trichloroethane	71-55-6	1.10E+01	Tier II Chronic (Suter & Tsao 1996)[d]	1.10E+01	Tier II Chronic (Suter & Tsao 1996)[d]
1,1,2,2-Tetrachloro-1,2-difluoroethane	76-12-0	No TRV		No TRV	
1,1,2,2-Tetrachloroethane	79-34-5	6.10E+02	Tier II Chronic (Suter & Tsao 1996)[d]	6.10E+02	Tier II Chronic (Suter & Tsao 1996)[d]
1,1,2,2-Tetrachloroethene	127-18-4	9.80E+01	Tier II Chronic (Suter & Tsao 1996)[d]	3.16E-02	Acute LOAEL for rainbow trout (Suter and Tsao 1996[d] Table C-1) × 0.1 for LOAEL-to-NOAEL conversion × 0.1 for acute-to-chronic conversion
1,1,2-Trichloroethane	79-00-5	1.20E+03	Tier II Chronic (Suter & Tsao 1996)[d]	1.20E+03	Tier II Chronic (Suter & Tsao 1996)[d]
1,1,2-Trichloroethylene	79-01-6	4.70E+01	Tier II Chronic (Suter & Tsao 1996)[d]	4.70E+01	Tier II Chronic (Suter & Tsao 1996)[d]
1,1-Dichloroethane	75-34-3	4.70E+01	Tier II Chronic (Suter & Tsao 1996)[d]	4.70E+01	Tier II Chronic (Suter & Tsao 1996)[d]
1,1-Dichloroethene	75-35-4	2.50E+01	Tier II Chronic (Suter & Tsao 1996)[d]	2.50E+01	Tier II Chronic (Suter & Tsao 1996)[d]
1,2,2-Trichloro-1,1,2-trifluoroethane	76-13-1	No TRV		No TRV	

Table C3-8 Toxicity Reference Values (TRVs) for COPCs and ROPCs

Constituent of Potential Concern	CAS Registry Number	Direct Contact, Aquatic Receptors	
		Benthic Organisms	
		NOAEL TRV	Source
n-Propyl alcohol	71-23-8	No TRV	
n-Valeraldehyde	110-62-3	No TRV	
Oxirane	75-21-8	No TRV	
p-Cymene	99-87-6	No TRV	
Phosgene	75-44-5	No TRV	
Propargyl alcohol	107-19-7	No TRV	
Propionic acid	79-09-4	No TRV	
Propionitrile	107-12-0	No TRV	
Propylene glycol monomethyl ether	107-98-2	No TRV	
p-tert-Butyltoluene	98-51-1	No TRV	
Triethylamine	121-44-8	No TRV	
Trimethylamine	75-50-3	No TRV	
Vinyl acetate	108-05-4	3.18E+00	EqP method (Jones and others 1997)[i]
Non-aromatic Halogenated Hydrocarbons			
1,1,1,2-Tetrachloro-2,2-difluoroethane	76-11-9	No TRV	
1,1,1,2-Tetrachloroethane	630-20-6	No TRV	
1,1,1-Trichloroethane	71-55-6	5.94E+04	EqP method (Jones and others 1997)[i]
1,1,2,2-Tetrachloro-1,2-difluoroethane	76-12-0	No TRV	
1,1,2,2-Tetrachloroethane	79-34-5	1.93E+03	EqP method (Jones and others 1997)[i]
1,1,2,2-Tetrachloroethene	127-18-4	1.04E+03	EqP method (Jones and others 1997)[i]
1,1,2-Trichloroethane	79-00-5	3.60E+03	EqP method (Jones and others 1997)[i]
1,1,2-Trichloroethylene	79-01-6	1.77E+02	EqP method (Jones and others 1997)[i]
1,1-Dichloroethane	75-34-3	9.96E+01	EqP method (Jones and others 1997)[i]
1,1-Dichloroethene	75-35-4	6.50E+01	EqP method (Jones and others 1997)[i]
1,2,2-Trichloro-1,1,2-trifluoroethane	76-13-1	No TRV	

Table C3-8 Toxicity Reference Values (TRVs) for COPCs and ROPCs

Constituent of Potential Concern	CAS Registry Number	Direct Exposure, Terrestrial Receptors			
		Plant		Terrestrial Invertebrate	
		TRV	Source	TRV	Source
1,2,3-Trichloropropane	96-18-4	No TRV		No TRV	
1,2-Dibromo-3-chloropropane	96-12-8	No TRV		No TRV	
1,2-Dichloro-1,1,2,2-tetrafluoroethane	76-14-2	No TRV		No TRV	
1,2-Dichloroethane	107-06-2	No TRV		No TRV	
1,2-Dichloroethylene	540-59-0	No TRV		No TRV	
1,2-Dichloropropane	78-87-5	No TRV		7.00E+05	Efroymson and others (1997b)[h]
1,3-Dichloropropene	542-75-6	No TRV		No TRV	
1,4-Dichloro-2-butene	764-41-0	No TRV		No TRV	
1-Chloroethene	75-01-4	No TRV		No TRV	
2,2-Dichloropropionic acid	75-99-0	No TRV		No TRV	
2-Chloropropane	75-29-6	No TRV		No TRV	
3-Chloropropene (Allyl chloride)	107-05-1	No TRV		No TRV	
Bromochloromethane	74-97-5	No TRV		No TRV	
Bromodichloromethane	75-27-4	No TRV		No TRV	
Bromoethene	593-60-2	No TRV		No TRV	
Bromoform	75-25-2	No TRV		No TRV	
Bromomethane	74-83-9	No TRV		No TRV	
Carbon tetrachloride	56-23-5	No TRV		No TRV	
Chlorodibromomethane	124-48-1	No TRV		No TRV	
Chlorodifluoromethane	75-45-6	No TRV		No TRV	
Chloroethane	75-00-3	No TRV		No TRV	
Chloroform	67-66-3	No TRV		No TRV	
Chloromethane	74-87-3	No TRV		No TRV	
Chloropentafluoroethane	76-15-3	No TRV		No TRV	
cis-1,2-Dichloroethene	156-59-2	No TRV		No TRV	
cis-1,3-Dichloropropene	10061-01-5	No TRV		No TRV	
Cyanogen bromide	506-68-3	No TRV		No TRV	
Cyanogen chloride	506-77-4	No TRV		No TRV	

Table C3-8 Toxicity Reference Values (TRVs) for COPCs and ROPCs

Constituent of Potential Concern	CAS Registry Number	Ingestion, Terrestrial Exposures			
		Mule Deer		Mourning Dove	
		NOAEL TRV	Source	NOAEL TRV	Source
1,2,3-Trichloropropane	96-18-4	5.71E+02	NTP (1983b) in IRIS (2002)[a]	No TRV	
1,2-Dibromo-3-chloropropane	96-12-8	No TRV		No TRV	
1,2-Dichloro-1,1,2,2-tetrafluoroethane	76-14-2	No TRV		No TRV	
1,2-Dichloroethane	107-06-2	5.00E+04	Lane and others (1982) in Sample and others (1996)[c]	1.72E+04	Alumot and others (1976) in Sample and others (1996)[c]
1,2-Dichloroethylene	540-59-0	4.52E+04	Palmer and others (1979) in Sample and others (1996)[c]	No TRV	
1,2-Dichloropropane	78-87-5	No TRV		No TRV	
1,3-Dichloropropene	542-75-6	2.50E+03	Stott and others (1995) in IRIS (2002)[a]	No TRV	
1,4-Dichloro-2-butene	764-41-0	No TRV		No TRV	
1-Chloroethene	75-01-4	1.70E+02	EPA 1999[f]	No TRV	
2,2-Dichloropropionic acid	75-99-0	No TRV		No TRV	
2-Chloropropane	75-29-6	No TRV		No TRV	
3-Chloropropene (Allyl chloride)	107-05-1	No TRV		No TRV	
Bromochloromethane	74-97-5	No TRV		No TRV	
Bromodichloromethane	75-27-4	1.79E+03	NTP (1986) in IRIS (2002)[a]	No TRV	
Bromoethene	593-60-2	No TRV		No TRV	
Bromoform	75-25-2	1.79E+03	NTP (1989) in IRIS (2002)[a]	No TRV	
Bromomethane	74-83-9	1.40E+02	Danse and others (1984) in IRIS (2002)[a]	No TRV	
Carbon tetrachloride	56-23-5	7.10E+01	Bruckner and others (1986) in IRIS (2002)[a]	No TRV	
Chlorodibromomethane	124-48-1	2.14E+03	NTP (1985a) in IRIS (2002)[a]	No TRV	
Chlorodifluoromethane	75-45-6	No TRV		No TRV	
Chloroethane	75-00-3	No TRV		No TRV	
Chloroform	67-66-3	6.00E+04	EPA 1999[f]	No TRV	
Chloromethane	74-87-3	No TRV		No TRV	
Chloropentafluoroethane	76-15-3	No TRV		No TRV	
cis-1,2-Dichloroethene	156-59-2	No TRV		No TRV	
cis-1,3-Dichloropropene	10061-01-5	No TRV		No TRV	
Cyanogen bromide	506-68-3	4.40E+03	Howard and Hanzal (1955) in IRIS (2002)[a]	No TRV	
Cyanogen chloride	506-77-4	2.53E+03	Howard and Hanzal (1955) in IRIS (2002)[a]	No TRV	

Table C3-8 Toxicity Reference Values (TRVs) for COPCs and ROPCs

Constituent of Potential Concern	CAS Registry Number	Ingestion, Terrestrial Exposures			
		Great Basin Pocket Mouse		Western Meadowlark	
		NOAEL TRV	Source	NOAEL TRV	Source
1,2,3-Trichloropropane	96-18-4	5.71E+02	NTP (1983b) in IRIS (2002)[a]	No TRV	
1,2-Dibromo-3-chloropropane	96-12-8	No TRV		No TRV	
1,2-Dichloro-1,1,2,2-tetrafluoroethane	76-14-2	No TRV		No TRV	
1,2-Dichloroethane	107-06-2	5.00E+04	Lane and others (1982) in Sample and others (1996)[c]	1.72E+04	Alumot and others (1976) in Sample and others (1996)[c]
1,2-Dichloroethylene	540-59-0	4.52E+04	Palmer and others (1979) in Sample and others (1996)[c]	No TRV	
1,2-Dichloropropane	78-87-5	No TRV		No TRV	
1,3-Dichloropropene	542-75-6	2.50E+03	Stott and others (1995) in IRIS (2002)[a]	No TRV	
1,4-Dichloro-2-butene	764-41-0	No TRV		No TRV	
1-Chloroethene	75-01-4	1.70E+02	EPA 1999[f]	No TRV	
2,2-Dichloropropionic acid	75-99-0	No TRV		No TRV	
2-Chloropropane	75-29-6	No TRV		No TRV	
3-Chloropropene (Allyl chloride)	107-05-1	No TRV		No TRV	
Bromochloromethane	74-97-5	No TRV		No TRV	
Bromodichloromethane	75-27-4	1.79E+03	NTP (1986) in IRIS (2002)[a]	No TRV	
Bromoethene	593-60-2	No TRV		No TRV	
Bromoform	75-25-2	1.79E+03	NTP (1989) in IRIS (2002)[a]	No TRV	
Bromomethane	74-83-9	1.40E+02	Danse et al (1984) in IRIS (2002)[a]	No TRV	
Carbon tetrachloride	56-23-5	7.10E+01	Bruckner and others (1986) in IRIS (2002)[a]	No TRV	
Chlorodibromomethane	124-48-1	2.14E+03	NTP (1985a) in IRIS (2002)[a]	No TRV	
Chlorodifluoromethane	75-45-6	No TRV		No TRV	
Chloroethane	75-00-3	No TRV		No TRV	
Chloroform	67-66-3	6.00E+04	EPA 1999[f]	No TRV	
Chloromethane	74-87-3	No TRV		No TRV	
Chloropentafluoroethane	76-15-3	No TRV		No TRV	
cis-1,2-Dichloroethene	156-59-2	No TRV		No TRV	
cis-1,3-Dichloropropene	10061-01-5	No TRV		No TRV	
Cyanogen bromide	506-68-3	4.40E+03	Howard and Hanzal (1955) in IRIS (2002)[a]	No TRV	
Cyanogen chloride	506-77-4	2.53E+03	Howard and Hanzal (1955) in IRIS (2002)[a]	No TRV	

Table C3-8 Toxicity Reference Values (TRVs) for COPCs and ROPCs

Constituent of Potential Concern	CAS Registry Number	Ingestion, Terrestrial Exposures			
		Coyote		Burrowing Owl	
		NOAEL TRV	Source	NOAEL TRV	Source
1,2,3-Trichloropropane	96-18-4	5.71E+02	NTP (1983b) in IRIS (2002)[a]	No TRV	
1,2-Dibromo-3-chloropropane	96-12-8	No TRV		No TRV	
1,2-Dichloro-1,1,2,2-tetrafluoroethane	76-14-2	No TRV		No TRV	
1,2-Dichloroethane	107-06-2	5.00E+04	Lane and others (1982) in Sample and others (1996)[c]	1.72E+04	Alumot and others (1976) in Sample and others (1996)[c]
1,2-Dichloroethylene	540-59-0	4.52E+04	Palmer and others (1979) in Sample and others (1996)[c]	No TRV	
1,2-Dichloropropane	78-87-5	No TRV		No TRV	
1,3-Dichloropropene	542-75-6	2.50E+03	Stott and others (1995) in IRIS (2002)[a]	No TRV	
1,4-Dichloro-2-butene	764-41-0	No TRV		No TRV	
1-Chloroethene	75-01-4	1.70E+02	EPA 1999[f]	No TRV	
2,2-Dichloropropionic acid	75-99-0	No TRV		No TRV	
2-Chloropropane	75-29-6	No TRV		No TRV	
3-Chloropropene (Allyl chloride)	107-05-1	No TRV		No TRV	
Bromochloromethane	74-97-5	No TRV		No TRV	
Bromodichloromethane	75-27-4	1.79E+03	NTP (1986) in IRIS (2002)[a]	No TRV	
Bromoethene	593-60-2	No TRV		No TRV	
Bromoform	75-25-2	1.79E+03	NTP (1989) in IRIS (2002)[a]	No TRV	
Bromomethane	74-83-9	1.40E+02	Danse et al (1984) in IRIS (2002)[a]	No TRV	
Carbon tetrachloride	56-23-5	7.10E+01	Bruckner and others (1986) in IRIS (2002)[a]	No TRV	
Chlorodibromomethane	124-48-1	2.14E+03	NTP (1985a) in IRIS (2002)[a]	No TRV	
Chlorodifluoromethane	75-45-6	No TRV		No TRV	
Chloroethane	75-00-3	No TRV		No TRV	
Chloroform	67-66-3	6.00E+04	EPA 1999[f]	No TRV	
Chloromethane	74-87-3	No TRV		No TRV	
Chloropentafluoroethane	76-15-3	No TRV		No TRV	
cis-1,2-Dichloroethene	156-59-2	No TRV		No TRV	
cis-1,3-Dichloropropene	10061-01-5	No TRV		No TRV	
Cyanogen bromide	506-68-3	4.40E+03	Howard and Hanzal (1955) in IRIS (2002)[a]	No TRV	
Cyanogen chloride	506-77-4	2.53E+03	Howard and Hanzal (1955) in IRIS (2002)[a]	No TRV	

Table C3-8 Toxicity Reference Values (TRVs) for COPCs and ROPCs

Constituent of Potential Concern	CAS Registry Number	Ingestion, Terrestrial Exposures		Ingestion, Aquatic Exposures	
		Red-tailed Hawk		Canada Goose	
		NOAEL TRV	Source	NOAEL TRV	Source
1,2,3-Trichloropropane	96-18-4	No TRV		No TRV	
1,2-Dibromo-3-chloropropane	96-12-8	No TRV		No TRV	
1,2-Dichloro-1,1,2,2-tetrafluoroethane	76-14-2	No TRV		No TRV	
1,2-Dichloroethane	107-06-2	1.72E+04	Alumot and others (1976) in Sample and others (1996)[c]	1.72E+04	Alumot and others (1976) in Sample and others (1996)c
1,2-Dichloroethylene	540-59-0	No TRV		No TRV	
1,2-Dichloropropane	78-87-5	No TRV		No TRV	
1,3-Dichloropropene	542-75-6	No TRV		No TRV	
1,4-Dichloro-2-butene	764-41-0	No TRV		No TRV	
1-Chloroethene	75-01-4	No TRV		No TRV	
2,2-Dichloropropionic acid	75-99-0	No TRV		No TRV	
2-Chloropropane	75-29-6	No TRV		No TRV	
3-Chloropropene (Allyl chloride)	107-05-1	No TRV		No TRV	
Bromochloromethane	74-97-5	No TRV		No TRV	
Bromodichloromethane	75-27-4	No TRV		No TRV	
Bromoethene	593-60-2	No TRV		No TRV	
Bromoform	75-25-2	No TRV		No TRV	
Bromomethane	74-83-9	No TRV		No TRV	
Carbon tetrachloride	56-23-5	No TRV		No TRV	
Chlorodibromomethane	124-48-1	No TRV		No TRV	
Chlorodifluoromethane	75-45-6	No TRV		No TRV	
Chloroethane	75-00-3	No TRV		No TRV	
Chloroform	67-66-3	No TRV		No TRV	
Chloromethane	74-87-3	No TRV		No TRV	
Chloropentafluoroethane	76-15-3	No TRV		No TRV	
cis-1,2-Dichloroethene	156-59-2	No TRV		No TRV	
cis-1,3-Dichloropropene	10061-01-5	No TRV		No TRV	
Cyanogen bromide	506-68-3	No TRV		No TRV	
Cyanogen chloride	506-77-4	No TRV		No TRV	

Table C3-8 Toxicity Reference Values (TRVs) for COPCs and ROPCs

Constituent of Potential Concern	CAS Registry Number	Ingestion, Aquatic Exposures			
		Spotted Sandpiper		Great Blue Heron	
		NOAEL TRV	Source	NOAEL TRV	Source
1,2,3-Trichloropropane	96-18-4	No TRV		No TRV	
1,2-Dibromo-3-chloropropane	96-12-8	No TRV		No TRV	
1,2-Dichloro-1,1,2,2-tetrafluoroethane	76-14-2	No TRV		No TRV	
1,2-Dichloroethane	107-06-2	1.72E+04	Alumot and others (1976) in Sample and others (1996)[c]	1.72E+04	Alumot and others (1976) in Sample and others (1996)[c]
1,2-Dichloroethylene	540-59-0	No TRV		No TRV	
1,2-Dichloropropane	78-87-5	No TRV		No TRV	
1,3-Dichloropropene	542-75-6	No TRV		No TRV	
1,4-Dichloro-2-butene	764-41-0	No TRV		No TRV	
1-Chloroethene	75-01-4	No TRV		No TRV	
2,2-Dichloropropionic acid	75-99-0	No TRV		No TRV	
2-Chloropropane	75-29-6	No TRV		No TRV	
3-Chloropropene (Allyl chloride)	107-05-1	No TRV		No TRV	
Bromochloromethane	74-97-5	No TRV		No TRV	
Bromodichloromethane	75-27-4	No TRV		No TRV	
Bromoethene	593-60-2	No TRV		No TRV	
Bromoform	75-25-2	No TRV		No TRV	
Bromomethane	74-83-9	No TRV		No TRV	
Carbon tetrachloride	56-23-5	No TRV		No TRV	
Chlorodibromomethane	124-48-1	No TRV		No TRV	
Chlorodifluoromethane	75-45-6	No TRV		No TRV	
Chloroethane	75-00-3	No TRV		No TRV	
Chloroform	67-66-3	No TRV		No TRV	
Chloromethane	74-87-3	No TRV		No TRV	
Chloropentafluoroethane	76-15-3	No TRV		No TRV	
cis-1,2-Dichloroethene	156-59-2	No TRV		No TRV	
cis-1,3-Dichloropropene	10061-01-5	No TRV		No TRV	
Cyanogen bromide	506-68-3	No TRV		No TRV	
Cyanogen chloride	506-77-4	No TRV		No TRV	

Table C3-8 Toxicity Reference Values (TRVs) for COPCs and ROPCs

Constituent of Potential Concern	CAS Registry Number	Ingestion, Aquatic Exposures			
		Bald Eagle		Mink	
		NOAEL TRV	Source	NOAEL TRV	Source
1,2,3-Trichloropropane	96-18-4	No TRV		5.71E+02	NTP (1983b) in IRIS (2002)[a]
1,2-Dibromo-3-chloropropane	96-12-8	No TRV		No TRV	
1,2-Dichloro-1,1,2,2-tetrafluoroethane	76-14-2	No TRV		No TRV	
1,2-Dichloroethane	107-06-2	1.72E+04	Alumot and others (1976) in Sample and others (1996)[c]	5.00E+04	Lane and others (1982) in Sample and others (1996)[c]
1,2-Dichloroethylene	540-59-0	No TRV		4.52E+04	Palmer and others (1979) in Sample and others (1996)[c]
1,2-Dichloropropane	78-87-5	No TRV		No TRV	
1,3-Dichloropropene	542-75-6	No TRV		2.50E+03	Stott and others (1995) in IRIS (2002)a
1,4-Dichloro-2-butene	764-41-0	No TRV		No TRV	
1-Chloroethene	75-01-4	No TRV		1.70E+02	EPA 1999[f]
2,2-Dichloropropionic acid	75-99-0	No TRV		No TRV	
2-Chloropropane	75-29-6	No TRV		No TRV	
3-Chloropropene (Allyl chloride)	107-05-1	No TRV		No TRV	
Bromochloromethane	74-97-5	No TRV		No TRV	
Bromodichloromethane	75-27-4	No TRV		1.79E+03	NTP (1986) in IRIS (2002)[a]
Bromoethene	593-60-2	No TRV		No TRV	
Bromoform	75-25-2	No TRV		1.79E+03	NTP (1989) in IRIS (2002)[a]
Bromomethane	74-83-9	No TRV		1.40E+02	Danse et al (1984) in IRIS (2002)[a]
Carbon tetrachloride	56-23-5	No TRV		7.10E+01	Bruckner and others (1986) in IRIS (2002)[a]
Chlorodibromomethane	124-48-1	No TRV		2.14E+03	NTP (1985a) in IRIS (2002)[a]
Chlorodifluoromethane	75-45-6	No TRV		No TRV	
Chloroethane	75-00-3	No TRV		No TRV	
Chloroform	67-66-3	No TRV		6.00E+04	EPA 1999[f]
Chloromethane	74-87-3	No TRV		No TRV	
Chloropentafluoroethane	76-15-3	No TRV		No TRV	
cis-1,2-Dichloroethene	156-59-2	No TRV		No TRV	
cis-1,3-Dichloropropene	10061-01-5	No TRV		No TRV	
Cyanogen bromide	506-68-3	No TRV		4.40E+03	Howard and Hanzal (1955) in IRIS (2002)[a]
Cyanogen chloride	506-77-4	No TRV		2.53E+03	Howard and Hanzal (1955) in IRIS (2002)[a]

Table C3-8 Toxicity Reference Values (TRVs) for COPCs and ROPCs

Constituent of Potential Concern	CAS Registry Number	Direct Contact, Aquatic Receptors			
		Aquatic Biota		Chinook Salmon and Other Salmonids	
		NOAEL TRV	Source	NOAEL TRV	Source
1,2,3-Trichloropropane	96-18-4	No TRV		No TRV	
1,2-Dibromo-3-chloropropane	96-12-8	No TRV		No TRV	
1,2-Dichloro-1,1,2,2-tetrafluoroethane	76-14-2	No TRV		No TRV	
1,2-Dichloroethane	107-06-2	9.10E+02	Tier II Chronic (Suter & Tsao 1996)[d]	9.10E+02	Tier II Chronic (Suter & Tsao 1996)[d]
1,2-Dichloroethylene	540-59-0	5.90E+02	Tier II Chronic (Suter & Tsao 1996)[d]	5.90E+02	Tier II Chronic (Suter & Tsao 1996)[d]
1,2-Dichloropropane	78-87-5	No TRV		No TRV	
1,3-Dichloropropene	542-75-6	5.50E-02	Tier II Chronic (Suter & Tsao 1996)[d]	5.50E-02	Tier II Chronic (Suter & Tsao 1996)[d]
1,4-Dichloro-2-butene	764-41-0	No TRV		No TRV	
1-Chloroethene	75-01-4	3.88E+03	EPA 1999[f]	3.88E+03	EPA 1999[f]
2,2-Dichloropropionic acid	75-99-0	No TRV		No TRV	
2-Chloropropane	75-29-6	No TRV		No TRV	
3-Chloropropene (Allyl chloride)	107-05-1	No TRV		No TRV	
Bromochloromethane	74-97-5	No TRV		No TRV	
Bromodichloromethane	75-27-4	No TRV		No TRV	
Bromoethene	593-60-2	No TRV		No TRV	
Bromoform	75-25-2	No TRV		No TRV	
Bromomethane	74-83-9	No TRV		No TRV	
Carbon tetrachloride	56-23-5	9.80E+00	Tier II Chronic (Suter & Tsao 1996)[d]	9.80E+00	Tier II Chronic (Suter & Tsao 1996)[d]
Chlorodibromomethane	124-48-1	No TRV		No TRV	
Chlorodifluoromethane	75-45-6	No TRV		No TRV	
Chloroethane	75-00-3	No TRV		No TRV	
Chloroform	67-66-3	2.80E+01	EPA 1999[f]	2.80E+01	EPA 1999[f]
Chloromethane	74-87-3	No TRV		No TRV	
Chloropentafluoroethane	76-15-3	No TRV		No TRV	
cis-1,2-Dichloroethene	156-59-2	No TRV		No TRV	
cis-1,3-Dichloropropene	10061-01-5	No TRV		No TRV	
Cyanogen bromide	506-68-3	No TRV		No TRV	
Cyanogen chloride	506-77-4	No TRV		No TRV	

Table C3-8 Toxicity Reference Values (TRVs) for COPCs and ROPCs

Constituent of Potential Concern	CAS Registry Number	Direct Contact, Aquatic Receptors	
		Benthic Organisms	
		NOAEL TRV	Source
1,2,3-Trichloropropane	96-18-4	No TRV	
1,2-Dibromo-3-chloropropane	96-12-8	No TRV	
1,2-Dichloro-1,1,2,2-tetrafluoroethane	76-14-2	No TRV	
1,2-Dichloroethane	107-06-2	7.13E+02	EqP method (Jones and others 1997)[i]
1,2-Dichloroethylene	540-59-0	6.78E+01	EqP method (Jones and others 1997)[i]
1,2-Dichloropropane	78-87-5	No TRV	
1,3-Dichloropropene	542-75-6	5.94E-02	EqP method (Jones and others 1997)[i]
1,4-Dichloro-2-butene	764-41-0	No TRV	
1-Chloroethene	75-01-4	1.72E+03	EqP method (EPA 1999[f])
2,2-Dichloropropionic acid	75-99-0	No TRV	
2-Chloropropane	75-29-6	No TRV	
3-Chloropropene (Allyl chloride)	107-05-1	No TRV	
Bromochloromethane	74-97-5	No TRV	
Bromodichloromethane	75-27-4	No TRV	
Bromoethene	593-60-2	No TRV	
Bromoform	75-25-2	No TRV	
Bromomethane	74-83-9	No TRV	
Carbon tetrachloride	56-23-5	5.96E+01	EqP method (Jones and others 1997)[i]
Chlorodibromomethane	124-48-1	No TRV	
Chlorodifluoromethane	75-45-6	No TRV	
Chloroethane	75-00-3	No TRV	
Chloroform	67-66-3	5.94E+01	EPA 1999[f]
Chloromethane	74-87-3	No TRV	
Chloropentafluoroethane	76-15-3	No TRV	
cis-1,2-Dichloroethene	156-59-2	No TRV	
cis-1,3-Dichloropropene	10061-01-5	No TRV	
Cyanogen bromide	506-68-3	No TRV	
Cyanogen chloride	506-77-4	No TRV	

Table C3-8 Toxicity Reference Values (TRVs) for COPCs and ROPCs

Constituent of Potential Concern	CAS Registry Number	Direct Exposure, Terrestrial Receptors			
		Plant		Terrestrial Invertebrate	
		TRV	Source	TRV	Source
Dichlorodifluoromethane	75-71-8	No TRV		No TRV	
Dichlorofluoromethane	75-43-4	No TRV		No TRV	
Dichloromethane	75-09-2	No TRV		No TRV	
Difluorodibromomethane	75-61-6	No TRV		No TRV	
Hexafluoroacetone	684-16-2	No TRV		No TRV	
Iodomethane	74-88-4	No TRV		No TRV	
Methylene bromide	74-95-3	No TRV		No TRV	
Pentachloroethane	76-01-7	No TRV		No TRV	
trans-1,2-Dichloroethylene	156-60-5	No TRV		No TRV	
trans-1,3-Dichloropropene	10061-02-6	No TRV		No TRV	
Trichloroacetic acid	76-03-9	No TRV		No TRV	
Trichlorofluoroethane	27154-33-2	No TRV		No TRV	
Trichlorofluoromethane	75-69-4	No TRV		No TRV	
Trifluorobromomethane	75-63-8	No TRV		No TRV	
Dioxin and Furan Compounds (PCDDs/PCDFs)					
1,2,3,4,6,7,8-Heptachlorodibenzo(p)dioxin	35822-46-9	No TRV		No TRV	
1,2,3,4,6,7,8-Heptachlorodibenzofuran	67562-39-4	No TRV		No TRV	
1,2,3,4,7,8,9-Heptachlorodibenzofuran	55673-89-7	No TRV		No TRV	
1,2,3,4,7,8-Hexachlorodibenzo(p)dioxin	39227-28-6	No TRV		No TRV	
1,2,3,4,7,8-Hexachlorodibenzofuran	70648-26-9	No TRV		No TRV	
1,2,3,6,7,8-Hexachlorodibenzo(p)dioxin	57653-85-7	No TRV		No TRV	
1,2,3,6,7,8-Hexachlorodibenzofuran	57117-44-9	No TRV		No TRV	
1,2,3,7,8,9-Hexachlorodibenzo(p)dioxin	19408-74-3	No TRV		No TRV	
1,2,3,7,8,9-Hexachlorodibenzofuran	72918-21-9	No TRV		No TRV	
1,2,3,7,8-Pentachlorodibenzo(p)dioxin	40321-76-4	No TRV		No TRV	
1,2,3,7,8-Pentachlorodibenzofuran	57117-41-6	No TRV		No TRV	
2,3,4,6,7,8-Hexachlorodibenzofuran	60851-34-5	No TRV		No TRV	
2,3,4,7,8-Pentachlorodibenzofuran	57117-31-4	No TRV		No TRV	

Table C3-8 Toxicity Reference Values (TRVs) for COPCs and ROPCs

Constituent of Potential Concern	CAS Registry Number	Ingestion, Terrestrial Exposures			
		Mule Deer		Mourning Dove	
		NOAEL TRV	Source	NOAEL TRV	Source
Dichlorodifluoromethane	75-71-8	1.50E+04	Sherman (1974) in IRIS (2002)[a]	No TRV	
Dichlorofluoromethane	75-43-4	No TRV		No TRV	
Dichloromethane	75-09-2	6.16E+03	National Coffee Association (1982) in IRIS (2002)[a]	No TRV	
Difluorodibromomethane	75-61-6	No TRV		No TRV	
Hexafluoroacetone	684-16-2	No TRV		No TRV	
Iodomethane	74-88-4	No TRV		No TRV	
Methylene bromide	74-95-3	No TRV		No TRV	
Pentachloroethane	76-01-7	No TRV		No TRV	
trans-1,2-Dichloroethylene	156-60-5	1.70E+03	Barnes and others (1985) in IRIS (2002)[a]	No TRV	
trans-1,3-Dichloropropene	10061-02-6	No TRV		No TRV	
Trichloroacetic acid	76-03-9	No TRV		No TRV	
Trichlorofluoroethane	27154-33-2	No TRV		No TRV	
Trichlorofluoromethane	75-69-4	3.49E+04	NCI (1978) in IRIS (2002)[a]	No TRV	
Trifluorobromomethane	75-63-8	No TRV		No TRV	
Dioxin and Furan Compounds (PCDDs/PCDFs)					
1,2,3,4,6,7,8-Heptachlorodibenzo(p)dioxin	35822-46-9	No TRV		No TRV	
1,2,3,4,6,7,8-Heptachlorodibenzofuran	67562-39-4	No TRV		No TRV	
1,2,3,4,7,8,9-Heptachlorodibenzofuran	55673-89-7	No TRV		No TRV	
1,2,3,4,7,8-Hexachlorodibenzo(p)dioxin	39227-28-6	No TRV		No TRV	
1,2,3,4,7,8-Hexachlorodibenzofuran	70648-26-9	No TRV		No TRV	
1,2,3,6,7,8-Hexachlorodibenzo(p)dioxin	57653-85-7	No TRV		No TRV	
1,2,3,6,7,8-Hexachlorodibenzofuran	57117-44-9	1.60E-01	Poiger and others (1989) in Sample and others (1996)[c]	No TRV	
1,2,3,7,8,9-Hexachlorodibenzo(p)dioxin	19408-74-3	No TRV		No TRV	
1,2,3,7,8,9-Hexachlorodibenzofuran	72918-21-9	No TRV		No TRV	
1,2,3,7,8-Pentachlorodibenzo(p)dioxin	40321-76-4	No TRV		No TRV	
1,2,3,7,8-Pentachlorodibenzofuran	57117-41-6	1.60E-01	Poiger and others (1989) in Sample and others (1996)[c]	No TRV	
2,3,4,6,7,8-Hexachlorodibenzofuran	60851-34-5	No TRV		No TRV	
2,3,4,7,8-Pentachlorodibenzofuran	57117-31-4	1.60E-02	Poiger and others (1989) in Sample and others (1996)[c]	No TRV	

Table C3-8 Toxicity Reference Values (TRVs) for COPCs and ROPCs

Constituent of Potential Concern	CAS Registry Number	Ingestion, Terrestrial Exposures			
		Great Basin Pocket Mouse		Western Meadowlark	
		NOAEL TRV	Source	NOAEL TRV	Source
Dichlorodifluoromethane	75-71-8	1.50E+04	Sherman (1974) in IRIS (2002)[a]	No TRV	
Dichlorofluoromethane	75-43-4	No TRV		No TRV	
Dichloromethane	75-09-2	6.16E+03	National Coffee Association (1982) in IRIS (2002)[a]	No TRV	
Difluorodibromomethane	75-61-6	No TRV		No TRV	
Hexafluoroacetone	684-16-2	No TRV		No TRV	
Iodomethane	74-88-4	No TRV		No TRV	
Methylene bromide	74-95-3	No TRV		No TRV	
Pentachloroethane	76-01-7	No TRV		No TRV	
trans-1,2-Dichloroethylene	156-60-5	1.70E+03	Barnes and others (1985) in IRIS (2002)[a]	No TRV	
trans-1,3-Dichloropropene	10061-02-6	No TRV		No TRV	
Trichloroacetic acid	76-03-9	No TRV		No TRV	
Trichlorofluoroethane	27154-33-2	No TRV		No TRV	
Trichlorofluoromethane	75-69-4	3.49E+04	NCI (1978) in IRIS (2002)[a]	No TRV	
Trifluorobromomethane	75-63-8	No TRV		No TRV	
Dioxin and Furan Compounds (PCDDs/PCDFs)					
1,2,3,4,6,7,8-Heptachlorodibenzo(p)dioxin	35822-46-9	No TRV		No TRV	
1,2,3,4,6,7,8-Heptachlorodibenzofuran	67562-39-4	No TRV		No TRV	
1,2,3,4,7,8,9-Heptachlorodibenzofuran	55673-89-7	No TRV		No TRV	
1,2,3,4,7,8-Hexachlorodibenzo(p)dioxin	39227-28-6	No TRV		No TRV	
1,2,3,4,7,8-Hexachlorodibenzofuran	70648-26-9	No TRV		No TRV	
1,2,3,6,7,8-Hexachlorodibenzo(p)dioxin	57653-85-7	No TRV		No TRV	
1,2,3,6,7,8-Hexachlorodibenzofuran	57117-44-9	1.60E-01	Poiger and others (1989) in Sample and others (1996)[c]	No TRV	
1,2,3,7,8,9-Hexachlorodibenzo(p)dioxin	19408-74-3	No TRV		No TRV	
1,2,3,7,8,9-Hexachlorodibenzofuran	72918-21-9	No TRV		No TRV	
1,2,3,7,8-Pentachlorodibenzo(p)dioxin	40321-76-4	No TRV		No TRV	
1,2,3,7,8-Pentachlorodibenzofuran	57117-41-6	1.60E-01	Poiger and others (1989) in Sample and others (1996)[c]	No TRV	
2,3,4,6,7,8-Hexachlorodibenzofuran	60851-34-5	No TRV		No TRV	
2,3,4,7,8-Pentachlorodibenzofuran	57117-31-4	1.60E-02	Poiger and others (1989) in Sample and others (1996)[c]	No TRV	

Table C3-8 Toxicity Reference Values (TRVs) for COPCs and ROPCs

Constituent of Potential Concern	CAS Registry Number	Ingestion, Terrestrial Exposures			
		Coyote		Burrowing Owl	
		NOAEL TRV	Source	NOAEL TRV	Source
Dichlorodifluoromethane	75-71-8	1.50E+04	Sherman (1974) in IRIS (2002)[a]	No TRV	
Dichlorofluoromethane	75-43-4	No TRV		No TRV	
Dichloromethane	75-09-2	6.16E+03	National Coffee Association (1982) in IRIS (2002)[a]	No TRV	
Difluorodibromomethane	75-61-6	No TRV		No TRV	
Hexafluoroacetone	684-16-2	No TRV		No TRV	
Iodomethane	74-88-4	No TRV		No TRV	
Methylene bromide	74-95-3	No TRV		No TRV	
Pentachloroethane	76-01-7	No TRV		No TRV	
trans-1,2-Dichloroethylene	156-60-5	1.70E+03	Barnes and others (1985) in IRIS (2002)[a]	No TRV	
trans-1,3-Dichloropropene	10061-02-6	No TRV		No TRV	
Trichloroacetic acid	76-03-9	No TRV		No TRV	
Trichlorofluoroethane	27154-33-2	No TRV		No TRV	
Trichlorofluoromethane	75-69-4	3.49E+04	NCI (1978) in IRIS (2002)[a]	No TRV	
Trifluorobromomethane	75-63-8	No TRV		No TRV	
Dioxin and Furan Compounds (PCDDs/PCDFs)					
1,2,3,4,6,7,8-Heptachlorodibenzo(p)dioxin	35822-46-9	No TRV		No TRV	
1,2,3,4,6,7,8-Heptachlorodibenzofuran	67562-39-4	No TRV		No TRV	
1,2,3,4,7,8,9-Heptachlorodibenzofuran	55673-89-7	No TRV		No TRV	
1,2,3,4,7,8-Hexachlorodibenzo(p)dioxin	39227-28-6	No TRV		No TRV	
1,2,3,4,7,8-Hexachlorodibenzofuran	70648-26-9	No TRV		No TRV	
1,2,3,6,7,8-Hexachlorodibenzo(p)dioxin	57653-85-7	No TRV		No TRV	
1,2,3,6,7,8-Hexachlorodibenzofuran	57117-44-9	1.60E-01	Poiger and others (1989) in Sample and others (1996)[c]	No TRV	
1,2,3,7,8,9-Hexachlorodibenzo(p)dioxin	19408-74-3	No TRV		No TRV	
1,2,3,7,8,9-Hexachlorodibenzofuran	72918-21-9	No TRV		No TRV	
1,2,3,7,8-Pentachlorodibenzo(p)dioxin	40321-76-4	No TRV		No TRV	
1,2,3,7,8-Pentachlorodibenzofuran	57117-41-6	1.60E-01	Poiger and others (1989) in Sample and others (1996)[c]	No TRV	
2,3,4,6,7,8-Hexachlorodibenzofuran	60851-34-5	No TRV		No TRV	
2,3,4,7,8-Pentachlorodibenzofuran	57117-31-4	1.60E-02	Poiger and others (1989) in Sample and others (1996)[c]	No TRV	

Table C3-8 Toxicity Reference Values (TRVs) for COPCs and ROPCs

Constituent of Potential Concern	CAS Registry Number	Ingestion, Terrestrial Exposures		Ingestion, Aquatic Exposures	
		Red-tailed Hawk		Canada Goose	
		NOAEL TRV	Source	NOAEL TRV	Source
Dichlorodifluoromethane	75-71-8	No TRV		No TRV	
Dichlorofluoromethane	75-43-4	No TRV		No TRV	
Dichloromethane	75-09-2	No TRV		No TRV	
Difluorodibromomethane	75-61-6	No TRV		No TRV	
Hexafluoroacetone	684-16-2	No TRV		No TRV	
Iodomethane	74-88-4	No TRV		No TRV	
Methylene bromide	74-95-3	No TRV		No TRV	
Pentachloroethane	76-01-7	No TRV		No TRV	
trans-1,2-Dichloroethylene	156-60-5	No TRV		No TRV	
trans-1,3-Dichloropropene	10061-02-6	No TRV		No TRV	
Trichloroacetic acid	76-03-9	No TRV		No TRV	
Trichlorofluoroethane	27154-33-2	No TRV		No TRV	
Trichlorofluoromethane	75-69-4	No TRV		No TRV	
Trifluorobromomethane	75-63-8	No TRV		No TRV	
Dioxin and Furan Compounds (PCDDs/PCDFs)					
1,2,3,4,6,7,8-Heptachlorodibenzo(p)dioxin	35822-46-9	No TRV		No TRV	
1,2,3,4,6,7,8-Heptachlorodibenzofuran	67562-39-4	No TRV		No TRV	
1,2,3,4,7,8,9-Heptachlorodibenzofuran	55673-89-7	No TRV		No TRV	
1,2,3,4,7,8-Hexachlorodibenzo(p)dioxin	39227-28-6	No TRV		No TRV	
1,2,3,4,7,8-Hexachlorodibenzofuran	70648-26-9	No TRV		No TRV	
1,2,3,6,7,8-Hexachlorodibenzo(p)dioxin	57653-85-7	No TRV		No TRV	
1,2,3,6,7,8-Hexachlorodibenzofuran	57117-44-9	No TRV		No TRV	
1,2,3,7,8,9-Hexachlorodibenzo(p)dioxin	19408-74-3	No TRV		No TRV	
1,2,3,7,8,9-Hexachlorodibenzofuran	72918-21-9	No TRV		No TRV	
1,2,3,7,8-Pentachlorodibenzo(p)dioxin	40321-76-4	No TRV		No TRV	
1,2,3,7,8-Pentachlorodibenzofuran	57117-41-6	No TRV		No TRV	
2,3,4,6,7,8-Hexachlorodibenzofuran	60851-34-5	No TRV		No TRV	
2,3,4,7,8-Pentachlorodibenzofuran	57117-31-4	No TRV		No TRV	

Table C3-8 Toxicity Reference Values (TRVs) for COPCs and ROPCs

Constituent of Potential Concern	CAS Registry Number	Ingestion, Aquatic Exposures			
		Spotted Sandpiper		Great Blue Heron	
		NOAEL TRV	Source	NOAEL TRV	Source
Dichlorodifluoromethane	75-71-8	No TRV		No TRV	
Dichlorofluoromethane	75-43-4	No TRV		No TRV	
Dichloromethane	75-09-2	No TRV		No TRV	
Difluorodibromomethane	75-61-6	No TRV		No TRV	
Hexafluoroacetone	684-16-2	No TRV		No TRV	
Iodomethane	74-88-4	No TRV		No TRV	
Methylene bromide	74-95-3	No TRV		No TRV	
Pentachloroethane	76-01-7	No TRV		No TRV	
trans-1,2-Dichloroethylene	156-60-5	No TRV		No TRV	
trans-1,3-Dichloropropene	10061-02-6	No TRV		No TRV	
Trichloroacetic acid	76-03-9	No TRV		No TRV	
Trichlorofluoroethane	27154-33-2	No TRV		No TRV	
Trichlorofluoromethane	75-69-4	No TRV		No TRV	
Trifluorobromomethane	75-63-8	No TRV		No TRV	
Dioxin and Furan Compounds (PCDDs/PCDFs)					
1,2,3,4,6,7,8-Heptachlorodibenzo(p)dioxin	35822-46-9	No TRV		No TRV	
1,2,3,4,6,7,8-Heptachlorodibenzofuran	67562-39-4	No TRV		No TRV	
1,2,3,4,7,8,9-Heptachlorodibenzofuran	55673-89-7	No TRV		No TRV	
1,2,3,4,7,8-Hexachlorodibenzo(p)dioxin	39227-28-6	No TRV		No TRV	
1,2,3,4,7,8-Hexachlorodibenzofuran	70648-26-9	No TRV		No TRV	
1,2,3,6,7,8-Hexachlorodibenzo(p)dioxin	57653-85-7	No TRV		No TRV	
1,2,3,6,7,8-Hexachlorodibenzofuran	57117-44-9	No TRV		No TRV	
1,2,3,7,8,9-Hexachlorodibenzo(p)dioxin	19408-74-3	No TRV		No TRV	
1,2,3,7,8,9-Hexachlorodibenzofuran	72918-21-9	No TRV		No TRV	
1,2,3,7,8-Pentachlorodibenzo(p)dioxin	40321-76-4	No TRV		No TRV	
1,2,3,7,8-Pentachlorodibenzofuran	57117-41-6	No TRV		No TRV	
2,3,4,6,7,8-Hexachlorodibenzofuran	60851-34-5	No TRV		No TRV	
2,3,4,7,8-Pentachlorodibenzofuran	57117-31-4	No TRV		No TRV	

Table C3-8 Toxicity Reference Values (TRVs) for COPCs and ROPCs

Constituent of Potential Concern	CAS Registry Number	Ingestion, Aquatic Exposures			
		Bald Eagle		Mink	
		NOAEL TRV	Source	NOAEL TRV	Source
Dichlorodifluoromethane	75-71-8	No TRV		1.50E+04	Sherman (1974) in IRIS (2002)[a]
Dichlorofluoromethane	75-43-4	No TRV		No TRV	
Dichloromethane	75-09-2	No TRV		6.16E+03	National Coffee Association (1982) in IRIS (2002)[a]
Difluorodibromomethane	75-61-6	No TRV		No TRV	
Hexafluoroacetone	684-16-2	No TRV		No TRV	
Iodomethane	74-88-4	No TRV		No TRV	
Methylene bromide	74-95-3	No TRV		No TRV	
Pentachloroethane	76-01-7	No TRV		No TRV	
trans-1,2-Dichloroethylene	156-60-5	No TRV		1.70E+03	Barnes and others (1985) in IRIS (2002)[a]
trans-1,3-Dichloropropene	10061-02-6	No TRV		No TRV	
Trichloroacetic acid	76-03-9	No TRV		No TRV	
Trichlorofluoroethane	27154-33-2	No TRV		No TRV	
Trichlorofluoromethane	75-69-4	No TRV		3.49E+04	NCI (1978) in IRIS (2002)[a]
Trifluorobromomethane	75-63-8	No TRV		No TRV	
Dioxin and Furan Compounds (PCDDs/PCDFs)					
1,2,3,4,6,7,8-Heptachlorodibenzo(p)dioxin	35822-46-9	No TRV		No TRV	
1,2,3,4,6,7,8-Heptachlorodibenzofuran	67562-39-4	No TRV		No TRV	
1,2,3,4,7,8,9-Heptachlorodibenzofuran	55673-89-7	No TRV		No TRV	
1,2,3,4,7,8-Hexachlorodibenzo(p)dioxin	39227-28-6	No TRV		No TRV	
1,2,3,4,7,8-Hexachlorodibenzofuran	70648-26-9	No TRV		No TRV	
1,2,3,6,7,8-Hexachlorodibenzo(p)dioxin	57653-85-7	No TRV		No TRV	
1,2,3,6,7,8-Hexachlorodibenzofuran	57117-44-9	No TRV		1.60E-01	Poiger and others (1989) in Sample and others (1996)[c]
1,2,3,7,8,9-Hexachlorodibenzo(p)dioxin	19408-74-3	No TRV		No TRV	
1,2,3,7,8,9-Hexachlorodibenzofuran	72918-21-9	No TRV		No TRV	
1,2,3,7,8-Pentachlorodibenzo(p)dioxin	40321-76-4	No TRV		No TRV	
1,2,3,7,8-Pentachlorodibenzofuran	57117-41-6	No TRV		1.60E-01	Poiger and others (1989) in Sample and others (1996)[c]
2,3,4,6,7,8-Hexachlorodibenzofuran	60851-34-5	No TRV		No TRV	
2,3,4,7,8-Pentachlorodibenzofuran	57117-31-4	No TRV		1.60E-02	Poiger and others (1989) in Sample and others (1996)[c]

Table C3-8 Toxicity Reference Values (TRVs) for COPCs and ROPCs

Constituent of Potential Concern	CAS Registry Number	Direct Contact, Aquatic Receptors			
		Aquatic Biota		Chinook Salmon and Other Salmonids	
		NOAEL TRV	Source	NOAEL TRV	Source
Dichlorodifluoromethane	75-71-8	No TRV		No TRV	
Dichlorofluoromethane	75-43-4	No TRV		No TRV	
Dichloromethane	75-09-2	2.20E+03	Tier II Chronic (Suter & Tsao 1996)[d]	2.20E+03	Tier II Chronic (Suter & Tsao 1996)[d]
Difluorodibromomethane	75-61-6	No TRV		No TRV	
Hexafluoroacetone	684-16-2	No TRV		No TRV	
Iodomethane	74-88-4	No TRV		No TRV	
Methylene bromide	74-95-3	No TRV		No TRV	
Pentachloroethane	76-01-7	3.90E+01	EPA 1987[b]	3.90E+01	EPA 1987[b]
trans-1,2-Dichloroethylene	156-60-5	No TRV		No TRV	
trans-1,3-Dichloropropene	10061-02-6	No TRV		No TRV	
Trichloroacetic acid	76-03-9	No TRV		No TRV	
Trichlorofluoroethane	27154-33-2	No TRV		No TRV	
Trichlorofluoromethane	75-69-4	No TRV		No TRV	
Trifluorobromomethane	75-63-8	No TRV		No TRV	
Dioxin and Furan Compounds (PCDDs/PCDFs)					
1,2,3,4,6,7,8-Heptachlorodibenzo(p)dioxin	35822-46-9	No TRV		No TRV	
1,2,3,4,6,7,8-Heptachlorodibenzofuran	67562-39-4	No TRV		No TRV	
1,2,3,4,7,8,9-Heptachlorodibenzofuran	55673-89-7	No TRV		No TRV	
1,2,3,4,7,8-Hexachlorodibenzo(p)dioxin	39227-28-6	No TRV		No TRV	
1,2,3,4,7,8-Hexachlorodibenzofuran	70648-26-9	No TRV		No TRV	
1,2,3,6,7,8-Hexachlorodibenzo(p)dioxin	57653-85-7	No TRV		No TRV	
1,2,3,6,7,8-Hexachlorodibenzofuran	57117-44-9	No TRV		No TRV	
1,2,3,7,8,9-Hexachlorodibenzo(p)dioxin	19408-74-3	No TRV		No TRV	
1,2,3,7,8,9-Hexachlorodibenzofuran	72918-21-9	No TRV		No TRV	
1,2,3,7,8-Pentachlorodibenzo(p)dioxin	40321-76-4	No TRV		No TRV	
1,2,3,7,8-Pentachlorodibenzofuran	57117-41-6	No TRV		No TRV	
2,3,4,6,7,8-Hexachlorodibenzofuran	60851-34-5	No TRV		No TRV	
2,3,4,7,8-Pentachlorodibenzofuran	57117-31-4	No TRV		No TRV	

Table C3-8 Toxicity Reference Values (TRVs) for COPCs and ROPCs

Constituent of Potential Concern	CAS Registry Number	Direct Contact, Aquatic Receptors	
		Benthic Organisms	
		NOAEL TRV	Source
Dichlorodifluoromethane	75-71-8	No TRV	
Dichlorofluoromethane	75-43-4	No TRV	
Dichloromethane	75-09-2	8.80E+02	EqP method (Jones and others 1997)[i]
Difluorodibromomethane	75-61-6	No TRV	
Hexafluoroacetone	684-16-2	No TRV	
Iodomethane	74-88-4	No TRV	
Methylene bromide	74-95-3	No TRV	
Pentachloroethane	76-01-7	No TRV	
trans-1,2-Dichloroethylene	156-60-5	No TRV	
trans-1,3-Dichloropropene	10061-02-6	No TRV	
Trichloroacetic acid	76-03-9	No TRV	
Trichlorofluoroethane	27154-33-2	No TRV	
Trichlorofluoromethane	75-69-4	No TRV	
Trifluorobromomethane	75-63-8	No TRV	
Dioxin and Furan Compounds (PCDDs/PCDFs)			
1,2,3,4,6,7,8-Heptachlorodibenzo(p)dioxin	35822-46-9	No TRV	
1,2,3,4,6,7,8-Heptachlorodibenzofuran	67562-39-4	No TRV	
1,2,3,4,7,8,9-Heptachlorodibenzofuran	55673-89-7	No TRV	
1,2,3,4,7,8-Hexachlorodibenzo(p)dioxin	39227-28-6	No TRV	
1,2,3,4,7,8-Hexachlorodibenzofuran	70648-26-9	No TRV	
1,2,3,6,7,8-Hexachlorodibenzo(p)dioxin	57653-85-7	No TRV	
1,2,3,6,7,8-Hexachlorodibenzofuran	57117-44-9	No TRV	
1,2,3,7,8,9-Hexachlorodibenzo(p)dioxin	19408-74-3	No TRV	
1,2,3,7,8,9-Hexachlorodibenzofuran	72918-21-9	No TRV	
1,2,3,7,8-Pentachlorodibenzo(p)dioxin	40321-76-4	No TRV	
1,2,3,7,8-Pentachlorodibenzofuran	57117-41-6	No TRV	
2,3,4,6,7,8-Hexachlorodibenzofuran	60851-34-5	No TRV	
2,3,4,7,8-Pentachlorodibenzofuran	57117-31-4	No TRV	

Table C3-8 Toxicity Reference Values (TRVs) for COPCs and ROPCs

Constituent of Potential Concern	CAS Registry Number	Direct Exposure, Terrestrial Receptors			
		Plant		Terrestrial Invertebrate	
		TRV	Source	TRV	Source
2,3,7,8-Tetrachlorodibenzo(p)dioxin	1746-01-6	No TRV		5.00E+02	EPA 1999[f]
2,3,7,8-Tetrachlorodibenzofuran	51207-31-9	No TRV		No TRV	
Dibenzofuran	132-64-9	No TRV		No TRV	
Octachlorodibenzo(p)dioxin	3268-87-9	No TRV		No TRV	
Octachlorodibenzofuran	39001-02-0	No TRV		No TRV	
Total dioxins and dibenzofurans	No CAS #	No TRV		No TRV	
Polychlorinated Biphenyls (PCBs)					
2,2',3,3',4,4',5-Heptachlorobiphenyl	35065-30-6	No TRV		No TRV	
2,2',3,4,4',5,5'-Heptachlorobiphenyl	35065-29-3	No TRV		No TRV	
2,3,3',4,4',5,5'-Heptachlorobiphenyl	39635-31-9	No TRV		No TRV	
2,3,3',4,4',5'-Hexachlorobiphenyl	69782-90-7	No TRV		No TRV	
2,3,3',4,4',5-Hexachlorobiphenyl	38380-08-4	No TRV		No TRV	
2,3,3',4,4'-Pentachlorobiphenyl	32598-14-4	No TRV		No TRV	
2,3',4,4',5,5'-Hexachlorobiphenyl	52663-72-6	No TRV		No TRV	
2,3,4,4',5-Pentachlorobiphenyl	74472-37-0	No TRV		No TRV	
2',3,4,4',5-Pentachlorobiphenyl	65510-44-3	No TRV		No TRV	
2,3',4,4',5-Pentachlorobiphenyl	31508-00-6	No TRV		No TRV	
3,3',4,4',5,5'-Hexachlorobiphenyl	32774-16-6	No TRV		No TRV	
3,3',4,4',5-Pentachlorobiphenyl	57465-28-8	No TRV		No TRV	
3,3',4,4'-Tetrachlorobiphenyl	32598-13-3	No TRV		No TRV	
3,4,4',5-Tetrachlorobiphenyl	70362-50-4	No TRV		No TRV	
Polychlorinated biphenyls (PCBs)[j]	1336-36-3	1.00E+04	EPA 1999[f]	2.51E+03	EPA 1999[f]
Phthalates					
Bis(2-ethylhexyl) phthalate (DEHP)	117-81-7	No TRV		No TRV	
Butylbenzyl phthalate	85-68-7	No TRV		No TRV	
Dibutyl phthalate	84-74-2	2.00E+05	Efroymson and others (1997a)[e]	No TRV	
Diethyl phthalate	84-66-2	1.00E+05	Efroymson and others (1997a)[e]	No TRV	

Table C3-8 Toxicity Reference Values (TRVs) for COPCs and ROPCs

Constituent of Potential Concern	CAS Registry Number	Ingestion, Terrestrial Exposures			
		Mule Deer		Mourning Dove	
		NOAEL TRV	Source	NOAEL TRV	Source
2,3,7,8-Tetrachlorodibenzo(p)dioxin	1746-01-6	1.00E-03	Murray and others (1979) in Sample and others (1996)[c]	1.00E-02	EPA 1999[f]
2,3,7,8-Tetrachlorodibenzofuran	51207-31-9	No TRV		1.00E-03	McKinney and others (1976) in Sample and others (1996)[c]
Dibenzofuran	132-64-9	No TRV		No TRV	
Octachlorodibenzo(p)dioxin	3268-87-9	No TRV		No TRV	
Octachlorodibenzofuran	39001-02-0	No TRV		No TRV	
Total dioxins and dibenzofurans	No CAS #	No TRV		No TRV	
Polychlorinated Biphenyls (PCBs)					
2,2',3,3',4,4',5-Heptachlorobiphenyl	35065-30-6	No TRV		No TRV	
2,2',3,4,4',5,5'-Heptachlorobiphenyl	35065-29-3	No TRV		No TRV	
2,3,3',4,4',5,5'-Heptachlorobiphenyl	39635-31-9	No TRV		No TRV	
2,3,3',4,4',5'-Hexachlorobiphenyl	69782-90-7	No TRV		No TRV	
2,3,3',4,4',5-Hexachlorobiphenyl	38380-08-4	No TRV		No TRV	
2,3,3',4,4'-Pentachlorobiphenyl	32598-14-4	No TRV		No TRV	
2,3',4,4',5,5'-Hexachlorobiphenyl	52663-72-6	No TRV		No TRV	
2,3,4,4',5-Pentachlorobiphenyl	74472-37-0	No TRV		No TRV	
2',3,4,4',5-Pentachlorobiphenyl	65510-44-3	No TRV		No TRV	
2,3',4,4',5-Pentachlorobiphenyl	31508-00-6	No TRV		No TRV	
3,3',4,4',5,5'-Hexachlorobiphenyl	32774-16-6	No TRV		No TRV	
3,3',4,4',5-Pentachlorobiphenyl	57465-28-8	No TRV		No TRV	
3,3',4,4'-Tetrachlorobiphenyl	32598-13-3	No TRV		No TRV	
3,4,4',5-Tetrachlorobiphenyl	70362-50-4	No TRV		No TRV	
Polychlorinated biphenyls (PCBs)[j]	1336-36-3	2.06E-01	EPA 1999[f]	7.20E+01	EPA 1999[f]
Phthalates					
Bis(2-ethylhexyl) phthalate (DEHP)	117-81-7	6.00E+04	EPA 1999[f]	1.11E+02	EPA 1999[f]
Butylbenzyl phthalate	85-68-7	No TRV		No TRV	
Dibutyl phthalate	84-74-2	5.50E+05	Lamb and others (1987) in Sample and others (1996)[c]	1.11E+02	Peakall (1974) in Sample and others (1996)[c]
Diethyl phthalate	84-66-2	4.58E+06	Lamb and others (1987) in Sample and others (1996)[c]	No TRV	

Table C3-8 Toxicity Reference Values (TRVs) for COPCs and ROPCs

Constituent of Potential Concern	CAS Registry Number	Ingestion, Terrestrial Exposures			
		Great Basin Pocket Mouse		Western Meadowlark	
		NOAEL TRV	Source	NOAEL TRV	Source
2,3,7,8-Tetrachlorodibenzo(p)dioxin	1746-01-6	1.00E-03	Murray and others (1979) in Sample and others (1996)[c]	1.00E-02	EPA 1999[f]
2,3,7,8-Tetrachlorodibenzofuran	51207-31-9	No TRV		1.00E-03	McKinney and others (1976) in Sample and others (1996)[c]
Dibenzofuran	132-64-9	No TRV		No TRV	
Octachlorodibenzo(p)dioxin	3268-87-9	No TRV		No TRV	
Octachlorodibenzofuran	39001-02-0	No TRV		No TRV	
Total dioxins and dibenzofurans	No CAS #	No TRV		No TRV	
Polychlorinated Biphenyls (PCBs)					
2,2',3,3',4,4',5-Heptachlorobiphenyl	35065-30-6	No TRV		No TRV	
2,2',3,4,4',5,5'-Heptachlorobiphenyl	35065-29-3	No TRV		No TRV	
2,3,3',4,4',5,5'-Heptachlorobiphenyl	39635-31-9	No TRV		No TRV	
2,3,3',4,4',5'-Hexachlorobiphenyl	69782-90-7	No TRV		No TRV	
2,3,3',4,4',5-Hexachlorobiphenyl	38380-08-4	No TRV		No TRV	
2,3,3',4,4'-Pentachlorobiphenyl	32598-14-4	No TRV		No TRV	
2,3',4,4',5,5'-Hexachlorobiphenyl	52663-72-6	No TRV		No TRV	
2,3,4,4',5-Pentachlorobiphenyl	74472-37-0	No TRV		No TRV	
2',3,4,4',5-Pentachlorobiphenyl	65510-44-3	No TRV		No TRV	
2,3',4,4',5-Pentachlorobiphenyl	31508-00-6	No TRV		No TRV	
3,3',4,4',5,5'-Hexachlorobiphenyl	32774-16-6	No TRV		No TRV	
3,3',4,4',5-Pentachlorobiphenyl	57465-28-8	No TRV		No TRV	
3,3',4,4'-Tetrachlorobiphenyl	32598-13-3	No TRV		No TRV	
3,4,4',5-Tetrachlorobiphenyl	70362-50-4	No TRV		No TRV	
Polychlorinated biphenyls (PCBs)[j]	1336-36-3	2.06E-01	EPA 1999[f]	7.20E+01	EPA 1999[f]
Phthalates					
Bis(2-ethylhexyl) phthalate (DEHP)	117-81-7	6.00E+04	EPA 1999[f]	1.11E+02	EPA 1999[f]
Butylbenzyl phthalate	85-68-7	No TRV		No TRV	EPA 1999[f]
Dibutyl phthalate	84-74-2	5.50E+05	Lamb and others (1987) in Sample and others (1996)[c]	1.11E+02	Peakall (1974) in Sample and others (1996)[c]
Diethyl phthalate	84-66-2	4.58E+06	Lamb and others (1987) in Sample and others (1996)[c]	No TRV	

Table C3-8 Toxicity Reference Values (TRVs) for COPCs and ROPCs

Constituent of Potential Concern	CAS Registry Number	Ingestion, Terrestrial Exposures			
		Coyote		Burrowing Owl	
		NOAEL TRV	Source	NOAEL TRV	Source
2,3,7,8-Tetrachlorodibenzo(p)dioxin	1746-01-6	1.00E-03	Murray and others (1979) in Sample and others (1996)[c]	1.00E-02	EPA 1999[f]
2,3,7,8-Tetrachlorodibenzofuran	51207-31-9	No TRV		1.00E-03	McKinney and others (1976) in Sample and others (1996)[c]
Dibenzofuran	132-64-9	No TRV		No TRV	
Octachlorodibenzo(p)dioxin	3268-87-9	No TRV		No TRV	
Octachlorodibenzofuran	39001-02-0	No TRV		No TRV	
Total dioxins and dibenzofurans	No CAS #	No TRV		No TRV	
Polychlorinated Biphenyls (PCBs)					
2,2',3,3',4,4',5-Heptachlorobiphenyl	35065-30-6	No TRV		No TRV	
2,2',3,4,4',5,5'-Heptachlorobiphenyl	35065-29-3	No TRV		No TRV	
2,3,3',4,4',5,5'-Heptachlorobiphenyl	39635-31-9	No TRV		No TRV	
2,3,3',4,4',5'-Hexachlorobiphenyl	69782-90-7	No TRV		No TRV	
2,3,3',4,4',5-Hexachlorobiphenyl	38380-08-4	No TRV		No TRV	
2,3,3',4,4'-Pentachlorobiphenyl	32598-14-4	No TRV		No TRV	
2,3',4,4',5,5'-Hexachlorobiphenyl	52663-72-6	No TRV		No TRV	
2,3,4,4',5-Pentachlorobiphenyl	74472-37-0	No TRV		No TRV	
2',3,4,4',5-Pentachlorobiphenyl	65510-44-3	No TRV		No TRV	
2,3',4,4',5-Pentachlorobiphenyl	31508-00-6	No TRV		No TRV	
3,3',4,4',5,5'-Hexachlorobiphenyl	32774-16-6	No TRV		No TRV	
3,3',4,4',5-Pentachlorobiphenyl	57465-28-8	No TRV		No TRV	
3,3',4,4'-Tetrachlorobiphenyl	32598-13-3	No TRV		No TRV	
3,4,4',5-Tetrachlorobiphenyl	70362-50-4	No TRV		No TRV	
Polychlorinated biphenyls (PCBs)[j]	1336-36-3	2.06E-01	EPA 1999[f]	7.20E+01	EPA 1999[f]
Phthalates					
Bis(2-ethylhexyl) phthalate (DEHP)	117-81-7	6.00E+04	EPA 1999[f]	1.11E+02	EPA 1999[f]
Butylbenzyl phthalate	85-68-7	No TRV		No TRV	EPA 1999[f]
Dibutyl phthalate	84-74-2	5.50E+05	Lamb and others (1987) in Sample and others (1996)[c]	1.11E+02	Peakall (1974) in Sample and others (1996)[c]
Diethyl phthalate	84-66-2	4.58E+06	Lamb and others (1987) in Sample and others (1996)[c]	No TRV	

Table C3-8 Toxicity Reference Values (TRVs) for COPCs and ROPCs

Constituent of Potential Concern	CAS Registry Number	Ingestion, Terrestrial Exposures		Ingestion, Aquatic Exposures	
		Red-tailed Hawk		Canada Goose	
		NOAEL TRV	Source	NOAEL TRV	Source
2,3,7,8-Tetrachlorodibenzo(p)dioxin	1746-01-6	1.00E-02	EPA 1999[f]	1.00E-02	EPA 1999[f]
2,3,7,8-Tetrachlorodibenzofuran	51207-31-9	1.00E-03	McKinney and others (1976) in Sample and others (1996)[c]	1.00E-03	McKinney and others (1976) in Sample and others (1996)[c]
Dibenzofuran	132-64-9	No TRV		No TRV	
Octachlorodibenzo(p)dioxin	3268-87-9	No TRV		No TRV	
Octachlorodibenzofuran	39001-02-0	No TRV		No TRV	
Total dioxins and dibenzofurans	No CAS #	No TRV		No TRV	
Polychlorinated Biphenyls (PCBs)					
2,2',3,3',4,4',5-Heptachlorobiphenyl	35065-30-6	No TRV		No TRV	
2,2',3,4,4',5,5'-Heptachlorobiphenyl	35065-29-3	No TRV		No TRV	
2,3,3',4,4',5,5'-Heptachlorobiphenyl	39635-31-9	No TRV		No TRV	
2,3,3',4,4',5'-Hexachlorobiphenyl	69782-90-7	No TRV		No TRV	
2,3,3',4,4',5-Hexachlorobiphenyl	38380-08-4	No TRV		No TRV	
2,3,3',4,4'-Pentachlorobiphenyl	32598-14-4	No TRV		No TRV	
2,3',4,4',5,5'-Hexachlorobiphenyl	52663-72-6	No TRV		No TRV	
2,3,4,4',5-Pentachlorobiphenyl	74472-37-0	No TRV		No TRV	
2',3,4,4',5-Pentachlorobiphenyl	65510-44-3	No TRV		No TRV	
2,3',4,4',5-Pentachlorobiphenyl	31508-00-6	No TRV		No TRV	
3,3',4,4',5,5'-Hexachlorobiphenyl	32774-16-6	No TRV		No TRV	
3,3',4,4',5-Pentachlorobiphenyl	57465-28-8	No TRV		No TRV	
3,3',4,4'-Tetrachlorobiphenyl	32598-13-3	No TRV		No TRV	
3,4,4',5-Tetrachlorobiphenyl	70362-50-4	No TRV		No TRV	
Polychlorinated biphenyls (PCBs)[j]	1336-36-3	7.20E+01	EPA 1999[f]	7.20E+01	EPA 1999[f]
Phthalates					
Bis(2-ethylhexyl) phthalate (DEHP)	117-81-7	1.11E+02	EPA 1999[f]	1.11E+02	EPA 1999[f]
Butylbenzyl phthalate	85-68-7	No TRV	EPA 1999[f]	No TRV	EPA 1999[f]
Dibutyl phthalate	84-74-2	1.11E+02	Peakall (1974) in Sample and others (1996)[c]	1.11E+02	Peakall (1974) in Sample and others (1996)[c]
Diethyl phthalate	84-66-2	No TRV		No TRV	

Table C3-8 Toxicity Reference Values (TRVs) for COPCs and ROPCs

Constituent of Potential Concern	CAS Registry Number	Ingestion, Aquatic Exposures			
		Spotted Sandpiper		Great Blue Heron	
		NOAEL TRV	Source	NOAEL TRV	Source
2,3,7,8-Tetrachlorodibenzo(p)dioxin	1746-01-6	1.00E-02	EPA 1999[f]	1.00E-02	EPA 1999[f]
2,3,7,8-Tetrachlorodibenzofuran	51207-31-9	1.00E-03	McKinney and others (1976) in Sample and others (1996)[c]	1.00E-03	McKinney and others (1976) in Sample and others (1996)[c]
Dibenzofuran	132-64-9	No TRV		No TRV	
Octachlorodibenzo(p)dioxin	3268-87-9	No TRV		No TRV	
Octachlorodibenzofuran	39001-02-0	No TRV		No TRV	
Total dioxins and dibenzofurans	No CAS #	No TRV		No TRV	
Polychlorinated Biphenyls (PCBs)					
2,2',3,3',4,4',5-Heptachlorobiphenyl	35065-30-6	No TRV		No TRV	
2,2',3,4,4',5,5'-Heptachlorobiphenyl	35065-29-3	No TRV		No TRV	
2,3,3',4,4',5,5'-Heptachlorobiphenyl	39635-31-9	No TRV		No TRV	
2,3,3',4,4',5'-Hexachlorobiphenyl	69782-90-7	No TRV		No TRV	
2,3,3',4,4',5-Hexachlorobiphenyl	38380-08-4	No TRV		No TRV	
2,3,3',4,4'-Pentachlorobiphenyl	32598-14-4	No TRV		No TRV	
2,3',4,4',5,5'-Hexachlorobiphenyl	52663-72-6	No TRV		No TRV	
2,3,4,4',5-Pentachlorobiphenyl	74472-37-0	No TRV		No TRV	
2',3,4,4',5-Pentachlorobiphenyl	65510-44-3	No TRV		No TRV	
2,3',4,4',5-Pentachlorobiphenyl	31508-00-6	No TRV		No TRV	
3,3',4,4',5,5'-Hexachlorobiphenyl	32774-16-6	No TRV		No TRV	
3,3',4,4',5-Pentachlorobiphenyl	57465-28-8	No TRV		No TRV	
3,3',4,4'-Tetrachlorobiphenyl	32598-13-3	No TRV		No TRV	
3,4,4',5-Tetrachlorobiphenyl	70362-50-4	No TRV		No TRV	
Polychlorinated biphenyls (PCBs)[j]	1336-36-3	7.20E+01	EPA 1999[f]	7.20E+01	EPA 1999[f]
Phthalates					
Bis(2-ethylhexyl) phthalate (DEHP)	117-81-7	1.11E+02	EPA 1999[f]	1.11E+02	EPA 1999[f]
Butylbenzyl phthalate	85-68-7	No TRV	EPA 1999[f]	No TRV	EPA 1999[f]
Dibutyl phthalate	84-74-2	1.11E+02	Peakall (1974) in Sample and others (1996)[c]	1.11E+02	Peakall (1974) in Sample and others (1996)[c]
Diethyl phthalate	84-66-2	No TRV		No TRV	

Table C3-8 Toxicity Reference Values (TRVs) for COPCs and ROPCs

Constituent of Potential Concern	CAS Registry Number	Ingestion, Aquatic Exposures			
		Bald Eagle		Mink	
		NOAEL TRV	Source	NOAEL TRV	Source
2,3,7,8-Tetrachlorodibenzo(p)dioxin	1746-01-6	1.00E-02	EPA 1999[f]	1.00E-03	Murray and others (1979) in Sample and others (1996)[c]
2,3,7,8-Tetrachlorodibenzofuran	51207-31-9	1.00E-03	McKinney and others (1976) in Sample and others (1996)[c]	No TRV	
Dibenzofuran	132-64-9	No TRV		No TRV	
Octachlorodibenzo(p)dioxin	3268-87-9	No TRV		No TRV	
Octachlorodibenzofuran	39001-02-0	No TRV		No TRV	
Total dioxins and dibenzofurans	No CAS #	No TRV		No TRV	
Polychlorinated Biphenyls (PCBs)					
2,2',3,3',4,4',5-Heptachlorobiphenyl	35065-30-6	No TRV		No TRV	
2,2',3,4,4',5,5'-Heptachlorobiphenyl	35065-29-3	No TRV		No TRV	
2,3,3',4,4',5,5'-Heptachlorobiphenyl	39635-31-9	No TRV		No TRV	
2,3,3',4,4',5'-Hexachlorobiphenyl	69782-90-7	No TRV		No TRV	
2,3,3',4,4',5-Hexachlorobiphenyl	38380-08-4	No TRV		No TRV	
2,3,3',4,4'-Pentachlorobiphenyl	32598-14-4	No TRV		No TRV	
2,3',4,4',5,5'-Hexachlorobiphenyl	52663-72-6	No TRV		No TRV	
2,3,4,4',5-Pentachlorobiphenyl	74472-37-0	No TRV		No TRV	
2',3,4,4',5-Pentachlorobiphenyl	65510-44-3	No TRV		No TRV	
2,3',4,4',5-Pentachlorobiphenyl	31508-00-6	No TRV		No TRV	
3,3',4,4',5,5'-Hexachlorobiphenyl	32774-16-6	No TRV		No TRV	
3,3',4,4',5-Pentachlorobiphenyl	57465-28-8	No TRV		No TRV	
3,3',4,4'-Tetrachlorobiphenyl	32598-13-3	No TRV		No TRV	
3,4,4',5-Tetrachlorobiphenyl	70362-50-4	No TRV		No TRV	
Polychlorinated biphenyls (PCBs)[j]	1336-36-3	7.20E+01	EPA 1999[f]	2.06E-01	EPA 1999[f]
Phthalates					
Bis(2-ethylhexyl) phthalate (DEHP)	117-81-7	1.11E+02	EPA 1999[f]	6.00E+04	EPA 1999[f]
Butylbenzyl phthalate	85-68-7	No TRV	EPA 1999[f]	No TRV	
Dibutyl phthalate	84-74-2	1.11E+02	Peakall (1974) in Sample and others (1996)[c]	5.50E+05	Lamb and others (1987) in Sample and others (1996)[c]
Diethyl phthalate	84-66-2	No TRV		4.58E+06	Lamb and others (1987) in Sample and others (1996)[c]

Table C3-8 Toxicity Reference Values (TRVs) for COPCs and ROPCs

Constituent of Potential Concern	CAS Registry Number	Direct Contact, Aquatic Receptors			
		Aquatic Biota		Chinook Salmon and Other Salmonids	
		NOAEL TRV	Source	NOAEL TRV	Source
2,3,7,8-Tetrachlorodibenzo(p)dioxin	1746-01-6	3.80E-06	EPA 1999[f]	3.80E-06	EPA 1999[f]
2,3,7,8-Tetrachlorodibenzofuran	51207-31-9	No TRV		No TRV	
Dibenzofuran	132-64-9	3.70E+00	Tier II Chronic (Suter & Tsao 1996)[d]	3.70E+00	Tier II Chronic (Suter & Tsao 1996)[d]
Octachlorodibenzo(p)dioxin	3268-87-9	No TRV		No TRV	
Octachlorodibenzofuran	39001-02-0	No TRV		No TRV	
Total dioxins and dibenzofurans	No CAS #	No TRV		No TRV	
	Polychlorinated Biphenyls (PCBs)				
2,2',3,3',4,4',5-Heptachlorobiphenyl	35065-30-6	No TRV		No TRV	
2,2',3,4,4',5,5'-Heptachlorobiphenyl	35065-29-3	No TRV		No TRV	
2,3,3',4,4',5,5'-Heptachlorobiphenyl	39635-31-9	No TRV		No TRV	
2,3,3',4,4',5'-Hexachlorobiphenyl	69782-90-7	No TRV		No TRV	
2,3,3',4,4',5-Hexachlorobiphenyl	38380-08-4	No TRV		No TRV	
2,3,3',4,4'-Pentachlorobiphenyl	32598-14-4	No TRV		No TRV	
2,3',4,4',5,5'-Hexachlorobiphenyl	52663-72-6	No TRV		No TRV	
2,3,4,4',5-Pentachlorobiphenyl	74472-37-0	No TRV		No TRV	
2',3,4,4',5-Pentachlorobiphenyl	65510-44-3	No TRV		No TRV	
2,3',4,4',5-Pentachlorobiphenyl	31508-00-6	No TRV		No TRV	
3,3',4,4',5,5'-Hexachlorobiphenyl	32774-16-6	No TRV		No TRV	
3,3',4,4',5-Pentachlorobiphenyl	57465-28-8	No TRV		No TRV	
3,3',4,4'-Tetrachlorobiphenyl	32598-13-3	No TRV		No TRV	
3,4,4',5-Tetrachlorobiphenyl	70362-50-4	No TRV		No TRV	
Polychlorinated biphenyls (PCBs)[j]	1336-36-3	1.40E-01	Tier II Chronic (Suter & Tsao 1996)[d]	1.40E-01	Tier II Chronic (Suter & Tsao 1996)[d]
	Phthalates				
Bis(2-ethylhexyl) phthalate (DEHP)	117-81-7	3.00E+00	EPA 1999[f]	3.00E+00	EPA 1999[f]
Butylbenzyl phthalate	85-68-7	1.90E+01	Tier II Chronic (Suter & Tsao 1996)[d]	1.90E+01	Tier II Chronic (Suter & Tsao 1996)[d]
Dibutyl phthalate	84-74-2	3.50E+01	Tier II Chronic (Suter & Tsao 1996)[d]	3.50E+01	Tier II Chronic (Suter & Tsao 1996)[d]
Diethyl phthalate	84-66-2	2.10E+02	Tier II Chronic (Suter & Tsao 1996)[d]	2.10E+02	Tier II Chronic (Suter & Tsao 1996)[d]

Table C3-8 Toxicity Reference Values (TRVs) for COPCs and ROPCs

Constituent of Potential Concern	CAS Registry Number	Direct Contact, Aquatic Receptors	
		Benthic Organisms	
		NOAEL TRV	Source
2,3,7,8-Tetrachlorodibenzo(p)dioxin	1746-01-6	4.10E-01	EPA 1999[f]
2,3,7,8-Tetrachlorodibenzofuran	51207-31-9	No TRV	
Dibenzofuran	132-64-9	3.20E+04	Ecology (1994) in EPA (1999a)
Octachlorodibenzo(p)dioxin	3268-87-9	No TRV	
Octachlorodibenzofuran	39001-02-0	No TRV	
Total dioxins and dibenzofurans	No CAS #	No TRV	
Polychlorinated Biphenyls (PCBs)			
2,2',3,3',4,4',5-Heptachlorobiphenyl	35065-30-6	No TRV	
2,2',3,4,4',5,5'-Heptachlorobiphenyl	35065-29-3	No TRV	
2,3,3',4,4',5,5'-Heptachlorobiphenyl	39635-31-9	No TRV	
2,3,3',4,4',5'-Hexachlorobiphenyl	69782-90-7	No TRV	
2,3,3',4,4',5-Hexachlorobiphenyl	38380-08-4	No TRV	
2,3,3',4,4'-Pentachlorobiphenyl	32598-14-4	No TRV	
2,3',4,4',5,5'-Hexachlorobiphenyl	52663-72-6	No TRV	
2,3,4,4',5-Pentachlorobiphenyl	74472-37-0	No TRV	
2',3,4,4',5-Pentachlorobiphenyl	65510-44-3	No TRV	
2,3',4,4',5-Pentachlorobiphenyl	31508-00-6	No TRV	
3,3',4,4',5,5'-Hexachlorobiphenyl	32774-16-6	No TRV	
3,3',4,4',5-Pentachlorobiphenyl	57465-28-8	No TRV	
3,3',4,4'-Tetrachlorobiphenyl	32598-13-3	No TRV	
3,4,4',5-Tetrachlorobiphenyl	70362-50-4	No TRV	
Polychlorinated biphenyls (PCBs)[j]	1336-36-3	7.00E+01	Persaud and others (1993)[k]
Phthalates			
Bis(2-ethylhexyl) phthalate (DEHP)	117-81-7	1.33E+04	EPA 1999[f]
Butylbenzyl phthalate	85-68-7	1.04E+04	EqP method (Jones and others 1997)[i]
Dibutyl phthalate	84-74-2	2.20E+03	EPA 1999[f]
Diethyl phthalate	84-66-2	6.89E+02	EqP method (Jones and others 1997)[i]

Table C3-8 Toxicity Reference Values (TRVs) for COPCs and ROPCs

Constituent of Potential Concern	CAS Registry Number	Direct Exposure, Terrestrial Receptors			
		Plant		Terrestrial Invertebrate	
		TRV	Source	TRV	Source
Dimethyl phthalate	131-11-3	No TRV		2.00E+05	Efroymson and others (1997b)[h]
n-Dioctyl phthalate	117-84-0	No TRV		No TRV	
Light Polycyclic Aromatic Hydrocarbons (molecular weight <200 g/mole)					
2-Chloronaphthalene	91-58-7	No TRV		No TRV	
2-Methyl naphthalene	91-57-6	No TRV		No TRV	
5-Nitroacenaphthene	602-87-9	No TRV		No TRV	
Acenaphthene	83-32-9	2.00E+04	Efroymson and others (1997a)[e]	No TRV	
Acenaphthylene	208-96-8	No TRV		No TRV	
Anthracene	120-12-7	No TRV		No TRV	
Fluorene	86-73-7	No TRV		3.00E+04	Efroymson and others (1997b)[h]
Indene	95-13-6	No TRV		No TRV	
Naphthalene	91-20-3	No TRV		No TRV	
Phenanthrene	85-01-8	No TRV		No TRV	
Pyrene	129-00-0	No TRV		No TRV	
Heavy Polycyclic Aromatic Hydrocarbons (molecular weight >200 g/mole)					
3-Methylcholanthrene	56-49-5	No TRV		No TRV	
5-Methylchrysene	3697-24-3	No TRV		No TRV	
Benzo[a]anthracene	56-55-3	1.20E+03	EPA 1999[f]	2.50E+04	EPA 1999[f]
Benzo[a]pyrene	50-32-8	1.20E+03	EPA 1999[f]	2.50E+04	EPA 1999[f]
Benzo[a,i]pyrene	191-30-0	No TRV		No TRV	
Benzo[b]fluoranthene	205-99-2	1.20E+03	EPA 1999[f]	2.50E+04	EPA 1999[f]
Benzo[e]pyrene	192-97-2	No TRV		No TRV	
Benzo[g,h,i]perylene	191-24-2	No TRV		No TRV	
Benzo[j]fluoranthene	205-82-3	No TRV		No TRV	
Benzo[k]fluoranthene	207-08-9	1.20E+03	EPA 1999[f]	2.50E+04	EPA 1999[f]
Chrysene	218-01-9	1.20E+03	EPA 1999[f]	2.50E+04	EPA 1999[f]
Dibenz[a,h]acridine	226-36-8	No TRV		No TRV	

Table C3-8 Toxicity Reference Values (TRVs) for COPCs and ROPCs

Constituent of Potential Concern	CAS Registry Number	Ingestion, Terrestrial Exposures			
		Mule Deer		Mourning Dove	
		NOAEL TRV	Source	NOAEL TRV	Source
Dimethyl phthalate	131-11-3	No TRV		No TRV	
n-Dioctyl phthalate	117-84-0	7.50E+06	EPA 1999[f]	No TRV	
Light Polycyclic Aromatic Hydrocarbons (molecular weight <200 g/mole)					
2-Chloronaphthalene	91-58-7	2.50E+05	US EPA (1989a) in IRIS (2002)[a]	No TRV	
2-Methyl naphthalene	91-57-6	No TRV		No TRV	
5-Nitroacenaphthene	602-87-9	No TRV		No TRV	
Acenaphthene	83-32-9	1.75E+04	US EPA (1989b) in IRIS (2002)[a]	No TRV	
Acenaphthylene	208-96-8	No TRV		No TRV	
Anthracene	120-12-7	1.00E+05	US EPA (1989c) in IRIS (2002)[a]	No TRV	
Fluorene	86-73-7	1.25E+04	US EPA (1989d) in IRIS (2002)[a]	No TRV	
Indene	95-13-6	No TRV		No TRV	
Naphthalene	91-20-3	7.10E+03	BCL (1980) in IRIS (2002)[a]	No TRV	
Phenanthrene	85-01-8	No TRV		No TRV	
Pyrene	129-00-0	7.50E+03	US EPA (1989e) in IRIS (2002)[a]	No TRV	
Heavy Polycyclic Aromatic Hydrocarbons (molecular weight >200 g/mole)					
3-Methylcholanthrene	56-49-5	No TRV		No TRV	
5-Methylchrysene	3697-24-3	No TRV		No TRV	
Benzo[a]anthracene	56-55-3	1.67E+02	EPA 1999[f]	7.90E-01	EPA 1999[f]
Benzo[a]pyrene	50-32-8	1.00E+02	EPA 1999[f]	1.00E+00	EPA 1999[f]
Benzo[a,i]pyrene	191-30-0	No TRV		No TRV	
Benzo[b]fluoranthene	205-99-2	No TRV		1.40E-01	EPA 1999[f]
Benzo[e]pyrene	192-97-2	No TRV		No TRV	
Benzo[g,h,i]perylene	191-24-2	No TRV		No TRV	
Benzo[j]fluoranthene	205-82-3	No TRV		No TRV	
Benzo[k]fluoranthene	207-08-9	No TRV		1.40E-01	EPA 1999[f]
Chrysene	218-01-9	No TRV		1.00E+00	EPA 1999[f]
Dibenz[a,h]acridine	226-36-8	No TRV		No TRV	

Table C3-8 Toxicity Reference Values (TRVs) for COPCs and ROPCs

Constituent of Potential Concern	CAS Registry Number	Ingestion, Terrestrial Exposures			
		Great Basin Pocket Mouse		Western Meadowlark	
		NOAEL TRV	Source	NOAEL TRV	Source
Dimethyl phthalate	131-11-3	No TRV		No TRV	
n-Dioctyl phthalate	117-84-0	7.50E+06	EPA 1999[f]	No TRV	
Light Polycyclic Aromatic Hydrocarbons (molecular weight <200 g/mole)					
2-Chloronaphthalene	91-58-7	2.50E+05	US EPA (1989a) in IRIS (2002)[a]	No TRV	
2-Methyl naphthalene	91-57-6	No TRV		No TRV	
5-Nitroacenaphthene	602-87-9	No TRV		No TRV	
Acenaphthene	83-32-9	1.75E+04	US EPA (1989b) in IRIS (2002)[a]	No TRV	
Acenaphthylene	208-96-8	No TRV		No TRV	
Anthracene	120-12-7	1.00E+05	US EPA (1989c) in IRIS (2002)[a]	No TRV	
Fluorene	86-73-7	1.25E+04	US EPA (1989d) in IRIS (2002)[a]	No TRV	
Indene	95-13-6	No TRV		No TRV	
Naphthalene	91-20-3	7.10E+03	BCL (1980) in IRIS (2002)[a]	No TRV	
Phenanthrene	85-01-8	No TRV		No TRV	
Pyrene	129-00-0	7.50E+03	US EPA (1989e) in IRIS (2002)[a]	No TRV	
Heavy Polycyclic Aromatic Hydrocarbons (molecular weight >200 g/mole)					
3-Methylcholanthrene	56-49-5	No TRV		No TRV	
5-Methylchrysene	3697-24-3	No TRV		No TRV	
Benzo[a]anthracene	56-55-3	1.67E+02	EPA 1999[f]	7.90E-01	EPA 1999[f]
Benzo[a]pyrene	50-32-8	1.00E+02	EPA 1999[f]	1.00E+00	EPA 1999[f]
Benzo[a,i]pyrene	191-30-0	No TRV		No TRV	
Benzo[b]fluoranthene	205-99-2	No TRV		1.40E-01	EPA 1999[f]
Benzo[e]pyrene	192-97-2	No TRV		No TRV	
Benzo[g,h,i]perylene	191-24-2	No TRV		No TRV	
Benzo[j]fluoranthene	205-82-3	No TRV		No TRV	
Benzo[k]fluoranthene	207-08-9	No TRV		1.40E-01	EPA 1999[f]
Chrysene	218-01-9	No TRV		1.00E+00	EPA 1999[f]
Dibenz[a,h]acridine	226-36-8	No TRV		No TRV	

Table C3-8 Toxicity Reference Values (TRVs) for COPCs and ROPCs

Constituent of Potential Concern	CAS Registry Number	Ingestion, Terrestrial Exposures			
		Coyote		Burrowing Owl	
		NOAEL TRV	Source	NOAEL TRV	Source
Dimethyl phthalate	131-11-3	No TRV		No TRV	
n-Dioctyl phthalate	117-84-0	7.50E+06	EPA 1999[f]	No TRV	
Light Polycyclic Aromatic Hydrocarbons (molecular weight <200 g/mole)					
2-Chloronaphthalene	91-58-7	2.50E+05	US EPA (1989a) in IRIS (2002)[a]	No TRV	
2-Methyl naphthalene	91-57-6	No TRV		No TRV	
5-Nitroacenaphthene	602-87-9	No TRV		No TRV	
Acenaphthene	83-32-9	1.75E+04	US EPA (1989b) in IRIS (2002)[a]	No TRV	
Acenaphthylene	208-96-8	No TRV		No TRV	
Anthracene	120-12-7	1.00E+05	US EPA (1989c) in IRIS (2002)[a]	No TRV	
Fluorene	86-73-7	1.25E+04	US EPA (1989d) in IRIS (2002)[a]	No TRV	
Indene	95-13-6	No TRV		No TRV	
Naphthalene	91-20-3	7.10E+03	BCL (1980) in IRIS (2002)[a]	No TRV	
Phenanthrene	85-01-8	No TRV		No TRV	
Pyrene	129-00-0	7.50E+03	US EPA (1989e) in IRIS (2002)[a]	No TRV	
Heavy Polycyclic Aromatic Hydrocarbons (molecular weight >200 g/mole)					
3-Methylcholanthrene	56-49-5	No TRV		No TRV	
5-Methylchrysene	3697-24-3	No TRV		No TRV	
Benzo[a]anthracene	56-55-3	1.67E+02	EPA 1999[f]	7.90E-01	EPA 1999[f]
Benzo[a]pyrene	50-32-8	1.00E+02	EPA 1999[f]	1.00E+00	EPA 1999[f]
Benzo[a,i]pyrene	191-30-0	No TRV		No TRV	
Benzo[b]fluoranthene	205-99-2	No TRV		1.40E-01	EPA 1999[f]
Benzo[e]pyrene	192-97-2	No TRV		No TRV	
Benzo[g,h,i]perylene	191-24-2	No TRV		No TRV	
Benzo[j]fluoranthene	205-82-3	No TRV		No TRV	
Benzo[k]fluoranthene	207-08-9	No TRV		1.40E-01	EPA 1999[f]
Chrysene	218-01-9	No TRV		1.00E+00	EPA 1999[f]
Dibenz[a,h]acridine	226-36-8	No TRV		No TRV	

Table C3-8 Toxicity Reference Values (TRVs) for COPCs and ROPCs

Constituent of Potential Concern	CAS Registry Number	Ingestion, Terrestrial Exposures		Ingestion, Aquatic Exposures	
		Red-tailed Hawk		Canada Goose	
		NOAEL TRV	Source	NOAEL TRV	Source
Dimethyl phthalate	131-11-3	No TRV		No TRV	
n-Dioctyl phthalate	117-84-0	No TRV		No TRV	
Light Polycyclic Aromatic Hydrocarbons (molecular weight <200 g/mole)					
2-Chloronaphthalene	91-58-7	No TRV		No TRV	
2-Methyl naphthalene	91-57-6	No TRV		No TRV	
5-Nitroacenaphthene	602-87-9	No TRV		No TRV	
Acenaphthene	83-32-9	No TRV		No TRV	
Acenaphthylene	208-96-8	No TRV		No TRV	
Anthracene	120-12-7	No TRV		No TRV	
Fluorene	86-73-7	No TRV		No TRV	
Indene	95-13-6	No TRV		No TRV	
Naphthalene	91-20-3	No TRV		No TRV	
Phenanthrene	85-01-8	No TRV		No TRV	
Pyrene	129-00-0	No TRV		No TRV	
Heavy Polycyclic Aromatic Hydrocarbons (molecular weight >200 g/mole)					
3-Methylcholanthrene	56-49-5	No TRV		No TRV	
5-Methylchrysene	3697-24-3	No TRV		No TRV	
Benzo[a]anthracene	56-55-3	7.90E-01	EPA 1999[f]	7.90E-01	EPA 1999[f]
Benzo[a]pyrene	50-32-8	1.00E+00	EPA 1999[f]	1.00E+00	EPA 1999[f]
Benzo[a,i]pyrene	191-30-0	No TRV		No TRV	
Benzo[b]fluoranthene	205-99-2	1.40E-01	EPA 1999[f]	1.40E-01	EPA 1999[f]
Benzo[e]pyrene	192-97-2	No TRV		No TRV	
Benzo[g,h,i]perylene	191-24-2	No TRV		No TRV	
Benzo[j]fluoranthene	205-82-3	No TRV		No TRV	
Benzo[k]fluoranthene	207-08-9	1.40E-01	EPA 1999[f]	1.40E-01	EPA 1999[f]
Chrysene	218-01-9	1.00E+00	EPA 1999[f]	1.00E+00	EPA 1999[f]
Dibenz[a,h]acridine	226-36-8	No TRV		No TRV	

Table C3-8 Toxicity Reference Values (TRVs) for COPCs and ROPCs

Constituent of Potential Concern	CAS Registry Number	Ingestion, Aquatic Exposures			
		Spotted Sandpiper		Great Blue Heron	
		NOAEL TRV	Source	NOAEL TRV	Source
Dimethyl phthalate	131-11-3	No TRV		No TRV	
n-Dioctyl phthalate	117-84-0	No TRV		No TRV	
Light Polycyclic Aromatic Hydrocarbons (molecular weight <200 g/mole)					
2-Chloronaphthalene	91-58-7	No TRV		No TRV	
2-Methyl naphthalene	91-57-6	No TRV		No TRV	
5-Nitroacenaphthene	602-87-9	No TRV		No TRV	
Acenaphthene	83-32-9	No TRV		No TRV	
Acenaphthylene	208-96-8	No TRV		No TRV	
Anthracene	120-12-7	No TRV		No TRV	
Fluorene	86-73-7	No TRV		No TRV	
Indene	95-13-6	No TRV		No TRV	
Naphthalene	91-20-3	No TRV		No TRV	
Phenanthrene	85-01-8	No TRV		No TRV	
Pyrene	129-00-0	No TRV		No TRV	
Heavy Polycyclic Aromatic Hydrocarbons (molecular weight >200 g/mole)					
3-Methylcholanthrene	56-49-5	No TRV		No TRV	
5-Methylchrysene	3697-24-3	No TRV		No TRV	
Benzo[a]anthracene	56-55-3	7.90E-01	EPA 1999[f]	7.90E-01	EPA 1999[f]
Benzo[a]pyrene	50-32-8	1.00E+00	EPA 1999[f]	1.00E+00	EPA 1999[f]
Benzo[a,i]pyrene	191-30-0	No TRV		No TRV	
Benzo[b]fluoranthene	205-99-2	1.40E-01	EPA 1999[f]	1.40E-01	EPA 1999[f]
Benzo[e]pyrene	192-97-2	No TRV		No TRV	
Benzo[g,h,i]perylene	191-24-2	No TRV		No TRV	
Benzo[j]fluoranthene	205-82-3	No TRV		No TRV	
Benzo[k]fluoranthene	207-08-9	1.40E-01	EPA 1999[f]	1.40E-01	EPA 1999[f]
Chrysene	218-01-9	1.00E+00	EPA 1999[f]	1.00E+00	EPA 1999[f]
Dibenz[a,h]acridine	226-36-8	No TRV		No TRV	

Table C3-8 Toxicity Reference Values (TRVs) for COPCs and ROPCs

Constituent of Potential Concern	CAS Registry Number	Ingestion, Aquatic Exposures			
		Bald Eagle		Mink	
		NOAEL TRV	Source	NOAEL TRV	Source
Dimethyl phthalate	131-11-3	No TRV		No TRV	
n-Dioctyl phthalate	117-84-0	No TRV		7.50E+06	EPA 1999[f]
Light Polycyclic Aromatic Hydrocarbons (molecular weight <200 g/mole)					
2-Chloronaphthalene	91-58-7	No TRV		2.50E+05	US EPA (1989a) in IRIS (2002)[a]
2-Methyl naphthalene	91-57-6	No TRV		No TRV	
5-Nitroacenaphthene	602-87-9	No TRV		No TRV	
Acenaphthene	83-32-9	No TRV		1.75E+04	US EPA (1989b) in IRIS (2002)[a]
Acenaphthylene	208-96-8	No TRV		No TRV	
Anthracene	120-12-7	No TRV		1.00E+05	US EPA (1989c) in IRIS (2002)[a]
Fluorene	86-73-7	No TRV		1.25E+04	US EPA (1989d) in IRIS (2002)[a]
Indene	95-13-6	No TRV		No TRV	
Naphthalene	91-20-3	No TRV		7.10E+03	BCL (1980) in IRIS (2002)[a]
Phenanthrene	85-01-8	No TRV		No TRV	
Pyrene	129-00-0	No TRV		7.50E+03	US EPA (1989e) in IRIS (2002)[a]
Heavy Polycyclic Aromatic Hydrocarbons (molecular weight >200 g/mole)					
3-Methylcholanthrene	56-49-5	No TRV		No TRV	
5-Methylchrysene	3697-24-3	No TRV		No TRV	
Benzo[a]anthracene	56-55-3	7.90E-01	EPA 1999[f]	1.67E+02	EPA 1999[f]
Benzo[a]pyrene	50-32-8	1.00E+00	EPA 1999[f]	1.00E+02	EPA 1999[f]
Benzo[a,i]pyrene	191-30-0	No TRV		No TRV	
Benzo[b]fluoranthene	205-99-2	1.40E-01	EPA 1999[f]	No TRV	
Benzo[e]pyrene	192-97-2	No TRV		No TRV	
Benzo[g,h,i]perylene	191-24-2	No TRV		No TRV	
Benzo[j]fluoranthene	205-82-3	No TRV		No TRV	
Benzo[k]fluoranthene	207-08-9	1.40E-01	EPA 1999[f]	No TRV	
Chrysene	218-01-9	1.00E+00	EPA 1999[f]	No TRV	
Dibenz[a,h]acridine	226-36-8	No TRV		No TRV	

Table C3-8 Toxicity Reference Values (TRVs) for COPCs and ROPCs

Constituent of Potential Concern	CAS Registry Number	Direct Contact, Aquatic Receptors			
		Aquatic Biota		Chinook Salmon and Other Salmonids	
		NOAEL TRV	Source	NOAEL TRV	Source
Dimethyl phthalate	131-11-3	No TRV		4.00E-04	Chronic LOAEL for rainbow trout (Suter and Tsao 1996[d] Table C-1) × 0.1 for LOAEL-to-NOAEL conversion
n-Dioctyl phthalate	117-84-0	3.20E+02	EPA 1999[f]	3.20E+02	EPA 1999[f]
Light Polycyclic Aromatic Hydrocarbons (molecular weight <200 g/mole)					
2-Chloronaphthalene	91-58-7	No TRV		No TRV	
2-Methyl naphthalene	91-57-6	No TRV		No TRV	
5-Nitroacenaphthene	602-87-9	No TRV		No TRV	
Acenaphthene	83-32-9	2.30E+01	Tier II Chronic (Suter & Tsao 1996)[d]	2.30E+01	NAWQC Chronic (Suter & Tsao 1996)[d]
Acenaphthylene	208-96-8	No TRV		No TRV	
Anthracene	120-12-7	7.30E-01	Tier II Chronic (Suter & Tsao 1996)[d]	7.30E-01	Tier II Chronic (Suter & Tsao 1996)[d]
Fluorene	86-73-7	3.90E+00	Tier II Chronic (Suter & Tsao 1996)[d]	3.90E+00	Tier II Chronic (Suter & Tsao 1996)[d]
Indene	95-13-6	No TRV		No TRV	
Naphthalene	91-20-3	1.20E+01	Tier II Chronic (Suter & Tsao 1996)[d]	1.20E+01	Tier II Chronic (Suter & Tsao 1996)[d]
Phenanthrene	85-01-8	6.30E+00	NAWQC Chronic (Suter & Tsao 1996)[d]	6.30E+00	NAWQC Chronic (Suter & Tsao 1996)[d]
Pyrene	129-00-0	No TRV		No TRV	
Heavy Polycyclic Aromatic Hydrocarbons (molecular weight >200 g/mole)					
3-Methylcholanthrene	56-49-5	No TRV		No TRV	
5-Methylchrysene	3697-24-3	No TRV		No TRV	
Benzo[a]anthracene	56-55-3	2.70E-02	EPA 1999[f]	2.70E-02	EPA 1999[f]
Benzo[a]pyrene	50-32-8	1.40E-02	EPA 1999[f]	1.40E-02	EPA 1999[f]
Benzo[a,i]pyrene	191-30-0	No TRV		No TRV	
Benzo[b]fluoranthene	205-99-2	2.70E-02	EPA 1999[f]	2.70E-02	EPA 1999[f]
Benzo[e]pyrene	192-97-2	No TRV		No TRV	
Benzo[g,h,i]perylene	191-24-2	No TRV		No TRV	
Benzo[j]fluoranthene	205-82-3	No TRV		No TRV	
Benzo[k]fluoranthene	207-08-9	2.70E-02	EPA 1999[f]	2.70E-02	EPA 1999[f]
Chrysene	218-01-9	2.70E-02	EPA 1999[f]	2.70E-02	EPA 1999[f]
Dibenz[a,h]acridine	226-36-8	No TRV		No TRV	

Table C3-8 Toxicity Reference Values (TRVs) for COPCs and ROPCs

Constituent of Potential Concern	CAS Registry Number	Direct Contact, Aquatic Receptors	
		Benthic Organisms	
		NOAEL TRV	Source
Dimethyl phthalate	131-11-3	No TRV	
n-Dioctyl phthalate	117-84-0	1.16E+10	EPA 1999[f]
Light Polycyclic Aromatic Hydrocarbons (molecular weight <200 g/mole)			
2-Chloronaphthalene	91-58-7	No TRV	
2-Methyl naphthalene	91-57-6	7.00E+01	NOAA (ER-L) Jones and others 1997[i]
5-Nitroacenaphthene	602-87-9	No TRV	
Acenaphthene	83-32-9	4.60E+01	NOAA (ER-L) Jones and others 1997[i]
Acenaphthylene	208-96-8	4.40E+01	NOAA (ER-L) Jones and others 1997[i]
Anthracene	120-12-7	2.20E+02	Persaud and others (1993)[k]
Fluorene	86-73-7	1.90E+02	Persaud and others (1993)[k]
Indene	95-13-6	No TRV	
Naphthalene	91-20-3	1.60E+02	NOAA (ER-L) Jones and others 1997[i]
Phenanthrene	85-01-8	5.60E+02	Persaud and others (1993)[k]
Pyrene	129-00-0	4.90E+02	Persaud and others (1993)[k]
Heavy Polycyclic Aromatic Hydrocarbons (molecular weight >200 g/mole)			
3-Methylcholanthrene	56-49-5	No TRV	
5-Methylchrysene	3697-24-3	No TRV	
Benzo[a]anthracene	56-55-3	1.90E+01	EPA 1999[f]
Benzo[a]pyrene	50-32-8	8.40E+01	EPA 1999[f]
Benzo[a,i]pyrene	191-30-0	No TRV	
Benzo[b]fluoranthene	205-99-2	3.70E+01	EPA 1999[f]
Benzo[e]pyrene	192-97-2	No TRV	
Benzo[g,h,i]perylene	191-24-2	1.70E+02	Persaud and others (1993)[k]
Benzo[j]fluoranthene	205-82-3	No TRV	
Benzo[k]fluoranthene	207-08-9	3.70E+01	EPA 1999[f]
Chrysene	218-01-9	3.00E+01	EPA 1999[f]
Dibenz[a,h]acridine	226-36-8	No TRV	

Table C3-8 Toxicity Reference Values (TRVs) for COPCs and ROPCs

Constituent of Potential Concern	CAS Registry Number	Direct Exposure, Terrestrial Receptors			
		Plant		Terrestrial Invertebrate	
		TRV	Source	TRV	Source
Dibenz[a,h]anthracene	53-70-3	1.20E+03	EPA 1999[f]	2.50E+04	EPA 1999[f]
Dibenz[a,j]acridine	224-42-0	No TRV		No TRV	
Dibenzo[a,e]fluoranthene	5385-75-1	No TRV		No TRV	
Dibenzo[a,e]pyrene	192-65-4	No TRV		No TRV	
Dibenzo[a,h]fluoranthene	No CAS #	No TRV		No TRV	
Dibenzo[a,h]pyrene	189-64-0	No TRV		No TRV	
Dibenzo[a,i]pyrene	189-55-9	No TRV		No TRV	
Fluoranthene	206-44-0	No TRV		No TRV	
Hexachloronaphthalene	1335-87-1	No TRV		No TRV	
Indeno[1,2,3-cd]pyrene	193-39-5	1.20E+03	EPA 1999[f]	2.50E+04	EPA 1999[f]
Octachloronaphthalene	2234-13-1	No TRV		No TRV	
Pentachloronaphthalene	1321-64-8	No TRV		No TRV	
Tetrachloronaphthalene	1335-88-2	No TRV		No TRV	
Trichloronaphthalene	1321-65-9	No TRV		No TRV	
Light Substituted Benzene Compounds (molecular weight <200 g/mole)					
1,2,3-Trichlorobenzene	87-61-6	No TRV		2.00E+04	Efroymson and others (1997b)[h]
1,2,4-Trichlorobenzene	120-82-1	No TRV		2.00E+04	Efroymson and others (1997b)[h]
1,2,4-Trimethyl benzene	95-63-6	No TRV		No TRV	
1,2-Dichlorobenzene	95-50-1	No TRV		No TRV	
1,3,5-Trimethyl benzene	108-67-8	No TRV		No TRV	
1,3-Dichlorobenzene	541-73-1	No TRV		No TRV	
1,3-Dinitrobenzene	99-65-0	No TRV		2.26E+03	EPA 1999[f]
1,4-Dichlorobenzene	106-46-7	No TRV		2.00E+04	Efroymson and others (1997b)[h]
1,4-Dinitrobenzene	100-25-4	No TRV		No TRV	
2,4,5-Trichlorophenol	95-95-4	4.00E+03	Efroymson and others (1997a)[e]	9.00E+03	Efroymson and others (1997b)[h]
2,4,6-Trichlorophenol	88-06-2	No TRV		1.00E+04	Efroymson and others (1997b)[h]
2,4-Dichlorophenol	120-83-2	No TRV		No TRV	
2,4-Dimethylphenol	105-67-9	No TRV		No TRV	
2,4-Dinitrophenol	51-28-5	2.00E+04	Efroymson and others (1997a)[e]	No TRV	
2,4-Dinitrotoluene	121-14-2	No TRV		No TRV	

Table C3-8 Toxicity Reference Values (TRVs) for COPCs and ROPCs

Constituent of Potential Concern	CAS Registry Number	Ingestion, Terrestrial Exposures			
		Mule Deer		Mourning Dove	
		NOAEL TRV	Source	NOAEL TRV	Source
Dibenz[a,h]anthracene	53-70-3	2.00E+00	EPA 1999[f]	3.90E-01	EPA 1999[f]
Dibenz[a,j]acridine	224-42-0	No TRV		No TRV	
Dibenzo[a,e]fluoranthene	5385-75-1	No TRV		No TRV	
Dibenzo[a,e]pyrene	192-65-4	No TRV		No TRV	
Dibenzo[a,h]fluoranthene	No CAS #	No TRV		No TRV	
Dibenzo[a,h]pyrene	189-64-0	No TRV		No TRV	
Dibenzo[a,i]pyrene	189-55-9	No TRV		No TRV	
Fluoranthene	206-44-0	1.25E+04	US EPA (1988) in IRIS (2002)[a]	No TRV	
Hexachloronaphthalene	1335-87-1	No TRV		No TRV	
Indeno[1,2,3-cd]pyrene	193-39-5	No TRV		1.00E+00	EPA 1999[f]
Octachloronaphthalene	2234-13-1	No TRV		No TRV	
Pentachloronaphthalene	1321-64-8	No TRV		No TRV	
Tetrachloronaphthalene	1335-88-2	No TRV		No TRV	
Trichloronaphthalene	1321-65-9	No TRV		No TRV	
Light Substituted Benzene Compounds (molecular weight <200 g/mole)					
1,2,3-Trichlorobenzene	87-61-6	No TRV		No TRV	
1,2,4-Trichlorobenzene	120-82-1	No TRV		No TRV	
1,2,4-Trimethyl benzene	95-63-6	No TRV		No TRV	
1,2-Dichlorobenzene	95-50-1	8.57E+04	NTP (1985b) in IRIS (2002)[a]	No TRV	
1,3,5-Trimethyl benzene	108-67-8	No TRV		No TRV	
1,3-Dichlorobenzene	541-73-1	No TRV		No TRV	
1,3-Dinitrobenzene	99-65-0	1.05E+03	EPA 1999[f]	4.22E-01	EPA 1999[f]
1,4-Dichlorobenzene	106-46-7	No TRV		No TRV	
1,4-Dinitrobenzene	100-25-4	No TRV		No TRV	
2,4,5-Trichlorophenol	95-95-4	1.00E+04	McCollister and others (1961) in IRIS (2002)[a]	No TRV	
2,4,6-Trichlorophenol	88-06-2	No TRV		No TRV	
2,4-Dichlorophenol	120-83-2	3.00E+01	Exon and Koller (1985) in IRIS (2002)[a]	No TRV	
2,4-Dimethylphenol	105-67-9	5.00E+03	US EPA (1989f) in IRIS (2002)[a]	No TRV	
2,4-Dinitrophenol	51-28-5	2.00E+02	Horner (1942) in IRIS (2002)[a]	No TRV	
2,4-Dinitrotoluene	121-14-2	3.50E+04	EPA 1999[f]	No TRV	

Table C3-8 Toxicity Reference Values (TRVs) for COPCs and ROPCs

Constituent of Potential Concern	CAS Registry Number	Ingestion, Terrestrial Exposures			
		Great Basin Pocket Mouse		Western Meadowlark	
		NOAEL TRV	Source	NOAEL TRV	Source
Dibenz[a,h]anthracene	53-70-3	2.00E+00	EPA 1999[f]	3.90E-01	EPA 1999[f]
Dibenz[a,j]acridine	224-42-0	No TRV		No TRV	
Dibenzo[a,e]fluoranthene	5385-75-1	No TRV		No TRV	
Dibenzo[a,e]pyrene	192-65-4	No TRV		No TRV	
Dibenzo[a,h]fluoranthene	No CAS #	No TRV		No TRV	
Dibenzo[a,h]pyrene	189-64-0	No TRV		No TRV	
Dibenzo[a,i]pyrene	189-55-9	No TRV		No TRV	
Fluoranthene	206-44-0	1.25E+04	US EPA (1988) in IRIS (2002)[a]	No TRV	
Hexachloronaphthalene	1335-87-1	No TRV		No TRV	
Indeno[1,2,3-cd]pyrene	193-39-5	No TRV		1.00E+00	EPA 1999[f]
Octachloronaphthalene	2234-13-1	No TRV		No TRV	
Pentachloronaphthalene	1321-64-8	No TRV		No TRV	
Tetrachloronaphthalene	1335-88-2	No TRV		No TRV	
Trichloronaphthalene	1321-65-9	No TRV		No TRV	
Light Substituted Benzene Compounds (molecular weight <200 g/mole)					
1,2,3-Trichlorobenzene	87-61-6	No TRV		No TRV	
1,2,4-Trichlorobenzene	120-82-1	No TRV		No TRV	
1,2,4-Trimethyl benzene	95-63-6	No TRV		No TRV	
1,2-Dichlorobenzene	95-50-1	8.57E+04	NTP (1985b) in IRIS (2002)[a]	No TRV	
1,3,5-Trimethyl benzene	108-67-8	No TRV		No TRV	
1,3-Dichlorobenzene	541-73-1	No TRV		No TRV	
1,3-Dinitrobenzene	99-65-0	1.05E+03	EPA 1999[f]	4.22E-01	EPA 1999[f]
1,4-Dichlorobenzene	106-46-7	No TRV		No TRV	
1,4-Dinitrobenzene	100-25-4	No TRV		No TRV	
2,4,5-Trichlorophenol	95-95-4	1.00E+04	McCollister and others (1961) in IRIS (2002)[a]	No TRV	
2,4,6-Trichlorophenol	88-06-2	No TRV		No TRV	
2,4-Dichlorophenol	120-83-2	3.00E+01	Exon and Koller (1985) in IRIS (2002)[a]	No TRV	
2,4-Dimethylphenol	105-67-9	5.00E+03	US EPA (1989f) in IRIS (2002)[a]	No TRV	
2,4-Dinitrophenol	51-28-5	2.00E+02	Horner (1942) in IRIS (2002)[a]	No TRV	
2,4-Dinitrotoluene	121-14-2	3.50E+04	EPA 1999[f]	No TRV	

Table C3-8 Toxicity Reference Values (TRVs) for COPCs and ROPCs

Constituent of Potential Concern	CAS Registry Number	Ingestion, Terrestrial Exposures			
		Coyote		Burrowing Owl	
		NOAEL TRV	Source	NOAEL TRV	Source
Dibenz[a,h]anthracene	53-70-3	2.00E+00	EPA 1999[f]	3.90E-01	EPA 1999[f]
Dibenz[a,j]acridine	224-42-0	No TRV		No TRV	
Dibenzo[a,e]fluoranthene	5385-75-1	No TRV		No TRV	
Dibenzo[a,e]pyrene	192-65-4	No TRV		No TRV	
Dibenzo[a,h]fluoranthene	No CAS #	No TRV		No TRV	
Dibenzo[a,h]pyrene	189-64-0	No TRV		No TRV	
Dibenzo[a,i]pyrene	189-55-9	No TRV		No TRV	
Fluoranthene	206-44-0	1.25E+04	US EPA (1988) in IRIS (2002)[a]	No TRV	
Hexachloronaphthalene	1335-87-1	No TRV		No TRV	
Indeno[1,2,3-cd]pyrene	193-39-5	No TRV		1.00E+00	EPA 1999[f]
Octachloronaphthalene	2234-13-1	No TRV		No TRV	
Pentachloronaphthalene	1321-64-8	No TRV		No TRV	
Tetrachloronaphthalene	1335-88-2	No TRV		No TRV	
Trichloronaphthalene	1321-65-9	No TRV		No TRV	
Light Substituted Benzene Compounds (molecular weight <200 g/mole)					
1,2,3-Trichlorobenzene	87-61-6	No TRV		No TRV	
1,2,4-Trichlorobenzene	120-82-1	No TRV		No TRV	
1,2,4-Trimethyl benzene	95-63-6	No TRV		No TRV	
1,2-Dichlorobenzene	95-50-1	8.57E+04	NTP (1985b) in IRIS (2002)[a]	No TRV	
1,3,5-Trimethyl benzene	108-67-8	No TRV		No TRV	
1,3-Dichlorobenzene	541-73-1	No TRV		No TRV	
1,3-Dinitrobenzene	99-65-0	1.05E+03	EPA 1999[f]	4.22E-01	EPA 1999[f]
1,4-Dichlorobenzene	106-46-7	No TRV		No TRV	
1,4-Dinitrobenzene	100-25-4	No TRV		No TRV	
2,4,5-Trichlorophenol	95-95-4	1.00E+04	McCollister and others (1961) in IRIS (2002)[a]	No TRV	
2,4,6-Trichlorophenol	88-06-2	No TRV		No TRV	
2,4-Dichlorophenol	120-83-2	3.00E+01	Exon and Koller (1985) in IRIS (2002)[a]	No TRV	
2,4-Dimethylphenol	105-67-9	5.00E+03	US EPA (1989f) in IRIS (2002)[a]	No TRV	
2,4-Dinitrophenol	51-28-5	2.00E+02	Horner (1942) in IRIS (2002)[a]	No TRV	
2,4-Dinitrotoluene	121-14-2	3.50E+04	EPA 1999[f]	No TRV	

Table C3-8 Toxicity Reference Values (TRVs) for COPCs and ROPCs

Constituent of Potential Concern	CAS Registry Number	Ingestion, Terrestrial Exposures		Ingestion, Aquatic Exposures	
		Red-tailed Hawk		Canada Goose	
		NOAEL TRV	Source	NOAEL TRV	Source
Dibenz[a,h]anthracene	53-70-3	3.90E-01	EPA 1999[f]	3.90E-01	EPA 1999[f]
Dibenz[a,j]acridine	224-42-0	No TRV		No TRV	
Dibenzo[a,e]fluoranthene	5385-75-1	No TRV		No TRV	
Dibenzo[a,e]pyrene	192-65-4	No TRV		No TRV	
Dibenzo[a,h]fluoranthene	No CAS #	No TRV		No TRV	
Dibenzo[a,h]pyrene	189-64-0	No TRV		No TRV	
Dibenzo[a,i]pyrene	189-55-9	No TRV		No TRV	
Fluoranthene	206-44-0	No TRV		No TRV	
Hexachloronaphthalene	1335-87-1	No TRV		No TRV	
Indeno[1,2,3-cd]pyrene	193-39-5	1.00E+00	EPA 1999[f]	1.00E+00	EPA 1999[f]
Octachloronaphthalene	2234-13-1	No TRV		No TRV	
Pentachloronaphthalene	1321-64-8	No TRV		No TRV	
Tetrachloronaphthalene	1335-88-2	No TRV		No TRV	
Trichloronaphthalene	1321-65-9	No TRV		No TRV	
Light Substituted Benzene Compounds (molecular weight <200 g/mole)					
1,2,3-Trichlorobenzene	87-61-6	No TRV		No TRV	
1,2,4-Trichlorobenzene	120-82-1	No TRV		No TRV	
1,2,4-Trimethyl benzene	95-63-6	No TRV		No TRV	
1,2-Dichlorobenzene	95-50-1	No TRV		No TRV	
1,3,5-Trimethyl benzene	108-67-8	No TRV		No TRV	
1,3-Dichlorobenzene	541-73-1	No TRV		No TRV	
1,3-Dinitrobenzene	99-65-0	4.22E-01	EPA 1999[f]	4.22E-01	EPA 1999[f]
1,4-Dichlorobenzene	106-46-7	No TRV		No TRV	
1,4-Dinitrobenzene	100-25-4	No TRV		No TRV	
2,4,5-Trichlorophenol	95-95-4	No TRV		No TRV	
2,4,6-Trichlorophenol	88-06-2	No TRV		No TRV	
2,4-Dichlorophenol	120-83-2	No TRV		No TRV	
2,4-Dimethylphenol	105-67-9	No TRV		No TRV	
2,4-Dinitrophenol	51-28-5	No TRV		No TRV	
2,4-Dinitrotoluene	121-14-2	No TRV		No TRV	

Table C3-8 Toxicity Reference Values (TRVs) for COPCs and ROPCs

Constituent of Potential Concern	CAS Registry Number	Ingestion, Aquatic Exposures			
		Spotted Sandpiper		Great Blue Heron	
		NOAEL TRV	Source	NOAEL TRV	Source
Dibenz[a,h]anthracene	53-70-3	3.90E-01	EPA 1999[f]	3.90E-01	EPA 1999[f]
Dibenz[a,j]acridine	224-42-0	No TRV		No TRV	
Dibenzo[a,e]fluoranthene	5385-75-1	No TRV		No TRV	
Dibenzo[a,e]pyrene	192-65-4	No TRV		No TRV	
Dibenzo[a,h]fluoranthene	No CAS #	No TRV		No TRV	
Dibenzo[a,h]pyrene	189-64-0	No TRV		No TRV	
Dibenzo[a,i]pyrene	189-55-9	No TRV		No TRV	
Fluoranthene	206-44-0	No TRV		No TRV	
Hexachloronaphthalene	1335-87-1	No TRV		No TRV	
Indeno[1,2,3-cd]pyrene	193-39-5	1.00E+00	EPA 1999[f]	1.00E+00	EPA 1999[f]
Octachloronaphthalene	2234-13-1	No TRV		No TRV	
Pentachloronaphthalene	1321-64-8	No TRV		No TRV	
Tetrachloronaphthalene	1335-88-2	No TRV		No TRV	
Trichloronaphthalene	1321-65-9	No TRV		No TRV	
Light Substituted Benzene Compounds (molecular weight <200 g/mole)					
1,2,3-Trichlorobenzene	87-61-6	No TRV		No TRV	
1,2,4-Trichlorobenzene	120-82-1	No TRV		No TRV	
1,2,4-Trimethyl benzene	95-63-6	No TRV		No TRV	
1,2-Dichlorobenzene	95-50-1	No TRV		No TRV	
1,3,5-Trimethyl benzene	108-67-8	No TRV		No TRV	
1,3-Dichlorobenzene	541-73-1	No TRV		No TRV	
1,3-Dinitrobenzene	99-65-0	4.22E-01	EPA 1999[f]	4.22E-01	EPA 1999[f]
1,4-Dichlorobenzene	106-46-7	No TRV		No TRV	
1,4-Dinitrobenzene	100-25-4	No TRV		No TRV	
2,4,5-Trichlorophenol	95-95-4	No TRV		No TRV	
2,4,6-Trichlorophenol	88-06-2	No TRV		No TRV	
2,4-Dichlorophenol	120-83-2	No TRV		No TRV	
2,4-Dimethylphenol	105-67-9	No TRV		No TRV	
2,4-Dinitrophenol	51-28-5	No TRV		No TRV	
2,4-Dinitrotoluene	121-14-2	No TRV		No TRV	

Table C3-8 Toxicity Reference Values (TRVs) for COPCs and ROPCs

Constituent of Potential Concern	CAS Registry Number	Ingestion, Aquatic Exposures			
		Bald Eagle		Mink	
		NOAEL TRV	Source	NOAEL TRV	Source
Dibenz[a,h]anthracene	53-70-3	3.90E-01	EPA 1999[f]	2.00E+00	EPA 1999[f]
Dibenz[a,j]acridine	224-42-0	No TRV		No TRV	
Dibenzo[a,e]fluoranthene	5385-75-1	No TRV		No TRV	
Dibenzo[a,e]pyrene	192-65-4	No TRV		No TRV	
Dibenzo[a,h]fluoranthene	No CAS #	No TRV		No TRV	
Dibenzo[a,h]pyrene	189-64-0	No TRV		No TRV	
Dibenzo[a,i]pyrene	189-55-9	No TRV		No TRV	
Fluoranthene	206-44-0	No TRV		1.25E+04	US EPA (1988) in IRIS (2002)[a]
Hexachloronaphthalene	1335-87-1	No TRV		No TRV	
Indeno[1,2,3-cd]pyrene	193-39-5	1.00E+00	EPA 1999[f]	No TRV	
Octachloronaphthalene	2234-13-1	No TRV		No TRV	
Pentachloronaphthalene	1321-64-8	No TRV		No TRV	
Tetrachloronaphthalene	1335-88-2	No TRV		No TRV	
Trichloronaphthalene	1321-65-9	No TRV		No TRV	
Light Substituted Benzene Compounds (molecular weight <200 g/mole)					
1,2,3-Trichlorobenzene	87-61-6	No TRV		No TRV	
1,2,4-Trichlorobenzene	120-82-1	No TRV		No TRV	
1,2,4-Trimethyl benzene	95-63-6	No TRV		No TRV	
1,2-Dichlorobenzene	95-50-1	No TRV		8.57E+04	NTP (1985b) in IRIS (2002)[a]
1,3,5-Trimethyl benzene	108-67-8	No TRV		No TRV	
1,3-Dichlorobenzene	541-73-1	No TRV		No TRV	
1,3-Dinitrobenzene	99-65-0	4.22E-01	EPA 1999[f]	1.05E+03	EPA 1999[f]
1,4-Dichlorobenzene	106-46-7	No TRV		No TRV	
1,4-Dinitrobenzene	100-25-4	No TRV		No TRV	
2,4,5-Trichlorophenol	95-95-4	No TRV		1.00E+04	McCollister and others (1961) in IRIS (2002)[a]
2,4,6-Trichlorophenol	88-06-2	No TRV		No TRV	
2,4-Dichlorophenol	120-83-2	No TRV		3.00E+01	Exon and Koller (1985) in IRIS (2002)[a]
2,4-Dimethylphenol	105-67-9	No TRV		5.00E+03	US EPA (1989f) in IRIS (2002)[a]
2,4-Dinitrophenol	51-28-5	No TRV		2.00E+02	Horner (1942) in IRIS (2002)[a]
2,4-Dinitrotoluene	121-14-2	No TRV		3.50E+04	EPA 1999[f]

Table C3-8 Toxicity Reference Values (TRVs) for COPCs and ROPCs

Constituent of Potential Concern	CAS Registry Number	Direct Contact, Aquatic Receptors			
		Aquatic Biota		Chinook Salmon and Other Salmonids	
		NOAEL TRV	Source	NOAEL TRV	Source
Dibenz[a,h]anthracene	53-70-3	2.70E-02	EPA 1999[f]	2.70E-02	EPA 1999[f]
Dibenz[a,j]acridine	224-42-0	No TRV		No TRV	
Dibenzo[a,e]fluoranthene	5385-75-1	No TRV		No TRV	
Dibenzo[a,e]pyrene	192-65-4	No TRV		No TRV	
Dibenzo[a,h]fluoranthene	No CAS #	No TRV		No TRV	
Dibenzo[a,h]pyrene	189-64-0	No TRV		No TRV	
Dibenzo[a,i]pyrene	189-55-9	No TRV		No TRV	
Fluoranthene	206-44-0	6.16E+00	NAWQC Chronic (Suter & Tsao 1996)[d]	6.16E+00	NAWQC Chronic (Suter & Tsao 1996)[d]
Hexachloronaphthalene	1335-87-1	No TRV		No TRV	
Indeno[1,2,3-cd]pyrene	193-39-5	2.70E-02	EPA 1999[f]	2.70E-02	EPA 1999[f]
Octachloronaphthalene	2234-13-1	No TRV		No TRV	
Pentachloronaphthalene	1321-64-8	No TRV		No TRV	
Tetrachloronaphthalene	1335-88-2	No TRV		No TRV	
Trichloronaphthalene	1321-65-9	No TRV		No TRV	
Light Substituted Benzene Compounds (molecular weight <200 g/mole)					
1,2,3-Trichlorobenzene	87-61-6	No TRV		No TRV	
1,2,4-Trichlorobenzene	120-82-1	1.10E+02	Tier II Chronic (Suter & Tsao 1996)[d]	1.10E+02	Tier II Chronic (Suter & Tsao 1996)[d]
1,2,4-Trimethyl benzene	95-63-6	No TRV		No TRV	
1,2-Dichlorobenzene	95-50-1	1.40E+01	Tier II Chronic (Suter & Tsao 1996)[d]	1.40E+01	Tier II Chronic (Suter & Tsao 1996)[d]
1,3,5-Trimethyl benzene	108-67-8	No TRV		No TRV	
1,3-Dichlorobenzene	541-73-1	7.10E+01	Tier II Chronic (Suter & Tsao 1996)[d]	7.10E+01	Tier II Chronic (Suter & Tsao 1996)[d]
1,3-Dinitrobenzene	99-65-0	2.60E+01	EPA 1999[f]	2.60E+01	EPA 1999[f]
1,4-Dichlorobenzene	106-46-7	1.50E+01	Tier II Chronic (Suter & Tsao 1996)[d]	1.50E+01	Tier II Chronic (Suter & Tsao 1996)[d]
1,4-Dinitrobenzene	100-25-4	No TRV		No TRV	
2,4,5-Trichlorophenol	95-95-4	No TRV		No TRV	
2,4,6-Trichlorophenol	88-06-2	9.70E+00	EPA 1987[b]	9.70E+00	EPA 1987[b]
2,4-Dichlorophenol	120-83-2	3.65E+01	EPA 1987[b]	3.65E+01	EPA 1987[b]
2,4-Dimethylphenol	105-67-9	2.12E+01	EPA 1987[b]	2.12E+01	EPA 1987[b]
2,4-Dinitrophenol	51-28-5	No TRV		No TRV	
2,4-Dinitrotoluene	121-14-2	2.30E+01	EPA 1999[f]	2.30E+01	EPA 1999[f]

Table C3-8 Toxicity Reference Values (TRVs) for COPCs and ROPCs

Constituent of Potential Concern	CAS Registry Number	Direct Contact, Aquatic Receptors	
		Benthic Organisms	
		NOAEL TRV	Source
Dibenz[a,h]anthracene	53-70-3	1.00E+01	EPA 1999[f]
Dibenz[a,j]acridine	224-42-0	No TRV	
Dibenzo[a,e]fluoranthene	5385-75-1	No TRV	
Dibenzo[a,e]pyrene	192-65-4	No TRV	
Dibenzo[a,h]fluoranthene	No CAS #	No TRV	
Dibenzo[a,h]pyrene	189-64-0	No TRV	
Dibenzo[a,i]pyrene	189-55-9	No TRV	
Fluoranthene	206-44-0	7.50E+02	Persaud and others (1993)[k]
Hexachloronaphthalene	1335-87-1	No TRV	
Indeno[1,2,3-cd]pyrene	193-39-5	3.00E+01	EPA 1999[f]
Octachloronaphthalene	2234-13-1	No TRV	
Pentachloronaphthalene	1321-64-8	No TRV	
Tetrachloronaphthalene	1335-88-2	No TRV	
Trichloronaphthalene	1321-65-9	No TRV	
Light Substituted Benzene Compounds (molecular weight <200 g/mole)			
1,2,3-Trichlorobenzene	87-61-6	No TRV	
1,2,4-Trichlorobenzene	120-82-1	7.30E+03	EqP method (Jones and others 1997)[i]
1,2,4-Trimethyl benzene	95-63-6	No TRV	
1,2-Dichlorobenzene	95-50-1	2.12E+02	EqP method (Jones and others 1997)[i]
1,3,5-Trimethyl benzene	108-67-8	No TRV	
1,3-Dichlorobenzene	541-73-1	2.28E+03	EqP method (Jones and others 1997)[i]
1,3-Dinitrobenzene	99-65-0	2.14E+01	EPA 1999[f]
1,4-Dichlorobenzene	106-46-7	3.70E+02	EqP method (Jones and others 1997)[i]
1,4-Dinitrobenzene	100-25-4	No TRV	
2,4,5-Trichlorophenol	95-95-4	No TRV	
2,4,6-Trichlorophenol	88-06-2	No TRV	
2,4-Dichlorophenol	120-83-2	No TRV	
2,4-Dimethylphenol	105-67-9	No TRV	
2,4-Dinitrophenol	51-28-5	No TRV	
2,4-Dinitrotoluene	121-14-2	4.69E+01	EPA 1999[f]

Table C3-8 Toxicity Reference Values (TRVs) for COPCs and ROPCs

Constituent of Potential Concern	CAS Registry Number	Direct Exposure, Terrestrial Receptors			
		Plant		Terrestrial Invertebrate	
		TRV	Source	TRV	Source
2,6-Dinitrotoluene	606-20-2	No TRV		No TRV	
2-Chlorophenol	95-57-8	No TRV		No TRV	
2-Chlorotoluene	95-49-8	No TRV		No TRV	
2-Nitrophenol	88-75-5	No TRV		No TRV	
4,6-Dinitro-o-cresol	534-52-1	No TRV		No TRV	
4-Chlorotoluene	106-43-4	No TRV		No TRV	
4-Nitrophenol	100-02-7	No TRV		7.00E+03	Efroymson and others (1997b)[h]
alpha-Methylstyrene	98-83-9	No TRV		No TRV	
Aniline	62-53-3	No TRV		No TRV	
Benzotrichloride	98-07-7	No TRV		No TRV	
Benzyl chloride	100-44-7	No TRV		No TRV	
Bromobenzene	108-86-1	No TRV		No TRV	
Chlorobenzene	108-90-7	No TRV		4.00E+04	Efroymson and others (1997b)[h]
Cumene	98-82-8	No TRV		No TRV	
m-Cresol	108-39-4	No TRV		No TRV	
n-Butyl benzene	104-51-8	No TRV		No TRV	
Nitrobenzene	98-95-3	No TRV		2.26E+03	EPA 1999[f]
n-Propyl benzene	103-65-1	No TRV		No TRV	
o-Cresol	95-48-7	No TRV		No TRV	
o-Dinitrobenzene	528-29-0	No TRV		No TRV	
o-Nitroaniline	88-74-4	No TRV		No TRV	
o-Toluidine	95-53-4	No TRV		No TRV	
p-Chloroaniline	106-47-8	No TRV		3.00E+04	Efroymson and others (1997b)[h]
p-Cresol	106-44-5	No TRV		No TRV	
Phenol	108-95-2	7.00E+04	Efroymson and others (1997a)[e]	3.00E+04	Efroymson and others (1997b)[h]

Table C3-8 Toxicity Reference Values (TRVs) for COPCs and ROPCs

Constituent of Potential Concern	CAS Registry Number	Ingestion, Terrestrial Exposures			
		Mule Deer		Mourning Dove	
		NOAEL TRV	Source	NOAEL TRV	Source
2,6-Dinitrotoluene	606-20-2	4.00E+01	EPA 1999[f]	No TRV	
2-Chlorophenol	95-57-8	No TRV		No TRV	
2-Chlorotoluene	95-49-8	2.00E+04	Gibson and others (1974) in IRIS (2002)[a]	No TRV	
2-Nitrophenol	88-75-5	No TRV		No TRV	
4,6-Dinitro-o-cresol	534-52-1	No TRV		No TRV	
4-Chlorotoluene	106-43-4	No TRV		No TRV	
4-Nitrophenol	100-02-7	No TRV		No TRV	
alpha-Methylstyrene	98-83-9	No TRV		No TRV	
Aniline	62-53-3	No TRV		No TRV	
Benzotrichloride	98-07-7	No TRV		No TRV	
Benzyl chloride	100-44-7	No TRV		No TRV	
Bromobenzene	108-86-1	No TRV		No TRV	
Chlorobenzene	108-90-7	1.90E+04	Monsanto Co. (1967), Knapp and others (1971) in IRIS (2002)[a]	No TRV	
Cumene	98-82-8	1.10E+05	Wolf and others (1956) in IRIS (2002)[a]	No TRV	
m-Cresol	108-39-4	5.00E+03	US EPA (1986g, 1987b) in IRIS (2002)[a]	No TRV	
n-Butyl benzene	104-51-8	No TRV		No TRV	
Nitrobenzene	98-95-3	4.60E+01	CIIT (1984) in IRIS (2002)[a]	No TRV	
n-Propyl benzene	103-65-1	No TRV		No TRV	
o-Cresol	95-48-7	5.00E+03	US EPA (1986g, 1987b) in IRIS (2002)[a]	No TRV	
o-Dinitrobenzene	528-29-0	No TRV		No TRV	
o-Nitroaniline	88-74-4	No TRV		No TRV	
o-Toluidine	95-53-4	No TRV		No TRV	
p-Chloroaniline	106-47-8	1.25E+03	NCI (1979a) in IRIS (2002)[a]	No TRV	
p-Cresol	106-44-5	No TRV		No TRV	
Phenol	108-95-2	6.00E+04	NTP (1983c) in IRIS (2002)[a]	No TRV	

Table C3-8 Toxicity Reference Values (TRVs) for COPCs and ROPCs

Constituent of Potential Concern	CAS Registry Number	Ingestion, Terrestrial Exposures			
		Great Basin Pocket Mouse		Western Meadowlark	
		NOAEL TRV	Source	NOAEL TRV	Source
2,6-Dinitrotoluene	606-20-2	4.00E+01	EPA 1999[f]	No TRV	
2-Chlorophenol	95-57-8	No TRV		No TRV	
2-Chlorotoluene	95-49-8	2.00E+04	Gibson and others (1974) in IRIS (2002)[a]	No TRV	
2-Nitrophenol	88-75-5	No TRV		No TRV	
4,6-Dinitro-o-cresol	534-52-1	No TRV		No TRV	
4-Chlorotoluene	106-43-4	No TRV		No TRV	
4-Nitrophenol	100-02-7	No TRV		No TRV	
alpha-Methylstyrene	98-83-9	No TRV		No TRV	
Aniline	62-53-3	No TRV		No TRV	
Benzotrichloride	98-07-7	No TRV		No TRV	
Benzyl chloride	100-44-7	No TRV		No TRV	
Bromobenzene	108-86-1	No TRV		No TRV	
Chlorobenzene	108-90-7	1.90E+04	Monsanto Co. (1967), Knapp and others (1971) in IRIS (2002)[a]	No TRV	
Cumene	98-82-8	1.10E+05	Wolf and others (1956) in IRIS (2002)[a]	No TRV	
m-Cresol	108-39-4	5.00E+03	US EPA (1986g, 1987b) in IRIS (2002)[a]	No TRV	
n-Butyl benzene	104-51-8	No TRV		No TRV	
Nitrobenzene	98-95-3	4.60E+01	CIIT (1984) in IRIS (2002)[a]	No TRV	
n-Propyl benzene	103-65-1	No TRV		No TRV	
o-Cresol	95-48-7	5.00E+03	US EPA (1986g, 1987b) in IRIS (2002)[a]	No TRV	
o-Dinitrobenzene	528-29-0	No TRV		No TRV	
o-Nitroaniline	88-74-4	No TRV		No TRV	
o-Toluidine	95-53-4	No TRV		No TRV	
p-Chloroaniline	106-47-8	1.25E+03	NCI (1979a) in IRIS (2002)[a]	No TRV	
p-Cresol	106-44-5	No TRV		No TRV	
Phenol	108-95-2	6.00E+04	NTP (1983c) in IRIS (2002)[a]	No TRV	

Table C3-8 Toxicity Reference Values (TRVs) for COPCs and ROPCs

Constituent of Potential Concern	CAS Registry Number	Ingestion, Terrestrial Exposures			
		Coyote		Burrowing Owl	
		NOAEL TRV	Source	NOAEL TRV	Source
2,6-Dinitrotoluene	606-20-2	4.00E+01	EPA 1999[f]	No TRV	
2-Chlorophenol	95-57-8	No TRV		No TRV	
2-Chlorotoluene	95-49-8	2.00E+04	Gibson and others (1974) in IRIS (2002)[a]	No TRV	
2-Nitrophenol	88-75-5	No TRV		No TRV	
4,6-Dinitro-o-cresol	534-52-1	No TRV		No TRV	
4-Chlorotoluene	106-43-4	No TRV		No TRV	
4-Nitrophenol	100-02-7	No TRV		No TRV	
alpha-Methylstyrene	98-83-9	No TRV		No TRV	
Aniline	62-53-3	No TRV		No TRV	
Benzotrichloride	98-07-7	No TRV		No TRV	
Benzyl chloride	100-44-7	No TRV		No TRV	
Bromobenzene	108-86-1	No TRV		No TRV	
Chlorobenzene	108-90-7	1.90E+04	Monsanto Co. (1967), Knapp and others (1971) in IRIS (2002)[a]	No TRV	
Cumene	98-82-8	1.10E+05	Wolf and others (1956) in IRIS (2002)[a]	No TRV	
m-Cresol	108-39-4	5.00E+03	US EPA (1986g, 1987b) in IRIS (2002)[a]	No TRV	
n-Butyl benzene	104-51-8	No TRV		No TRV	
Nitrobenzene	98-95-3	4.60E+01	CIIT (1984) in IRIS (2002)[a]	No TRV	
n-Propyl benzene	103-65-1	No TRV		No TRV	
o-Cresol	95-48-7	5.00E+03	US EPA (1986g, 1987b) in IRIS (2002)[a]	No TRV	
o-Dinitrobenzene	528-29-0	No TRV		No TRV	
o-Nitroaniline	88-74-4	No TRV		No TRV	
o-Toluidine	95-53-4	No TRV		No TRV	
p-Chloroaniline	106-47-8	1.25E+03	NCI (1979a) in IRIS (2002)[a]	No TRV	
p-Cresol	106-44-5	No TRV		No TRV	
Phenol	108-95-2	6.00E+04	NTP (1983c) in IRIS (2002)[a]	No TRV	

Table C3-8 Toxicity Reference Values (TRVs) for COPCs and ROPCs

Constituent of Potential Concern	CAS Registry Number	Ingestion, Terrestrial Exposures		Ingestion, Aquatic Exposures	
		Red-tailed Hawk		Canada Goose	
		NOAEL TRV	Source	NOAEL TRV	Source
2,6-Dinitrotoluene	606-20-2	No TRV		No TRV	
2-Chlorophenol	95-57-8	No TRV		No TRV	
2-Chlorotoluene	95-49-8	No TRV		No TRV	
2-Nitrophenol	88-75-5	No TRV		No TRV	
4,6-Dinitro-o-cresol	534-52-1	No TRV		No TRV	
4-Chlorotoluene	106-43-4	No TRV		No TRV	
4-Nitrophenol	100-02-7	No TRV		No TRV	
alpha-Methylstyrene	98-83-9	No TRV		No TRV	
Aniline	62-53-3	No TRV		No TRV	
Benzotrichloride	98-07-7	No TRV		No TRV	
Benzyl chloride	100-44-7	No TRV		No TRV	
Bromobenzene	108-86-1	No TRV		No TRV	
Chlorobenzene	108-90-7	No TRV		No TRV	
Cumene	98-82-8	No TRV		No TRV	
m-Cresol	108-39-4	No TRV		No TRV	
n-Butyl benzene	104-51-8	No TRV		No TRV	
Nitrobenzene	98-95-3	No TRV		No TRV	
n-Propyl benzene	103-65-1	No TRV		No TRV	
o-Cresol	95-48-7	No TRV		No TRV	
o-Dinitrobenzene	528-29-0	No TRV		No TRV	
o-Nitroaniline	88-74-4	No TRV		No TRV	
o-Toluidine	95-53-4	No TRV		No TRV	
p-Chloroaniline	106-47-8	No TRV		No TRV	
p-Cresol	106-44-5	No TRV		No TRV	
Phenol	108-95-2	No TRV		No TRV	

Table C3-8 Toxicity Reference Values (TRVs) for COPCs and ROPCs

Constituent of Potential Concern	CAS Registry Number	Ingestion, Aquatic Exposures			
		Spotted Sandpiper		Great Blue Heron	
		NOAEL TRV	Source	NOAEL TRV	Source
2,6-Dinitrotoluene	606-20-2	No TRV		No TRV	
2-Chlorophenol	95-57-8	No TRV		No TRV	
2-Chlorotoluene	95-49-8	No TRV		No TRV	
2-Nitrophenol	88-75-5	No TRV		No TRV	
4,6-Dinitro-o-cresol	534-52-1	No TRV		No TRV	
4-Chlorotoluene	106-43-4	No TRV		No TRV	
4-Nitrophenol	100-02-7	No TRV		No TRV	
alpha-Methylstyrene	98-83-9	No TRV		No TRV	
Aniline	62-53-3	No TRV		No TRV	
Benzotrichloride	98-07-7	No TRV		No TRV	
Benzyl chloride	100-44-7	No TRV		No TRV	
Bromobenzene	108-86-1	No TRV		No TRV	
Chlorobenzene	108-90-7	No TRV		No TRV	
Cumene	98-82-8	No TRV		No TRV	
m-Cresol	108-39-4	No TRV		No TRV	
n-Butyl benzene	104-51-8	No TRV		No TRV	
Nitrobenzene	98-95-3	No TRV		No TRV	
n-Propyl benzene	103-65-1	No TRV		No TRV	
o-Cresol	95-48-7	No TRV		No TRV	
o-Dinitrobenzene	528-29-0	No TRV		No TRV	
o-Nitroaniline	88-74-4	No TRV		No TRV	
o-Toluidine	95-53-4	No TRV		No TRV	
p-Chloroaniline	106-47-8	No TRV		No TRV	
p-Cresol	106-44-5	No TRV		No TRV	
Phenol	108-95-2	No TRV		No TRV	

Table C3-8 Toxicity Reference Values (TRVs) for COPCs and ROPCs

Constituent of Potential Concern	CAS Registry Number	Ingestion, Aquatic Exposures			
		Bald Eagle		Mink	
		NOAEL TRV	Source	NOAEL TRV	Source
2,6-Dinitrotoluene	606-20-2	No TRV		4.00E+01	EPA 1999[f]
2-Chlorophenol	95-57-8	No TRV		No TRV	
2-Chlorotoluene	95-49-8	No TRV		2.00E+04	Gibson and others (1974) in IRIS (2002)[a]
2-Nitrophenol	88-75-5	No TRV		No TRV	
4,6-Dinitro-o-cresol	534-52-1	No TRV		No TRV	
4-Chlorotoluene	106-43-4	No TRV		No TRV	
4-Nitrophenol	100-02-7	No TRV		No TRV	
alpha-Methylstyrene	98-83-9	No TRV		No TRV	
Aniline	62-53-3	No TRV		No TRV	
Benzotrichloride	98-07-7	No TRV		No TRV	
Benzyl chloride	100-44-7	No TRV		No TRV	
Bromobenzene	108-86-1	No TRV		No TRV	
Chlorobenzene	108-90-7	No TRV		1.90E+04	Monsanto Co. (1967), Knapp and others (1971) in IRIS (2002)[a]
Cumene	98-82-8	No TRV		1.10E+05	Wolf and others (1956) in IRIS (2002)[a]
m-Cresol	108-39-4	No TRV		5.00E+03	US EPA (1986g, 1987b) in IRIS (2002)[a]
n-Butyl benzene	104-51-8	No TRV		No TRV	US EPA (1986g, 1987b) in IRIS (2002)[a]
Nitrobenzene	98-95-3	No TRV		4.60E+01	CIIT (1984) in IRIS (2002)[a]
n-Propyl benzene	103-65-1	No TRV		No TRV	
o-Cresol	95-48-7	No TRV		5.00E+03	US EPA (1986g, 1987b) in IRIS (2002)[a]
o-Dinitrobenzene	528-29-0	No TRV		No TRV	
o-Nitroaniline	88-74-4	No TRV		No TRV	
o-Toluidine	95-53-4	No TRV		No TRV	
p-Chloroaniline	106-47-8	No TRV		1.25E+03	NCI (1979a) in IRIS (2002)[a]
p-Cresol	106-44-5	No TRV		No TRV	
Phenol	108-95-2	No TRV		6.00E+04	NTP (1983c) in IRIS (2002)[a]

Table C3-8 Toxicity Reference Values (TRVs) for COPCs and ROPCs

Constituent of Potential Concern	CAS Registry Number	Direct Contact, Aquatic Receptors			
		Aquatic Biota		Chinook Salmon and Other Salmonids	
		NOAEL TRV	Source	NOAEL TRV	Source
2,6-Dinitrotoluene	606-20-2	6.00E+01	EPA 1999[f]	6.00E+01	EPA 1999[f]
2-Chlorophenol	95-57-8	No TRV		No TRV	
2-Chlorotoluene	95-49-8	No TRV		No TRV	
2-Nitrophenol	88-75-5	No TRV		No TRV	
4,6-Dinitro-o-cresol	534-52-1	No TRV		No TRV	
4-Chlorotoluene	106-43-4	No TRV		No TRV	
4-Nitrophenol	100-02-7	3.00E+02	Tier II Chronic (Suter & Tsao 1996)[d]	6.31E-02	Acute LOAEL for rainbow trout (AQUIRE[g]) × 0.1 for LOAEL-to-NOAEL conversion × 0.1 for acute-to-chronic conversion
alpha-Methylstyrene	98-83-9	No TRV		No TRV	
Aniline	62-53-3	No TRV		No TRV	
Benzotrichloride	98-07-7	No TRV		No TRV	
Benzyl chloride	100-44-7	No TRV		No TRV	
Bromobenzene	108-86-1	No TRV		No TRV	
Chlorobenzene	108-90-7	6.40E+01	Tier II Chronic (Suter & Tsao 1996)[d]	6.40E+01	Tier II Chronic (Suter & Tsao 1996)[d]
Cumene	98-82-8	No TRV		No TRV	
m-Cresol	108-39-4	No TRV		No TRV	
n-Butyl benzene	104-51-8	No TRV		No TRV	
Nitrobenzene	98-95-3	2.70E+02	EPA 1999[f]	2.70E+02	EPA 1999[f]
n-Propyl benzene	103-65-1	No TRV		No TRV	
o-Cresol	95-48-7	1.30E+01	Tier II Chronic (Suter & Tsao 1996)[d]	6.31E-02	Acute LOAEL for rainbow trout (AQUIRE[g]) × 0.1 for LOAEL-to-NOAEL conversion × 0.1 for acute-to-chronic conversion
o-Dinitrobenzene	528-29-0	No TRV		No TRV	
o-Nitroaniline	88-74-4	No TRV		No TRV	
o-Toluidine	95-53-4	No TRV		No TRV	
p-Chloroaniline	106-47-8	No TRV		No TRV	
p-Cresol	106-44-5	No TRV		No TRV	
Phenol	108-95-2	1.10E+02	NAWQC Chronic (Suter & Tsao 1996)[d]	1.10E+02	NAWQC Chronic (Suter & Tsao 1996)[d]

Table C3-8 Toxicity Reference Values (TRVs) for COPCs and ROPCs

Constituent of Potential Concern	CAS Registry Number	Direct Contact, Aquatic Receptors	
		Benthic Organisms	
		NOAEL TRV	Source
2,6-Dinitrotoluene	606-20-2	1.01E+02	EPA 1999[f]
2-Chlorophenol	95-57-8	No TRV	
2-Chlorotoluene	95-49-8	No TRV	
2-Nitrophenol	88-75-5	No TRV	
4,6-Dinitro-o-cresol	534-52-1	No TRV	
4-Chlorotoluene	106-43-4	No TRV	
4-Nitrophenol	100-02-7	5.24E+02	EqP method (Jones and others 1997)[i]
alpha-Methylstyrene	98-83-9	No TRV	
Aniline	62-53-3	No TRV	
Benzotrichloride	98-07-7	No TRV	
Benzyl chloride	100-44-7	No TRV	
Bromobenzene	108-86-1	No TRV	
Chlorobenzene	108-90-7	5.73E+02	EqP method (Jones and others 1997)[i]
Cumene	98-82-8	No TRV	
m-Cresol	108-39-4	No TRV	
n-Butyl benzene	104-51-8	No TRV	
Nitrobenzene	98-95-3	1.28E+03	EPA 1999[f]
n-Propyl benzene	103-65-1	No TRV	
o-Cresol	95-48-7	2.78E+01	EqP method (Jones and others 1997)[i]
o-Dinitrobenzene	528-29-0	No TRV	
o-Nitroaniline	88-74-4	No TRV	
o-Toluidine	95-53-4	No TRV	
p-Chloroaniline	106-47-8	No TRV	
p-Cresol	106-44-5	No TRV	
Phenol	108-95-2	4.80E+01	Ecology (1994) in EPA (1999a)

Table C3-8 Toxicity Reference Values (TRVs) for COPCs and ROPCs

Constituent of Potential Concern	CAS Registry Number	Direct Exposure, Terrestrial Receptors			
		Plant		Terrestrial Invertebrate	
		TRV	Source	TRV	Source
p-Nitrochlorobenzene	100-00-5	No TRV		No TRV	
p-Toluidine	106-49-0	No TRV		No TRV	
sec-Butyl benzene	135-98-8	No TRV		No TRV	
tert-Butyl benzene	98-06-6	No TRV		No TRV	
Toluene-2,6-diamine	823-40-5	No TRV		No TRV	
Trimethyl benzene	25551-13-7	No TRV		No TRV	
Other Light Semivolatile Compounds (molecular weight <200 g/mole)					
1,1'-Biphenyl	92-52-4	6.00E+04	Efroymson and others (1997a)[e]	No TRV	
1,1-Dimethylhydrazine	57-14-7	No TRV		No TRV	
1,2-Dimethylhydrazine	540-73-8	No TRV		No TRV	
1,2-Diphenylhydrazine	122-66-7	No TRV		No TRV	
1,3-Propane sultone	1120-71-4	No TRV		No TRV	
2,4-Toluene diisocyanate	584-84-9	No TRV		No TRV	
2-Chloroacetophenone	532-27-4	No TRV		No TRV	
2-Propenoic acid	79-10-7	No TRV		No TRV	
4,4'-Methylenedianiline	101-77-9	No TRV		No TRV	
Acetophenone	98-86-2	No TRV		No TRV	
Benzoic acid	65-85-0	No TRV		No TRV	
bis(2-Chloroethoxy)methane	111-91-1	No TRV		No TRV	
bis(2-Chloroethyl) ether	111-44-4	No TRV		No TRV	
Chlorocyclopentadiene	41851-50-7	No TRV		No TRV	
Cyclohexanol	108-93-0	No TRV		No TRV	
Dichloroisopropyl ether	108-60-1	No TRV		No TRV	
Dichloromethyl ether	542-88-1	No TRV		No TRV	
Dichloropentadiene	61626-71-9	No TRV		No TRV	
Dimethyl sulfate	77-78-1	No TRV		No TRV	
Dimethylaniline	121-69-7	No TRV		No TRV	
Di-n-propylnitrosamine	621-64-7	No TRV		No TRV	
Diphenyl ether	101-84-8	No TRV		No TRV	
Epichlorohydrin	106-89-8	No TRV		No TRV	
Ethyl carbamate (urethane)	51-79-6	No TRV		No TRV	
Ethyl methanesulfonate	62-50-0	No TRV		No TRV	

Table C3-8 Toxicity Reference Values (TRVs) for COPCs and ROPCs

Constituent of Potential Concern	CAS Registry Number	Ingestion, Terrestrial Exposures			
		Mule Deer		Mourning Dove	
		NOAEL TRV	Source	NOAEL TRV	Source
p-Nitrochlorobenzene	100-00-5	No TRV		No TRV	
p-Toluidine	106-49-0	No TRV		No TRV	
sec-Butyl benzene	135-98-8	No TRV		No TRV	
tert-Butyl benzene	98-06-6	No TRV		No TRV	
Toluene-2,6-diamine	823-40-5	No TRV		No TRV	
Trimethyl benzene	25551-13-7	No TRV		No TRV	
Other Light Semivolatile Compounds (molecular weight <200 g/mole)					
1,1'-Biphenyl	92-52-4	5.00E+04	Ambrose and others (1960) in IRIS (2002)[a]	No TRV	
1,1-Dimethylhydrazine	57-14-7	No TRV		No TRV	
1,2-Dimethylhydrazine	540-73-8	No TRV		No TRV	
1,2-Diphenylhydrazine	122-66-7	No TRV		No TRV	
1,3-Propane sultone	1120-71-4	No TRV		No TRV	
2,4-Toluene diisocyanate	584-84-9	No TRV		No TRV	
2-Chloroacetophenone	532-27-4	No TRV		No TRV	
2-Propenoic acid	79-10-7	5.30E+03	BASF (1993) in IRIS (2002)[a]	No TRV	
4,4'-Methylenedianiline	101-77-9	No TRV		No TRV	
Acetophenone	98-86-2	4.23E+04	Hagen and others (1967) in IRIS (2002)[a]	No TRV	
Benzoic acid	65-85-0	4.00E+03	Shtenberg and Ignat'ev (1970) in IRIS (2002)[a]	No TRV	
bis(2-Chloroethoxy)methane	111-91-1	No TRV		No TRV	
bis(2-Chloroethyl) ether	111-44-4	No TRV		No TRV	
Chlorocyclopentadiene	41851-50-7	No TRV		No TRV	
Cyclohexanol	108-93-0	No TRV		No TRV	
Dichloroisopropyl ether	108-60-1	No TRV		No TRV	
Dichloromethyl ether	542-88-1	No TRV		No TRV	
Dichloropentadiene	61626-71-9	No TRV		No TRV	
Dimethyl sulfate	77-78-1	No TRV		No TRV	
Dimethylaniline	121-69-7	2.23E+02	Abdo and others (1984b) in IRIS (2002)[a]	No TRV	
Di-n-propylnitrosamine	621-64-7	No TRV		No TRV	
Diphenyl ether	101-84-8	No TRV		No TRV	
Epichlorohydrin	106-89-8	No TRV		No TRV	
Ethyl carbamate (urethane)	51-79-6	No TRV		No TRV	
Ethyl methanesulfonate	62-50-0	No TRV		No TRV	

Table C3-8 Toxicity Reference Values (TRVs) for COPCs and ROPCs

Constituent of Potential Concern	CAS Registry Number	Ingestion, Terrestrial Exposures			
		Great Basin Pocket Mouse		Western Meadowlark	
		NOAEL TRV	Source	NOAEL TRV	Source
p-Nitrochlorobenzene	100-00-5	No TRV		No TRV	
p-Toluidine	106-49-0	No TRV		No TRV	
sec-Butyl benzene	135-98-8	No TRV		No TRV	
tert-Butyl benzene	98-06-6	No TRV		No TRV	
Toluene-2,6-diamine	823-40-5	No TRV		No TRV	
Trimethyl benzene	25551-13-7	No TRV		No TRV	
Other Light Semivolatile Compounds (molecular weight <200 g/mole)					
1,1'-Biphenyl	92-52-4	5.00E+04	Ambrose and others (1960) in IRIS (2002)[a]	No TRV	
1,1-Dimethylhydrazine	57-14-7	No TRV		No TRV	
1,2-Dimethylhydrazine	540-73-8	No TRV		No TRV	
1,2-Diphenylhydrazine	122-66-7	No TRV		No TRV	
1,3-Propane sultone	1120-71-4	No TRV		No TRV	
2,4-Toluene diisocyanate	584-84-9	No TRV		No TRV	
2-Chloroacetophenone	532-27-4	No TRV		No TRV	
2-Propenoic acid	79-10-7	5.30E+03	BASF (1993) in IRIS (2002)[a]	No TRV	
4,4'-Methylenedianiline	101-77-9	No TRV		No TRV	
Acetophenone	98-86-2	4.23E+04	Hagen and others (1967) in IRIS (2002)[a]	No TRV	
Benzoic acid	65-85-0	4.00E+03	Shtenberg and Ignat'ev (1970) in IRIS (2002)[a]	No TRV	
bis(2-Chloroethoxy)methane	111-91-1	No TRV		No TRV	
bis(2-Chloroethyl) ether	111-44-4	No TRV		No TRV	
Chlorocyclopentadiene	41851-50-7	No TRV		No TRV	
Cyclohexanol	108-93-0	No TRV		No TRV	
Dichloroisopropyl ether	108-60-1	No TRV		No TRV	
Dichloromethyl ether	542-88-1	No TRV		No TRV	
Dichloropentadiene	61626-71-9	No TRV		No TRV	
Dimethyl sulfate	77-78-1	No TRV		No TRV	
Dimethylaniline	121-69-7	2.23E+02	Abdo and others (1984b) in IRIS (2002)[a]	No TRV	
Di-n-propylnitrosamine	621-64-7	No TRV		No TRV	
Diphenyl ether	101-84-8	No TRV		No TRV	
Epichlorohydrin	106-89-8	No TRV		No TRV	
Ethyl carbamate (urethane)	51-79-6	No TRV		No TRV	
Ethyl methanesulfonate	62-50-0	No TRV		No TRV	

Table C3-8 Toxicity Reference Values (TRVs) for COPCs and ROPCs

Constituent of Potential Concern	CAS Registry Number	Ingestion, Terrestrial Exposures			
		Coyote		Burrowing Owl	
		NOAEL TRV	Source	NOAEL TRV	Source
p-Nitrochlorobenzene	100-00-5	No TRV		No TRV	
p-Toluidine	106-49-0	No TRV		No TRV	
sec-Butyl benzene	135-98-8	No TRV		No TRV	
tert-Butyl benzene	98-06-6	No TRV		No TRV	
Toluene-2,6-diamine	823-40-5	No TRV		No TRV	
Trimethyl benzene	25551-13-7	No TRV		No TRV	
Other Light Semivolatile Compounds (molecular weight <200 g/mole)					
1,1'-Biphenyl	92-52-4	5.00E+04	Ambrose and others (1960) in IRIS (2002)[a]	No TRV	
1,1-Dimethylhydrazine	57-14-7	No TRV		No TRV	
1,2-Dimethylhydrazine	540-73-8	No TRV		No TRV	
1,2-Diphenylhydrazine	122-66-7	No TRV		No TRV	
1,3-Propane sultone	1120-71-4	No TRV		No TRV	
2,4-Toluene diisocyanate	584-84-9	No TRV		No TRV	
2-Chloroacetophenone	532-27-4	No TRV		No TRV	
2-Propenoic acid	79-10-7	5.30E+03	BASF (1993) in IRIS (2002)[a]	No TRV	
4,4'-Methylenedianiline	101-77-9	No TRV		No TRV	
Acetophenone	98-86-2	4.23E+04	Hagen and others (1967) in IRIS (2002)[a]	No TRV	
Benzoic acid	65-85-0	4.00E+03	Shtenberg and Ignat'ev (1970) in IRIS (2002)[a]	No TRV	
bis(2-Chloroethoxy)methane	111-91-1	No TRV		No TRV	
bis(2-Chloroethyl) ether	111-44-4	No TRV		No TRV	
Chlorocyclopentadiene	41851-50-7	No TRV		No TRV	
Cyclohexanol	108-93-0	No TRV		No TRV	
Dichloroisopropyl ether	108-60-1	No TRV		No TRV	
Dichloromethyl ether	542-88-1	No TRV		No TRV	
Dichloropentadiene	61626-71-9	No TRV		No TRV	
Dimethyl sulfate	77-78-1	No TRV		No TRV	
Dimethylaniline	121-69-7	2.23E+02	Abdo and others (1984b) in IRIS (2002)[a]	No TRV	
Di-n-propylnitrosamine	621-64-7	No TRV		No TRV	
Diphenyl ether	101-84-8	No TRV		No TRV	
Epichlorohydrin	106-89-8	No TRV		No TRV	
Ethyl carbamate (urethane)	51-79-6	No TRV		No TRV	
Ethyl methanesulfonate	62-50-0	No TRV		No TRV	

Table C3-8 Toxicity Reference Values (TRVs) for COPCs and ROPCs

Constituent of Potential Concern	CAS Registry Number	Ingestion, Terrestrial Exposures		Ingestion, Aquatic Exposures	
		Red-tailed Hawk		Canada Goose	
		NOAEL TRV	Source	NOAEL TRV	Source
p-Nitrochlorobenzene	100-00-5	No TRV		No TRV	
p-Toluidine	106-49-0	No TRV		No TRV	
sec-Butyl benzene	135-98-8	No TRV		No TRV	
tert-Butyl benzene	98-06-6	No TRV		No TRV	
Toluene-2,6-diamine	823-40-5	No TRV		No TRV	
Trimethyl benzene	25551-13-7	No TRV		No TRV	
	Other Light Semivolatile Compounds (molecular weight <200 g/mole)				
1,1'-Biphenyl	92-52-4	No TRV		No TRV	
1,1-Dimethylhydrazine	57-14-7	No TRV		No TRV	
1,2-Dimethylhydrazine	540-73-8	No TRV		No TRV	
1,2-Diphenylhydrazine	122-66-7	No TRV		No TRV	
1,3-Propane sultone	1120-71-4	No TRV		No TRV	
2,4-Toluene diisocyanate	584-84-9	No TRV		No TRV	
2-Chloroacetophenone	532-27-4	No TRV		No TRV	
2-Propenoic acid	79-10-7	No TRV		No TRV	
4,4'-Methylenedianiline	101-77-9	No TRV		No TRV	
Acetophenone	98-86-2	No TRV		No TRV	
Benzoic acid	65-85-0	No TRV		No TRV	
bis(2-Chloroethoxy)methane	111-91-1	No TRV		No TRV	
bis(2-Chloroethyl) ether	111-44-4	No TRV		No TRV	
Chlorocyclopentadiene	41851-50-7	No TRV		No TRV	
Cyclohexanol	108-93-0	No TRV		No TRV	
Dichloroisopropyl ether	108-60-1	No TRV		No TRV	
Dichloromethyl ether	542-88-1	No TRV		No TRV	
Dichloropentadiene	61626-71-9	No TRV		No TRV	
Dimethyl sulfate	77-78-1	No TRV		No TRV	
Dimethylaniline	121-69-7	No TRV		No TRV	
Di-n-propylnitrosamine	621-64-7	No TRV		No TRV	
Diphenyl ether	101-84-8	No TRV		No TRV	
Epichlorohydrin	106-89-8	No TRV		No TRV	
Ethyl carbamate (urethane)	51-79-6	No TRV		No TRV	
Ethyl methanesulfonate	62-50-0	No TRV		No TRV	

Table C3-8 Toxicity Reference Values (TRVs) for COPCs and ROPCs

Constituent of Potential Concern	CAS Registry Number	Ingestion, Aquatic Exposures			
		Spotted Sandpiper		Great Blue Heron	
		NOAEL TRV	Source	NOAEL TRV	Source
p-Nitrochlorobenzene	100-00-5	No TRV		No TRV	
p-Toluidine	106-49-0	No TRV		No TRV	
sec-Butyl benzene	135-98-8	No TRV		No TRV	
tert-Butyl benzene	98-06-6	No TRV		No TRV	
Toluene-2,6-diamine	823-40-5	No TRV		No TRV	
Trimethyl benzene	25551-13-7	No TRV		No TRV	
	Other Light Semivolatile Compounds (molecular weight <200 g/mole)				
1,1'-Biphenyl	92-52-4	No TRV		No TRV	
1,1-Dimethylhydrazine	57-14-7	No TRV		No TRV	
1,2-Dimethylhydrazine	540-73-8	No TRV		No TRV	
1,2-Diphenylhydrazine	122-66-7	No TRV		No TRV	
1,3-Propane sultone	1120-71-4	No TRV		No TRV	
2,4-Toluene diisocyanate	584-84-9	No TRV		No TRV	
2-Chloroacetophenone	532-27-4	No TRV		No TRV	
2-Propenoic acid	79-10-7	No TRV		No TRV	
4,4'-Methylenedianiline	101-77-9	No TRV		No TRV	
Acetophenone	98-86-2	No TRV		No TRV	
Benzoic acid	65-85-0	No TRV		No TRV	
bis(2-Chloroethoxy)methane	111-91-1	No TRV		No TRV	
bis(2-Chloroethyl) ether	111-44-4	No TRV		No TRV	
Chlorocyclopentadiene	41851-50-7	No TRV		No TRV	
Cyclohexanol	108-93-0	No TRV		No TRV	
Dichloroisopropyl ether	108-60-1	No TRV		No TRV	
Dichloromethyl ether	542-88-1	No TRV		No TRV	
Dichloropentadiene	61626-71-9	No TRV		No TRV	
Dimethyl sulfate	77-78-1	No TRV		No TRV	
Dimethylaniline	121-69-7	No TRV		No TRV	
Di-n-propylnitrosamine	621-64-7	No TRV		No TRV	
Diphenyl ether	101-84-8	No TRV		No TRV	
Epichlorohydrin	106-89-8	No TRV		No TRV	
Ethyl carbamate (urethane)	51-79-6	No TRV		No TRV	
Ethyl methanesulfonate	62-50-0	No TRV		No TRV	

Table C3-8 Toxicity Reference Values (TRVs) for COPCs and ROPCs

Constituent of Potential Concern	CAS Registry Number	Ingestion, Aquatic Exposures			
		Bald Eagle		Mink	
		NOAEL TRV	Source	NOAEL TRV	Source
p-Nitrochlorobenzene	100-00-5	No TRV		No TRV	
p-Toluidine	106-49-0	No TRV		No TRV	
sec-Butyl benzene	135-98-8	No TRV		No TRV	
tert-Butyl benzene	98-06-6	No TRV		No TRV	
Toluene-2,6-diamine	823-40-5	No TRV		No TRV	
Trimethyl benzene	25551-13-7	No TRV		No TRV	
	Other Light Semivolatile Compounds (molecular weight <200 g/mole)				
1,1'-Biphenyl	92-52-4	No TRV		5.00E+04	Ambrose and others (1960) in IRIS (2002)[a]
1,1-Dimethylhydrazine	57-14-7	No TRV		No TRV	
1,2-Dimethylhydrazine	540-73-8	No TRV		No TRV	
1,2-Diphenylhydrazine	122-66-7	No TRV		No TRV	
1,3-Propane sultone	1120-71-4	No TRV		No TRV	
2,4-Toluene diisocyanate	584-84-9	No TRV		No TRV	
2-Chloroacetophenone	532-27-4	No TRV		No TRV	
2-Propenoic acid	79-10-7	No TRV		5.30E+03	BASF (1993) in IRIS (2002)[a]
4,4'-Methylenedianiline	101-77-9	No TRV		No TRV	
Acetophenone	98-86-2	No TRV		4.23E+04	Hagen and others (1967) in IRIS (2002)[a]
Benzoic acid	65-85-0	No TRV		4.00E+03	Shtenberg and Ignat'ev (1970) in IRIS (2002)[a]
bis(2-Chloroethoxy)methane	111-91-1	No TRV		No TRV	
bis(2-Chloroethyl) ether	111-44-4	No TRV		No TRV	
Chlorocyclopentadiene	41851-50-7	No TRV		No TRV	
Cyclohexanol	108-93-0	No TRV		No TRV	
Dichloroisopropyl ether	108-60-1	No TRV		No TRV	
Dichloromethyl ether	542-88-1	No TRV		No TRV	
Dichloropentadiene	61626-71-9	No TRV		No TRV	
Dimethyl sulfate	77-78-1	No TRV		No TRV	
Dimethylaniline	121-69-7	No TRV		2.23E+02	Abdo and others (1984b) in IRIS (2002)[a]
Di-n-propylnitrosamine	621-64-7	No TRV		No TRV	
Diphenyl ether	101-84-8	No TRV		No TRV	
Epichlorohydrin	106-89-8	No TRV		No TRV	
Ethyl carbamate (urethane)	51-79-6	No TRV		No TRV	
Ethyl methanesulfonate	62-50-0	No TRV		No TRV	

Table C3-8 Toxicity Reference Values (TRVs) for COPCs and ROPCs

Constituent of Potential Concern	CAS Registry Number	Direct Contact, Aquatic Receptors			
		Aquatic Biota		Chinook Salmon and Other Salmonids	
		NOAEL TRV	Source	NOAEL TRV	Source
p-Nitrochlorobenzene	100-00-5	No TRV		No TRV	
p-Toluidine	106-49-0	No TRV		No TRV	
sec-Butyl benzene	135-98-8	No TRV		No TRV	
tert-Butyl benzene	98-06-6	No TRV		No TRV	
Toluene-2,6-diamine	823-40-5	No TRV		No TRV	
Trimethyl benzene	25551-13-7	No TRV		No TRV	
Other Light Semivolatile Compounds (molecular weight <200 g/mole)					
1,1'-Biphenyl	92-52-4	1.40E+01	Tier II Chronic (Suter & Tsao 1996)[d]	1.40E+01	Tier II Chronic (Suter & Tsao 1996)[d]
1,1-Dimethylhydrazine	57-14-7	No TRV		No TRV	
1,2-Dimethylhydrazine	540-73-8	No TRV		No TRV	
1,2-Diphenylhydrazine	122-66-7	2.70E+00	EPA 1987[b]	2.70E+00	EPA 1987[b]
1,3-Propane sultone	1120-71-4	No TRV		No TRV	
2,4-Toluene diisocyanate	584-84-9	No TRV		No TRV	
2-Chloroacetophenone	532-27-4	No TRV		No TRV	
2-Propenoic acid	79-10-7	No TRV		No TRV	
4,4'-Methylenedianiline	101-77-9	No TRV		No TRV	
Acetophenone	98-86-2	No TRV		No TRV	
Benzoic acid	65-85-0	4.20E+01	Tier II Chronic (Suter & Tsao 1996)[d]	4.20E+01	Tier II Chronic (Suter & Tsao 1996)[d]
bis(2-Chloroethoxy)methane	111-91-1	No TRV		No TRV	
bis(2-Chloroethyl) ether	111-44-4	No TRV		No TRV	
Chlorocyclopentadiene	41851-50-7	No TRV		No TRV	
Cyclohexanol	108-93-0	No TRV		No TRV	
Dichloroisopropyl ether	108-60-1	No TRV		No TRV	
Dichloromethyl ether	542-88-1	No TRV		No TRV	
Dichloropentadiene	61626-71-9	No TRV		No TRV	
Dimethyl sulfate	77-78-1	No TRV		No TRV	
Dimethylaniline	121-69-7	No TRV		No TRV	
Di-n-propylnitrosamine	621-64-7	No TRV		No TRV	
Diphenyl ether	101-84-8	No TRV		No TRV	
Epichlorohydrin	106-89-8	No TRV		No TRV	
Ethyl carbamate (urethane)	51-79-6	No TRV		No TRV	
Ethyl methanesulfonate	62-50-0	No TRV		No TRV	

Table C3-8 Toxicity Reference Values (TRVs) for COPCs and ROPCs

Constituent of Potential Concern	CAS Registry Number	Direct Contact, Aquatic Receptors	
		Benthic Organisms	
		NOAEL TRV	Source
p-Nitrochlorobenzene	100-00-5	No TRV	
p-Toluidine	106-49-0	No TRV	
sec-Butyl benzene	135-98-8	No TRV	
tert-Butyl benzene	98-06-6	No TRV	
Toluene-2,6-diamine	823-40-5	No TRV	
Trimethyl benzene	25551-13-7	No TRV	
Other Light Semivolatile Compounds (molecular weight <200 g/mole)			
1,1'-Biphenyl	92-52-4	No TRV	
1,1-Dimethylhydrazine	57-14-7	No TRV	
1,2-Dimethylhydrazine	540-73-8	No TRV	
1,2-Diphenylhydrazine	122-66-7	No TRV	
1,3-Propane sultone	1120-71-4	No TRV	
2,4-Toluene diisocyanate	584-84-9	No TRV	
2-Chloroacetophenone	532-27-4	No TRV	
2-Propenoic acid	79-10-7	No TRV	
4,4'-Methylenedianiline	101-77-9	No TRV	
Acetophenone	98-86-2	No TRV	
Benzoic acid	65-85-0	No TRV	
bis(2-Chloroethoxy)methane	111-91-1	No TRV	
bis(2-Chloroethyl) ether	111-44-4	No TRV	
Chlorocyclopentadiene	41851-50-7	No TRV	
Cyclohexanol	108-93-0	No TRV	
Dichloroisopropyl ether	108-60-1	No TRV	
Dichloromethyl ether	542-88-1	No TRV	
Dichloropentadiene	61626-71-9	No TRV	
Dimethyl sulfate	77-78-1	No TRV	
Dimethylaniline	121-69-7	No TRV	
Di-n-propylnitrosamine	621-64-7	No TRV	
Diphenyl ether	101-84-8	No TRV	
Epichlorohydrin	106-89-8	No TRV	
Ethyl carbamate (urethane)	51-79-6	No TRV	
Ethyl methanesulfonate	62-50-0	No TRV	

Table C3-8 Toxicity Reference Values (TRVs) for COPCs and ROPCs

Constituent of Potential Concern	CAS Registry Number	Direct Exposure, Terrestrial Receptors			
		Plant		Terrestrial Invertebrate	
		TRV	Source	TRV	Source
Ethylene dibromide	106-93-4	No TRV		No TRV	
Ethylene glycol	107-21-1	No TRV		No TRV	
Ethylene glycol monobutyl ether	111-76-2	No TRV		No TRV	
Ethylene glycol monoethyl ether acetate	111-15-9	No TRV		No TRV	
Ethylene thiourea	96-45-7	No TRV		No TRV	
Furfural	98-01-1	No TRV		No TRV	
Maleic hydrazide	123-33-1	No TRV		No TRV	
Malononitrile	109-77-3	No TRV		No TRV	
Methyl styrene (mixed isomers)	25013-15-4	No TRV		No TRV	
Methylhydrazine	60-34-4	No TRV		No TRV	
N,N-Diphenylamine	122-39-4	No TRV		No TRV	
Nitric acid, propyl ester	627-13-4	No TRV		No TRV	
N-Nitrosodi-n-butylamine	924-16-3	No TRV		No TRV	
N-Nitrosomorpholine	59-89-2	No TRV		No TRV	
N-Nitroso-N,N-dimethylamine	62-75-9	No TRV		No TRV	
o-Anisidine	90-04-0	No TRV		No TRV	
Oxalic acid	144-62-7	No TRV		No TRV	
Phthalic anhydride	85-44-9	No TRV		No TRV	
p-Phthalic acid	100-21-0	No TRV		No TRV	
Pyridine	110-86-1	No TRV		No TRV	
Quinoline	91-22-5	No TRV		No TRV	
Quinone	106-51-4	No TRV		No TRV	
Safrole	94-59-7	No TRV		No TRV	
Tetrahydrofuran	109-99-9	No TRV		No TRV	
Other Heavy Semivolatile Compounds (molecular weight >200 g/mole)					
1,2,4,5-Tetrachlorobenzene	95-94-3	No TRV		No TRV	
1,3,5-Trinitrobenzene	99-35-4	No TRV		No TRV	
2,6-Bis(tert-butyl)-4-methylphenol	128-37-0	No TRV		No TRV	
2-Cyclohexyl-4,6-dinitrophenol	131-89-5	No TRV		No TRV	

Table C3-8 Toxicity Reference Values (TRVs) for COPCs and ROPCs

Constituent of Potential Concern	CAS Registry Number	Ingestion, Terrestrial Exposures			
		Mule Deer		Mourning Dove	
		NOAEL TRV	Source	NOAEL TRV	Source
Ethylene dibromide	106-93-4	No TRV		No TRV	
Ethylene glycol	107-21-1	2.00E+04	DePass and others (1996a) in IRIS (2002)[a]	No TRV	
Ethylene glycol monobutyl ether	111-76-2	5.10E+02	NTP (1993) in IRIS (2002)[a]	No TRV	
Ethylene glycol monoethyl ether acetate	111-15-9	No TRV		No TRV	
Ethylene thiourea	96-45-7	2.50E+01	Graham and others (1975) in IRIS (2002)[a]	No TRV	
Furfural	98-01-1	7.90E+01	NTP (1981) in IRIS (2002)[a]	No TRV	
Maleic hydrazide	123-33-1	5.00E+04	Uniroyal Chemical Co (1981) in IRIS (2002)[a]	No TRV	
Malononitrile	109-77-3	No TRV		No TRV	
Methyl styrene (mixed isomers)	25013-15-4	No TRV		No TRV	
Methylhydrazine	60-34-4	No TRV		No TRV	
N,N-Diphenylamine	122-39-4	2.50E+02	Thomas and others (1967) in IRIS (2002)[a]	No TRV	
Nitric acid, propyl ester	627-13-4	No TRV		No TRV	
N-Nitrosodi-n-butylamine	924-16-3	No TRV		No TRV	
N-Nitrosomorpholine	59-89-2	No TRV		No TRV	
N-Nitroso-N,N-dimethylamine	62-75-9	No TRV		No TRV	
o-Anisidine	90-04-0	No TRV		No TRV	
Oxalic acid	144-62-7	No TRV		No TRV	
Phthalic anhydride	85-44-9	1.56E+05	NCI (1979b) in IRIS (2002)[a]	No TRV	
p-Phthalic acid	100-21-0	No TRV		No TRV	
Pyridine	110-86-1	1.00E+02	US EPA (1986h) in IRIS (2002)[a]	No TRV	
Quinoline	91-22-5	No TRV		No TRV	
Quinone	106-51-4	No TRV		No TRV	
Safrole	94-59-7	No TRV		No TRV	
Tetrahydrofuran	109-99-9	No TRV		No TRV	
Other Heavy Semivolatile Compounds (molecular weight >200 g/mole)					
1,2,4,5-Tetrachlorobenzene	95-94-3	3.40E+01	Chu and others (1984) in IRIS (2002)[a]	No TRV	
1,3,5-Trinitrobenzene	99-35-4	2.68E+03	Reddy and others (1997) in IRIS (2002)[a]	No TRV	
2,6-Bis(tert-butyl)-4-methylphenol	128-37-0	No TRV		No TRV	
2-Cyclohexyl-4,6-dinitrophenol	131-89-5	2.00E+01	Horner (1942) in IRIS (2002)[a]	No TRV	

Table C3-8 Toxicity Reference Values (TRVs) for COPCs and ROPCs

Constituent of Potential Concern	CAS Registry Number	Ingestion, Terrestrial Exposures			
		Great Basin Pocket Mouse		Western Meadowlark	
		NOAEL TRV	Source	NOAEL TRV	Source
Ethylene dibromide	106-93-4	No TRV		No TRV	
Ethylene glycol	107-21-1	2.00E+04	DePass and others (1996a) in IRIS (2002)[a]	No TRV	
Ethylene glycol monobutyl ether	111-76-2	5.10E+02	NTP (1993) in IRIS (2002)[a]	No TRV	
Ethylene glycol monoethyl ether acetate	111-15-9	No TRV		No TRV	
Ethylene thiourea	96-45-7	2.50E+01	Graham and others (1975) in IRIS (2002)[a]	No TRV	
Furfural	98-01-1	7.90E+01	NTP (1981) in IRIS (2002)[a]	No TRV	
Maleic hydrazide	123-33-1	5.00E+04	Uniroyal Chemical Co (1981) in IRIS (2002)[a]	No TRV	
Malononitrile	109-77-3	No TRV		No TRV	
Methyl styrene (mixed isomers)	25013-15-4	No TRV		No TRV	
Methylhydrazine	60-34-4	No TRV		No TRV	
N,N-Diphenylamine	122-39-4	2.50E+02	Thomas and others (1967) in IRIS (2002)[a]	No TRV	
Nitric acid, propyl ester	627-13-4	No TRV		No TRV	
N-Nitrosodi-n-butylamine	924-16-3	No TRV		No TRV	
N-Nitrosomorpholine	59-89-2	No TRV		No TRV	
N-Nitroso-N,N-dimethylamine	62-75-9	No TRV		No TRV	
o-Anisidine	90-04-0	No TRV		No TRV	
Oxalic acid	144-62-7	No TRV		No TRV	
Phthalic anhydride	85-44-9	1.56E+05	NCI (1979b) in IRIS (2002)[a]	No TRV	
p-Phthalic acid	100-21-0	No TRV		No TRV	
Pyridine	110-86-1	1.00E+02	US EPA (1986h) in IRIS (2002)[a]	No TRV	
Quinoline	91-22-5	No TRV		No TRV	
Quinone	106-51-4	No TRV		No TRV	
Safrole	94-59-7	No TRV		No TRV	
Tetrahydrofuran	109-99-9	No TRV		No TRV	
Other Heavy Semivolatile Compounds (molecular weight >200 g/mole)					
1,2,4,5-Tetrachlorobenzene	95-94-3	3.40E+01	Chu and others (1984) in IRIS (2002)[a]	No TRV	
1,3,5-Trinitrobenzene	99-35-4	2.68E+03	Reddy and others (1997) in IRIS (2002)[a]	No TRV	
2,6-Bis(tert-butyl)-4-methylphenol	128-37-0	No TRV		No TRV	
2-Cyclohexyl-4,6-dinitrophenol	131-89-5	2.00E+01	Horner (1942) in IRIS (2002)[a]	No TRV	

Table C3-8 Toxicity Reference Values (TRVs) for COPCs and ROPCs

Constituent of Potential Concern	CAS Registry Number	Ingestion, Terrestrial Exposures			
		Coyote		Burrowing Owl	
		NOAEL TRV	Source	NOAEL TRV	Source
Ethylene dibromide	106-93-4	No TRV		No TRV	
Ethylene glycol	107-21-1	2.00E+04	DePass and others (1996a) in IRIS (2002)[a]	No TRV	
Ethylene glycol monobutyl ether	111-76-2	5.10E+02	NTP (1993) in IRIS (2002)[a]	No TRV	
Ethylene glycol monoethyl ether acetate	111-15-9	No TRV		No TRV	
Ethylene thiourea	96-45-7	2.50E+01	Graham and others (1975) in IRIS (2002)[a]	No TRV	
Furfural	98-01-1	7.90E+01	NTP (1981) in IRIS (2002)[a]	No TRV	
Maleic hydrazide	123-33-1	5.00E+04	Uniroyal Chemical Co (1981) in IRIS (2002)[a]	No TRV	
Malononitrile	109-77-3	No TRV		No TRV	
Methyl styrene (mixed isomers)	25013-15-4	No TRV		No TRV	
Methylhydrazine	60-34-4	No TRV		No TRV	
N,N-Diphenylamine	122-39-4	2.50E+02	Thomas and others (1967) in IRIS (2002)[a]	No TRV	
Nitric acid, propyl ester	627-13-4	No TRV		No TRV	
N-Nitrosodi-n-butylamine	924-16-3	No TRV		No TRV	
N-Nitrosomorpholine	59-89-2	No TRV		No TRV	
N-Nitroso-N,N-dimethylamine	62-75-9	No TRV		No TRV	
o-Anisidine	90-04-0	No TRV		No TRV	
Oxalic acid	144-62-7	No TRV		No TRV	
Phthalic anhydride	85-44-9	1.56E+05	NCI (1979b) in IRIS (2002)[a]	No TRV	
p-Phthalic acid	100-21-0	No TRV		No TRV	
Pyridine	110-86-1	1.00E+02	US EPA (1986h) in IRIS (2002)[a]	No TRV	
Quinoline	91-22-5	No TRV		No TRV	
Quinone	106-51-4	No TRV		No TRV	
Safrole	94-59-7	No TRV		No TRV	
Tetrahydrofuran	109-99-9	No TRV		No TRV	
Other Heavy Semivolatile Compounds (molecular weight >200 g/mole)					
1,2,4,5-Tetrachlorobenzene	95-94-3	3.40E+01	Chu and others (1984) in IRIS (2002)[a]	No TRV	
1,3,5-Trinitrobenzene	99-35-4	2.68E+03	Reddy and others (1997) in IRIS (2002)[a]	No TRV	
2,6-Bis(tert-butyl)-4-methylphenol	128-37-0	No TRV		No TRV	
2-Cyclohexyl-4,6-dinitrophenol	131-89-5	2.00E+01	Horner (1942) in IRIS (2002)[a]	No TRV	

Table C3-8 Toxicity Reference Values (TRVs) for COPCs and ROPCs

Constituent of Potential Concern	CAS Registry Number	Ingestion, Terrestrial Exposures		Ingestion, Aquatic Exposures	
		Red-tailed Hawk		Canada Goose	
		NOAEL TRV	Source	NOAEL TRV	Source
Ethylene dibromide	106-93-4	No TRV		No TRV	
Ethylene glycol	107-21-1	No TRV		No TRV	
Ethylene glycol monobutyl ether	111-76-2	No TRV		No TRV	
Ethylene glycol monoethyl ether acetate	111-15-9	No TRV		No TRV	
Ethylene thiourea	96-45-7	No TRV		No TRV	
Furfural	98-01-1	No TRV		No TRV	
Maleic hydrazide	123-33-1	No TRV		No TRV	
Malononitrile	109-77-3	No TRV		No TRV	
Methyl styrene (mixed isomers)	25013-15-4	No TRV		No TRV	
Methylhydrazine	60-34-4	No TRV		No TRV	
N,N-Diphenylamine	122-39-4	No TRV		No TRV	
Nitric acid, propyl ester	627-13-4	No TRV		No TRV	
N-Nitrosodi-n-butylamine	924-16-3	No TRV		No TRV	
N-Nitrosomorpholine	59-89-2	No TRV		No TRV	
N-Nitroso-N,N-dimethylamine	62-75-9	No TRV		No TRV	
o-Anisidine	90-04-0	No TRV		No TRV	
Oxalic acid	144-62-7	No TRV		No TRV	
Phthalic anhydride	85-44-9	No TRV		No TRV	
p-Phthalic acid	100-21-0	No TRV		No TRV	
Pyridine	110-86-1	No TRV		No TRV	
Quinoline	91-22-5	No TRV		No TRV	
Quinone	106-51-4	No TRV		No TRV	
Safrole	94-59-7	No TRV		No TRV	
Tetrahydrofuran	109-99-9	No TRV		No TRV	
Other Heavy Semivolatile Compounds (molecular weight >200 g/mole)					
1,2,4,5-Tetrachlorobenzene	95-94-3	No TRV		No TRV	
1,3,5-Trinitrobenzene	99-35-4	No TRV		No TRV	
2,6-Bis(tert-butyl)-4-methylphenol	128-37-0	No TRV		No TRV	
2-Cyclohexyl-4,6-dinitrophenol	131-89-5	No TRV		No TRV	

Table C3-8 Toxicity Reference Values (TRVs) for COPCs and ROPCs

Constituent of Potential Concern	CAS Registry Number	Ingestion, Aquatic Exposures			
		Spotted Sandpiper		Great Blue Heron	
		NOAEL TRV	Source	NOAEL TRV	Source
Ethylene dibromide	106-93-4	No TRV		No TRV	
Ethylene glycol	107-21-1	No TRV		No TRV	
Ethylene glycol monobutyl ether	111-76-2	No TRV		No TRV	
Ethylene glycol monoethyl ether acetate	111-15-9	No TRV		No TRV	
Ethylene thiourea	96-45-7	No TRV		No TRV	
Furfural	98-01-1	No TRV		No TRV	
Maleic hydrazide	123-33-1	No TRV		No TRV	
Malononitrile	109-77-3	No TRV		No TRV	
Methyl styrene (mixed isomers)	25013-15-4	No TRV		No TRV	
Methylhydrazine	60-34-4	No TRV		No TRV	
N,N-Diphenylamine	122-39-4	No TRV		No TRV	
Nitric acid, propyl ester	627-13-4	No TRV		No TRV	
N-Nitrosodi-n-butylamine	924-16-3	No TRV		No TRV	
N-Nitrosomorpholine	59-89-2	No TRV		No TRV	
N-Nitroso-N,N-dimethylamine	62-75-9	No TRV		No TRV	
o-Anisidine	90-04-0	No TRV		No TRV	
Oxalic acid	144-62-7	No TRV		No TRV	
Phthalic anhydride	85-44-9	No TRV		No TRV	
p-Phthalic acid	100-21-0	No TRV		No TRV	
Pyridine	110-86-1	No TRV		No TRV	
Quinoline	91-22-5	No TRV		No TRV	
Quinone	106-51-4	No TRV		No TRV	
Safrole	94-59-7	No TRV		No TRV	
Tetrahydrofuran	109-99-9	No TRV		No TRV	
Other Heavy Semivolatile Compounds (molecular weight >200 g/mole)					
1,2,4,5-Tetrachlorobenzene	95-94-3	No TRV		No TRV	
1,3,5-Trinitrobenzene	99-35-4	No TRV		No TRV	
2,6-Bis(tert-butyl)-4-methylphenol	128-37-0	No TRV		No TRV	
2-Cyclohexyl-4,6-dinitrophenol	131-89-5	No TRV		No TRV	

Table C3-8 Toxicity Reference Values (TRVs) for COPCs and ROPCs

Constituent of Potential Concern	CAS Registry Number	Ingestion, Aquatic Exposures			
		Bald Eagle		Mink	
		NOAEL TRV	Source	NOAEL TRV	Source
Ethylene dibromide	106-93-4	No TRV		No TRV	
Ethylene glycol	107-21-1	No TRV		2.00E+04	DePass and others (1996a) in IRIS (2002)[a]
Ethylene glycol monobutyl ether	111-76-2	No TRV		5.10E+02	NTP (1993) in IRIS (2002)[a]
Ethylene glycol monoethyl ether acetate	111-15-9	No TRV		No TRV	
Ethylene thiourea	96-45-7	No TRV		2.50E+01	Graham and others (1975) in IRIS (2002)[a]
Furfural	98-01-1	No TRV		7.90E+01	NTP (1981) in IRIS (2002)[a]
Maleic hydrazide	123-33-1	No TRV		5.00E+04	Uniroyal Chemical Co (1981) in IRIS (2002)[a]
Malononitrile	109-77-3	No TRV		No TRV	
Methyl styrene (mixed isomers)	25013-15-4	No TRV		No TRV	
Methylhydrazine	60-34-4	No TRV		No TRV	
N,N-Diphenylamine	122-39-4	No TRV		2.50E+02	Thomas and others (1967) in IRIS (2002)[a]
Nitric acid, propyl ester	627-13-4	No TRV		No TRV	
N-Nitrosodi-n-butylamine	924-16-3	No TRV		No TRV	
N-Nitrosomorpholine	59-89-2	No TRV		No TRV	
N-Nitroso-N,N-dimethylamine	62-75-9	No TRV		No TRV	
o-Anisidine	90-04-0	No TRV		No TRV	
Oxalic acid	144-62-7	No TRV		No TRV	
Phthalic anhydride	85-44-9	No TRV		1.56E+05	NCI (1979b) in IRIS (2002)[a]
p-Phthalic acid	100-21-0	No TRV		No TRV	
Pyridine	110-86-1	No TRV		1.00E+02	US EPA (1986h) in IRIS (2002)[a]
Quinoline	91-22-5	No TRV		No TRV	
Quinone	106-51-4	No TRV		No TRV	
Safrole	94-59-7	No TRV		No TRV	
Tetrahydrofuran	109-99-9	No TRV		No TRV	
Other Heavy Semivolatile Compounds (molecular weight >200 g/mole)					
1,2,4,5-Tetrachlorobenzene	95-94-3	No TRV		3.40E+01	Chu and others (1984) in IRIS (2002)[a]
1,3,5-Trinitrobenzene	99-35-4	No TRV		2.68E+03	Reddy and others (1997) in IRIS (2002)[a]
2,6-Bis(tert-butyl)-4-methylphenol	128-37-0	No TRV		No TRV	
2-Cyclohexyl-4,6-dinitrophenol	131-89-5	No TRV		2.00E+01	Horner (1942) in IRIS (2002)[a]

Table C3-8 Toxicity Reference Values (TRVs) for COPCs and ROPCs

Constituent of Potential Concern	CAS Registry Number	Direct Contact, Aquatic Receptors			
		Aquatic Biota		Chinook Salmon and Other Salmonids	
		NOAEL TRV	Source	NOAEL TRV	Source
Ethylene dibromide	106-93-4	No TRV		No TRV	
Ethylene glycol	107-21-1	No TRV		No TRV	
Ethylene glycol monobutyl ether	111-76-2	No TRV		No TRV	
Ethylene glycol monoethyl ether acetate	111-15-9	No TRV		No TRV	
Ethylene thiourea	96-45-7	No TRV		No TRV	
Furfural	98-01-1	No TRV		No TRV	
Maleic hydrazide	123-33-1	No TRV		No TRV	
Malononitrile	109-77-3	No TRV		No TRV	
Methyl styrene (mixed isomers)	25013-15-4	No TRV		No TRV	
Methylhydrazine	60-34-4	No TRV		No TRV	
N,N-Diphenylamine	122-39-4	No TRV		No TRV	
Nitric acid, propyl ester	627-13-4	No TRV		No TRV	
N-Nitrosodi-n-butylamine	924-16-3	No TRV		No TRV	
N-Nitrosomorpholine	59-89-2	No TRV		No TRV	
N-Nitroso-N,N-dimethylamine	62-75-9	No TRV		No TRV	
o-Anisidine	90-04-0	No TRV		No TRV	
Oxalic acid	144-62-7	No TRV		No TRV	
Phthalic anhydride	85-44-9	No TRV		No TRV	
p-Phthalic acid	100-21-0	No TRV		No TRV	
Pyridine	110-86-1	No TRV		No TRV	
Quinoline	91-22-5	No TRV		No TRV	
Quinone	106-51-4	No TRV		No TRV	
Safrole	94-59-7	No TRV		No TRV	
Tetrahydrofuran	109-99-9	No TRV		No TRV	
Other Heavy Semivolatile Compounds (molecular weight >200 g/mole)					
1,2,4,5-Tetrachlorobenzene	95-94-3	No TRV		No TRV	
1,3,5-Trinitrobenzene	99-35-4	No TRV		1.30E+00	Chronic LOAEL for rainbow trout (Suter and Tsao 1996[d] Table C-1) × 0.1 for LOAEL-to-NOAEL conversion
2,6-Bis(tert-butyl)-4-methylphenol	128-37-0	No TRV		No TRV	
2-Cyclohexyl-4,6-dinitrophenol	131-89-5	No TRV		No TRV	

Table C3-8 Toxicity Reference Values (TRVs) for COPCs and ROPCs

Constituent of Potential Concern	CAS Registry Number	Direct Contact, Aquatic Receptors	
		Benthic Organisms	
		NOAEL TRV	Source
Ethylene dibromide	106-93-4	No TRV	
Ethylene glycol	107-21-1	No TRV	
Ethylene glycol monobutyl ether	111-76-2	No TRV	
Ethylene glycol monoethyl ether acetate	111-15-9	No TRV	
Ethylene thiourea	96-45-7	No TRV	
Furfural	98-01-1	No TRV	
Maleic hydrazide	123-33-1	No TRV	
Malononitrile	109-77-3	No TRV	
Methyl styrene (mixed isomers)	25013-15-4	No TRV	
Methylhydrazine	60-34-4	No TRV	
N,N-Diphenylamine	122-39-4	No TRV	
Nitric acid, propyl ester	627-13-4	No TRV	
N-Nitrosodi-n-butylamine	924-16-3	No TRV	
N-Nitrosomorpholine	59-89-2	No TRV	
N-Nitroso-N,N-dimethylamine	62-75-9	No TRV	
o-Anisidine	90-04-0	No TRV	
Oxalic acid	144-62-7	No TRV	
Phthalic anhydride	85-44-9	No TRV	
p-Phthalic acid	100-21-0	No TRV	
Pyridine	110-86-1	No TRV	
Quinoline	91-22-5	No TRV	
Quinone	106-51-4	No TRV	
Safrole	94-59-7	No TRV	
Tetrahydrofuran	109-99-9	No TRV	
Other Heavy Semivolatile Compounds (molecular weight >200 g/mole)			
1,2,4,5-Tetrachlorobenzene	95-94-3	No TRV	
1,3,5-Trinitrobenzene	99-35-4	No TRV	
2,6-Bis(tert-butyl)-4-methylphenol	128-37-0	No TRV	
2-Cyclohexyl-4,6-dinitrophenol	131-89-5	No TRV	

Table C3-8 Toxicity Reference Values (TRVs) for COPCs and ROPCs

Constituent of Potential Concern	CAS Registry Number	Direct Exposure, Terrestrial Receptors			
		Plant		Terrestrial Invertebrate	
		TRV	Source	TRV	Source
2-sec-Butyl-4,6-dinitrophenol	88-85-7	No TRV		No TRV	
3,3'-Dichlorobenzidine	91-94-1	No TRV		No TRV	
3,3'-Dimethoxybenzidine	119-90-4	No TRV		No TRV	
4-Bromophenylphenyl ether	101-55-3	No TRV		No TRV	
Ammonium perfluorooctanoate	3825-26-1	No TRV		No TRV	
Azobenzene	103-33-3	No TRV		No TRV	
Bis(3-tert-butyl-4-hydroxy-6-methyl-phenyl)s	96-69-5	No TRV		No TRV	
Captan	133-06-2	No TRV		No TRV	
Chlorobenzilate	510-15-6	No TRV		No TRV	
Dibutylphosphate	107-66-4	No TRV		No TRV	
Dimethyl aminoazobenzene	60-11-7	No TRV		No TRV	
Hexachlorobenzene	118-74-1	No TRV		No TRV	
Hexachlorobutadiene	87-68-3	No TRV		No TRV	
Hexachlorocyclopentadiene	77-47-4	1.00E+02	EPA 1999[f]	No TRV	
Hexachloroethane	67-72-1	No TRV		No TRV	
Hexachlorophene	70-30-4	No TRV		No TRV	
Hexamethylene-1,5-diisocyanate	822-06-0	No TRV		No TRV	
Mirex	2385-85-5	No TRV		No TRV	
Nitrofen	1836-75-5	No TRV		No TRV	
Pentachlorobenzene	608-93-5	No TRV		1.15E+03	EPA 1999[f]
Pentachloronitrobenzene	82-68-8	No TRV		No TRV	
Pentachlorophenol	87-86-5	1.73E+03	EPA 1999[f]	1.00E+04	EPA 1999[f]
Picric acid	88-89-1	No TRV		No TRV	
Pronamide	23950-58-5	No TRV		No TRV	
Strychnine	57-24-9	No TRV		No TRV	
Terphenyls	26140-60-3	No TRV		No TRV	
Tributyl phosphate	126-73-8	No TRV		No TRV	

Table C3-8 Toxicity Reference Values (TRVs) for COPCs and ROPCs

Constituent of Potential Concern	CAS Registry Number	Ingestion, Terrestrial Exposures			
		Mule Deer		Mourning Dove	
		NOAEL TRV	Source	NOAEL TRV	Source
2-sec-Butyl-4,6-dinitrophenol	88-85-7	No TRV		No TRV	
3,3'-Dichlorobenzidine	91-94-1	No TRV		No TRV	
3,3'-Dimethoxybenzidine	119-90-4	No TRV		No TRV	
4-Bromophenylphenyl ether	101-55-3	No TRV		No TRV	
Ammonium perfluorooctanoate	3825-26-1	No TRV		No TRV	
Azobenzene	103-33-3	No TRV		No TRV	
Bis(3-tert-butyl-4-hydroxy-6-methyl-phenyl)s	96-69-5	No TRV		No TRV	
Captan	133-06-2	No TRV		No TRV	
Chlorobenzilate	510-15-6	No TRV		No TRV	
Dibutylphosphate	107-66-4	No TRV		No TRV	
Dimethyl aminoazobenzene	60-11-7	No TRV		No TRV	
Hexachlorobenzene	118-74-1	1.60E+03	EPA 1999[f]	2.25E+02	EPA 1999[f]
Hexachlorobutadiene	87-68-3	2.00E+02	EPA 1999[f]	3.19E+03	EPA 1999[f]
Hexachlorocyclopentadiene	77-47-4	3.80E+03	EPA 1999[f]	No TRV	
Hexachloroethane	67-72-1	1.00E+02	Gorzinski and others (1985) in IRIS (2002)[a]	No TRV	
Hexachlorophene	70-30-4	5.60E+03	EPA 1999[f]	5.75E+03	EPA 1999[f]
Hexamethylene-1,5-diisocyanate	822-06-0	No TRV		No TRV	
Mirex	2385-85-5	7.00E+01	NTP (1990) in IRIS (2002)[a]	No TRV	
Nitrofen	1836-75-5	No TRV		No TRV	
Pentachlorobenzene	608-93-5	7.25E+03	EPA 1999[f]	No TRV	
Pentachloronitrobenzene	82-68-8	4.58E+05	EPA 1999[f]	6.88E+04	EPA 1999[f]
Pentachlorophenol	87-86-5	3.00E+02	EPA 1999[f]	4.03E+03	EPA 1999[f]
Picric acid	88-89-1	No TRV		No TRV	
Pronamide	23950-58-5	7.50E+02	Rohm & Hass. Co (1970) in IRIS (2002)[a]	No TRV	
Strychnine	57-24-9	2.50E+01	Seidl and Zbinden (1982) in IRIS (2002)[a]	No TRV	
Terphenyls	26140-60-3	No TRV		No TRV	
Tributyl phosphate	126-73-8	No TRV		No TRV	

Table C3-8 Toxicity Reference Values (TRVs) for COPCs and ROPCs

Constituent of Potential Concern	CAS Registry Number	Ingestion, Terrestrial Exposures			
		Great Basin Pocket Mouse		Western Meadowlark	
		NOAEL TRV	Source	NOAEL TRV	Source
2-sec-Butyl-4,6-dinitrophenol	88-85-7	No TRV		No TRV	
3,3'-Dichlorobenzidine	91-94-1	No TRV		No TRV	
3,3'-Dimethoxybenzidine	119-90-4	No TRV		No TRV	
4-Bromophenylphenyl ether	101-55-3	No TRV		No TRV	
Ammonium perfluorooctanoate	3825-26-1	No TRV		No TRV	
Azobenzene	103-33-3	No TRV		No TRV	
Bis(3-tert-butyl-4-hydroxy-6-methyl-phenyl)s	96-69-5	No TRV		No TRV	
Captan	133-06-2	No TRV		No TRV	
Chlorobenzilate	510-15-6	No TRV		No TRV	
Dibutylphosphate	107-66-4	No TRV		No TRV	
Dimethyl aminoazobenzene	60-11-7	No TRV		No TRV	
Hexachlorobenzene	118-74-1	1.60E+03	EPA 1999[f]	2.25E+02	EPA 1999[f]
Hexachlorobutadiene	87-68-3	2.00E+02	EPA 1999[f]	3.19E+03	EPA 1999[f]
Hexachlorocyclopentadiene	77-47-4	3.80E+03	EPA 1999[f]	No TRV	
Hexachloroethane	67-72-1	1.00E+02	Gorzinski and others (1985) in IRIS (2002)[a]	No TRV	
Hexachlorophene	70-30-4	5.60E+03	EPA 1999[f]	5.75E+03	EPA 1999[f]
Hexamethylene-1,5-diisocyanate	822-06-0	No TRV		No TRV	
Mirex	2385-85-5	7.00E+01	NTP (1990) in IRIS (2002)[a]	No TRV	
Nitrofen	1836-75-5	No TRV		No TRV	
Pentachlorobenzene	608-93-5	7.25E+03	EPA 1999[f]	No TRV	
Pentachloronitrobenzene	82-68-8	4.58E+05	EPA 1999[f]	6.88E+04	EPA 1999[f]
Pentachlorophenol	87-86-5	3.00E+02	EPA 1999[f]	4.03E+03	EPA 1999[f]
Picric acid	88-89-1	No TRV		No TRV	
Pronamide	23950-58-5	7.50E+02	Rohm & Hass. Co (1970) in IRIS (2002)[a]	No TRV	
Strychnine	57-24-9	2.50E+01	Seidl and Zbinden (1982) in IRIS (2002)[a]	No TRV	
Terphenyls	26140-60-3	No TRV		No TRV	
Tributyl phosphate	126-73-8	No TRV		No TRV	

Table C3-8 Toxicity Reference Values (TRVs) for COPCs and ROPCs

Constituent of Potential Concern	CAS Registry Number	Ingestion, Terrestrial Exposures			
		Coyote		Burrowing Owl	
		NOAEL TRV	Source	NOAEL TRV	Source
2-sec-Butyl-4,6-dinitrophenol	88-85-7	No TRV		No TRV	
3,3'-Dichlorobenzidine	91-94-1	No TRV		No TRV	
3,3'-Dimethoxybenzidine	119-90-4	No TRV		No TRV	
4-Bromophenylphenyl ether	101-55-3	No TRV		No TRV	
Ammonium perfluorooctanoate	3825-26-1	No TRV		No TRV	
Azobenzene	103-33-3	No TRV		No TRV	
Bis(3-tert-butyl-4-hydroxy-6-methyl-phenyl)s	96-69-5	No TRV		No TRV	
Captan	133-06-2	No TRV		No TRV	
Chlorobenzilate	510-15-6	No TRV		No TRV	
Dibutylphosphate	107-66-4	No TRV		No TRV	
Dimethyl aminoazobenzene	60-11-7	No TRV		No TRV	
Hexachlorobenzene	118-74-1	1.60E+03	EPA 1999[f]	2.25E+02	EPA 1999[f]
Hexachlorobutadiene	87-68-3	2.00E+02	EPA 1999[f]	3.19E+03	EPA 1999[f]
Hexachlorocyclopentadiene	77-47-4	3.80E+03	EPA 1999[f]	No TRV	
Hexachloroethane	67-72-1	1.00E+02	Gorzinski and others (1985) in IRIS (2002)[a]	No TRV	
Hexachlorophene	70-30-4	5.60E+03	EPA 1999[f]	5.75E+03	EPA 1999[f]
Hexamethylene-1,5-diisocyanate	822-06-0	No TRV		No TRV	
Mirex	2385-85-5	7.00E+01	NTP (1990) in IRIS (2002)[a]	No TRV	
Nitrofen	1836-75-5	No TRV		No TRV	
Pentachlorobenzene	608-93-5	7.25E+03	EPA 1999[f]	No TRV	
Pentachloronitrobenzene	82-68-8	4.58E+05	EPA 1999[f]	6.88E+04	EPA 1999[f]
Pentachlorophenol	87-86-5	3.00E+02	EPA 1999[f]	4.03E+03	EPA 1999[f]
Picric acid	88-89-1	No TRV		No TRV	
Pronamide	23950-58-5	7.50E+02	Rohm & Hass. Co (1970) in IRIS (2002)[a]	No TRV	
Strychnine	57-24-9	2.50E+01	Seidl and Zbinden (1982) in IRIS (2002)[a]	No TRV	
Terphenyls	26140-60-3	No TRV		No TRV	
Tributyl phosphate	126-73-8	No TRV		No TRV	

Table C3-8 Toxicity Reference Values (TRVs) for COPCs and ROPCs

Constituent of Potential Concern	CAS Registry Number	Ingestion, Terrestrial Exposures		Ingestion, Aquatic Exposures	
		Red-tailed Hawk		Canada Goose	
		NOAEL TRV	Source	NOAEL TRV	Source
2-sec-Butyl-4,6-dinitrophenol	88-85-7	No TRV		No TRV	
3,3'-Dichlorobenzidine	91-94-1	No TRV		No TRV	
3,3'-Dimethoxybenzidine	119-90-4	No TRV		No TRV	
4-Bromophenylphenyl ether	101-55-3	No TRV		No TRV	
Ammonium perfluorooctanoate	3825-26-1	No TRV		No TRV	
Azobenzene	103-33-3	No TRV		No TRV	
Bis(3-tert-butyl-4-hydroxy-6-methyl-phenyl)s	96-69-5	No TRV		No TRV	
Captan	133-06-2	No TRV		No TRV	
Chlorobenzilate	510-15-6	No TRV		No TRV	
Dibutylphosphate	107-66-4	No TRV		No TRV	
Dimethyl aminoazobenzene	60-11-7	No TRV		No TRV	
Hexachlorobenzene	118-74-1	2.25E+02	EPA 1999[f]	2.25E+02	EPA 1999[f]
Hexachlorobutadiene	87-68-3	3.19E+03	EPA 1999[f]	3.19E+03	EPA 1999[f]
Hexachlorocyclopentadiene	77-47-4	No TRV		No TRV	
Hexachloroethane	67-72-1	No TRV		No TRV	
Hexachlorophene	70-30-4	5.75E+03	EPA 1999[f]	5.75E+03	EPA 1999[f]
Hexamethylene-1,5-diisocyanate	822-06-0	No TRV		No TRV	
Mirex	2385-85-5	No TRV		No TRV	
Nitrofen	1836-75-5	No TRV		No TRV	
Pentachlorobenzene	608-93-5	No TRV		No TRV	
Pentachloronitrobenzene	82-68-8	6.88E+04	EPA 1999[f]	6.88E+04	EPA 1999[f]
Pentachlorophenol	87-86-5	4.03E+03	EPA 1999[f]	4.03E+03	EPA 1999[f]
Picric acid	88-89-1	No TRV		No TRV	
Pronamide	23950-58-5	No TRV		No TRV	
Strychnine	57-24-9	No TRV		No TRV	
Terphenyls	26140-60-3	No TRV		No TRV	
Tributyl phosphate	126-73-8	No TRV		No TRV	

Table C3-8 Toxicity Reference Values (TRVs) for COPCs and ROPCs

Constituent of Potential Concern	CAS Registry Number	Ingestion, Aquatic Exposures			
		Spotted Sandpiper		Great Blue Heron	
		NOAEL TRV	Source	NOAEL TRV	Source
2-sec-Butyl-4,6-dinitrophenol	88-85-7	No TRV		No TRV	
3,3'-Dichlorobenzidine	91-94-1	No TRV		No TRV	
3,3'-Dimethoxybenzidine	119-90-4	No TRV		No TRV	
4-Bromophenylphenyl ether	101-55-3	No TRV		No TRV	
Ammonium perfluorooctanoate	3825-26-1	No TRV		No TRV	
Azobenzene	103-33-3	No TRV		No TRV	
Bis(3-tert-butyl-4-hydroxy-6-methyl-phenyl)s	96-69-5	No TRV		No TRV	
Captan	133-06-2	No TRV		No TRV	
Chlorobenzilate	510-15-6	No TRV		No TRV	
Dibutylphosphate	107-66-4	No TRV		No TRV	
Dimethyl aminoazobenzene	60-11-7	No TRV		No TRV	
Hexachlorobenzene	118-74-1	2.25E+02	EPA 1999[f]	2.25E+02	EPA 1999[f]
Hexachlorobutadiene	87-68-3	3.19E+03	EPA 1999[f]	3.19E+03	EPA 1999[f]
Hexachlorocyclopentadiene	77-47-4	No TRV		No TRV	
Hexachloroethane	67-72-1	No TRV		No TRV	
Hexachlorophene	70-30-4	5.75E+03	EPA 1999[f]	5.75E+03	EPA 1999[f]
Hexamethylene-1,5-diisocyanate	822-06-0	No TRV		No TRV	
Mirex	2385-85-5	No TRV		No TRV	
Nitrofen	1836-75-5	No TRV		No TRV	
Pentachlorobenzene	608-93-5	No TRV		No TRV	
Pentachloronitrobenzene	82-68-8	6.88E+04	EPA 1999[f]	6.88E+04	EPA 1999[f]
Pentachlorophenol	87-86-5	4.03E+03	EPA 1999[f]	4.03E+03	EPA 1999[f]
Picric acid	88-89-1	No TRV		No TRV	
Pronamide	23950-58-5	No TRV		No TRV	
Strychnine	57-24-9	No TRV		No TRV	
Terphenyls	26140-60-3	No TRV		No TRV	
Tributyl phosphate	126-73-8	No TRV		No TRV	

Table C3-8 Toxicity Reference Values (TRVs) for COPCs and ROPCs

Constituent of Potential Concern	CAS Registry Number	Ingestion, Aquatic Exposures			
		Bald Eagle		Mink	
		NOAEL TRV	Source	NOAEL TRV	Source
2-sec-Butyl-4,6-dinitrophenol	88-85-7	No TRV		No TRV	
3,3'-Dichlorobenzidine	91-94-1	No TRV		No TRV	
3,3'-Dimethoxybenzidine	119-90-4	No TRV		No TRV	
4-Bromophenylphenyl ether	101-55-3	No TRV		No TRV	
Ammonium perfluorooctanoate	3825-26-1	No TRV		No TRV	
Azobenzene	103-33-3	No TRV		No TRV	
Bis(3-tert-butyl-4-hydroxy-6-methyl-phenyl)s	96-69-5	No TRV		No TRV	
Captan	133-06-2	No TRV		No TRV	
Chlorobenzilate	510-15-6	No TRV		No TRV	
Dibutylphosphate	107-66-4	No TRV		No TRV	
Dimethyl aminoazobenzene	60-11-7	No TRV		No TRV	
Hexachlorobenzene	118-74-1	2.25E+02	EPA 1999[f]	1.60E+03	EPA 1999[f]
Hexachlorobutadiene	87-68-3	3.19E+03	EPA 1999[f]	2.00E+02	EPA 1999[f]
Hexachlorocyclopentadiene	77-47-4	No TRV		3.80E+03	EPA 1999[f]
Hexachloroethane	67-72-1	No TRV		1.00E+02	Gorzinski and others (1985) in IRIS (2002)[a]
Hexachlorophene	70-30-4	5.75E+03	EPA 1999[f]	5.60E+03	EPA 1999[f]
Hexamethylene-1,5-diisocyanate	822-06-0	No TRV		No TRV	
Mirex	2385-85-5	No TRV		7.00E+01	NTP (1990) in IRIS (2002)[a]
Nitrofen	1836-75-5	No TRV		No TRV	
Pentachlorobenzene	608-93-5	No TRV		7.25E+03	EPA 1999[f]
Pentachloronitrobenzene	82-68-8	6.88E+04	EPA 1999[f]	4.58E+05	EPA 1999[f]
Pentachlorophenol	87-86-5	4.03E+03	EPA 1999[f]	3.00E+02	EPA 1999[f]
Picric acid	88-89-1	No TRV		No TRV	
Pronamide	23950-58-5	No TRV		7.50E+02	Rohm & Hass. Co (1970) in IRIS (2002)[a]
Strychnine	57-24-9	No TRV		2.50E+01	Seidl and Zbinden (1982) in IRIS (2002)[a]
Terphenyls	26140-60-3	No TRV		No TRV	
Tributyl phosphate	126-73-8	No TRV		No TRV	

Table C3-8 Toxicity Reference Values (TRVs) for COPCs and ROPCs

Constituent of Potential Concern	CAS Registry Number	Direct Contact, Aquatic Receptors			
		Aquatic Biota		Chinook Salmon and Other Salmonids	
		NOAEL TRV	Source	NOAEL TRV	Source
2-sec-Butyl-4,6-dinitrophenol	88-85-7	No TRV		1.30E-02	Chronic LOAEL for fathead minnow (Suter and Tsao 1996[d] Table C-1) × 0.1 for LOAEL-to-NOAEL conversion
3,3'-Dichlorobenzidine	91-94-1	No TRV		No TRV	
3,3'-Dimethoxybenzidine	119-90-4	No TRV		No TRV	
4-Bromophenylphenyl ether	101-55-3	1.50E+00	Tier II Chronic (Suter & Tsao 1996)[d]	1.50E+00	Tier II Chronic (Suter & Tsao 1996)[d]
Ammonium perfluorooctanoate	3825-26-1	No TRV		No TRV	
Azobenzene	103-33-3	No TRV		No TRV	
Bis(3-tert-butyl-4-hydroxy-6-methyl-phenyl)s	96-69-5	No TRV		No TRV	
Captan	133-06-2	No TRV		No TRV	
Chlorobenzilate	510-15-6	No TRV		No TRV	
Dibutylphosphate	107-66-4	No TRV		No TRV	
Dimethyl aminoazobenzene	60-11-7	No TRV		No TRV	
Hexachlorobenzene	118-74-1	3.68E+00	EPA 1999[f]	3.68E+00	EPA 1999[f]
Hexachlorobutadiene	87-68-3	9.30E-01	EPA 1999[f]	9.30E-01	EPA 1999[f]
Hexachlorocyclopentadiene	77-47-4	5.20E-01	EPA 1999[f]	5.20E-01	EPA 1999[f]
Hexachloroethane	67-72-1	1.20E+01	Tier II Chronic (Suter & Tsao 1996)[d]	1.20E+01	Tier II Chronic (Suter & Tsao 1996)[d]
Hexachlorophene	70-30-4	8.80E-01	EPA 1999[f]	8.80E-01	EPA 1999[f]
Hexamethylene-1,5-diisocyanate	822-06-0	No TRV		No TRV	
Mirex	2385-85-5	1.00E-03	EPA 1987[b]	1.00E-03	EPA 1987[b]
Nitrofen	1836-75-5	No TRV		No TRV	
Pentachlorobenzene	608-93-5	4.70E-01	EPA 1999[f]	4.70E-01	EPA 1999[f]
Pentachloronitrobenzene	82-68-8	1.00E+01	EPA 1999[f]	1.00E+01	EPA 1999[f]
Pentachlorophenol	87-86-5	1.50E+01	EPA 1999[f]	5.59E-02	Pentachlorophenol LC_{50} from AQUIRE[g], CV calculated by Eq. 2 in Suter and Tsao (1996), Sect. 2.5
Picric acid	88-89-1	No TRV		No TRV	
Pronamide	23950-58-5	No TRV		No TRV	
Strychnine	57-24-9	No TRV		No TRV	
Terphenyls	26140-60-3	No TRV		No TRV	
Tributyl phosphate	126-73-8	No TRV		No TRV	

Table C3-8 Toxicity Reference Values (TRVs) for COPCs and ROPCs

Constituent of Potential Concern	CAS Registry Number	Direct Contact, Aquatic Receptors	
		Benthic Organisms	
		NOAEL TRV	Source
2-sec-Butyl-4,6-dinitrophenol	88-85-7	No TRV	
3,3'-Dichlorobenzidine	91-94-1	No TRV	
3,3'-Dimethoxybenzidine	119-90-4	No TRV	
4-Bromophenylphenyl ether	101-55-3	No TRV	
Ammonium perfluorooctanoate	3825-26-1	No TRV	
Azobenzene	103-33-3	No TRV	
Bis(3-tert-butyl-4-hydroxy-6-methyl-phenyl)s	96-69-5	No TRV	
Captan	133-06-2	No TRV	
Chlorobenzilate	510-15-6	No TRV	
Dibutylphosphate	107-66-4	No TRV	
Dimethyl aminoazobenzene	60-11-7	No TRV	
Hexachlorobenzene	118-74-1	2.00E+01	EPA 1999[f]
Hexachlorobutadiene	87-68-3	2.58E+02	EPA 1999[f]
Hexachlorocyclopentadiene	77-47-4	1.98E+02	EPA 1999[f]
Hexachloroethane	67-72-1	8.74E+02	EqP method (Jones and others 1997)[i]
Hexachlorophene	70-30-4	6.34E+04	EPA 1999[f]
Hexamethylene-1,5-diisocyanate	822-06-0	No TRV	
Mirex	2385-85-5	7.00E+00	Persaud and others (1993)[k]
Nitrofen	1836-75-5	No TRV	
Pentachlorobenzene	608-93-5	6.04E+02	EPA 1999[f]
Pentachloronitrobenzene	82-68-8	2.36E+03	EPA 1999[f]
Pentachlorophenol	87-86-5	7.00E+03	EPA 1999[f]
Picric acid	88-89-1	No TRV	
Pronamide	23950-58-5	No TRV	
Strychnine	57-24-9	No TRV	
Terphenyls	26140-60-3	No TRV	
Tributyl phosphate	126-73-8	No TRV	

Table C3-8 Toxicity Reference Values (TRVs) for COPCs and ROPCs

Constituent of Potential Concern	CAS Registry Number	Direct Exposure, Terrestrial Receptors			
		Plant		Terrestrial Invertebrate	
		TRV	Source	TRV	Source
Trifluralin	1582-09-8	No TRV		No TRV	
Triphenylamine	603-34-9	No TRV		No TRV	
Herbicides and Organochlorinated Pesticides					
2,4,5-T	93-76-5	No TRV		No TRV	
2,4-D and esters	94-75-7	No TRV		No TRV	
4,4'-DDD	72-54-8	No TRV		No TRV	
4,4'-DDE	72-55-9	No TRV		No TRV	
4,4'-DDT	50-29-3	No TRV		No TRV	
Aldrin	309-00-2	No TRV		No TRV	
alpha-BHC	319-84-6	No TRV		No TRV	
beta-BHC	319-85-7	No TRV		No TRV	
Chlordane	57-74-9	No TRV		No TRV	
Delta-BHC	319-86-8	No TRV		No TRV	
Dieldrin	60-57-1	No TRV		No TRV	
Endothall	145-73-3	No TRV		No TRV	
Endrin	72-20-8	No TRV		No TRV	
gamma-BHC (Lindane)	58-89-9	No TRV		No TRV	
Heptachlor	76-44-8	1.00E+03	EPA 1999[f]	No TRV	
Isodrin	465-73-6	No TRV		No TRV	

Table C3-8 Toxicity Reference Values (TRVs) for COPCs and ROPCs

Constituent of Potential Concern	CAS Registry Number	Ingestion, Terrestrial Exposures			
		Mule Deer		Mourning Dove	
		NOAEL TRV	Source	NOAEL TRV	Source
Trifluralin	1582-09-8	7.50E+01	Hoechst Aktiengesellschaft (1984) in IRIS (2002)[a]	No TRV	
Triphenylamine	603-34-9	No TRV		No TRV	
Herbicides and Organochlorinated Pesticides					
2,4,5-T	93-76-5	3.00E+03	Smith and others (1981) in IRIS (2002)[a]	No TRV	
2,4-D and esters	94-75-7	No TRV		No TRV	
4,4'-DDD	72-54-8	No TRV		No TRV	
4,4'-DDE	72-55-9	1.00E+03	EPA 1999[f]	8.45E+02	EPA 1999[f]
4,4'-DDT	50-29-3	8.00E+02	Fitzhugh (1948) in Sample and others (1996)c	2.80E+00	Anderson and others (1975) in Sample and others (1996)[c]
Aldrin	309-00-2	2.00E+02	Treon and Cleveland (1955) in Sample and others (1996)[c]	No TRV	
alpha-BHC	319-84-6	No TRV		No TRV	
beta-BHC	319-85-7	4.00E-01	Van Velsen and others (1986) in Sample and others (1996)	No TRV	
Chlordane	57-74-9	4.58E+03	Keplinger and others (1968) in Sample and others (1996)c	2.14E+03	Stickel and others (1983) in Sample and others (1996)[c]
Delta-BHC	319-86-8	No TRV		No TRV	
Dieldrin	60-57-1	2.00E+01	Treon and Cleveland (1955) in Sample and others (1996)c	7.70E+01	Mendenhall and others (1983) in Sample and others (1996)[c]
Endothall	145-73-3	2.00E+03	Pennwalt Agchem (1965) in IRIS (2002)[a]	No TRV	
Endrin	72-20-8	9.20E+01	Good and Ware (1969) in Sample and others (1996)[c]	3.00E+02	Spann and others (1986) in Sample and others (1996)c
gamma-BHC (Lindane)	58-89-9	8.00E+03	Palmer and others (1978) in Sample and others (1996)[c]	2.00E+03	Chakravarty and Lahiri (1986) in Sample and others (1996)[c]
Heptachlor	76-44-8	2.50E+00	EPA 1999[f]	6.50E+01	EPA 1999[f]
Isodrin	465-73-6	No TRV		No TRV	

Table C3-8 Toxicity Reference Values (TRVs) for COPCs and ROPCs

Constituent of Potential Concern	CAS Registry Number	Ingestion, Terrestrial Exposures			
		Great Basin Pocket Mouse		Western Meadowlark	
		NOAEL TRV	Source	NOAEL TRV	Source
Trifluralin	1582-09-8	7.50E+01	Hoechst Aktiengesellschaft (1984) in IRIS (2002)[a]	No TRV	
Triphenylamine	603-34-9	No TRV		No TRV	
Herbicides and Organochlorinated Pesticides					
2,4,5-T	93-76-5	3.00E+03	Smith and others (1981) in IRIS (2002)[a]	No TRV	
2,4-D and esters	94-75-7	No TRV		No TRV	
4,4'-DDD	72-54-8	No TRV		No TRV	
4,4'-DDE	72-55-9	1.00E+03	EPA 1999[f]	8.45E+02	EPA 1999[f]
4,4'-DDT	50-29-3	8.00E+02	Fitzhugh (1948) in Sample and others (1996)[c]	2.80E+00	Anderson and others (1975) in Sample and others (1996)[c]
Aldrin	309-00-2	2.00E+02	Treon and Cleveland (1955) in Sample and others (1996)[c]	No TRV	
alpha-BHC	319-84-6	No TRV		No TRV	
beta-BHC	319-85-7	4.00E-01	Van Velsen and others (1986) in Sample and others (1996)	No TRV	
Chlordane	57-74-9	4.58E+03	Keplinger and others (1968) in Sample and others (1996)[c]	2.14E+03	Stickel and others (1983) in Sample and others (1996)[c]
Delta-BHC	319-86-8	No TRV		No TRV	
Dieldrin	60-57-1	2.00E+01	Treon and Cleveland (1955) in Sample and others (1996)[c]	7.70E+01	Mendenhall and others (1983) in Sample and others (1996)[c]
Endothall	145-73-3	2.00E+03	Pennwalt Agchem (1965) in IRIS (2002)[a]	No TRV	
Endrin	72-20-8	9.20E+01	Good and Ware (1969) in Sample and others (1996)[c]	3.00E+02	Spann and others (1986) in Sample and others (1996)[c]
gamma-BHC (Lindane)	58-89-9	8.00E+03	Palmer and others (1978) in Sample and others (1996)[c]	2.00E+03	Chakravarty and Lahiri (1986) in Sample and others (1996)[c]
Heptachlor	76-44-8	2.50E+00	EPA 1999[f]	6.50E+01	EPA 1999[f]
Isodrin	465-73-6	No TRV		No TRV	

Table C3-8 Toxicity Reference Values (TRVs) for COPCs and ROPCs

Constituent of Potential Concern	CAS Registry Number	Ingestion, Terrestrial Exposures			
		Coyote		Burrowing Owl	
		NOAEL TRV	Source	NOAEL TRV	Source
Trifluralin	1582-09-8	7.50E+01	Hoechst Aktiengesellschaft (1984) in IRIS (2002)[a]	No TRV	
Triphenylamine	603-34-9	No TRV		No TRV	
Herbicides and Organochlorinated Pesticides					
2,4,5-T	93-76-5	3.00E+03	Smith and others (1981) in IRIS (2002)[a]	No TRV	
2,4-D and esters	94-75-7	No TRV		No TRV	
4,4'-DDD	72-54-8	No TRV		No TRV	
4,4'-DDE	72-55-9	1.00E+03	EPA 1999[f]	8.45E+02	EPA 1999[f]
4,4'-DDT	50-29-3	8.00E+02	Fitzhugh (1948) in Sample and others (1996)[c]	2.80E+00	Anderson and others (1975) in Sample and others (1996)[c]
Aldrin	309-00-2	2.00E+02	Treon and Cleveland (1955) in Sample and others (1996)[c]	No TRV	
alpha-BHC	319-84-6	No TRV		No TRV	
beta-BHC	319-85-7	4.00E-01	Van Velsen and others (1986) in Sample and others (1996)	No TRV	
Chlordane	57-74-9	4.58E+03	Keplinger and others (1968) in Sample and others (1996)[c]	2.14E+03	Stickel and others (1983) in Sample and others (1996)[c]
Delta-BHC	319-86-8	No TRV		No TRV	
Dieldrin	60-57-1	2.00E+01	Treon and Cleveland (1955) in Sample and others (1996)[c]	7.70E+01	Mendenhall and others (1983) in Sample and others (1996)[c]
Endothall	145-73-3	2.00E+03	Pennwalt Agchem (1965) in IRIS (2002)[a]	No TRV	
Endrin	72-20-8	9.20E+01	Good and Ware (1969) in Sample and others (1996)[c]	3.00E+02	Spann and others (1986) in Sample and others (1996)[c]
gamma-BHC (Lindane)	58-89-9	8.00E+03	Palmer and others (1978) in Sample and others (1996)[c]	2.00E+03	Chakravarty and Lahiri (1986) in Sample and others (1996)[c]
Heptachlor	76-44-8	2.50E+00	EPA 1999[f]	6.50E+01	EPA 1999[f]
Isodrin	465-73-6	No TRV		No TRV	

Table C3-8 Toxicity Reference Values (TRVs) for COPCs and ROPCs

Constituent of Potential Concern	CAS Registry Number	Ingestion, Terrestrial Exposures		Ingestion, Aquatic Exposures	
		Red-tailed Hawk		Canada Goose	
		NOAEL TRV	Source	NOAEL TRV	Source
Trifluralin	1582-09-8	No TRV		No TRV	
Triphenylamine	603-34-9	No TRV		No TRV	
Herbicides and Organochlorinated Pesticides					
2,4,5-T	93-76-5	No TRV		No TRV	
2,4-D and esters	94-75-7	No TRV		No TRV	
4,4'-DDD	72-54-8	No TRV		No TRV	
4,4'-DDE	72-55-9	8.45E+02	EPA 1999[f]	8.45E+02	EPA 1999[f]
4,4'-DDT	50-29-3	2.80E+00	Anderson and others (1975) in Sample and others (1996)[c]	2.80E+00	Anderson and others (1975) in Sample and others (1996)[c]
Aldrin	309-00-2	No TRV		No TRV	
alpha-BHC	319-84-6	No TRV		No TRV	
beta-BHC	319-85-7	No TRV		No TRV	
Chlordane	57-74-9	2.14E+03	Stickel and others (1983) in Sample and others (1996)[c]	2.14E+03	Stickel and others (1983) in Sample and others (1996)[c]
Delta-BHC	319-86-8	No TRV		No TRV	
Dieldrin	60-57-1	7.70E+01	Mendenhall and others (1983) in Sample and others (1996)[c]	7.70E+01	Mendenhall and others (1983) in Sample and others (1996)[c]
Endothall	145-73-3	No TRV		No TRV	
Endrin	72-20-8	3.00E+02	Spann and others (1986) in Sample and others (1996)[c]	3.00E+02	Spann and others (1986) in Sample and others (1996)[c]
gamma-BHC (Lindane)	58-89-9	2.00E+03	Chakravarty and Lahiri (1986) in Sample and others (1996)[c]	2.00E+03	Chakravarty and Lahiri (1986) in Sample and others (1996)[c]
Heptachlor	76-44-8	6.50E+01	EPA 1999[f]	6.50E+01	EPA 1999[f]
Isodrin	465-73-6	No TRV		No TRV	

Table C3-8 Toxicity Reference Values (TRVs) for COPCs and ROPCs

Constituent of Potential Concern	CAS Registry Number	Ingestion, Aquatic Exposures			
		Spotted Sandpiper		Great Blue Heron	
		NOAEL TRV	Source	NOAEL TRV	Source
Trifluralin	1582-09-8	No TRV		No TRV	
Triphenylamine	603-34-9	No TRV		No TRV	
Herbicides and Organochlorinated Pesticides					
2,4,5-T	93-76-5	No TRV		No TRV	
2,4-D and esters	94-75-7	No TRV		No TRV	
4,4'-DDD	72-54-8	No TRV		No TRV	
4,4'-DDE	72-55-9	8.45E+02	EPA 1999[f]	8.45E+02	EPA 1999[f]
4,4'-DDT	50-29-3	2.80E+00	Anderson and others (1975) in Sample and others (1996)[c]	2.80E+00	Anderson and others (1975) in Sample and others (1996)[c]
Aldrin	309-00-2	No TRV		No TRV	
alpha-BHC	319-84-6	No TRV		No TRV	
beta-BHC	319-85-7	No TRV		No TRV	
Chlordane	57-74-9	2.14E+03	Stickel and others (1983) in Sample and others (1996)[c]	2.14E+03	Stickel and others (1983) in Sample and others (1996)[c]
Delta-BHC	319-86-8	No TRV		No TRV	
Dieldrin	60-57-1	7.70E+01	Mendenhall and others (1983) in Sample and others (1996)[c]	7.70E+01	Mendenhall and others (1983) in Sample and others (1996)[c]
Endothall	145-73-3	No TRV		No TRV	
Endrin	72-20-8	3.00E+02	Spann and others (1986) in Sample and others (1996)[c]	3.00E+02	Spann and others (1986) in Sample and others (1996)[c]
gamma-BHC (Lindane)	58-89-9	2.00E+03	Chakravarty and Lahiri (1986) in Sample and others (1996)[c]	2.00E+03	Chakravarty and Lahiri (1986) in Sample and others (1996)[c]
Heptachlor	76-44-8	6.50E+01	EPA 1999[f]	6.50E+01	EPA 1999[f]
Isodrin	465-73-6	No TRV		No TRV	

Table C3-8 Toxicity Reference Values (TRVs) for COPCs and ROPCs

Constituent of Potential Concern	CAS Registry Number	Ingestion, Aquatic Exposures			
		Bald Eagle		Mink	
		NOAEL TRV	Source	NOAEL TRV	Source
Trifluralin	1582-09-8	No TRV		7.50E+01	Hoechst Aktiengesellschaft (1984) in IRIS (2002)[a]
Triphenylamine	603-34-9	No TRV		No TRV	
Herbicides and Organochlorinated Pesticides					
2,4,5-T	93-76-5	No TRV		3.00E+03	Smith and others (1981) in IRIS (2002)[a]
2,4-D and esters	94-75-7	No TRV		No TRV	
4,4'-DDD	72-54-8	No TRV		No TRV	
4,4'-DDE	72-55-9	8.45E+02	EPA 1999[f]	1.00E+03	EPA 1999[f]
4,4'-DDT	50-29-3	2.80E+00	Anderson and others (1975) in Sample and others (1996)[c]	8.00E+02	Fitzhugh (1948) in Sample and others (1996)[c]
Aldrin	309-00-2	No TRV		2.00E+02	Treon and Cleveland (1955) in Sample and others (1996)[c]
alpha-BHC	319-84-6	No TRV		No TRV	
beta-BHC	319-85-7	No TRV		4.00E-01	Van Velsen and others (1986) in Sample and others (1996)
Chlordane	57-74-9	2.14E+03	Stickel and others (1983) in Sample and others (1996)[c]	4.58E+03	Keplinger and others (1968) in Sample and others (1996)[c]
Delta-BHC	319-86-8	No TRV		No TRV	
Dieldrin	60-57-1	7.70E+01	Mendenhall and others (1983) in Sample and others (1996)[c]	2.00E+01	Treon and Cleveland (1955) in Sample and others (1996)[c]
Endothall	145-73-3	No TRV		2.00E+03	Pennwalt Agchem (1965) in IRIS (2002)[a]
Endrin	72-20-8	3.00E+02	Spann and others (1986) in Sample and others (1996)[c]	9.20E+01	Good and Ware (1969) in Sample and others (1996)[c]
gamma-BHC (Lindane)	58-89-9	2.00E+03	Chakravarty and Lahiri (1986) in Sample and others (1996)[c]	8.00E+03	Palmer and others (1978) in Sample and others (1996)[c]
Heptachlor	76-44-8	6.50E+01	EPA 1999[f]	2.50E+00	EPA 1999[f]
Isodrin	465-73-6	No TRV		No TRV	

Table C3-8 Toxicity Reference Values (TRVs) for COPCs and ROPCs

Constituent of Potential Concern	CAS Registry Number	Direct Contact, Aquatic Receptors			
		Aquatic Biota		Chinook Salmon and Other Salmonids	
		NOAEL TRV	Source	NOAEL TRV	Source
Trifluralin	1582-09-8	No TRV		No TRV	
Triphenylamine	603-34-9	No TRV		No TRV	
Herbicides and Organochlorinated Pesticides					
2,4,5-T	93-76-5	No TRV		No TRV	
2,4-D and esters	94-75-7	No TRV		No TRV	
4,4'-DDD	72-54-8	1.10E-02	Tier II Chronic (Suter & Tsao 1996)[d]	2.00E-04	Acute LOAEL for rainbow trout (Suter and Sao 1996[d] Table C-1) × 0.1 for LOAEL-to-NOAEL conversion × 0.1 for acute-to-chronic conversion
4,4'-DDE	72-55-9	1.05E+01	EPA 1999[f]	1.05E+01	EPA 1999[f]
4,4'-DDT	50-29-3	1.30E-02	Tier II Chronic (Suter & Tsao 1996)[d]	8.00E-03	Sensitive Species Test EC_{20} (Suter and Tsao 1996[d], Table 2)
Aldrin	309-00-2	3.00E+00	EPA 1987[b]	3.00E+00	EPA 1987[b]
alpha-BHC	319-84-6	2.20E+00	Tier II Chronic (Suter & Tsao 1996)[d]	2.20E+00	Tier II Chronic (Suter & Tsao 1996)[d]
beta-BHC	319-85-7	2.20E+00	Tier II Chronic (Suter & Tsao 1996)[d]	2.20E+00	Tier II Chronic (Suter & Tsao 1996)[d]
Chlordane	57-74-9	1.70E-01	NAWQC Chronic (Suter & Tsao 1996)[d]	2.00E-02	LOAEL for brook trout (Suter and Tsao 1996[d] Table C-1) × 0.1 for LOAEL-to-NOAEL conversion
Delta-BHC	319-86-8	2.20E+00	Tier II Chronic (Suter & Tsao 1996)[d]	2.20E+00	Tier II Chronic (Suter & Tsao 1996)[d]
Dieldrin	60-57-1	6.20E-02	NAWQC Chronic (Suter & Tsao 1996)[d]	6.20E-02	NAWQC Chronic (Suter & Tsao 1996)[d]
Endothall	145-73-3	No TRV		No TRV	
Endrin	72-20-8	6.10E-02	NAWQC Chronic (Suter & Tsao 1996)[d]	6.10E-02	NAWQC Chronic (Suter & Tsao 1996)[d]
gamma-BHC (Lindane)	58-89-9	8.00E-02	NAWQC Chronic (Suter & Tsao 1996)[d]	8.00E-02	NAWQC Chronic (Suter & Tsao 1996)[d]
Heptachlor	76-44-8	3.80E-03	EPA 1999[f]	3.80E-03	EPA 1999[f]
Isodrin	465-73-6	No TRV		No TRV	

Table C3-8 Toxicity Reference Values (TRVs) for COPCs and ROPCs

Constituent of Potential Concern	CAS Registry Number	Direct Contact, Aquatic Receptors	
		Benthic Organisms	
		NOAEL TRV	Source
Trifluralin	1582-09-8	No TRV	
Triphenylamine	603-34-9	No TRV	
Herbicides and Organochlorinated Pesticides			
2,4,5-T	93-76-5	No TRV	
2,4-D and esters	94-75-7	No TRV	
4,4'-DDD	72-54-8	8.00E+00	Persaud and others (1993)[k]
4,4'-DDE	72-55-9	5.00E+00	EPA 1999[f]
4,4'-DDT	50-29-3	8.00E+00	Persaud and others (1993)[k]
Aldrin	309-00-2	2.00E+00	Persaud and others (1993)[k]
alpha-BHC	319-84-6	6.00E+00	Persaud and others (1993)[k]
beta-BHC	319-85-7	5.00E+00	Persaud and others (1993)[k]
Chlordane	57-74-9	7.00E+00	Persaud and others (1993)[k]
Delta-BHC	319-86-8	2.48E-01	EqP method (Jones and others 1997)[i]
Dieldrin	60-57-1	2.00E+00	Persaud and others (1993)[k]
Endothall	145-73-3	No TRV	Persaud and others (1993)[k]
Endrin	72-20-8	3.00E+00	Persaud and others (1993)[k]
gamma-BHC (Lindane)	58-89-9	3.00E+00	Persaud and others (1993)[k]
Heptachlor	76-44-8	3.08E-01	EPA 1999[f]
Isodrin	465-73-6	No TRV	

Table C3-8 Toxicity Reference Values (TRVs) for COPCs and ROPCs

Constituent of Potential Concern	CAS Registry Number	Direct Exposure, Terrestrial Receptors			
		Plant		Terrestrial Invertebrate	
		TRV	Source	TRV	Source
Methoxychlor	72-43-5	No TRV		No TRV	
Silvex (2,4,5-TP)	93-72-1	No TRV		No TRV	
Toxaphene	8001-35-2	No TRV		No TRV	
Inorganic Chemicals and Compounds					
	Metals				
Aluminum	7429-90-5	5.00E+00	EPA 1999[f]	No TRV	
Antimony	7440-36-0	5.00E-01	EPA 1999[f]	No TRV	
Arsenic	7440-38-2	1.00E+00	EPA 1999[f]	2.50E-01	EPA 1999[f]
Barium	7440-39-3	5.00E+00	EPA 1999[f]	No TRV	
Beryllium	7440-41-7	1.00E-01	EPA 1999[f]	No TRV	
Bismuth	7440-69-9	No TRV		No TRV	
Boron	7440-42-8	5.00E-01	Efroymson and others (1997a)[e]	No TRV	
Cadmium	7440-43-9	2.00E-01	EPA 1999[f]	1.00E+01	EPA 1999[f]
Calcium	7440-70-2	No TRV		No TRV	
Chromium[l]	18540-29-9	1.80E-02	EPA 1999[f]	2.00E-01	EPA 1999[f]
Cobalt	7440-48-4	2.00E+01	Efroymson and others (1997a)[e]	No TRV	
Copper	7440-50-8	1.00E+00	EPA 1999[f]	3.20E+01	EPA 1999[f]
Iron	7439-89-6	No TRV		No TRV	
Lead	7439-92-1	4.60E+00	EPA 1999[f]	1.00E+02	EPA 1999[f]

Table C3-8 Toxicity Reference Values (TRVs) for COPCs and ROPCs

Constituent of Potential Concern	CAS Registry Number	Ingestion, Terrestrial Exposures			
		Mule Deer		Mourning Dove	
		NOAEL TRV	Source	NOAEL TRV	Source
Methoxychlor	72-43-5	5.01E+03	Kincaid Enterprises (1986) in IRIS (2002)[a]	No TRV	
Silvex (2,4,5-TP)	93-72-1	7.50E+02	Mullison (1966), Gehring and Betso (1978) in IRIS (2002)[a]	No TRV	
Toxaphene	8001-35-2	8.00E+03	Kennedy and others (1973) in Sample and others (1996)[c]	No TRV	
Inorganic Chemicals and Compounds		(mg/kgBW/d)			
	Metals				
Aluminum	7429-90-5	1.93E+00	EPA 1999[f]	1.00E+02	EPA 1999[f]
Antimony	7440-36-0	6.60E-02	EPA 1999[f]	No TRV	
Arsenic	7440-38-2	1.25E+00	EPA 1999[f]	2.46E+00	EPA 1999[f]
Barium	7440-39-3	5.10E-01	EPA 1999[f]	2.08E+01	EPA 1999[f]
Beryllium	7440-41-7	6.60E-01	EPA 1999[f]	No TRV	
Bismuth	7440-69-9	No TRV		No TRV	
Boron	7440-42-8	2.80E+01	Weir and Fisher (1972) in Sample and others (1996)[c]	2.88E+01	Smith and Anders (1989) in Sample and others (1996)[c]
Cadmium	7440-43-9	2.52E-02	EPA 1999[f]	1.45E+00	EPA 1999[f]
Calcium	7440-70-2	No TRV		No TRV	
Chromium[l]	18540-29-9	3.50E+00	EPA 1999[f]	1.00E+00	EPA 1999[f]
Cobalt	7440-48-4	2.86E-01	Underhill and others (1931) in Clayton and Clayton (1981)[m]	No TRV	
Copper	7440-50-8	1.20E+01	EPA 1999[f]	4.70E+01	EPA 1999[f]
Iron	7439-89-6	No TRV		No TRV	
Lead	7439-92-1	3.75E-02	EPA 1999[f]	2.50E-02	EPA 1999[f]

Table C3-8 Toxicity Reference Values (TRVs) for COPCs and ROPCs

Constituent of Potential Concern	CAS Registry Number	Ingestion, Terrestrial Exposures			
		Great Basin Pocket Mouse		Western Meadowlark	
		NOAEL TRV	Source	NOAEL TRV	Source
Methoxychlor	72-43-5	5.01E+03	Kincaid Enterprises (1986) in IRIS (2002)[a]	No TRV	
Silvex (2,4,5-TP)	93-72-1	7.50E+02	Mullison (1966), Gehring and Betso (1978) in IRIS (2002)[a]	No TRV	
Toxaphene	8001-35-2	8.00E+03	Kennedy and others (1973) in Sample and others (1996)[c]	No TRV	
Inorganic Chemicals and Compounds		(mg/kgBW/d)			
	Metals				
Aluminum	7429-90-5	1.93E+00	EPA 1999[f]	1.00E+02	EPA 1999[f]
Antimony	7440-36-0	6.60E-02	EPA 1999[f]	No TRV	
Arsenic	7440-38-2	1.25E+00	EPA 1999[f]	2.46E+00	EPA 1999[f]
Barium	7440-39-3	5.10E-01	EPA 1999[f]	2.08E+01	EPA 1999[f]
Beryllium	7440-41-7	6.60E-01	EPA 1999[f]	No TRV	
Bismuth	7440-69-9	No TRV		No TRV	
Boron	7440-42-8	2.80E+01	Weir and Fisher (1972) in Sample and others (1996)[c]	2.88E+01	Smith and Anders (1989) in Sample and others (1996)[c]
Cadmium	7440-43-9	2.52E-02	EPA 1999[f]	1.45E+00	EPA 1999[f]
Calcium	7440-70-2	No TRV		No TRV	
Chromium[l]	18540-29-9	3.50E+00	EPA 1999[f]	1.00E+00	EPA 1999[f]
Cobalt	7440-48-4	2.86E-01	Underhill and others (1931) in Clayton and Clayton (1981)[m]	No TRV	
Copper	7440-50-8	1.20E+01	EPA 1999[f]	4.70E+01	EPA 1999[f]
Iron	7439-89-6	No TRV		No TRV	
Lead	7439-92-1	3.75E-02	EPA 1999[f]	2.50E-02	EPA 1999[f]

Table C3-8 Toxicity Reference Values (TRVs) for COPCs and ROPCs

Constituent of Potential Concern	CAS Registry Number	Ingestion, Terrestrial Exposures			
		Coyote		Burrowing Owl	
		NOAEL TRV	Source	NOAEL TRV	Source
Methoxychlor	72-43-5	5.01E+03	Kincaid Enterprises (1986) in IRIS (2002)[a]	No TRV	
Silvex (2,4,5-TP)	93-72-1	7.50E+02	Mullison (1966), Gehring and Betso (1978) in IRIS (2002)[a]	No TRV	
Toxaphene	8001-35-2	8.00E+03	Kennedy and others (1973) in Sample and others (1996)[c]	No TRV	
Inorganic Chemicals and Compounds		(mg/kgBW/d)			
	Metals				
Aluminum	7429-90-5	1.93E+00	EPA 1999[f]	1.00E+02	EPA 1999[f]
Antimony	7440-36-0	6.60E-02	EPA 1999[f]	No TRV	
Arsenic	7440-38-2	1.25E+00	EPA 1999[f]	2.46E+00	EPA 1999[f]
Barium	7440-39-3	5.10E-01	EPA 1999[f]	2.08E+01	EPA 1999[f]
Beryllium	7440-41-7	6.60E-01	EPA 1999[f]	No TRV	
Bismuth	7440-69-9	No TRV		No TRV	
Boron	7440-42-8	2.80E+01	Weir and Fisher (1972) in Sample and others (1996)[c]	2.88E+01	Smith and Anders (1989) in Sample and others (1996)[c]
Cadmium	7440-43-9	2.52E-02	EPA 1999[f]	1.45E+00	EPA 1999[f]
Calcium	7440-70-2	No TRV		No TRV	
Chromium[l]	18540-29-9	3.50E+00	EPA 1999[f]	1.00E+00	EPA 1999[f]
Cobalt	7440-48-4	2.86E-01	Underhill and others (1931) in Clayton and Clayton (1981)[m]	No TRV	
Copper	7440-50-8	1.20E+01	EPA 1999[f]	4.70E+01	EPA 1999[f]
Iron	7439-89-6	No TRV		No TRV	
Lead	7439-92-1	3.75E-02	EPA 1999[f]	2.50E-02	EPA 1999[f]

Table C3-8 Toxicity Reference Values (TRVs) for COPCs and ROPCs

Constituent of Potential Concern	CAS Registry Number	Ingestion, Terrestrial Exposures		Ingestion, Aquatic Exposures	
		Red-tailed Hawk		Canada Goose	
		NOAEL TRV	Source	NOAEL TRV	Source
Methoxychlor	72-43-5	No TRV		No TRV	
Silvex (2,4,5-TP)	93-72-1	No TRV		No TRV	
Toxaphene	8001-35-2	No TRV		No TRV	
Inorganic Chemicals and Compounds					
	Metals				
Aluminum	7429-90-5	1.00E+02	EPA 1999[f]	1.00E+02	EPA 1999[f]
Antimony	7440-36-0	No TRV		No TRV	
Arsenic	7440-38-2	2.46E+00	EPA 1999[f]	2.46E+00	EPA 1999[f]
Barium	7440-39-3	2.08E+01	EPA 1999[f]	2.08E+01	EPA 1999[f]
Beryllium	7440-41-7	No TRV		No TRV	
Bismuth	7440-69-9	No TRV		No TRV	
Boron	7440-42-8	2.88E+01	Smith and Anders (1989) in Sample and others (1996)[c]	2.88E+01	Smith and Anders (1989) in Sample and others (1996)[c]
Cadmium	7440-43-9	1.45E+00	EPA 1999[f]	1.45E+00	EPA 1999[f]
Calcium	7440-70-2	No TRV		No TRV	
Chromium[l]	18540-29-9	1.00E+00	EPA 1999[f]	1.00E+00	EPA 1999[f]
Cobalt	7440-48-4	No TRV		No TRV	
Copper	7440-50-8	4.70E+01	EPA 1999[f]	4.70E+01	EPA 1999[f]
Iron	7439-89-6	No TRV		No TRV	
Lead	7439-92-1	2.50E-02	EPA 1999[f]	2.50E-02	EPA 1999[f]

Table C3-8 Toxicity Reference Values (TRVs) for COPCs and ROPCs

Constituent of Potential Concern	CAS Registry Number	Ingestion, Aquatic Exposures			
		Spotted Sandpiper		Great Blue Heron	
		NOAEL TRV	Source	NOAEL TRV	Source
Methoxychlor	72-43-5	No TRV		No TRV	
Silvex (2,4,5-TP)	93-72-1	No TRV		No TRV	
Toxaphene	8001-35-2	No TRV		No TRV	
Inorganic Chemicals and Compounds					
	Metals				
Aluminum	7429-90-5	1.00E+02	EPA 1999[f]	1.00E+02	EPA 1999[f]
Antimony	7440-36-0	No TRV		No TRV	
Arsenic	7440-38-2	2.46E+00	EPA 1999[f]	2.46E+00	EPA 1999[f]
Barium	7440-39-3	2.08E+01	EPA 1999[f]	2.08E+01	EPA 1999[f]
Beryllium	7440-41-7	No TRV		No TRV	
Bismuth	7440-69-9	No TRV		No TRV	
Boron	7440-42-8	2.88E+01	Smith and Anders (1989) in Sample and others (1996)[c]	2.88E+01	Smith and Anders (1989) in Sample and others (1996)[c]
Cadmium	7440-43-9	1.45E+00	EPA 1999[f]	1.45E+00	EPA 1999[f]
Calcium	7440-70-2	No TRV		No TRV	
Chromium[1]	18540-29-9	1.00E+00	EPA 1999[f]	1.00E+00	EPA 1999[f]
Cobalt	7440-48-4	No TRV		No TRV	
Copper	7440-50-8	4.70E+01	EPA 1999[f]	4.70E+01	EPA 1999[f]
Iron	7439-89-6	No TRV		No TRV	
Lead	7439-92-1	2.50E-02	EPA 1999[f]	2.50E-02	EPA 1999[f]

Table C3-8 Toxicity Reference Values (TRVs) for COPCs and ROPCs

Constituent of Potential Concern	CAS Registry Number	Ingestion, Aquatic Exposures			
		Bald Eagle		Mink	
		NOAEL TRV	Source	NOAEL TRV	Source
Methoxychlor	72-43-5	No TRV		5.01E+03	Kincaid Enterprises (1986) in IRIS (2002)[a]
Silvex (2,4,5-TP)	93-72-1	No TRV		7.50E+02	Mullison (1966), Gehring and Betso (1978) in IRIS (2002)[a]
Toxaphene	8001-35-2	No TRV		8.00E+03	Kennedy and others (1973) in Sample and others (1996)[c]
Inorganic Chemicals and Compounds				(mg/kgBW/d)	
			Metals		
Aluminum	7429-90-5	1.00E+02	EPA 1999[f]	1.93E+00	EPA 1999[f]
Antimony	7440-36-0	No TRV		6.60E-02	EPA 1999[f]
Arsenic	7440-38-2	2.46E+00	EPA 1999[f]	1.25E+00	EPA 1999[f]
Barium	7440-39-3	2.08E+01	EPA 1999[f]	5.10E-01	EPA 1999[f]
Beryllium	7440-41-7	No TRV		6.60E-01	EPA 1999[f]
Bismuth	7440-69-9	No TRV		No TRV	
Boron	7440-42-8	2.88E+01	Smith and Anders (1989) in Sample and others (1996)[c]	2.80E+01	Weir and Fisher (1972) in Sample and others (1996)[c]
Cadmium	7440-43-9	1.45E+00	EPA 1999[f]	2.52E-02	EPA 1999[f]
Calcium	7440-70-2	No TRV		No TRV	
Chromium[l]	18540-29-9	1.00E+00	EPA 1999[f]	3.50E+00	EPA 1999[f]
Cobalt	7440-48-4	No TRV		2.86E-01	Underhill and others (1931) in Clayton and Clayton (1981)[m]
Copper	7440-50-8	4.70E+01	EPA 1999[f]	1.20E+01	EPA 1999[f]
Iron	7439-89-6	No TRV		No TRV	
Lead	7439-92-1	2.50E-02	EPA 1999[f]	3.75E-02	EPA 1999[f]

Table C3-8 Toxicity Reference Values (TRVs) for COPCs and ROPCs

Constituent of Potential Concern	CAS Registry Number	Direct Contact, Aquatic Receptors			
		Aquatic Biota		Chinook Salmon and Other Salmonids	
		NOAEL TRV	Source	NOAEL TRV	Source
Methoxychlor	72-43-5	1.90E-02	NAWQC Chronic (Suter & Tsao 1996)[d]	1.90E-02	NAWQC Chronic (Suter & Tsao 1996)[d]
Silvex (2,4,5-TP)	93-72-1	No TRV		No TRV	
Toxaphene	8001-35-2	1.75E+02	EPA 1987[b]	1.00E-03	Chronic LOAEL for brook trout (Suter and Tsao 1996[d] Table C-1) × 0.1 for LOAEL-to-NOAEL conversion
Inorganic Chemicals and Compounds		(mg/L)		(mg/L)	
	Metals				
Aluminum	7429-90-5	8.70E-02	EPA 1999[f]	7.50E-02	Sensitive Species Test EC_{20} (Suter and Tsao 1996[d], Table 2)
Antimony	7440-36-0	3.00E-02	EPA 1999[f]	3.00E-02	EPA 1999[f]
Arsenic	7440-38-2	1.50E-01	EPA 1999[f]	5.50E-02	Sensitive Species Test EC_{20} (Suter and Tsao 1996[d], Table 2)
Barium	7440-39-3	4.00E-03	Tier II Chronic (Suter & Tsao 1996)[d]	4.00E-03	Tier II Chronic (Suter & Tsao 1996)[d]
Beryllium	7440-41-7	6.60E-04	EPA 1999[f]	6.60E-04	EPA 1999[f]
Bismuth	7440-69-9	No TRV		No TRV	
Boron	7440-42-8	1.60E-03	Tier II Chronic (Suter & Tsao 1996)[d]	1.60E-03	Tier II Chronic (Suter & Tsao 1996)[d]
Cadmium	7440-43-9	2.20E-03	EPA 1999[f]	1.30E-05	Sensitive Species Test EC_{20} (Suter and Tsao 1996[d], Table 2)
Calcium	7440-70-2	No TRV		No TRV	
Chromium[1]	18540-29-9	1.10E-02	EPA 1999[f]	2.66E-04	Sensitive Species Test EC_{20} (Suter and Tsao 1996[d], Table 2)
Cobalt	7440-48-4	2.30E-02	Tier II Chronic (Suter & Tsao 1996)[d]	2.30E-02	Tier II Chronic (Suter & Tsao 1996)[d]
Copper	7440-50-8	9.00E-03	EPA 1999[f]	2.60E-04	Sensitive Species Test EC_{20} (Suter and Tsao 1996[d], Table 2)
Iron	7439-89-6	1.00E+00	NAWQC Chronic (Suter & Tsao 1996)[d]	1.00E+00	NAWQC Chronic (Suter & Tsao 1996)[d]
Lead	7439-92-1	2.50E-03	EPA 1999[f]	3.50E-04	Sensitive Species Test EC_{20} (Suter and Tsao 1996[d], Table 2)

Table C3-8 Toxicity Reference Values (TRVs) for COPCs and ROPCs

Constituent of Potential Concern	CAS Registry Number	Direct Contact, Aquatic Receptors	
		Benthic Organisms	
		NOAEL TRV	Source
Methoxychlor	72-43-5	6.08E+01	EqP method (Jones and others 1997)[i]
Silvex (2,4,5-TP)	93-72-1	No TRV	
Toxaphene	8001-35-2	3.50E+01	EqP method (Jones and others 1997)[i]
Inorganic Chemicals and Compounds		(mg/kg)	
	Metals		
Aluminum	7429-90-5	1.40E+04	EPA 1999[f]
Antimony	7440-36-0	6.40E+01	EPA 1999[f]
Arsenic	7440-38-2	6.00E+00	EPA 1999[f]
Barium	7440-39-3	2.00E+01	EPA 1999[f]
Beryllium	7440-41-7	No TRV	
Bismuth	7440-69-9	No TRV	
Boron	7440-42-8	No TRV	
Cadmium	7440-43-9	6.00E-01	EPA 1999[f]
Calcium	7440-70-2	No TRV	
Chromium[l]	18540-29-9	2.60E+01	EPA 1999[f]
Cobalt	7440-48-4	No TRV	
Copper	7440-50-8	1.60E+01	EPA 1999[f]
Iron	7439-89-6	2.00E+04	Persaud and others (1993)
Lead	7439-92-1	3.10E+01	EPA 1999[f]

Table C3-8 Toxicity Reference Values (TRVs) for COPCs and ROPCs

Constituent of Potential Concern	CAS Registry Number	Direct Exposure, Terrestrial Receptors			
		Plant		Terrestrial Invertebrate	
		TRV	Source	TRV	Source
Lithium	7439-93-2	2.00E+00	Efroymson and others (1997a)[e]	No TRV	
Magnesium	7439-95-4	No TRV		No TRV	
Manganese	7439-96-5	5.00E+02	Efroymson and others (1997a)[e]	No TRV	
Mercury	7439-97-6	No TRV		No TRV	
Mercury - Hg+2	7487-94-7	3.49E-01	EPA 1999[f]	2.50E+00	EPA 1999[f]
Methylmercury	22967-92-6	No TRV		2.50E+00	EPA 1999[f]
Molybdenum	7439-98-7	2.00E+00	Efroymson and others (1997a)[e]	No TRV	
Nickel	7440-02-0	2.50E+01	EPA 1999[f]	1.00E+02	EPA 1999[f]
Potassium	7440-09-7	No TRV		No TRV	
Rhodium	7440-16-6	No TRV		No TRV	
Selenium	7782-49-2	5.00E-02	EPA 1999[f]	7.70E+00	EPA 1999[f]
Silicon	7440-21-3	No TRV		No TRV	
Silver	7440-22-4	2.00E-02	EPA 1999[f]	No TRV	
Sodium	7440-23-5	No TRV		No TRV	
Strontium	7440-24-6	No TRV		No TRV	
Tantalum	7440-25-7	No TRV		No TRV	
Thallium	7440-28-0	1.00E-02	EPA 1999[f]	No TRV	
Tin	7440-31-5	5.00E+01	Efroymson and others (1997a)[e]	No TRV	
Tungsten	7440-33-7	No TRV		No TRV	
Uranium	7440-61-1	5.00E+00	Efroymson and others (1997a)[e]	No TRV	
Vanadium	7440-62-2	2.00E+00	Efroymson and others (1997a)[e]	No TRV	
Yttrium	7440-65-5	No TRV		No TRV	

Table C3-8 Toxicity Reference Values (TRVs) for COPCs and ROPCs

Constituent of Potential Concern	CAS Registry Number	Ingestion, Terrestrial Exposures			
		Mule Deer		Mourning Dove	
		NOAEL TRV	Source	NOAEL TRV	Source
Lithium	7439-93-2	9.39E+00	Marathe and Thomas (1986) in Sample and others (1996)[c]	No TRV	
Magnesium	7439-95-4	No TRV		No TRV	
Manganese	7439-96-5	8.80E+01	Laskey and others (1982) in Sample and others (1996)[c]	9.77E+02	Laskey and Edens (1985) in Sample and others (1996)[c]
Mercury	7439-97-6	No TRV		No TRV	
Mercury - Hg+2	7487-94-7	1.01E+00	EPA 1999[f]	3.25E+00	EPA 1999[f]
Methylmercury	22967-92-6	3.20E-02	EPA 1999[f]	6.40E-03	EPA 1999[f]
Molybdenum	7439-98-7	2.58E-01	Schroeder and Mitchner (1971) in Sample and others (1996)[c]	3.53E+00	Lepore and Miller (1965) in Sample and others (1996)[c]
Nickel	7440-02-0	5.00E+01	EPA 1999[f]	6.50E+01	EPA 1999[f]
Potassium	7440-09-7	No TRV		No TRV	
Rhodium	7440-16-6	No TRV		No TRV	
Selenium	7782-49-2	7.60E-02	EPA 1999[f]	5.00E-01	EPA 1999[f]
Silicon	7440-21-3	No TRV		No TRV	
Silver	7440-22-4	3.75E-01	EPA 1999[f]	1.78E+02	EPA 1999[f]
Sodium	7440-23-5	No TRV		No TRV	
Strontium	7440-24-6	2.63E+02	Skoryna (1981) in Sample and others (1996)	No TRV	
Tantalum	7440-25-7	No TRV		No TRV	
Thallium	7440-28-0	1.31E-02	EPA 1999[f]	3.50E-01	EPA 1999[f]
Tin	7440-31-5	No TRV		No TRV	
Tungsten	7440-33-7	No TRV		No TRV	
Uranium	7440-61-1	3.07E+00	Paternain and others (1989) in Sample and others (1996)[c]	1.60E+01	Haseltine and Sileo (1983) in Sample and others (1996)[c]
Vanadium	7440-62-2	2.10E-01	Domingo and others (1986) in Sample and others (1996)[c]	1.14E+01	White and Dieter (1978) in Sample and others (1996)[c]
Yttrium	7440-65-5	No TRV		No TRV	

Table C3-8 Toxicity Reference Values (TRVs) for COPCs and ROPCs

Constituent of Potential Concern	CAS Registry Number	Ingestion, Terrestrial Exposures			
		Great Basin Pocket Mouse		Western Meadowlark	
		NOAEL TRV	Source	NOAEL TRV	Source
Lithium	7439-93-2	9.39E+00	Marathe and Thomas (1986) in Sample and others (1996)[c]	No TRV	
Magnesium	7439-95-4	No TRV		No TRV	
Manganese	7439-96-5	8.80E+01	Laskey and others (1982) in Sample and others (1996)[c]	9.77E+02	Laskey and Edens (1985) in Sample and others (1996)[c]
Mercury	7439-97-6	No TRV		No TRV	
Mercury - Hg+2	7487-94-7	1.01E+00	EPA 1999[f]	3.25E+00	EPA 1999[f]
Methylmercury	22967-92-6	3.20E-02	EPA 1999[f]	6.40E-03	EPA 1999[f]
Molybdenum	7439-98-7	2.58E-01	Schroeder and Mitchner (1971) in Sample and others (1996)[c]	3.53E+00	Lepore and Miller (1965) in Sample and others (1996)[c]
Nickel	7440-02-0	5.00E+01	EPA 1999[f]	6.50E+01	EPA 1999[f]
Potassium	7440-09-7	No TRV		No TRV	
Rhodium	7440-16-6	No TRV		No TRV	
Selenium	7782-49-2	7.60E-02	EPA 1999[f]	5.00E-01	EPA 1999[f]
Silicon	7440-21-3	No TRV		No TRV	
Silver	7440-22-4	3.75E-01	EPA 1999[f]	1.78E+02	EPA 1999[f]
Sodium	7440-23-5	No TRV		No TRV	
Strontium	7440-24-6	2.63E+02	Skoryna (1981) in Sample and others (1996)	No TRV	
Tantalum	7440-25-7	No TRV		No TRV	
Thallium	7440-28-0	1.31E-02	EPA 1999[f]	3.50E-01	EPA 1999[f]
Tin	7440-31-5	No TRV		No TRV	
Tungsten	7440-33-7	No TRV		No TRV	
Uranium	7440-61-1	3.07E+00	Paternain and others (1989) in Sample and others (1996)[c]	1.60E+01	Haseltine and Sileo (1983) in Sample and others (1996)[c]
Vanadium	7440-62-2	2.10E-01	Domingo and others (1986) in Sample and others (1996)[c]	1.14E+01	White and Dieter (1978) in Sample and others (1996)[c]
Yttrium	7440-65-5	No TRV		No TRV	

Table C3-8 Toxicity Reference Values (TRVs) for COPCs and ROPCs

Constituent of Potential Concern	CAS Registry Number	Ingestion, Terrestrial Exposures			
		Coyote		Burrowing Owl	
		NOAEL TRV	Source	NOAEL TRV	Source
Lithium	7439-93-2	9.39E+00	Marathe and Thomas (1986) in Sample and others (1996)[c]	No TRV	
Magnesium	7439-95-4	No TRV		No TRV	
Manganese	7439-96-5	8.80E+01	Laskey and others (1982) in Sample and others (1996)[c]	9.77E+02	Laskey and Edens (1985) in Sample and others (1996)[c]
Mercury	7439-97-6	No TRV		No TRV	
Mercury - Hg+2	7487-94-7	1.01E+00	EPA 1999[f]	3.25E+00	EPA 1999[f]
Methylmercury	22967-92-6	3.20E-02	EPA 1999[f]	6.40E-03	EPA 1999[f]
Molybdenum	7439-98-7	2.58E-01	Schroeder and Mitchner (1971) in Sample and others (1996)[c]	3.53E+00	Lepore and Miller (1965) in Sample and others (1996)[c]
Nickel	7440-02-0	5.00E+01	EPA 1999[f]	6.50E+01	EPA 1999[f]
Potassium	7440-09-7	No TRV		No TRV	
Rhodium	7440-16-6	No TRV		No TRV	
Selenium	7782-49-2	7.60E-02	EPA 1999[f]	5.00E-01	EPA 1999[f]
Silicon	7440-21-3	No TRV		No TRV	
Silver	7440-22-4	3.75E-01	EPA 1999[f]	1.78E+02	EPA 1999[f]
Sodium	7440-23-5	No TRV		No TRV	
Strontium	7440-24-6	2.63E+02	Skoryna (1981) in Sample and others (1996)	No TRV	
Tantalum	7440-25-7	No TRV		No TRV	
Thallium	7440-28-0	1.31E-02	EPA 1999[f]	3.50E-01	EPA 1999[f]
Tin	7440-31-5	No TRV		No TRV	
Tungsten	7440-33-7	No TRV		No TRV	
Uranium	7440-61-1	3.07E+00	Paternain and others (1989) in Sample and others (1996)[c]	1.60E+01	Haseltine and Sileo (1983) in Sample and others (1996)[c]
Vanadium	7440-62-2	2.10E-01	Domingo and others (1986) in Sample and others (1996)[c]	1.14E+01	White and Dieter (1978) in Sample and others (1996)[c]
Yttrium	7440-65-5	No TRV		No TRV	

Table C3-8 Toxicity Reference Values (TRVs) for COPCs and ROPCs

Constituent of Potential Concern	CAS Registry Number	Ingestion, Terrestrial Exposures		Ingestion, Aquatic Exposures	
		Red-tailed Hawk		Canada Goose	
		NOAEL TRV	Source	NOAEL TRV	Source
Lithium	7439-93-2	No TRV		No TRV	
Magnesium	7439-95-4	No TRV		No TRV	
Manganese	7439-96-5	9.77E+02	Laskey and Edens (1985) in Sample and others (1996)[c]	9.77E+02	Laskey and Edens (1985) in Sample and others (1996)[c]
Mercury	7439-97-6	No TRV		No TRV	
Mercury - Hg+2	7487-94-7	3.25E+00	EPA 1999[f]	3.25E+00	EPA 1999[f]
Methylmercury	22967-92-6	6.40E-03	EPA 1999[f]	6.40E-03	EPA 1999[f]
Molybdenum	7439-98-7	3.53E+00	Lepore and Miller (1965) in Sample and others (1996)[c]	3.53E+00	Lepore and Miller (1965) in Sample and others (1996)[c]
Nickel	7440-02-0	6.50E+01	EPA 1999[f]	6.50E+01	EPA 1999[f]
Potassium	7440-09-7	No TRV		No TRV	
Rhodium	7440-16-6	No TRV		No TRV	
Selenium	7782-49-2	5.00E-01	EPA 1999[f]	5.00E-01	EPA 1999[f]
Silicon	7440-21-3	No TRV		No TRV	
Silver	7440-22-4	1.78E+02	EPA 1999[f]	1.78E+02	EPA 1999[f]
Sodium	7440-23-5	No TRV		No TRV	
Strontium	7440-24-6	No TRV		No TRV	
Tantalum	7440-25-7	No TRV		No TRV	
Thallium	7440-28-0	3.50E-01	EPA 1999[f]	3.50E-01	EPA 1999[f]
Tin	7440-31-5	No TRV		No TRV	
Tungsten	7440-33-7	No TRV		No TRV	
Uranium	7440-61-1	1.60E+01	Haseltine and Sileo (1983) in Sample and others (1996)[c]	1.60E+01	Haseltine and Sileo (1983) in Sample and others (1996)[c]
Vanadium	7440-62-2	1.14E+01	White and Dieter (1978) in Sample and others (1996)[c]	1.14E+01	White and Dieter (1978) in Sample and others (1996)[c]
Yttrium	7440-65-5	No TRV		No TRV	

Table C3-8 Toxicity Reference Values (TRVs) for COPCs and ROPCs

Constituent of Potential Concern	CAS Registry Number	Ingestion, Aquatic Exposures			
		Spotted Sandpiper		Great Blue Heron	
		NOAEL TRV	Source	NOAEL TRV	Source
Lithium	7439-93-2	No TRV		No TRV	
Magnesium	7439-95-4	No TRV		No TRV	
Manganese	7439-96-5	9.77E+02	Laskey and Edens (1985) in Sample and others (1996)[c]	9.77E+02	Laskey and Edens (1985) in Sample and others (1996)[c]
Mercury	7439-97-6	No TRV		No TRV	
Mercury - Hg+2	7487-94-7	3.25E+00	EPA 1999[f]	3.25E+00	EPA 1999[f]
Methylmercury	22967-92-6	6.40E-03	EPA 1999[f]	6.40E-03	EPA 1999[f]
Molybdenum	7439-98-7	3.53E+00	Lepore and Miller (1965) in Sample and others (1996)[c]	3.53E+00	Lepore and Miller (1965) in Sample and others (1996)[c]
Nickel	7440-02-0	6.50E+01	EPA 1999[f]	6.50E+01	EPA 1999[f]
Potassium	7440-09-7	No TRV		No TRV	
Rhodium	7440-16-6	No TRV		No TRV	
Selenium	7782-49-2	5.00E-01	EPA 1999[f]	5.00E-01	EPA 1999[f]
Silicon	7440-21-3	No TRV		No TRV	
Silver	7440-22-4	1.78E+02	EPA 1999[f]	1.78E+02	EPA 1999[f]
Sodium	7440-23-5	No TRV		No TRV	
Strontium	7440-24-6	No TRV		No TRV	
Tantalum	7440-25-7	No TRV		No TRV	
Thallium	7440-28-0	3.50E-01	EPA 1999[f]	3.50E-01	EPA 1999[f]
Tin	7440-31-5	No TRV		No TRV	
Tungsten	7440-33-7	No TRV		No TRV	
Uranium	7440-61-1	1.60E+01	Haseltine and Sileo (1983) in Sample and others (1996)[c]	1.60E+01	Haseltine and Sileo (1983) in Sample and others (1996)[c]
Vanadium	7440-62-2	1.14E+01	White and Dieter (1978) in Sample and others (1996)[c]	1.14E+01	White and Dieter (1978) in Sample and others (1996)[c]
Yttrium	7440-65-5	No TRV		No TRV	

Table C3-8 Toxicity Reference Values (TRVs) for COPCs and ROPCs

Constituent of Potential Concern	CAS Registry Number	Ingestion, Aquatic Exposures			
		Bald Eagle		Mink	
		NOAEL TRV	Source	NOAEL TRV	Source
Lithium	7439-93-2	No TRV		9.39E+00	Marathe and Thomas (1986) in Sample and others (1996)[c]
Magnesium	7439-95-4	No TRV		No TRV	
Manganese	7439-96-5	9.77E+02	Laskey and Edens (1985) in Sample and others (1996)[c]	8.80E+01	Laskey and others (1982) in Sample and others (1996)[c]
Mercury	7439-97-6	No TRV		No TRV	
Mercury - Hg+2	7487-94-7	3.25E+00	EPA 1999[f]	1.01E+00	EPA 1999[f]
Methylmercury	22967-92-6	6.40E-03	EPA 1999[f]	3.20E-02	EPA 1999[f]
Molybdenum	7439-98-7	3.53E+00	Lepore and Miller (1965) in Sample and others (1996)[c]	2.58E-01	Schroeder and Mitchner (1971) in Sample and others (1996)[c]
Nickel	7440-02-0	6.50E+01	EPA 1999[f]	5.00E+01	EPA 1999[f]
Potassium	7440-09-7	No TRV		No TRV	
Rhodium	7440-16-6	No TRV		No TRV	
Selenium	7782-49-2	5.00E-01	EPA 1999[f]	7.60E-02	EPA 1999[f]
Silicon	7440-21-3	No TRV		No TRV	
Silver	7440-22-4	1.78E+02	EPA 1999[f]	3.75E-01	EPA 1999[f]
Sodium	7440-23-5	No TRV		No TRV	
Strontium	7440-24-6	No TRV		2.63E+02	Skoryna (1981) in Sample and others (1996)
Tantalum	7440-25-7	No TRV		No TRV	
Thallium	7440-28-0	3.50E-01	EPA 1999[f]	1.31E-02	EPA 1999[f]
Tin	7440-31-5	No TRV		No TRV	
Tungsten	7440-33-7	No TRV		No TRV	
Uranium	7440-61-1	1.60E+01	Haseltine and Sileo (1983) in Sample and others (1996)[c]	3.07E+00	Paternain and others (1989) in Sample and others (1996)[c]
Vanadium	7440-62-2	1.14E+01	White and Dieter (1978) in Sample and others (1996)[c]	2.10E-01	Domingo and others (1986) in Sample and others (1996)[c]
Yttrium	7440-65-5	No TRV		No TRV	

Table C3-8 Toxicity Reference Values (TRVs) for COPCs and ROPCs

Constituent of Potential Concern	CAS Registry Number	Direct Contact, Aquatic Receptors			
		Aquatic Biota		Chinook Salmon and Other Salmonids	
		NOAEL TRV	Source	NOAEL TRV	Source
Lithium	7439-93-2	1.40E-02	Tier II Chronic (Suter & Tsao 1996)[d]	1.40E-02	Tier II Chronic (Suter & Tsao 1996)[d]
Magnesium	7439-95-4	No TRV		No TRV	
Manganese	7439-96-5	1.20E-01	Tier II Chronic (Suter & Tsao 1996)[d]	1.20E-01	Tier II Chronic (Suter & Tsao 1996)[d]
Mercury	7439-97-6	No TRV		No TRV	
Mercury - Hg+2	7487-94-7	7.70E-04	EPA 1999[f]	1.80E-04	Sensitive Species Test EC_{20} (Suter and Tsao 1996[d], Table 2)
Methylmercury	22967-92-6	2.80E-06	EPA 1999[f]	2.80E-06	EPA 1999[f]
Molybdenum	7439-98-7	3.70E-01	Tier II Chronic (Suter & Tsao 1996)[d]	3.70E-01	Tier II Chronic (Suter & Tsao 1996)[d]
Nickel	7440-02-0	5.20E-02	EPA 1999[f]	1.10E-02	Sensitive Species Test EC_{20} (Suter and Tsao 1996[d], Table 2)
Potassium	7440-09-7	No TRV		No TRV	
Rhodium	7440-16-6	No TRV		No TRV	
Selenium	7782-49-2	5.00E-03	EPA 1999[f]	2.60E-03	Sensitive Species Test EC_{20} (Suter and Tsao 1996[d], Table 2)
Silicon	7440-21-3	No TRV		No TRV	
Silver	7440-22-4	1.20E-04	EPA 1999[f]	1.20E-04	EPA 1999[f]
Sodium	7440-23-5	No TRV		No TRV	
Strontium	7440-24-6	1.50E+00	Tier II Chronic (Suter & Tsao 1996)[d]	1.50E+00	Tier II Chronic (Suter & Tsao 1996)[d]
Tantalum	7440-25-7	No TRV		No TRV	
Thallium	7440-28-0	4.00E-03	EPA 1999[f]	4.00E-03	EPA 1999[f]
Tin	7440-31-5	7.30E-02	Tier II Chronic (Suter & Tsao 1996)[d]	7.30E-02	Tier II Chronic (Suter & Tsao 1996)[d]
Tungsten	7440-33-7	No TRV		No TRV	
Uranium	7440-61-1	2.60E-03	Tier II Chronic (Suter & Tsao 1996)[d]	2.60E-03	Tier II Chronic (Suter & Tsao 1996)[d]
Vanadium	7440-62-2	2.00E-02	Tier II Chronic (Suter & Tsao 1996)[d]	2.00E-02	Tier II Chronic (Suter & Tsao 1996)[d]
Yttrium	7440-65-5	No TRV		No TRV	

Table C3-8 Toxicity Reference Values (TRVs) for COPCs and ROPCs

Constituent of Potential Concern	CAS Registry Number	Direct Contact, Aquatic Receptors	
		Benthic Organisms	
		NOAEL TRV	Source
Lithium	7439-93-2	No TRV	
Magnesium	7439-95-4	No TRV	
Manganese	7439-96-5	4.60E+02	Persaud and others (1993)[k]
Mercury	7439-97-6	No TRV	
Mercury - Hg+2	7487-94-7	2.00E-01	EPA 1999[f]
Methylmercury	22967-92-6	2.00E-01	EPA 1999[f]
Molybdenum	7439-98-7	No TRV	
Nickel	7440-02-0	1.60E+01	EPA 1999[f]
Potassium	7440-09-7	No TRV	
Rhodium	7440-16-6	No TRV	
Selenium	7782-49-2	1.00E-01	EPA 1999[f]
Silicon	7440-21-3	No TRV	
Silver	7440-22-4	4.50E+00	EPA 1999[f]
Sodium	7440-23-5	No TRV	
Strontium	7440-24-6	No TRV	
Tantalum	7440-25-7	No TRV	
Thallium	7440-28-0	No TRV	
Tin	7440-31-5	No TRV	
Tungsten	7440-33-7	No TRV	
Uranium	7440-61-1	No TRV	
Vanadium	7440-62-2	No TRV	
Yttrium	7440-65-5	No TRV	

Table C3-8 Toxicity Reference Values (TRVs) for COPCs and ROPCs

Constituent of Potential Concern	CAS Registry Number	Direct Exposure, Terrestrial Receptors			
		Plant		Terrestrial Invertebrate	
		TRV	Source	TRV	Source
Zinc	7440-66-6	9.00E-01	EPA 1999[f]	1.99E+02	EPA 1999[f]
Zirconium	7440-67-7	No TRV		No TRV	
	Non-metals and Anions				
Ammonia/Ammonium	7664-41-7	No TRV		No TRV	
Bromide	24959-67-9	1.00E+01	Efroymson and others (1997a)[e]	No TRV	
Chloride	16887-00-6	No TRV		No TRV	
Cyanide	57-12-5	No TRV		No TRV	
Fluoride	16984-48-8	2.00E+02	Efroymson and others (1997a)[e]	No TRV	
Hydroxide	14280-30-9	No TRV		No TRV	
Iodine	7553-56-2	4.00E+00	Efroymson and others (1997a)[e]	No TRV	
Nitrate	14797-55-8	No TRV		No TRV	
Nitrite	14797-65-0	No TRV		No TRV	
Phosphate	14265-44-2	No TRV		No TRV	
Phosphorus	7723-14-0	No TRV		No TRV	
Sulfate	14808-79-8	No TRV		No TRV	
Total Sulfur	63705-05-5	No TRV		No TRV	
	Criteria Pollutants				
Carbon monoxide	630-08-0	No TRV		No TRV	
Nitrogen dioxide	10102-44-0	No TRV		No TRV	
Ozone	10028-15-6	No TRV		No TRV	
Particulate matter	No CAS #	No TRV		No TRV	
Sulfur dioxide	7446-09-5	No TRV		No TRV	
Radionuclides					
All radionuclides combined (rad/d)[n]	No CAS #	1.00E+00	IAEA 1992[o]	1.00E+00	IAEA 1992[o]

Table C3-8 Toxicity Reference Values (TRVs) for COPCs and ROPCs

Constituent of Potential Concern	CAS Registry Number	Ingestion, Terrestrial Exposures			
		Mule Deer		Mourning Dove	
		NOAEL TRV	Source	NOAEL TRV	Source
Zinc	7440-66-6	1.04E+01	EPA 1999[f]	1.31E+02	EPA 1999[f]
Zirconium	7440-67-7	1.74E+00	Schroeder and others (1968) in Sample and others (1996)	No TRV	
	Non-metals and Anions				
Ammonia/Ammonium	7664-41-7	No TRV		No TRV	
Bromide	24959-67-9	No TRV		No TRV	
Chloride	16887-00-6	No TRV		No TRV	
Cyanide	57-12-5	2.40E+01	EPA 1999[f]	4.00E-02	EPA 1999[f]
Fluoride	16984-48-8	3.14E+01	Aulerich and others (1987) in Sample and others (1996)[c]	7.80E+00	Pattee and others (1988) in Sample and others (1996)[c]
Hydroxide	14280-30-9	No TRV		No TRV	
Iodine	7553-56-2	No TRV		No TRV	
Nitrate	14797-55-8	No TRV		No TRV	
Nitrite	14797-65-0	No TRV		No TRV	
Phosphate	14265-44-2	No TRV		No TRV	
Phosphorus	7723-14-0	No TRV		No TRV	
Sulfate	14808-79-8	No TRV		No TRV	
Total Sulfur	63705-05-5	No TRV		No TRV	
	Criteria Pollutants				
Carbon monoxide	630-08-0	No TRV		No TRV	
Nitrogen dioxide	10102-44-0	No TRV		No TRV	
Ozone	10028-15-6	No TRV		No TRV	
Particulate matter	No CAS #	No TRV		No TRV	
Sulfur dioxide	7446-09-5	No TRV		No TRV	
Radionuclides					
All radionuclides combined (rad/d)[n]	No CAS #	1.00E-01	IAEA 1992[o]	1.00E-01	IAEA 1992[o]

Table C3-8 Toxicity Reference Values (TRVs) for COPCs and ROPCs

Constituent of Potential Concern	CAS Registry Number	Ingestion, Terrestrial Exposures			
		Great Basin Pocket Mouse		Western Meadowlark	
		NOAEL TRV	Source	NOAEL TRV	Source
Zinc	7440-66-6	1.04E+01	EPA 1999[f]	1.31E+02	EPA 1999[f]
Zirconium	7440-67-7	1.74E+00	Schroeder and others (1968) in Sample and others (1996)	No TRV	
	Non-metals and Anions				
Ammonia/Ammonium	7664-41-7	No TRV		No TRV	
Bromide	24959-67-9	No TRV		No TRV	
Chloride	16887-00-6	No TRV		No TRV	
Cyanide	57-12-5	2.40E+01	EPA 1999[f]	4.00E-02	EPA 1999[f]
Fluoride	16984-48-8	3.14E+01	Aulerich and others (1987) in Sample and others (1996)[c]	7.80E+00	Pattee and others (1988) in Sample and others (1996)[c]
Hydroxide	14280-30-9	No TRV		No TRV	
Iodine	7553-56-2	No TRV		No TRV	
Nitrate	14797-55-8	No TRV		No TRV	
Nitrite	14797-65-0	No TRV		No TRV	
Phosphate	14265-44-2	No TRV		No TRV	
Phosphorus	7723-14-0	No TRV		No TRV	
Sulfate	14808-79-8	No TRV		No TRV	
Total Sulfur	63705-05-5	No TRV		No TRV	
	Criteria Pollutants				
Carbon monoxide	630-08-0	No TRV		No TRV	
Nitrogen dioxide	10102-44-0	No TRV		No TRV	
Ozone	10028-15-6	No TRV		No TRV	
Particulate matter	No CAS #	No TRV		No TRV	
Sulfur dioxide	7446-09-5	No TRV		No TRV	
Radionuclides					
All radionuclides combined (rad/d)[n]	No CAS #	1.00E-01	IAEA 1992[o]	1.00E-01	IAEA 1992[o]

Table C3-8 Toxicity Reference Values (TRVs) for COPCs and ROPCs

Constituent of Potential Concern	CAS Registry Number	Ingestion, Terrestrial Exposures			
		Coyote		Burrowing Owl	
		NOAEL TRV	Source	NOAEL TRV	Source
Zinc	7440-66-6	1.04E+01	EPA 1999[f]	1.31E+02	EPA 1999[f]
Zirconium	7440-67-7	1.74E+00	Schroeder and others (1968) in Sample and others (1996)	No TRV	
	Non-metals and Anions				
Ammonia/Ammonium	7664-41-7	No TRV		No TRV	
Bromide	24959-67-9	No TRV		No TRV	
Chloride	16887-00-6	No TRV		No TRV	
Cyanide	57-12-5	2.40E+01	EPA 1999[f]	4.00E-02	EPA 1999[f]
Fluoride	16984-48-8	3.14E+01	Aulerich and others (1987) in Sample and others (1996)[c]	7.80E+00	Pattee and others (1988) in Sample and others (1996)[c]
Hydroxide	14280-30-9	No TRV		No TRV	
Iodine	7553-56-2	No TRV		No TRV	
Nitrate	14797-55-8	No TRV		No TRV	
Nitrite	14797-65-0	No TRV		No TRV	
Phosphate	14265-44-2	No TRV		No TRV	
Phosphorus	7723-14-0	No TRV		No TRV	
Sulfate	14808-79-8	No TRV		No TRV	
Total Sulfur	63705-05-5	No TRV		No TRV	
	Criteria Pollutants				
Carbon monoxide	630-08-0	No TRV		No TRV	
Nitrogen dioxide	10102-44-0	No TRV		No TRV	
Ozone	10028-15-6	No TRV		No TRV	
Particulate matter	No CAS #	No TRV		No TRV	
Sulfur dioxide	7446-09-5	No TRV		No TRV	
Radionuclides					
All radionuclides combined (rad/d)[n]	No CAS #	1.00E-01	IAEA 1992[o]	1.00E-01	IAEA 1992[o]

Table C3-8 Toxicity Reference Values (TRVs) for COPCs and ROPCs

Constituent of Potential Concern	CAS Registry Number	Ingestion, Terrestrial Exposures		Ingestion, Aquatic Exposures	
		Red-tailed Hawk		Canada Goose	
		NOAEL TRV	Source	NOAEL TRV	Source
Zinc	7440-66-6	1.31E+02	EPA 1999[f]	1.31E+02	EPA 1999[f]
Zirconium	7440-67-7	No TRV		No TRV	
	Non-metals and Anions				
Ammonia/Ammonium	7664-41-7	No TRV		No TRV	
Bromide	24959-67-9	No TRV		No TRV	
Chloride	16887-00-6	No TRV		No TRV	
Cyanide	57-12-5	4.00E-02	EPA 1999[f]	4.00E-02	EPA 1999[f]
Fluoride	16984-48-8	7.80E+00	Pattee and others (1988) in Sample and others (1996)[c]	7.80E+00	Pattee and others (1988) in Sample and others (1996)c
Hydroxide	14280-30-9	No TRV		No TRV	
Iodine	7553-56-2	No TRV		No TRV	
Nitrate	14797-55-8	No TRV		No TRV	
Nitrite	14797-65-0	No TRV		No TRV	
Phosphate	14265-44-2	No TRV		No TRV	
Phosphorus	7723-14-0	No TRV		No TRV	
Sulfate	14808-79-8	No TRV		No TRV	
Total Sulfur	63705-05-5	No TRV		No TRV	
	Criteria Pollutants				
Carbon monoxide	630-08-0	No TRV		No TRV	
Nitrogen dioxide	10102-44-0	No TRV		No TRV	
Ozone	10028-15-6	No TRV		No TRV	
Particulate matter	No CAS #	No TRV		No TRV	
Sulfur dioxide	7446-09-5	No TRV		No TRV	
Radionuclides					
All radionuclides combined (rad/d)[n]	No CAS #	1.00E-01	IAEA 1992[o]	1.00E-01	IAEA 1992[o]

Table C3-8 Toxicity Reference Values (TRVs) for COPCs and ROPCs

Constituent of Potential Concern	CAS Registry Number	Ingestion, Aquatic Exposures			
		Spotted Sandpiper		Great Blue Heron	
		NOAEL TRV	Source	NOAEL TRV	Source
Zinc	7440-66-6	1.31E+02	EPA 1999[f]	1.31E+02	EPA 1999[f]
Zirconium	7440-67-7	No TRV		No TRV	
	Non-metals and Anions				
Ammonia/Ammonium	7664-41-7	No TRV		No TRV	
Bromide	24959-67-9	No TRV		No TRV	
Chloride	16887-00-6	No TRV		No TRV	
Cyanide	57-12-5	4.00E-02	EPA 1999[f]	4.00E-02	EPA 1999[f]
Fluoride	16984-48-8	7.80E+00	Pattee and others (1988) in Sample and others (1996)[c]	7.80E+00	Pattee and others (1988) in Sample and others (1996)[c]
Hydroxide	14280-30-9	No TRV		No TRV	
Iodine	7553-56-2	No TRV		No TRV	
Nitrate	14797-55-8	No TRV		No TRV	
Nitrite	14797-65-0	No TRV		No TRV	
Phosphate	14265-44-2	No TRV		No TRV	
Phosphorus	7723-14-0	No TRV		No TRV	
Sulfate	14808-79-8	No TRV		No TRV	
Total Sulfur	63705-05-5	No TRV		No TRV	
	Criteria Pollutants				
Carbon monoxide	630-08-0	No TRV		No TRV	
Nitrogen dioxide	10102-44-0	No TRV		No TRV	
Ozone	10028-15-6	No TRV		No TRV	
Particulate matter	No CAS #	No TRV		No TRV	
Sulfur dioxide	7446-09-5	No TRV		No TRV	
Radionuclides					
All radionuclides combined (rad/d)[n]	No CAS #	1.00E-01	IAEA 1992[o]	1.00E-01	IAEA 1992[o]

Table C3-8 Toxicity Reference Values (TRVs) for COPCs and ROPCs

Constituent of Potential Concern	CAS Registry Number	Ingestion, Aquatic Exposures			
		Bald Eagle		Mink	
		NOAEL TRV	Source	NOAEL TRV	Source
Zinc	7440-66-6	1.31E+02	EPA 1999[f]	1.04E+01	EPA 1999[f]
Zirconium	7440-67-7	No TRV		1.74E+00	Schroeder and others (1968) in Sample and others (1996)
	Non-metals and Anions				
Ammonia/Ammonium	7664-41-7	No TRV		No TRV	
Bromide	24959-67-9	No TRV		No TRV	
Chloride	16887-00-6	No TRV		No TRV	
Cyanide	57-12-5	4.00E-02	EPA 1999[f]	2.40E+01	EPA 1999[f]
Fluoride	16984-48-8	7.80E+00	Pattee and others (1988) in Sample and others (1996)[c]	3.14E+01	Aulerich and others (1987) in Sample and others (1996)[c]
Hydroxide	14280-30-9	No TRV		No TRV	
Iodine	7553-56-2	No TRV		No TRV	
Nitrate	14797-55-8	No TRV		No TRV	
Nitrite	14797-65-0	No TRV		No TRV	
Phosphate	14265-44-2	No TRV		No TRV	
Phosphorus	7723-14-0	No TRV		No TRV	
Sulfate	14808-79-8	No TRV		No TRV	
Total Sulfur	63705-05-5	No TRV		No TRV	
	Criteria Pollutants				
Carbon monoxide	630-08-0	No TRV		No TRV	
Nitrogen dioxide	10102-44-0	No TRV		No TRV	
Ozone	10028-15-6	No TRV		No TRV	
Particulate matter	No CAS #	No TRV		No TRV	
Sulfur dioxide	7446-09-5	No TRV		No TRV	
Radionuclides					
All radionuclides combined (rad/d)[n]	No CAS #	1.00E-01	IAEA 1992[o]	1.00E-01	IAEA 1992[o]

Table C3-8 Toxicity Reference Values (TRVs) for COPCs and ROPCs

Constituent of Potential Concern	CAS Registry Number	Direct Contact, Aquatic Receptors			
		Aquatic Biota		Chinook Salmon and Other Salmonids	
		NOAEL TRV	Source	NOAEL TRV	Source
Zinc	7440-66-6	1.18E-01	EPA 1999[f]	2.10E-02	Sensitive Species Test EC_{20} (Suter and Tsao 1996[d], Table 2)
Zirconium	7440-67-7	1.70E-02	Tier II Chronic (Suter & Tsao 1996)[d]	1.70E-02	Tier II Chronic (Suter & Tsao 1996)[d]
Non-metals and Anions					
Ammonia/Ammonium	7664-41-7	No TRV		1.70E-03	Ammonia lowest chronic value for early life stage of salmon (Rice and Bailey 1980 in Suter and Tsao 1996[d] Table 1)
Bromide	24959-67-9	No TRV		No TRV	
Chloride	16887-00-6	No TRV		No TRV	
Cyanide	57-12-5	5.20E-03	EPA 1999[f]	1.17E-03	Sensitive Species Test EC_{20} (Suter and Tsao 1996[d], Table 2)
Fluoride	16984-48-8	No TRV		No TRV	
Hydroxide	14280-30-9	No TRV		No TRV	
Iodine	7553-56-2	No TRV		No TRV	
Nitrate	14797-55-8	No TRV		No TRV	
Nitrite	14797-65-0	No TRV		No TRV	
Phosphate	14265-44-2	No TRV		No TRV	
Phosphorus	7723-14-0	No TRV		No TRV	
Sulfate	14808-79-8	No TRV		No TRV	
Total Sulfur	63705-05-5	No TRV		No TRV	
Criteria Pollutants					
Carbon monoxide	630-08-0	No TRV		No TRV	
Nitrogen dioxide	10102-44-0	No TRV		No TRV	
Ozone	10028-15-6	No TRV		No TRV	
Particulate matter	No CAS #	No TRV		No TRV	
Sulfur dioxide	7446-09-5	No TRV		No TRV	
Radionuclides					
All radionuclides combined (rad/d)[n]	No CAS #	1.00E+00	NCRP 1991[p]	1.00E+00	NCRP 1991[p]

Table C3-8 Toxicity Reference Values (TRVs) for COPCs and ROPCs

Constituent of Potential Concern	CAS Registry Number	Direct Contact, Aquatic Receptors	
		Benthic Organisms	
		NOAEL TRV	Source
Zinc	7440-66-6	1.10E+02	EPA 1999[f]
Zirconium	7440-67-7	No TRV	
Non-metals and Anions			
Ammonia/Ammonium	7664-41-7	9.30E+02	Ecology (1997)
Bromide	24959-67-9	No TRV	
Chloride	16887-00-6	No TRV	
Cyanide	57-12-5	1.00E-01	EPA 1999[f]
Fluoride	16984-48-8	No TRV	
Hydroxide	14280-30-9	No TRV	
Iodine	7553-56-2	No TRV	
Nitrate	14797-55-8	No TRV	
Nitrite	14797-65-0	No TRV	
Phosphate	14265-44-2	No TRV	
Phosphorus	7723-14-0	No TRV	
Sulfate	14808-79-8	No TRV	
Total Sulfur	63705-05-5	No TRV	
Criteria Pollutants			
Carbon monoxide	630-08-0	No TRV	
Nitrogen dioxide	10102-44-0	No TRV	
Ozone	10028-15-6	No TRV	
Particulate matter	No CAS #	No TRV	
Sulfur dioxide	7446-09-5	No TRV	
Radionuclides			
All radionuclides combined (rad/d)[n]	No CAS #	1.00E+00	NCRP 1991[p]

Table C3-8 Toxicity Reference Values (TRVs) for COPCs and ROPCs

Notes/Sources

TRV = toxicity reference value for ingestion (mg/kg/d) or total daily dose (rad/d).

[a] IRIS (Integrated Risk Information System). 2002. Online database. http://www.epa.gov/iris/ Office of Environmental Criteria and Assessment, Cincinnati, Ohio, USA.

[b] US Environmental Protection Agency. 1987. Quality criteria for water 1986 and update no. 1 and update no. 2 (May 1, 1987), EPA-440/5-86-001. US Environmental Protection Agency, Washington, DC, USA.

[c] Sample B E, Opresko DM, and Suter GW II. 1996. *Toxicological Benchmarks for Wildlife*, 1996 Revision, ES/ER/TM-86/R3. Lockheed Martin Energy Systems, Oak Ridge National Laboratory, Oak Ridge, Tennessee, USA.

[d] Suter GW II and Tsao CL. 1996. *Toxicological Benchmarks for Screening Potential Contaminants of Concern for Effects on Aquatic Biota*, 1996 Revision, ES/ER/TM-96/R2. Lockheed Martin Energy Systems, Oak Ridge National Laboratory, Oak Ridge, Tennessee, USA.

[e] Efroymson RA, Will ME, Suter GW II, and Wooten AC. 1997a. *Toxicological Benchmarks for Screening Contaminants of Potential Concern for Effects on Terrestrial Plants*, 1997 Revision, ES/ER/TM-85/R3. Lockheed Martin Energy Systems, Oak Ridge National Laboratory, Oak Ridge, Tennessee, USA.

[f] EPA. 1999. *Screening Level Ecological Risk Assessment Protocol for Hazardous Waste Combustion Facilities, Volume 3*, EPA/530/D-99/001C. August 1999. Peer Review Draft.

[g] AQUIRE (Aquatic Information Retrieval). 2002. Chemical Information Systems, Inc., Baltimore, Maryland, USA. (URL http://www.epa.gov/med/databases/databases.html#aquire)

[h] Efroymson RA, Will ME, and Suter, GW II. 1997b. *Toxicological Benchmarks for Contaminants of Potential Concern for Effects on Soil and Litter Invertebrates and Heterotrophic Processes*, 1997 Revision, ER/ER/TM-126/R2. Oak Ridge National Laboratory, Oak Ridge, Tennessee, USA.

[i] Jones DS, Suter G W II, and Hull RN. 1997. *Toxicological Benchmarks for Screening Potential Contaminants of Concern for Effects on Sediment-Associated Biota*, 1997 Revision, ES/ER/TM-95/R3. Oak Ridge National Laboratory, Oak Ridge, Tennessee, USA.

[j] Toxicity values for Aroclor-1254 were used for polychlorinated biphenyl mixtures.

[k] Persaud D, Jaagumagi R, and Hayton A. 1993. *Guidelines for the Protection and Management of Aquatic Sediment Quality in Ontario*. Ontario Ministry of the Environment and Energy.

[l] Toxicity values for Cr(VI).

[m] Clayton GD and Clayton FE. 1981. *Patty's Industrial Hygiene and Toxicology, Vol. 2A, Toxicology*, 3rd Revised Edition. John Wiley & Sons, New York, New York, USA.

[n] TRV for total radionuclides applies to total daily dose for the risk evaluation but is used also for each individual radionuclide for calculations of relative contribution to risk.

[o] International Atomic Energy Agency (IAEA). 1992. *Effects of Ionizing Radiation on Plants and Animals at Levels Implied by Current Radiation Protection Standards*, IAEA Technical Report Series 332. Vienna, Austria.

[p] National Council on Radiation Protection (NCRP). 1991. *Effects of Ionizing Radiation on Aquatic Organisms*, NCRP Report No. 109. National Council on Radiation Protection and Measurements, Bethesda, Maryland, USA.

Attachment 1

Integrated Emissions Baseline Report for the Hanford Tank Waste Treatment and Immobilization Plant (24590-WTP-RPT-PO-03-008, Rev 0)

Attachment 1
Integrated Emissions Baseline Report for the Hanford Tank Waste Treatment and Immobilization Plant (24590-WTP-RPT-PO-03-008, Rev 0)

Orientation

This report documents the methods, assumptions, and resulting process emission rates. The model used was the Hanford Tank Waste Treatment and Immobilization Plant (WTP) project's baseline steady-state flowsheet model. This document was issued on 30 May 2003.

Errata to the *Integrated Emissions Baseline Report for the Hanford Tank Waste Treatment and Immobilization Plant* (24590-WTP-RPT-PO-03-008, Rev 0)

The *Integrated Emissions Baseline Report for the Hanford Tank Waste Treatment and Immobilization Plant* (referred to herein as the "emissions report") is a document that will be routinely updated to reflect changing design features that influence emissions at the WTP. The current emissions report (24590-WTP-RPT-PO-03-008, Rev 0) does not consider several recent design changes that are reflected in the narrative of the *Environmental Risk Assessment Work Plan for the Hanford Tank Waste Treatment and Immobilization Plant* (24590-WTP-RPT-PO-03-008). These changes include the deletion of the technetium ion exchange process in pretreatment, rearrangement of the treated activated carbon unit in low-activity waste (LAW) vitrification, and rearrangement of the treated activated carbon and silver mordenite units in high-level waste (HLW) vitrification. These changes will be reflected in the next revision to the emissions report. Each of the design changes, along with their expected impact to air emissions, is discussed below.

Removal of Technetium Ion Exchange

The conceptual and preliminary design of the WTP included a processing step to remove soluble technetium from the LAW waste stream using ion exchange. Under the earlier design, technetium-99 removed from the LAW waste stream was transferred to the HLW vitrification facility for immobilization. Recently, the US Department of Energy (DOE) and WTP concluded that technetium-99 removal was not a necessary, practical, or cost-effective process, and the decision was made to delete the technetium ion exchange process. Subsequent revisions to the emissions report will remove technetium ion exchange from the narrative, figures, and emissions model.

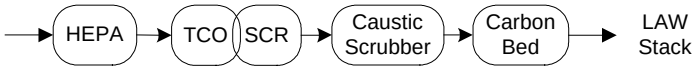
The deletion of technetium ion exchange will result in a different emissions profile for technetium-99. The emission rates for constituents of potential concern other than technetium-99 will not be affected by the deletion of the technetium ion exchange process. The table below summarizes the technetium-99 emission rates that correspond to unabated and abated emission points in the facility without the technetium ion exchange process. For comparative purposes, the emission rate estimates that applied with technetium ion exchange in place have been included in the table as well. Comparison of the emission rates reveals that the abated and unabated emission values in pretreatment are essentially unaffected by the change. The unabated and abated emissions of technetium-99 in the LAW vitrification facility are observed to increase. The increased technetium emissions are the result of the soluble fraction of technetium (that is, the fraction of technetium that was previously removed from the LAW) entering the LAW melter and receiving less treatment than that received in the HLW offgas system. Specifically, the presence of a high-efficiency mist eliminator (HEME) in HLW results in a higher overall technetium removal efficiency than that of the LAW vitrification offgas system. The abated and unabated emission values associated with the HLW vitrification are seen to decrease slightly due to a reduced amount of technetium-99 processed through the HLW melter and offgas system.

Unabated and Abated Emission Rates of ^{99}Tc With and Without Technetium Ion Exchange

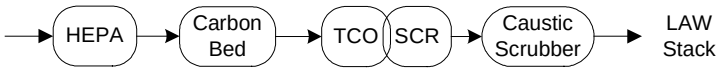
	Feed	Unabated Streams					Abated Streams				
	FRP14	PVP01	PJV04	LMP06	HMP06	PJV32	PVP12	PJV11	LVP26	HOP33	PJV34
	WTP Feed	PT Vessel Vent	PT RFD/PJM	LAW Melter	HLW Melter	HLW PJM/RFD	PT Vessel Vent	PT RFD/PJM	LAW Melter	HLW Melter	HLW PJM/RFD
Compound	Ci/d	Ci/d	Ci/d	Ci/d	Ci/d	Ci/d	Ci/d	Ci/d	Ci/d	Ci/d	Ci/d
^{99}Tc without ion exchange	1.86E+02	1.57E-03	1.79E-02	1.11E+01	8.16E+01	1.27E-07	1.18E-11	1.79E-08	7.10E-07	5.24E-08	6.33E-13
^{99}Tc with ion exchange	1.87E+02	1.53E-03	1.84E-02	3.75E-01	9.32E+01	1.43E-07	1.15E-11	1.84E-08	2.41E-08	5.98E-08	7.17E-13

Rearrangement of LAW Vitrification Secondary Offgas System

The LAW vitrification secondary offgas system has been rearranged to increase the life expectancy of the catalyst used in the thermal catalytic oxidizer (TCO). Prior to the rearrangement, the secondary offgas configuration consisted of high-efficiency particulate air (HEPA) filtration, thermal catalytic oxidation, selective catalytic reduction (SCR), caustic scrubbing, and sulfur impregnated carbon adsorption. The existing emissions report reflects this prior configuration, as shown below.



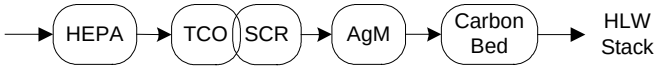
The rearranged configuration places the activated carbon adsorption unit between the HEPA filters and TCO. The carbon bed will remove mercury and other halides from the stream prior to being treated by the TCO, thereby increasing the life expectancy of the TCO catalyst. The offgas continues through the SCR process and caustic scrubber as before, prior to being released to the LAW stack. The rearranged secondary offgas system design will be reflected in the next revision to the emissions report, as shown below.



The LAW vitrification secondary offgas system rearrangement is not expected to result in any changes to the estimated emission rates currently reflected in the emissions report.

Rearrangement of HLW Vitrification Secondary Offgas System

The HLW vitrification secondary offgas system has also been rearranged to increase the life expectancy of the thermal catalytic oxidizer. Prior to the rearrangement, the secondary offgas system configuration consisted of HEPA filtration, followed by thermal catalytic oxidation, selective catalytic reduction, silver mordenite (AgM), and activated carbon adsorption. The existing emissions report reflects this prior configuration, as shown below.



The rearranged configuration will place the activated carbon adsorption and silver mordenite units between the HEPA filters and TCO. The carbon bed and silver mordenite will remove mercury, iodine, and other halides from the stream prior to being treated by the TCO, thereby increasing the life expectancy of the TCO catalyst. Following thermal catalytic oxidation, the offgas will proceed through the SCR process and be discharged to the HLW stack. The next revision to the emissions report will reflect the rearranged configuration, as shown below.

The HLW vitrification secondary offgas system rearrangement is not expected to result in any changes to the estimated emission rates currently reflected in the emissions report.

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History Sheet

Rev	Date	Reason for revision	Revised by
A	21 April 2003	Draft for WTP internal review.	E Berrios/J Cook
0	30 May 2003	Initial issue. This document supercedes all previously issued integrated emissions baseline reports, including *Integrated Emissions Baseline Report for the River Protection Project Waste Treatment Plant* (RPT-W375-ES00001, Rev 2), and Integrated *Emissions Baseline Report Update* (24590-WTP-RPT-PT-02-002, Rev 2). This document reflects a 2 LAW and 2 HLW melter configuration.	E Berrios/J Cook

Contents

Acronyms and Abbreviations v
Executive Summary vii
1 Introduction 1
1.1 Pretreatment Facility Changes 1
1.2 LAW Facility Changes 1
1.3 HLW Facility Changes 1
1.4 Pretreatment Emission Sources 2
1.5 LAW Vitrification Emission Sources 2
1.6 HLW Vitrification Emission Sources 2
2 Process Configuration 3
2.1 General Description 3
2.2 Pretreatment Overview 3
2.3 LAW Vitrification Overview 4
2.4 HLW Vitrification Overview 5
2.5 Emissions Objective 5
3 Constituents of Potential Concern 6
4 Analysis Tool 7
5 Representative Constituents in the Emissions Analysis 7
5.1 Selection of Representative Organic COPCs 7
5.2 Selection of Representative Inorganic, Radionuclide, and Criteria Pollutant COPCs 9
5.3 Application of Representative Organic COPCs 9
5.4 Application of Representative Inorganic and Radionuclide COPCs 10
6 Process Flowsheet Condition 11
7 Flowsheet Description and Emissions Analysis 11
7.1 Flowsheet Description 11
7.2 Emissions Analysis 12
8 Emissions Analysis Bases 15
8.1 Throughput and Operating Conditions 16
8.2 Feed Concentration for Organic Compounds 16
8.3 Feed Concentrations for Inorganic and Radionuclide Compounds 18
8.4 Concentration of Products of Incomplete Combustion 19
8.5 Phase Allocation of Constituents of Potential Concern 20
8.6 Equipment Decontamination Factors 21

9 Summary of Emissions Analysis Results 22

10 References 23

Appendices

Appendix A ACM Results for Selected Streams ..... A-i

Appendix B Calculation: Estimation of Non-SSFM Represented Organic Emission Rates Required to Support the Integrated Emissions Baseline Report ..... B-i

Appendix C Calculation: Integrated Emissions Baseline Report Non-SSFM Represented Constituents Emission Rate Estimation ..... C-i

Appendix D Calculation: Updated Emissions Run Feed Vector ..... D-i

Appendix E Calculation: Integrated Emissions Report PIC Estimation ..... E-i

Appendix F Phase Determination for COPCs Potentially Emitted from the Hanford Tank Waste Treatment and Immobilization Plant (WTP) ..... F-i

Appendix G Organic Abatement DFs in Pretreatment PVP System ..... G-i

Tables

Table 1 List of Process Flow Diagrams 26

Table 2 List of Organic COPCs and PICs 27

Table 3 List of Inorganic COPCs and Criteria Pollutants 37

Table 4 List of Radionuclide COPCs 39

Table 5 Representative Compounds for Inorganic and Radionuclides 40

Table 6 Estimated Organic Feed Concentrations 41

Table 7 Estimated LAW Feed Concentrations 47

Table 8 Estimated HLW Feed Concentrations 49

Table 9 Summary of Assumed Stack Concentrations for PICs 51

Table 10 Pretreatment Emissions Analysis Equipment Decontamination Factors 52

Table 11 Summary of Offgas Treatment Equipment DFs for Organic COPCs 54

Table 12 HLW and LAW Vitrification Emissions Analysis Equipment Decontamination Factors 59

Table 13 Summary of Organic Constituents Emission Rates for the WTP 63

Table 14 Estimated Inorganic COPC Emissions 69

Table 15 Estimated Radionuclide COPC Emissions 71

Table 16 WTP PIC Emissions 73

Figures

Figure 1 Simplified WTP Process Overview 76
Figure 2 Simplified Pretreatment Process Flowsheet (Sheet 1 of 2) 77
Figure 3 Simplified Pretreatment Process Flowsheet (Sheet 2 of 2) 78
Figure 4 Simplified LAW Vitrification Process Flowsheet 79
Figure 5 Simplified HLW Vitrification Process Flowsheet 80
Figure 6 Emissions Estimate Objectives 81

Acronyms and Abbreviations

ACM	Aspen Custom Modeler
ASIL	acceptable source impact levels
ASME	American Society of Mechanical Engineers
BBI	best basis inventory
BNI	Bechtel National, Inc.
CAS	Chemical Abstracts Service
COPC	constituent of potential concern
DF	decontamination factor
DOE	US Department of Energy
DOE-RL	US Department of Energy, Richland Operations Office
DST	double-shell tank
E&NS	environmental and nuclear safety
EPA	US Environmental Protection Agency
ESP	electrostatic precipitator
ETF	effluent treatment facility
HEME	high efficiency mist eliminator
HEPA	high efficiency particulate air (filter)
HLW	high-level waste
LAW	low-activity waste
ILAW	immobilized low-activity waste
LERF	liquid effluent retention facility
MACT	maximum achievable control technology
MW	molecular weight
NO_x	nitrogen oxides
PAH	polycyclic aromatic hydrocarbon
PCB	polychlorinated biphenyl
PFD	process flow diagrams
PIC	product of incomplete combustion
PJM	pulse-jet mixer
PJV	pulse-jet ventilation system
QAM	quality assurance manual
R&T	research and technology

RF	release factor
RFD	reverse flow diverter
SBS	submerged bed scrubber
SCR	selective catalytic reduction
SOW	statement of work
SRTC	Savannah River Technology Center
SSFM	steady state flowsheet model
SVOC	semivolatile organic compound
TEQ	toxicity equivalent quotient
TRU	transuranic elements
TWINS	Tank Waste Information Network System
VOC	volatile organic compound
VSL	Vitreous State Laboratory
WESP	wet electrostatic precipitator
WTP	Hanford Tank Waste Treatment and Immobilization Plant

Executive Summary

The Hanford Tank Waste Treatment and Immobilization Plant (WTP) is designed to vitrify radiochemical waste comprised primarily of inorganic salts and oxides, with smaller amounts of organics and radionuclides. An engineering estimate of stack emissions is necessary to facilitate preparation and approval of air permits required for construction and operation of the WTP. The emissions information will also be used to support human health and ecological risk assessment.

Previously released emissions reports, including the *Integrated Emissions Baseline Report for the River Protection Project Waste Treatment Plant* (RPT-W375-ES00001) and the *Integrated Emissions Baseline Report Update* (24590-WTP-RPT-PT-02-002), contained estimated emission rates for 470 organic, inorganic, and radionuclide constituents of potential concern (COPCs) from the WTP. The emission rates were estimated using the steady state flowsheet model (SSFM), ACM (Aspen Custom Modeler). This report supercedes earlier reports and reflects emission estimates that are consistent with current regulatory permitting assumptions and aligned with WTP design evolution and research and technology (R&T) data reconciliation.

A team comprised of personnel from the process operations and environmental and nuclear safety (E&NS) groups have cooperatively produced this emissions report. The following summarizes the report results:

- The emissions profile presented is adequately conservative and bounds the emissions of 2 low-activity waste (LAW) melters with expanded capacity and 2 high-level waste (HLW) melters.
- Estimated emission rates for 250 organic feed constituents, 120 organic products of incomplete combustion (PICs), 49 inorganic constituents, 46 radionuclide constituents, and 5 criteria pollutants have been predicted. These emissions are associated with 2 pretreatment process flues, 1 LAW vitrification process flue, and 3 HLW vitrification process flues. Pretreatment, LAW, and HLW cell flues are not part of the scope of this document.
- Predicted emission rates for all 470 COPCs are conservative. The concentration of the toxic organics in the feed utilized for this analysis is 280 times greater than detected concentrations or the detection limit of an actual Hanford tank sample collected from a high organic-bearing waste. The inorganic and radionuclide feed bases are also conservative. WTP contractual maximum concentrations or Hanford "best basis inventory" (BBI) maximum concentrations were used as the basis for inorganic and radionuclide COPCs.
- The WTP baseline steady state flowsheet was used to produce this emissions profile. This flowsheet represents the WTP design as of January 2, 2003. It also reflects the latest design bases and R&T information.
- R&T data from testing at the Vitreous State Laboratory (VSL) was used to estimate generation rates of PICs from all 3 facilities. The PIC emission rates were calculated on the basis that these constituents are present in the stack at an upper analytical detection limit.
- Evaporator partitioning and organic vessel vent emissions were predicted from known liquid phase concentrations using vapor-liquid equilibrium. Henry's Law constants for 250 organic compounds in the feed were compiled for the vapor-liquid equilibrium calculations.

1 Introduction

In May of 2001, Bechtel National, Inc. (BNI), released the first revision of *Integrated Emissions Baseline Report for the River Protection Project Waste Treatment Plant,* RPT-W375-ES00001 (hereinafter referred to as the "Emissions Report"). The Emissions Report contained an estimate of stack emissions based on the April 2000 design of the Hanford Tank Waste Treatment and Immobilization Plant (WTP). These emission estimates were necessary to support air permits for construction and operation of the WTP.

Since the release of the Emissions Report, new R&T testing data has been made available to the project that affects the emissions generation. Also, design changes have occurred, including a shift to a 2 LAW melter and 2 HLW melter (2 + 2) configuration. In addition, the bases for the emissions profile have been reviewed and updated by a team comprised of personnel from process operations and E&NS with inputs from R&T and process engineering. Several sub-teams were formed to review different aspects of the bases, ranging from the feed vector to the removal efficiencies and assumptions. Each team used the latest R&T data and design basis as input and updated the bases, as necessary.

In order to incorporate the updated bases from the emissions task teams and to reflect the new 2 + 2 melter configuration, an updated emissions profile was developed and is presented in this report. The data from this profile will supplement the update of the risk assessment analysis and air permits.

Design changes reflected in this new emissions profile are addressed in the following text.

1.1 Pretreatment Facility Changes

- Tank reconfiguration
- Evaporation of HLW feed through the feed evaporator
- Treatment of LAW and HLW feeds through the same ultrafiltration unit
- Deletion of the low-level pretreatment plant
- Treatment of all vessel vents and evaporator overheads in a common offgas system
- Replacement of the pulse-jet ventilation (PJV) system high-efficiency mist eliminator (HEME) with a demister

1.2 LAW Facility Changes

- Deletion of 1 LAW melter
- Addition of treated activated carbon beds for mercury abatement

1.3 HLW Facility Changes

- Addition of a second HLW melter and its associated offgas train
- Addition of treated activated carbon beds for mercury abatement
- Deletion of the caustic scrubber
- Addition of the silver mordenite unit for radioactive iodine removal and acid gases
- Addition of a NO_x selective catalytic reducer

These changes reflect the WTP project's design as of 2 January 2003.

The intent of this emissions estimate is to arrive at appropriately realistic and conservatively bounded emission rates that rely upon defensible, documented assumptions. The emission rates at the process flues are referred to in this document as abated emissions. This document also presents unabated emission rates. These unabated emission rates correspond to the emission rates of COPCs at generation points in the process. This document provides the methods and assumptions for arriving at the emission rates from the emission sources addressed below.

1.4 Pretreatment Emission Sources

Pretreatment emission sources consist of the following:

- Unabated emissions from the evaporator offgases, vessel vent exhaust, and exhaust from the reverse-flow diverters (RFDs) and pulse-jet mixers (PJMs)
- Abated emissions from the pretreatment offgas treatment system

1.5 LAW Vitrification Emission Sources

LAW vitrification emission sources are:

- Unabated emissions from the LAW melter
- Abated emissions from the LAW melter offgas treatment systems, including vessel vents

1.6 HLW Vitrification Emission Sources

Lastly, HLW vitrification emission sources are made up of the following:

- Unabated emissions from the HLW melter and PJM/RFD exhaust
- Abated emissions from the HLW melter offgas, RFD/PJM exhaust, and vessel vent offgas treatment systems

This document is structured as outlined below.

- Section 2 provides an overview of the WTP process.
- Sections 3, 4, and 5 identify the COPCs evaluated and describe the steady state flowsheet model (SSFM), the primary tool used for the evaluation.
- Sections 6, 7, and 8 provide the flowsheet conditions, flowsheet structure, and bases for the emissions profile generation.
- Section 9 of this report provides a summary of the emissions estimates.
- Appendix A contains SSFM stream-specific report output for unabated, abated, and feed points in the WTP process. The rest of the appendices provide supporting documentation for the emissions profile generated.

2 Process Configuration

2.1 General Description

The previous emissions report (*Integrated Emissions Baseline Report for the River Protection Project Waste Treatment Plant,* RPT-W375-ES-00001) estimated emissions using a flowsheet that was based on the WTP conceptual design available at the time. Since then, the design of the WTP has evolved; therefore, the current emissions flowsheet reflects those changes and improvements. Table 1 lists the process flow diagrams (PFDs) that establish the basis for the updated emissions flowsheet and analysis.

One significant design change has been incorporated into the current emissions flowsheet that is not reflected in the low-activity waste (LAW) and high-level waste (HLW) process flow diagrams depicted in Table 1; this change pertains to a new configuration of LAW and HLW melters. The previous emissions report (RPT-W375-ES-00001) was based on continuous operation of 3 LAW melters and 1 HLW melter. In 2002, the US Department of Energy (DOE) and the WTP project jointly agreed to shift to a design based on operation of 2 LAW melters and 2 HLW melters, which is reflected by the current emissions flowsheet.

Figure 1 provides a simplified overview of the WTP process. In Figure 1, the movement of LAW and HLW waste can be traced from a starting point in the DOE double-shell tank system (shown in the lower-left corner of the diagram) through the various pretreatment unit operations (including feed evaporation, ultrafiltration, cesium, and technetium ion exchange) and into the LAW and HLW melter systems. The treatment of offgas resulting from operations of the pretreatment and melter processes, (including reverse flow diverter and pulse-jet mixing and vessel ventilation of vessels not individually depicted on the diagram), can also be traced to a point source emission location in the pretreatment, LAW vitrification, or HLW vitrification stack. The diagram has shading to distinguish the offgas treatment steps from other process operations.

Figures 2, 3, 4, and 5 provide a more detailed depiction of the WTP process. Figures 2 and 3 focus on the pretreatment processes and vessels. Figures 4 and 5 show the LAW vitrification and HLW vitrification processes, respectively. The arrows and lines leaving Figures 2, 3, 4, and 5 are positioned in a fashion that allows the reader to place them side to side and view the overall integrated process. The figures show the configuration of major system components and include selected stream names that correspond to stream identifiers in the steady state flowsheet model (SSFM). Figure 2, for example, shows stream FRP14 coming from the double-shell tanks into the HLW feed receipt vessel. Stream FRP14 is the unique identifier in the SSFM that corresponds to the HLW feed vector established for the emission estimate. Additional details are included in Sections 8.2 and 8.3 on the assumed composition and basis for this feed stream. General process descriptions for the 3 main WTP facilities are spelled out below.

2.2 Pretreatment Overview

The Hanford tank farm contractor transfers waste from the waste tanks to the WTP pretreatment facility. LAW Envelopes A, B, and C are transferred to the WTP as solutions that contain some undissolved solids (Envelope D-type waste or undesignated LAW precipitated salts). HLW undissolved solids (Envelope D) are transferred as slurry to the WTP pretreatment facilities.

Low sodium concentration (< 5 molar) waste received from the tank farms and some low sodium concentration recycle streams from the pretreatment and vitrification facilities are concentrated in the waste feed evaporator. In most cases, the sodium concentration from the waste feed evaporator is about 5 molar sodium. However, other processing constraints (for example, undissolved solids concentration and slurry-specific gravity) may require a lower sodium concentration.

When the sodium concentration is acceptable for further processing (either as received or after evaporation), the waste goes through the following processes:

- Feeds from LAW Envelopes A or B are blended with HLW feeds (Envelope D) in an ultrafilter preparation vessel. The ratio of LAW to HLW undissolved solids is established to support both LAW and HLW glass production rates. The blended HLW and LAW feed streams undergo a filtration process that separates LAW liquid stream (permeate) from the slurry. The LAW permeate is then processed through the ion exchange (IX) processes discussed below. The concentrated solids slurry is caustic leached (if warranted), washed, and blended before being transferred to the HLW vitrification facility.
- Envelope C feeds contain organic complexants that cause the Sr and some TRU waste to remain in the solution. This waste undergoes a ^{90}Sr/TRU precipitation process before filtration. The filtration step then separates the ^{90}Sr/TRU solids, manganese oxide solids (a byproduct from the precipitation process), and entrained solids from permeate (LAW stream). The ^{90}Sr/TRU precipitate is washed and stored for blending with HLW feed before HLW vitrification. The ^{90}Sr/TRU precipitate (Envelope C solids) are not caustic leached. Envelope C permeates are processed through the IX processes.
- After filtration, the permeate undergoes IX to remove ^{137}Cs and ^{99}Tc. The ^{137}Cs and ^{99}Tc eluates are concentrated by evaporation; it is then blended with pretreated HLW solids before being transferred for HLW vitrification. The last step taken in the pretreatment facility is to concentrate the treated LAW liquid by evaporation prior to transferring for LAW vitrification processing.

The pretreatment building also contains a process vessel ventilation system, an offgas treatment system, and a stack. Liquid effluents are either recycled back into the facility or sent to the Hanford Site liquid effluent retention facility (LERF)/200 Area effluent treatment facility (ETF). Figures 2 and 3 represent an overview of the pretreatment process.

2.3 LAW Vitrification Overview

Treated Envelopes A, B, and C supernatants from pretreatment are processed for LAW vitrification. The LAW vitrification process consists of 2 melter systems operated in parallel. Each melter system has a set of feed preparation vessels, a large-capacity, joule-heated ceramic melter, and an offgas treatment system. The facility also has a secondary offgas system shared by the 2 melter systems. The following description applies to each of the 2 LAW melter systems.

Pretreated LAW waste feeds are received into 1 of 2 common LAW concentrate receipt vessels inside the LAW vitrification building. Batches of concentrated LAW feed are transferred from these vessels to feed preparation vessels, where glass formers and sucrose are added and blended to form a uniform batch of feed to the LAW melters. The slurry feed is transferred to the melter feed vessels, where it is fed continuously to the LAW melters.

Each LAW melter is designed to a nameplate rate of 15 metric tons per day of immobilized low-activity waste (ILAW), and to operate between 950 °C and 1150 °C. The feed enters the melter from the top and forms a cold cap above the melt pool. Volatile components in the feed are evaporated or decomposed, then drawn off through the melter offgas system. Nonvolatile components react to form oxides or other compounds dissolved in the glass matrix. Bubblers agitate the mixture to increase the glass production rate. Finally, an airlift system pours the glass from the melter into stainless steel containers.

Each LAW melter system has its own primary offgas equipment, including a film cooler, submerged bed scrubber (SBS), and wet electrostatic precipitator (WESP). Particulates and condensables, including entrained or volatilized radionuclides in the melter offgas stream, are captured in the SBS and WESP. Condensables from the SBS and the WESP are collected in the liquid effluent system and recycled to the

treated LAW evaporator in the pretreatment facility. The primary offgas systems join after the WESP, and are routed to the secondary offgas system. At this point, the LAW vessel vent header joins the offgas stream. The secondary offgas system provides final filtration, destroys organics, reduces NO_x, and removes halides and mercury. This is done by using high efficiency particulate air (HEPA) filters, a thermal catalytic oxidizer, a selective catalytic reducer, a caustic scrubber, and treated activated carbon beds. Figure 4 provides an overview of the LAW vitrification process.

2.4 HLW Vitrification Overview

The HLW vitrification facility receives the pretreated HLW feed from the pretreatment facility. Treated Envelope D slurry and the LAW intermediate waste products (separated ^{90}Sr/TRU, ^{137}Cs, and ^{99}Tc) make up the feed to the HLW vitrification facility. The HLW vitrification process consists of 2 joule-heated ceramic melters fed by independent feed and blending vessel trains, a dedicated offgas treatment system for each melter, and a common secondary effluent collection system. A common canister receipt system supplies canisters to separate melter pouring systems, providing IHLW to a common product canister decontamination and export system. HLW feed concentrate is transferred from the pretreatment building to the HLW concentrate receipt vessels in the HLW vitrification building. Batches of HLW feed concentrate are transferred to 1 of the 2 melter feed preparation vessels. The feed concentrate is blended with glass-forming chemicals and sucrose, then mixed to ensure a uniform mixture. The melter feed slurry is transferred to the melter feed vessel, where it can be fed to a dedicated HLW melter.

Each HLW melter is designed to operate between 950 °C and 1200 °C at a nameplate rate of 3 metric tons per day IHLW. Melter feed slurry is introduced at the top of the melter and forms a cold cap on the surface of the melt pool. Water and volatile components evaporate or decompose and are drawn off through the offgas system. Nonvolatile components react to form oxides, which become part of the molten glass.

Each HLW melter has a dedicated primary and secondary offgas system where the offgas from the melter passes through a film cooler, submerged bed scrubber (SBS), wet electrostatic precipitator (WESP), high-efficiency mist eliminators (HEMEs), and HEPA filters, to remove particulates and radionuclides. The offgas then passes through a secondary offgas system consisting of recuperative heat exchangers, fans, a thermal catalytic oxidizer, a selective catalytic reducer, a silver mordenite column, and treated activated carbon beds. This secondary system destroys organics, reduces NO_x, and removes halides and mercury.

An airlift system inside the melter pours molten HLW glass into stainless steel canisters. The filled canister is then inspected, the glass sampled (as necessary), and the canister sealed. The canisters from the 2 melters are decontaminated by a nitric acid/cerium (HNO_3/Ce^{+4}) chemical milling process that dissolves a thin layer of the canister outer wall material. Canister decontamination waste effluents are then recycled and transferred to the pretreatment building. Figure 5 provides an overview of the HLW vitrification process.

2.5 Emissions Objective

Figure 6 graphically depicts the objectives of the emissions estimate. For this emissions estimate, it is assumed that the WTP feed streams contain 350 individual constituents of potential concern. An additional 120 products of incomplete combustion (PICs) that could be generated as a result of the treatment process are also considered. The resulting emission rates for 470 constituents from the pretreatment and vitrification processes are estimates.

3 Constituents of Potential Concern

This section provides the bases for selecting the constituents of potential concern (COPCs) analyzed in this report. The WTP emissions estimate scopes 470 COPCs, which were identified through development of the *Final Work Plan for Screening Level Risk Assessment for the WTP* (RPT-W375-EN00001, BNFL 2000). These COPCs were originally selected with consideration to guidance provided in the *Human Health Risk Assessment Protocol for Hazardous Waste Combustion Facilities* (EPA 1998), the *Screening Level Risk Assessment Protocol for Hazardous Waste Combustion Facilities* (EPA 1999), and through interactions with EPA Region 10 and the Washington State Department of Ecology.

The COPC selection criteria identified compounds that fell within one or more of the following categories:

- A compound with the potential to be emitted due to the presence of the compound or its precursors in the waste feed
- A compound that was potentially a product of incomplete combustion
- A compound potentially toxic to humans
- A compound with a propensity for bio-accumulating or bio-concentrating in human and ecological food chains

The 470 COPCs contain chemical and radionuclide constituents, and include compounds not known to be present at detectable concentrations in the actual waste. A total of 304 chemical COPCs associated with WTP feed streams were identified. The chemical COPCs are comprised of 250 organic compounds, 49 inorganic compounds, and 5 criteria pollutants. An additional 120 organic PICs were identified as being potentially formed in the treatment process. The chemical COPCs were compiled using input from the following sources:

- *Regulatory Data Quality Objectives Supporting Tank Waste Remediation System Privatization Project* (Wiemers and others, 1998)
- List of PICs identified in Table A.1, *Human Health Risk Assessment Protocol for Hazardous Waste Combustion Facilities* (EPA 1998)
- Criteria pollutants regulated by the *National Ambient Air Quality Standards* (40 CFR Part 50)

Table 2 lists the 250 organic COPCs and 120 organic PICs. Table 3 lists the 49 inorganic COPCs and the 5 criteria pollutants. In each table, the compounds are sorted using their unique Chemical Abstracts Service (CAS) registry number.

A total of 46 radionuclide COPCs were identified to be associated with WTP feed streams. The radionuclide COPCs were derived from Hanford's best basis inventory and include 16 radionuclides identified as contributing greater than 99.99 % of the radioactivity in the tank waste (Kupfer 1997). Information used to establish the radionuclide inventory originated from key historical records, various chemical flowsheets used in reprocessing of irradiated Hanford Site reactor fuels, and from calculations of radionuclide isotope generation and decay. Table 4 identifies the 46 radionuclide COPCs.

Additional details on the selection of COPCs can be found in Section 4.0 of the *Final Work Plan for Screening Level Risk Assessment for the WTP* (RPT-W375-EN00001).

4 Analysis Tool

The emissions estimate was developed using the WTP project's baseline steady state flowsheet model (SSFM). This flowsheet is representative of the latest WTP design and is constantly being updated to include the latest design bases, requirements, and R&T testing results. The flowsheet tracks the main constituents that are expected to have the biggest impact on the material and heat balance of the plant. The constituents tracked in the flowsheet account for 117 of the constituents of potential concern (COPCs) required to be analyzed, per Section 3. Thus to facilitate the estimation of the rest of the COPCs, several calculations were performed which determined these emission rates based on the results provided by the steady state flowsheet. Section 5 describes this process in detail.

The SSFM tracks the partitioning of the COPCs across the pretreatment and vitrification facilities, and provides a steady state representation of process stream compositions through the WTP. The steady state flowsheet provides an overall material and energy balance with time-averaged flow rates. The SSFM makes it possible to apply the use of simple equipment decontamination factors or more complicated thermodynamic calculations. The SSFM uses the Henry's Law concept to estimate releases of organic compounds from vessel vents within all facilities, and evaporator overheads.

The SSFM is separated into equipment-oriented areas that represent pretreatment and vitrification unit operations. Pretreatment consists primarily of evaporation, precipitation, ultrafiltration, and ion exchange separation processes. LAW and HLW vitrification consist of staging and preparation vessels to prepare the pretreated feed for vitrification. The pretreatment, LAW vitrification, and HLW vitrification unit operations also include offgas treatment, effluent, and recycle streams. In addition, the HLW facility takes into account the recycle from the container decontamination system. Section 7 provides more detail on the flowsheet structure.

A verification and validation process is performed on each version release of the SSFM consistent with NQA-1 requirements and the quality assurance manual (QAM). This emissions estimate was performed on version 2.0 of the steady state flowsheet. Details on this version of the flowsheet can be found in the *Steady-State Flowsheet (ACM) Model Design Document* (24590-WTP-MDD-PR-01-003).

5 Representative Constituents in the Emissions Analysis

An approach for correlating the emission rates for compounds included in the SSFM with the remaining COPCs was established with consideration to physical properties, chemical class, and feed concentration. This approach for selecting representative compounds and applying the SSFM results to determine the rate for constituents not tracked in the flowsheet is described in the following sections.

5.1 Selection of Representative Organic COPCs

A subset of the organic COPCs was selected to represent the larger list of organic COPCs in the SSFM. In total, 51 of the 250 organic feed COPCs were selected. The basis for selection of these compounds is discussed below. The SSFM was not used to estimate PICs as these were estimated in a dedicated calculation. The methodology for addressing PIC emissions is described in Section 8.4.

Henry's Law constants were compiled for all of the feed organics. The *Vessel Vents and PJM/RFD Emissions* (RPT-24590-EN00001) document shows the compilation process for these Henry's Law constants. These constants were divided into 29 groups based upon closeness of numerical values within

a group. An additional 6 subgroups were added to differentiate between particle and vapor phase within assessment groups. Constituents from each of these groups were selected for analysis using the SSFM.

To supplement constituents selected based upon Henry's Law, additional compounds were selected based upon physical properties including boiling point, offgas phase, and solubility. Specifically, the constituent boiling points (bp) were classified as 1 of the following 3 groups:

- Volatile (bp < 100 °C)
- Semi-volatile (100 °C < bp < 300 °C)
- Nonvolatile (bp > 300 °C)

Likewise, the offgas phases were classified as 1 of the following 2 groups:

- Vapor phase
- Particle (or particle-bound) phase

The organic aqueous solubility was classified as 1 of the following 2 groups:

- Insoluble (solubility in water < 0.01 g per 100 ml)
- Slightly soluble/soluble (solubility in water ≥ 0.01 g per 100 ml)

Constituents representing the applicable combinations of these physical properties (such as semi-volatile, particle phase, and insoluble compounds) were included as constituents for analysis.

Several additional compounds were selected to ensure that each of the following 13 chemical families were represented:

- Aromatic halogenated hydrocarbons
- Aromatic non-halogenated hydrocarbons
- Non-aromatic non-halogenated hydrocarbons
- Non-aromatic halogenated hydrocarbons
- Dioxin and furan compounds
- Polychlorinated biphenyls (PCBs)
- Phthalates
- Light polycyclic aromatic hydrocarbons; molecular weight (MW) less than 200 g per mole (g/mole)
- Heavy polycyclic aromatic hydrocarbons (MW greater than 200 g/mole)
- Light substituted benzene compounds (MW less than 200 g/mole)
- Other light semi-volatile organic compounds (SVOCs) (MW less than 200 g/mole)
- Other heavy SVOCs (MW greater than 200 g/mole)
- Herbicides and organochlorinated pesticides

Table 2 identifies the organic COPCs that were selected for analysis using the SSFM based upon the criteria and rationale discussed above. WTP has produced an engineering calculation that arrives at

emission rates for the organic constituents not included in the SSFM. The calculation is entitled *Estimation of Non-SSFM Represented Organic Emission Rates Required to Support the Integrated Emissions Baseline Report* (24590-WTP-M4C-FRP-00005). This calculation is included in Appendix B of this report.

5.2 Selection of Representative Inorganic, Radionuclide, and Criteria Pollutant COPCs

The radionuclide and inorganic constituents currently tracked in the steady state flowsheet comprise about 70 % of the total inorganic and radionuclide constituents analyzed in this report. Specifically, the SSFM tracks 35 out of 49 of the inorganic constituents and 28 out of 46 radionuclide constituents. Tables 3 and 4 identify the list of inorganic and radionuclide constituents that were analyzed with the SSFM. The WTP project has produced an engineering calculation that arrives at emissions rates for the inorganic and radionuclide constituents not included in the SSFM. The calculation is entitled *Integrated Emissions Baseline Report Non-SSFM Represented Constituents Emissions Rate Estimation* (24590-WTP-M4C-FRP-00003), and is included in Appendix C of this report.

Of all the inorganic, radionuclides, and criteria pollutants, the only ones that are not estimated for this analysis are ozone, bromide, and iodine (I_2). Ozone is usually produced by passing an electrical discharge through O_2 gas or through dry air. Based on current process design, ozone is not expected at the WTP and, therefore, is not presented in this emission estimate. The presence of bromide is known to lead to very rapid corrosion of carbon steel tanks. This constituent is prohibited from Hanford tank wastes and no process history for its introduction exists. Bromide is, therefore, not presented in this emissions estimate. Non-radioactive iodine is not tracked as a constituent in the Hanford best basis inventory. The emissions estimate based the iodine inventory in the tanks as being entirely radioactive iodine-129 (^{129}I).

5.3 Application of Representative Organic COPCs

As stated in Section 5.1, the existing process and emissions analysis configuration is dependent on Henry's Law, boiling point, phase type, and, to a lesser extent, solubility. As intended by the grouping methods described above, constituents within the same organic group are expected to behave similarly in the process. As such, the emission rates are expected to be a linear function of the feed rates as shown below:

$$emission\ rate_2 = \frac{emission\ rate_1 \cdot [concentration]_2}{[concentration]_1} \cdot (LAW + HLW[\text{feed rate}])$$

Organic treatment groups included in the SSFM were reallocated to differentiate particle and vapor phase treatment for 6 of the 29 Henry's Law groupings (see Section 5.1). The mean treatment difference for these 6 groups provides a correction factor for constituents not estimated using the SSFM.

5.3.1 Estimation of Coplanar PCB Emissions

The feed organic compounds listed in Table 2 include 14 coplanar PCB congeners. Coplanar PCBs have 4 or more chlorine atoms with few substitutions in the ortho positions. The rings can rotate into the same plane if not blocked from rotation by ortho-substituted chlorine atoms and, in this coplanar configuration, exhibit dioxin-like properties. For the purpose of the emissions estimate, the 14 coplanar PCBs comprise 1 % of the total PCB emissions concentration. This basis is consistent with EPA guidance regarding PCB emissions from combustion facilities (EPA 1998). Assuming that 1 % concentration is evenly distributed across the 14 coplanar compounds, an individual coplanar PCB emission rate is calculated as 1/14 of 1 % of the total PCB emissions from each of the WTP process flues. Total PCBs are represented in the SSFM by the Chemical Abstracts Service (CAS), registry number 1336-36-3.

5.4 Application of Representative Inorganic and Radionuclide COPCs

As described in Section 5.2, the baseline SSFM tracks 35 of the 49 inorganics and 28 of the 46 radionuclides. The emission rates for compounds not estimated using the SSFM are based on the emission rate of a representative analyzed compound that is chemically or physically similar. This is achieved by using a performance factor (PF) of the representative compound calculated by the following equation:

$$PF = \frac{\text{mass rate at point of interest [representative compound]}}{\text{mass rate at waste feed [representative compound]}}$$

The "mass rate at the point of interest" refers to the mass rate of a representative compound at various points in the process train, such as at the plant stack or the unabated emission to each offgas treatment unit. The "mass rate at waste feed" refers to the mass rate of each representative compound in the SSFM analyzed waste feed. The mass rate for the waste feed in the above equation is the sum of HLW and LAW feed rates for the compound. The PF is assumed to be the same for the associated compounds that are not part of the baseline SSFM.

The emission rates of the compounds that are not part of the baseline SSFM can also be determined using the following methods, when appropriate.

When an elemental radionuclide form is analyzed with the SSFM, it will be used to estimate the non-radioactive element. For example, the emission rates for cobalt (Co) will be the same as the emission rates for ^{60}Co. The emission rate for uranium (U) will be the same as the overall uranium radionuclide emissions analyzed (^{233}U, ^{234}U, ^{235}U, and ^{238}U).

Additionally, when a parent radionuclide form is analyzed, it will be used to determine its decay products. For example ^{90}Y and ^{137m}Ba are decay products of ^{90}Sr and ^{137}Cs, respectively. Therefore, the emission rates of the decay products will be estimated based on the respective activity ratio to the parent radionuclides. This approach is particularly conservative with respect to strontium and cesium decay during processing, as these decays are β transitions that increase the valence (oxidation capability), thereby increasing the stability of the material within solid phases (such as vitrified product).

The following sections describe the selection of representative compounds for inorganic and radionuclide COPCs. Table 5 provides the representative constituents for these COPCs.

5.4.1 Representative Inorganic COPCs in the SSFM

The inorganics constituents were categorized into non-volatile, semi-volatile, and volatile inorganics. The emission rates for zirconium (Zr) was used to estimate the emission rates for non-volatile inorganics, such as rhodium (Rh), tantalum (Ta), tungsten (W), vanadium, and beryllium (Be). This approach was based on the following:

1) The primary mechanism for non-volatiles to enter the melter offgas and vessel vent system stream is through entrainment, which is not specific to chemical species.
2) The decontamination factors (DFs) for the HLW and LAW offgas treatment equipment are determined based on the average of the particle size distributions of aluminum (Al), iron (Fe), and Zr.

For semi-volatile and volatile inorganics, such as molybdenum (Mo), thallium (Tl), and selenium (Se), the DFs that were reported in engineering calculations (24590-WTP-MKC-50-00004) were compared to other analyzed semi-volatile and volatile elements. The elements with the most comparable overall DFs are used as the representative elements.

5.4.2 Representative Radionuclide COPCs in the SSFM

A methodology similar to that applied to the inorganic COPCs has been applied to the radionuclide constituents. The emission rate for zirconium is used to estimate the emission rates for non-volatile radionuclides, such as radium-226 (^{226}Ra), protactinium-231 (^{231}Pa), actinium-227 (^{227}Ac), radium-228 (^{228}Ra), and niobium-93m (^{93m}Nb).

For semi-volatile and volatile radionuclides, the DFs that were reported in the engineering calculations (24590-WTP-MKC-50-00004) were compared to other analyzed semi-volatile and volatile elements. The elements with the most comparable overall DFs were used as the representative elements.

6 Process Flowsheet Condition

The baseline steady state flowsheet provides WTP material and energy balance information and data. This flowsheet is also the tool to provide the WTP emissions profile used to support environmental air permitting and risk assessment activities. Even though the same flowsheet is used, parameters used for generating emissions estimates differ from the ones used for baseline plant performance. The operating parameters within the unit operations remain the same (operating temperatures and pressures, for example). The major differences between the parameters are found in the feed vector, equipment performance (decontamination factors), and plant throughput rates. The DFs and throughput rates utilized for the WTP material and energy balance provide the best realistic conditions for plant operations. The DFs and throughput rates used for this emissions estimate conservatively estimate plant operation, which bounds plant emissions for regulatory concerns.

For a complete detail of operating conditions for each unit operation within the WTP, refer to Sections 2 (Pretreatment), 3 (LAW), and 4 (HLW) of the *Flowsheet Bases, Assumptions, and Requirements* (24590-WTP-RPT-PT-02-005). Conditions used for this emissions profile, including throughput rates, feed vector, and equipment DFs, are presented in Section 8 of this report.

7 Flowsheet Description and Emissions Analysis

This section provides an overview of the setup and structure of the flowsheet and how the emissions analysis is performed. For a detailed description of the depiction of the WTP flowsheet using the ACM software, refer to the *Steady State Flowsheet (ACM) Model Design Document* (24590-WTP-MDD-PR-01-003).

7.1 Flowsheet Description

A description of the setup and structure of the flowsheet is described below.

7.1.1 Inputs

The SSFM uses a large number of input (constrained) variables to specify the values within the equation matrix. The constrained variables fall into 2 categories: parameters and fixed variables. Parameters typically include constant properties such as DFs. Fixed variables include the operating conditions that define how the process operates.

7.1.2 Tracking of Constituents

The flowsheet is constructed to track non-radioactive and radioactive elements in solid, aqueous, and vapor phases. For tracking purposes, the components entrained in a vapor stream are considered to be part of the solid array. Overall conservation of mass is applied throughout the flowsheet.

7.1.3 System Structure

The overall WTP process has been divided in 30 systems common to the flowsheet. Detailed information on how the flowsheet is constructed for these 30 systems can be found in Section 4 of the *Steady State Flowsheet (ACM) Model Design Document* (24590-WTP-MDD-PR-01-003).

7.1.4 Flowsheet Structure

The steady state flowsheet model is comprised of 1 single flowsheet encompassing the entire process. Portions of that flowsheet represent the modeling of specific unit operation and systems. Within the steady state flowsheet model there are 38 independent custom modules. These modules serve as building blocks that are assembled to model the process. The major plant systems are characterized by either a single module or a combination of modules. Within the individual modules reside the equations which serve to define the processes. The modules are comprised of visual basic type code defining the mathematical relationship between the fixed variables, the parameters, and the other calculated values based on engineering principles. The modules are connected by streams through which they transfer information defining the properties pertaining to the streams. Collectively, the modules and streams make up the plant systems, which ultimately define the overall process.

7.2 Emissions Analysis

A description of the areas from the WTP flowsheet pertinent to the emissions analysis and methods used to generate the emissions profile is presented below.

7.2.1 Pretreatment Emissions Analysis

The pretreatment facility offgas systems are shown in Figure 2. The pretreatment vessel vent system provides the abatement for offgases from pretreatment process vessels and equipment. The pulse-jet ventilation (PJV) system controls emissions from the exhausts of pretreatment fluidic devices, such as pulse-jet mixers (PJMs) and reverse flow diverters (RFDs). Each system discharges to the pretreatment stack through separate headers.

Purge air supplied to pretreatment process vessels for hydrogen mitigation is collected and treated by a caustic scrubber, HEME, 2 stages of high efficiency particulate air (HEPA) filtration, thermal oxidizer, and carbon bed adsorber prior to discharge through the pretreatment stack. Offgases from pretreatment process equipment, such as evaporator overheads, are also collected and treated by the pretreatment vessel vent system.

PJMs are used throughout the pretreatment facility to re-suspend solids in process vessels and to disperse mixtures before sampling process liquids. RFDs are used for liquid transfers and collecting samples of process liquids. Both PJMs and RFDs are fluidic devices that use compressed air to draw process liquid into a charge vessel, located within the process vessel, and then force the liquid back out to achieve the desired operation. The exhaust air from these operations, along with entrained aerosols, are collected and treated by medium efficiency mist eliminators, or demisters, and 2 stages of HEPA filtration prior to discharge through the pretreatment stack.

Sections 7.2.1.1 through 7.2.1.3 describe the emissions analysis methods for pretreatment facility emissions associated with:

- Vessel vent exhaust
- Evaporator overheads
- RFD/PJM exhaust

7.2.1.1 Vessel Vent Exhaust

The exhaust from the vessel vent system consists of the purge air supplied to pretreatment process vessels for the purpose of controlling radiolytic hydrogen generation within the vessel vapor space. In addition to increasing in temperature and moisture content, the purge air also becomes contaminated as it passes through the vessel vapor space. Mixing, sparging, radiolytic hydrogen generation, process transfers, and evaporation contribute to the release of aerosols and particulates into the vessel vent offgas stream.

A liquid entrainment factor has been calculated for several process vessels based on *PT Vessel Vent System Baseline Operating Conditions and Radioactive Aerosol Loading of Exhaust Air Stream* (RPT-W375PT-PR00021). These entrainment factors are listed in Table 2.13-3 of the *Flowsheet Bases, Assumptions and Requirements* document (24590-WTP-RPT-PT-02-005). From the entrainment factor for inorganics and radionuclides, the quantity of a constituent in the vessel vent offgas stream can be determined by multiplying the quantity of the constituent entering the vessel in the liquid phase by the entrainment factor for that vessel. The quantity of organics in the offgas stream is determined through the application of Henry's Law, which estimates the equilibrium gas phase concentration of a compound from the known liquid phase concentration (RPT-24590-EN00001, *Vessel Vents and PJM/RFD Emissions*). Henry's Law constants used for the organic constituents are presented in Table 2. The Henry's Law method was used throughout the vessel vent systems (both pretreatment and vitrification plants) and evaporator systems in the flowsheet to calculate the organic emission releases. The constants were developed on the basis that operating conditions on the vessels are near standard temperature and pressure conditions, thus the Henry's Law constants at standard conditions are used. Details on selection of the Henry's Law constants can be found in Section 5 of the report titled *Vessel Vents and PJM/RFD Emissions* (RPT-24590-EN00001).

The pretreatment vessel vent thermal oxidizer is designed for a minimum operating temperature of 1,600 °F (24590-PTF-M0C-PVP-00001) and could potentially generate products of incomplete combustion (PICs). For purposes of the emissions analysis, PICs are defined as compounds identified in Table A-1 of the *Human Health Risk Assessment Protocol for Hazardous Waste Combustion Facilities* (EPA 1998), but are not components of the waste feed. It has been conservatively established for emissions estimation purposes that PICs are present at the pretreatment stack at their estimated detection limits. The rationale and discussion for this basis are provided in Section 8.4.

7.2.1.2 Evaporator Overheads

The pretreatment facility contains 4 evaporators to reduce the volume of certain streams prior to further processing steps. These evaporators are associated with the following process streams:

- Waste feed
- Cesium eluate
- Technetium eluate
- Treated LAW

Each evaporator is analyzed under continuous operation at a pressure of 1.0 to 1.5 psia. The reduced pressure lowers the boiling point of the process stream. The waste feed and treated LAW evaporator overheads are routed to primary condensers, where most of the vapor is condensed at the saturation pressure. Contaminant removal by the evaporators and condensers are estimated using DFs. Tables 2.2-1, 2.2-2, and 2.2-3 of *Flowsheet Bases, Assumptions, and Requirements* provide the waste feed evaporator and condenser DFs. The treated LAW evaporator and condenser DFs are provided in Tables 2.12-1, 2.12-2, and 2.12-3 of *Flowsheet Bases, Assumptions, and Requirements*.

The vapor stream from the cesium and technetium evaporators enters the rectifier columns prior to the primary condensers. Tables 2.6-1 and 2.8-1 of *Flowsheet Bases, Assumptions, and Requirements* provide the decontamination factors for the cesium and technetium evaporators/rectifiers, respectively. Non-condensable vapors from all 4 evaporators join the vessel vent header prior to the offgas treatment system as shown in Figures 2 and 3. For the purpose of the analysis, the evaporator/condenser overheads are considered to be saturated air containing entrained evaporator liquid.

Section 8.6 contains additional information regarding emissions analysis specific equipment decontamination factors.

7.2.1.3 RFD and PJM Exhaust

Both RFDs and PJMs work by using compressed air to raise and lower process fluid in a charge vessel located inside the process vessel. One end of the charge vessel is connected to a jet pump pair that provides the suction for drawing liquid up into the charge vessel and the drive for forcing the liquid back out of the charge vessel. At the end of the drive phase, residual compressed air in the charge vessel passes back up through the jet pump pair and into the PJV system header. Significant quantities of compressed air are exhausted through the jet pump pair during the suction and vent phases. Liquid aerosols and radiolytic particulates will become entrained in the exhausts from the jet pump pair via the charge vessel. For organic, inorganic, and radionuclide constituents, an aerosol entrainment factor of 1×10^{-5} has been used to calculate the amount of process liquid in the charge vessel that is transferred to the exhaust stream (*Flowsheet Bases, Assumptions, and Requirements*, Section 2.14.3.2).

7.2.2 LAW and HLW Vitrification Emissions Analysis

The LAW and HLW vitrification facilities have devoted offgas systems for controlling emissions. Additional detail regarding the vitrification facilities is provided below.

7.2.2.1 LAW and HLW Melters

For the melters, the feed enters from the top and forms a cold cap above the melt pool. Volatile and semivolatile compounds are evaporated or decomposed, then drawn off through the melter offgas system. Nonvolatile compounds react to form oxides or other compounds dissolved in the glass matrix. Behavior

in the melter is represented in the flowsheet by chemical reactions and application of DFs. A complete list of reactions occurring in the melters can be found in Sections 3.2 for LAW and 4.2 for HLW in the *Flowsheet Bases, Assumptions, and Requirements*. Specific DFs used for emissions analysis for the melters are presented in Section 8.6 of this report.

7.2.2.2 Vitrification Scrubbers

The submerged bed scrubber (SBS), in both HLW and LAW, and the LAW Caustic Scrubber behavior in the flowsheet is also represented by operating conditions, occurring chemical reactions, and DFs applied. For a listing of chemical reactions and operating conditions refer to Section 3.3 for LAW and 4.3 for HLW of the *Flowsheet Bases, Assumptions, and Requirements.* Specific DFs used for emissions analysis for all 3 scrubbers are presented in Section 8.6 of this report.

7.2.2.3 Remaining Vitrification Offgas Unit Operations

The remainder of the unit operations' behavior in the offgas systems (WESP, HEME – HLW only, thermal catalytic oxidizer, selective catalytic reducer, silver mordenite – HLW only, and treated activated carbon beds) is represented by applying pertinent DFs. Some chemical reactions also occur in these units. For example, in the thermal catalytic oxidizer, SO_2 is oxidized to SO_3, and CO is oxidized to CO_2. For a listing of chemical reactions and operating conditions for all these units refer to Sections 3.3 for LAW and 4.3 for HLW of the *Flowsheet Bases, Assumptions, and Requirements.* Specific DFs used for emissions analysis for all these units are discussed in Section 8.6 of this report.

7.2.2.4 LAW and HLW Vessel Ventilation Systems

The exhaust from the vessel vent system consists mainly of air inleakage and instrument air addition to process vessels. This air becomes contaminated as it passes through the vessel vapor space. Mixing, sparging, radiolytic hydrogen generation, process transfers, and evaporation contribute to the release of aerosols and particulates into the vessel vent offgas stream.

A liquid entrainment factor has been calculated for all process vessels based on calculations CALC-W375LV-PR00022, Rev 2 *System 234 LAW Vessel Ventilation Calculation,* and CALC-W375HV-PR00033, Rev 1 *HLW Vessel Ventilation Calculation*. These entrainment factors are listed in Sections 3.3.3.3 (LAW) and 4.3.3.3 (HLW) of 24590-WTP-RPT-PT-02-005, *Flowsheet Bases, Assumptions, and Requirements*. From the entrainment factor for inorganics and radionuclides, the quantity of a constituent in the vessel vent offgas stream can be determined by multiplying the quantity of the constituent entering the vessel in the liquid phase by the entrainment factor for that vessel. The quantity of organics in the offgas stream is determined through the application of Henry's Law, which estimates the equilibrium gas phase concentration of a compound from the known liquid phase concentration.

7.2.2.5 HLW PJM/RFD Exhaust

These units have been represented identically as the ones in Pretreatment described in Section 7.2.1.3.

8 Emissions Analysis Bases

As stated in Section 6, the differences between the baseline design and the emissions case analyzed in the SSFM are the throughput rates, DFs, and feed vector. This section outlines the bases for the emissions case. All of this information can also be found in Section 7 of the *Flowsheet Bases, Assumptions, and Requirements* (24590-WTP-RPT-PT-02-005).

8.1 Throughput and Operating Conditions

The previous emissions analysis reflected an ILAW production rate of 50 metric tons of glass per day and an IHLW production rate of 3 metric tons per day. This was based on the previous WTP configuration of 3 LAW melters and 1 HLW melter. Although the configuration of melters has changed to 2 LAW melters and 2 HLW melters, an ILAW production rate of 50 metric tons per day has been retained for the emissions analysis. This ensures that the emissions profile is bounding from a melter perspective. With the addition of a second HLW melter, the production rate for IHLW has been set at 6 metric tons per day for emissions analysis.

8.1.1 Feed Conditions

LAW feed envelopes fall within a range from 4 to 10 moles of sodium per liter. The lower sodium molarity feeds will be processed by the WTP at a higher rate. In order to bound the emissions estimate, the WTP feed is set at a 4 molar sodium concentration.

8.1.2 Pretreatment Facility Conditions

During normal operations, any feed that enters the pretreatment plant with a sodium molarity of 5 molar or higher bypasses the feed evaporator. To conservatively maximize emissions from the pretreatment facility the sodium molarity of feed streams was set at 4 molar sodium, as stated in Section 8.1.1.

Operating conditions for all other systems in the pretreatment facility are as stated in Section 2 of the *Flowsheet Bases, Assumptions, and Requirements* (24590-WTP-RPT-PT-02-005). Conditions are similar to those stated for processing an Envelope A waste. No leaching occurs in the emissions analysis as administrative controls will be set in the pretreatment facility to stop the delivery of any feed that is out of the specified LAW source term. Treated LAW feed is delivered to the LAW facility at an 8 molar sodium concentration.

8.1.3 LAW Facility Conditions

Operating conditions for all the systems in the LAW facility are as stated in Section 3 of the *Flowsheet Bases, Assumptions, and Requirements* (24590-WTP-RPT-PT-02-005). LAW waste oxide loading in the glass was set at 20 % to maximize melter emissions as this is considered to be the upper bound waste loading expected in the ILAW at this time. Nominal operating range will be between 14 % and 17 %. LAW waste oxide loading is defined as the weight of sodium oxide (Na_2O) to the total weight of waste and glass formers.

8.1.4 HLW Facility Conditions

Operating conditions for all the systems in the HLW facility are as stated in Section 4 of the *Flowsheet Bases, Assumptions, and Requirements* (24590-WTP-RPT-PT-02-005). HLW waste oxide loading in the glass was set at 40 % to maximize melter emissions, as this is considered to be the upper bound waste loading expected in the IHLW at this time. Nominal operating range will be between 30 % and 35 %. HLW waste oxide loading is defined as the weight of waste oxides to the total oxides and glass formers.

8.2 Feed Concentration for Organic Compounds

Organic characterization data applicable to the organic COPCs from candidate double-shell tank system feed streams is not completely available. To compensate for data gaps, an approach for establishing a conservative, bounding basis for hazardous organic concentrations was used. The approach, which relies

on previous analytical work relating to total organic carbon (TOC) in the double-shell tanks, process knowledge, and hazardous organic analyses, is summarized below.

Based on maximum TOC analyses from double-shell tanks scheduled for processing during the first 11 years of operation and the WTP's contractual limit for TOC, a value of 4 wt. % TOC was used for this analysis. Non-regulated organics, such as complexants and low molecular weight acids (Campbell and others 1995), have been measured between 78 % and 99 % of TOC. These results are biased low, as the analysis methods do not adequately address most paraffins and many phosphates. For the purposes of this analysis, 87.5 % was used to represent a minimum proportion of unregulated organic content, and the remainder assumed to be regulated chemicals. The TOC concentration includes the hazardous organic COPCs and other non-regulated organic compounds that were used in Hanford processes. More specifically, the origins of organic compounds in Hanford tanks are associated with one of the following:

- Process additions (such as complexants and solvent extractants)
- Laboratory wastes
- Decontamination solutions
- Other minor additions

With the exception of process additions, few records exist about the amount of organic compounds added to the tanks. As part of the safety programs for the tanks, Hanford personnel have conducted a number of studies that focused on accounting for the predominant contributors to the historically measured TOC values. The studies have shown that the process additions, particularly the complexants, and their associated degradation products comprise the majority of the organic compounds in the tanks. Specifically, the predominant organic complexants used in the Hanford processes include ethylenediamine tetraacetate (EDTA), hydroxyethylenediamine triacetate (HEDTA), glycolate, and citrate. Lesser amounts of complexants, such as nitrilotriacetic acid (NTA), di-(2-ethylhexyl) phosphoric acid, and oxalic acid, were used. The degradation products from the complexants are low molecular weight materials whose parent acids include formic, acetic, glycolic, oxalic, succinic, and citric acids.

The 12.5 % of TOC that was not accounted for as complexants has been distributed across the organic COPCs using the analytical results performed on 2 representative tanks (Klinger and others 1999). To compensate for data uncertainty, a scaling factor was applied. This factor was determined by summing the concentrations of compounds that were detected with those compounds that were undetected (assumed to be present at their detection limit) and dividing 12.5 % of the TOC by this sum. This resulted in a scale factor of approximately 280. The increased values have been used as feed concentrations in the emissions estimate. A complete list of the resulting feed concentrations is included in Table 6.

8.2.1 Feed Concentration for Polychlorinated Biphenyls

The Hanford double-shell tanks are known to contain polychlorinated biphenyl remediation waste that will be included in the mixed waste feed processed by the WTP. The list of organic COPCs identified in Table 4 includes the PCBs scoped by this emissions estimate.

DOE and its contractors have been working with EPA and Ecology to resolve regulatory issues associated with managing PCB remediation waste at the WTP. On 31 August 2000, DOE, EPA, and Ecology signed the *Framework Agreement for Management of Polychlorinated Biphenyls (PCBs) in Hanford Tank Waste* (DOE and others 2000). This agreement establishes that the waste feed to the WTP be limited to 50 parts per million PCBs. The agreement does not specify whether this concentration applies to the liquid fraction, the solid fraction, or both.

Solubility information for polychlorinated biphenyl compounds indicates that they are essentially insoluble in water. Specifically, data are available indicating solubilities that range from 1.3E-06 to 5.7E-8 g/100 mL of water (Howard and others 1997). In applying the PCB feed criteria specified in the *Framework Agreement*, it has been assumed that the 50 parts per million by weight would be most appropriately applied to Envelope D HLW feed streams, as Envelope D is principally comprised of undissolved salt and oxide solids. The emissions estimate has thus assumed a HLW feed concentration for total PCBs of 50 mg/kg. The LAW feed concentration for total PCBs was established using the same methodology as that described in Section 8.2 for other organic COPCs. This concentration (0.65 mg/L) has been used for LAW feeds and is bounding considering the near insolubility of PCBs in aqueous salt solution.

8.3 Feed Concentrations for Inorganic and Radionuclide Compounds

Feed concentrations for inorganic and radionuclide compounds were based on 2 main sources as of September 2002: the WTP statement of work (SOW), and the best basis inventory (BBI). SOW maximum concentrations were used for all constituents (both inorganic and radionuclide) that had a specified value. For those that did not have a specified value, the BBI data was used to estimate the feed concentration. BBI data was downloaded from the TWINS database (http://twins.pnl.gov:8001/twins.htm) for all the WTP Phase I tanks. The WTP Phase I tanks are defined as follows (24590-WTP-M4C-FRP-00001):

LAW

- AP-101 supernate
- AZ-101 supernate
- AZ-102 supernate
- AN-102 supernate
- AN-104 salt cake and supernate
- AN-107 supernate
- AN-105 salt cake and supernate
- SY-101 supernate
- AN-103 salt cake and supernate
- AW-101 salt cake and supernate
- AP-104 supernate

HLW

- AZ-101 solids
- AZ-102 solids
- AY-102 solids
- C-106 solids
- AY-101 solids
- C-104 solids
- SY-102 solids
- C-107 solids
- AW-104 solids

The maximum concentration of each constituent from all of the evaluated tanks was selected and used as the feed concentration for the emissions analysis.

This selection process and the determination of the final emissions analysis feed vector can be found in the *Updated Emissions Run Feed Vector* (24590-WTP-M4C-FRP-00001). This calculation is attached in Appendix D of this report. A summary of the inorganic and radionuclide feed vector selected is included in Table 7 for LAW feed and Table 8 for HLW feed.

8.4 Concentration of Products of Incomplete Combustion

The list of COPCs discussed in Section 3 includes 120 products of incomplete combustion (PICs) that are not known or suspected to be components of the WTP feed streams. These constituents have been included based upon their potential to be formed within thermal components of the WTP process; specifically, the vitrification melters and thermal oxidizing components of the offgas treatment system. The subject PICs are comprised of volatile and semi-volatile compounds. The semi-volatile compounds include a subset of polycyclic aromatic hydrocarbons (PAHs), dioxins, and furans that are of particular interest to risk assessment.

EPA's *Human Health Risk Assessment Protocol for Hazardous Waste* (EPA 1998) provides guidance for establishing emissions estimates for facilities that are not yet operational. The guidance states the following:

> Good engineering practice dictates a check of, and comparison with, data from similar existing units. Stack test reports for facilities of similar technology, design, operation, capacity, auxiliary fuels, waste feed types, and air pollution control standards (APCSs) should be used to estimate COPC emission rates for new facilities that have not been constructed.
>
> If the preferred option of using surrogate data from similar facilities is not available, some state environmental agencies enforce emission rate limits based on state laws. Since these limits cannot be exceeded, they can be used to develop emission rate estimates for the risk assessment. The facility will demonstrate that its emissions are less than those considered in the permit and risk assessment during the trial or risk burn.

The EPA guidance has been utilized in selecting the method for estimating PIC emissions at the WTP. There have been 2 mixed waste treatment facilities in Washington and Idaho that have pursued regulatory permits that include human health and ecological risk assessment similar to that required for the WTP. Although neither facility has been operated to date, they have been used as precedents for estimating PIC emissions resulting from the treatment process. In the cases of both precedent facilities, emission rates for PICs were estimated by multiplying the PIC detection limit (or in some cases, one-half the detection limit) by the air flow rate at the stack sampling location. A similar methodology has been used to estimate PIC emissions at the WTP; here, PIC emission rates are based upon the assumption that each PIC will be present in the process flue at its corresponding analytical detection limit.

In order to establish a basis for achievable stack detection limits, available R&T data was reviewed. Tests were conducted at the Vitreous State Laboratory (VSL) of the Catholic University of America. These tests were performed on a small-scale vitrification system with WTP simulants that were spiked with selected hazardous organic compounds. The tests were conducted to assess destruction efficiencies in the melter and collect data on hazardous constituents in the offgas stream, including PICs. A total of 24 tests were conducted to study the effects of various parameters on hazardous organics emissions. These parameters included feed type, residence time, cold-cap coverage, plenum temperature, and presence of sugar as a reductant.

The VSL melter exhaust was sampled and monitored for volatiles, semivolatiles, dioxins, and furans. EPA SW-846 Method 0030 was used to sample volatile constituents from the offgas stream. The volatile samples were analyzed using Method 8260-B. Semivolatile analytes were sampled using Method 0010, and analyzed using Method 8270-C. Dioxins and furans were sampled using 40 CFR 60 Method 23, and analyzed using Method 8290. Details of the small-scale melter testing and results are documented in the *Determination of the Fate of Hazardous Organics During Vitrification of WTP LAW and HLW Simulants* (VSL 1999).

Assumed detection limit concentrations have been applied based upon 4 groupings of compounds: volatile organics, semi-volatiles, polycyclic aromatic hydrocarbons, and dioxins/furans. The detection limits reported from the VSL work should be conservative from an emissions perspective because the test work was not intended to drive detection limits to the lowest achievable levels. If longer sample durations and high resolution analytical techniques are used, it is expected that lower detection limits could be achieved. A summary of the resulting detection limit concentrations for the volatile, semivolatile, and polycyclic aromatic hydrocarbon groupings are shown in Table 9. Detection limits for each of the individual dioxin and furan compounds are also specified in Table 9. The concentrations of PICs shown in Table 9 have been multiplied by the volumetric flowrate for the applicable process flues to produce the individual PIC emission rates that are summarized in the calculation entitled *Integrated Emissions Report PIC Estimation* (24590-WTP-M4C-FRP-00002). This calculation is included in Appendix E of this report.

8.5 Phase Allocation of Constituents of Potential Concern

For the purpose of the emissions analysis, the COPCs are partitioned to the vapor phase, particle phase, or particle-bound phase. Vapor phase emissions are those emitted as volatile gases. Particle-phase emissions are particulate constituents (generally metals or other inorganics). Particle-bound emissions are volatile or semi-volatile constituents that are bound to other particles.

The phase type for each COPC is determined based on a partitioning factor, *Fv*, as provided in the methodology published in the draft *Human Health Risk Assessment Protocol for Hazardous Waste Combustion Facilities* (EPA 1998). The *Fv* is defined as follows:

$$Fv = 1 - \frac{cS_t}{p_l + cS_t}$$

where:

c is Junge constant [1.7×10^{-04} atmospheres-centimeter (atm-cm)]

p_l is liquid phase vapor pressure of compound (atm)

S_t is Whitby's average surface area of particles (3.5×10^{-06} cm^2/cm^3 air)

As shown in the above equation, as the vapor pressure increases, the *Fv* would approach 1. The following criteria (EPA 1998) are used to aid the determination of phase types:

- *Fv* is less than 0.05: the compound is particle phase
- *Fv* is equal to 1.0: the compound is vapor phase
- *Fv* is less than 1.0 but greater than or equal to 0.05: the compound is particle-bound phase

For the WTP emissions analysis, the COPCs were evaluated for *Fv* at ambient conditions (25 °C, atmospheric pressure). Where available, the *Fv* values for individual COPCs were taken directly from the EPA guidance document entitled *Human Health Risk Assessment Protocol for Hazardous Waste*

Combustion Facilities (EPA 1998) or an errata to the Human Health Risk Assessment Protocol for Hazardous Waste Combustion Facilities (HHRAP) that revised certain selected data (EPA 1999a). *Fv* values for the remaining COPCs were estimated using the equation defining *Fv* (shown above) and liquid phase vapor pressure data collected for the individual COPCs. Tables 2, 3 and 4 provide the phase types for organic, inorganic and radionuclide COPCs, respectively. The methodology used to establish constituent phase is summarized in *Phase Determination for COPCs Potentially Emitted from the Hanford Tank Waste Treatment and Immobilization Plant (WTP)* (CCN #057415). This document is included as Appendix F of this report, and lists the *Fv* values for each COPC, including the vapor pressure data used for the estimates.

8.6 Equipment Decontamination Factors

For the emission analysis, decontamination factors (DFs) are used to predict the removal of COPCs by the offgas treatment systems. As shown in the following equation, the DF is a function of removal efficiency (η).

$$DF = \frac{1}{1-\eta}$$

The equipment DFs are established based on the following information sources:

- Available experimental or treatability study data
- Available engineering calculation on decontamination factors
- Offgas phase allocation of COPCs (see Section 8.5)
- Vendor literature

The SSFM has DFs for unit operations based on nominal operating conditions. These DFs provide the best realistic performance to be expected from the unit operations. For emissions purposes, the design basis DFs were used. These DFs are sometimes lower (and more conservative) than the DFs expected to ensure that the profile obtained is bounding. The DFs per facility are described in the sections below.

8.6.1 Pretreatment Vessel Vents and Offgas Treatment Systems

The unabated quantities of organic, inorganic, and radionuclide constituents in the pretreatment facility offgas streams are estimated as described in Section 7.1. Entrainment factors are used in determining the inorganic and radionuclide quantities in the vessel vent and RFD/PJM exhausts. Henry's Law constants are used in determining the quantity of organic compounds from the vessel vents and evaporators. Inorganics and radionuclide emissions from the evaporator overheads are determined from equipment DFs.

The emission control equipment DFs for the pretreatment vessel vent (PVP) and pulse-jet ventilation (PJV) systems are based primarily on vendor information. Table 10 presents the offgas treatment DFs and basis for the inorganic and radionuclide constituents. Table 11 provides the organic DFs for the pretreatment offgas treatment equipment. The methodology used to estimate the DFs for each organic constituent in the PVP system is presented in Appendix G. Though preliminary, it provides a bounding basis for organic constituents releases through the PVP process flue.

8.6.2 LAW and HLW Melter Offgas Treatment Systems

The principal components of the melter offgas stream are air and water vapor. Secondary components of the melter offgas stream are acid gases and aerosols. Water present in the melter feed is vaporized to

steam. Acid gases are generated from the decomposition of salts and organic compounds present in the feed. Aerosols are present due to cold-cap solids being entrained in the offgas stream. The HLW melter offgas is expected to contain less acid gases than LAW melter offgas. However, the HLW melter offgas will contain higher concentrations of radionuclides than the LAW melter offgas.

All the DFs used for this emissions analysis are based on actual R&T testing results, vendor information, and engineering calculations. The DFs used for emissions analysis in the vitrification plants are presented in Table 12 for inorganic, and radionuclide constituents. This table also specifies the basis (i.e. reference) for each DF used. Table 11 shows the removal efficiencies expected for the organic constituents within the vitrification plants. All the DFs presented in these tables are based on memoranda CCN# 044663 and CCN# 053500.

9 Summary of Emissions Analysis Results

The SSFM output identifies the emission rates for the 117 analyzed organic, inorganic, radionuclide COPCs, and criteria pollutants. This output is provided in Appendix A. As discussed in Section 5, representative compounds are used to estimate emission rates for compounds not analyzed within the SSFM. Tables 13 through 15 present the estimated emissions for each of the organic, inorganic, and radionuclide COPCs, respectively. The emission rates at the stack are referred to as abated emissions. In addition to stack emission rates, the SSFM produces output for unabated (or uncontrolled) emission points that correspond to the stack emission rates. The SSFM streams that are summarized in Tables 13 through 15 include:

Feed Streams

- Feed from Tank Farms to HLW Feed Receipt (FRP14)
- Feed from Tank Farms to LAW Feed Receipt (FRP01)

Abated emissions:

- The abated pretreatment vessel vent (stream PVP12)
- The abated pretreatment RFD/PJM vent (stream PJV11)
- The LAW process offgas and vessel vent (stream LVP26)
- The HLW process offgas and vessel vent (stream HOP33)
- The HLW RFD/PJM vent (stream PJV34)

Unabated emissions:

- The unabated pretreatment vessel vent (stream before PVP01)
- The unabated pretreatment RFD/PJM (stream PJV04)
- The unabated LAW melter offgas (stream LMP06)
- The unabated HLW melter offgas (stream HMP06)
- The unabated HLW RFD/PJM (stream PJV32)

All of the values in Tables 13 and 14 are listed in grams per second. Table 15 values are presented in curies per day. The PIC emission rate estimates are presented in Table 16. Rates are shown in units of grams per second and are provided for the pretreatment, HLW, and LAW process flues.

As expected, the pretreatment processes contribute the highest abated organic emission rates, and vitrification processes contribute the highest abated inorganic and radionuclide emission rates. The vitrification processes are the main contributors for Hg, NO_2 and SO_2 emissions. They are also the main contributors for ^{129}I, ^{3}H, ^{14}C, and ^{137}Cs.

Emission estimates have been prepared, as detailed in Tables 13, 14, 15, and 16, in accordance with current comprehension of waste feed materials, normal process operations and treatment efficiencies. The emissions estimate has retained conservatism with respect to composition, treatment, and analysis to ensure safe operation and protection of human health and the environment.

10 References

Project Documents

RPT-W375PT-PR00021, *PT Vessel Vent System Baseline Operating Conditions and Radioactive Aerosol Loading of Exhaust Air Streams,* Rev 0

RPT-24590-EN00001, *Vessel Vents and PJM/RFD Emissions,* Rev 0

RPT-W375-EN00001, *Final Work Plan for Screening Level Risk Assessment for the WTP*, Rev 1

RPT-W375-ES-00001, *Integrated Emissions Baseline Report for the River Protection Project Waste Treatment Plant,* Rev 1

CALC-W375HV-PR00033, *HLW Vessel Ventilation Calculation,* Rev 1

CALC-W375LV-PR00022, *System 234 LAW Vessel Ventilation Calculation,* Rev 2

CALC-W375PT-PR00100, *PT Vessel Vents HEME Sizing - (System PT-540),* Rev 2

CCN#044663, *Updated Basis for the WTP's Emissions Profile*

CCN# 053500, *HLW and LAW Vitrification Decontamination Factors for Air Emissions Modeling*

CNN #057415, *Phase Determination for COPCs Potentially Emitted from the Hanford Tank Waste Treatment and Immobilization Plant (WTP)*

24590-WTP-RPT-PR-01-011, *Mercury Pathway and Treatment Assessment for the WTP*, Rev 0

24590-WTP-RPT-PT-02-002, *Integrated Emissions Baseline Report Update*, Rev 1

24590-WTP-RPT-PT-02-005, *Flowsheet Bases, Assumptions, and Requirements*, Rev 1

24590-WTP-RPT-ENV-01-004, *Best Available Radionuclide Control Technology Analysis for the WTP,* Rev 1

24590-WTP-MDD-PR-01-003, *Steady State Flowsheet (ACM) Model Design Document,* Rev 4

24590-HLW-MKC-HOP-00001, *Melter Decontamination Estimation*, Rev 0

24590-PTF-M0C-PVP-00001, *Duty of Pretreatment Thermal Oxidizer (PVP-OXID-00001),* Rev B

24590-WTP-M4C-FRP-00001, *Updated Emissions Run Feed Vector*, Rev 0A

24590-WTP-M4C-HOP-00001, *Mercury Abatement System Equipment Calculation*, Rev A

24590-WTP-M4C-FRP-00002, *Integrated Emissions Report PIC Estimation*, Rev 0A

24590-HLW-MKC-HOP-00002, *Sizing of the HLW Silver Mordenite Columns,* Rev B

24590-LAW-MKC-LVP-00002, *Sizing of the LAW Caustic Scrubber Column*, Rev A

24590-WTP-M4C-FRP-00003, *Integrated Emissions Baseline Report Non-SSFM Represented Constituents Emissions Rate Estimation*, Rev A

24590-WTP-M4C-FRP-00005, *Estimation of Non-SSFM Represented Organic Emission Rates Required to Support the Integrated Emissions Baseline Report*, Rev A

24590-PTF-MVC-PVP-00012, *Sizing of PT Vessel Vent Caustic Scrubber PVP-SCB-00002,* Rev A

24590-WTP-MKC-50-00004, *Vitrification Offgas Treatment Equipment Effective Particulate Decontamination Factors*, Rev 0

Codes and Standards

40 CFR Part 50. *The National Primary and Secondary Ambient Air Quality Standards*, January 20, 1983. US Environmental Protection Agency.

LRAPA. Lane Regional Air Pollution Authority (LRAPA), *Rules and Regulations: Title 35, Major Source Interim Emission Fee Rules*, Section 35-065, http://www.lrapa.org/rules/title35.htm

Other Documents

Best Basis Inventory, TWINS database,
http//twins.pnl.gov:8001/twins.htmhttp://twins.pnl.gov:8001/twins.htm

Campbell and others. 1995. *Flammable Gas Safety Program. Organic Analysis and Analytical Methods Development: FY 1995 Progress Report*, PNL-10776. Pacific Northwest Laboratory, Richland, Washington, USA.

DOE and others. 2000. *Framework Agreement for Management of Polychlorinated Biphenyls (PCBs) in Hanford Tank Waste*, signed by H. Boston (DOE-ORP), T. Fitzsimmons (Ecology), C. Findley (EPA), K. Klein (DOE-RL), August 31, 2000.

EPA 1999. *Screening Level Ecological Risk Assessment Protocol for Hazardous Waste Combustion Facilities*, EPA 530-D-99-001A, Peer Review Draft, US Environmental Protection Agency Office of Solid Waste and Emergency Response, August 1999.

EPA 1999a. *Errata - Human Health Risk Assessment Protocol for Hazardous Waste Combustion Facilities (Peer Review Draft*), US Environmental Protection Agency, August 2, 1999.

EPA. 1998. *Human Health Risk Assessment Protocol for Hazardous Waste Combustion Facilities*, EPA530-D-98-001A, Peer Review Draft, US Environmental Protection Agency Office of Solid Waste and Emergency Response, July 1998.

Howard PH and Meylan WM. 1997. *Handbook of Physical Properties of Organic Chemicals.* Lewis Publishers.

Klinger and others. 1999. *Organic Analysis of AW-101 and AN-107 Tank Waste*, BNFL-RPT-001 Revision 0. Battelle Pacific Northwest Laboratories, Richland, Washington, USA.

Kupfer, MJ. 1997. *Standard Inventories of Chemicals and Radionuclides in Hanford Site Tank Wastes*, Appendix I. HNF-SD-WM-TI-740, Revision 0.

Pegg, I, and others, *Final Report Integrated Off-Gas System Tests on the DM-1200 Melter with RPP-WTP LAW Sub-Envelope A1 Simulants*, VSL-02R8800-2, Vitreous State Laboratory, September 3, 2002, Washington, DC

Pegg, I, and others, *Final Report Integrated Off-Gas System Tests on the DM-1200 Melter with RPP-WTP LAW Sub-Envelope C1 Simulants*, VSL-02R8800-1, Vitreous State Laboratory, July 25, 2002, Washington, DC

Pegg, I, and others, *Final Report Off-Line Tests of the DM-1200 Thermal Catalytic Oxidation (TCO) Unit*, VSL-02R8200-1, Vitreous State Laboratory, August 30, 2002, Washington, DC

Pegg, I, and others, *Final Report Test on the DuraMelter 1200 HLW Pilot Melter System Using AZ-101 HLW Simulants*, VSL-02R0100-2, Vitreous State Laboratory, June 11, 2002, Washington, DC

VSL. 1999. *Determination of the Fate of Hazardous Organics During Vitrification of WTP LAW and HLW Simulants,* TRPT-W375-99-00002, Revision 0. Vitreous State Laboratory.

Wiemers KD, Miller M, Lerchen ME, Meier K. 1998. *Regulatory Data Quality Objectives Supporting Tank Waste Remediation System Privatization Project*, PNNL-12040 Rev. 0.

Table 1 List of Process Flow Diagrams

Facility	System	Process Flow Diagram Name	Drawing #	Rev #
Pretreatment	FRP	Waste Feed Receipt	24590-PTF-M5-V17T-00003	1
	FEP	Waste Feed Evaporation (Sheet 1 of 2)	24590-PTF-M5-V17T-00004001	0
	FEP	Waste Feed Evaporation (Sheet 2 of 2)	24590-PTF-M5-V17T-00004002	0
	TLP	Treated LAW Evaporation	24590-PTF-M5-V17T-00005	0
	TCP	Treated LAW Concentrate Storage	24590-PTF-M5-V17T-00006	1
	HLP	HLW Feed Receipt	24590-PTF-M5-V17T-00007	1
	HLP	HLW Lag Storage and Feed Blending	24590-PTF-M5-V17T-00008	1
	UFP	Ultrafiltration Feed Preparation	24590-PTF-M5-V17T-00009	1
	UFP	Ultrafiltration	24590-PTF-M5-V17T-00010	1
	UFP	Ultrafiltration Permeate Collection	24590-PTF-M5-V17T-00011	1
	CXP	Cesium Ion Exchange Process Vessels	24590-PTF-M5-V17T-00012	0
	CXP	Cesium Ion Exchange Process Columns	24590-PTF-M5-V17T-00013	0
	CNP	Cesium Nitric Acid Recovery Process	24590-PTF-M5-V17T-00014	0
	TXP	Technetium Ion Exchange Process Vessels	24590-PTF-M5-V17T-00015	0
	TXP	Technetium Ion Exchange Process Columns	24590-PTF-M5-V17T-00016	0
	TEP	Technetium Eluant Recovery Process	24590-PTF-M5-V17T-00017	0
	CRP	Cesium Resin Addition Process	24590-PTF-M5-V17T-00018	0
	TRP	Technetium Resin Addition Process	24590-PTF-M5-V17T-00019	0
	RDP	Spent Resin Collection And Dewatering Process	24590-PTF-M5-V17T-00020	0
	PVP/PVV/PJV	Pretreatment Vessel Vents Process (PVP/PVV)	24590-PTF-M5-V17T-00021001	0
	PVP/PVV/PJV	Pretreatment RFD/PJM Exhaust (PJV)	24590-PTF-M5-V17T-00021002	0
	PVP/PVV/PJV	Pretreatment Vessel Passive Purge Air Inlets (PVP)	24590-PTF-M5-V17T-00021003	0
	PVP/PVV/PJV	Pretreatment Vessels Vent Exhaust Header (PVP)	24590-PTF-M5-V17T-00021004	0
	PWD	Pretreatment Effluent, Plant Wash and Drain	24590-PTF-M5-V17T-00022001	0
	PWD	Pretreatment Plant Wash and Drain	24590-PTF-M5-V17T-00022002	0
	PWD/RLD	Pretreatment Radioactive Liquid Disposal (RLD)	24590-PTF-M5-V17T-00022003	0
	PWD/RLD	Pretreatment Radioactive Liquid Disposal/Recycle (RLD)	24590-PTF-M5-V17T-00022004	0
	NAR	Pretreatment Process Reagents	24590-PTF-M5-V17T-00023001	0
	SHR/SNR	Pretreatment Process Reagents	24590-PTF-M5-V17T-00023002	0
	DIW	Pretreatment Process Reagents	24590-PTF-M5-V17T-00023003	0
	AFR/STR/SPR	Pretreatment Process Reagents	24590-PTF-M5-V17T-00023004	0
LAW Vitrification	LCP/GFR/LFP	LAW Vitrification Feed Preparation	24590-LAW-M5-V17T-00001	3
	LCP/GFR/LFP	LAW Vitrification Feed Preparation	24590-LAW-M5-V17T-00002	3
	LMP	LAW Vitrification Melter 1	24590-LAW-M5-V17T-00004	3
	LMP	LAW Vitrification Melter 2	24590-LAW-M5-V17T-00005	3
	LOP	Melter 1 Primary Offgas Treatment	24590-LAW-M5-V17T-00007	3
	LOP	Melter 2 Primary Offgas Treatment	24590-LAW-M5-V17T-00008	3
	LVP/URR	LAW Vit Secondary Offgas & Urea	24590-LAW-M5-V17T-00010	3
	LVP	LAW Vit Secondary Offgas Treatment	24590-LAW-M5-V17T-00011	3
	GFR	Inert Fill Supply	24590-LAW-M5-V17T-00012	2
	CDG	LAW Vitrification Container Decontamination	24590-LAW-M5-V17T-00013	3
	RLD/NLD	LAW Liquid Effluent	24590-LAW-M5-V17T-00014	3
	SHR/MXR	LAW Cold Chemical Supply	24590-LAW-M5-V17T-00016	3
HLW Vitrification	HCP/GFR/HFP	HLW Receipt & Feed Preparation	24590-HLW-M5-V17T-00001	3
	HMP	HLW Vitrification Melter	24590-HLW-M5-V17T-00002	3
	HOP	HLW Vit Primary Offgas Treatment	24590-HLW-M5-V17T-00003	3
	HOP	HLW Vitrification Secondary Offgas Treatment	24590-HLW-M5-V17T-00004	3
	PJV	HLW Vitrification Pulse Ventilation Treatment	24590-HLW-M5-V17T-00005	2
	HDH	HLW Vitrification HLW Canister Decon	24590-HLW-M5-V17T-00006	3
	RLD	HLW Vitrification Liquid Waste Effluent (Sheet 1)	24590-HLW-M5-V17T-00007001	3
	RLD	HLW Vitrification Liquid Waste Effluent (Sheet 2)	24590-HLW-M5-V17T-00007002	3
	NAR/SHR/AMR/DIW	HLW Vitrification Reagents	24590-HLW-M5-V17T-00008	3
	NLD	HLW C1/C2 Drains	24590-HLW-M5-V17T-00009	3

Table 2 List of Organic COPCs and PICs

#	CAS Registry Number	Compound	Source	SSFM Indicator?	Henry's Law Constant (bar*m^3/kgmol)	Henry's Law-Based Grouping	Offgas Phase Type
1	100-00-5	p-Nitrochlorobenzene	feed	-	4.83E-03	10	vapor
2	100-21-0	p-Phthalic acid	feed	yes	3.83E-10	1	vapor
3	100-25-4	1,4-Dinitrobenzene	feed	-	8.28E-05	6	particle-bound
4	100-41-4	Ethyl benzene	feed	-	7.78E+00	20	vapor
5	100-42-5	Styrene	feed	-	2.71E+00	19	vapor
6	10061-01-5	cis-1,3-Dichloropropene	feed	yes	2.67E+00	19	vapor
7	10061-02-6	trans-1,3-Dichloropropene	feed	-	8.60E-01	17	vapor
8	101-55-3	4-Bromophenylphenyl ether	feed	-	1.15E-01	14	vapor
9	101-84-8	Diphenyl ether	feed	-	2.75E-01	16	vapor
10	106-35-4	3-Heptanone	feed	-	8.96E-02	14	vapor
11	106-42-3	p-Xylene (Dimethyl benzene)	feed	-	6.81E+00	19	vapor
12	106-46-7	1,4-Dichlorobenzene	feed	-	2.38E+00	18	vapor
13	106-88-7	1,2-Epoxybutane	feed	-	1.78E-01	15	vapor
14	106-93-4	Ethylene dibromide (Dibromethane)	feed	yes	6.58E-01	16	vapor
15	106-97-8	Butane	feed	yes	9.37E+02	26	vapor
16	106-99-0	1,3-Butadiene	feed	yes	7.26E+01	23	vapor
17	107-02-8	Acrolein	feed	-	1.20E-01	14	vapor
18	107-05-1	3-Chloropropene (Allyl chloride)	feed	-	1.09E+01	20	vapor
19	107-06-2	1,2-Dichloroethane (Ethylene chloride)	feed	-	1.16E+00	17	vapor
20	107-12-0	Propionitrile	feed	-	3.65E-02	13	vapor
21	107-13-1	Acrylonitrile	feed	-	1.36E-01	14	vapor
22	107-18-6	2-Propene-1-ol	feed	-	4.92E-03	10	vapor
23	107-31-3	Formic acid, methyl ester	feed	-	2.20E-01	15	vapor
24	107-66-4	Dibutylphosphate	feed	-	4.20E-06	5	particle-bound
25	107-87-9	2-Pentanone	feed	-	8.25E-02	14	vapor
26	108-03-2	1-Nitropropane	feed	-	8.59E-02	14	vapor
27	108-05-4	Vinyl acetate	feed	-	5.04E-01	16	vapor
28	108-10-1	Hexone (4-Methyl-2-pentanone or MIBK)	feed	-	1.36E-01	14	vapor
29	108-20-3	Bis(isopropyl)ether	feed	-	2.25E+00	18	vapor
30	108-38-3	m-Xylene (Dimethyl benzene)	feed	-	7.09E+00	19	vapor
31	108-39-4	m-Cresol	feed	-	8.45E-04	9	vapor
32	108-87-2	Methylcyclohexane	feed	yes	4.24E+02	25	vapor
33	108-88-3	Toluene	feed	yes	6.55E+00	19	vapor
34	108-90-7	Chlorobenzene	feed	-	3.07E+00	19	vapor
35	108-93-0	Cyclohexanol	feed	-	4.34E-03	10	vapor
36	108-94-1	Cyclohexanone	feed	-	8.88E-03	11	vapor
37	108-95-2	Phenol	feed	yes	3.29E-04	8	vapor
38	109-66-0	n-Pentane	feed	-	1.23E+03	26	vapor
39	109-99-9	Tetrahydrofuran	feed	-	6.96E-02	13	vapor
40	110-12-3	5-Methyl-2-hexanone	feed	-	1.58E-01	15	vapor

Table 2 List of Organic COPCs and PICs

#	CAS Registry Number	Compound	Source	SSFM Indicator?	Henry's Law Constant (bar*m^3/kgmol)	Henry's Law-Based Grouping	Offgas Phase Type
41	110-43-0	2-Heptanone	feed	-	1.67E-01	15	vapor
42	110-54-3	n-Hexane	feed	yes	1.78E+03	27	vapor
43	110-62-3	n-Valeraldehyde	feed	-	1.45E-01	15	vapor
44	110-82-7	Cyclohexane	feed	yes	1.48E+02	24	vapor
45	110-83-8	Cyclohexene	feed	-	4.49E+01	22	vapor
46	110-86-1	Pyridine	feed	-	1.09E-02	11	vapor
47	111-65-9	n-Octane	feed	-	3.17E+03	28	vapor
48	111-76-2	Ethylene glycol monobutyl ether	feed	-	1.58E-03	9	vapor
49	111-84-2	n-Nonane	feed	yes	3.36E+03	28	vapor
50	117-81-7	Bis(2-ethylhexyl)phthalate (DEHP)	feed	-	2.66E-04	30	particle-bound
51	117-84-0	n-Dioctyl phthalate	feed	-	2.54E-03	32	particle-bound
52	118-74-1	Hexachlorobenzene	feed	yes	1.68E+00	18	vapor
53	120-12-7	Anthracene	feed	yes	5.49E-02	13	vapor
54	120-82-1	1,2,4-Trichlorobenzene	feed	yes	1.40E+00	17	vapor
55	120-83-2	2,4-Dichlorophenol	feed	-	5.44E-03	10	vapor
56	121-44-8	Triethylamine	feed	-	1.47E-01	15	vapor
57	121-69-7	Dimethylaniline	feed	-	5.61E-02	13	vapor
58	122-39-4	N,N-Diphenylamine	feed	yes	3.35E-03	10	vapor
59	123-19-3	4-Heptanone	feed	-	5.42E-02	13	vapor
60	123-38-6	n-Propionaldehyde	feed	-	7.24E-02	14	vapor
61	123-51-3	3-Methyl-1-butanol	feed	-	1.39E-02	12	vapor
62	123-86-4	Acetic acid n-butyl ester	feed	-	2.77E-01	16	vapor
63	123-91-1	1,4-Dioxane	feed	-	4.74E-03	10	vapor
64	126-73-8	Tributyl phosphate	feed	yes	1.48E-04	7	vapor
65	126-98-7	2-Methyl-2-propenenitrile (Methacrylonitrile)	feed	-	2.44E-01	16	vapor
66	127-18-4	Perchloroethylene (tetrachloroethylene)	feed	yes	1.75E+01	21	vapor
67	127-19-5	N,N-Dimethylacetamide	feed	-	1.29E-05	5	vapor
68	128-37-0	2,6-Bis(tert-butyl)-4-methylphenol	feed	-	4.07E-03	32	vapor
69	129-00-0	Pyrene	feed	yes	1.17E-02	33	particle-bound
70	1321-64-8	Pentachloronaphthalene	feed	-	1.16E-01	14	particle-bound
71	1321-65-9	Trichloronaphthalene	feed	-	2.11E-01	15	vapor
72	132-64-9	Dibenzofuran	feed	yes	2.10E-01	15	vapor
73	1335-87-1	Hexachloronaphthalene	feed	-	8.59E-02	14	particle-bound
74	1335-88-2	Tetrachloronaphthalene	feed	-	1.57E-01	15	particle-bound
75	1336-36-3	Polychlorinated biphenyls (PCBs)	feed	yes	4.10E-01	35	particle-bound
76	141-78-6	Acetic acid ethyl ester (Ethyl acetate)	feed	-	1.32E-01	14	vapor
77	141-79-7	4-Methyl-3-penten-2-one	feed	-	3.62E-02	13	vapor
78	142-82-5	n-Heptane	feed	-	1.97E+03	27	vapor
79	144-62-7	Oxalic acid	feed	yes	1.41E-07	3	vapor
80	156-60-5	trans-1,2-Dichloroethylene	feed	-	9.26E+00	20	vapor

Table 2 List of Organic COPCs and PICs

#	CAS Registry Number	Compound	Source	SSFM Indicator?	Henry's Law Constant (bar*m^3/kgmol)	Henry's Law-Based Grouping	Offgas Phase Type
81	1582-09-8	Trifluralin	feed	-	1.02E-01	14	particle-bound
82	1634-04-4	Methyl tert-butyl ether	feed	-	5.79E-01	16	vapor
83	1836-75-5	Nitrofen	feed	-	2.52E-04	30	particle-bound
84	189-55-9	Dibenzo[a,i]pyrene	feed	-	1.39E-05	5	particle
85	189-64-0	Dibenzo[a,h]pyrene	feed	-	1.39E-05	5	particle
86	191-24-2	Benzo(g,h,i)perylene	feed	-	3.27E-04	30	particle-bound
87	191-30-0	Benzo[a,i]pyrene	feed	-	1.39E-05	5	particle
88	192-65-4	Dibenzo[a,e]pyrene	feed	-	1.39E-05	5	particle
89	193-39-5	Indeno(1,2,3-cd)pyrene	feed	-	3.43E-04	30	particle
90	205-82-3	Benzo(j)fluoranthene	feed	-	2.00E-04	7	particle-bound
91	205-99-2	Benzo(b)fluoranthene	feed	-	6.48E-04	30	particle-bound
92	206-44-0	Fluoranthene	feed	-	8.74E-03	33	particle-bound
93	207-08-9	Benzo(k)fluoranthene	feed	-	5.76E-04	30	particle-bound
94	208-96-8	Acenaphthylene	feed	yes	1.13E-01	14	vapor
95	218-01-9	Chrysene	feed	yes	5.16E-03	32	particle-bound
96	2234-13-1	Octachloronaphthalene	feed	-	1.01E-01	14	particle-bound
97	224-42-0	Dibenz[a,j]acridine	feed	-	1.88E-06	4	particle-bound
98	226-36-8	Dibenz[a,h]acridine	feed	-	1.88E-06	4	particle-bound
99	2385-85-5	Mirex	feed	-	8.00E-01	17	vapor
100	25551-13-7	Trimethyl benzene	feed	-	7.15E+00	19	vapor
101	26140-60-3	Terphenyls	feed	-	3.14E-02	34	particle-bound
102	27154-33-2	Trichlorofluoroethane	feed	-	1.23E+02	23	vapor
103	287-92-3	Cyclopentane	feed	-	1.86E+02	24	vapor
104	309-00-2	Aldrin	feed	yes	4.34E-02	34	particle-bound
105	31508-00-6	2,3',4,4',5-Pentachlorobiphenyl (PBC 118)	feed	-	2.84E-01	35	particle-bound
106	319-84-6	Hexachlorocyclohexane (Lindane) Alpha BHC	feed	-	1.20E-02	33	vapor
107	319-85-7	Hexachlorocyclohexane (Lindane) Beta BHC	feed	yes	4.34E-04	30	particle-bound
108	319-86-8	Delta-BHC	feed	-	4.23E-04	30	particle-bound
109	32598-13-3	3,3',4,4'-Tetrachlorobiphenyl (TCB)	feed	-	9.28E-03	33	particle-bound
110	32598-14-4	2,3,3',4,4'-Pentachlorobiphenyl (PCB 105)	feed	-	8.14E-01	17	particle-bound
111	32774-16-6	3,3',4,4',5,5'-Hexachlorobiphenyl	feed	-	6.76E-02	34	particle-bound
112	35065-29-3	2,2',3,4,4',5,5'-Heptachlorobiphenyl	feed	-	9.87E-03	33	particle-bound
113	35065-30-6	2,2',3,3',4,4',5-Heptachlorobiphenyl	feed	-	8.88E-03	33	particle-bound
114	3697-24-3	5-Methylchrysene	feed	-	5.46E-03	32	particle-bound
115	3825-26-1	Ammonium perfluorooctanoate	feed	-	9.87E-02	14	particle-bound
116	38380-08-4	2,3,3',4,4',5-Hexachlorobiphenyl (PCB 157)	feed	yes	9.55E-03	14	particle-bound
117	39635-31-9	2,3,3',4,4',5,5'-Heptachlorobiphenyl	feed	-	3.82E-01	33	particle-bound
118	4170-30-3	2-Butenaldehyde (2-Butenal)	feed	yes	9.55E-03	11	vapor
119	465-73-6	Isodrin	feed	-	3.82E-01	35	vapor
120	50-00-0	Formaldehyde	feed	-	3.33E-04	8	vapor

Table 2 List of Organic COPCs and PICs

#	CAS Registry Number	Compound	Source	SSFM Indicator?	Henry's Law Constant (bar*m^3/kgmol)	Henry's Law-Based Grouping	Offgas Phase Type
121	50-29-3	4,4-DDT	feed	-	8.21E-03	33	particle-bound
122	50-32-8	Benzo(a)pyrene	feed	yes	4.51E-04	30	particle-bound
123	52663-72-6	2,3',4,4',5,5'-Hexachlorobiphenyl	feed	-	6.76E-02	34	particle-bound
124	53-70-3	Dibenzo(a,h)anthracene	feed	-	1.21E-04	7	particle
125	540-59-0	1,2-Dichloroethylene	feed	-	4.03E+00	19	vapor
126	540-84-1	2,2,4-Trimethylpentane	feed	-	3.00E+03	28	vapor
127	541-73-1	1,3-Dichlorobenzene	feed	-	2.60E+00	19	vapor
128	56-23-5	Carbon tetrachloride	feed	yes	2.72E+01	22	vapor
129	563-80-4	3-Methyl-2-butanone	feed	-	9.60E-02	14	vapor
130	56-49-5	3-Methylcholanthrene	feed	-	2.97E+03	28	particle-bound
131	56-55-3	Benzo(a)anthracene	feed	-	1.18E-02	33	particle-bound
132	57-14-7	1,1-Dimethylhydrazine	feed	yes	1.23E-02	12	vapor
133	57465-28-8	3,3',4,4',5-Pentachlorobiphenyl	feed	-	2.84E-01	15	particle-bound
134	58-89-9	gamma-BHC (Lindane)	feed	yes	5.07E-03	32	particle-bound
135	58-90-2	2,3,4,6-Tetrachlorophenol	feed	yes	8.72E-03	11	vapor
136	591-78-6	2-Hexanone	feed	-	9.20E-02	14	vapor
137	59-50-7	4-Chloro-3-methylphenol	feed	-	2.42E-03	32	particle-bound
138	59-89-2	N-Nitrosomorpholine	feed	-	2.42E-05	6	vapor
139	602-87-9	5-Nitroacenaphthene	feed	-	1.10E-03	9	particle-bound
140	60-29-7	Ethyl ether	feed	-	1.21E+00	17	vapor
141	603-34-9	Triphenylamine	feed	yes	5.34E-03	32	vapor
142	60-34-4	Methylhydrazine	feed	-	2.99E-03	10	vapor
143	60-35-5	Acetamide	feed	yes	1.11E-05	5	vapor
144	60-57-1	Dieldrin	feed	yes	9.87E-03	33	particle-bound
145	621-64-7	Di-n-Propylnitrosamine	feed	-	5.31E-03	10	vapor
146	624-83-9	Methyl isocyanate	feed	-	9.14E-01	17	vapor
147	627-13-4	Nitric acid, propyl ester	feed	-	1.25E+00	17	vapor
148	62-75-9	N-Nitroso-N,N-dimethylamine	feed	yes	1.80E-03	9	vapor
149	630-20-6	1,1,1,2-Tetrachloroethane	feed	-	2.39E+00	18	vapor
150	64-17-5	Ethyl alcohol	feed	-	4.93E-03	10	vapor
151	64-18-6	Formic acid	feed	-	1.65E-04	7	vapor
152	64-19-7	Acetic acid	feed	-	9.87E-05	6	vapor
153	65510-44-3	2',3,4,4',5-Pentachlorobiphenyl	feed	-	2.84E-01	15	particle-bound
154	67-56-1	Methyl alcohol (Methanol)	feed	-	4.49E-03	10	vapor
155	67-63-0	2-Propyl alcohol (Isopropanol)	feed	-	7.99E-03	11	vapor
156	67-64-1	2-Propanone (Acetone)	feed	-	3.92E-02	13	vapor
157	67-66-3	Chloroform	feed	-	3.62E+00	19	vapor
158	67-72-1	Hexachloroethane	feed	-	3.84E+00	19	vapor
159	684-16-2	Hexafluoroacetone	feed	-	3.03E+00	19	vapor
160	69782-90-7	2,3,3',4,4',5'-Hexachlorobiphenyl	feed	-	6.76E-02	34	particle-bound

Table 2 List of Organic COPCs and PICs

#	CAS Registry Number	Compound	Source	SSFM Indicator?	Henry's Law Constant (bar*m^3/kgmol)	Henry's Law-Based Grouping	Offgas Phase Type
161	70362-50-4	3,4,4',5-Tetrachlorobiphenyl	feed	-	9.28E-03	33	particle-bound
162	71-23-8	n-Propyl alcohol	feed	-	7.31E-03	11	vapor
163	71-36-3	n-Butyl alcohol	feed	-	8.69E-03	11	vapor
164	71-43-2	Benzene	feed	yes	5.48E+00	19	vapor
165	71-55-6	Methyl chloroform (1,1,1-Trichloroethane)	feed	-	1.70E+01	21	vapor
166	72-20-8	Endrin	feed	-	6.28E-03	32	particle-bound
167	72-43-5	Methoxychlor	feed	-	2.00E-04	7	particle-bound
168	72-54-8	4,4-DDD	feed	-	6.51E-03	32	particle-bound
169	72-55-9	4,4-DDE	feed	-	4.11E-02	34	particle-bound
170	74472-37-0	2,3,4,4',5-Pentachlorobiphenyl	feed	-	2.84E-01	15	particle-bound
171	74-83-9	Bromomethane (Methyl bromide)	feed	-	6.16E+00	19	vapor
172	74-87-3	Chloromethane (Methyl chloride)	feed	-	8.70E+00	20	vapor
173	74-97-5	Bromochloromethane	feed	-	1.44E+00	17	vapor
174	74-99-7	Methylacetylene	feed	-	1.09E+01	20	vapor
175	75-00-3	Chloroethane	feed	-	1.10E+01	20	vapor
176	75-01-4	Vinyl chloride (1-Chloroethene)	feed	-	2.74E+01	22	vapor
177	75-05-8	Acetonitrile	feed	yes	3.40E-02	13	vapor
178	75-07-0	Acetaldehyde	feed	-	6.58E-02	13	vapor
179	75-09-2	Dichloromethane (Methylene chloride)	feed	-	3.21E+00	19	vapor
180	75-12-7	Formamide	feed	yes	1.37E-06	4	vapor
181	75-15-0	Carbon disulfide	feed	-	1.42E+01	20	vapor
182	75-21-8	Ethylene oxide (Oxirane)	feed	-	1.46E-01	15	vapor
183	75-27-4	Bromodichloromethane	feed	-	2.09E+00	18	vapor
184	75-34-3	1,1-Dichloroethane	feed	-	5.55E+00	19	vapor
185	75-35-4	1,1-Dichloroethene (Vinylidene chloride)	feed	-	2.58E+01	22	vapor
186	75-43-4	Dichlorofluoromethane	feed	-	1.07E+01	20	vapor
187	75-45-6	Chlorodifluoromethane	feed	-	4.01E+01	22	vapor
188	75-50-3	Trimethylamine	feed	-	1.03E-01	14	vapor
189	75-52-5	Nitromethane	feed	-	2.82E-02	13	vapor
190	75-55-8	2-Methylaziridine	feed	-	8.31E-03	11	vapor
191	75-61-6	Difluorodibromomethane	feed	-	3.04E+01	22	vapor
192	75-63-8	Trifluorobromomethane	feed	-	4.92E+02	25	vapor
193	75-65-0	2-Methyl-2-propanol	feed	-	8.93E-03	11	vapor
194	75-69-4	Trichlorofluoromethane	feed	yes	9.57E+01	23	vapor
195	75-71-8	Dichlorodifluoromethane	feed	-	3.39E+02	25	vapor
196	75-99-0	2,2-Dichloropropionic acid	feed	-	6.35E-05	6	vapor
197	76-03-9	Trichloroacetic acid	feed	-	1.33E-05	5	vapor
198	76-11-9	1,1,1,2-Tetrachloro-2,2-difluoroethane	feed	-	1.45E+02	24	vapor
199	76-12-0	1,1,2,2-Tetrachloro-1,2-difluoroethane	feed	-	1.12E+02	23	vapor
200	76-13-1	1,2,2-Trichloro-1,1,2-trifluoroethane (Freon 113)	feed	-	5.19E+02	25	vapor

Table 2 List of Organic COPCs and PICs

#	CAS Registry Number	Compound	Source	SSFM Indicator?	Henry's Law Constant (bar*m^3/kgmol)	Henry's Law-Based Grouping	Offgas Phase Type
201	76-14-2	1,2-Dichloro-1,1,2,2-tetrafluoroethane	feed	-	2.76E+03	28	vapor
202	76-15-3	Chloropentafluoroethane	feed	yes	5.51E+03	29	vapor
203	76-44-8	Heptachlor	feed	yes	2.90E-01	16	vapor
204	78-83-1	2-Methylpropyl alcohol (Isobutyl alcohol)	feed	-	9.65E-03	11	vapor
205	78-87-5	1,2-Dichloropropane	feed	-	2.78E+00	19	vapor
206	78-92-2	1-Methylpropyl alcohol (2-Butanol)	feed	-	8.94E-03	11	vapor
207	78-93-3	Methyl ethyl ketone (MEK, 2-Butanone)	feed	-	5.62E-02	13	vapor
208	79-00-5	1,1,2-Trichloroethane	feed	-	8.13E-01	17	vapor
209	79-01-6	Trichloroethylene	feed	yes	9.72E+00	20	vapor
210	79-09-4	Propionic acid	feed	-	4.39E-04	8	vapor
211	79-10-7	2-Propenoic acid	feed	-	3.65E-04	8	vapor
212	79-20-9	Methyl acetate	feed	-	1.13E-01	14	vapor
213	79-34-5	1,1,2,2-Tetrachloroethane	feed	-	3.62E-01	16	vapor
214	8001-35-2	Toxaphene	feed	yes	5.92E-03	10	particle-bound
215	82-68-8	Pentachloronitrobenzene (PCBN)	feed	-	4.36E-02	13	vapor
216	83-32-9	Acenaphthene	feed	-	1.82E-01	15	vapor
217	84-66-2	Diethyl phthalate	feed	yes	6.02E-04	8	vapor
218	84-74-2	Dibutyl phthalate	feed	yes	1.79E-03	31	particle-bound
219	85-01-8	Phenanthrene	feed	-	4.17E-02	13	vapor
220	85-68-7	Butylbenzyl phthalate	feed	-	1.24E-03	31	particle-bound
221	86-73-7	Fluorene	feed	-	9.49E-02	14	particle-bound
222	87-68-3	Hexachlorobutadiene	feed	yes	1.02E+01	20	vapor
223	87-86-5	Pentachlorophenol	feed	yes	2.42E-05	6	vapor
224	88-06-2	2,4,6-Trichlorophenol	feed	-	2.57E-03	10	vapor
225	88-72-2	2-Nitrotoluene	feed	-	1.23E-02	12	vapor
226	88-75-5	2-Nitrophenol	feed	-	1.26E-02	12	vapor
227	88-85-7	2-sec-Butyl-4,6-dinitrophenol (Dinoseb)	feed	yes	4.50E-04	8	particle-bound
228	88-89-1	Picric acid	feed	yes	1.68E-08	2	particle-bound
229	91-20-3	Naphthalene	feed	yes	4.34E-01	16	vapor
230	91-22-5	Quinoline	feed	-	1.65E-03	9	vapor
231	91-58-7	2-Chloronapthalene	feed	-	3.16E-01	16	vapor
232	92-52-4	1,1`-Biphenyl	feed	-	3.04E-01	16	vapor
233	92-93-3	4-Nitrobiphenyl	feed	-	3.49E-03	10	particle-bound
234	93-72-1	Silvex (2,4,5-TP)	feed	-	8.94E-06	5	particle-bound
235	93-76-5	2,4,5-T	feed	-	8.57E-06	5	particle-bound
236	94-75-7	2,4-D and esters (160C typed)	feed	-	3.49E-05	6	vapor
237	95-13-6	Indene	feed	-	1.57E+00	18	vapor
238	95-47-6	o-Xylene	feed	-	5.11E+00	19	vapor
239	95-48-7	o-Cresol (2-Methylphenol)	feed	-	1.18E-03	9	vapor
240	95-49-8	2-Chlorotoluene	feed	-	3.52E+00	19	vapor

Table 2 List of Organic COPCs and PICs

#	CAS Registry Number	Compound	Source	SSFM Indicator?	Henry's Law Constant (bar*m^3/kgmol)	Henry's Law-Based Grouping	Offgas Phase Type
241	95-50-1	o-Dichlorobenzene (1,2-Dichlorobenzene)	feed	-	1.89E+00	18	vapor
242	95-57-8	2-Chlorophenol	feed	-	1.11E-02	11	vapor
243	95-95-4	2,4,5-Trichlorophenol	feed	-	1.60E-03	9	vapor
244	96-22-0	3-Pentanone	feed	-	8.76E-02	14	vapor
245	96-69-5	Bis(3-tert-butyl-4-hydroxy-6-methyl-phenyl)sulfide	feed	-	2.83E+00	19	particle-bound
246	98-51-1	p-tert-Butyltoluene	feed	-	1.51E+01	21	vapor
247	98-82-8	Cumene	feed	-	1.13E+01	20	vapor
248	98-83-9	alpha-Methylstyrene	feed	-	2.52E+00	19	vapor
249	98-86-2	Acetophenone	feed	yes	1.03E-02	11	vapor
250	98-95-3	Nitrobenzene	feed	-	2.37E-02	12	vapor
1	100-02-7	4-Nitrophenol	pic	-	-	-	vapor
2	100-44-7	Benzyl chloride	pic	-	-	-	vapor
3	100-51-6	Benzyl alcohol	pic	-	-	-	vapor
4	100-52-7	Benzaldehyde	pic	-	-	-	vapor
5	101-77-9	4,4-Methylenedianiline	pic	-	-	-	vapor
6	103-33-3	Azobenzene	pic	-	-	-	vapor
7	103-65-1	n-Propyl benzene (Isocumene)	pic	-	-	-	vapor
8	104-51-8	n-Butylbenzene	pic	-	-	-	vapor
9	105-67-9	2,4-Dimethylphenol	pic	-	-	-	vapor
10	106-43-4	4-Chlorotoluene (p-Tolyl chloride)	pic	-	-	-	vapor
11	106-44-5	p-Cresol (4-Methyl phenol)	pic	-	-	-	vapor
12	106-47-8	p-Chloroaniline	pic	-	-	-	vapor
13	106-49-0	p-Toluidine	pic	-	-	-	vapor
14	106-51-4	Quinone	pic	-	-	-	vapor
15	106-89-8	Epichlorohydrin (1-chloro-2,3-epoxypropane)	pic	-	-	-	vapor
16	107-19-7	Propargyl alcohol	pic	-	-	-	vapor
17	107-21-1	Ethylene glycol	pic	-	-	-	vapor
18	107-98-2	Propylene gylcol monomethyl ether	pic	-	-	-	vapor
19	108-60-1	Dichloroisopropyl ether	pic	-	-	-	vapor
20	108-67-8	1,3,5-Trimethyl benzene	pic	-	-	-	vapor
21	108-86-1	Bromobenzene (Phenyl bromide)	pic	-	-	-	vapor
22	109-77-3	Malononitrile	pic	-	-	-	vapor
23	109-86-4	2-Methoxyethanol	pic	-	-	-	vapor
24	110-80-5	2-Ethoxyethanol	pic	-	-	-	vapor
25	111-15-9	Ethylene glycol monoethyl ether acetate	pic	-	-	-	vapor
26	111-44-4	Bis(2-chloroethyl) ether	pic	-	-	-	vapor
27	111-91-1	Bis(2-chloroethoxy)methane	pic	-	-	-	vapor
28	1120-71-4	1,3-Propane sultone	pic	-	-	-	vapor
29	119-90-4	3,3'-Dimethoxybenzidine (ortol-dianisidine)	pic	-	-	-	particle-bound
30	121-14-2	2,4-Dinitrotoluene	pic	-	-	-	particle-bound

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31	122-66-7	1,2-Diphenylhydrazine	pic	-	-	-	particle-bound
32	123-33-1	Maleic hydrazide	pic	-	-	-	particle-bound
33	124-48-1	Chlorodibromomethane	pic	-	-	-	vapor
34	131-11-3	Dimethylphthalate	pic	-	-	-	vapor
35	131-89-5	2-Cyclohexyl-4,6-dinitrophenol	pic	-	-	-	particle-bound
36	133-06-2	Captan	pic	-	-	-	particle-bound
37	135-98-8	sec-Butylbenzene	pic	-	-	-	vapor
38	145-73-3	Endothall	pic	-	-	-	particle
39	156-59-2	cis-1,2-Dichloroethene	pic	-	-	-	vapor
40	1746-01-6	2,3,7,8-Tetrachlorodibenzo(p)dioxin (TCDD)	pic	-	-	-	particle-bound
41	192-97-2	Benzo(e)pyrene	pic	-	-	-	particle-bound
42	19408-74-3	1,2,3,7,8,9-Hexachlorodibenzo(p)dioxin	pic	-	-	-	particle
43	23950-58-5	Pronamide	pic	-	-	-	vapor
44	25013-15-4	Methyl styrene (mixed isomers)	pic	-	-	-	vapor
45	3268-87-9	Octachlorodibenzo(p)dioxin	pic	-	-	-	particle
46	35822-46-9	1,2,3,4,6,7,8-Heptachlorodibenzo(p)dioxin	pic	-	-	-	particle
47	39001-02-0	Octachlorodibenzofuran	pic	-	-	-	particle
48	39227-28-6	1,2,3,4,7,8-Hexachlorodibenzo(p)dioxin	pic	-	-	-	particle-bound
49	40321-76-4	1,2,3,7,8-Pentachlorodibenzo(p)dioxin	pic	-	-	-	particle-bound
50	41851-50-7	Chlorocyclopentadiene	pic	-	-	-	vapor
51	460-19-5	Cyanogen	pic	-	-	-	vapor
52	506-68-3	Cyanogen bromide	pic	-	-	-	vapor
53	506-77-4	Cyanogen chloride	pic	-	-	-	vapor
54	510-15-6	Chlorobenzilate	pic	-	-	-	particle-bound
55	51207-31-9	2,3,7,8-Tetrachlorodibenzofuran	pic	-	-	-	particle-bound
56	51-28-5	2,4-Dinitrophenol	pic	-	-	-	particle-bound
57	51-79-6	Ethyl Carbamate (urethane)	pic	-	-	-	vapor
58	528-29-0	o-Dinitrobenzene	pic	-	-	-	particle-bound
59	532-27-4	2-Chloroacetophenone	pic	-	-	-	vapor
60	534-52-1	4,6-Dinitro-o-cresol	pic	-	-	-	particle-bound
61	5385-75-1	Dibenzo(a,e)fluoranthene	pic	-	-	-	particle
62	540-73-8	1,2-Dimethylhydrazine	pic	-	-	-	vapor
63	542-75-6	1,3-Dichloropropene	pic	-	-	-	vapor
64	542-88-1	Dichloromethyl ether	pic	-	-	-	vapor
65	55673-89-7	1,2,3,4,7,8,9-Heptachlorodibenzofuran	pic	-	-	-	particle
66	57117-31-4	2,3,4,7,8-Pentachlorodibenzofuran	pic	-	-	-	particle-bound
67	57117-41-6	1,2,3,7,8-Pentachlorodibenzofuran	pic	-	-	-	particle-bound
68	57117-44-9	1,2,3,6,7,8-Hexachlorodibenzofuran	pic	-	-	-	particle-bound
69	57-24-9	Strychnine	pic	-	-	-	particle-bound
70	57653-85-7	1,2,3,6,7,8-Hexachlorodibenzo(p)dioxin	pic	-	-	-	particle

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71	57-74-9	Chlordane	pic	-	-	-	particle-bound
72	584-84-9	2,4-Toluene diisocyante	pic	-	-	-	vapor
73	593-60-2	Bromoethene	pic	-	-	-	vapor
74	60-11-7	Dimethyl aminoazobenzene	pic	-	-	-	particle-bound
75	606-20-2	2,6-Dinitrotoluene	pic	-	-	-	vapor
76	60851-34-5	2,3,4,6,7,8-Hexachlorodibenzofuran	pic	-	-	-	particle-bound
77	608-93-5	Pentachlorobenzene	pic	-	-	-	vapor
78	61626-71-9	Dichloropentadiene	pic	-	-	-	vapor
79	62-50-0	Ethyl methanesulfonate	pic	-	-	-	vapor
80	62-53-3	Aniline	pic	-	-	-	vapor
81	65-85-0	Benzoic acid	pic	-	-	-	vapor
82	67562-39-4	1,2,3,4,6,7,8-Heptachlorodibenzofuran	pic	-	-	-	particle
83	70-30-4	Hexachlorophene	pic	-	-	-	particle
84	70648-26-9	1,2,3,4,7,8-Hexachlorodibenzofuran	pic	-	-	-	particle
85	72918-21-9	1,2,3,7,8,9-Hexachlorodibenzofuran	pic	-	-	-	particle-bound
86	74-88-4	Iodomethane (Methyl iodide)	pic	-	-	-	vapor
87	74-95-3	Methylene bromide	pic	-	-	-	vapor
88	75-25-2	Bromoform	pic	-	-	-	vapor
89	75-29-6	2-Chloropropane	pic	-	-	-	vapor
90	75-44-5	Phosgene	pic	-	-	-	vapor
91	76-01-7	Pentachloroethane	pic	-	-	-	vapor
92	764-41-0	1,4-Dichloro-2-butene	pic	-	-	-	vapor
93	765-34-4	Glycidylaldehyde	pic	-	-	-	vapor
94	77-47-4	Hexachlorocyclopentadiene	pic	-	-	-	vapor
95	77-78-1	Dimethyl sulfate	pic	-	-	-	vapor
96	80-62-6	Methyl methacrylate	pic	-	-	-	vapor
97	822-06-0	Hexamethylene-1,5-diisocyanate	pic	-	-	-	vapor
98	823-40-5	Toluene-2,6-diamine	pic	-	-	-	vapor
99	85-44-9	Phthalic anhydride	pic	-	-	-	vapor
100	87-61-6	1,2,3-Trichlorobenzene	pic	-	-	-	vapor
101	88-74-4	o-Nitroaniline (2-Nitroaniline)	pic	-	-	-	vapor
102	90-04-0	o-Anisidine	pic	-	-	-	vapor
103	91-57-6	2-Methylnaphthalene	pic	-	-	-	vapor
104	91-94-1	3,3'-Dichlorobenzidine	pic	-	-	-	particle-bound
105	924-16-3	N-Nitrosodi-n-butylamine	pic	-	-	-	vapor
106	94-59-7	Safrole	pic	-	-	-	vapor
107	95-53-4	o-Toluidine	pic	-	-	-	vapor
108	95-63-6	1,2,4-Trimethyl benzene	pic	-	-	-	vapor
109	95-94-3	1,2,4,5-Tetrachlorobenzene	pic	-	-	-	vapor
110	96-12-8	1,2-Dibromo-3-chloropropane	pic	-	-	-	vapor

Table 2 List of Organic COPCs and PICs

#	CAS Registry Number	Compound	Source	SSFM Indicator?	Henry's Law Constant (bar*m^3/kgmol)	Henry's Law-Based Grouping	Offgas Phase Type
111	96-18-4	1,2,3-Trichloropropane	pic	-	-	-	vapor
112	96-45-7	Ethylene thiourea	pic	-	-	-	particle-bound
113	97-63-2	Ethyl methacrylate	pic	-	-	-	vapor
114	98-01-1	Furfural	pic	-	-	-	vapor
115	98-06-6	tert-Butyl benzene	pic	-	-	-	vapor
116	98-07-7	Benzotrichloride	pic	-	-	-	vapor
117	99-35-4	1,3,5-Trinitrobenzene	pic	-	-	-	vapor
118	99-65-0	1,3-Dinitrobenzene	pic	-	-	-	vapor
119	99-87-6	p-Cymene	pic	-	-	-	vapor
120	no cas #	Dibenzo(a,h)fluoranthene	pic	-	-	-	particle-bound

Table 3 List of Inorganic COPCs and Criteria Pollutants

CAS Registry Number	Constituent	Constituent Family	SSFM Indicator?	Phase
14265-44-2	Phosphate	Non-metals and Anions	yes	particle
14280-30-9	Hydroxide	Non-metals and Anions	yes	particle
14797-55-8	Nitrate	Non-metals and Anions	yes	particle
14797-65-0	Nitrite	Non-metals and Anions	yes	particle
14808-79-8	Sulfate	Non-metals and Anions	yes	particle
16887-00-6	Chloride	Non-metals and Anions	yes	particle
16984-48-8	Fluoride	Non-metals and Anions	yes	particle
18540-29-9	Chromium (hexavalent)	Metals	yes	particle
24959-67-9	Bromide	Non-metals and Anions	-	particle
57-12-5	Cyanide	Non-metals and Anions	-	vapor
63705-05-5	Total Sulfur	Non-metals and Anions	yes	particle
7429-90-5	Aluminum	Metals	yes	particle
7439-89-6	Iron	Metals	yes	particle
7439-92-1	Lead	Metals	yes	particle
7439-93-2	Lithium	Metals	yes	particle
7439-95-4	Magnesium	Metals	yes	particle
7439-96-5	Manganese	Metals	yes	particle
7439-97-6	Mercury	Metals	yes	vapor
7439-98-7	Molybdenum	Metals	-	particle
7440-02-0	Nickel	Metals	yes	particle
7440-09-7	Potassium	Metals	yes	particle
7440-16-6	Rhodium	Metals	-	particle
7440-21-3	Silicon	Metals	yes	particle
7440-22-4	Silver	Metals	yes	particle
7440-23-5	Sodium	Metals	yes	particle
7440-24-6	Strontium (total)	Metals	yes	particle
7440-25-7	Tantalum	Metals	-	particle
7440-28-0	Thallium	Metals	-	particle
7440-31-5	Tin	Metals	-	particle
7440-33-7	Tungsten	Metals	-	particle
7440-36-0	Antimony	Metals	-	particle
7440-38-2	Arsenic	Metals	yes	particle
7440-39-3	Barium	Metals	yes	particle
7440-41-7	Beryllium	Metals	-	particle
7440-42-8	Boron	Metals	yes	particle
7440-43-9	Cadmium	Metals	yes	particle
7440-48-4	Cobalt	Metals	-	particle
7440-50-8	Copper	Metals	yes	particle
7440-61-1	Uranium	Metals	-	particle
7440-62-2	Vanadium	Metals	-	particle
7440-65-5	Yttrium	Metals	-	particle
7440-66-6	Zinc	Metals	yes	particle
7440-67-7	Zirconium	Metals	yes	particle

Table 3 List of Inorganic COPCs and Criteria Pollutants

CAS Registry Number	Constituent	Constituent Family	SSFM Indicator?	Phase
7440-69-9	Bismuth	Metals	yes	particle
7440-70-2	Calcium	Metals	yes	particle
7553-56-2	Iodine (I2)	Non-metals and Anions	-	vapor
7664-41-7	Ammonia	Non-metals and Anions	yes	vapor
7723-14-0	Phosphorous	Non-metals and Anions	yes	particle
7782-49-2	Selenium	Metals	-	particle
10028-15-6	Ozone	Criteria Pollutant	-	vapor
10102-44-0	Nitrogen dioxide	Criteria Pollutant	yes	vapor
10102-43-9	Nitric oxide	Criteria Pollutant	yes	vapor
630-08-0	Carbon monoxide	Criteria Pollutant	yes	vapor
7446-09-5	Sulfur dioxide	Criteria Pollutant	yes	vapor
no cas #	particulate matter	Criteria Pollutant	-	particle

Table 4 List of Radionuclide COPCs

CAS Registry Number	Constituent	SSFM Indicator?	Offgas Phase
10028-17-8	Tritium	yes	vapor
10045-97-3	Cesium-137	yes	particle
10098-91-6	Yttrium-90	-	particle
10098-97-2	Strontium-90	yes	particle
10198-40-0	Cobalt-60	yes	particle
13966-29-5	Uranium-234	yes	particle
13967-48-1	Ruthenium-106	-	particle
13967-70-9	Cesium-134	-	particle
13968-55-3	Uranium-233	yes	particle
13981-15-2	Curium-244	yes	particle
13981-16-3	Plutonium-238	yes	particle
13981-37-8	Nickel-63	yes	particle
13981-97-0	Barium-137m	-	particle
13982-10-0	Plutonium-242	-	particle
13982-63-3	Radium-226	-	particle
13982-70-2	Uranium-236	yes	particle
13994-20-2	Neptunium-237	yes	particle
14119-32-5	Plutonium-241	yes	particle
14119-33-6	Plutonium-240	yes	particle
14133-76-7	Technetium-99	yes	particle
14158-29-3	Uranium-232	-	particle
14234-35-6	Antimony-125	yes	particle
14331-85-2	Protactinium-231	-	particle
14336-70-0	Nickel-59	-	particle
14391-16-3	Europium-155	yes	particle
14596-10-2	Americium-241	yes	particle
14683-23-9	Europium-152	yes	particle
14762-75-5	Carbon-14	yes	vapor
14952-40-0	Actinium-227	-	particle
14993-75-0	Americium-243	-	particle
15046-84-1	Iodine-129	yes	vapor
15117-48-3	Plutonium-239	yes	particle
15117-96-1	Uranium-235	yes	particle
15262-20-1	Radium-228	-	particle
15510-73-3	Curium-242	-	particle
15585-10-1	Europium-154	yes	particle
15594-54-4	Thorium-229	-	particle
15715-94-3	Samarium-151	yes	particle
15751-77-6	Zirconium-93	-	particle
15757-87-6	Curium-243	yes	particle
15832-50-5	Tin-126	yes	particle
7440-03-1	Niobium-93m	-	particle
7440-29-1	Thorium-232	yes	particle
7440-61-1	Uranium-238	yes	particle
no cas #	Cadmium-113m	-	particle
no cas #	Selenium-79	-	particle

Table 5 Representative Compounds for Inorganics and Radionuclides

Radionuclide			Metals			Non-metals and Anions	
Unanalyzed Compound	Representative Compounds		Unanalyzed Compound	Representative Compounds		Unanalyzed Compound	Representative Compounds
Cs-134	Cs-137		Be	Zr		CN	PO_4
Ba-137m	Cs-137		Y	Sr-90		-	-
Ra-226	Zr		V	Bi		-	-
Ra-228	Zr		Ta	Zr		-	-
Ac-227	Zr		Mo	Bi		-	-
Y-90	Sr-90		W	Zr		-	-
Zr-93	Zr		Co	Co-60		-	-
Nb-93m	Zr		Rh	Zr		-	-
Ni-59	Ni-63		Tl	F		-	-
Ru-106	F		Sn	Sn-126		-	-
Cd-113m	Cd		Sb	Sb-125		-	-
Se-79	F		Se	F		-	-
Th-229	Th-232		U	U-234		-	-
Pa-231	Zr		-	-		-	-
U-232	U-233		-	-		-	-
Pu-242	Pu-241		-	-		-	-
Am-243	Am-241		-	-		-	-
Cm-242	Cm-243		-	-		-	-

Table 6 Estimated Organic Feed Concentrations

CAS #	COPC	Conc (mg/L)	In SSFM
100-00-5	p-Nitrochlorobenzene	84.8	No
100-21-0	p-Phthalic acid	84.8	Yes
100-25-4	1,4-Dinitrobenzene	84.8	No
100-41-4	Ethyl benzene	18.7	No
100-42-5	Styrene	18.7	No
10061-01-5	cis-1,3-Dichloropropene	18.7	Yes
10061-02-6	trans-1,3-Dichloropropene	18.7	No
101-55-3	4-Bromophenylphenyl ether	84.8	No
101-84-8	Diphenyl ether	18.7	No
106-35-4	3-Heptanone	18.7	No
106-42-3	p-Xylene (Dimethyl benzene)	18.7	No
106-46-7	1,4-Dichlorobenzene	18.7	No
106-88-7	1,2-Epoxybutane	18.7	No
106-93-4	Ethylene dibromide (Dibromethane)	84.8	Yes
106-97-8	Butane	18.7	Yes
106-99-0	1,3-Butadiene	18.7	Yes
107-02-8	Acrolein	18.7	No
107-05-1	3-Chloropropene (Allyl chloride)	18.7	No
107-06-2	1,2-Dichloroethane (Ethylene chloride)	18.7	No
107-12-0	Propionitrile	18.7	No
107-13-1	Acrylonitrile	18.7	No
107-18-6	2-Propene-1-ol	84.8	No
107-31-3	Formic acid, methyl ester	84.8	No
107-66-4	Dibutylphosphate	84.8	No
107-87-9	2-Pentanone	18.7	No
108-03-2	1-Nitropropane	84.8	No
108-05-4	Vinyl acetate	84.8	No
108-10-1	Hexone (4-Methyl-2-pentanone or MIBK)	18.7	No
108-20-3	Bis(isopropyl)ether	18.7	No
108-38-3	m-Xylene (Dimethyl benzene)	18.7	No
108-39-4	m-Cresol	18.7	No
108-87-2	Methylcyclohexane	18.7	Yes
108-88-3	Toluene	18.7	Yes
108-90-7	Chlorobenzene	18.7	No
108-93-0	Cyclohexanol	18.7	No
108-94-1	Cyclohexanone	18.7	No
108-95-2	Phenol	84.8	Yes
109-66-0	n-Pentane	18.7	No
109-99-9	Tetrahydrofuran	39.6	No
110-12-3	5-Methyl-2-hexanone	18.7	No
110-43-0	2-Heptanone	18.7	No
110-54-3	n-Hexane	18.7	Yes
110-62-3	n-Valeraldehyde	84.8	No
110-82-7	Cyclohexane	18.7	Yes
110-83-8	Cyclohexene	18.7	No

Table 6 Estimated Organic Feed Concentrations

CAS #	COPC	Conc (mg/L)	In SSFM
110-86-1	Pyridine	84.8	No
111-65-9	n-Octane	18.7	No
111-76-2	Ethylene glycol monobutyl ether	84.8	No
111-84-2	n-Nonane	18.7	Yes
117-81-7	Bis(2-ethylhexyl)phthalate (DEHP)	84.8	No
117-84-0	n-Dioctyl phthalate	84.8	No
118-74-1	Hexachlorobenzene	1.8	Yes
120-12-7	Anthracene	84.8	Yes
120-82-1	1,2,4-Trichlorobenzene	18.7	Yes
120-83-2	2,4-Dichlorophenol	84.8	No
121-44-8	Triethylamine	18.7	No
121-69-7	Dimethylaniline	18.7	No
122-39-4	N,N-Diphenylamine	18.7	Yes
123-19-3	4-Heptanone	18.7	No
123-38-6	n-Propionaldehyde	18.7	No
123-51-3	3-Methyl-1-butanol	18.7	No
123-86-4	Acetic acid n-butyl ester	84.8	No
123-91-1	1,4-Dioxane	50.9	No
126-73-8	Tributyl phosphate	84.8	Yes
126-98-7	2-Methyl-2-propenenitrile (Methacrylonitrile)	18.7	No
127-18-4	Perchloroethylene (tetrachloroethylene)	18.7	Yes
127-19-5	N,N-Dimethylacetamide	18.7	No
128-37-0	2,6-Bis(tert-butyl)-4-methylphenol	84.8	No
129-00-0	Pyrene	84.8	Yes
1321-64-8	Pentachloronaphthalene	84.8	No
1321-65-9	Trichloronaphthalene	84.8	No
132-64-9	Dibenzofuran	84.8	Yes
1335-87-1	Hexachloronaphthalene	84.8	No
1335-88-2	Tetrachloronaphthalene	84.8	No
1336-36-3	Polychlorinated biphenyls (PCBs)	29.4	Yes
141-78-6	Acetic acid ethyl ester (Ethyl acetate)	84.8	No
141-79-7	4-Methyl-3-penten-2-one	84.8	No
142-82-5	n-Heptane	18.7	No
144-62-7	Oxalic acid	8.5	Yes
156-60-5	trans-1,2-Dichloroethylene	18.7	No
1582-09-8	Trifluralin	84.8	No
1634-04-4	Methyl tert-butyl ether	18.7	No
1836-75-5	Nitrofen	84.8	No
189-55-9	Dibenzo[a,i]pyrene	84.8	No
189-64-0	Dibenzo[a,h]pyrene	84.8	No
191-24-2	Benzo(g,h,i)perylene	84.8	No
191-30-0	Benzo[a,i]pyrene	84.8	No
192-65-4	Dibenzo[a,e]pyrene	84.8	No
193-39-5	Indeno(1,2,3-cd)pyrene	84.8	No
205-82-3	Benzo(j)fluoranthene	84.8	No
205-99-2	Benzo(b)fluoranthene	84.8	No

Table 6 Estimated Organic Feed Concentrations

CAS #	COPC	Conc (mg/L)	In SSFM
206-44-0	Fluoranthene	84.8	No
207-08-9	Benzo(k)fluoranthene	84.8	No
208-96-8	Acenaphthylene	84.8	Yes
218-01-9	Chrysene	84.8	Yes
2234-13-1	Octachloronaphthalene	84.8	No
224-42-0	Dibenz[a,j]acridine	84.8	No
226-36-8	Dibenz[a,h]acridine	84.8	No
2385-85-5	Mirex	84.8	No
2551-13-7	Trimethyl benzene	18.7	No
26140-60-3	Terphenyls	84.8	No
27154-33-2	Trichlorofluoroethane	18.7	No
287-92-3	Cyclopentane	18.7	No
309-00-2	Aldrin	1.0	Yes
319-84-6	Hexachlorocyclohexane (Lindane) Alpha BHC	0.3	No
319-85-7	Hexachlorocyclohexane (Lindane) Beta BHC	0.3	Yes
319-86-8	Delta-BHC	0.3	No
3697-24-3	5-Methylchrysene	84.8	No
3825-26-1	Ammonium perfluorooctanoate	84.8	No
4170-30-3	2-Butenaldehyde (2-Butenal or Crotonaldehyde)	18.7	Yes
465-73-6	Isodrin	0.6	No
50-00-0	Formaldehyde	18.7	No
50-29-3	4,4-DDT	0.6	No
50-32-8	Benzo(a)pyrene	1.1	Yes
53-70-3	Dibenzo(a,h)anthracene	0.1	No
540-59-0	1,2-Dichloroethylene	18.7	No
540-84-1	2,2,4-Trimethylpentane	18.7	No
541-73-1	1,3-Dichlorobenzene	18.7	No
56-23-5	Carbon tetrachloride	18.7	Yes
563-80-4	3-Methyl-2-butanone	18.7	No
56-49-5	3-Methylcholanthrene	84.8	No
56-55-3	Benzo(a)anthracene	84.8	No
57-14-7	1,1-Dimethylhydrazine	84.8	Yes
58-89-9	gamma-BHC (Lindane)	0.3	Yes
58-90-2	2,3,4,6-Tetrachlorophenol	84.8	Yes
591-78-6	2-Hexanone	18.7	No
59-50-7	4-Chloro-3-methylphenol	84.8	No
59-89-2	N-Nitrosomorpholine	84.8	No
602-87-9	5-Nitroacenaphthene	84.8	No
60-29-7	Ethyl ether	84.8	No
603-34-9	Triphenylamine	84.8	Yes
60-34-4	Methylhydrazine	18.7	No
60-35-5	Acetamide	18.7	Yes
60-57-1	Dieldrin	0.6	Yes
621-64-7	Di-n-Propylnitrosamine (N-Nitroso-di-n-propylamine)	84.8	No
624-83-9	Methyl isocyanate	18.7	No
627-13-4	Nitric acid, propyl ester	84.8	No

Table 6 Estimated Organic Feed Concentrations

CAS #	COPC	Conc (mg/L)	In SSFM
62-75-9	N-Nitroso-N,N-dimethylamine (Dimethylnitrosamine)	158.4	Yes
630-20-6	1,1,1,2-Tetrachloroethane	18.7	No
64-17-5	Ethyl alcohol	18.7	No
64-18-6	Formic acid	84.8	No
64-19-7	Acetic acid	84.8	No
67-56-1	Methyl alcohol (Methanol)	18.7	No
67-63-0	2-Propyl alcohol (Isopropanol; Propan-2-01)	18.7	No
67-64-1	2-Propanone (Acetone)	101.8	No
67-66-3	Chloroform	18.7	No
67-72-1	Hexachloroethane	84.8	No
684-16-2	Hexafluoroacetone	18.7	No
71-23-8	n-Propyl alcohol	18.7	No
71-36-3	n-Butyl alcohol	18.7	No
71-43-2	Benzene	18.7	Yes
71-55-6	Methyl chloroform (1,1,1-Trichloroethane)	18.7	No
72-20-8	Endrin	0.6	No
72-43-5	Methoxychlor	2.8	No
72-54-8	4,4-DDD	0.6	No
72-55-9	4,4-DDE	0.6	No
74-83-9	Bromomethane (Methyl bromide)	18.7	No
74-87-3	Chloromethane (Methyl chloride)	18.7	No
74-97-5	Bromochloromethane	18.7	No
74-99-7	Methylacetylene	84.8	No
75-00-3	Chloroethane	18.7	No
75-01-4	Vinyl chloride (1-Chloroethene)	84.8	No
75-05-8	Acetonitrile	26.6	Yes
75-07-0	Acetaldehyde	84.8	No
75-09-2	Dichloromethane (Methylene chloride)	18.7	No
75-12-7	Formamide	84.8	Yes
75-15-0	Carbon disulfide	18.7	No
75-21-8	Ethylene oxide (Oxirane)	18.7	No
75-27-4	Bromodichloromethane	18.7	No
75-34-3	1,1-Dichloroethane	18.7	No
75-35-4	1,1-Dichloroethene (Vinylidene chloride)	18.7	No
75-43-4	Dichlorofluoromethane	18.7	No
75-45-6	Chlorodifluoromethane	18.7	No
75-50-3	Trimethylamine	18.7	No
75-52-5	Nitromethane	84.8	No
75-55-8	2-Methylaziridine	84.8	No
75-61-6	Difluorodibromomethane	18.7	No
75-63-8	Trifluorobromomethane	18.7	No
75-65-0	2-Methyl-2-propanol	18.7	No
75-69-4	Trichlorofluoromethane	18.7	No
75-71-8	Dichlorodifluoromethane	18.7	No
75-99-0	2,2-Dichloropropionic acid	84.8	No
76-03-9	Trichloroacetic acid	18.7	No

Table 6 Estimated Organic Feed Concentrations

CAS #	COPC	Conc (mg/L)	In SSFM
76-11-9	1,1,1,2-Tetrachloro-2,2-difluoroethane	84.8	No
76-12-0	1,1,2,2-Tetrachloro-1,2-difluoroethane	84.8	No
76-13-1	1,2,2-Trichloro-1,1,2-trifluoroethane (Freon 113)	18.7	No
76-14-2	1,2-Dichloro-1,1,2,2-tetrafluoroethane	18.7	No
76-15-3	Chloropentafluoroethane	18.7	Yes
76-44-8	Heptachlor	1.8	Yes
78-83-1	2-Methylpropyl alcohol (Isobutyl alcohol)	84.8	No
78-87-5	1,2-Dichloropropane	18.7	No
78-92-2	1-Methylpropyl alcohol (2-Butanol)	18.7	No
78-93-3	Methyl ethyl ketone (MEK, 2-Butanone)	18.7	No
79-00-5	1,1,2-Trichloroethane	18.7	No
79-01-6	Trichloroethylene	18.7	Yes
79-09-4	Propionic acid	84.8	No
79-10-7	2-Propenoic acid	84.8	No
79-20-9	Methyl acetate	84.8	No
79-34-5	1,1,2,2-Tetrachloroethane	18.7	No
8001-35-2	Toxaphene	0.7	Yes
82-68-8	Pentachloronitrobenzene (PCBN or quintobenzene)	84.8	No
83-32-9	Acenaphthene	84.8	No
84-66-2	Diethyl phthalate	84.8	Yes
84-74-2	Dibutyl phthalate	84.8	Yes
85-01-8	Phenanthrene	84.8	No
85-68-7	Butylbenzyl phthalate	84.8	No
86-73-7	Fluorene	84.8	No
87-68-3	Hexachlorobutadiene	18.7	Yes
87-86-5	Pentachlorophenol	84.8	Yes
88-06-2	2,4,6-Trichlorophenol	84.8	No
88-72-2	2-Nitrotoluene	18.7	No
88-75-5	2-Nitrophenol	84.8	No
88-85-7	2-sec-Butyl-4,6-dinitrophenol (Dinoseb)	84.8	Yes
88-89-1	Picric acid	84.8	Yes
91-20-3	Naphthalene	2.8	Yes
91-22-5	Quinoline	84.8	No
91-58-7	2-Chloronapthalene	84.8	No
92-52-4	1,1`-Biphenyl	84.8	No
92-93-3	4-Nitrobiphenyl	84.8	No
93-72-1	Silvex (2,4,5-TP)	84.8	No
93-76-5	2,4,5-T	84.8	No
94-75-7	2,4-D and esters (160C typed)	84.8	No
95-13-6	Indene	84.8	No
95-47-6	o-Xylene	18.7	No
95-48-7	o-Cresol (2-Methylphenol)	18.7	No
95-49-8	2-Chlorotoluene	84.8	No
95-50-1	o-Dichlorobenzene (1,2-Dichlorobenzene)	18.7	No
95-57-8	2-Chlorophenol	84.8	No
95-95-4	2,4,5-Trichlorophenol	84.8	No

Table 6 Estimated Organic Feed Concentrations

CAS #	COPC	Conc (mg/L)	In SSFM
96-22-0	3-Pentanone	18.7	No
96-69-5	Bis(3-tert-butyl-4-hydroxy-6-methyl-phenyl)sulfide	84.8	No
98-51-1	p-tert-Butyltoluene	84.8	No
98-82-8	Cumene	84.8	No
98-83-9	alpha-Methylstyrene	18.7	No
98-86-2	Acetophenone	84.8	Yes
98-95-3	Nitrobenzene	84.8	No

Table 7 Estimated LAW Feed Concentrations

LAW Chemical Analytes Emissions Feed Vector			
Analyte	**mol/mol Na**	**Analyte**	**mol/mol Na**
Ag	1.21E-04	NO2	1.96E-01
Al	2.50E-01	NO3	4.12E-01
As	6.11E-04	OH	1.55E+00
B	6.46E-03	Oxalate	2.58E-01
Ba	1.00E-04	Pb	6.80E-04
Be	1.21E-04	Pd	8.04E-06
Bi	2.02E-04	PO4	6.70E-02
Ca	4.00E-02	Pr	3.49E-07
Cd	4.00E-03	Rb	1.35E-05
Ce	3.02E-04	Rh	5.54E-05
Cl	4.59E-02	Ru	6.13E-05
CN	2.89E-04	Sb	1.07E-04
Co	1.67E-04	Se	2.04E-04
Cr	2.00E-02	Si	1.68E-02
Cu	2.21E-04	SO4	3.61E-02
F	1.03E-01	Sr	4.82E-05
Fe	1.00E-02	Ta	2.95E-05
Hg	1.40E-05	Te	3.85E-07
K	1.80E-01	Th	2.15E-05
La	8.30E-05	Ti	9.66E-05
Li	3.95E-03	TIC as CO3	1.55E-01
Mg	1.78E-03	Tl	2.13E-04
Mn	4.87E-03	U(total)	6.18E-04
Mo	2.67E-04	V	2.14E-04
Na	1.00E+00	W	2.01E-04
Nd	1.69E-04	Y	2.02E-05
NH3	1.02E-02	Zn	4.05E-04
Ni	3.00E-03	Zr	3.59E-04

LAW Radionuclide Emissions Feed Vector			
Analyte	**Bq/mol Na**	**Analyte**	**Bq/mol Na**
106Ru	7.78E-01	236U	6.93E+02
113mCd	8.26E+05	237Np	7.78E+02
125Sb	1.99E+07	238Pu	2.06E+03
126Sn	1.49E+05	238U	4.45E+03
129I	2.88E+03	239Pu	2.44E+04
134Cs	3.70E+07	240Pu	4.31E+03
137Cs	2.00E+10	241Am	3.46E+05
137mBa	1.36E+10	241Pu	1.01E+05
14C	2.64E+05	242Cm	4.49E+02
151Sm	2.47E+08	242Pu	2.79E-01
152Eu	1.30E+06	243Am	7.29E+00
154Eu	4.30E+06	243Cm	7.25E+01

Table 7 Estimated LAW Feed Concentrations

LAW Radionuclide Emissions Feed Vector			
Analyte	**Bq/mol Na**	**Analyte**	**Bq/mol Na**
155Eu	7.42E+06	244Cm	5.04E+02
226Ra	1.19E+00	3H	3.53E+06
227Ac	1.32E+01	59Ni	1.29E+04
228Ra	2.31E+03	60Co	3.70E+05
229Th	5.43E+01	63Ni	2.37E+06
231Pa	3.85E+01	79Se	1.13E+04
232Th	5.54E+02	90Sr	8.00E+08
232U	1.30E+03	90Y	7.70E+08
233U	1.03E+04	93mNb	1.52E+05
234U	5.99E+03	93Zr	1.92E+05
235U	2.31E+02	99Tc	7.10E+06

Table 8 Estimated HLW Feed Concentrations

HLW Chemical Analytes Emissions Feed Vector			
Analyte	**mol/mol Na**	**Analyte**	**mol/mol Na**
Ag	6.17E-03	NO2	1.51E-01
Al	6.28E-01	NO3	7.03E-01
As	2.59E-03	OH	8.64E+00
B	1.46E-01	Oxalate	1.51E-01
Ba	3.97E-02	Pb	6.43E-03
Be	8.74E-03	Pd	1.48E-03
Bi	1.62E-02	PO4	1.18E-01
Ca	2.14E-01	Pr	3.01E-03
Cd	4.85E-02	Rb	2.69E-03
Ce	7.00E-03	Rh	1.53E-03
Cl	1.13E-02	Ru	4.19E-03
CN	7.45E-02	Sb	8.35E-03
Co	9.25E-03	Se	7.97E-03
Cr	1.58E-02	Si	8.19E-01
Cu	9.15E-03	SO4	1.67E-02
F	2.23E-01	Sr	7.19E-03
Fe	6.29E-01	Ta	2.01E-04
Hg	6.03E-04	Te	1.23E-03
K	4.02E-02	Th	2.61E-02
La	2.27E-02	Ti	3.29E-02
Li	2.46E-02	TIC as CO3	6.05E-01
Mg	1.05E-01	Tl	2.67E-03
Mn	1.43E-01	U(total)	7.12E-02
Mo	8.20E-03	V	7.61E-04
Na	1.00E+00	W	1.58E-03
Nd	1.43E-02	Y	2.18E-03
NH3	1.14E-01	Zn	7.77E-03
Ni	4.95E-02	Zr	1.99E-01

HLW Radionuclide Emissions Feed Vector			
Analyte	**Bq/mol Na**	**Analyte**	**Bq/mol Na**
106Ru	4.37E+06	236U	4.57E+03
113mCd	1.36E+07	237Np	3.31E+06
125Sb	1.43E+09	238Pu	1.57E+07
126Sn	6.72E+06	238U	8.24E+04
129I	1.30E+04	239Pu	1.39E+08
134Cs	3.15E+06	240Pu	7.61E+06
137Cs	6.72E+10	241Am	4.03E+09
137mBa	3.28E+09	241Pu	9.85E+08
14C	2.91E+05	242Cm	1.62E+05
151Sm	4.48E+09	242Pu	1.44E+03
152Eu	2.15E+07	243Am	3.95E+04
154Eu	2.33E+09	243Cm	1.34E+08

Table 8 Estimated HLW Feed Concentrations

HLW Radionuclide Emissions Feed Vector			
Analyte	**Bq/mol Na**	**Analyte**	**Bq/mol Na**
155Eu	1.30E+09	244Cm	1.34E+08
226Ra	1.52E+02	3H	2.91E+06
227Ac	7.68E+05	59Ni	2.27E+06
228Ra	1.59E+05	60Co	4.48E+08
229Th	6.63E+03	63Ni	2.12E+08
231Pa	1.69E+06	79Se	1.26E+05
232Th	3.52E+04	90Sr	4.48E+11
232U	1.36E+05	90Y	3.71E+10
233U	4.03E+04	93mNb	4.92E+06
234U	1.47E+05	93Zr	5.46E+06
235U	1.12E+04	99Tc	6.72E+08

Table 9 Summary of Assumed Stack Concentrations for PICs

CAS Registry Number	PIC Grouping or Individual Constituent	Assumed Stack Concentration (a) (ug/dscm)
various	volatile organic PICs (38 constituents)	2
various	semi-volatile PICs (61 constituents)	15
various	polycyclic aromatic PICs (4 constituents)	3
	dioxins/furans (17 constituents)	see below
1746-01-6	2,3,7,8-Tetrachlorodibenzo(p)dioxin (TCDD)	9.4E-06
19408-74-3	1,2,3,7,8,9-Hexachlorodibenzo(p)dioxin	1.6E-05
3268-87-9	Octachlorodibenzo(p)dioxin	7.8E-05
35822-46-9	1,2,3,4,6,7,8-Heptachlorodibenzo(p)dioxin	3.1E-05
39001-02-0	Octachlorodibenzofuran	6.3E-05
39227-28-6	1,2,3,4,7,8-Hexachlorodibenzo(p)dioxin	1.6E-05
40321-76-4	1,2,3,7,8-Pentachlorodibenzo(p)dioxin	1.6E-05
51207-31-9	2,3,7,8-Tetrachlorodibenzofuran	7.8E-06
55673-89-7	1,2,3,4,7,8,9-Heptachlorodibenzofuran	1.6E-05
57117-31-4	2,3,4,7,8-Pentachlorodibenzofuran	7.8E-06
57117-41-6	1,2,3,7,8-Pentachlorodibenzofuran	7.8E-06
57117-44-9	1,2,3,6,7,8-Hexachlorodibenzofuran	1.3E-05
57653-85-7	1,2,3,6,7,8-Hexachlorodibenzo(p)dioxin	1.6E-05
60851-34-5	2,3,4,6,7,8-Hexachlorodibenzofuran	1.4E-05
67562-39-4	1,2,3,4,6,7,8-Heptachlorodibenzofuran	1.6E-05
70648-26-9	1,2,3,4,7,8-Hexachlorodibenzofuran	1.4E-05
72918-21-9	1,2,3,7,8,9-Hexachlorodibenzofuran	1.6E-05

(a) - stack concentrations are based upon historical laboratory testing performed in support of the WTP

Table 10 Pretreatment Emissions Analysis Equipment Decontamination Factors

Inorganic Constituents[1]	Symbol	Rep	Caustic Scrubber		HEME		Primary HEPA		Secondary HEPA		Thermal Oxidizer		Carbon Bed Adsorber		Demister	
			DF	Reference	DF	Reference	DF	Reference	DF	Reference	DF	Reference	DF	Reference	DF	Reference
Silver	Ag^{+}		3.3	A	200	D	2,000	E	100	E	1	n/a	1	n/a	5	F
Aluminum	Al^{+3}		3.3	A	200	D	2,000	E	100	E	1	n/a	1	n/a	5	F
Arsenic	As^{+3}		3.3	A	200	D	2,000	E	100	E	1	n/a	1	n/a	5	F
Boron	B^{+3}		3.3	A	200	D	2,000	E	100	E	1	n/a	1	n/a	5	F
Barium	Ba^{+2}		3.3	A	200	D	2,000	E	100	E	1	n/a	1	n/a	5	F
Bismuth	Bi^{+3}		3.3	A	200	D	2,000	E	100	E	1	n/a	1	n/a	5	F
Calcium	Ca^{+2}		3.3	A	200	D	2,000	E	100	E	1	n/a	1	n/a	5	F
Cadmium	Cd^{+2}		3.3	A	200	D	2,000	E	100	E	1	n/a	1	n/a	5	F
Chloride	Cl^{-}		3.3	A	200	D	2,000	E	100	E	1	n/a	1	n/a	5	F
Chromium (hexavalent)	Cr^{+3}		3.3	A	200	D	2,000	E	100	E	1	n/a	1	n/a	5	F
Copper	Cu^{+2}		3.3	A	200	D	2,000	E	100	E	1	n/a	1	n/a	5	F
Flouride	F^{-}		3.3	A	200	D	2,000	E	100	E	1	n/a	1	n/a	5	F
Iron	Fe^{+3}		3.3	A	200	D	2,000	E	100	E	1	n/a	1	n/a	5	F
Mercury	Hg^{+2}		1	n/a	1	n/a	1	n/a	1	n/a	1	n/a	1	n/a	1	n/a
Potassium	K^{+}		3.3	A	200	D	2,000	E	100	E	1	n/a	1	n/a	5	F
Lithium	Li^{+}		3.3	A	200	D	2,000	E	100	E	1	n/a	1	n/a	5	F
Magnesium	Mg^{+2}		3.3	A	200	D	2,000	E	100	E	1	n/a	1	n/a	5	F
Manganese	Mn^{+3}		3.3	A	200	D	2,000	E	100	E	1	n/a	1	n/a	5	F
Sodium	Na^{+}		3.3	A	200	D	2,000	E	100	E	1	n/a	1	n/a	5	F
Nickel	Ni^{+2}		3.3	A	200	D	2,000	E	100	E	1	n/a	1	n/a	5	F
Nitrite	NO_2^{-}		3.3	A	200	D	2,000	E	100	E	1	n/a	1	n/a	5	F
Nitrate	NO_3^{-}		3.3	A	200	D	2,000	E	100	E	1	n/a	1	n/a	5	F
Hydroxide	OH^{-}		3.3	A	200	D	2,000	E	100	E	1	n/a	1	n/a	5	F
Phosphorous	P^{+5}		3.3	A	200	D	2,000	E	100	E	1	n/a	1	n/a	5	F
Lead	Pb^{+2}		3.3	A	200	D	2,000	E	100	E	1	n/a	1	n/a	5	F
Phosphate	PO_4^{-3}		3.3	A	200	D	2,000	E	100	E	1	n/a	1	n/a	5	F
Total Sulfur	S^{+6}		3.3	A	200	D	2,000	E	100	E	1	n/a	1	n/a	5	F
Silicon	Si^{+4}		3.3	A	200	D	2,000	E	100	E	1	n/a	1	n/a	5	F
Sulfate	SO_4^{-2}		3.3	A	200	D	2,000	E	100	E	1	n/a	1	n/a	5	F
Strontium (total)	Sr^{+2}		3.3	A	200	D	2,000	E	100	E	1	n/a	1	n/a	5	F
Zinc	Zn^{+2}		3.3	A	200	D	2,000	E	100	E	1	n/a	1	n/a	5	F
Zirconium	Zr^{+4}		3.3	A	200	D	2,000	E	100	E	1	n/a	1	n/a	5	F
Beryllium	Be	Zr^{+4}	3.3	A	200	D	2,000	E	100	E	1	n/a	1	n/a	5	F
Cyanide	CN	PO_4^{-3}	3.3	A	200	D	2,000	E	100	E	1	n/a	1	n/a	5	F
Cobalt	Co	^{60}Co	3.3	A	200	D	2,000	E	100	E	1	n/a	1	n/a	5	F
Molybdenum	Mo	Bi^{+3}	3.3	A	200	D	2,000	E	100	E	1	n/a	1	n/a	5	F
Rhodium	Rh	Zr^{+4}	3.3	A	200	D	2,000	E	100	E	1	n/a	1	n/a	5	F
Antimony	Sb	^{125}Sb	3.3	A	200	D	2,000	E	100	E	1	n/a	1	n/a	5	F
Selenium	Se	F^{-}	3.3	A	200	D	2,000	E	100	E	1	n/a	1	n/a	5	F
Tin	Sn	^{126}Sn	3.3	A	200	D	2,000	E	100	E	1	n/a	1	n/a	5	F
Tantalum	Ta	Zr^{+4}	3.3	A	200	D	2,000	E	100	E	1	n/a	1	n/a	5	F
Thallium	Tl	F^{-}	3.3	A	200	D	2,000	E	100	E	1	n/a	1	n/a	5	F
Uranium	U	^{234}U	3.3	A	200	D	2,000	E	100	E	1	n/a	1	n/a	5	F
Vanadium	V	Bi^{+3}	3.3	A	200	D	2,000	E	100	E	1	n/a	1	n/a	5	F
Tungsten	W	Zr^{+4}	3.3	A	200	D	2,000	E	100	E	1	n/a	1	n/a	5	F
Yttrium	Y	^{90}Sr	3.3	A	200	D	2,000	E	100	E	1	n/a	1	n/a	5	F
Carbon monoxide	CO		1	n/a	1	n/a	1	n/a	1	n/a	1	n/a	1	n/a	1	n/a
Carbon dioxide	CO_2		1	n/a	1	n/a	1	n/a	1	n/a	1	n/a	1	n/a	1	n/a
Nitric oxide	NO		1.5	B	1	n/a	1	n/a	1	n/a	1	n/a	1	n/a	1	n/a
Nitrogen dioxide	NO_2		1.5	B	1	n/a	1	n/a	1	n/a	1	n/a	1	n/a	1	n/a
Sulfur dioxide	SO_2		3	C	1	n/a	1	n/a	1	n/a	1	n/a	1	n/a	1	n/a
Ammonia/Ammonium	NH_3		3	C	1	n/a	1	n/a	1	n/a	1	n/a	1	n/a	1	n/a

Table 10 Pretreatment Emissions Analysis Equipment Decontamination Factors

Radionuclide Constituents[2]	Symbol	Rep	Caustic Scrubber		HEME		Primary HEPA		Secondary HEPA		Thermal Oxidizer		Carbon Bed Adsorber		Demister	
			DF	Reference	DF	Reference	DF	Reference	DF	Reference	DF	Reference	DF	Reference	DF	Reference
Americium-241	^{241}Am		3.3	A	200	D	2,000	E	100	E	1	n/a	1	n/a	5	F
Carbon-14	^{14}C		1	n/a	1	n/a	1	n/a	1	n/a	1	n/a	1	n/a	1	n/a
Cobalt-60	^{60}Co		3.3	A	200	D	2,000	E	100	E	1	n/a	1	n/a	5	F
Curium-243	^{243}Cm		3.3	A	200	D	2,000	E	100	E	1	n/a	1	n/a	5	F
Curium-244	^{244}Cm		3.3	A	200	D	2,000	E	100	E	1	n/a	1	n/a	5	F
Cesium-137	^{137}Cs		3.3	A	200	D	2,000	E	100	E	1	n/a	1	n/a	5	F
Europium-152	^{152}Eu		3.3	A	200	D	2,000	E	100	E	1	n/a	1	n/a	5	F
Europium-154	^{154}Eu		3.3	A	200	D	2,000	E	100	E	1	n/a	1	n/a	5	F
Europium-155	^{155}Eu		3.3	A	200	D	2,000	E	100	E	1	n/a	1	n/a	5	F
Tritium	^{3}H		1	n/a	1	n/a	1	n/a	1	n/a	1	n/a	1	n/a	1	n/a
Iodine-129	^{129}I		3.3	A	1	n/a	1	n/a	1	n/a	1	n/a	1	n/a	1	n/a
Nickel-63	^{63}Ni		3.3	A	200	D	2,000	E	100	E	1	n/a	1	n/a	5	F
Neptunium-237	^{237}Np		3.3	A	200	D	2,000	E	100	E	1	n/a	1	n/a	5	F
Plutonium-238	^{238}Pu		3.3	A	200	D	2,000	E	100	E	1	n/a	1	n/a	5	F
Plutonium-239	^{239}Pu		3.3	A	200	D	2,000	E	100	E	1	n/a	1	n/a	5	F
Plutonium-240	^{240}Pu		3.3	A	200	D	2,000	E	100	E	1	n/a	1	n/a	5	F
Plutonium-241	^{241}Pu		3.3	A	200	D	2,000	E	100	E	1	n/a	1	n/a	5	F
Antimony-125	^{125}Sb		3.3	A	200	D	2,000	E	100	E	1	n/a	1	n/a	5	F
Samarium-151	^{151}Sm		3.3	A	200	D	2,000	E	100	E	1	n/a	1	n/a	5	F
Tin-126	^{126}Sn		3.3	A	200	D	2,000	E	100	E	1	n/a	1	n/a	5	F
Strontium-90	^{90}Sr		3.3	A	200	D	2,000	E	100	E	1	n/a	1	n/a	5	F
Technetium-99	^{99}Tc		3.3	A	200	D	2,000	E	100	E	1	n/a	1	n/a	5	F
Thorium-232	^{232}Th		3.3	A	200	D	2,000	E	100	E	1	n/a	1	n/a	5	F
Uranium-233	^{233}U		3.3	A	200	D	2,000	E	100	E	1	n/a	1	n/a	5	F
Uranium-234	^{234}U		3.3	A	200	D	2,000	E	100	E	1	n/a	1	n/a	5	F
Uranium-235	^{235}U		3.3	A	200	D	2,000	E	100	E	1	n/a	1	n/a	5	F
Uranium-236	^{236}U		3.3	A	200	D	2,000	E	100	E	1	n/a	1	n/a	5	F
Uranium-238	^{238}U		3.3	A	200	D	2,000	E	100	E	1	n/a	1	n/a	5	F
Yttrium-90	^{90}Y	^{90}Sr	3.3	A	200	D	2,000	E	100	E	1	n/a	1	n/a	5	F
Ruthenium-106	^{106}Ru	F^-	3.3	A	200	D	2,000	E	100	E	1	n/a	1	n/a	5	F
Cesium-134	^{134}Cs	^{137}Cs	3.3	A	200	D	2,000	E	100	E	1	n/a	1	n/a	5	F
Barium-137m	^{137}mBa	^{137}Cs	3.3	A	200	D	2,000	E	100	E	1	n/a	1	n/a	5	F
Plutonium-242	^{242}Pu	^{241}Pu	3.3	A	200	D	2,000	E	100	E	1	n/a	1	n/a	5	F
Radium-226	^{226}Ra	Zr^{+4}	3.3	A	200	D	2,000	E	100	E	1	n/a	1	n/a	5	F
Uranium-232	^{232}U	^{233}U	3.3	A	200	D	2,000	E	100	E	1	n/a	1	n/a	5	F
Protactinium-231	^{231}Pa	Zr^{+4}	3.3	A	200	D	2,000	E	100	E	1	n/a	1	n/a	5	F
Nickel-59	^{59}Ni	^{63}Ni	3.3	A	200	D	2,000	E	100	E	1	n/a	1	n/a	5	F
Actinium-227	^{227}Ac	Zr^{+4}	3.3	A	200	D	2,000	E	100	E	1	n/a	1	n/a	5	F
Americium-243	^{243}Am	^{241}Am	3.3	A	200	D	2,000	E	100	E	1	n/a	1	n/a	5	F
Radium-228	^{228}Ra	Zr^{+4}	3.3	A	200	D	2,000	E	100	E	1	n/a	1	n/a	5	F
Curium-242	^{242}Cm	^{243}Cm	3.3	A	200	D	2,000	E	100	E	1	n/a	1	n/a	5	F
Thorium-229	^{229}Th	^{232}Th	3.3	A	200	D	2,000	E	100	E	1	n/a	1	n/a	5	F
Zirconium-93	^{93}Zr	Zr^{+4}	3.3	A	200	D	2,000	E	100	E	1	n/a	1	n/a	5	F
Niobium-93m	^{93}mNb	Zr^{+4}	3.3	A	200	D	2,000	E	100	E	1	n/a	1	n/a	5	F
Cadmium-113m	^{113}mCd	Cd^{+2}	3.3	A	200	D	2,000	E	100	E	1	n/a	1	n/a	5	F
Selenium-79	^{79}Se	F^-	3.3	A	200	D	2,000	E	100	E	1	n/a	1	n/a	5	F

Notes:

1 – Mercury in the Pretreatment offgas is assumed to be in the vapor phase

2 – ^{3}H and ^{14}C are assumed to have the same DF as water and CO_2, respectively; therefore, a DF of 1 has been specificed for these constituents

A – Recommended particulate DF for low energy wet scrubber, Lane Regional Air Pollution Authority (LRAPA), *Rules and Regulations: Title 35, Major Source Interim Emission Fee Rules*, Section 35-065, http://www.lrapa.org/rules/title35.htm

B – Recommended NOx DF, *Sizing of PT Vessel Vent Caustic Scrubber PVP-SCB-00002*, calculation 24590-PTF-MVC-PVP-00012, Rev. A

C – Assumption

D – Recommended particulate DF, *PT Vessel Vents HEME Sizing - (System PT-540)*, calculation CALC-W375PT-PR00100, Rev. 2

E – Emissions particulate DF, *Best Available Radionuclide Control Technology Analysis for the WTP*, 24590-WTP-RPT-ENV-01-004, Rev. 1

F – Tables 2.14-2 – 3, *Flowsheet Bases, Assumptions, and Requirements*, 24590-WTP-RPT-PT-02-005, Rev. 1

n/a – No removal is expected for this constituent

Table 11 Summary of Offgas Treatment Equipment DFs for Organic COPCs

CAS Registry Number	Compound	Phase	PT HEME	PT Thermal Oxidizer	PT Caustic Scrubber	PT Carbon Bed Adsorber	PT PJM/RFD Demister	HLW & LAW Melters	HLW & LAW Submerged Bed Scrubber	HLW & LAW WESP	HLW HEME	LAW Caustic Scrubber	All HEPAs (First)	All HEPAs (Second)	HLW & LAW Thermal Catalytic Oxidizer
100-00-5	p-Nitrochlorobenzene	vapor	1	10000	1	5	1	1.1	1	1	1	1	1	1	20
100-21-0	p-Phthalic acid	vapor	1	20	1	50	1	1.1	1	1	1	1	1	1	20
100-25-4	1,4-Dinitrobenzene	vapor	1	10000	1	5	1	1.1	1	1	1	1	1	1	20
100-41-4	Ethyl benzene	vapor	1	10000	1	1	1	1.1	1	1	1	1	1	1	20
100-42-5	Styrene	vapor	1	10000	1	1	1	1.1	1	1	1	1	1	1	20
10061-01-5	cis-1,3-Dichloropropene	vapor	1	100	1	1	1	1.1	1	1	1	1	1	1	20
10061-02-6	trans-1,3-Dichloropropene	vapor	1	50	1	1	1	1.1	1	1	1	1	1	1	20
101-55-3	4-Bromophenylphenyl ether	vapor	1	3.33333333	1	50	1	1.1	1	1	1	1	1	1	20
101-84-8	Diphenyl ether	vapor	1	50	1	5	1	1.1	1	1	1	1	1	1	20
106-35-4	3-Heptanone	vapor	1	10000	1	1	1	1.1	1	1	1	1	1	1	20
106-42-3	p-Xylene (Dimethyl benzene)	vapor	1	1000	1	1	1	1.1	1	1	1	1	1	1	20
106-46-7	1,4-Dichlorobenzene	vapor	1	50	1	2	1	1.1	1	1	1	1	1	1	20
106-88-7	1,2-Epoxybutane	vapor	1	10000	1	1	1	1.1	1	1	1	1	1	1	20
106-93-4	Ethylene dibromide (Dibromethane)	vapor	1	1	1	10	1	1.1	1	1	1	1	1	1	20
106-97-8	Butane	vapor	1	10000	1	1	1	1.1	1	1	1	1	1	1	20
106-99-0	1,3-Butadiene	vapor	1	10000	1	1	1	1.1	1	1	1	1	1	1	20
107-02-8	Acrolein	vapor	1	10000	1	1	1	1.1	1	1	1	1	1	1	20
107-05-1	3-Chloropropene (Allyl chloride)	vapor	1	10000	1	1	1	1.1	1	1	1	1	1	1	20
107-06-2	1,2-Dichloroethane (Ethylene chloride)	vapor	1	10000	1	1	1	1.1	1	1	1	1	1	1	20
107-12-0	Propionitrile	vapor	1	1000	1	1	1	1.1	1	1	1	1	1	1	20
107-13-1	Acrylonitrile	vapor	1	10000	1	1	1	1.1	1	1	1	1	1	1	20
107-18-6	2-Propene-1-ol	vapor	1	10000	1	1	1	1.1	1	1	1	1	1	1	20
107-31-3	Formic acid, methyl ester	vapor	1	10000	1	1	1	1.1	1	1	1	1	1	1	20
107-66-4	Dibutylphosphate	vapor	1	1000	1	1	1	1.1	1	1	1	1	1	1	20
107-87-9	2-Pentanone	vapor	1	10000	1	1	1	1.1	1	1	1	1	1	1	20
108-03-2	1-Nitropropane	vapor	1	10000	1	1	1	1.1	1	1	1	1	1	1	20
108-05-4	Vinyl acetate	vapor	1	10000	1	1	1	1.1	1	1	1	1	1	1	20
108-10-1	Hexone (4-Methyl-2-pentanone or MIBK)	vapor	1	10000	1	1	1	1.1	1	1	1	1	1	1	20
108-20-3	Bis(isopropyl)ether	vapor	1	10000	1	1	1	1.1	1	1	1	1	1	1	20
108-38-3	m-Xylene (Dimethyl benzene)	vapor	1	1000	1	1	1	1.1	1	1	1	1	1	1	20
108-39-4	m-Cresol	vapor	1	1000	1	2	1	1.1	1	1	1	1	1	1	20
108-87-2	Methylcyclohexane	vapor	1	10000	1	1	1	1.1	1	1	1	1	1	1	20
108-88-3	Toluene	vapor	1	10000	1	1	1	1.1	1	1	1	1	1	1	20
108-90-7	Chlorobenzene	vapor	1	20	1	5	1	1.1	1	1	1	1	1	1	20
108-93-0	Cyclohexanol	vapor	1	10000	1	2	1	1.1	1	1	1	1	1	1	20
108-94-1	Cyclohexanone	vapor	1	10000	1	2	1	1.1	1	1	1	1	1	1	20
108-95-2	Phenol	vapor	1	20	1	20	1	1.1	1	1	1	1	1	1	20
109-66-0	n-Pentane	vapor	1	10000	1	1	1	1.1	1	1	1	1	1	1	20
109-99-9	Tetrahydrofuran	vapor	1	10000	1	1	1	1.1	1	1	1	1	1	1	20
110-12-3	5-Methyl-2-hexanone	vapor	1	10000	1	1	1	1.1	1	1	1	1	1	1	20
110-43-0	2-Heptanone	vapor	1	10000	1	1	1	1.1	1	1	1	1	1	1	20
110-54-3	n-Hexane	vapor	1	10000	1	1	1	1.1	1	1	1	1	1	1	20
110-62-3	n-Valeraldehyde	vapor	1	10000	1	1	1	1.1	1	1	1	1	1	1	20
110-82-7	Cyclohexane	vapor	1	10000	1	1	1	1.1	1	1	1	1	1	1	20
110-83-8	Cyclohexene	vapor	1	10000	1	1	1	1.1	1	1	1	1	1	1	20
110-86-1	Pyridine	vapor	1	10000	1	1	1	1.1	1	1	1	1	1	1	20
111-65-9	n-Octane	vapor	1	10000	1	1	1	1.1	1	1	1	1	1	1	20
111-76-2	Ethylene glycol monobutyl ether	vapor	1	10000	1	2	1	1.1	1	1	1	1	1	1	20
111-84-2	n-Nonane	vapor	1	10000	1	2	1	1.1	1	1	1	1	1	1	20
117-81-7	Bis(2-ethylhexyl)phthalate (DEHP)	particle-bound	200	10000	3.3	5	5	1.1	40	11	90	1	2000	100	20
117-84-0	n-Dioctyl phthalate	particle-bound	200	10000	3.3	5	5	1.1	40	11	90	1	2000	100	20
118-74-1	Hexachlorobenzene	vapor	1	3.33333333	1	50	1	1.1	1	1	1	1	1	1	20

Table 11 Summary of Offgas Treatment Equipment DFs for Organic COPCs

CAS Registry Number	Compound	Phase	PT HEME	PT Thermal Oxidizer	PT Caustic Scrubber	PT Carbon Bed Adsorber	PT PJM/RFD Demister	HLW & LAW Melters	HLW & LAW Submerged Bed Scrubber	HLW & LAW WESP	HLW HEME	LAW Caustic Scrubber	All HEPAs (First)	All HEPAs (Second)	HLW & LAW Thermal Catalytic Oxidizer
120-12-7	Anthracene	vapor	1	1000	1	5	1	1.1	1	1	1	1	1	1	20
120-82-1	1,2,4-Trichlorobenzene	vapor	1	100	1	5	1	1.1	1	1	1	1	1	1	20
120-83-2	2,4-Dichlorophenol	vapor	1	3.33333333	1	50	1	1.1	1	1	1	1	1	1	20
121-44-8	Triethylamine	vapor	1	10000	1	1	1	1.1	1	1	1	1	1	1	20
121-69-7	Dimethylaniline	vapor	1	10000	1	2	1	1.1	1	1	1	1	1	1	20
122-39-4	N,N-Diphenylamine	vapor	1	50	1	5	1	1.1	1	1	1	1	1	1	20
123-19-3	4-Heptanone	vapor	1	10000	1	1	1	1.1	1	1	1	1	1	1	20
123-38-6	n-Propionaldehyde	vapor	1	10000	1	1	1	1.1	1	1	1	1	1	1	20
123-51-3	3-Methyl-1-butanol	vapor	1	10000	1	1	1	1.1	1	1	1	1	1	1	20
123-86-4	Acetic acid n-butyl ester	vapor	1	10000	1	1	1	1.1	1	1	1	1	1	1	20
123-91-1	1,4-Dioxane	vapor	1	10000	1	1	1	1.1	1	1	1	1	1	1	20
126-73-8	Tributyl phosphate	vapor	1	10000	1	5	1	1.1	1	1	1	1	1	1	20
126-98-7	2-Methyl-2-propenenitrile (Methacrylonitrile)	vapor	1	10000	1	1	1	1.1	1	1	1	1	1	1	20
127-18-4	Perchloroethylene (tetrachloroethylene)	vapor	1	1	1	10	1	1.1	1	1	1	1	1	1	20
127-19-5	N,N-Dimethylacetamide	vapor	1	10000	1	2	1	1.1	1	1	1	1	1	1	20
128-37-0	2,6-Bis(tert-butyl)-4-methylphenol	particle-bound	200	10000	3.3	5	5	1.1	40	11	90	1	2000	100	20
129-00-0	Pyrene	particle-bound	200	3.33333333	3.3	50	5	1.1	40	11	90	1	2000	100	20
1321-64-8	Pentachloronaphthalene	particle-bound	200	3.33333333	3.3	50	5	1.1	40	11	90	1	2000	100	20
1321-65-9	Trichloronaphthalene	particle-bound	200	3.33333333	3.3	50	5	1.1	40	11	90	1	2000	100	20
132-64-9	Dibenzofuran	vapor	1	3.33333333	1	50	1	1.1	1	1	1	1	1	1	20
1335-87-1	Hexachloronaphthalene	particle-bound	200	3.33333333	3.3	50	5	1.1	40	11	90	1	2000	100	20
1335-88-2	Tetrachloronaphthalene	particle-bound	200	3.33333333	3.3	50	5	1.1	40	11	90	1	2000	100	20
1336-36-3	Polychlorinated biphenyls (PCBs)	particle-bound	200	3.33333333	3.3	50	5	1.1	40	11	90	1	2000	100	20
141-78-6	Acetic acid ethyl ester (Ethyl acetate)	vapor	1	10000	1	1	1	1.1	1	1	1	1	1	1	20
141-79-7	4-Methyl-3-penten-2-one	vapor	1	10000	1	1	1	1.1	1	1	1	1	1	1	20
142-82-5	n-Heptane	vapor	1	10000	1	1	1	1.1	1	1	1	1	1	1	20
144-62-7	Oxalic acid	vapor	1	10	1	20	1	1.1	1	1	1	1	1	1	20
156-60-5	trans-1,2-Dichloroethylene	vapor	1	10000	1	1	1	1.1	1	1	1	1	1	1	20
1582-09-8	Trifluralin	particle-bound	200	10000	3.3	1	5	1.1	40	11	90	1	2000	100	20
1634-04-4	Methyl tert-butyl ether	vapor	1	10000	1	1	1	1.1	1	1	1	1	1	1	20
1836-75-5	Nitrofen	particle-bound	200	3.33333333	3.3	50	5	1.1	40	11	90	1	2000	100	20
189-55-9	Dibenzo[a,i]pyrene	particle-bound	200	3.33333333	3.3	50	5	1.1	40	11	90	1	2000	100	20
189-64-0	Dibenzo[a,h]pyrene	particle-bound	200	3.33333333	3.3	50	5	1.1	40	11	90	1	2000	100	20
191-24-2	Benzo(g,h,i)perylene	particle-bound	200	3.33333333	3.3	50	5	1.1	40	11	90	1	2000	100	20
191-30-0	Benzo[a,i]pyrene	particle-bound	200	3.33333333	3.3	50	5	1.1	40	11	90	1	2000	100	20
192-65-4	Dibenzo[a,e]pyrene	particle-bound	200	3.33333333	3.3	50	5	1.1	40	11	90	1	2000	100	20
193-39-5	Indeno(1,2,3-cd)pyrene	particle	200	3.33333333	3.3	50	5	1.1	40	11	90	1	2000	100	20
205-82-3	Benzo(j)fluoranthene	particle-bound	200	3.33333333	3.3	50	5	1.1	40	11	90	1	2000	100	20
205-99-2	Benzo(b)fluoranthene	particle-bound	200	3.33333333	3.3	50	5	1.1	40	11	90	1	2000	100	20
206-44-0	Fluoranthene	particle-bound	200	3.33333333	3.3	50	5	1.1	40	11	90	1	2000	100	20
207-08-9	Benzo(k)fluoranthene	particle-bound	200	3.33333333	3.3	50	5	1.1	40	11	90	1	2000	100	20
208-96-8	Acenaphthylene	vapor	1	3.33333333	1	50	1	1.1	1	1	1	1	1	1	20
218-01-9	Chrysene	particle-bound	200	3.33333333	3.3	50	5	1.1	40	11	90	1	2000	100	20
2234-13-1	Octachloronaphthalene	particle-bound	200	3.33333333	3.3	50	5	1.1	40	11	90	1	2000	100	20
224-42-0	Dibenz[a,j]acridine	particle-bound	200	3.33333333	3.3	50	5	1.1	40	11	90	1	2000	100	20
226-36-8	Dibenz[a,h]acridine	particle-bound	200	3.33333333	3.3	50	5	1.1	40	11	90	1	2000	100	20
2385-85-5	Mirex	particle-bound	200	3.33333333	3.3	50	5	1.1	40	11	90	1	2000	100	20
25551-13-7	Trimethyl benzene	vapor	1	1000	1	2	1	1.1	1	1	1	1	1	1	20
26140-60-3	Terphenyls	particle-bound	200	3.33333333	3.3	50	5	1.1	40	11	90	1	2000	100	20
27154-33-2	Trichlorofluoroethane	vapor	1	1	1	10	1	1.1	1	1	1	1	1	1	20
287-92-3	Cyclopentane	vapor	1	10000	1	1	1	1.1	1	1	1	1	1	1	20
309-00-2	Aldrin	particle-bound	200	3.33333333	3.3	10	5	1.1	40	11	90	1	2000	100	20

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319-84-6	Hexachlorocyclohexane (Lindane) Alpha BHC	particle-bound	200	3.33333333	3.3	50	5	1.1	40	11	90	1	2000	100	20
319-85-7	Hexachlorocyclohexane (Lindane) Beta BHC	particle-bound	200	3.33333333	3.3	50	5	1.1	40	11	90	1	2000	100	20
319-86-8	Delta-BHC	particle-bound	200	3.33333333	3.3	50	5	1.1	40	11	90	1	2000	100	20
3697-24-3	5-Methylchrysene	particle-bound	200	3.33333333	3.3	50	5	1.1	40	11	90	1	2000	100	20
3825-26-1	Ammonium perfluorooctanoate	particle-bound	200	3.33333333	3.3	50	5	1.1	40	11	90	1	2000	100	20
4170-30-3	2-Butenaldehyde (2-Butenal)	vapor	1	10000	1	1	1	1.1	1	1	1	1	1	1	20
465-73-6	Isodrin	particle-bound	200	3.33333333	3.3	50	5	1.1	40	11	90	1	2000	100	20
50-00-0	Formaldehyde	vapor	1	10000	1	1	1	1.1	1	1	1	1	1	1	20
50-29-3	4,4-DDT	particle-bound	200	3.33333333	3.3	50	5	1.1	40	11	90	1	2000	100	20
50-32-8	Benzo(a)pyrene	particle-bound	200	3.33333333	3.3	50	5	1.1	40	11	90	1	2000	100	20
53-70-3	Dibenzo(a,h)anthracene	particle	200	3.33333333	3.3	50	5	1.1	40	11	90	1	2000	100	20
540-59-0	1,2-Dichloroethylene	vapor	1	10000	1	1	1	1.1	1	1	1	1	1	1	20
540-84-1	2,2,4-Trimethylpentane	vapor	1	10000	1	1	1	1.1	1	1	1	1	1	1	20
541-73-1	1,3-Dichlorobenzene	vapor	1	50	1	2	1	1.1	1	1	1	1	1	1	20
56-23-5	Carbon tetrachloride	vapor	1	1	1	5	1	1.1	1	1	1	1	1	1	20
563-80-4	3-Methyl-2-butanone	vapor	1	10000	1	1	1	1.1	1	1	1	1	1	1	20
56-49-5	3-Methylcholanthrene	particle-bound	200	3.33333333	3.3	50	5	1.1	40	11	90	1	2000	100	20
56-55-3	Benzo(a)anthracene	particle-bound	200	3.33333333	3.3	50	5	1.1	40	11	90	1	2000	100	20
57-14-7	1,1-Dimethylhydrazine	vapor	1	10000	1	1	1	1.1	1	1	1	1	1	1	20
58-89-9	gamma-BHC (Lindane)	particle-bound	200	3.33333333	3.3	50	5	1.1	40	11	90	1	2000	100	20
58-90-2	2,3,4,6-Tetrachlorophenol	vapor	1	3.33333333	1	10	1	1.1	1	1	1	1	1	1	20
591-78-6	2-Hexanone	vapor	1	1000	1	1	1	1.1	1	1	1	1	1	1	20
59-50-7	4-Chloro-3-methylphenol	particle-bound	200	3.33333333	3.3	20	5	1.1	40	11	90	1	2000	100	20
59-89-2	N-Nitrosomorpholine	vapor	1	10000	1	2	1	1.1	1	1	1	1	1	1	20
602-87-9	5-Nitroacenaphthene	vapor	1	3.33333333	1	50	1	1.1	1	1	1	1	1	1	20
60-29-7	Ethyl ether	vapor	1	10000	1	1	1	1.1	1	1	1	1	1	1	20
603-34-9	Triphenylamine	vapor	1	3.33333333	1	50	1	1.1	1	1	1	1	1	1	20
60-34-4	Methylhydrazine	vapor	1	10000	1	1	1	1.1	1	1	1	1	1	1	20
60-35-5	Acetamide	vapor	1	10000	1	2	1	1.1	1	1	1	1	1	1	20
60-57-1	Dieldrin	particle-bound	200	3.33333333	3.3	50	5	1.1	40	11	90	1	2000	100	20
621-64-7	Di-n-Propylnitrosamine	vapor	1	10000	1	2	1	1.1	1	1	1	1	1	1	20
624-83-9	Methyl isocyanate	vapor	1	1000	1	1	1	1.1	1	1	1	1	1	1	20
627-13-4	Nitric acid, propyl ester	vapor	1	10000	1	1	1	1.1	1	1	1	1	1	1	20
62-75-9	N-Nitroso-N,N-dimethylamine	vapor	1	10000	1	1	1	1.1	1	1	1	1	1	1	20
630-20-6	1,1,1,2-Tetrachloroethane	vapor	1	1	1	10	1	1.1	1	1	1	1	1	1	20
64-17-5	Ethyl alcohol	vapor	1	10000	1	1	1	1.1	1	1	1	1	1	1	20
64-18-6	Formic acid	vapor	1	10000	1	1	1	1.1	1	1	1	1	1	1	20
64-19-7	Acetic acid	vapor	1	10000	1	1	1	1.1	1	1	1	1	1	1	20
67-56-1	Methyl alcohol (Methanol)	vapor	1	10000	1	1	1	1.1	1	1	1	1	1	1	20
67-63-0	2-Propyl alcohol (Isopropanol)	vapor	1	10000	1	1	1	1.1	1	1	1	1	1	1	20
67-64-1	2-Propanone (Acetone)	vapor	1	10000	1	1	1	1.1	1	1	1	1	1	1	20
67-66-3	Chloroform	vapor	1	1	1	2	1	1.1	1	1	1	1	1	1	20
67-72-1	Hexachloroethane	vapor	1	1	1	50	1	1.1	1	1	1	1	1	1	20
684-16-2	Hexafluoroacetone	vapor	1	1	1	1	1	1.1	1	1	1	1	1	1	20
71-23-8	n-Propyl alcohol	vapor	1	10000	1	1	1	1.1	1	1	1	1	1	1	20
71-36-3	n-Butyl alcohol	vapor	1	10000	1	1	1	1.1	1	1	1	1	1	1	20
71-43-2	Benzene	vapor	1	100	1	1	1	1.1	1	1	1	1	1	1	20
71-55-6	Methyl chloroform (1,1,1-Trichloroethane)	vapor	1	1000	1	1	1	1.1	1	1	1	1	1	1	20
72-20-8	Endrin	particle-bound	200	3.33333333	3.3	50	5	1.1	40	11	90	1	2000	100	20
72-43-5	Methoxychlor	particle-bound	200	3.33333333	3.3	50	5	1.1	40	11	90	1	2000	100	20
72-54-8	4,4-DDD	particle-bound	200	3.33333333	3.3	50	5	1.1	40	11	90	1	2000	100	20
72-55-9	4,4-DDE	particle-bound	200	3.33333333	3.3	50	5	1.1	40	11	90	1	2000	100	20

Table 11 Summary of Offgas Treatment Equipment DFs for Organic COPCs

CAS Registry Number	Compound	Phase	PT HEME	PT Thermal Oxidizer	PT Caustic Scrubber	PT Carbon Bed Adsorber	PT PJM/RFD Demister	HLW & LAW Melters	HLW & LAW Submerged Bed Scrubber	HLW & LAW WESP	HLW HEME	LAW Caustic Scrubber	All HEPAs (First)	All HEPAs (Second)	HLW & LAW Thermal Catalytic Oxidizer
74-83-9	Bromomethane (Methyl bromide)	vapor	1	1000	1	1	1	1.1	1	1	1	1	1	1	20
74-87-3	Chloromethane (Methyl chloride)	vapor	1	20	1	1	1	1.1	1	1	1	1	1	1	20
74-97-5	Bromochloromethane	vapor	1	1	1	2	1	1.1	1	1	1	1	1	1	20
74-99-7	Methylacetylene	vapor	1	10000	1	1	1	1.1	1	1	1	1	1	1	20
75-00-3	Chloroethane	vapor	1	1000	1	1	1	1.1	1	1	1	1	1	1	20
75-01-4	Vinyl chloride (1-Chloroethene)	vapor	1	10000	1	1	1	1.1	1	1	1	1	1	1	20
75-05-8	Acetonitrile	vapor	1	1000	1	1	1	1.1	1	1	1	1	1	1	20
75-07-0	Acetaldehyde	vapor	1	10000	1	1	1	1.1	1	1	1	1	1	1	20
75-09-2	Dichloromethane (Methylene chloride)	vapor	1	50	1	1	1	1.1	1	1	1	1	1	1	20
75-12-7	Formamide	vapor	1	10000	1	1	1	1.1	1	1	1	1	1	1	20
75-15-0	Carbon disulfide	vapor	1	10000	1	1	1	1.1	1	1	1	1	1	1	20
75-21-8	Ethylene oxide (Oxirane)	vapor	1	10000	1	1	1	1.1	1	1	1	1	1	1	20
75-27-4	Bromodichloromethane	vapor	1	1	1	5	1	1.1	1	1	1	1	1	1	20
75-34-3	1,1-Dichloroethane	vapor	1	10000	1	1	1	1.1	1	1	1	1	1	1	20
75-35-4	1,1-Dichloroethene (Vinylidene chloride)	vapor	1	10000	1	1	1	1.1	1	1	1	1	1	1	20
75-43-4	Dichlorofluoromethane	vapor	1	1000	1	1	1	1.1	1	1	1	1	1	1	20
75-45-6	Chlorodifluoromethane	vapor	1	50	1	1	1	1.1	1	1	1	1	1	1	20
75-50-3	Trimethylamine	vapor	1	10000	1	1	1	1.1	1	1	1	1	1	1	20
75-52-5	Nitromethane	vapor	1	10000	1	1	1	1.1	1	1	1	1	1	1	20
75-55-8	2-Methylaziridine	vapor	1	10000	1	1	1	1.1	1	1	1	1	1	1	20
75-61-6	Difluorodibromomethane	vapor	1	1	1	1	1	1.1	1	1	1	1	1	1	20
75-63-8	Trifluorobromomethane	vapor	1	1	1	1	1	1.1	1	1	1	1	1	1	20
75-65-0	2-Methyl-2-propanol	vapor	1	10000	1	1	1	1.1	1	1	1	1	1	1	20
75-69-4	Trichlorofluoromethane	vapor	1	1	1	1	1	1.1	1	1	1	1	1	1	20
75-71-8	Dichlorodifluoromethane	vapor	1	1	1	1	1	1.1	1	1	1	1	1	1	20
75-99-0	2,2-Dichloropropionic acid	vapor	1	100	1	2	1	1.1	1	1	1	1	1	1	20
76-03-9	Trichloroacetic acid	vapor	1	1	1	50	1	1.1	1	1	1	1	1	1	20
76-11-9	1,1,1,2-Tetrachloro-2,2-difluoroethane	vapor	1	20	1	5	1	1.1	1	1	1	1	1	1	20
76-12-0	1,1,2,2-Tetrachloro-1,2-difluoroethane	vapor	1	20	1	5	1	1.1	1	1	1	1	1	1	20
76-13-1	1,2,2-Trichloro-1,1,2-trifluoroethane (Freon 113)	vapor	1	20	1	2	1	1.1	1	1	1	1	1	1	20
76-14-2	1,2-Dichloro-1,1,2,2-tetrafluoroethane	vapor	1	1	1	1	1	1.1	1	1	1	1	1	1	20
76-15-3	Chloropentafluoroethane	vapor	1	1	1	1	1	1.1	1	1	1	1	1	1	20
76-44-8	Heptachlor	vapor	1	3.33333333	1	10	1	1.1	1	1	1	1	1	1	20
78-83-1	2-Methylpropyl alcohol (Isobutyl alcohol)	vapor	1	10000	1	1	1	1.1	1	1	1	1	1	1	20
78-87-5	1,2-Dichloropropane	vapor	1	1000	1	1	1	1.1	1	1	1	1	1	1	20
78-92-2	1-Methylpropyl alcohol (2-Butanol)	vapor	1	10000	1	1	1	1.1	1	1	1	1	1	1	20
78-93-3	Methyl ethyl ketone (MEK, 2-Butanone)	vapor	1	1000	1	1	1	1.1	1	1	1	1	1	1	20
79-00-5	1,1,2-Trichloroethane	vapor	1	10000	1	1	1	1.1	1	1	1	1	1	1	20
79-01-6	Trichloroethylene	vapor	1	10000	1	1	1	1.1	1	1	1	1	1	1	20
79-09-4	Propionic acid	vapor	1	10000	1	1	1	1.1	1	1	1	1	1	1	20
79-10-7	2-Propenoic acid	vapor	1	10000	1	1	1	1.1	1	1	1	1	1	1	20
79-20-9	Methyl acetate	vapor	1	10000	1	1	1	1.1	1	1	1	1	1	1	20
79-34-5	1,1,2,2-Tetrachloroethane	vapor	1	1	1	10	1	1.1	1	1	1	1	1	1	20
8001-35-2	Toxaphene	particle-bound	200	3.33333333	3.3	50	5	1.1	40	11	90	1	2000	100	20
82-68-8	Pentachloronitrobenzene (PCBN)	vapor	1	3.33333333	1	50	1	1.1	1	1	1	1	1	1	20
83-32-9	Acenaphthene	vapor	1	3.33333333	1	50	1	1.1	1	1	1	1	1	1	20
84-66-2	Diethyl phthalate	vapor	1	10000	1	5	1	1.1	1	1	1	1	1	1	20
84-74-2	Dibutyl phthalate	particle-bound	200	10000	3.3	5	5	1.1	40	11	90	1	2000	100	20
85-01-8	Phenanthrene	vapor	1	3.33333333	1	50	1	1.1	1	1	1	1	1	1	20
85-68-7	Butylbenzyl phthalate	particle-bound	200	10000	3.3	5	5	1.1	40	11	90	1	2000	100	20
86-73-7	Fluorene	particle-bound	200	3.33333333	3.3	50	5	1.1	40	11	90	1	2000	100	20
87-68-3	Hexachlorobutadiene	vapor	1	50	1	5	1	1.1	1	1	1	1	1	1	20

Table 11 Summary of Offgas Treatment Equipment DFs for Organic COPCs

CAS Registry Number	Compound	Phase	PT HEME	PT Thermal Oxidizer	PT Caustic Scrubber	PT Carbon Bed Adsorber	PT PJM/RFD Demister	HLW & LAW Melters	HLW & LAW Submerged Bed Scrubber	HLW & LAW WESP	HLW HEME	LAW Caustic Scrubber	All HEPAs (First)	All HEPAs (Second)	HLW & LAW Thermal Catalytic Oxidizer
87-86-5	Pentachlorophenol	vapor	1	3.33333333	1	50	1	1.1	1	1	1	1	1	1	20
88-06-2	2,4,6-Trichlorophenol	vapor	1	3.33333333	1	50	1	1.1	1	1	1	1	1	1	20
88-72-2	2-Nitrotoluene	vapor	1	10000	1	2	1	1.1	1	1	1	1	1	1	20
88-75-5	2-Nitrophenol	vapor	1	3.33333333	1	20	1	1.1	1	1	1	1	1	1	20
88-85-7	2-sec-Butyl-4,6-dinitrophenol (Dinoseb)	particle-bound	200	3.33333333	3.3	50	5	1.1	40	11	90	1	2000	100	20
88-89-1	Picric acid	particle-bound	200	10000	3.3	5	5	1.1	40	11	90	1	2000	100	20
91-20-3	Naphthalene	vapor	1	1000	1	2	1	1.1	1	1	1	1	1	1	20
91-22-5	Quinoline	vapor	1	10000	1	2	1	1.1	1	1	1	1	1	1	20
91-58-7	2-Chloronapthalene	vapor	1	3.33333333	1	50	1	1.1	1	1	1	1	1	1	20
92-52-4	1,1`-Biphenyl	vapor	1	1000	1	5	1	1.1	1	1	1	1	1	1	20
92-93-3	4-Nitrobiphenyl	vapor	1	3.33333333	1	50	1	1.1	1	1	1	1	1	1	20
93-72-1	Silvex (2,4,5-TP)	particle-bound	200	3.33333333	3.3	50	5	1.1	40	11	90	1	2000	100	20
93-76-5	2,4,5-T	particle-bound	200	3.33333333	3.3	50	5	1.1	40	11	90	1	2000	100	20
94-75-7	2,4-D and esters (160C typed)	particle-bound	200	3.33333333	3.3	50	5	1.1	40	11	90	1	2000	100	20
95-13-6	Indene	vapor	1	1000	1	2	1	1.1	1	1	1	1	1	1	20
95-47-6	o-Xylene	vapor	1	10000	1	1	1	1.1	1	1	1	1	1	1	20
95-48-7	o-Cresol (2-Methylphenol)	vapor	1	1000	1	2	1	1.1	1	1	1	1	1	1	20
95-49-8	2-Chlorotoluene	vapor	1	10000	1	2	1	1.1	1	1	1	1	1	1	20
95-50-1	o-Dichlorobenzene (1,2-Dichlorobenzene)	vapor	1	50	1	2	1	1.1	1	1	1	1	1	1	20
95-57-8	2-Chlorophenol	vapor	1	10000	1	2	1	1.1	1	1	1	1	1	1	20
95-95-4	2,4,5-Trichlorophenol	vapor	1	3.33333333	1	50	1	1.1	1	1	1	1	1	1	20
96-22-0	3-Pentanone	vapor	1	10000	1	1	1	1.1	1	1	1	1	1	1	20
96-69-5	Bis(3-tert-butyl-4-hydroxy-6-methyl-phenyl)sulfide	particle-bound	200	3.33333333	3.3	50	5	1.1	40	11	90	1	2000	100	20
98-51-1	p-tert-Butyltoluene	vapor	1	10000	1	2	1	1.1	1	1	1	1	1	1	20
98-82-8	Cumene	vapor	1	10000	1	2	1	1.1	1	1	1	1	1	1	20
98-83-9	alpha-Methylstyrene	vapor	1	100	1	2	1	1.1	1	1	1	1	1	1	20
98-86-2	Acetophenone	vapor	1	100	1	2	1	1.1	1	1	1	1	1	1	20
98-95-3	Nitrobenzene	vapor	1	10000	1	2	1	1.1	1	1	1	1	1	1	20

Table 12 HLW and LAW Vitrification Emissions Analysis Equipment Decontamination Factors

Inorganic Constituents	Melter		SBS		WESP		HLW HEME		LAW/HLW/PJV HEPA (First)		LAW/HLW/PJV HEPA (Second)		Thermal Cat Ox		NOx SCR		HLW AgZ Column		LAW Caustic Scrubber		LAW S-AC Column		HLW S-AC Column	
	DF	Ref	DF	Ref	DF	Ref	DF	Ref	DF	Ref	DF	Ref	DF	Ref	DF	Ref	DF	Ref	DF	Ref	DF	Ref	DF	Ref
Silver	30	(1)	1.8	(2)	50	(2)	100	(2)	2,000	(3)	100	(3)	1	(6)	1	(6)	1	(6)	1	(7)	1	(6)	1	(6)
Aluminum	100	(1)	40	(2)	10	(2)	90	(2)	2,000	(3)	100	(3)	1	(6)	1	(6)	1	(6)	1	(7)	1	(6)	1	(6)
Arsenic	1	(22)	4.8	(2)	20	(2)	100	(2)	2,000	(3)	100	(3)	1	(6)	1	(6)	1	(6)	1	(7)	1	(6)	1	(6)
Boron	30	(1)	30	(2)	10	(2)	90	(2)	2,000	(3)	100	(3)	1	(6)	1	(6)	1	(6)	1	(7)	1	(6)	1	(6)
Barium	100	(1)	90	(2)	11	(2)	90	(2)	2,000	(3)	100	(3)	1	(6)	1	(6)	1	(6)	1	(7)	1	(6)	1	(6)
Bismuth	100	(1)	2.6	(2)	30	(2)	100	(2)	2,000	(3)	100	(3)	1	(6)	1	(6)	1	(6)	1	(7)	1	(6)	1	(6)
Calcium	75	(1)	20	(2)	10	(2)	90	(2)	2,000	(3)	100	(3)	1	(6)	1	(6)	1	(6)	1	(7)	1	(6)	1	(6)
Cadmium	10	(1)	1.6	(2)	80	(2)	110	(2)	2,000	(3)	100	(3)	1	(6)	1	(6)	1	(6)	1	(7)	1	(6)	1	(6)
Chloride	1.9	(1)	30	(2)	10	(2)	90	(2)	2,000	(3)	100	(3)	1	(6)	1	(6)	1	(6)	1	(7)	1	(6)	1	(6)
Chromium (hexavalent)	100	(1)	3.4	(2)	12	(2)	90	(2)	2,000	(3)	100	(3)	1	(6)	1	(6)	1	(6)	1	(7)	1	(6)	1	(6)
Copper	200	(1)	2.9	(2)	30	(2)	100	(2)	2,000	(3)	100	(3)	1	(6)	1	(6)	1	(6)	1	(7)	1	(6)	1	(6)
Flouride	4	(1)	30	(2)	10	(2)	90	(2)	2,000	(3)	100	(3)	1	(6)	1	(6)	1	(6)	1	(7)	1	(6)	1	(6)
Iron	200	(1)	40	(2)	10	(2)	90	(2)	2,000	(3)	100	(3)	1	(6)	1	(6)	1	(6)	1	(7)	1	(6)	1	(6)
Mercury	1	(1)	6	(14)	1	(14)	3.5	(14)	1	(14)	1	(14)	1	(14)	1	(14)	1	(14)	3	(14)	20	(15)	1000	(15)
Potassium	20	(1)	1.7	(2)	60	(2)	100	(2)	2,000	(3)	100	(3)	1	(6)	1	(6)	1	(6)	1	(7)	1	(6)	1	(6)
Lithium	100	(1)	2.1	(2)	40	(2)	100	(2)	2,000	(3)	100	(3)	1	(6)	1	(6)	1	(6)	1	(7)	1	(6)	1	(6)
Magnesium	200	(1)	20	(2)	10	(2)	90	(2)	2,000	(3)	100	(3)	1	(6)	1	(6)	1	(6)	1	(7)	1	(6)	1	(6)
Manganese	75	(1)	30	(2)	10	(2)	90	(2)	2,000	(3)	100	(3)	1	(6)	1	(6)	1	(6)	1	(7)	1	(6)	1	(6)
Sodium	100	(1)	2.6	(2)	30	(2)	100	(2)	2,000	(3)	100	(3)	1	(6)	1	(6)	1	(6)	1	(7)	1	(6)	1	(6)
Nickel	89	(1)	5.9	(2)	20	(2)	90	(2)	2,000	(3)	100	(3)	1	(6)	1	(6)	1	(6)	1	(7)	1	(6)	1	(6)
Nitrite	1	(1)	30	(24)	10	(24)	90	(24)	2,000	(3)	100	(3)	1	(6)	1	(6)	1	(6)	1	(7)	1	(6)	1	(6)
Nitrate	1	(1)	30	(24)	10	(24)	90	(24)	2,000	(3)	100	(3)	1	(6)	1	(6)	1	(6)	1	(7)	1	(6)	1	(6)
Hydroxide	1	(1)	30	(24)	10	(24)	90	(24)	2,000	(3)	100	(3)	1	(6)	1	(6)	1	(6)	1	(7)	1	(6)	1	(6)
Phosphorous	40	(1)	30	(24)	10	(24)	90	(24)	2,000	(3)	100	(3)	1	(6)	1	(6)	1	(6)	1	(7)	1	(6)	1	(6)
Lead	200	(1)	2.3	(2)	30	(2)	100	(2)	2,000	(3)	100	(3)	1	(6)	1	(6)	1	(6)	1	(7)	1	(6)	1	(6)
Phosphate	40	(1)	30	(24)	10	(24)	90	(24)	2,000	(3)	100	(3)	1	(6)	1	(6)	1	(6)	1	(7)	1	(6)	1	(6)
Total Sulfur	2.7	(1)	30	(24)	10	(24)	90	(24)	2,000	(3)	100	(3)	1	(6)	1	(6)	1	(6)	1	(7)	1	(6)	1	(6)
Silicon	300	(1)	30	(2)	10	(2)	90	(2)	2,000	(3)	100	(3)	1	(6)	1	(6)	1	(6)	1	(7)	1	(6)	1	(6)
Sulfate	2.7	(1)	30	(24)	10	(24)	90	(24)	2,000	(3)	100	(3)	1	(6)	1	(6)	1	(6)	1	(7)	1	(6)	1	(6)
Strontium (total)	100	(1)	40	(2)	10	(2)	90	(2)	2,000	(3)	100	(3)	1	(6)	1	(6)	1	(6)	1	(7)	1	(6)	1	(6)
Zinc	100	(1)	20	(2)	11	(2)	90	(2)	2,000	(3)	100	(3)	1	(6)	1	(6)	1	(6)	1	(7)	1	(6)	1	(6)
Zirconium	300	(1)	30	(2)	10	(2)	90	(2)	2,000	(3)	100	(3)	1	(6)	1	(6)	1	(6)	1	(7)	1	(6)	1	(6)
Beryllium	300	(28)	30	(28)	10	(28)	90	(28)	2,000	(28)	100	(28)	1	(28)	1	(28)	1	(28)	1	(28)	1	(28)	1	(28)
Cyanide	40	(28)	30	(28)	10	(28)	90	(28)	2,000	(28)	100	(28)	1	(28)	1	(28)	1	(28)	1	(28)	1	(28)	1	(28)
Cobalt	200	(28)	3	(28)	20	(28)	100	(28)	2,000	(28)	100	(28)	1	(28)	1	(28)	1	(28)	1	(28)	1	(28)	1	(28)
Molybdenum	100	(28)	3	(28)	30	(28)	100	(28)	2,000	(28)	100	(28)	1	(28)	1	(28)	1	(28)	1	(28)	1	(28)	1	(28)
Rhodium	300	(28)	30	(28)	10	(28)	90	(28)	2,000	(28)	100	(28)	1	(28)	1	(28)	1	(28)	1	(28)	1	(28)	1	(28)
Antimony	100	(28)	4	(28)	11	(28)	90	(28)	2,000	(28)	100	(28)	1	(28)	1	(28)	1	(28)	1	(28)	1	(28)	1	(28)
Selenium	4	(28)	30	(28)	10	(28)	90	(28)	2,000	(28)	100	(28)	1	(28)	1	(28)	1	(28)	1	(28)	1	(28)	1	(28)
Tin	200	(28)	40	(28)	10	(28)	90	(28)	2,000	(28)	100	(28)	1	(28)	1	(28)	1	(28)	1	(28)	1	(28)	1	(28)
Tantalum	300	(28)	30	(28)	10	(28)	90	(28)	2,000	(28)	100	(28)	1	(28)	1	(28)	1	(28)	1	(28)	1	(28)	1	(28)
Thallium	4	(28)	30	(28)	10	(28)	90	(28)	2,000	(28)	100	(28)	1	(28)	1	(28)	1	(28)	1	(28)	1	(28)	1	(28)
Uranium	200	(28)	40	(28)	10	(28)	90	(28)	2,000	(28)	100	(28)	1	(28)	1	(28)	1	(28)	1	(28)	1	(28)	1	(28)
Vanadium	100	(28)	3	(28)	30	(28)	100	(28)	2,000	(28)	100	(28)	1	(28)	1	(28)	1	(28)	1	(28)	1	(28)	1	(28)
Tungsten	300	(28)	30	(28)	10	(28)	90	(28)	2,000	(28)	100	(28)	1	(28)	1	(28)	1	(28)	1	(28)	1	(28)	1	(28)
Yttrium	100	(28)	40	(28)	10	(28)	90	(28)	2,000	(28)	100	(28)	1	(28)	1	(28)	1	(28)	1	(28)	1	(28)	1	(28)
Carbon monoxide	1	(26)	1	(27)	1	(27)	1	(27)	1	(3)	1	(3)	20	(19)	1	(20)	1	(20)	1	(20)	1	(20)	1	(20)
Carbon Dioxide	1	(26)	1	(21)	1	(21)	1	(21)	1	(3)	1	(3)	1	(20)	1	(20)	1	(20)	1	(10)	1	(20)	1	(20)
Nitric Oxide	1	(26)	1.0	(17)	1.0	(17)	1.0	(17)	1	(3)	1	(3)	1	(20)	20	(16)	1	(20)	1.2	(9)	1	(20)	1	(20)
Nitrogen Dioxide	1	(26)	1.0	(17)	1.0	(17)	1.0	(17)	1	(3)	1	(3)	1	(20)	20	(16)	1	(20)	1.2	(9)	1	(20)	1	(20)
Hydrochloric Acid	1	(26)	1.0	(17)	1.3	(17)	1.0	(17)	1	(3)	1	(3)	1	(20)	1	(20)	1000	(20)	25	(9)	1	(20)	1	(20)
Hydrofluoric Acid	1	(26)	2.0	(17)	2.0	(17)	2.0	(17)	1	(3)	1	(3)	1	(20)	1	(20)	1000	(20)	15	(9)	1	(20)	1	(20)
Sulfur dioxide	1	(26)	1.0	(17)	1.0	(17)	1.0	(17)	1	(3)	1	(3)	1.2	(19)	1	(20)	1	(20)	10	(9)	1	(20)	1	(20)

Table 12 HLW and LAW Vitrification Emissions Analysis Equipment Decontamination Factors

Radionuclide Constituents	Melter		SBS		WESP		HLW HEME		LAW/HLW/PJV HEPA (First)		LAW/HLW/PJV HEPA (Second)		Thermal Cat Ox		NOx SCR		HLW AgZ Column		LAW Caustic Scrubber		LAW S-AC Column		HLW S-AC Column	
	DF	Ref	DF	Ref	DF	Ref	DF	Ref	DF	Ref	DF	Ref	DF	Ref	DF	Ref	DF	Ref	DF	Ref	DF	Ref	DF	Ref
Ammonia/Ammonium	1	(26)	4.0	(17)	1.1	(17)	1.1	(17)	1	(3)	1	(3)	1	(20)	1	(20)	1	(20)	1	(9)	1	(23)	1	(20)
Americium-241	200	(1)	40	(2)	10	(2)	90	(2)	2,000	(3)	100	(3)	1	(6)	1	(6)	1	(6)	1	(7)	1	(6)	1	(6)
Carbon-14	1	(5)	1	(5)	1	(5)	1	(5)	1	(5)	1	(5)	1	(5)	1	(5)	1	(5)	1	(10)	1	(5)	1	(5)
Cobalt-60	200	(1)	3.2	(2)	20	(2)	100	(2)	2,000	(3)	100	(3)	1	(6)	1	(6)	1	(6)	1	(7)	1	(6)	1	(6)
Curium-243	200	(1)	40	(2)	10	(2)	90	(2)	2,000	(3)	100	(3)	1	(6)	1	(6)	1	(6)	1	(7)	1	(6)	1	(6)
Curium-244	200	(1)	40	(2)	10	(2)	90	(2)	2,000	(3)	100	(3)	1	(6)	1	(6)	1	(6)	1	(7)	1	(6)	1	(6)
Cesium-137	30	(1)	2.4	(2)	30	(2)	100	(2)	2,000	(3)	100	(3)	1	(6)	1	(6)	1	(6)	1	(7)	1	(6)	1	(6)
Europium-152	200	(1)	40	(2)	10	(2)	90	(2)	2,000	(3)	100	(3)	1	(6)	1	(6)	1	(6)	1	(7)	1	(6)	1	(6)
Europium-154	200	(1)	40	(2)	10	(2)	90	(2)	2,000	(3)	100	(3)	1	(6)	1	(6)	1	(6)	1	(7)	1	(6)	1	(6)
Europium-155	200	(1)	40	(2)	10	(2)	90	(2)	2,000	(3)	100	(3)	1	(6)	1	(6)	1	(6)	1	(7)	1	(6)	1	(6)
Tritium	1	(4)	N/A	(4)	N/A	(4)	N/A	(4)	1	(4)	1	(4)	1	(4)	1	(4)	1	(4)	N/A	(4)	1	(4)	1	(4)
Iodine-129	1.1	(18)	1.2	(18)	1	(18)	1	(18)	1	(18)	1	(18)	1	(18)	1	(18)	1000	(8)	100	(9)	1	(18)	1	(18)
Nickel-63	89	(1)	5.9	(2)	20	(2)	90	(2)	2,000	(3)	100	(3)	1	(6)	1	(6)	1	(6)	1	(7)	1	(6)	1	(6)
Neptunium-237	200	(1)	40	(2)	10	(2)	90	(2)	2,000	(3)	100	(3)	1	(6)	1	(6)	1	(6)	1	(7)	1	(6)	1	(6)
Plutonium-238	200	(1)	40	(2)	10	(2)	90	(2)	2,000	(3)	100	(3)	1	(6)	1	(6)	1	(6)	1	(7)	1	(6)	1	(6)
Plutonium-239	200	(1)	40	(2)	10	(2)	90	(2)	2,000	(3)	100	(3)	1	(6)	1	(6)	1	(6)	1	(7)	1	(6)	1	(6)
Plutonium-240	200	(1)	40	(2)	10	(2)	90	(2)	2,000	(3)	100	(3)	1	(6)	1	(6)	1	(6)	1	(7)	1	(6)	1	(6)
Plutonium-241	200	(1)	40	(2)	10	(2)	90	(2)	2,000	(3)	100	(3)	1	(6)	1	(6)	1	(6)	1	(7)	1	(6)	1	(6)
Antimony-125	100	(1)	3.7	(2)	11	(2)	90	(2)	2,000	(3)	100	(3)	1	(6)	1	(6)	1	(6)	1	(7)	1	(6)	1	(6)
Samarium-151	200	(1)	40	(2)	11	(2)	90	(2)	2,000	(3)	100	(3)	1	(6)	1	(6)	1	(6)	1	(7)	1	(6)	1	(6)
Tin-126	200	(1)	40	(2)	10	(2)	90	(2)	2,000	(3)	100	(3)	1	(6)	1	(6)	1	(6)	1	(7)	1	(6)	1	(6)
Strontium-90	100	(1)	40	(2)	10	(2)	90	(2)	2,000	(3)	100	(3)	1	(6)	1	(6)	1	(6)	1	(7)	1	(6)	1	(6)
Technetium-99	3	(1)	3.9	(2)	20	(2)	100	(2)	2,000	(3)	100	(3)	1	(6)	1	(6)	1	(6)	1	(7)	1	(6)	1	(6)
Thorium-232	200	(1)	40	(2)	10	(2)	90	(2)	2,000	(3)	100	(3)	1	(6)	1	(6)	1	(6)	1	(7)	1	(6)	1	(6)
Uranium-233	200	(1)	40	(2)	10	(2)	90	(2)	2,000	(3)	100	(3)	1	(6)	1	(6)	1	(6)	1	(7)	1	(6)	1	(6)
Uranium-234	200	(1)	40	(2)	10	(2)	90	(2)	2,000	(3)	100	(3)	1	(6)	1	(6)	1	(6)	1	(7)	1	(6)	1	(6)
Uranium-235	200	(1)	40	(2)	10	(2)	90	(2)	2,000	(3)	100	(3)	1	(6)	1	(6)	1	(6)	1	(7)	1	(6)	1	(6)
Uranium-236	200	(1)	40	(2)	10	(2)	90	(2)	2,000	(3)	100	(3)	1	(6)	1	(6)	1	(6)	1	(7)	1	(6)	1	(6)
Uranium-238	200	(1)	40	(2)	10	(2)	90	(2)	2,000	(3)	100	(3)	1	(6)	1	(6)	1	(6)	1	(7)	1	(6)	1	(6)
Yttrium-90	100	(1)	40	(2)	10	(2)	90	(2)	2,000	(3)	100	(3)	1	(6)	1	(6)	1	(6)	1	(7)	1	(6)	1	(6)
Ruthenium-106	4	(28)	30	(28)	10	(28)	90	(28)	2,000	(28)	100	(28)	1	(28)	1	(28)	1	(28)	1	(28)	1	(28)	1	(28)
Cesium-134	30	(28)	2.4	(28)	30	(28)	100	(28)	2,000	(28)	100	(28)	1	(28)	1	(28)	1	(28)	1	(28)	1	(28)	1	(28)
Barium-137m	30	(28)	2.4	(28)	30	(28)	100	(28)	2,000	(28)	100	(28)	1	(28)	1	(28)	1	(28)	1	(28)	1	(28)	1	(28)
Plutonium-242	200	(28)	40	(28)	10	(28)	90	(28)	2,000	(28)	100	(28)	1	(28)	1	(28)	1	(28)	1	(28)	1	(28)	1	(28)
Radium-226	300	(28)	30	(28)	10	(28)	90	(28)	2,000	(28)	100	(28)	1	(28)	1	(28)	1	(28)	1	(28)	1	(28)	1	(28)
Uranium-232	200	(28)	40	(28)	10	(28)	90	(28)	2,000	(28)	100	(28)	1	(28)	1	(28)	1	(28)	1	(28)	1	(28)	1	(28)
Protactinium-231	300	(28)	30	(28)	10	(28)	90	(28)	2,000	(28)	100	(28)	1	(28)	1	(28)	1	(28)	1	(28)	1	(28)	1	(28)
Nickel-59	89	(28)	6	(28)	20	(28)	90	(28)	2,000	(28)	100	(28)	1	(28)	1	(28)	1	(28)	1	(28)	1	(28)	1	(28)
Actinium-227	300	(28)	30	(28)	10	(28)	90	(28)	2,000	(28)	100	(28)	1	(28)	1	(28)	1	(28)	1	(28)	1	(28)	1	(28)
Americium-243	200	(28)	40	(28)	10	(28)	90	(28)	2,000	(28)	100	(28)	1	(28)	1	(28)	1	(28)	1	(28)	1	(28)	1	(28)
Radium-228	300	(28)	30	(28)	10	(28)	90	(28)	2,000	(28)	100	(28)	1	(28)	1	(28)	1	(28)	1	(28)	1	(28)	1	(28)
Curium-242	200	(28)	40	(28)	10	(28)	90	(28)	2,000	(28)	100	(28)	1	(28)	1	(28)	1	(28)	1	(28)	1	(28)	1	(28)
Thorium-229	200	(28)	40	(28)	10	(28)	90	(28)	2,000	(28)	100	(28)	1	(28)	1	(28)	1	(28)	1	(28)	1	(28)	1	(28)
Zirconium-93	300	(28)	30	(28)	10	(28)	90	(28)	2,000	(28)	100	(28)	1	(28)	1	(28)	1	(28)	1	(28)	1	(28)	1	(28)
Niobium-93m	300	(28)	30	(28)	10	(28)	90	(28)	2,000	(28)	100	(28)	1	(28)	1	(28)	1	(28)	1	(28)	1	(28)	1	(28)
Cadmium-113m	10	(28)	2	(28)	80	(28)	110	(28)	2,000	(28)	100	(28)	1	(28)	1	(28)	1	(28)	1	(28)	1	(28)	1	(28)
Selenium-79	4	(28)	30	(28)	10	(28)	90	(28)	2,000	(28)	100	(28)	1	(28)	1	(28)	1	(28)	1	(28)	1	(28)	1	(28)
Organic Constituents	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Non-Volatile	1	(25)	20	(24)	20	(24)	90	(24)	2000	(3)	100	(3)	20	(11)	1	(6)	1	(6)	1	(7)	1	(6)	1	(6)
SVOC	1.1	(13)	1	(12)	1	(12)	1	(12)	1	(12)	1	(12)	20	(11)	1	(12)	1	(12)	1	(12)	1	(12)	1	(12)
VOC	1.1	(13)	1	(12)	1	(12)	1	(12)	1	(12)	1	(12)	20	(11)	1	(12)	1	(12)	1	(12)	1	(12)	1	(12)

Notes: Table 12

The following notes correspond to Table 12, HLW and LAW Vitrification Emissions Analysis Equipment Decontamination Factors, and provide the bases for vitrification melter and offgas decontamination factors for the facility emissions report

1. Based on Table B.3, Calculation 24590-HLW-MKC-HOP-00001, Rev. 0 (NOTE: Cesium-137 and technicium-99 melter DFs are based on experimental data. However, no reduction in melter capture has been assumed relating to cesium/technetium interactions.)
2. Based on Table D.1, Calculation 24590-WTP-MKC-50-00004, Rev. 0. (NOTE: Offgas particulate DFs are based on experimental data assuming certain elemental speciation. However, emissions modeling assumes all elements are in their base forms, primarily as oxides.)
3. Based on the BARCT analysis, 24590-WTP-RPT-ENV-01-004, Rev. 1
4. It is assumed that Tritium (H-3) will have the same decontamination factor (DF) as water in the respective process unit. No reduction in capture efficiency has been incorporated. If the unit is operated under evaporative conditions, a DF of 1 is defined.
5. It is assumed that Carbon-14 will have the same DF as carbon dioxide in the respective process unit. No reduction in capture efficiency has been incorporated.
6. No particulate removal efficiency is assumed.
7. Based on the information provided in Table D.1, Calculation 24590-WTP-MKC-50-00004, Rev. 0, the LAW Caustic Scrubber is assumed to have a particulate scrubbing efficiency DF of 1.
8. Based on Section 7.13, Calculation 24590-HLW-MKC-HOP-00002, Rev. B., no reduction in efficiency is recommended since the silver mordenite's efficiency will effectively be infinite until breakthrough is approached.
9. Because of the inherent uncertainties in predicting scrubbing efficiencies in packed bed columns, the DFs defined in Table 4 of Calculation 24590-LAW-MKC-LVP-00002 have been divided by two (2), except for iodine. Per E&NS management direction, the full 99% abatement efficiency (DF=100) for iodine (including I-129) is to be used for emissions modeling.
10. Although the LAW caustic scrubber may have a small collection efficiency (<10%) for carbon dioxide, it is assumed to be 0% (DF=1). Since the unit has not been designed as an abatement technology for carbon dioxide (i.e., Carbon-14), the unit will be operated to minimize carbon dioxide capture in order to minimize solids sent to the Hanford Effluent Treatment Facility. Therefore, no capture of carbon dioxide (i.e., Carbon-14) removal can be assumed.
11. Per the VSL report *Off-Line Tests of the DM-1200 Thermal Catalytic Oxidation (TCO) Unit* (VSL-02R8200-1), the TCO can achieve a DRE of >99% if the offgas residence time exceeds 0.4 seconds. If the residence time drops to 0.15 seconds a DRE of ~95% would be expected. No difference in efficiency was observed between SVOCs and VOCs. Preliminary TCO information (based on early vendor contacts) provided residence times between 0.05 and 0.1 seconds. There is also concern that the TCO units will lose efficiency over time due to poisoning. Therefore, a VOC/SVOC DRE of 90% was initially recommended for the facility emissions report. However, per E&NS management direction, a 95% organic DRE abatement efficiency is to be used for emissions modeling.
12. Per Tables 6.11 and 6.9, of VSL reports *Integrated Off-Gas System Tests on the DM-1200 Melter with RPP-WTP LAW Sub-Envelope A1 Simulants* (VSL-02R8800-2) and *Integrated Off-Gas System Tests on the DM-1200 Melter with RPP-WTP LAW Sub-Envelope C1 Simulants* (VSL-02R8800-1), respectively, the observed offgas system DRE is basically the same as the DRE measured on the TCO. Therefore, a DRE of 0% (DF=1) on the remaining offgas system is defined.
13. Per the same VSL report tables defined in #12, the DM-1200 melter organic DRE ranged from 0% to 33% for Envelope A and 42% to 57% for Envelope C. Because of the observed inefficient destruction efficiency in the DM-1200 melter, a combined VOC/SVOC DRE of 10% (DF=1.1) for both the HLW and LAW melters is recommended.
14. Mercury DFs for the SBS, WESP, HLW HEME, and LAW caustic scrubber are per the *Mercury Pathway and Treatment Assessment for the WTP* (24590-WTP-RPT-PR-01-011). These DFs have not been reduced so as to not limit the amount of mercury that could potentially leach to the LAW system.
15. The design basis mercury DFs for the HLW and LAW S-AC columns are 1000, and 20, respectively, per calculation 24590-WTP-M4C-HOP-00001. No reduction in efficiency is recommended since the unit's efficiency will effectively be infinite until breakthrough is approached. Use of the full design abatement efficiency was also recommended by E&NS management.

Notes: Table 12

16. Per the VSL reports defined in #12, the DM-1200 SCR unit initially experienced very poor NO_x destruction efficiencies of ~40%. With the use of a different catalyst media, the NOx efficiency was raised well above the 90% design specification. The SCR unit at the LAW Pilot Melter at Duratek has recorded very high NOx destruction efficiencies exceeding 99%. However, the Duratek SCR operates with an excessive ammonia slip. The SCR at VSL has also had to operate at a high ammonia slip in order to compensate for NO_x concentration fluctuations caused by the pulsating melter feed. Therefore, if the ammonia injection to the SCRs will be controlled to minimize ammonia slip, a 90% (DF=10) destruction efficiency was originally recommended. If the SCR units can be operated at a high ammonia slip, higher NO_x destruction efficiencies are achievable. Taking this into account, E&NS management has directed that a NO_x abatement efficiency of 95% be used for both HLW and LAW emissions modeling. Therefore, the average permitting contingency for NO_x in the LAW system will be approximately a factor of "2" (50 MT/day*20%Na Loading / 30 MT/day*17%Na Loading).

17. After a review of the *Integrated Off-Gas System Tests on the DM-1200 Melter with RPP-WTP LAW Sub-Envelope A1 Simulants* (VSL-02R8800-2), *Integrated Off-Gas System Tests on the DM-1200 Melter with RPP-WTP LAW Sub-Envelope C1 Simulants* (VSL-02R8800-1), and *Tests on the DuraMelter 1200 HLW Pilot Melter System Using AZ-101 HLW Simulants*, (VSL-02R0100-2), the identified acid gas decontamination factors are recommended for the SBS, WESP, and HEME. In general, it was observed that the SBS, WESP, and HEME are very poor gas scrubbers for most acid gas species. This would be expected because of the limited gas/liquid contact time and because the units are simply not design to be very efficient at gas scrubbing. (NOTE: The identified VSL reports discuss significant analytical errors when trying to calculate unit acid gas DFs. This may be rectified in the future, allowing for better estimation of acid gas DFs. However, the identified DFs are deemed bounding for the emissions estimate.)

18. Per Table 6.8 of VSL reports *Integrated Off-Gas System Tests on the DM-1200 Melter with RPP-WTP LAW Sub-Envelope A1 Simulants* (VSL-02R8800-2), the melter and offgas system capture efficiencies for iodine were found to be ~20% and ~40%, respectively. Therefore, the recommended iodine capture efficiencies for the emissions report are 10% (DF=1.1) and 20% (DF=1.2) for the melter and offgas system, respectively. For simplicity, the offgas system iodine DF will be exclusively applied to the SBS.

19. The thermal catalytic oxidizer is known to oxidize both carbon monoxide (CO) and sulfur dioxide (SO_2) to carbon dioxide (CO_2) and sulfur trioxide (SO_3), respectively. Per contacts with catalyst vendors, the oxidation efficiency of carbon monoxide tends to be higher then the realized organic destruction efficiency, while the oxidation of sulfur dioxide tends to be less. However, to be conservative, the carbon monoxide conversion DF in the TCO emissions will be assumed to be equal to the organic DF DRE. For SO_2, the vendor recommended an oxidization efficiency of 20% (DF=1.2).

20. No Gas Scrubbing Efficiency is assumed.

21. Since the VSL analysis shows that the SBS/WESP/HEME condensate will be mildly acidic to neutral, no scrubbing efficiency (DF=1) for carbon dioxide is assumed.

22. Per Table A-13 of calculation 24590-HLW-MKC-HOP-00001, arsenic (As) decontamination factors in the DM-1000 melter were measured between 200 and 700. This was based on AZ-101 simulant feed during stable melter operations. This is the only known arsenic melter DF data known to exist. Based on this information and the precedent set of dividing minimal observed DFs by 2, a melter DF of 100 is recommended for arsenic. This is a change from the previous recommendation of 1 (based on arsenic volatility) before the DM-1000 information was obtained.

23. It is assumed that no ammonia (DF=1) will be removed in the LAW caustic scrubber because of the alkaline conditions.

24. Miscellaneous anion species and nonvolatile organics are defined with the average cation DF due to the various speciation potentials.

25. Non-Volatile organics in the melter feed are assumed to have no glass solubility and completely decompose to carbon dioxide, carbon monoxide, and PICs so that these decomposition products are maximized at the stack discharge.

26. Gas species are assumed to have no solubility in glass and therefore have no retention in the melter.

27. These gas species are assumed to have no retention in the identified offgas units because of their high stability and/or volatility.

28. DFs are based on the representative compound.

Table 13 Summary of Organic Constituents Emission Rates for the WTP

CAS #	COPC	Feed	Unabated Streams					Abated Streams				
		FRP14	PVP01	PJV04	LMP06	HMP06	PJV32	PVP12	PJV11	LVP26	HOP33	PJV34
		WTP Feed	PT Vessel Vent	PT RFD/PJM	LAW Melter	HLW Melter	HLW PJM/RFD	PT Vessel Vent	PT RFD/PJM	LAW Melter	HLW Melter	HLW PJM/RFD
		g/sec	g/sec	g/sec	g/sec	g/sec	g/sec	g/sec	g/sec	g/sec	g/sec	g/sec
100-00-5	p-Nitrochlorobenzene	3.49E-02	2.32E-03	1.42E-06	2.55E-04	5.03E-03	3.82E-12	4.65E-08	1.42E-06	1.27E-05	2.52E-04	3.82E-12
100-21-0	p-Phthalic acid	3.49E-02	3.05E-08	2.90E-06	2.48E-02	6.81E-03	7.49E-13	3.05E-11	2.90E-06	1.24E-03	3.41E-04	7.49E-13
100-25-4	1,4-Dinitrobenzene	3.49E-02	2.15E-05	2.82E-06	2.28E-02	6.86E-03	7.54E-13	3.25E-18	2.82E-12	1.29E-11	4.34E-14	3.77E-18
100-41-4	Ethyl benzene	7.67E-03	7.69E-03	7.78E-08	0.00E+00	1.17E-12	3.90E-22	7.69E-07	7.78E-08	0.00E+00	1.89E-13	3.90E-22
100-42-5	Styrene	7.67E-03	7.70E-03	7.92E-08	0.00E+00	3.39E-10	5.85E-20	7.70E-07	7.92E-08	0.00E+00	2.75E-11	5.85E-20
10061-01-5	cis-1,3-Dichloropropene	7.67E-03	7.72E-03	8.06E-08	0.00E+00	9.78E-10	1.66E-19	7.72E-05	8.06E-08	0.00E+00	7.83E-11	1.66E-19
10061-02-6	trans-1,3-Dichloropropene	7.67E-03	7.66E-03	8.33E-08	0.00E+00	1.88E-08	2.66E-18	1.53E-04	8.33E-08	0.00E+00	1.24E-09	2.66E-18
101-55-3	4-Bromophenylphenyl ether	3.49E-02	2.41E-02	6.48E-07	1.03E-07	3.50E-04	3.94E-14	1.45E-04	6.48E-07	5.13E-09	1.80E-05	3.94E-14
101-84-8	Diphenyl ether	7.67E-03	7.19E-03	9.69E-08	7.45E-13	2.99E-06	3.51E-16	2.87E-05	9.69E-08	3.73E-14	1.61E-07	3.51E-16
106-35-4	3-Heptanone	7.67E-03	5.31E-03	1.43E-07	2.26E-08	7.71E-05	8.67E-15	5.31E-07	1.43E-07	1.13E-09	3.95E-06	8.67E-15
106-42-3	p-Xylene (Dimethyl benzene)	7.67E-03	7.70E-03	7.92E-08	0.00E+00	3.39E-10	5.85E-20	7.70E-06	7.92E-08	0.00E+00	2.75E-11	5.85E-20
106-46-7	1,4-Dichlorobenzene	7.67E-03	7.86E-03	8.43E-08	0.00E+00	8.79E-09	1.30E-18	7.86E-05	8.43E-08	0.00E+00	6.05E-10	1.30E-18
106-88-7	1,2-Epoxybutane	7.67E-03	6.54E-03	1.17E-07	1.14E-09	1.74E-05	1.99E-15	6.54E-07	1.17E-07	5.68E-11	9.10E-07	1.99E-15
106-93-4	Ethylene dibromide (Dibromethane)	3.49E-02	3.41E-02	4.10E-07	1.02E-11	1.87E-06	2.33E-16	3.41E-03	4.10E-07	5.08E-13	1.07E-07	2.33E-16
106-97-8	Butane	7.67E-03	7.71E-03	7.71E-08	0.00E+00	0.00E+00	0.00E+00	7.71E-07	7.71E-08	0.00E+00	0.00E+00	0.00E+00
106-99-0	1,3-Butadiene	7.67E-03	7.71E-03	7.72E-08	0.00E+00	0.00E+00	2.11E-26	7.71E-07	7.72E-08	0.00E+00	0.00E+00	2.11E-26
107-02-8	Acrolein	7.67E-03	5.31E-03	1.43E-07	2.26E-08	7.71E-05	8.67E-15	5.31E-07	1.43E-07	1.13E-09	3.95E-06	8.67E-15
107-05-1	3-Chloropropene (Allyl chloride)	7.67E-03	7.69E-03	7.78E-08	0.00E+00	1.17E-12	3.90E-22	7.69E-07	7.78E-08	0.00E+00	1.89E-13	3.90E-22
107-06-2	1,2-Dichloroethane (Ethylene chloride)	7.67E-03	7.66E-03	8.33E-08	0.00E+00	1.88E-08	2.66E-18	7.66E-07	8.33E-08	0.00E+00	1.24E-09	2.66E-18
107-12-0	Propionitrile	7.67E-03	3.05E-03	1.86E-07	4.05E-07	3.23E-04	3.59E-14	3.05E-07	1.86E-07	2.02E-08	1.63E-05	3.59E-14
107-13-1	Acrylonitrile	7.67E-03	5.31E-03	1.43E-07	2.26E-08	7.71E-05	8.67E-15	5.31E-07	1.43E-07	1.13E-09	3.95E-06	8.67E-15
107-18-6	2-Propene-1-ol	3.49E-02	2.32E-03	1.42E-06	2.55E-04	5.03E-03	3.82E-12	2.32E-07	1.42E-06	1.27E-05	2.52E-04	3.82E-12
107-31-3	Formic acid, methyl ester	3.49E-02	2.97E-02	5.30E-07	5.16E-09	7.90E-05	9.06E-15	2.97E-06	5.30E-07	2.58E-10	4.14E-06	9.06E-15
107-66-4	Dibutylphosphate	3.49E-02	9.95E-06	2.88E-06	2.40E-02	6.86E-03	7.55E-13	7.54E-18	2.88E-12	1.36E-11	4.34E-14	3.77E-18
107-87-9	2-Pentanone	7.67E-03	5.31E-03	1.43E-07	2.26E-08	7.71E-05	8.67E-15	5.31E-07	1.43E-07	1.13E-09	3.95E-06	8.67E-15
108-03-2	1-Nitropropane	3.49E-02	2.41E-02	6.48E-07	1.03E-07	3.50E-04	3.94E-14	2.41E-06	6.48E-07	5.13E-09	1.80E-05	3.94E-14
108-05-4	Vinyl acetate	3.49E-02	3.27E-02	4.40E-07	3.39E-12	1.36E-05	1.60E-15	3.27E-06	4.40E-07	1.69E-13	7.31E-07	1.60E-15
108-10-1	Hexone (4-Methyl-2-pentanone or MIBK)	7.67E-03	5.31E-03	1.43E-07	2.26E-08	7.71E-05	8.67E-15	5.31E-07	1.43E-07	1.13E-09	3.95E-06	8.67E-15
108-20-3	Bis(isopropyl)ether	7.67E-03	7.86E-03	8.43E-08	0.00E+00	8.79E-09	1.30E-18	7.86E-07	8.43E-08	0.00E+00	6.05E-10	1.30E-18
108-38-3	m-Xylene (Dimethyl benzene)	7.67E-03	7.70E-03	7.92E-08	0.00E+00	3.39E-10	5.85E-20	7.70E-06	7.92E-08	0.00E+00	2.75E-11	5.85E-20
108-39-4	m-Cresol	7.67E-03	2.09E-04	3.20E-07	2.59E-04	1.16E-03	1.28E-13	1.04E-07	3.20E-07	1.30E-05	5.82E-05	1.28E-13
108-87-2	Methylcyclohexane	7.67E-03	7.68E-03	7.69E-08	0.00E+00	0.00E+00	0.00E+00	7.68E-07	7.69E-08	0.00E+00	0.00E+00	0.00E+00
108-88-3	Toluene	7.67E-03	7.70E-03	7.84E-08	0.00E+00	1.06E-11	2.73E-21	7.70E-07	7.84E-08	0.00E+00	1.31E-12	2.73E-21
108-90-7	Chlorobenzene	7.67E-03	7.70E-03	7.92E-08	0.00E+00	3.39E-10	5.85E-20	7.70E-05	7.92E-08	0.00E+00	2.75E-11	5.85E-20
108-93-0	Cyclohexanol	7.67E-03	5.11E-04	3.13E-07	5.60E-05	1.11E-03	8.41E-13	2.56E-08	3.13E-07	2.80E-06	5.54E-05	8.41E-13
108-94-1	Cyclohexanone	7.67E-03	8.63E-04	2.39E-07	1.17E-05	7.96E-04	8.78E-14	4.32E-08	2.39E-07	5.87E-07	3.99E-05	8.78E-14
108-95-2	Phenol	3.49E-02	2.41E-04	2.21E-06	9.42E-03	6.71E-03	7.39E-13	1.21E-06	2.21E-06	4.71E-04	3.36E-04	7.39E-13
109-66-0	n-Pentane	7.67E-03	7.71E-03	7.71E-08	0.00E+00	0.00E+00	0.00E+00	7.71E-07	7.71E-08	0.00E+00	0.00E+00	0.00E+00
109-99-9	Tetrahydrofuran	1.63E-02	6.47E-03	3.95E-07	8.58E-07	6.86E-04	7.61E-14	6.47E-07	3.95E-07	4.29E-08	3.46E-05	7.61E-14
110-12-3	5-Methyl-2-hexanone	7.67E-03	6.54E-03	1.17E-07	1.14E-09	1.74E-05	1.99E-15	6.54E-07	1.17E-07	5.68E-11	9.10E-07	1.99E-15
110-43-0	2-Heptanone	7.67E-03	6.54E-03	1.17E-07	1.14E-09	1.74E-05	1.99E-15	6.54E-07	1.17E-07	5.68E-11	9.10E-07	1.99E-15
110-54-3	n-Hexane	7.67E-03	7.70E-03	7.70E-08	0.00E+00	0.00E+00	0.00E+00	7.70E-07	7.70E-08	0.00E+00	0.00E+00	0.00E+00

Table 13 Summary of Organic Constituents Emission Rates for the WTP

CAS #	COPC	Feed	Unabated Streams					Abated Streams				
		FRP14	PVP01	PJV04	LMP06	HMP06	PJV32	PVP12	PJV11	LVP26	HOP33	PJV34
		WTP Feed	PT Vessel Vent	PT RFD/PJM	LAW Melter	HLW Melter	HLW PJM/RFD	PT Vessel Vent	PT RFD/PJM	LAW Melter	HLW Melter	HLW PJM/RFD
		g/sec	g/sec	g/sec	g/sec	g/sec	g/sec	g/sec	g/sec	g/sec	g/sec	g/sec
110-62-3	n-Valeraldehyde	3.49E-02	2.97E-02	5.30E-07	5.16E-09	7.90E-05	9.06E-15	2.97E-06	5.30E-07	2.58E-10	4.14E-06	9.06E-15
110-82-7	Cyclohexane	7.67E-03	7.69E-03	7.70E-08	0.00E+00	0.00E+00	1.24E-34	7.69E-07	7.70E-08	0.00E+00	0.00E+00	1.24E-34
110-83-8	Cyclohexene	7.67E-03	7.73E-03	7.76E-08	0.00E+00	1.83E-20	2.75E-24	7.73E-07	7.76E-08	0.00E+00	6.47E-21	2.75E-24
110-86-1	Pyridine	3.49E-02	3.92E-03	1.09E-06	5.33E-05	3.62E-03	3.99E-13	3.92E-07	1.09E-06	2.67E-06	1.81E-04	3.99E-13
111-65-9	n-Octane	7.67E-03	7.71E-03	7.71E-08	0.00E+00	0.00E+00	0.00E+00	7.71E-07	7.71E-08	0.00E+00	0.00E+00	0.00E+00
111-76-2	Ethylene glycol monobutyl ether	3.49E-02	9.48E-04	1.45E-06	1.18E-03	5.29E-03	5.82E-13	4.74E-08	1.45E-06	5.89E-05	2.65E-04	5.82E-13
111-84-2	n-Nonane	7.67E-03	7.71E-03	7.71E-08	0.00E+00	0.00E+00	0.00E+00	3.86E-07	7.71E-08	0.00E+00	0.00E+00	0.00E+00
117-81-7	Bis(2-ethylhexyl)phthalate (DEHP)	3.49E-02	3.67E-04	2.78E-06	9.49E-03	8.50E-03	1.13E-11	5.57E-17	2.78E-12	5.39E-12	6.07E-14	5.64E-17
117-84-0	n-Dioctyl phthalate	3.49E-02	2.52E-03	1.42E-06	1.84E-04	4.97E-03	4.89E-12	3.81E-16	1.42E-12	1.05E-13	7.01E-14	2.45E-17
118-74-1	Hexachlorobenzene	7.21E-04	7.39E-04	7.92E-09	0.00E+00	8.26E-10	1.22E-19	4.43E-06	7.92E-09	0.00E+00	5.68E-11	1.22E-19
120-12-7	Anthracene	3.49E-02	1.62E-02	8.01E-07	8.55E-07	1.11E-03	1.23E-13	3.25E-06	8.01E-07	4.27E-08	5.62E-05	1.23E-13
120-82-1	1,2,4-Trichlorobenzene	7.67E-03	7.66E-03	8.33E-08	0.00E+00	1.88E-08	2.66E-18	1.53E-05	8.33E-08	0.00E+00	1.24E-09	2.66E-18
120-83-2	2,4-Dichlorophenol	3.49E-02	2.32E-03	1.42E-06	2.55E-04	5.03E-03	3.82E-12	1.39E-05	1.42E-06	1.27E-05	2.52E-04	3.82E-12
121-44-8	Triethylamine	7.67E-03	6.54E-03	1.17E-07	1.14E-09	1.74E-05	1.99E-15	6.54E-07	1.17E-07	5.68E-11	9.10E-07	1.99E-15
121-69-7	Dimethylaniline	7.67E-03	3.05E-03	1.86E-07	4.05E-07	3.23E-04	3.59E-14	1.53E-07	1.86E-07	2.02E-08	1.63E-05	3.59E-14
122-39-4	N,N-Diphenylamine	7.67E-03	3.51E-04	2.82E-07	8.77E-05	1.03E-03	1.14E-13	1.41E-06	2.82E-07	4.39E-06	5.17E-05	1.14E-13
123-19-3	4-Heptanone	7.67E-03	3.05E-03	1.86E-07	4.05E-07	3.23E-04	3.59E-14	3.05E-07	1.86E-07	2.02E-08	1.63E-05	3.59E-14
123-38-6	n-Propionaldehyde	7.67E-03	5.31E-03	1.43E-07	2.26E-08	7.71E-05	8.67E-15	5.31E-07	1.43E-07	1.13E-09	3.95E-06	8.67E-15
123-51-3	3-Methyl-1-butanol	7.67E-03	1.08E-03	2.31E-07	6.90E-06	7.28E-04	8.02E-14	1.08E-07	2.31E-07	3.45E-07	3.65E-05	8.02E-14
123-86-4	Acetic acid n-butyl ester	3.49E-02	3.27E-02	4.40E-07	3.39E-12	1.36E-05	1.60E-15	3.27E-06	4.40E-07	1.69E-13	7.31E-07	1.60E-15
123-91-1	1,4-Dioxane	2.09E-02	1.39E-03	8.54E-07	1.53E-04	3.02E-03	2.29E-12	1.39E-07	8.54E-07	7.64E-06	1.51E-04	2.29E-12
126-73-8	Tributyl phosphate	3.49E-02	1.20E-04	2.52E-06	1.52E-02	6.90E-03	7.59E-13	2.41E-09	2.52E-06	7.60E-04	3.45E-04	7.59E-13
126-98-7	2-Methyl-2-propenenitrile (Methacrylonitrile)	7.67E-03	7.19E-03	9.69E-08	7.45E-13	2.99E-06	3.51E-16	7.19E-07	9.69E-08	3.73E-14	1.61E-07	3.51E-16
127-18-4	Perchloroethylene (tetrachloroethylene)	7.67E-03	7.72E-03	7.77E-08	0.00E+00	4.81E-14	2.48E-23	7.72E-04	7.77E-08	0.00E+00	1.19E-14	2.48E-23
127-19-5	N,N-Dimethylacetamide	7.67E-03	2.19E-06	6.33E-07	5.28E-03	1.51E-03	1.66E-13	1.09E-10	6.33E-07	2.64E-04	7.55E-05	1.66E-13
128-37-0	2,6-Bis(tert-butyl)-4-methylphenol	3.49E-02	2.52E-03	1.42E-06	1.84E-04	4.97E-03	4.89E-12	5.03E-08	1.42E-06	9.20E-06	2.49E-04	4.89E-12
129-00-0	Pyrene	3.49E-02	5.32E-03	1.41E-06	4.53E-05	4.37E-03	5.85E-12	2.42E-13	1.41E-12	2.58E-14	1.24E-13	2.92E-17
1321-64-8	Pentachloronaphthalene	3.49E-02	2.41E-02	6.48E-07	1.03E-07	3.50E-04	3.94E-14	1.10E-12	6.48E-13	5.82E-17	2.67E-14	1.97E-19
1321-65-9	Trichloronaphthalene	3.49E-02	2.97E-02	5.30E-07	5.16E-09	7.90E-05	9.06E-15	1.78E-04	5.30E-07	2.58E-10	4.14E-06	9.06E-15
132-64-9	Dibenzofuran	3.49E-02	2.97E-02	5.30E-07	5.16E-09	7.90E-05	9.06E-15	1.78E-04	5.30E-07	2.58E-10	4.14E-06	9.06E-15
1335-87-1	Hexachloronaphthalene	3.49E-02	2.41E-02	6.48E-07	1.03E-07	3.50E-04	3.94E-14	1.10E-12	6.48E-13	5.82E-17	2.67E-14	1.97E-19
1335-88-2	Tetrachloronaphthalene	3.49E-02	2.97E-02	5.30E-07	5.16E-09	7.90E-05	9.06E-15	1.35E-12	5.30E-13	2.93E-18	1.09E-14	4.53E-20
1336-36-3	Polychlorinated biphenyls (PCBs)	1.21E-02	5.79E-02	1.32E-06	5.42E-11	6.62E-05	1.14E-13	2.63E-12	1.32E-12	3.08E-20	5.41E-14	5.68E-19
141-78-6	Acetic acid ethyl ester (Ethyl acetate)	3.49E-02	2.41E-02	6.48E-07	1.03E-07	3.50E-04	3.94E-14	2.41E-06	6.48E-07	5.13E-09	1.80E-05	3.94E-14
141-79-7	4-Methyl-3-penten-2-one	3.49E-02	1.39E-02	8.47E-07	1.84E-06	1.47E-03	1.63E-13	1.39E-06	8.47E-07	9.20E-08	7.42E-05	1.63E-13
142-82-5	n-Heptane	7.67E-03	7.70E-03	7.70E-08	0.00E+00	0.00E+00	0.00E+00	7.70E-07	7.70E-08	0.00E+00	0.00E+00	0.00E+00
144-62-7	Oxalic acid	3.49E-03	1.58E-08	2.90E-07	2.48E-03	6.83E-04	7.51E-14	7.91E-11	2.90E-07	1.24E-04	3.41E-05	7.51E-14
156-60-5	trans-1,2-Dichloroethylene	7.67E-03	7.69E-03	7.78E-08	0.00E+00	1.17E-12	3.90E-22	7.69E-07	7.78E-08	0.00E+00	1.89E-13	3.90E-22
1582-09-8	Trifluralin	3.49E-02	2.41E-02	6.48E-07	1.03E-07	3.50E-04	3.94E-14	1.83E-14	6.48E-13	5.82E-17	2.67E-14	1.97E-19
1634-04-4	Methyl tert-butyl ether	7.67E-03	7.19E-03	9.69E-08	7.45E-13	2.99E-06	3.51E-16	7.19E-07	9.69E-08	3.73E-14	1.61E-07	3.51E-16
1836-75-5	Nitrofen	3.49E-02	3.67E-04	2.78E-06	9.49E-03	8.50E-03	1.13E-11	1.67E-14	2.78E-12	5.39E-12	6.07E-14	5.64E-17
189-55-9	Dibenzo[a,i]pyrene	3.49E-02	9.95E-06	2.88E-06	2.40E-02	6.86E-03	7.55E-13	4.52E-16	2.88E-12	1.36E-11	4.34E-14	3.77E-18

Table 13 Summary of Organic Constituents Emission Rates for the WTP

CAS #	COPC	Feed	Unabated Streams					Abated Streams				
		FRP14	PVP01	PJV04	LMP06	HMP06	PJV32	PVP12	PJV11	LVP26	HOP33	PJV34
		WTP Feed	PT Vessel Vent	PT RFD/PJM	LAW Melter	HLW Melter	HLW PJM/RFD	PT Vessel Vent	PT RFD/PJM	LAW Melter	HLW Melter	HLW PJM/RFD
		g/sec	g/sec	g/sec	g/sec	g/sec	g/sec	g/sec	g/sec	g/sec	g/sec	g/sec
189-64-0	Dibenzo[a,h]pyrene	3.49E-02	9.95E-06	2.88E-06	2.40E-02	6.86E-03	7.55E-13	4.52E-16	2.88E-12	1.36E-11	4.34E-14	3.77E-18
191-24-2	Benzo(g,h,i)perylene	3.49E-02	3.67E-04	2.78E-06	9.49E-03	8.50E-03	1.13E-11	1.67E-14	2.78E-12	5.39E-12	6.07E-14	5.64E-17
191-30-0	Benzo[a,i]pyrene	3.49E-02	9.95E-06	2.88E-06	2.40E-02	6.86E-03	7.55E-13	4.52E-16	2.88E-12	1.36E-11	4.34E-14	3.77E-18
192-65-4	Dibenzo[a,e]pyrene	3.49E-02	9.95E-06	2.88E-06	2.40E-02	6.86E-03	7.55E-13	4.52E-16	2.88E-12	1.36E-11	4.34E-14	3.77E-18
193-39-5	Indeno(1,2,3-cd)pyrene	3.49E-02	3.67E-04	2.78E-06	9.49E-03	8.50E-03	1.13E-11	1.67E-14	2.78E-12	5.39E-12	6.07E-14	5.64E-17
205-82-3	Benzo(j)fluoranthene	3.49E-02	1.20E-04	2.52E-06	1.52E-02	6.90E-03	7.59E-13	5.47E-15	2.52E-12	8.64E-12	4.42E-14	3.80E-18
205-99-2	Benzo(b)fluoranthene	3.49E-02	3.67E-04	2.78E-06	9.49E-03	8.50E-03	1.13E-11	1.67E-14	2.78E-12	5.39E-12	6.07E-14	5.64E-17
206-44-0	Fluoranthene	3.49E-02	5.04E-03	1.45E-06	4.07E-05	4.58E-03	6.11E-12	2.29E-13	1.45E-12	2.31E-14	1.21E-13	3.06E-17
207-08-9	Benzo(k)fluoranthene	3.49E-02	3.67E-04	2.78E-06	9.49E-03	8.50E-03	1.13E-11	1.67E-14	2.78E-12	5.39E-12	6.07E-14	5.64E-17
208-96-8	Acenaphthylene	3.49E-02	2.41E-02	6.48E-07	1.03E-07	3.50E-04	3.94E-14	1.45E-04	6.48E-07	5.13E-09	1.80E-05	3.94E-14
218-01-9	Chrysene	3.49E-02	2.55E-03	1.51E-06	2.40E-04	5.26E-03	7.00E-12	1.16E-13	1.51E-12	1.36E-13	8.40E-14	3.50E-17
2234-13-1	Octachloronaphthalene	3.49E-02	2.41E-02	6.48E-07	1.03E-07	3.50E-04	3.94E-14	1.10E-12	6.48E-13	5.82E-17	2.67E-14	1.97E-19
224-42-0	Dibenz[a,j]acridine	3.49E-02	1.27E-06	2.89E-06	2.47E-02	6.80E-03	7.48E-13	5.78E-17	2.89E-12	1.40E-11	4.30E-14	3.74E-18
226-36-8	Dibenz[a,h]acridine	3.49E-02	1.27E-06	2.89E-06	2.47E-02	6.80E-03	7.48E-13	5.78E-17	2.89E-12	1.40E-11	4.30E-14	3.74E-18
2385-85-5	Mirex	3.49E-02	3.48E-02	3.79E-07	0.00E+00	8.55E-08	1.21E-17	2.09E-04	3.79E-07	0.00E+00	5.62E-09	1.21E-17
2551-13-7	Trimethyl benzene	7.67E-03	7.70E-03	7.92E-08	0.00E+00	3.39E-10	5.85E-20	3.85E-06	7.92E-08	0.00E+00	2.75E-11	5.85E-20
26140-60-3	Terphenyls	3.49E-02	1.70E-02	1.39E-06	9.55E-07	2.45E-03	3.34E-12	7.73E-13	1.39E-12	5.42E-16	2.15E-13	1.67E-17
27154-33-2	Trichlorofluoroethane	7.67E-03	7.71E-03	7.72E-08	0.00E+00	0.00E+00	2.11E-26	7.71E-04	7.72E-08	0.00E+00	0.00E+00	2.11E-26
287-92-3	Cyclopentane	7.67E-03	7.69E-03	7.70E-08	0.00E+00	0.00E+00	1.24E-34	7.69E-07	7.70E-08	0.00E+00	0.00E+00	1.24E-34
309-00-2	Aldrin	4.30E-04	2.10E-04	1.72E-08	1.18E-08	3.02E-05	4.12E-14	4.77E-14	1.72E-14	6.69E-18	2.66E-15	2.06E-19
319-84-6	Hexachlorocyclohexane (Lindane) Alpha BHC	1.16E-04	1.68E-05	4.83E-09	1.36E-07	1.53E-05	2.04E-14	1.01E-07	4.83E-09	6.79E-09	7.68E-07	2.04E-14
319-85-7	Hexachlorocyclohexane (Lindane) Beta BHC	1.16E-04	1.22E-06	9.38E-09	3.11E-05	2.86E-05	3.80E-14	5.55E-17	9.38E-15	1.77E-14	2.04E-16	1.90E-19
319-86-8	Delta-BHC	1.16E-04	1.22E-06	9.25E-09	3.16E-05	2.83E-05	3.76E-14	5.57E-17	9.25E-15	1.80E-14	2.02E-16	1.88E-19
3697-24-3	5-Methylchrysene	3.49E-02	2.52E-03	1.42E-06	1.84E-04	4.97E-03	4.89E-12	1.14E-13	1.42E-12	1.05E-13	7.01E-14	2.45E-17
3825-26-1	Ammonium perfluorooctanoate	3.49E-02	2.41E-02	6.48E-07	1.03E-07	3.50E-04	3.94E-14	1.10E-12	6.48E-13	5.82E-17	2.67E-14	1.97E-19
4170-30-3	2-Butenaldehyde (2-Butenal or Crotonaldehyde)	7.67E-03	8.70E-04	2.39E-07	1.16E-05	7.96E-04	8.77E-14	8.70E-08	2.39E-07	5.80E-07	3.99E-05	8.77E-14
465-73-6	Isodrin	2.32E-04	1.12E-03	2.57E-08	1.05E-12	1.29E-06	2.20E-15	6.74E-06	2.57E-08	5.25E-14	8.30E-08	2.20E-15
50-00-0	Formaldehyde	7.67E-03	7.67E-05	5.38E-07	2.46E-03	1.67E-03	1.05E-12	7.67E-09	5.38E-07	1.23E-04	8.34E-05	1.05E-12
50-29-3	4,4-DDT	2.32E-04	3.36E-05	9.67E-09	2.72E-07	3.05E-05	4.08E-14	1.53E-15	9.67E-15	1.54E-16	8.08E-16	2.04E-19
50-32-8	Benzo(a)pyrene	4.42E-04	4.67E-06	3.47E-08	1.22E-04	1.07E-04	1.41E-13	2.12E-16	3.47E-14	6.95E-14	7.62E-16	7.07E-19
53-70-3	Dibenzo(a,h)anthracene	5.81E-05	2.01E-07	4.19E-09	2.53E-05	1.15E-05	1.27E-15	9.12E-18	4.19E-15	1.44E-14	7.37E-17	6.33E-21
540-59-0	1,2-Dichloroethylene	7.67E-03	7.70E-03	7.92E-08	0.00E+00	3.39E-10	5.85E-20	7.70E-07	7.92E-08	0.00E+00	2.75E-11	5.85E-20
540-84-1	2,2,4-Trimethylpentane	7.67E-03	7.71E-03	7.71E-08	0.00E+00	0.00E+00	0.00E+00	7.71E-07	7.71E-08	0.00E+00	0.00E+00	0.00E+00
541-73-1	1,3-Dichlorobenzene	7.67E-03	7.70E-03	7.92E-08	0.00E+00	3.39E-10	5.85E-20	7.70E-05	7.92E-08	0.00E+00	2.75E-11	5.85E-20
56-23-5	Carbon tetrachloride	7.67E-03	7.73E-03	7.76E-08	0.00E+00	1.83E-20	2.75E-24	1.55E-03	7.76E-08	0.00E+00	6.47E-21	2.75E-24
563-80-4	3-Methyl-2-butanone	7.67E-03	5.31E-03	1.43E-07	2.26E-08	7.71E-05	8.67E-15	5.31E-07	1.43E-07	1.13E-09	3.95E-06	8.67E-15
56-49-5	3-Methylcholanthrene	3.49E-02	3.51E-02	3.51E-07	0.00E+00	0.00E+00	0.00E+00	1.59E-12	3.51E-13	0.00E+00	0.00E+00	0.00E+00
56-55-3	Benzo(a)anthracene	3.49E-02	5.04E-03	1.45E-06	4.07E-05	4.58E-03	6.11E-12	2.29E-13	1.45E-12	2.31E-14	1.21E-13	3.06E-17
57-14-7	1,1-Dimethylhydrazine	3.49E-02	4.90E-03	1.05E-06	3.14E-05	3.31E-03	3.65E-13	4.90E-07	1.05E-06	1.57E-06	1.66E-04	3.65E-13
58-89-9	gamma-BHC (Lindane)	1.16E-04	8.74E-06	5.22E-09	4.92E-07	1.81E-05	2.41E-14	3.97E-16	5.22E-15	2.79E-16	2.86E-16	1.20E-19
58-90-2	2,3,4,6-Tetrachlorophenol	3.49E-02	3.64E-03	1.10E-06	6.24E-05	3.71E-03	4.09E-13	1.09E-04	1.10E-06	3.12E-06	1.86E-04	4.09E-13
591-78-6	2-Hexanone	7.67E-03	5.31E-03	1.43E-07	2.26E-08	7.71E-05	8.67E-15	5.31E-06	1.43E-07	1.13E-09	3.95E-06	8.67E-15

Table 13 Summary of Organic Constituents Emission Rates for the WTP

CAS #	COPC	Feed	Unabated Streams					Abated Streams				
		FRP14	PVP01	PJV04	LMP06	HMP06	PJV32	PVP12	PJV11	LVP26	HOP33	PJV34
		WTP Feed	PT Vessel Vent	PT RFD/PJM	LAW Melter	HLW Melter	HLW PJM/RFD	PT Vessel Vent	PT RFD/PJM	LAW Melter	HLW Melter	HLW PJM/RFD
		g/sec	g/sec	g/sec	g/sec	g/sec	g/sec	g/sec	g/sec	g/sec	g/sec	g/sec
59-50-7	4-Chloro-3-methylphenol	3.49E-02	2.52E-03	1.42E-06	1.84E-04	4.97E-03	4.89E-12	2.86E-13	1.42E-12	1.05E-13	7.01E-14	2.45E-17
59-89-2	N-Nitrosomorpholine	3.49E-02	2.15E-05	2.82E-06	2.28E-02	6.86E-03	7.54E-13	8.13E-18	2.82E-06	1.14E-03	3.43E-04	7.54E-13
602-87-9	5-Nitroacenaphthene	3.49E-02	9.48E-04	1.45E-06	1.18E-03	5.29E-03	5.82E-13	4.31E-14	1.45E-12	6.69E-13	3.93E-14	2.91E-18
60-29-7	Ethyl ether	3.49E-02	3.48E-02	3.79E-07	0.00E+00	8.55E-08	1.21E-17	3.48E-06	3.79E-07	0.00E+00	5.62E-09	1.21E-17
603-34-9	Triphenylamine	3.49E-02	2.37E-03	1.18E-06	1.65E-04	4.22E-03	4.65E-13	1.42E-05	1.18E-06	8.23E-06	2.11E-04	4.65E-13
60-34-4	Methylhydrazine	7.67E-03	5.11E-04	3.13E-07	5.60E-05	1.11E-03	8.41E-13	5.11E-08	3.13E-07	2.80E-06	5.54E-05	8.41E-13
60-35-5	Acetamide	7.67E-03	2.19E-06	6.33E-07	5.28E-03	1.51E-03	1.66E-13	1.09E-10	6.33E-07	2.64E-04	7.55E-05	1.66E-13
60-57-1	Dieldrin	2.32E-04	3.18E-05	9.95E-09	2.41E-07	3.19E-05	4.26E-14	1.44E-15	9.95E-15	1.37E-16	7.88E-16	2.13E-19
621-64-7	Di-n-Propylnitrosamine (N-Nitroso-di-n-propylamine)	3.49E-02	2.32E-03	1.42E-06	2.55E-04	5.03E-03	3.82E-12	1.16E-07	1.42E-06	1.27E-05	2.52E-04	3.82E-12
624-83-9	Methyl isocyanate	7.67E-03	7.66E-03	8.33E-08	0.00E+00	1.88E-08	2.66E-18	7.66E-06	8.33E-08	0.00E+00	1.24E-09	2.66E-18
627-13-4	Nitric acid, propyl ester	3.49E-02	3.48E-02	3.79E-07	0.00E+00	8.55E-08	1.21E-17	3.48E-06	3.79E-07	0.00E+00	5.62E-09	1.21E-17
62-75-9	N-Nitroso-N,N-dimethylamine (Dimethylnitrosamine)	6.51E-02	1.77E-03	2.71E-06	2.20E-03	9.87E-03	1.09E-12	8.85E-08	2.71E-06	1.10E-04	4.94E-04	1.09E-12
630-20-6	1,1,1,2-Tetrachloroethane	7.67E-03	7.86E-03	8.43E-08	0.00E+00	8.79E-09	1.30E-18	7.86E-04	8.43E-08	0.00E+00	6.05E-10	1.30E-18
64-17-5	Ethyl alcohol	7.67E-03	5.11E-04	3.13E-07	5.60E-05	1.11E-03	8.41E-13	5.11E-08	3.13E-07	2.80E-06	5.54E-05	8.41E-13
64-18-6	Formic acid	3.49E-02	1.20E-04	2.52E-06	1.52E-02	6.90E-03	7.59E-13	1.20E-08	2.52E-06	7.60E-04	3.45E-04	7.59E-13
64-19-7	Acetic acid	3.49E-02	2.15E-05	2.82E-06	2.28E-02	6.86E-03	7.54E-13	2.15E-09	2.82E-06	1.14E-03	3.43E-04	7.54E-13
67-56-1	Methyl alcohol (Methanol)	7.67E-03	5.11E-04	3.13E-07	5.60E-05	1.11E-03	8.41E-13	5.11E-08	3.13E-07	2.80E-06	5.54E-05	8.41E-13
67-63-0	2-Propyl alcohol (Isopropanol; Propan-2-01)	7.67E-03	8.63E-04	2.39E-07	1.17E-05	7.96E-04	8.78E-14	8.63E-08	2.39E-07	5.87E-07	3.99E-05	8.78E-14
67-64-1	2-Propanone (Acetone)	4.18E-02	1.66E-02	1.02E-06	2.21E-06	1.76E-03	1.96E-13	1.66E-06	1.02E-06	1.10E-07	8.91E-05	1.96E-13
67-66-3	Chloroform	7.67E-03	7.70E-03	7.92E-08	0.00E+00	3.39E-10	5.85E-20	3.85E-03	7.92E-08	0.00E+00	2.75E-11	5.85E-20
67-72-1	Hexachloroethane	3.49E-02	3.50E-02	3.60E-07	0.00E+00	1.54E-09	2.66E-19	7.00E-04	3.60E-07	0.00E+00	1.25E-10	2.66E-19
684-16-2	Hexafluoroacetone	7.67E-03	7.70E-03	7.92E-08	0.00E+00	3.39E-10	5.85E-20	7.70E-03	7.92E-08	0.00E+00	2.75E-11	5.85E-20
71-23-8	n-Propyl alcohol	7.67E-03	8.63E-04	2.39E-07	1.17E-05	7.96E-04	8.78E-14	8.63E-08	2.39E-07	5.87E-07	3.99E-05	8.78E-14
71-36-3	n-Butyl alcohol	7.67E-03	8.63E-04	2.39E-07	1.17E-05	7.96E-04	8.78E-14	8.63E-08	2.39E-07	5.87E-07	3.99E-05	8.78E-14
71-43-2	Benzene	7.67E-03	7.69E-03	7.85E-08	0.00E+00	2.73E-11	6.36E-21	7.69E-05	7.85E-08	0.00E+00	3.04E-12	6.36E-21
71-55-6	Methyl chloroform (1,1,1-Trichloroethane)	7.67E-03	7.72E-03	7.77E-08	0.00E+00	4.81E-14	2.48E-23	7.72E-06	7.77E-08	0.00E+00	1.19E-14	2.48E-23
72-20-8	Endrin	2.32E-04	1.68E-05	9.45E-09	1.23E-06	3.31E-05	3.26E-14	7.62E-16	9.45E-15	6.97E-16	4.68E-16	1.63E-19
72-43-5	Methoxychlor	1.16E-03	4.01E-06	8.39E-08	5.07E-04	2.30E-04	2.53E-14	1.82E-16	8.39E-14	2.88E-13	1.47E-15	1.27E-19
72-54-8	4,4-DDD	2.32E-04	1.68E-05	9.45E-09	1.23E-06	3.31E-05	3.26E-14	7.62E-16	9.45E-15	6.97E-16	4.68E-16	1.63E-19
72-55-9	4,4-DDE	2.32E-04	1.13E-04	9.28E-09	6.36E-09	1.63E-05	2.23E-14	5.15E-15	9.28E-15	3.62E-18	1.44E-15	1.11E-19
74-83-9	Bromomethane (Methyl bromide)	7.67E-03	7.70E-03	7.92E-08	0.00E+00	3.39E-10	5.85E-20	7.70E-06	7.92E-08	0.00E+00	2.75E-11	5.85E-20
74-87-3	Chloromethane (Methyl chloride)	7.67E-03	7.69E-03	7.78E-08	0.00E+00	1.17E-12	3.90E-22	3.85E-04	7.78E-08	0.00E+00	1.89E-13	3.90E-22
74-97-5	Bromochloromethane	7.67E-03	7.66E-03	8.33E-08	0.00E+00	1.88E-08	2.66E-18	3.83E-03	8.33E-08	0.00E+00	1.24E-09	2.66E-18
74-99-7	Methylacetylene	3.49E-02	3.50E-02	3.54E-07	0.00E+00	5.34E-12	1.77E-21	3.50E-06	3.54E-07	0.00E+00	8.57E-13	1.77E-21
75-00-3	Chloroethane	7.67E-03	7.69E-03	7.78E-08	0.00E+00	1.17E-12	3.90E-22	7.69E-06	7.78E-08	0.00E+00	1.89E-13	3.90E-22
75-01-4	Vinyl chloride (1-Chloroethene)	3.49E-02	3.51E-02	3.53E-07	0.00E+00	8.32E-20	1.25E-23	3.51E-06	3.53E-07	0.00E+00	2.94E-20	1.25E-23
75-05-8	Acetonitrile	1.09E-02	3.60E-03	2.80E-07	8.85E-07	5.74E-04	6.35E-14	3.60E-06	2.80E-07	4.42E-08	2.89E-05	6.35E-14
75-07-0	Acetaldehyde	3.49E-02	1.39E-02	8.47E-07	1.84E-06	1.47E-03	1.63E-13	1.39E-06	8.47E-07	9.20E-08	7.42E-05	1.63E-13
75-09-2	Dichloromethane (Methylene chloride)	7.67E-03	7.70E-03	7.92E-08	0.00E+00	3.39E-10	5.85E-20	3.85E-04	7.92E-08	0.00E+00	2.75E-11	5.85E-20
75-12-7	Formamide	3.49E-02	1.27E-06	2.89E-06	2.47E-02	6.80E-03	7.48E-13	1.27E-10	2.89E-06	1.24E-03	3.40E-04	7.48E-13
75-15-0	Carbon disulfide	7.67E-03	7.69E-03	7.78E-08	0.00E+00	1.17E-12	3.90E-22	7.69E-07	7.78E-08	0.00E+00	1.89E-13	3.90E-22
75-21-8	Ethylene oxide (Oxirane)	7.67E-03	6.54E-03	1.17E-07	1.14E-09	1.74E-05	1.99E-15	6.54E-07	1.17E-07	5.68E-11	9.10E-07	1.99E-15

Table 13 Summary of Organic Constituents Emission Rates for the WTP

CAS #	COPC	Feed	Unabated Streams					Abated Streams				
		FRP14	PVP01	PJV04	LMP06	HMP06	PJV32	PVP12	PJV11	LVP26	HOP33	PJV34
		WTP Feed	PT Vessel Vent	PT RFD/PJM	LAW Melter	HLW Melter	HLW PJM/RFD	PT Vessel Vent	PT RFD/PJM	LAW Melter	HLW Melter	HLW PJM/RFD
		g/sec	g/sec	g/sec	g/sec	g/sec	g/sec	g/sec	g/sec	g/sec	g/sec	g/sec
75-27-4	Bromodichloromethane	7.67E-03	7.86E-03	8.43E-08	0.00E+00	8.79E-09	1.30E-18	1.57E-03	8.43E-08	0.00E+00	6.05E-10	1.30E-18
75-34-3	1,1-Dichloroethane	7.67E-03	7.70E-03	7.92E-08	0.00E+00	3.39E-10	5.85E-20	7.70E-07	7.92E-08	0.00E+00	2.75E-11	5.85E-20
75-35-4	1,1-Dichloroethene (Vinylidene chloride)	7.67E-03	7.73E-03	7.76E-08	0.00E+00	1.83E-20	2.75E-24	7.73E-07	7.76E-08	0.00E+00	6.47E-21	2.75E-24
75-43-4	Dichlorofluoromethane	7.67E-03	7.69E-03	7.78E-08	0.00E+00	1.17E-12	3.90E-22	7.69E-06	7.78E-08	0.00E+00	1.89E-13	3.90E-22
75-45-6	Chlorodifluoromethane	7.67E-03	7.73E-03	7.76E-08	0.00E+00	1.83E-20	2.75E-24	1.55E-04	7.76E-08	0.00E+00	6.47E-21	2.75E-24
75-50-3	Trimethylamine	7.67E-03	5.31E-03	1.43E-07	2.26E-08	7.71E-05	8.67E-15	5.31E-07	1.43E-07	1.13E-09	3.95E-06	8.67E-15
75-52-5	Nitromethane	3.49E-02	1.39E-02	8.47E-07	1.84E-06	1.47E-03	1.63E-13	1.39E-06	8.47E-07	9.20E-08	7.42E-05	1.63E-13
75-55-8	2-Methylaziridine	3.49E-02	3.92E-03	1.09E-06	5.33E-05	3.62E-03	3.99E-13	3.92E-07	1.09E-06	2.67E-06	1.81E-04	3.99E-13
75-61-6	Difluorodibromomethane	7.67E-03	7.73E-03	7.76E-08	0.00E+00	1.83E-20	2.75E-24	7.73E-03	7.76E-08	0.00E+00	6.47E-21	2.75E-24
75-63-8	Trifluorobromomethane	7.67E-03	7.68E-03	7.69E-08	0.00E+00	0.00E+00	0.00E+00	7.68E-03	7.69E-08	0.00E+00	0.00E+00	0.00E+00
75-65-0	2-Methyl-2-propanol	7.67E-03	8.63E-04	2.39E-07	1.17E-05	7.96E-04	8.78E-14	8.63E-08	2.39E-07	5.87E-07	3.99E-05	8.78E-14
75-69-4	Trichlorofluoromethane	7.67E-03	7.71E-03	7.72E-08	0.00E+00	0.00E+00	2.11E-26	7.71E-03	7.72E-08	0.00E+00	0.00E+00	2.11E-26
75-71-8	Dichlorodifluoromethane	7.67E-03	7.68E-03	7.69E-08	0.00E+00	0.00E+00	0.00E+00	7.68E-03	7.69E-08	0.00E+00	0.00E+00	0.00E+00
75-99-0	2,2-Dichloropropionic acid	3.49E-02	2.15E-05	2.82E-06	2.28E-02	6.86E-03	7.54E-13	1.07E-07	2.82E-06	1.14E-03	3.43E-04	7.54E-13
76-03-9	Trichloroacetic acid	7.67E-03	2.19E-06	6.33E-07	5.28E-03	1.51E-03	1.66E-13	4.38E-08	6.33E-07	2.64E-04	7.55E-05	1.66E-13
76-11-9	1,1,1,2-Tetrachloro-2,2-difluoroethane	3.49E-02	3.50E-02	3.50E-07	0.00E+00	0.00E+00	5.66E-34	6.99E-04	3.50E-07	0.00E+00	0.00E+00	5.66E-34
76-12-0	1,1,2,2-Tetrachloro-1,2-difluoroethane	3.49E-02	3.50E-02	3.51E-07	0.00E+00	0.00E+00	9.60E-26	7.01E-04	3.51E-07	0.00E+00	0.00E+00	9.60E-26
76-13-1	1,2,2-Trichloro-1,1,2-trifluoroethane (Freon 113)	7.67E-03	7.68E-03	7.69E-08	0.00E+00	0.00E+00	0.00E+00	1.92E-04	7.69E-08	0.00E+00	0.00E+00	0.00E+00
76-14-2	1,2-Dichloro-1,1,2,2-tetrafluoroethane	7.67E-03	7.71E-03	7.71E-08	0.00E+00	0.00E+00	0.00E+00	7.71E-03	7.71E-08	0.00E+00	0.00E+00	0.00E+00
76-15-3	Chloropentafluoroethane	7.67E-03	7.70E-03	7.70E-08	0.00E+00	0.00E+00	0.00E+00	7.70E-03	7.70E-08	0.00E+00	4.24E-30	0.00E+00
76-44-8	Heptachlor	7.56E-04	6.72E-04	1.03E-08	0.00E+00	6.62E-07	7.72E-17	2.02E-05	1.03E-08	0.00E+00	3.53E-08	7.72E-17
78-83-1	2-Methylpropyl alcohol (Isobutyl alcohol)	3.49E-02	3.92E-03	1.09E-06	5.33E-05	3.62E-03	3.99E-13	3.92E-07	1.09E-06	2.67E-06	1.81E-04	3.99E-13
78-87-5	1,2-Dichloropropane	7.67E-03	7.70E-03	7.92E-08	0.00E+00	3.39E-10	5.85E-20	7.70E-06	7.92E-08	0.00E+00	2.75E-11	5.85E-20
78-92-2	1-Methylpropyl alcohol (2-Butanol)	7.67E-03	8.63E-04	2.39E-07	1.17E-05	7.96E-04	8.78E-14	8.63E-08	2.39E-07	5.87E-07	3.99E-05	8.78E-14
78-93-3	Methyl ethyl ketone (MEK, 2-Butanone)	7.67E-03	3.05E-03	1.86E-07	4.05E-07	3.23E-04	3.59E-14	3.05E-06	1.86E-07	2.02E-08	1.63E-05	3.59E-14
79-00-5	1,1,2-Trichloroethane	7.67E-03	7.66E-03	8.33E-08	0.00E+00	1.88E-08	2.66E-18	7.66E-07	8.33E-08	0.00E+00	1.24E-09	2.66E-18
79-01-6	Trichloroethylene	7.67E-03	7.68E-03	7.78E-08	0.00E+00	1.33E-12	4.37E-22	7.68E-07	7.78E-08	0.00E+00	2.11E-13	4.37E-22
79-09-4	Propionic acid	3.49E-02	3.49E-04	2.44E-06	1.12E-02	7.58E-03	4.77E-12	3.49E-08	2.44E-06	5.58E-04	3.79E-04	4.77E-12
79-10-7	2-Propenoic acid	3.49E-02	3.49E-04	2.44E-06	1.12E-02	7.58E-03	4.77E-12	3.49E-08	2.44E-06	5.58E-04	3.79E-04	4.77E-12
79-20-9	Methyl acetate	3.49E-02	2.41E-02	6.48E-07	1.03E-07	3.50E-04	3.94E-14	2.41E-06	6.48E-07	5.13E-09	1.80E-05	3.94E-14
79-34-5	1,1,2,2-Tetrachloroethane	7.67E-03	7.19E-03	9.69E-08	7.45E-13	2.99E-06	3.51E-16	7.19E-04	9.69E-08	3.73E-14	1.61E-07	3.51E-16
8001-35-2	Toxaphene	2.67E-04	2.34E-05	1.20E-08	8.46E-07	4.11E-05	5.47E-14	1.06E-15	1.20E-14	4.81E-16	7.14E-16	2.73E-19
82-68-8	Pentachloronitrobenzene (PCBN or quintobenzene)	3.49E-02	1.39E-02	8.47E-07	1.84E-06	1.47E-03	1.63E-13	8.32E-05	8.47E-07	9.20E-08	7.42E-05	1.63E-13
83-32-9	Acenaphthene	3.49E-02	2.97E-02	5.30E-07	5.16E-09	7.90E-05	9.06E-15	1.78E-04	5.30E-07	2.58E-10	4.14E-06	9.06E-15
84-66-2	Diethyl phthalate	3.49E-02	3.97E-04	1.92E-06	5.30E-03	6.33E-03	6.97E-13	7.94E-09	1.92E-06	2.65E-04	3.17E-04	6.97E-13
84-74-2	Dibutyl phthalate	3.49E-02	1.07E-03	1.89E-06	1.84E-03	6.66E-03	8.85E-12	1.63E-16	1.89E-12	1.04E-12	6.43E-14	4.42E-17
85-01-8	Phenanthrene	3.49E-02	1.39E-02	8.47E-07	1.84E-06	1.47E-03	1.63E-13	8.32E-05	8.47E-07	9.20E-08	7.42E-05	1.63E-13
85-68-7	Butylbenzyl phthalate	3.49E-02	1.07E-03	1.89E-06	1.84E-03	6.66E-03	8.85E-12	1.63E-16	1.89E-12	1.04E-12	6.43E-14	4.42E-17
86-73-7	Fluorene	3.49E-02	2.41E-02	6.48E-07	1.03E-07	3.50E-04	3.94E-14	1.10E-12	6.48E-13	5.82E-17	2.67E-14	1.97E-19
87-68-3	Hexachlorobutadiene	7.67E-03	7.70E-03	7.79E-08	0.00E+00	1.02E-12	3.44E-22	3.08E-05	7.79E-08	0.00E+00	1.67E-13	3.44E-22
87-86-5	Pentachlorophenol	3.49E-02	2.15E-05	2.82E-06	2.28E-02	6.86E-03	7.54E-13	1.29E-07	2.82E-06	1.14E-03	3.43E-04	7.54E-13
88-06-2	2,4,6-Trichlorophenol	3.49E-02	2.32E-03	1.42E-06	2.55E-04	5.03E-03	3.82E-12	1.39E-05	1.42E-06	1.27E-05	2.52E-04	3.82E-12

Table 13 Summary of Organic Constituents Emission Rates for the WTP

CAS #	COPC	Feed	Unabated Streams					Abated Streams				
		FRP14	PVP01	PJV04	LMP06	HMP06	PJV32	PVP12	PJV11	LVP26	HOP33	PJV34
		WTP Feed	PT Vessel Vent	PT RFD/PJM	LAW Melter	HLW Melter	HLW PJM/RFD	PT Vessel Vent	PT RFD/PJM	LAW Melter	HLW Melter	HLW PJM/RFD
		g/sec	g/sec	g/sec	g/sec	g/sec	g/sec	g/sec	g/sec	g/sec	g/sec	g/sec
88-72-2	2-Nitrotoluene	7.67E-03	1.08E-03	2.31E-07	6.90E-06	7.28E-04	8.02E-14	5.39E-08	2.31E-07	3.45E-07	3.65E-05	8.02E-14
88-75-5	2-Nitrophenol	3.49E-02	4.90E-03	1.05E-06	3.14E-05	3.31E-03	3.65E-13	7.35E-05	1.05E-06	1.57E-06	1.66E-04	3.65E-13
88-85-7	2-sec-Butyl-4,6-dinitrophenol (Dinoseb)	3.49E-02	4.08E-04	3.20E-06	1.88E-02	9.69E-03	1.29E-11	1.86E-14	3.20E-12	1.07E-11	6.94E-14	6.43E-17
88-89-1	Picric acid	3.49E-02	6.84E-08	1.03E-05	3.31E-01	8.46E-03	1.12E-11	1.04E-20	1.03E-11	1.88E-10	5.34E-14	5.61E-17
91-20-3	Naphthalene	1.16E-03	1.10E-03	1.45E-08	0.00E+00	2.77E-07	3.32E-17	5.48E-06	1.45E-08	0.00E+00	1.52E-08	3.32E-17
91-22-5	Quinoline	3.49E-02	9.48E-04	1.45E-06	1.18E-03	5.29E-03	5.82E-13	4.74E-08	1.45E-06	5.89E-05	2.65E-04	5.82E-13
91-58-7	2-Chloronapthalene	3.49E-02	3.27E-02	4.40E-07	3.39E-12	1.36E-05	1.60E-15	1.96E-04	4.40E-07	1.69E-13	7.31E-07	1.60E-15
92-52-4	1,1`-Biphenyl	3.49E-02	3.27E-02	4.40E-07	3.39E-12	1.36E-05	1.60E-15	6.53E-06	4.40E-07	1.69E-13	7.31E-07	1.60E-15
92-93-3	4-Nitrobiphenyl	3.49E-02	2.32E-03	1.42E-06	2.55E-04	5.03E-03	3.82E-12	1.06E-13	1.42E-12	1.45E-13	6.63E-14	1.91E-17
93-72-1	Silvex (2,4,5-TP)	3.49E-02	9.95E-06	2.88E-06	2.40E-02	6.86E-03	7.55E-13	4.52E-16	2.88E-12	1.36E-11	4.34E-14	3.77E-18
93-76-5	2,4,5-T	3.49E-02	9.95E-06	2.88E-06	2.40E-02	6.86E-03	7.55E-13	4.52E-16	2.88E-12	1.36E-11	4.34E-14	3.77E-18
94-75-7	2,4-D and esters (160C typed)	3.49E-02	2.15E-05	2.82E-06	2.28E-02	6.86E-03	7.54E-13	1.29E-07	2.82E-06	1.14E-03	3.43E-04	7.54E-13
95-13-6	Indene	3.49E-02	3.57E-02	3.83E-07	0.00E+00	4.00E-08	5.90E-18	1.79E-05	3.83E-07	0.00E+00	2.75E-09	5.90E-18
95-47-6	o-Xylene	7.67E-03	7.70E-03	7.92E-08	0.00E+00	3.39E-10	5.85E-20	7.70E-07	7.92E-08	0.00E+00	2.75E-11	5.85E-20
95-48-7	o-Cresol (2-Methylphenol)	7.67E-03	2.09E-04	3.20E-07	2.59E-04	1.16E-03	1.28E-13	1.04E-07	3.20E-07	1.30E-05	5.82E-05	1.28E-13
95-49-8	2-Chlorotoluene	3.49E-02	3.50E-02	3.60E-07	0.00E+00	1.54E-09	2.66E-19	1.75E-06	3.60E-07	0.00E+00	1.25E-10	2.66E-19
95-50-1	o-Dichlorobenzene (1,2-Dichlorobenzene)	7.67E-03	7.86E-03	8.43E-08	0.00E+00	8.79E-09	1.30E-18	7.86E-05	8.43E-08	0.00E+00	6.05E-10	1.30E-18
95-57-8	2-Chlorophenol	3.49E-02	3.92E-03	1.09E-06	5.33E-05	3.62E-03	3.99E-13	1.96E-07	1.09E-06	2.67E-06	1.81E-04	3.99E-13
95-95-4	2,4,5-Trichlorophenol	3.49E-02	9.48E-04	1.45E-06	1.18E-03	5.29E-03	5.82E-13	5.69E-06	1.45E-06	5.89E-05	2.65E-04	5.82E-13
96-22-0	3-Pentanone	7.67E-03	5.31E-03	1.43E-07	2.26E-08	7.71E-05	8.67E-15	5.31E-07	1.43E-07	1.13E-09	3.95E-06	8.67E-15
96-69-5	Bis(3-tert-butyl-4-hydroxy-6-methyl-phenyl)sulfide	3.49E-02	3.50E-02	3.60E-07	0.00E+00	1.54E-09	2.66E-19	1.59E-12	3.60E-13	0.00E+00	2.69E-18	1.33E-24
98-51-1	p-tert-Butyltoluene	3.49E-02	3.51E-02	3.53E-07	0.00E+00	2.19E-13	1.13E-22	1.75E-06	3.53E-07	0.00E+00	5.40E-14	1.13E-22
98-82-8	Cumene	3.49E-02	3.50E-02	3.54E-07	0.00E+00	5.34E-12	1.77E-21	1.75E-06	3.54E-07	0.00E+00	8.57E-13	1.77E-21
98-83-9	alpha-Methylstyrene	7.67E-03	7.70E-03	7.92E-08	0.00E+00	3.39E-10	5.85E-20	3.85E-05	7.92E-08	0.00E+00	2.75E-11	5.85E-20
98-86-2	Acetophenone	3.49E-02	4.18E-03	1.07E-06	4.49E-05	3.53E-03	3.89E-13	2.09E-05	1.07E-06	2.25E-06	1.77E-04	3.89E-13
98-95-3	Nitrobenzene	3.49E-02	4.90E-03	1.05E-06	3.14E-05	3.31E-03	3.65E-13	2.45E-07	1.05E-06	1.57E-06	1.66E-04	3.65E-13
Coplanar PCB's												
31508-00-6	2,3',4,4',5-Pentachlorobiphenyl (PBC 118)	8.72E-06	4.18E-05	9.56E-10	3.91E-14	4.78E-08	8.20E-17	1.90E-15	9.56E-16	2.22E-23	3.90E-17	4.10E-22
32598-13-3	3,3',4,4'-Tetrachlorobiphenyl (TCB)	8.72E-06	4.18E-05	9.56E-10	3.91E-14	4.78E-08	8.20E-17	1.90E-15	9.56E-16	2.22E-23	3.90E-17	4.10E-22
32598-14-4	2,3,3',4,4'-Pentachlorobiphenyl (PCB 105)	8.72E-06	4.18E-05	9.56E-10	3.91E-14	4.78E-08	8.20E-17	1.90E-15	9.56E-16	2.22E-23	3.90E-17	4.10E-22
32774-16-6	3,3',4,4',5,5'-Hexachlorobiphenyl	8.72E-06	4.18E-05	9.56E-10	3.91E-14	4.78E-08	8.20E-17	1.90E-15	9.56E-16	2.22E-23	3.90E-17	4.10E-22
35065-29-3	2,2',3,4,4',5,5'-Heptachlorobiphenyl	8.72E-06	4.18E-05	9.56E-10	3.91E-14	4.78E-08	8.20E-17	1.90E-15	9.56E-16	2.22E-23	3.90E-17	4.10E-22
35065-30-6	2,2',3,3',4,4',5-Heptachlorobiphenyl	8.72E-06	4.18E-05	9.56E-10	3.91E-14	4.78E-08	8.20E-17	1.90E-15	9.56E-16	2.22E-23	3.90E-17	4.10E-22
38380-08-4	2,3,3',4,4',5-Hexachlorobiphenyl (PCB 157)	8.72E-06	4.18E-05	9.56E-10	3.91E-14	4.78E-08	8.20E-17	1.90E-15	9.56E-16	2.22E-23	3.90E-17	4.10E-22
39635-31-9	2,3,3',4,4',5,5'-Heptachlorobiphenyl	8.72E-06	4.18E-05	9.56E-10	3.91E-14	4.78E-08	8.20E-17	1.90E-15	9.56E-16	2.22E-23	3.90E-17	4.10E-22
52663-72-6	2,3',4,4',5,5'-Hexachlorobiphenyl	8.72E-06	4.18E-05	9.56E-10	3.91E-14	4.78E-08	8.20E-17	1.90E-15	9.56E-16	2.22E-23	3.90E-17	4.10E-22
57465-28-8	3,3',4,4',5-Pentachlorobiphenyl	8.72E-06	4.18E-05	9.56E-10	3.91E-14	4.78E-08	8.20E-17	1.90E-15	9.56E-16	2.22E-23	3.90E-17	4.10E-22
65510-44-3	2',3,4,4',5-Pentachlorobiphenyl	8.72E-06	4.18E-05	9.56E-10	3.91E-14	4.78E-08	8.20E-17	1.90E-15	9.56E-16	2.22E-23	3.90E-17	4.10E-22
69782-90-7	2,3,3',4,4',5'-Hexachlorobiphenyl	8.72E-06	4.18E-05	9.56E-10	3.91E-14	4.78E-08	8.20E-17	1.90E-15	9.56E-16	2.22E-23	3.90E-17	4.10E-22
70362-50-4	3,4,4',5-Tetrachlorobiphenyl	8.72E-06	4.18E-05	9.56E-10	3.91E-14	4.78E-08	8.20E-17	1.90E-15	9.56E-16	2.22E-23	3.90E-17	4.10E-22
74472-37-0	2,3,4,4',5-Pentachlorobiphenyl	8.72E-06	4.18E-05	9.56E-10	3.91E-14	4.78E-08	8.20E-17	1.90E-15	9.56E-16	2.22E-23	3.90E-17	4.10E-22

Table 14 Estimated Inorganic COPC Emissions

CAS Number	Compound	Feed	Unabated Streams					Abated Streams				
		FRP14	PVP01	PJV04	LMP06	HMP06	PJV32	PVP12	PJV11	LVP26	HOP33	PJV34
		WTP Feed	PT Vessel Vent	PT RFD/PJM	LAW Melter	HLW Melter	HLW PJM/RFD	PT Vessel Vent	PT RFD/PJM	LAW Melter	HLW Melter	HLW PJM/RFD
		g/sec	g/sec	g/sec	g/sec	g/sec	g/sec	g/sec	g/sec	g/sec	g/sec	g/sec
7440-22-4	Silver	8.96E-02	6.83E-07	6.26E-06	6.70E-04	2.41E-03	1.03E-11	5.13E-15	6.26E-12	3.72E-11	1.34E-12	5.15E-17
7429-90-5	Aluminum	1.28E+01	1.42E-04	1.14E-03	1.83E-01	2.77E-02	3.11E-10	1.06E-12	1.14E-09	2.29E-09	3.87E-12	1.55E-15
7440-38-2	Arsenic	9.52E-02	1.79E-04	2.43E-03	6.34E+00	3.29E+01	4.39E-08	1.34E-12	2.43E-09	3.30E-07	1.71E-08	2.19E-13
7440-42-8	Boron	2.76E-01	5.11E-06	3.74E-05	6.30E-01	6.47E-02	1.02E-10	3.84E-14	3.74E-11	1.05E-08	1.20E-11	5.12E-16
7440-39-3	Barium	5.80E-01	3.42E-06	3.59E-05	2.07E-04	5.65E-03	6.33E-11	2.56E-14	3.59E-11	1.05E-12	3.20E-13	3.17E-16
7440-69-9	Bismuth	4.16E-01	1.89E-06	2.75E-05	6.37E-04	3.56E-03	4.01E-11	1.42E-14	2.75E-11	4.08E-11	2.29E-12	2.01E-16
7440-70-2	Calcium	3.52E+00	4.84E-04	3.06E-04	3.34E-01	1.51E-02	1.32E-10	3.64E-12	3.06E-10	8.36E-09	4.21E-12	6.60E-16
7440-43-9	Cadmium	1.30E+00	9.50E-06	1.09E-04	7.45E-02	6.94E-02	1.58E-10	7.13E-14	1.09E-10	2.91E-09	2.47E-11	7.89E-16
16887-00-6	Chloride	2.72E+00	3.06E-05	2.72E-04	4.21E-01	4.23E-02	1.22E-10	2.30E-13	2.72E-10	7.01E-09	7.87E-15	6.08E-16
18540-29-9	Chromium (hexavalent)	1.80E+00	1.66E-05	1.65E-04	1.57E-02	2.42E-03	2.72E-11	1.25E-13	1.65E-10	1.93E-09	3.30E-12	1.36E-16
7440-50-8	Copper	8.26E-02	6.47E-07	5.74E-06	1.05E-04	3.09E-04	6.57E-12	4.86E-15	5.74E-12	6.05E-12	1.78E-13	3.29E-17
16984-48-8	Flouride	3.66E+00	3.53E-05	3.61E-04	6.51E-01	1.37E-01	3.30E-10	2.65E-13	3.61E-10	1.09E-08	2.54E-14	1.65E-15
7439-89-6	Iron	4.51E+00	3.36E-05	3.06E-04	1.08E-01	1.85E-02	3.92E-10	2.52E-13	3.06E-10	1.35E-09	2.58E-12	1.96E-15
7439-97-6	Mercury	1.70E-02	1.40E-06	1.92E-05	2.51E-02	2.65E-01	3.36E-10	1.40E-06	1.92E-05	6.99E-05	1.26E-05	3.36E-10
7440-09-7	Potassium	1.18E+01	1.25E-04	1.10E-03	5.54E-01	6.19E-02	2.02E-10	9.39E-13	1.10E-09	2.72E-08	3.04E-11	1.01E-15
7439-93-2	Lithium	6.26E-02	7.36E-07	7.81E-06	1.10E-01	5.58E-03	9.75E-12	5.52E-15	7.81E-12	6.53E-09	3.32E-12	4.88E-17
7439-95-4	Magnesium	3.31E-01	1.83E-05	2.31E-05	4.09E-02	1.34E-03	2.84E-11	1.38E-13	2.31E-11	1.02E-09	3.73E-13	1.42E-16
7439-96-5	Manganese	1.25E+00	1.02E-05	9.02E-05	5.39E-03	1.14E-02	9.96E-11	7.62E-14	9.02E-11	8.98E-11	2.12E-12	4.98E-16
7440-23-5	Sodium	4.02E+01	4.88E-04	3.92E-03	3.69E-01	6.39E-02	7.19E-10	3.66E-12	3.92E-09	3.55E-08	6.15E-11	3.59E-15
7440-02-0	Nickel	5.87E-01	3.87E-06	4.53E-05	3.01E-03	3.68E-03	3.72E-11	2.90E-14	4.53E-11	1.27E-10	1.73E-12	1.86E-16
14797-65-0	Nitrite	1.56E+01	1.44E-04	1.42E-03	0.00E+00	0.00E+00	2.06E-10	1.08E-12	1.42E-09	1.34E-12	1.37E-15	1.03E-15
14797-55-8	Nitrate	4.66E+01	7.70E-04	7.49E-03	0.00E+00	0.00E+00	1.42E-09	5.78E-12	7.49E-09	6.98E-12	9.58E-15	7.11E-15
14280-30-9	Hydroxide	5.84E+01	5.76E-04	4.21E-03	0.00E+00	0.00E+00	1.78E-09	4.32E-12	4.21E-09	3.21E-12	1.19E-14	8.90E-15
7723-14-0	Phosphorous	0.00E+00	6.41E-11	2.84E-12	7.73E-02	1.71E-02	1.05E-17	4.81E-19	2.84E-18	3.86E-07	8.56E-08	5.27E-23
7439-92-1	Lead	3.68E-01	2.68E-06	2.98E-05	1.06E-03	7.90E-04	1.68E-11	2.01E-14	2.98E-11	7.66E-11	5.73E-13	8.40E-17
14265-44-2	Phosphate	1.16E+01	1.45E-04	1.04E-03	0.00E+00	0.00E+00	2.10E-10	1.09E-12	1.04E-09	9.48E-13	1.40E-15	1.05E-15
63705-05-5	Total Sulfur	0.00E+00	1.44E-07	8.60E-12	0.00E+00	0.00E+00	1.43E-17	1.08E-15	8.60E-18	1.06E-02	1.41E-02	7.17E-23
7440-21-3	Silicon	2.35E+00	2.61E-05	1.74E-04	4.20E-01	4.27E-02	2.93E-10	1.96E-13	1.74E-10	7.00E-09	7.94E-12	1.47E-15
14808-79-8	Sulfate	5.87E+00	5.91E-05	5.40E-04	0.00E+00	0.00E+00	6.84E-11	4.44E-13	5.40E-10	5.16E-13	4.56E-16	3.42E-16
7440-24-6	Strontium (total)	7.14E-02	2.93E-07	4.56E-06	6.38E-05	6.57E-04	7.37E-12	2.20E-15	4.56E-12	7.98E-13	9.16E-14	3.68E-17
7440-66-6	Zinc	9.56E-02	1.41E-06	1.07E-05	1.42E-01	9.75E-03	1.85E-11	1.06E-14	1.07E-11	3.23E-09	2.47E-12	9.23E-17
7440-67-7	Zirconium	1.91E+00	1.11E-05	1.18E-04	4.32E-02	6.23E-03	1.94E-10	8.36E-14	1.18E-10	7.20E-10	1.16E-12	9.72E-16
7440-41-7	Beryllium	1.29E-01	7.50E-07	7.93E-06	2.89E-03	4.19E-04	1.31E-11	5.63E-15	7.93E-12	4.82E-11	7.80E-14	6.55E-17
57-12-5	Cyanide	3.17E+00	3.94E-05	2.83E-04	6.46E-02	1.43E-02	5.73E-11	2.96E-13	2.83E-10	2.58E-13	3.82E-16	2.86E-16

Table 14 Estimated Inorganic COPC Emissions

CAS Number	Compound	Feed	Unabated Streams					Abated Streams				
		FRP14	PVP01	PJV04	LMP06	HMP06	PJV32	PVP12	PJV11	LVP26	HOP33	PJV34
		WTP Feed	PT Vessel Vent	PT RFD/PJM	LAW Melter	HLW Melter	HLW PJM/RFD	PT Vessel Vent	PT RFD/PJM	LAW Melter	HLW Melter	HLW PJM/RFD
7440-48-4	Cobalt	8.92E-01	4.60E-06	5.42E-05	5.32E-05	4.42E-03	9.41E-11	3.46E-14	5.42E-11	4.16E-12	3.46E-12	4.70E-16
7439-98-7	Molybdenum	1.29E+00	5.82E-06	8.50E-05	1.96E-03	1.10E-02	1.24E-10	4.37E-14	8.50E-11	1.26E-10	7.08E-12	6.21E-16
7440-16-6	Rhodium	2.58E-01	1.50E-06	1.59E-05	5.78E-03	8.39E-04	2.62E-11	1.13E-14	1.59E-11	9.64E-11	1.56E-13	1.31E-16
7440-36-0	Antimony	1.66E+00	7.67E-06	1.11E-04	2.76E-03	1.40E-02	1.58E-10	5.76E-14	1.11E-10	3.40E-10	1.72E-11	7.89E-16
7782-49-2	Selenium	1.03E+00	9.92E-06	1.01E-04	1.83E-01	3.87E-02	9.37E-11	7.45E-14	1.01E-10	3.05E-09	7.21E-15	4.69E-16
7440-31-5	Tin	1.03E-02	5.21E-08	7.06E-07	1.22E-05	3.92E-05	8.33E-13	3.91E-16	7.06E-13	1.53E-13	5.47E-15	4.16E-18
7440-25-7	Tantalum	5.95E-02	3.47E-07	3.66E-06	1.33E-03	1.94E-04	6.05E-12	2.60E-15	3.66E-12	2.23E-11	3.60E-14	3.03E-17
7440-28-0	Thallium	8.93E-01	8.61E-06	8.79E-05	1.59E-01	3.36E-02	8.13E-11	6.46E-14	8.79E-11	2.65E-09	6.25E-15	4.07E-16
7440-61-1	Uranium	2.77E+01	2.44E-04	2.03E-03	4.98E-02	8.93E-02	1.90E-09	1.83E-12	2.03E-09	6.24E-10	1.25E-11	9.48E-15
7440-62-2	Vanadium	6.34E-02	2.87E-07	4.19E-06	9.64E-05	5.43E-04	6.12E-12	2.15E-15	4.19E-12	6.18E-12	3.49E-13	3.06E-17
7440-33-7	Tungsten	4.75E-01	2.77E-06	2.93E-05	1.07E-02	1.55E-03	4.83E-11	2.08E-14	2.93E-11	1.78E-10	2.88E-13	2.42E-16
7440-65-5	Yttrium	3.17E-01	1.17E-06	1.95E-05	8.09E-05	3.12E-03	3.51E-11	8.78E-15	1.95E-11	1.01E-12	4.36E-13	1.75E-16
630-08-0	Carbon monoxide	0.00E+00	7.58E-22	5.55E-22	6.37E-01	1.05E-01	1.68E-27	2.09E-23	5.58E-22	6.37E-02	1.05E-02	3.74E-22
10102-43-9	Nitric Oxide	0.00E+00	3.71E-27	5.77E-27	2.24E+01	4.33E+00	1.47E-32	1.60E-28	5.58E-27	9.34E-01	2.17E-01	6.99E-39
10102-44-0	Nitrogen dioxide	0.00E+00	2.73E-21	2.55E-28	3.13E+00	6.05E-01	2.69E-32	1.07E-18	2.35E-28	1.30E-01	3.03E-02	3.38E-44
7446-09-5	Sulfur dioxide	0.00E+00	1.40E-23	4.51E-27	1.28E+00	1.69E-01	2.98E-33	7.93E-24	1.34E-24	1.06E-01	1.41E-01	0.00E+00
7664-41-7	Ammonia/Ammonium	0.00E+00	1.60E-03	1.32E-05	3.58E-03	5.75E-02	5.99E-11	5.32E-04	1.35E-05	3.27E-02	1.89E-02	9.75E-11
	Total	2.67E+02	5.25E-03	2.83E-02	3.85E+01	3.93E+01	5.39E-08	5.33E-04	3.28E-05	1.28E+00	4.31E-01	4.34E-10

Table 15 Estimated Radionuclide COPC Emissions

CAS Number	Compound	Feed	Unabated Streams					Abated Streams				
		FRP14	PVP01	PJV04	LMP06	HMP06	PJV32	PVP12	PJV11	LVP26	HOP33	PJV34
		WTP Feed	PT Vessel Vent	PT RFD/PJM	LAW Melter	HLW Melter	HLW PJM/RFD	PT Vessel Vent	PT RFD/PJM	LAW Melter	HLW Melter	HLW PJM/RFD
		Ci/d	Ci/d	Ci/d	Ci/d	Ci/d	Ci/d	Ci/d	Ci/d	Ci/d	Ci/d	Ci/d
14596-10-2	Americium-241	9.62E+02	3.38E-03	5.81E-02	6.53E-03	4.83E+00	1.02E-07	2.54E-11	5.81E-08	8.17E-11	6.74E-10	5.12E-13
14762-75-5	Carbon-14	1.08E+00	1.38E-05	9.84E-05	9.17E-01	1.62E-01	1.62E-11	1.38E-05	9.84E-05	9.17E-01	1.62E-01	1.62E-11
10198-40-0	Cobalt-60	1.08E+02	5.57E-04	6.57E-03	6.51E-03	5.37E-01	1.14E-08	4.18E-12	6.57E-09	5.08E-10	4.20E-10	5.70E-14
15757-87-6	Curium-243	3.20E+01	1.61E-04	1.93E-03	1.74E-05	1.61E-01	3.41E-09	1.21E-12	1.93E-09	2.17E-13	2.24E-11	1.71E-14
13981-15-2	Curium-244	2.40E+01	1.21E-04	1.45E-03	1.87E-05	1.21E-01	2.56E-09	9.08E-13	1.45E-09	2.34E-13	1.68E-11	1.28E-14
10045-97-3	Cesium-137	9.28E+04	6.03E-01	7.62E+00	4.64E-01	3.20E+03	1.36E-05	4.53E-09	7.62E-06	3.22E-08	2.22E-06	6.81E-11
14683-23-9	Europium-152	1.01E+01	6.53E-05	7.74E-04	2.28E-02	2.80E-02	5.94E-10	4.90E-13	7.74E-10	2.85E-10	3.91E-12	2.97E-15
15585-10-1	Europium-154	5.72E+02	2.10E-03	3.50E-02	7.55E-02	2.80E+00	5.93E-08	1.58E-11	3.50E-08	9.45E-10	3.90E-10	2.97E-13
14391-16-3	Europium-155	3.38E+02	1.36E-03	2.13E-02	1.30E-01	1.57E+00	3.33E-08	1.02E-11	2.13E-08	1.63E-09	2.19E-10	1.66E-13
10028-17-8	Tritium	1.43E+01	3.30E-01	8.30E-04	4.49E-01	5.03E+00	6.01E-09	2.63E-01	8.30E-04	6.37E-02	5.00E-01	6.01E-09
15046-84-1	Iodine-129	1.42E-02	2.19E-07	1.30E-06	1.07E-02	4.41E-03	1.38E-12	6.57E-08	1.30E-06	8.90E-05	3.67E-06	1.38E-12
13981-37-8	Nickel-63	5.96E+01	2.68E-04	3.92E-03	9.37E-02	5.84E-01	5.91E-09	2.01E-12	3.92E-09	3.97E-09	2.75E-10	2.96E-14
13994-20-2	Neptunium-237	7.93E-01	4.02E-06	4.79E-05	2.81E-05	3.97E-03	8.42E-11	3.02E-14	4.79E-11	3.51E-13	5.54E-13	4.21E-16
13981-16-3	Plutonium-238	3.74E+00	1.32E-05	2.26E-04	3.79E-05	1.88E-02	3.98E-10	9.89E-14	2.26E-10	4.74E-13	2.62E-12	1.99E-15
15117-48-3	Plutonium-239	3.32E+01	1.17E-04	2.01E-03	4.43E-04	1.66E-01	3.53E-09	8.78E-13	2.01E-09	5.54E-12	2.32E-11	1.76E-14
14119-33-6	Plutonium-240	1.83E+00	6.52E-06	1.11E-04	7.63E-05	9.12E-03	1.94E-10	4.89E-14	1.11E-10	9.55E-13	1.27E-12	9.68E-16
14119-32-5	Plutonium-241	2.35E+02	8.27E-04	1.42E-02	1.89E-03	1.18E+00	2.50E-08	6.21E-12	1.42E-08	2.36E-11	1.65E-10	1.25E-13
14234-35-6	Antimony-125	4.18E+02	1.93E-03	2.79E-02	6.99E-01	3.52E+00	3.96E-08	1.45E-11	2.79E-08	8.59E-08	4.33E-09	1.98E-13
15715-94-3	Samarium-151	2.02E+03	1.27E-02	1.53E-01	4.32E+00	5.80E+00	1.23E-07	9.55E-11	1.53E-07	5.41E-08	8.09E-10	6.15E-13
15832-50-5	Tin-126	2.18E+00	1.11E-05	1.50E-04	2.61E-03	8.31E-03	1.76E-10	8.31E-14	1.50E-10	3.27E-11	1.16E-12	8.81E-16
10098-97-2	Strontium-90	1.10E+05	4.05E-01	6.77E+00	2.82E+01	1.08E+03	1.21E-05	3.04E-09	6.77E-06	3.53E-07	1.51E-07	6.06E-11
14133-76-7	Technetium-99	1.87E+02	1.53E-03	1.84E-02	3.75E-01	9.32E+01	1.43E-07	1.15E-11	1.84E-08	2.41E-08	5.98E-08	7.17E-13
7440-29-1	Thorium-232	1.05E-02	7.05E-08	7.03E-07	9.67E-06	4.31E-05	9.13E-13	5.29E-16	7.03E-13	1.21E-13	6.01E-15	4.57E-18
13968-55-3	Uranium-233	4.91E-02	5.73E-07	4.25E-06	1.79E-04	6.64E-05	1.41E-12	4.30E-15	4.25E-12	2.25E-12	9.26E-15	7.04E-18
13966-29-5	Uranium-234	5.79E-02	4.81E-07	4.24E-06	1.04E-04	1.86E-04	3.95E-12	3.61E-15	4.24E-12	1.31E-12	2.60E-14	1.97E-17
15117-96-1	Uranium-235	3.56E-03	2.52E-08	2.44E-07	4.03E-06	1.38E-05	2.93E-13	1.89E-16	2.44E-13	5.05E-14	1.93E-15	1.47E-18
13982-70-2	Uranium-236	3.75E-03	4.08E-08	3.13E-07	1.21E-05	6.68E-06	1.42E-13	3.06E-16	3.13E-13	1.51E-13	9.33E-16	7.09E-19
7440-61-1	Uranium-238	3.67E-02	3.26E-07	2.78E-06	7.77E-05	1.07E-04	2.26E-12	2.45E-15	2.78E-12	9.72E-13	1.49E-14	1.13E-17
10098-91-6	Yttrium-90	1.42E+05	5.23E-01	8.74E+00	3.62E+01	1.40E+03	1.57E-05	3.93E-09	8.74E-06	4.52E-07	1.95E-07	7.84E-11
13967-48-1	Ruthenium-106	1.67E+01	1.61E-04	1.64E-03	2.97E+00	6.29E-01	1.52E-09	1.21E-12	1.64E-09	4.96E-08	1.17E-13	7.61E-15
13967-70-9	Cesium-134	1.20E+01	7.80E-05	9.86E-04	6.03E-05	4.15E-01	1.77E-09	5.86E-13	9.86E-10	4.19E-12	2.88E-10	8.86E-15
13981-97-0	Barium-137m	1.25E+04	8.13E-02	1.03E+00	6.28E-02	4.32E+02	1.84E-06	6.10E-10	1.03E-06	4.36E-09	3.00E-07	9.22E-12
13982-10-0	Plutonium-242	5.50E-03	1.94E-08	3.32E-07	4.38E-08	2.76E-05	5.86E-13	1.45E-16	3.32E-13	5.49E-16	3.85E-15	2.93E-18
13982-63-3	Radium-226	5.81E-04	3.38E-09	3.58E-08	1.30E-05	1.89E-06	5.91E-14	2.54E-17	3.58E-14	2.17E-13	3.52E-16	2.95E-19

Table 15 Estimated Radionuclide COPC Emissions

CAS Number	Compound	Feed	Unabated Streams					Abated Streams				
		FRP14	PVP01	PJV04	LMP06	HMP06	PJV32	PVP12	PJV11	LVP26	HOP33	PJV34
		WTP Feed	PT Vessel Vent	PT RFD/PJM	LAW Melter	HLW Melter	HLW PJM/RFD	PT Vessel Vent	PT RFD/PJM	LAW Melter	HLW Melter	HLW PJM/RFD
14158-29-3	Uranium-232	5.20E-01	6.59E-06	4.49E-05	1.90E-03	7.04E-04	1.50E-11	4.95E-14	4.49E-11	2.38E-11	9.83E-14	7.48E-17
14331-85-2	Protactinium-231	6.46E+00	3.76E-05	3.98E-04	1.45E-01	2.10E-02	6.57E-10	2.82E-13	3.98E-10	2.42E-09	3.91E-12	3.28E-15
14336-70-0	Nickel-59	8.68E+00	3.90E-05	5.70E-04	1.35E-02	8.50E-02	8.62E-10	2.93E-13	5.70E-10	5.74E-10	4.01E-11	4.31E-15
14952-40-0	Actinium-227	2.94E+00	1.71E-05	1.81E-04	6.58E-02	9.56E-03	2.99E-10	1.28E-13	1.81E-10	1.10E-09	1.78E-12	1.49E-15
14993-75-0	Americium-243	1.51E-01	5.31E-07	9.12E-06	1.02E-06	7.58E-04	1.61E-11	3.98E-15	9.12E-12	1.27E-14	1.06E-13	8.04E-17
15262-20-1	Radium-228	6.08E-01	3.54E-06	3.74E-05	1.36E-02	1.98E-03	6.18E-11	2.66E-14	3.74E-11	2.27E-10	3.68E-13	3.09E-16
15510-73-3	Curium-242	6.19E-01	3.12E-06	3.74E-05	3.35E-07	3.11E-03	6.60E-11	2.34E-14	3.74E-11	4.20E-15	4.34E-13	3.30E-16
15594-54-4	Thorium-229	2.53E-02	1.69E-07	1.69E-06	2.32E-05	1.04E-04	2.21E-12	1.27E-15	1.69E-12	2.90E-13	1.45E-14	1.10E-17
15751-77-6	Zirconium-93	2.09E+01	1.22E-04	1.28E-03	4.68E-01	6.80E-02	2.12E-09	9.12E-13	1.28E-09	7.81E-09	1.26E-11	1.06E-14
7440-03-1	Niobium-93m	1.88E+01	1.09E-04	1.16E-03	4.22E-01	6.12E-02	1.91E-09	8.22E-13	1.16E-09	7.03E-09	1.14E-11	9.56E-15
no cas #	Cadmium-113m	5.20E+01	3.79E-04	4.34E-03	2.98E+00	2.79E+00	6.37E-09	2.85E-12	4.34E-09	1.16E-07	9.91E-10	3.19E-14
no cas #	Selenium-79	4.82E-01	4.64E-06	4.74E-05	8.57E-02	1.81E-02	4.39E-11	3.49E-14	4.74E-11	1.43E-09	3.37E-15	2.19E-16
	Total	3.62E+05	1.97E+00	2.45E+01	7.92E+01	6.23E+03	4.38E-05	2.63E-01	9.54E-04	9.81E-01	6.62E-01	6.25E-09

Table 16 WTP PIC Emissions

CAS Registry Number	Compound	PT Stack Flowrate (g/sec)	LAW Stack Flowrate (g/sec)	HLW Stack Flowrate (g/sec)
100-02-7	4-Nitrophenol	1.75E-05	3.09E-05	7.81E-06
100-44-7	Benzyl chloride	2.33E-06	4.12E-06	1.04E-06
100-51-6	Benzyl alcohol	1.75E-05	3.09E-05	7.81E-06
100-52-7	Benzaldehyde	1.75E-05	3.09E-05	7.81E-06
101-77-9	4,4-Methylenedianiline	1.75E-05	3.09E-05	7.81E-06
103-33-3	Azobenzene	1.75E-05	3.09E-05	7.81E-06
103-65-1	n-Propyl benzene (Isocumene)	2.33E-06	4.12E-06	1.04E-06
104-51-8	n-Butylbenzene	2.33E-06	4.12E-06	1.04E-06
105-67-9	2,4-Dimethylphenol	1.75E-05	3.09E-05	7.81E-06
106-43-4	4-Chlorotoluene (p-Tolyl chloride)	2.33E-06	4.12E-06	1.04E-06
106-44-5	p-Cresol (4-Methyl phenol)	1.75E-05	3.09E-05	7.81E-06
106-47-8	p-Chloroaniline	1.75E-05	3.09E-05	7.81E-06
106-49-0	p-Toluidine	1.75E-05	3.09E-05	7.81E-06
106-51-4	Quinone	1.75E-05	3.09E-05	7.81E-06
106-89-8	Epichlorohydrin (1-chloro-2,3-epoxypropane)	2.33E-06	4.12E-06	1.04E-06
107-19-7	Propargyl alcohol	2.33E-06	4.12E-06	1.04E-06
107-21-1	Ethylene glycol	2.33E-06	4.12E-06	1.04E-06
107-98-2	Propylene gylcol monomethyl ether	1.75E-05	3.09E-05	7.81E-06
108-60-1	Dichloroisopropyl ether	1.75E-05	3.09E-05	7.81E-06
108-67-8	1,3,5-Trimethyl benzene	2.33E-06	4.12E-06	1.04E-06
108-86-1	Bromobenzene (Phenyl bromide)	2.33E-06	4.12E-06	1.04E-06
109-77-3	Malononitrile	2.33E-06	4.12E-06	1.04E-06
109-86-4	2-Methoxyethanol	1.75E-05	3.09E-05	7.81E-06
110-80-5	2-Ethoxyethanol	1.75E-05	3.09E-05	7.81E-06
111-15-9	Ethylene glycol monoethyl ether acetate	1.75E-05	3.09E-05	7.81E-06
111-44-4	Bis(2-chloroethyl) ether	1.75E-05	3.09E-05	7.81E-06
111-91-1	Bis(2-chloroethoxy)methane	1.75E-05	3.09E-05	7.81E-06
1120-71-4	1,3-Propane sultone	1.75E-05	3.09E-05	7.81E-06
119-90-4	3,3'-Dimethoxybenzidine (ortol-dianisidine)	1.75E-05	3.09E-05	7.81E-06
121-14-2	2,4-Dinitrotoluene	1.75E-05	3.09E-05	7.81E-06
122-66-7	1,2-Diphenylhydrazine	1.75E-05	3.09E-05	7.81E-06
123-33-1	Maleic hydrazide	1.75E-05	3.09E-05	7.81E-06
124-48-1	Chlorodibromomethane	2.33E-06	4.12E-06	1.04E-06
131-11-3	Dimethylphthalate	1.75E-05	3.09E-05	7.81E-06
131-89-5	2-Cyclohexyl-4,6-dinitrophenol	1.75E-05	3.09E-05	7.81E-06
133-06-2	Captan	1.75E-05	3.09E-05	7.81E-06
135-98-8	sec-Butylbenzene	2.33E-06	4.12E-06	1.04E-06
145-73-3	Endothall	1.75E-05	3.09E-05	7.81E-06
156-59-2	cis-1,2-Dichloroethene	2.33E-06	4.12E-06	1.04E-06
1746-01-6	2,3,7,8-Tetrachlorodibenzo(p)dioxin (TCDD)	1.10E-11	1.93E-11	4.88E-12
192-97-2	Benzo(e)pyrene	3.50E-06	6.19E-06	1.56E-06
19408-74-3	1,2,3,7,8,9-Hexachlorodibenzo(p)dioxin	1.82E-11	3.22E-11	8.12E-12
23950-58-5	Pronamide	1.75E-05	3.09E-05	7.81E-06
25013-15-4	Methyl styrene (mixed isomers)	2.33E-06	4.12E-06	1.04E-06
3268-87-9	Octachlorodibenzo(p)dioxin	9.12E-11	1.61E-10	4.07E-11
35822-46-9	1,2,3,4,6,7,8-Heptachlorodibenzo(p)dioxin	3.65E-11	6.45E-11	1.63E-11
39001-02-0	Octachlorodibenzofuran	7.30E-11	1.29E-10	3.25E-11
39227-28-6	1,2,3,4,7,8-Hexachlorodibenzo(p)dioxin	1.82E-11	3.22E-11	8.12E-12
40321-76-4	1,2,3,7,8-Pentachlorodibenzo(p)dioxin	1.82E-11	3.22E-11	8.12E-12
41851-50-7	Chlorocyclopentadiene	2.33E-06	4.12E-06	1.04E-06
460-19-5	Cyanogen	2.33E-06	4.12E-06	1.04E-06

Table 16 WTP PIC Emissions

CAS Registry Number	Compound	PT Stack Flowrate (g/sec)	LAW Stack Flowrate (g/sec)	HLW Stack Flowrate (g/sec)
506-68-3	Cyanogen bromide	1.75E-05	3.09E-05	7.81E-06
506-77-4	Cyanogen chloride	2.33E-06	4.12E-06	1.04E-06
510-15-6	Chlorobenzilate	1.75E-05	3.09E-05	7.81E-06
51207-31-9	2,3,7,8-Tetrachlorodibenzofuran	9.12E-12	1.61E-11	4.07E-12
51-28-5	2,4-Dinitrophenol	1.75E-05	3.09E-05	7.81E-06
51-79-6	Ethyl Carbamate (urethane)	1.75E-05	3.09E-05	7.81E-06
528-29-0	o-Dinitrobenzene	1.75E-05	3.09E-05	7.81E-06
532-27-4	2-Chloroacetophenone	1.75E-05	3.09E-05	7.81E-06
534-52-1	4,6-Dinitro-o-cresol	1.75E-05	3.09E-05	7.81E-06
5385-75-1	Dibenzo(a,e)fluoranthene	3.50E-06	6.19E-06	1.56E-06
540-73-8	1,2-Dimethylhydrazine	2.33E-06	4.12E-06	1.04E-06
542-75-6	1,3-Dichloropropene	2.33E-06	4.12E-06	1.04E-06
542-88-1	Dichloromethyl ether	2.33E-06	4.12E-06	1.04E-06
55673-89-7	1,2,3,4,7,8,9-Heptachlorodibenzofuran	1.82E-11	3.22E-11	8.12E-12
57117-31-4	2,3,4,7,8-Pentachlorodibenzofuran	9.12E-12	1.61E-11	4.07E-12
57117-41-6	1,2,3,7,8-Pentachlorodibenzofuran	9.12E-12	1.61E-11	4.07E-12
57117-44-9	1,2,3,6,7,8-Hexachlorodibenzofuran	1.46E-11	2.58E-11	6.51E-12
57-24-9	Strychnine	1.75E-05	3.09E-05	7.81E-06
57653-85-7	1,2,3,6,7,8-Hexachlorodibenzo(p)dioxin	1.82E-11	3.22E-11	8.12E-12
57-74-9	Chlordane	1.75E-05	3.09E-05	7.81E-06
584-84-9	2,4-Toluene diisocyante	1.75E-05	3.09E-05	7.81E-06
593-60-2	Bromoethene	2.33E-06	4.12E-06	1.04E-06
60-11-7	Dimethyl aminoazobenzene	1.75E-05	3.09E-05	7.81E-06
606-20-2	2,6-Dinitrotoluene	1.75E-05	3.09E-05	7.81E-06
60851-34-5	2,3,4,6,7,8-Hexachlorodibenzofuran	1.65E-11	2.91E-11	7.34E-12
608-93-5	Pentachlorobenzene	1.75E-05	3.09E-05	7.81E-06
61626-71-9	Dichloropentadiene	2.33E-06	4.12E-06	1.04E-06
62-50-0	Ethyl methanesulfonate	1.75E-05	3.09E-05	7.81E-06
62-53-3	Aniline	1.75E-05	3.09E-05	7.81E-06
65-85-0	Benzoic acid	1.75E-05	3.09E-05	7.81E-06
67562-39-4	1,2,3,4,6,7,8-Heptachlorodibenzofuran	1.82E-11	3.22E-11	8.12E-12
70-30-4	Hexachlorophene	1.75E-05	3.09E-05	7.81E-06
70648-26-9	1,2,3,4,7,8-Hexachlorodibenzofuran	1.65E-11	2.91E-11	7.34E-12
72918-21-9	1,2,3,7,8,9-Hexachlorodibenzofuran	1.82E-11	3.22E-11	8.12E-12
74-88-4	Iodomethane (Methyl iodide)	2.33E-06	4.12E-06	1.04E-06
74-95-3	Methylene bromide	2.33E-06	4.12E-06	1.04E-06
75-25-2	Bromoform	2.33E-06	4.12E-06	1.04E-06
75-29-6	2-Chloropropane	2.33E-06	4.12E-06	1.04E-06
75-44-5	Phosgene	2.33E-06	4.12E-06	1.04E-06
76-01-7	Pentachloroethane	2.33E-06	4.12E-06	1.04E-06
764-41-0	1,4-Dichloro-2-butene	2.33E-06	4.12E-06	1.04E-06
765-34-4	Glycidylaldehyde	1.75E-05	3.09E-05	7.81E-06
77-47-4	Hexachlorocyclopentadiene	1.75E-05	3.09E-05	7.81E-06
77-78-1	Dimethyl sulfate	1.75E-05	3.09E-05	7.81E-06
80-62-6	Methyl methacrylate	2.33E-06	4.12E-06	1.04E-06
822-06-0	Hexamethylene-1,5-diisocyanate	1.75E-05	3.09E-05	7.81E-06
823-40-5	Toluene-2,6-diamine	1.75E-05	3.09E-05	7.81E-06
85-44-9	Phthalic anhydride	1.75E-05	3.09E-05	7.81E-06
87-61-6	1,2,3-Trichlorobenzene	2.33E-06	4.12E-06	1.04E-06
88-74-4	o-Nitroaniline (2-Nitroaniline)	1.75E-05	3.09E-05	7.81E-06

Table 16 WTP PIC Emissions

CAS Registry Number	Compound	PT Stack Flowrate (g/sec)	LAW Stack Flowrate (g/sec)	HLW Stack Flowrate (g/sec)
90-04-0	o-Anisidine	1.75E-05	3.09E-05	7.81E-06
91-57-6	2-Methylnaphthalene	3.50E-06	6.19E-06	1.56E-06
91-94-1	3,3'-Dichlorobenzidine	1.75E-05	3.09E-05	7.81E-06
924-16-3	N-Nitrosodi-n-butylamine	2.33E-06	4.12E-06	1.04E-06
94-59-7	Safrole	1.75E-05	3.09E-05	7.81E-06
95-53-4	o-Toluidine	2.33E-06	4.12E-06	1.04E-06
95-63-6	1,2,4-Trimethyl benzene	2.33E-06	4.12E-06	1.04E-06
95-94-3	1,2,4,5-Tetrachlorobenzene	1.75E-05	3.09E-05	7.81E-06
96-12-8	1,2-Dibromo-3-chloropropane	1.75E-05	3.09E-05	7.81E-06
96-18-4	1,2,3-Trichloropropane	2.33E-06	4.12E-06	1.04E-06
96-45-7	Ethylene thiourea	1.75E-05	3.09E-05	7.81E-06
97-63-2	Ethyl methacrylate	2.33E-06	4.12E-06	1.04E-06
98-01-1	Furfural	1.75E-05	3.09E-05	7.81E-06
98-06-6	tert-Butyl benzene	2.33E-06	4.12E-06	1.04E-06
98-07-7	Benzotrichloride	1.75E-05	3.09E-05	7.81E-06
99-35-4	1,3,5-Trinitrobenzene	1.75E-05	3.09E-05	7.81E-06
99-65-0	1,3-Dinitrobenzene	1.75E-05	3.09E-05	7.81E-06
99-87-6	p-Cymene	2.33E-06	4.12E-06	1.04E-06
no cas #	Dibenzo(a,h)fluoranthene	3.50E-06	6.19E-06	1.56E-06

Figure 1 Simplified WTP Process Overview

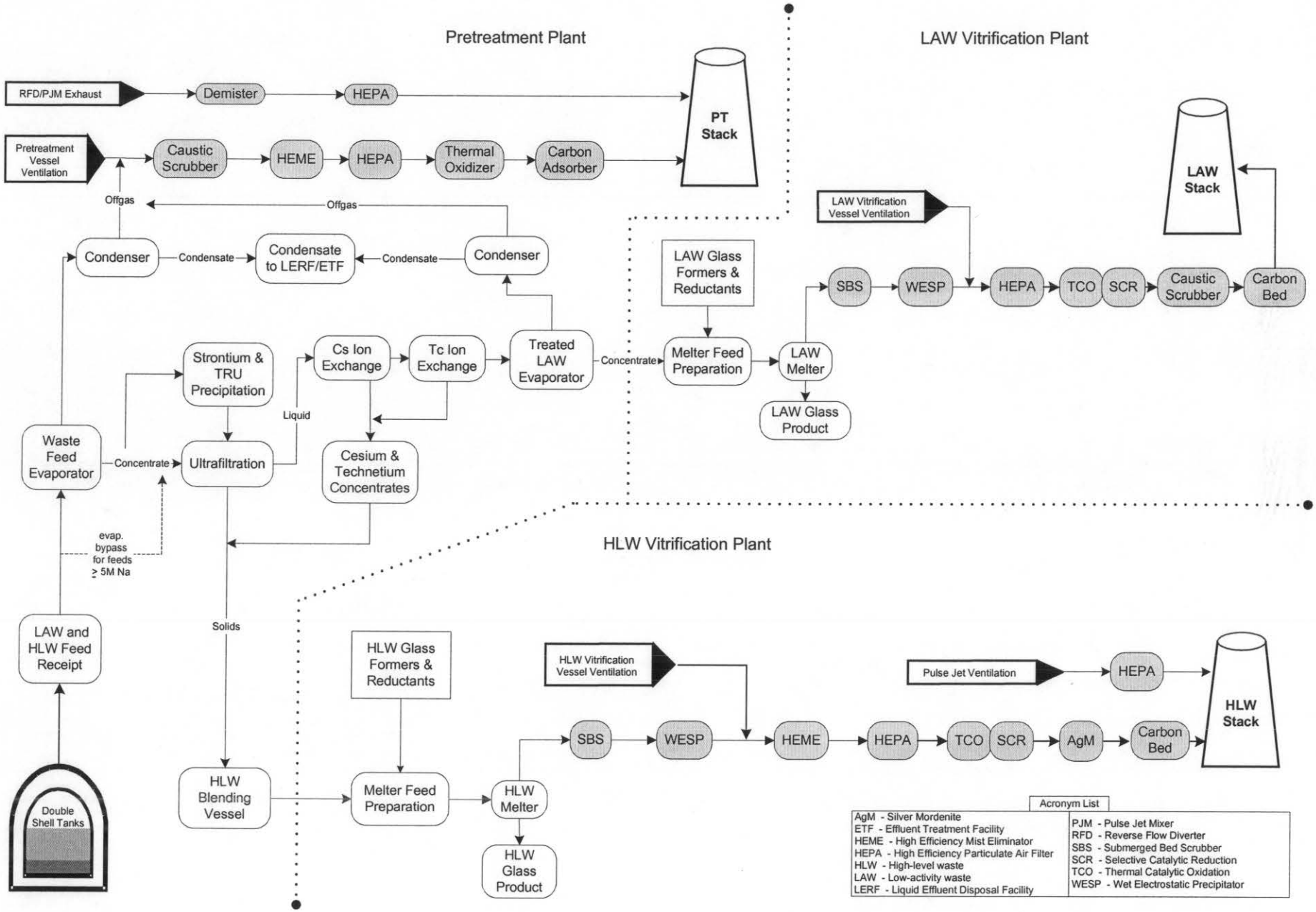


Figure 2 Simplified Pretreatment Process Flowsheet (sheet 1 of 2)

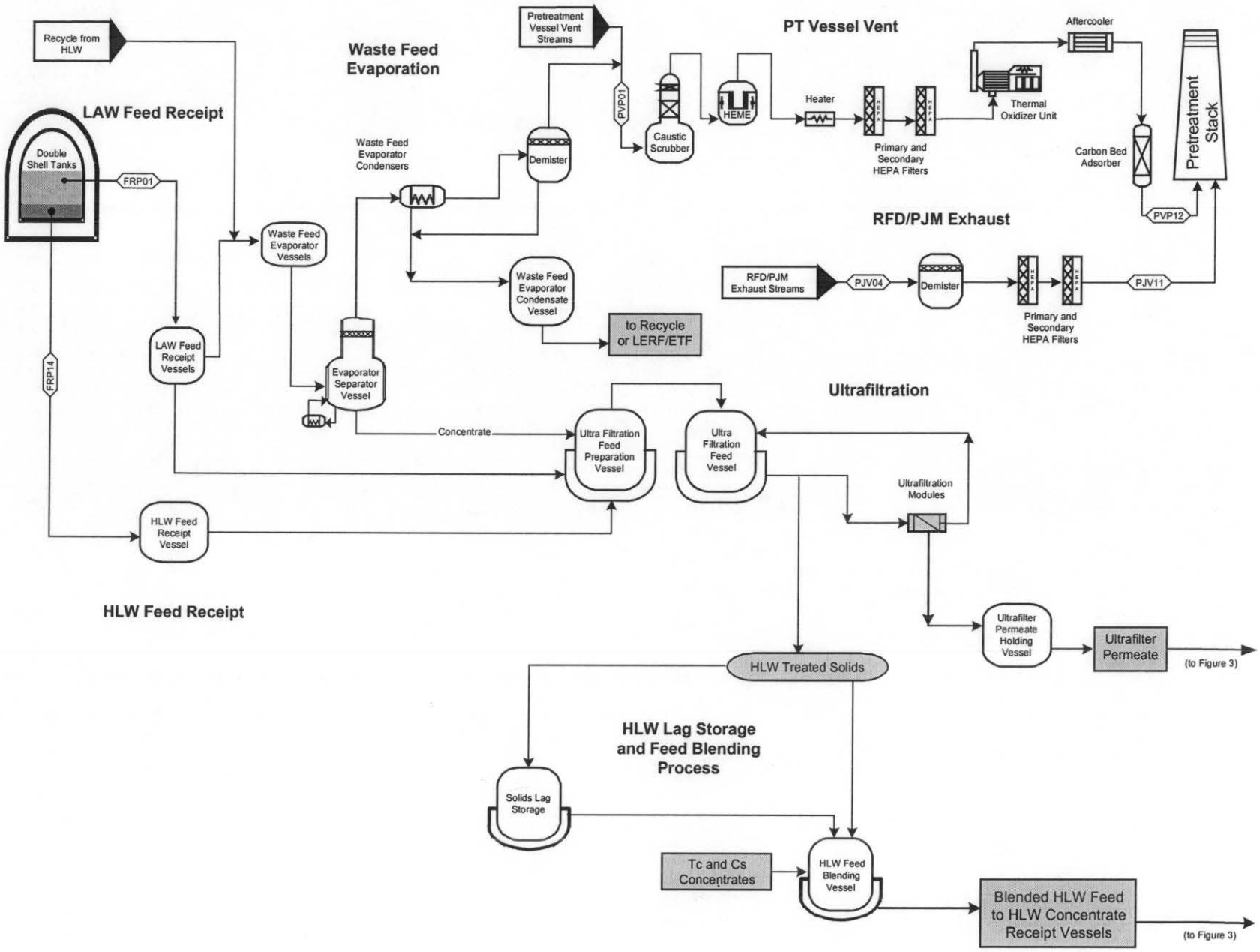


Figure 3 Simplified Pretreatment Process Flowsheet (sheet 2 of 2)

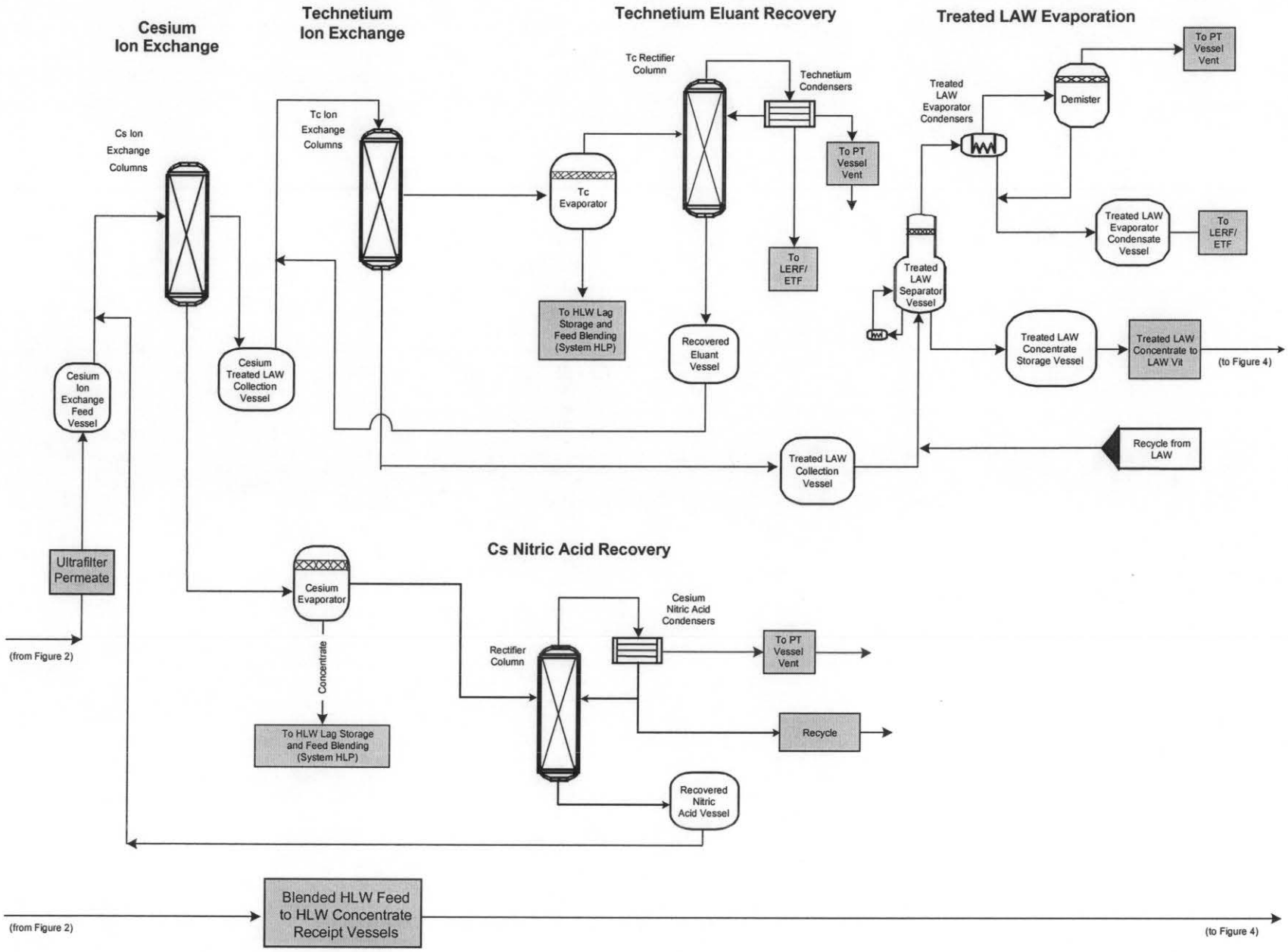


Figure 4 Simplified LAW Vitrification Process Flowsheet

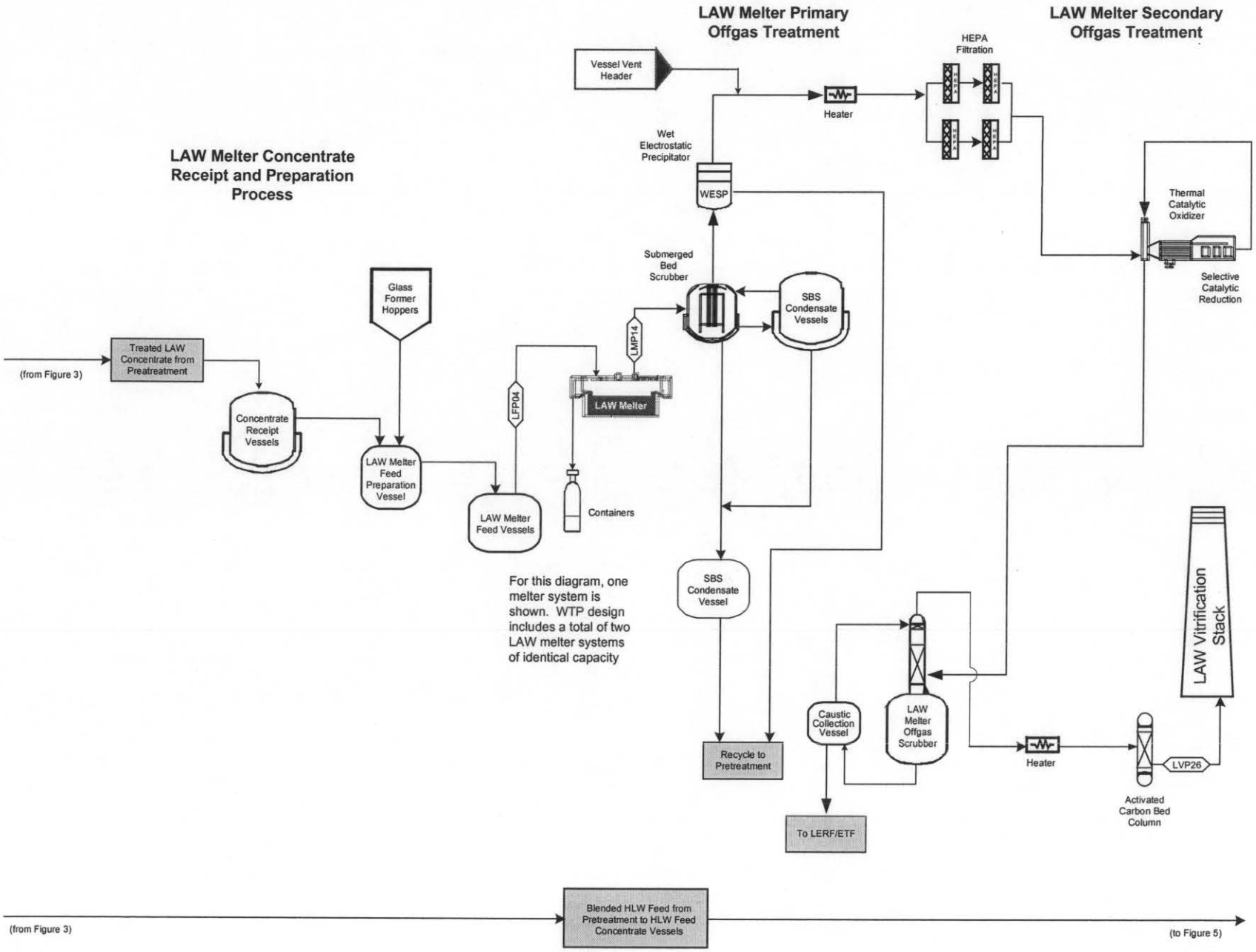
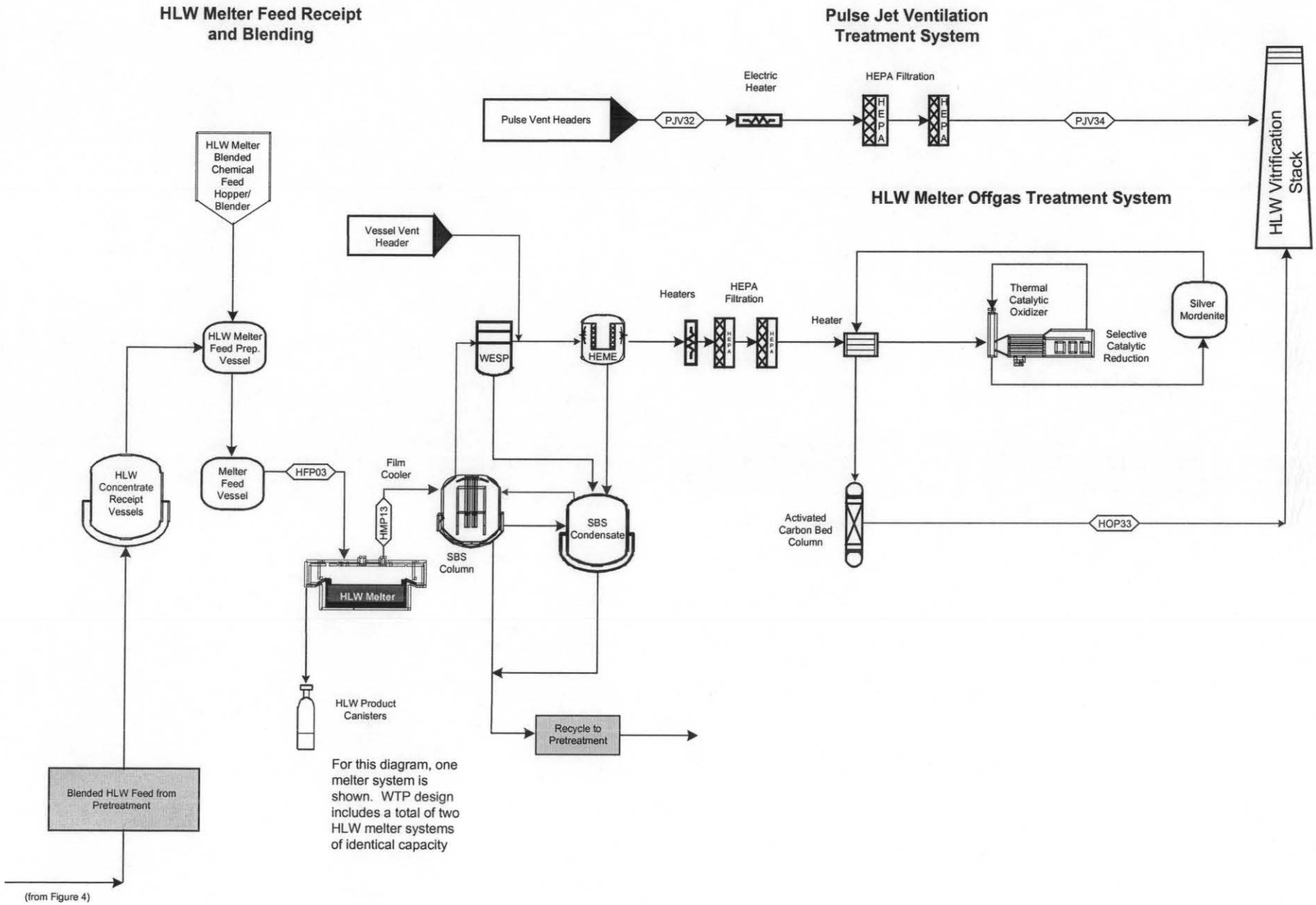
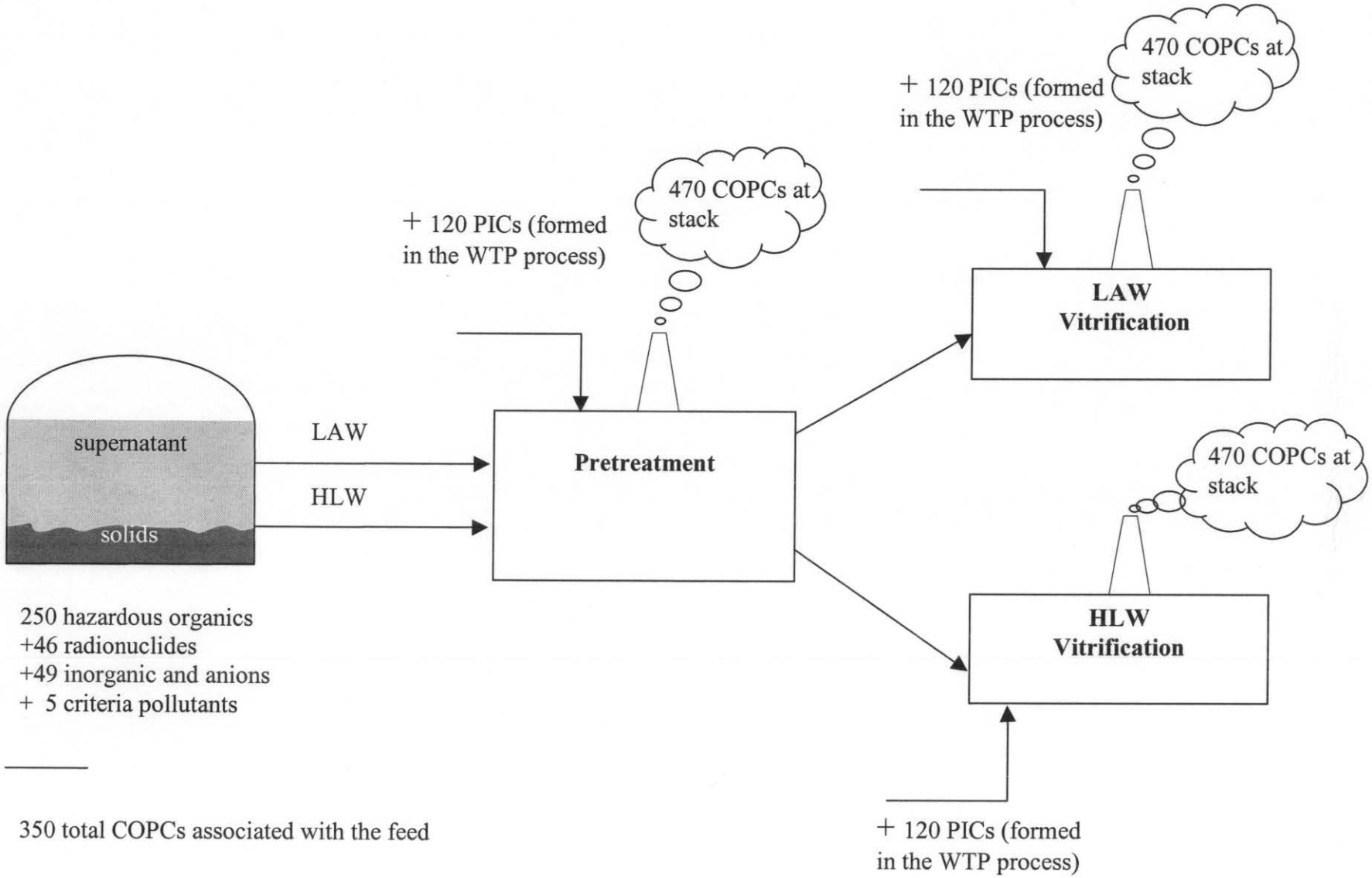


Figure 5 Simplified HLW Vitrification Process Flowsheet



For this diagram, one melter system is shown. WTP design includes a total of two HLW melter systems of identical capacity

Figure 6 Emissions Estimate Objectives



A

Appendix A
Selected Stream-Specific Reports from the Steady State Flowsheet Model

Appendix A contains stream-specific output from the steady state flowsheet model (SSFM) for unabated, abated, and feed points in the Hanford Tank Waste Treatment and Immobilization Plant (WTP) process. These stream-specific reports contain mass flow rate information for each of the inorganic, radionuclide, and organic constituents of potential concern (COPCs) included in the SSFM. Mass flow rates for COPCs not included directly in the SSFM are described in separate calculations. These calculations are included in Appendices B through E.

River Protection Project - Waste Treatment Plant

Stream Number: FRP14
Stream Name: Waste feed from DOE to HLW Feed Receipt
Run Data File: H:\Working Folder 11 (Vishal)\Emissions_Case2_Run4_SubEm\MRQ_03_054_run1_Streams.csv
Run Date / Time: 4/15/2003 - 6:40:10 AM

Stream Properties Variable	Value	Units
Density	1.40E+00	g/cm^3
Enthalpy	-2.57E+07	BTU/hr
Mass Flow	4.97E+03	Lb/hr
	1.19E+05	Lb/day
Volumetric Flow	6.51E+00	GPM
Molar Flow	2.03E+02	Lbmol/hr
Volumetric Flow	8.71E-01	ft^3/min
Molecular Weight	2.25E+01	Lb/Lbmol
Pressure	1.00E+03	mbar
Temperature	4.90E+01	C
Viscosity	1.28E+00	cP
Na Molarity	4.00E+00	mol/L
pH	1.48E+01	pH
Total TRU	3.64E-02	Ci/L
Total Activity	5.85E+00	Ci/L

Component	Aqueous Components mol/L	Lb/gal	Lb/day	Solid Components Lb/day	Total Component Lb/day	Solid Components mt/day	Total Component g/sec
Total	6.23E+01	1.17E+01	1.10E+05	8.38E+03	1.18E+05	53.64864013	620.9333349
Ag^+	4.83E-04	4.35E-04	4.08E+00	1.29E+01	1.70E+01	0.007740203	0.089585679
Al^{+3}	1.00E+00	2.25E-01	2.11E+03	3.29E+02	2.44E+03	1.109729644	12.8440931
As^{+3}	2.44E-03	1.53E-03	1.43E+01	3.77E+00	1.81E+01	0.008220997	0.095150424
B^{+3}	2.58E-02	2.33E-03	2.19E+01	3.06E+01	5.25E+01	0.023846189	0.275997561
Ba^{+2}	4.00E-04	4.58E-04	4.30E+00	1.06E+02	1.10E+02	0.050111708	0.579996625
Bi^{+3}	8.09E-04	1.41E-03	1.32E+01	6.59E+01	7.91E+01	0.035969283	0.416311146
$C_2O_4^{-2}$	1.03E+00	7.57E-01	7.10E+03	2.59E+02	7.36E+03	3.345108586	38.71653456
Ca^{+2}	1.60E-01	5.35E-02	5.02E+02	1.67E+02	6.69E+02	0.304089337	3.519552508
Cd^{+2}	1.60E-02	1.50E-02	1.41E+02	1.06E+02	2.47E+02	0.112148176	1.298011292
Ce^{+3}	1.21E-03	1.41E-03	1.32E+01	1.91E+01	3.23E+01	0.014682341	0.169934501
Cl^-	1.83E-01	5.43E-02	5.09E+02	7.76E+00	5.17E+02	0.234917812	2.71895616
CO_3^{-2}	6.18E-01	3.10E-01	2.90E+03	7.06E+02	3.61E+03	1.640967843	18.99268337
Cr^{+3}	8.00E-02	3.47E-02	3.26E+02	1.60E+01	3.42E+02	0.155282362	1.797249561
Cu^{+2}	8.84E-04	4.69E-04	4.40E+00	1.13E+01	1.57E+01	0.007139273	0.082630473
F^-	4.12E-01	6.54E-02	6.13E+02	8.24E+01	6.95E+02	0.316083725	3.65837645
Fe^{+3}	4.00E-02	1.86E-02	1.75E+02	6.83E+02	8.58E+02	0.390028704	4.514221108
H^+	0.00E+00	0.00E+00	0.00E+00		0.00E+00	0	0
H_2O	4.48E+01	6.74E+00	6.32E+04		6.32E+04	28.72915881	332.5134121
Hg^{+2}	5.60E-05	9.37E-05	8.79E-01	2.35E+00	3.23E+00	0.001469583	0.01700906
K^+	7.20E-01	2.35E-01	2.20E+03	3.06E+01	2.23E+03	1.015550922	11.7540616
La^{+3}	3.32E-04	3.85E-04	3.61E+00	6.12E+01	6.48E+01	0.029460681	0.340980099
Li^+	1.58E-02	9.16E-04	8.59E+00	3.32E+00	1.19E+01	0.005412403	0.062643552
Mg^{+2}	7.13E-03	1.45E-03	1.36E+01	4.94E+01	6.30E+01	0.02864116	0.331494911
Mn^{+3}	1.95E-02	8.93E-03	8.38E+01	1.53E+02	2.37E+02	0.107685054	1.246354787
MnO_4^-	0.00E+00	0.00E+00	0.00E+00		0.00E+00	0	0
Na^+	4.00E+00	7.67E-01	7.20E+03	4.47E+02	7.65E+03	3.475226795	40.22253235
NH_4^+	4.09E-02	6.15E-03	5.77E+01	0.00E+00	5.77E+01	0.02622164	0.303491205
Ni^{+2}	1.20E-02	5.88E-03	5.51E+01	5.65E+01	1.12E+02	0.050736576	0.587228885
NO_2^-	7.83E-01	3.01E-01	2.82E+03	1.36E+02	2.96E+03	1.34362847	15.55125544
NO_3^-	1.65E+00	8.53E-01	8.00E+03	8.47E+02	8.85E+03	4.022894274	46.56127632
O^{-2}				0.00E+00	0.00E+00	0	0
OH^-	6.19E+00	8.79E-01	8.24E+03	2.86E+03	1.11E+04	5.046797694	58.41201035
$OH(b)^-$	0.00E+00	0.00E+00	0.00E+00		0.00E+00	0	0
P^{+5}				0.00E+00	0.00E+00	0	0
Pb^{+2}	2.72E-03	4.70E-03	4.41E+01	2.59E+01	7.00E+01	0.03182098	0.368298379
Pd^{+2}	3.19E-05	2.83E-05	2.66E-01	3.06E+00	3.33E+00	0.001511881	0.017498618
PO_4^{-3}	2.68E-01	2.12E-01	1.99E+03	2.18E+02	2.21E+03	1.004334961	11.62424723
S^{+6}				0.00E+00	0.00E+00	0	0
Si^{+4}				4.47E+02	4.47E+02	0.203185511	2.351684151
SiO_4^{-4}	2.06E-02	1.58E-02	1.48E+02		1.48E+02	0.067336469	0.779357285
SO_4^{-2}	1.44E-01	1.16E-01	1.08E+03	3.12E+01	1.12E+03	0.507316191	5.871715175
Sr^{+2}	1.93E-04	1.41E-04	1.32E+00	1.22E+01	1.36E+01	0.006166552	0.071372135
Ti^{+4}	3.86E-04	1.54E-04	1.45E+00	3.06E+01	3.20E+01	0.014557811	0.168493178
Zn^{+2}	1.62E-03	8.84E-04	8.29E+00	9.88E+00	1.82E+01	0.008260836	0.095611531
Zr^{+4}	1.44E-03	1.09E-03	1.03E+01	3.53E+02	3.63E+02	0.165198702	1.912022011

Rad. Component	Aqueous Rad. Components			Solids Rad. Components (1)			Total Rad. Components (1)		
	Ci/L	Ci/day	Lb/day	Ci/L	Ci/day	Lb/day	Ci/L	Ci/day	Lb/day
Total	2.280385293	8.10E+04	1.62E+02	3.57E+00	1.27E+05	3.27E+02	5.85E+00	2.08E+05	4.89E+02
^{241}Am	3.73834E-05	1.33E+00	8.54E-04	2.71E-02	9.61E+02	6.18E-01	2.71E-02	9.62E+02	6.19E-01
^{14}C	2.86E-05	1.01E+00	5.01E-04	1.95E-06	6.94E-02	3.43E-05	3.05E-05	1.08E+00	5.35E-04
^{60}Co	4.00E-05	1.42E+00	2.77E-06	3.01E-03	1.07E+02	2.08E-04	3.05E-03	1.08E+02	2.11E-04
^{243}Cm	7.84E-09	2.78E-04	1.21E-08	9.02E-04	3.20E+01	1.40E-03	9.02E-04	3.20E+01	1.40E-03
^{244}Cm	4.08E-08	1.45E-03	3.95E-08	6.76E-04	2.40E+01	6.54E-04	6.76E-04	2.40E+01	6.54E-04
^{137}Cs	2.16E+00	7.68E+04	1.95E+00	4.51E-01	1.60E+04	4.07E-01	2.61E+00	9.28E+04	2.36E+00
^{152}Eu	1.41E-04	4.99E+00	6.34E-05	1.44E-04	5.12E+00	6.50E-05	2.85E-04	1.01E+01	1.28E-04
^{154}Eu	4.65E-04	1.65E+01	1.35E-04	1.56E-02	5.55E+02	4.53E-03	1.61E-02	5.72E+02	4.66E-03
^{155}Eu	8.02E-04	2.85E+01	1.29E-04	8.72E-03	3.10E+02	1.41E-03	9.52E-03	3.38E+02	1.53E-03
^{3}H	3.82E-04	1.36E+01	3.11E-06	1.95E-05	6.94E-01	1.59E-07	4.01E-04	1.43E+01	3.27E-06
^{129}I	3.11E-07	1.11E-02	1.38E-01	8.72E-08	3.10E-03	3.86E-02	3.99E-07	1.42E-02	1.77E-01
^{63}Ni	2.56E-04	9.10E+00	3.53E-04	1.42E-03	5.06E+01	1.96E-03	1.68E-03	5.96E+01	2.31E-03
^{237}Np	8.42E-08	2.99E-03	9.35E-03	2.23E-05	7.90E-01	2.47E+00	2.23E-05	7.93E-01	2.48E+00
^{238}Pu	2.22E-07	7.90E-03	1.02E-06	1.05E-04	3.74E+00	4.81E-04	1.05E-04	3.74E+00	4.82E-04
^{239}Pu	2.63E-06	9.35E-02	3.32E-03	9.32E-04	3.31E+01	1.18E+00	9.35E-04	3.32E+01	1.18E+00
^{240}Pu	4.66E-07	1.66E-02	1.61E-04	5.11E-05	1.81E+00	1.76E-02	5.15E-05	1.83E+00	1.78E-02
^{241}Pu	1.09E-05	3.89E-01	8.32E-06	6.62E-03	2.35E+02	5.03E-03	6.63E-03	2.35E+02	5.04E-03
^{125}Sb	2.15E-03	7.63E+01	1.62E-04	9.62E-03	3.42E+02	7.26E-04	1.18E-02	4.18E+02	8.88E-04
^{151}Sm	2.67E-02	9.48E+02	7.94E-02	3.01E-02	1.07E+03	8.95E-02	5.68E-02	2.02E+03	1.69E-01
^{126}Sn	1.62E-05	5.74E-01	1.11E-01	4.51E-05	1.60E+00	3.11E-01	6.13E-05	2.18E+00	4.22E-01
^{90}Sr	8.65E-02	3.07E+03	4.90E-02	3.01E+00	1.07E+05	1.70E+00	3.09E+00	1.10E+05	1.75E+00
^{99}Tc	7.68E-04	2.73E+01	3.55E+00	4.51E-03	1.60E+02	2.08E+01	5.28E-03	1.87E+02	2.44E+01
^{232}Th	5.99E-08	2.13E-03	4.26E+01	2.36E-07	8.38E-03	1.68E+02	2.96E-07	1.05E-02	2.10E+02
^{233}U	1.11E-06	3.95E-02	9.04E-03	2.71E-07	9.61E-03	2.20E-03	1.38E-06	4.91E-02	1.12E-02
^{234}U	6.47E-07	2.30E-02	8.16E-03	9.84E-07	3.49E-02	1.24E-02	1.63E-06	5.79E-02	2.06E-02
^{235}U	2.50E-08	8.87E-04	9.05E-01	7.52E-08	2.67E-03	2.72E+00	1.00E-07	3.56E-03	3.63E+00
^{236}U	7.49E-08	2.66E-03	9.06E-02	3.06E-08	1.09E-03	3.71E-02	1.06E-07	3.75E-03	1.28E-01
^{238}U	4.81E-07	1.71E-02	1.12E+02	5.53E-07	1.96E-02	1.29E+02	1.03E-06	3.67E-02	2.41E+02

Component (CAS)	Organic Components mol/L	Lb/gal	Lb/day	Mt/day	g/sec
Total	8.37E-03	1.00E-02	1.64E+02	0.07460656	0.863501849
57-14-7	1.41E-03	0.00071	6.63E+00	0.00301522	0.034898378
58-90-2	3.66E-04	0.00071	6.64E+00	0.003020052	0.034954309
58-89-9	1.03E-06	2.5E-06	2.34E-02	1.06588E-05	0.000123366
71-43-2	2.39E-04	0.00016	1.46E+00	0.000664259	0.007688178
75-05-8	6.48E-04	0.00022	2.08E+00	0.0009465	0.010954865
76-44-8	4.82E-06	1.5E-05	1.41E-01	6.40318E-05	0.000741109
79-01-6	1.42E-04	0.00016	1.46E+00	0.000663921	0.00768427
84-74-2	3.05E-04	0.00071	6.65E+00	0.003020703	0.034961845
84-66-2	3.82E-04	0.00071	6.65E+00	0.003020774	0.034962661
87-86-5	3.18E-04	0.00071	6.63E+00	0.003013673	0.034880476
87-68-3	7.17E-05	0.00016	1.46E+00	0.000665262	0.007699792
88-85-7	3.53E-04	0.00071	6.64E+00	0.003017286	0.034922293
91-20-3	2.18E-05	2.3E-05	2.19E-01	9.94126E-05	0.001150609
98-86-2	7.04E-04	0.00071	6.64E+00	0.003018508	0.034936435
108-95-2	9.01E-04	0.00071	6.64E+00	0.003017124	0.034920419
108-88-3	2.03E-04	0.00016	1.46E+00	0.000665472	0.007702221
120-82-1	1.03E-04	0.00016	1.46E+00	0.000665045	0.007697275
122-66-7	0.00E+00	0	0.00E+00	0	0
122-39-4	1.11E-04	0.00016	1.47E+00	0.000668395	0.007736049
129-00-0	4.19E-04	0.00071	6.63E+00	0.003015183	0.034897954
132-64-9	5.04E-04	0.00071	6.64E+00	0.003016222	0.034909979
218-01-9	3.71E-04	0.00071	6.63E+00	0.003013522	0.034878729
309-00-2	2.74E-06	8.3E-06	7.83E-02	3.55789E-05	0.000411793
319-85-7	1.03E-06	2.5E-06	2.34E-02	1.06588E-05	0.000123366
534-52-1	0.00E+00	0	0.00E+00	0	0
603-34-9	3.46E-04	0.00071	6.64E+00	0.003020242	0.0349565
4170-30-3	2.67E-04	0.00016	1.46E+00	0.000665896	0.007707125
10061-01-5	1.69E-04	0.00016	1.47E+00	0.000667306	0.007723447
38380-08-4	9.99E-07	3E-06	2.82E-02	1.28281E-05	0.000148473
100-21-0	5.10E-04	0.00071	6.63E+00	0.003014747	0.034892905
106-93-4	4.51E-04	0.00071	6.63E+00	0.003015017	0.034896026
106-97-8	3.22E-04	0.00016	1.47E+00	0.000665942	0.007707664
106-99-0	3.46E-04	0.00016	1.47E+00	0.000665938	0.007707615
108-87-2	1.90E-04	0.00016	1.46E+00	0.000663811	0.007683001
110-54-3	2.17E-04	0.00016	1.46E+00	0.000665401	0.007701405
110-82-7	2.22E-04	0.00016	1.46E+00	0.000664808	0.007694541
111-84-2	1.46E-04	0.00016	1.47E+00	0.000666311	0.007711928
118-74-1	6.32E-06	1.5E-05	1.41E-01	6.40007E-05	0.000740749
120-12-7	4.76E-04	0.00071	6.64E+00	0.003018534	0.034936732
127-18-4	1.13E-04	0.00016	1.47E+00	0.000666848	0.007718143
1336-36-3	9.13E-05	0.00025	2.30E+00	0.001046066	0.012107251
144-62-7	9.44E-05	7.1E-05	6.65E-01	0.000302424	0.003500276
208-96-8	5.57E-04	0.00071	6.64E+00	0.003016692	0.034915419
50-32-8	4.36E-06	9.2E-06	8.61E-02	3.91414E-05	0.000453025
56-23-5	1.22E-04	0.00016	1.47E+00	0.000667824	0.007729439
60-35-5	3.17E-04	0.00016	1.47E+00	0.000666283	0.007711611
60-57-1	1.58E-06	5E-06	4.71E-02	2.14158E-05	0.000247868
62-75-9	2.14E-03	0.00132	1.24E+01	0.00564241	0.065305666
75-12-7	1.88E-03	0.00071	6.63E+00	0.003012929	0.03487186
76-15-3	1.21E-04	0.00016	1.46E+00	0.000665062	0.007697477
8001-35-2	1.69E-06	5.8E-06	5.48E-02	2.48954E-05	0.000288142
88-89-1	3.70E-04	0.00071	6.64E+00	0.003016327	0.03491119
126-73-8	3.18E-04	0.00071	6.63E+00	0.00301322	0.034875237

River Protection Project - Waste Treatment Plant

Stream Number: FRP01
Stream Name: Waste feed from DOE to LAW Feed Receipt
Run Data File: H:\Working Folder 11 (Vishal)\Emissions_Case2_Run4_SubEm\MRQ_03_054_run1_Streams.csv
Run Date / Time: 4/15/2003 - 6:40:10 AM

Stream Properties Variable	Value	Units
Density	0.00E+00	g/cm^3
Enthalpy	0.00E+00	BTU/hr
Mass Flow	0.00E+00	Lb/hr
	0.00E+00	Lb/day
Volumetric Flow	0.00E+00	GPM
Molar Flow	0.00E+00	Lbmol/hr
Volumetric Flow	0.00E+00	ft^3/min
Molecular Weight	2.25E+01	Lb/Lbmol
Pressure	1.00E+03	mbar
Temperature	2.50E+01	C
Viscosity	1.87E+00	cP
Na Molarity	4.00E+00	mol/L
pH	0.00E+00	pH
Total TRU	0.00E+00	Ci/L
Total Activity	0.00E+00	Ci/L

Component	Aqueous Components mol/L	Lb/gal	Lb/day	Solid Components Lb/day	Total Component Lb/day	Solid Components mt/day	Total Component g/sec
Total	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0	0
Ag^+	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0	0
Al^{+3}	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0	0
As^{+3}	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0	0
B^{+3}	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0	0
Ba^{+2}	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0	0
Bi^{+3}	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0	0
$C_2O_4^{-2}$	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0	0
Ca^{+2}	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0	0
Cd^{+2}	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0	0
Ce^{+3}	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0	0
Cl^-	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0	0
CO_3^{-2}	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0	0
Cr^{+3}	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0	0
Cu^{+2}	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0	0
F^-	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0	0
Fe^{+3}	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0	0
H^+	0.00E+00	0.00E+00	0.00E+00		0.00E+00	0	0
H_2O	0.00E+00	0.00E+00	0.00E+00		0.00E+00	0	0
Hg^{+2}	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0	0
K^+	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0	0
La^{+3}	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0	0
Li^+	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0	0
Mg^{+2}	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0	0
Mn^{+3}	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0	0
MnO_4^-	0.00E+00	0.00E+00	0.00E+00		0.00E+00	0	0
Na^+	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0	0
NH_4^+	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0	0
Ni^{+2}	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0	0
NO_2^-	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0	0
NO_3^-	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0	0
O^{-2}				0.00E+00	0.00E+00	0	0
OH^-	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0	0
$OH(b)^-$	0.00E+00	0.00E+00	0.00E+00		0.00E+00	0	0
P^{+5}				0.00E+00	0.00E+00	0	0
Pb^{+2}	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0	0
Pd^{+2}	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0	0
PO_4^{-3}	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0	0
S^{+6}				0.00E+00	0.00E+00	0	0
Si^{+4}				0.00E+00	0.00E+00	0	0
SiO_4^{-4}	0.00E+00	0.00E+00	0.00E+00		0.00E+00	0	0
SO_4^{-2}	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0	0
Sr^{+2}	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0	0
Ti^{+4}	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0	0
Zn^{+2}	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0	0
Zr^{+4}	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0	0

Rad.	Aqueous Rad. Components			Solids Rad. Components (1)			Total Rad. Components (1)		
Component	Ci/L	Ci/day	Lb/day	Ci/L	Ci/day	Lb/day	Ci/L	Ci/day	Lb/day
Total	0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
^{241}Am	0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
^{14}C	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
^{60}Co	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
^{243}Cm	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
^{244}Cm	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
^{137}Cs	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
^{152}Eu	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
^{154}Eu	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
^{155}Eu	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
^{3}H	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
^{129}I	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
^{63}Ni	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
^{237}Np	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
^{238}Pu	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
^{239}Pu	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
^{240}Pu	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
^{241}Pu	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
^{125}Sb	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
^{151}Sm	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
^{126}Sn	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
^{90}Sr	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
^{99}Tc	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
^{232}Th	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
^{233}U	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
^{234}U	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
^{235}U	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
^{236}U	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
^{238}U	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

Component	Organic Components				
(CAS)	mol/L	Lb/gal	Lb/day	Mt/day	g/sec
Total	0.00E+00	0.00E+00	0.00E+00	0	0
57-14-7	0.00E+00	0	0.00E+00	0	0
58-90-2	0.00E+00	0	0.00E+00	0	0
58-89-9	0.00E+00	0	0.00E+00	0	0
71-43-2	0.00E+00	0	0.00E+00	0	0
75-05-8	0.00E+00	0	0.00E+00	0	0
76-44-8	0.00E+00	0	0.00E+00	0	0
79-01-6	0.00E+00	0	0.00E+00	0	0
84-74-2	0.00E+00	0	0.00E+00	0	0
84-66-2	0.00E+00	0	0.00E+00	0	0
87-86-5	0.00E+00	0	0.00E+00	0	0
87-68-3	0.00E+00	0	0.00E+00	0	0
88-85-7	0.00E+00	0	0.00E+00	0	0
91-20-3	0.00E+00	0	0.00E+00	0	0
98-86-2	0.00E+00	0	0.00E+00	0	0
108-95-2	0.00E+00	0	0.00E+00	0	0
108-88-3	0.00E+00	0	0.00E+00	0	0
120-82-1	0.00E+00	0	0.00E+00	0	0
122-66-7	0.00E+00	0	0.00E+00	0	0
122-39-4	0.00E+00	0	0.00E+00	0	0
129-00-0	0.00E+00	0	0.00E+00	0	0
132-64-9	0.00E+00	0	0.00E+00	0	0
218-01-9	0.00E+00	0	0.00E+00	0	0
309-00-2	0.00E+00	0	0.00E+00	0	0
319-85-7	0.00E+00	0	0.00E+00	0	0
534-52-1	0.00E+00	0	0.00E+00	0	0
603-34-9	0.00E+00	0	0.00E+00	0	0
4170-30-3	0.00E+00	0	0.00E+00	0	0
10061-01-5	0.00E+00	0	0.00E+00	0	0
38380-08-4	0.00E+00	0	0.00E+00	0	0
100-21-0	0.00E+00	0	0.00E+00	0	0
106-93-4	0.00E+00	0	0.00E+00	0	0
106-97-8	0.00E+00	0	0.00E+00	0	0
106-99-0	0.00E+00	0	0.00E+00	0	0
108-87-2	0.00E+00	0	0.00E+00	0	0
110-54-3	0.00E+00	0	0.00E+00	0	0
110-82-7	0.00E+00	0	0.00E+00	0	0
111-84-2	0.00E+00	0	0.00E+00	0	0
118-74-1	0.00E+00	0	0.00E+00	0	0
120-12-7	0.00E+00	0	0.00E+00	0	0
127-18-4	0.00E+00	0	0.00E+00	0	0
1336-36-3	0.00E+00	0	0.00E+00	0	0
144-62-7	0.00E+00	0	0.00E+00	0	0
208-96-8	0.00E+00	0	0.00E+00	0	0
50-32-8	0.00E+00	0	0.00E+00	0	0
56-23-5	0.00E+00	0	0.00E+00	0	0
60-35-5	0.00E+00	0	0.00E+00	0	0
60-57-1	0.00E+00	0	0.00E+00	0	0
62-75-9	0.00E+00	0	0.00E+00	0	0
75-12-7	0.00E+00	0	0.00E+00	0	0
76-15-3	0.00E+00	0	0.00E+00	0	0
8001-35-2	0.00E+00	0	0.00E+00	0	0
88-89-1	0.00E+00	0	0.00E+00	0	0
126-73-8	0.00E+00	0	0.00E+00	0	0

River Protection Project - Waste Treatment Plant

Stream Number: PVP01
Stream Name: Pretreatment vessel vents feed to caustic scrubber
Run Data File: H:\Working Folder 11 (Vishal)\Emissions_Case2_Run4_SubEm\MRQ_03_054_run1_Streams.csv
Run Date / Time: 4/15/2003 - 6:40:10 AM

Stream Properties Variable	Value	Units
Density	1.13E-03	g/cm^3
Enthalpy	-1.63E+06	BTU/hr
Mass Flow	1.13E+04	Lb/hr
	2.70E+05	Lb/day
Volumetric Flow	1.98E+04	GPM
Molar Flow	3.96E+02	Lbmol/hr
Volumetric Flow	2.65E+03	ft^3/min
Molecular Weight	2.84E+01	Lb/Lbmol
Pressure	1.00E+03	mbar
Temperature	2.87E+01	C
Viscosity	1.84E-02	cP
Na Molarity	0.00E+00	mol/L
pH	N/A	pH
Total TRU	4.29E-11	Ci/L
Total Activity	1.26E-08	Ci/L

Gaseous Components (1) Component	mol/L	Lb/day	Mt/day
CO	2.16E-26	1.44E-19	6.54528E-23
CO_2	2.40E-07	2.52E+00	0.001143265
H_2O	1.59E-03	6.82E+03	3.098916416
NO	9.86E-32	7.05E-25	3.20254E-28
NO_2	4.73E-26	5.19E-19	2.35788E-22
N_2	3.03E-02	2.02E+05	91.76572837
O_2	8.04E-03	6.13E+04	27.85029459
SO_2	1.75E-28	2.66E-21	1.21113E-24
NH_3	7.48E-08	3.03E-01	0.000137852
HNO_3	1.67E-09	2.51E-02	1.14135E-05
HCl	1.63E-51	1.42E-44	6.45101E-48
HF	1.57E-33	7.50E-27	3.41023E-30

(1) All radionuclides in gaseous streams are assumed to exist as solid particulate.

Component	Aqueous Components mol/L	Lb/gal	Lb/day	Solid Components Lb/day	Total Component Lb/day	Solid Components mt/day	Total Component g/sec
Total	0.00E+00	0.00E+00	0.00E+00	7.69E-01	7.69E-01	0.000349523	0.004045407
Ag^+	0.00E+00	0.00E+00	0.00E+00	1.30E-04	1.30E-04	5.89875E-08	6.82726E-07
Al^{+3}	0.00E+00	0.00E+00	0.00E+00	2.69E-02	2.69E-02	1.22381E-05	0.000141644
As^{+3}	0.00E+00	0.00E+00	0.00E+00	3.40E-02	3.40E-02	1.54518E-05	0.00017884
B^{+3}	0.00E+00	0.00E+00	0.00E+00	9.72E-04	9.72E-04	4.4192E-07	5.11482E-06
Ba^{+2}	0.00E+00	0.00E+00	0.00E+00	6.49E-04	6.49E-04	2.95089E-07	3.41539E-06
Bi^{+3}	0.00E+00	0.00E+00	0.00E+00	3.58E-04	3.58E-04	1.62918E-07	1.88563E-06
$C_2O_4^{-2}$	0.00E+00	0.00E+00	0.00E+00	6.60E-02	6.60E-02	3.00047E-05	0.000347277
Ca^{+2}	0.00E+00	0.00E+00	0.00E+00	9.21E-02	9.21E-02	4.18505E-05	0.00048438
Cd^{+2}	0.00E+00	0.00E+00	0.00E+00	1.81E-03	1.81E-03	8.20623E-07	9.49795E-06
Ce^{+3}	0.00E+00	0.00E+00	0.00E+00	5.76E-04	5.76E-04	2.61819E-07	3.03031E-06
Cl^-	0.00E+00	0.00E+00	0.00E+00	5.81E-03	5.81E-03	2.64213E-06	3.05802E-05
CO_3^{-2}	0.00E+00	0.00E+00	0.00E+00	5.53E-02	5.53E-02	2.51478E-05	0.000291062
Cr^{+3}	0.00E+00	0.00E+00	0.00E+00	3.15E-03	3.15E-03	1.43293E-06	1.65849E-05
Cu^{+2}	0.00E+00	0.00E+00	0.00E+00	1.23E-04	1.23E-04	5.59235E-08	6.47262E-07
F^-	0.00E+00	0.00E+00	0.00E+00	6.72E-03	6.72E-03	3.05323E-06	3.53383E-05
Fe^{+3}	0.00E+00	0.00E+00	0.00E+00	6.38E-03	6.38E-03	2.90203E-06	3.35883E-05
H^+	0.00E+00	0.00E+00	0.00E+00		0.00E+00	0	0
H_2O	0.00E+00	0.00E+00	0.00E+00		0.00E+00	0	0
Hg^{+2}	0.00E+00	0.00E+00	0.00E+00	2.65E-04	2.65E-04	1.20609E-07	1.39594E-06
K^+	0.00E+00	0.00E+00	0.00E+00	2.38E-02	2.38E-02	1.08041E-05	0.000125047
La^{+3}	0.00E+00	0.00E+00	0.00E+00	3.61E-04	3.61E-04	1.64133E-07	1.89969E-06
Li^+	0.00E+00	0.00E+00	0.00E+00	1.40E-04	1.40E-04	6.35706E-08	7.35771E-07
Mg^{+2}	0.00E+00	0.00E+00	0.00E+00	3.48E-03	3.48E-03	1.58246E-06	1.83155E-05
Mn^{+3}	0.00E+00	0.00E+00	0.00E+00	1.93E-03	1.93E-03	8.77447E-07	1.01556E-05
MnO_4^-	0.00E+00	0.00E+00	0.00E+00		0.00E+00	0	0
Na^+	0.00E+00	0.00E+00	0.00E+00	9.28E-02	9.28E-02	4.21632E-05	0.000488
NH_4^+	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0	0
Ni^{+2}	0.00E+00	0.00E+00	0.00E+00	7.35E-04	7.35E-04	3.34163E-07	3.86763E-06
NO_2^-	0.00E+00	0.00E+00	0.00E+00	2.74E-02	2.74E-02	1.24641E-05	0.00014426
NO_3^-	0.00E+00	0.00E+00	0.00E+00	1.46E-01	1.46E-01	6.6543E-05	0.000770174
O^{-2}				1.37E-02	1.37E-02	6.24709E-06	7.23043E-05
OH^-	0.00E+00	0.00E+00	0.00E+00	1.09E-01	1.09E-01	4.97714E-05	0.000576058
$OH(b)^-$	0.00E+00	0.00E+00	0.00E+00		0.00E+00	0	0
P^{+5}				1.22E-08	1.22E-08	5.53418E-12	6.4053E-11
Pb^{+2}	0.00E+00	0.00E+00	0.00E+00	5.10E-04	5.10E-04	2.31623E-07	2.68082E-06
Pd^{+2}	0.00E+00	0.00E+00	0.00E+00	1.34E-05	1.34E-05	6.10952E-09	7.07121E-08
PO_4^{-3}	0.00E+00	0.00E+00	0.00E+00	2.75E-02	2.75E-02	1.25029E-05	0.000144709
S^{+6}				2.73E-05	2.73E-05	1.24123E-08	1.43661E-07
Si^{+4}				4.96E-03	4.96E-03	2.25506E-06	2.61003E-05
SiO_4^{-4}	0.00E+00	0.00E+00	0.00E+00		0.00E+00	0	0
SO_4^{-2}	0.00E+00	0.00E+00	0.00E+00	1.12E-02	1.12E-02	5.10494E-06	5.90849E-05
Sr^{+2}	0.00E+00	0.00E+00	0.00E+00	5.57E-05	5.57E-05	2.53085E-08	2.92923E-07
Ti^{+4}	0.00E+00	0.00E+00	0.00E+00	7.59E-04	7.59E-04	3.45051E-07	3.99365E-06
Zn^{+2}	0.00E+00	0.00E+00	0.00E+00	2.68E-04	2.68E-04	1.21763E-07	1.40929E-06
Zr^{+4}	0.00E+00	0.00E+00	0.00E+00	2.12E-03	2.12E-03	9.624E-07	1.11389E-05

Rad. Component	Aqueous Rad. Components			Solids Rad. Components (1)			Total Rad. Components (1)		
	Ci/L	Ci/day	Lb/day	Ci/L	Ci/day	Lb/day	Ci/L	Ci/day	Lb/day
Total	0.00E+00	0.00E+00	0.00E+00	1.26E-08	1.36E+00	3.83E-03	1.26E-08	1.36E+00	3.83E-03
^{241}Am	0	0.00E+00	0.00E+00	3.13E-11	3.38E-03	2.18E-06	3.13E-11	3.38E-03	2.18E-06
^{14}C	0.00E+00	0.00E+00	0.00E+00	1.28E-13	1.38E-05	6.81E-09	1.28E-13	1.38E-05	6.81E-09
^{60}Co	0.00E+00	0.00E+00	0.00E+00	5.15E-12	5.57E-04	1.08E-09	5.15E-12	5.57E-04	1.08E-09
^{243}Cm	0.00E+00	0.00E+00	0.00E+00	1.49E-12	1.61E-04	7.04E-09	1.49E-12	1.61E-04	7.04E-09
^{244}Cm	0.00E+00	0.00E+00	0.00E+00	1.12E-12	1.21E-04	3.30E-09	1.12E-12	1.21E-04	3.30E-09
^{137}Cs	0.00E+00	0.00E+00	0.00E+00	5.58E-09	6.03E-01	1.53E-05	5.58E-09	6.03E-01	1.53E-05
^{152}Eu	0.00E+00	0.00E+00	0.00E+00	6.04E-13	6.53E-05	8.28E-10	6.04E-13	6.53E-05	8.28E-10
^{154}Eu	0.00E+00	0.00E+00	0.00E+00	1.95E-11	2.10E-03	1.72E-08	1.95E-11	2.10E-03	1.72E-08
^{155}Eu	0.00E+00	0.00E+00	0.00E+00	1.25E-11	1.36E-03	6.15E-09	1.25E-11	1.36E-03	6.15E-09
^{3}H	0.00E+00	0.00E+00	0.00E+00	3.06E-09	3.30E-01	7.58E-08	3.06E-09	3.30E-01	7.58E-08
^{129}I	0.00E+00	0.00E+00	0.00E+00	2.02E-15	2.19E-07	2.73E-06	2.02E-15	2.19E-07	2.73E-06
^{63}Ni	0.00E+00	0.00E+00	0.00E+00	2.48E-12	2.68E-04	1.04E-08	2.48E-12	2.68E-04	1.04E-08
^{237}Np	0.00E+00	0.00E+00	0.00E+00	3.72E-14	4.02E-06	1.26E-05	3.72E-14	4.02E-06	1.26E-05
^{238}Pu	0.00E+00	0.00E+00	0.00E+00	1.22E-13	1.32E-05	1.70E-09	1.22E-13	1.32E-05	1.70E-09
^{239}Pu	0.00E+00	0.00E+00	0.00E+00	1.08E-12	1.17E-04	4.16E-06	1.08E-12	1.17E-04	4.16E-06
^{240}Pu	0.00E+00	0.00E+00	0.00E+00	6.03E-14	6.52E-06	6.33E-08	6.03E-14	6.52E-06	6.33E-08
^{241}Pu	0.00E+00	0.00E+00	0.00E+00	7.66E-12	8.27E-04	1.77E-08	7.66E-12	8.27E-04	1.77E-08
^{125}Sb	0.00E+00	0.00E+00	0.00E+00	1.79E-11	1.93E-03	4.10E-09	1.79E-11	1.93E-03	4.10E-09
^{151}Sm	0.00E+00	0.00E+00	0.00E+00	1.18E-10	1.27E-02	1.07E-06	1.18E-10	1.27E-02	1.07E-06
^{126}Sn	0.00E+00	0.00E+00	0.00E+00	1.02E-13	1.11E-05	2.15E-06	1.02E-13	1.11E-05	2.15E-06
^{90}Sr	0.00E+00	0.00E+00	0.00E+00	3.75E-09	4.05E-01	6.47E-06	3.75E-09	4.05E-01	6.47E-06
^{99}Tc	0.00E+00	0.00E+00	0.00E+00	1.42E-11	1.53E-03	1.99E-04	1.42E-11	1.53E-03	1.99E-04
^{232}Th	0.00E+00	0.00E+00	0.00E+00	6.52E-16	7.05E-08	1.41E-03	6.52E-16	7.05E-08	1.41E-03
^{233}U	0.00E+00	0.00E+00	0.00E+00	5.30E-15	5.73E-07	1.31E-07	5.30E-15	5.73E-07	1.31E-07
^{234}U	0.00E+00	0.00E+00	0.00E+00	4.45E-15	4.81E-07	1.71E-07	4.45E-15	4.81E-07	1.71E-07
^{235}U	0.00E+00	0.00E+00	0.00E+00	2.33E-16	2.52E-08	2.57E-05	2.33E-16	2.52E-08	2.57E-05
^{236}U	0.00E+00	0.00E+00	0.00E+00	3.78E-16	4.08E-08	1.39E-06	3.78E-16	4.08E-08	1.39E-06
^{238}U	0.00E+00	0.00E+00	0.00E+00	3.02E-15	3.26E-07	2.14E-03	3.02E-15	3.26E-07	2.14E-03

Component (CAS)	Organic Components mol/L	Lb/gal	Lb/day	Mt/day	g/sec
Total	6.87E-07	7.18E-07	5.94E+01	0.027014765	0.312670887
57-14-7	6.50E-08	3.26217E-08	9.31E-01	0.000423276	0.004899027
58-90-2	1.25E-08	2.42289E-08	6.92E-01	0.000314377	0.003638628
58-89-9	2.40E-11	5.81876E-11	1.66E-03	7.55002E-07	8.73844E-06
71-43-2	7.85E-08	5.1186E-08	1.46E+00	0.000664153	0.007686962
75-05-8	7.00E-08	2.39872E-08	6.85E-01	0.000311241	0.003602328
76-44-8	1.44E-09	4.47363E-09	1.28E-01	5.80466E-05	0.000671836
79-01-6	4.67E-08	5.1166E-08	1.46E+00	0.000663894	0.007683954
84-74-2	3.07E-09	7.14178E-09	2.04E-01	9.26668E-05	0.001072532
84-66-2	1.42E-09	2.642E-09	7.54E-02	3.42808E-05	0.000396769
87-86-5	6.43E-11	1.42965E-10	4.08E-03	1.85502E-06	2.14701E-05
87-68-3	2.36E-08	5.12695E-08	1.46E+00	0.000665237	0.007699507
88-85-7	1.36E-09	2.7176E-09	7.76E-02	3.52617E-05	0.000408121
91-20-3	6.82E-09	7.29335E-09	2.08E-01	9.46334E-05	0.001095294
98-86-2	2.77E-08	2.78467E-08	7.95E-01	0.000361319	0.004181929
108-95-2	2.05E-09	1.60707E-09	4.59E-02	2.08522E-05	0.000241345
108-88-3	6.67E-08	5.12824E-08	1.46E+00	0.000665405	0.007701446
120-82-1	3.37E-08	5.10229E-08	1.46E+00	0.000662038	0.007662477
122-66-7	0.00E+00	0	0.00E+00	0	0
122-39-4	1.66E-09	2.33936E-09	6.68E-02	3.03539E-05	0.000351318
129-00-0	2.10E-08	3.54211E-08	1.01E+00	0.0004596	0.00531944
132-64-9	1.41E-07	1.97889E-07	5.65E+00	0.002567666	0.029718351
218-01-9	8.92E-09	1.69946E-08	4.85E-01	0.00022051	0.002552196
309-00-2	4.59E-10	1.39646E-09	3.99E-02	1.81194E-05	0.000209716
319-85-7	3.35E-12	8.12988E-12	2.32E-04	1.05488E-07	1.22092E-06
534-52-1	0.00E+00	0	0.00E+00	0	0
603-34-9	7.72E-09	1.57976E-08	4.51E-01	0.000204978	0.002372436
4170-30-3	9.90E-09	5.79024E-09	1.65E-01	7.51301E-05	0.000869562
10061-01-5	5.55E-08	5.13791E-08	1.47E+00	0.000666659	0.007715964
38380-08-4	2.58E-11	7.75674E-11	2.21E-03	1.00646E-06	1.16488E-05
100-21-0	1.46E-13	2.02784E-13	5.79E-06	2.63118E-09	3.04535E-08
106-93-4	1.45E-07	2.27177E-07	6.48E+00	0.002947695	0.034116845
106-97-8	1.06E-07	5.13233E-08	1.47E+00	0.000665936	0.007707587
106-99-0	1.14E-07	5.1323E-08	1.47E+00	0.000665931	0.007707537
108-87-2	6.24E-08	5.11591E-08	1.46E+00	0.000663805	0.007682924
110-54-3	7.13E-08	5.12816E-08	1.46E+00	0.000665395	0.007701328
110-82-7	7.29E-08	5.12359E-08	1.46E+00	0.000664802	0.007694464
111-84-2	4.80E-08	5.13517E-08	1.47E+00	0.000666304	0.007711851
118-74-1	2.07E-09	4.91768E-09	1.40E-01	6.38084E-05	0.000738523
120-12-7	7.27E-08	1.08195E-07	3.09E+00	0.001403865	0.016248441
127-18-4	3.71E-08	5.13928E-08	1.47E+00	0.000666837	0.007718021
1336-36-3	1.45E-07	3.89316E-07	1.11E+01	0.005051489	0.058466306
144-62-7	1.40E-13	1.0529E-13	3.01E-06	1.36617E-09	1.58122E-08
208-96-8	1.26E-07	1.60626E-07	4.59E+00	0.002084173	0.024122374
50-32-8	1.48E-11	3.10783E-11	8.87E-04	4.0325E-07	4.66724E-06
56-23-5	4.01E-08	5.14682E-08	1.47E+00	0.000667816	0.00772935
60-35-5	2.96E-11	1.45745E-11	4.16E-04	1.89109E-07	2.18876E-06
60-57-1	6.65E-11	2.11462E-10	6.04E-03	2.74378E-06	3.17567E-05
62-75-9	1.91E-08	1.17883E-08	3.37E-01	0.000152956	0.001770326
75-12-7	2.25E-11	8.46011E-12	2.41E-04	1.09772E-07	1.27051E-06
76-15-3	3.98E-08	5.12555E-08	1.46E+00	0.000665055	0.0076974
8001-35-2	4.51E-11	1.55781E-10	4.45E-03	2.0213E-06	2.33947E-05
88-89-1	2.38E-13	4.55733E-13	1.30E-05	5.91327E-09	6.84407E-08
126-73-8	3.61E-10	8.01694E-10	2.29E-02	1.04022E-05	0.000120396

River Protection Project - Waste Treatment Plant

Stream Number: PJV04
Stream Name: Vapor feed to demister
Run Data File: H:\Working Folder 11 (Vishal)\Emissions_Case2_Run4_SubEm\MRQ_03_054_run1_Streams.csv
Run Date / Time: 4/15/2003 - 6:40:10 AM

Stream Properties Variable	Value	Units
Density	1.16E-03	g/cm^3
Enthalpy	-7.83E+06	BTU/hr
Mass Flow	1.52E+05	Lb/hr
	3.65E+06	Lb/day
Volumetric Flow	2.62E+05	GPM
Molar Flow	5.30E+03	Lbmol/hr
Volumetric Flow	3.50E+04	ft^3/min
Molecular Weight	2.87E+01	Lb/Lbmol
Pressure	1.00E+03	mbar
Temperature	2.50E+01	C
Viscosity	1.83E-02	cP
Na Molarity	0.00E+00	mol/L
pH	N/A	pH
Total TRU	5.47E-11	Ci/L
Total Activity	1.03E-08	Ci/L

Gaseous Components (1) Component	mol/L	Lb/day	Mt/day
CO	1.20E-27	1.05E-19	4.79109E-23
CO_2	5.28E-13	7.32E-05	3.32582E-08
H_2O	5.72E-04	3.25E+04	14.75494908
NO	1.16E-32	1.10E-24	4.98335E-28
NO_2	3.35E-34	4.85E-26	2.20602E-29
N_2	3.14E-02	2.77E+06	1260.313993
O_2	8.36E-03	8.42E+05	382.6816086
SO_2	4.25E-33	8.58E-25	3.89794E-28
NH_3	4.68E-11	2.51E-03	1.14081E-06
HNO_3	2.30E-11	4.57E-03	2.0767E-06
HCl	1.17E-44	1.34E-36	6.10866E-40
HF	2.53E-83	1.60E-75	7.25621E-79

(1) All radionuclides in gaseous streams are assumed to exist as solid particulate.

Component	Aqueous Components mol/L	Lb/gal	Lb/day	Solid Components Lb/day	Total Component Lb/day	Solid Components mt/day	Total Component g/sec
Total	0.00E+00	0.00E+00	0.00E+00	5.96E+00	5.96E+00	0.002710504	0.03137157
Ag^+	0.00E+00	0.00E+00	0.00E+00	1.19E-03	1.19E-03	5.4102E-07	6.2618E-06
Al^{+3}	0.00E+00	0.00E+00	0.00E+00	2.17E-01	2.17E-01	9.8667E-05	0.00114198
As^{+3}	0.00E+00	0.00E+00	0.00E+00	4.63E-01	4.63E-01	0.000210383	0.002434986
B^{+3}	0.00E+00	0.00E+00	0.00E+00	7.11E-03	7.11E-03	3.23396E-06	3.74301E-05
Ba^{+2}	0.00E+00	0.00E+00	0.00E+00	6.83E-03	6.83E-03	3.10419E-06	3.59281E-05
Bi^{+3}	0.00E+00	0.00E+00	0.00E+00	5.23E-03	5.23E-03	2.37877E-06	2.75321E-05
$C_2O_4^{-2}$	0.00E+00	0.00E+00	0.00E+00	6.32E-01	6.32E-01	0.000287319	0.003325449
Ca^{+2}	0.00E+00	0.00E+00	0.00E+00	5.81E-02	5.81E-02	2.64153E-05	0.000305733
Cd^{+2}	0.00E+00	0.00E+00	0.00E+00	2.07E-02	2.07E-02	9.3864E-06	0.000108639
Ce^{+3}	0.00E+00	0.00E+00	0.00E+00	4.79E-03	4.79E-03	2.17732E-06	2.52004E-05
Cl^-	0.00E+00	0.00E+00	0.00E+00	5.16E-02	5.16E-02	2.34656E-05	0.000271593
CO_3^{-2}	0.00E+00	0.00E+00	0.00E+00	3.12E-01	3.12E-01	0.000141932	0.00164273
Cr^{+3}	0.00E+00	0.00E+00	0.00E+00	3.14E-02	3.14E-02	1.42677E-05	0.000165135
Cu^{+2}	0.00E+00	0.00E+00	0.00E+00	1.09E-03	1.09E-03	4.96037E-07	5.74117E-06
F^-	0.00E+00	0.00E+00	0.00E+00	6.86E-02	6.86E-02	3.11823E-05	0.000360906
Fe^{+3}	0.00E+00	0.00E+00	0.00E+00	5.81E-02	5.81E-02	2.64126E-05	0.000305702
H^+	0.00E+00	0.00E+00	0.00E+00		0.00E+00	0	0
H_2O	0.00E+00	0.00E+00	0.00E+00		0.00E+00	0	0
Hg^{+2}	0.00E+00	0.00E+00	0.00E+00	3.66E-03	3.66E-03	1.66269E-06	1.92441E-05
K^+	0.00E+00	0.00E+00	0.00E+00	2.10E-01	2.10E-01	9.54319E-05	0.001104536
La^{+3}	0.00E+00	0.00E+00	0.00E+00	4.10E-03	4.10E-03	1.86138E-06	2.15437E-05
Li^+	0.00E+00	0.00E+00	0.00E+00	1.48E-03	1.48E-03	6.74453E-07	7.80617E-06
Mg^{+2}	0.00E+00	0.00E+00	0.00E+00	4.40E-03	4.40E-03	1.99915E-06	2.31383E-05
Mn^{+3}	0.00E+00	0.00E+00	0.00E+00	1.71E-02	1.71E-02	7.79026E-06	9.01651E-05
MnO_4^-	0.00E+00	0.00E+00	0.00E+00		0.00E+00	0	0
Na^+	0.00E+00	0.00E+00	0.00E+00	7.46E-01	7.46E-01	0.000339074	0.003924468
NH_4^+	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0	0
Ni^{+2}	0.00E+00	0.00E+00	0.00E+00	8.61E-03	8.61E-03	3.91324E-06	4.52921E-05
NO_2^-	0.00E+00	0.00E+00	0.00E+00	2.70E-01	2.70E-01	0.000122849	0.001421868
NO_3^-	0.00E+00	0.00E+00	0.00E+00	1.42E+00	1.42E+00	0.000647567	0.00749499
O^{-2}				1.64E-01	1.64E-01	7.46284E-05	0.000863755
OH^-	0.00E+00	0.00E+00	0.00E+00	7.99E-01	7.99E-01	0.000363358	0.004205533
$OH(b)^-$	0.00E+00	0.00E+00	0.00E+00		0.00E+00	0	0
P^{+5}				5.39E-10	5.39E-10	2.44951E-13	2.83509E-12
Pb^{+2}	0.00E+00	0.00E+00	0.00E+00	5.67E-03	5.67E-03	2.57661E-06	2.98219E-05
Pd^{+2}	0.00E+00	0.00E+00	0.00E+00	2.09E-04	2.09E-04	9.5195E-08	1.10179E-06
PO_4^{-3}	0.00E+00	0.00E+00	0.00E+00	1.98E-01	1.98E-01	9.00342E-05	0.001042062
S^{+6}				1.64E-09	1.64E-09	7.43287E-13	8.60286E-12
Si^{+4}				3.32E-02	3.32E-02	1.50745E-05	0.000174473
SiO_4^{-4}	0.00E+00	0.00E+00	0.00E+00		0.00E+00	0	0
SO_4^{-2}	0.00E+00	0.00E+00	0.00E+00	1.03E-01	1.03E-01	4.66699E-05	0.000540161
Sr^{+2}	0.00E+00	0.00E+00	0.00E+00	8.67E-04	8.67E-04	3.93912E-07	4.55917E-06
Ti^{+4}	0.00E+00	0.00E+00	0.00E+00	5.26E-03	5.26E-03	2.39152E-06	2.76796E-05
Zn^{+2}	0.00E+00	0.00E+00	0.00E+00	2.03E-03	2.03E-03	9.22881E-07	1.06815E-05
Zr^{+4}	0.00E+00	0.00E+00	0.00E+00	2.24E-02	2.24E-02	1.0173E-05	0.000117744

Rad. Component	Aqueous Rad. Components			Solids Rad. Components (1)			Total Rad. Components (1)		
	Ci/L	Ci/day	Lb/day	Ci/L	Ci/day	Lb/day	Ci/L	Ci/day	Lb/day
Total	0.00E+00	0.00E+00	0.00E+00	1.03E-08	1.47E+01	3.56E-02	1.03E-08	1.47E+01	3.56E-02
^{241}Am	0	0.00E+00	0.00E+00	4.07E-11	5.81E-02	3.74E-05	4.07E-11	5.81E-02	3.74E-05
^{14}C	0.00E+00	0.00E+00	0.00E+00	6.89E-14	9.84E-05	4.86E-08	6.89E-14	9.84E-05	4.86E-08
^{60}Co	0.00E+00	0.00E+00	0.00E+00	4.60E-12	6.57E-03	1.28E-08	4.60E-12	6.57E-03	1.28E-08
^{243}Cm	0.00E+00	0.00E+00	0.00E+00	1.35E-12	1.93E-03	8.43E-08	1.35E-12	1.93E-03	8.43E-08
^{244}Cm	0.00E+00	0.00E+00	0.00E+00	1.01E-12	1.45E-03	3.95E-08	1.01E-12	1.45E-03	3.95E-08
^{137}Cs	0.00E+00	0.00E+00	0.00E+00	5.34E-09	7.62E+00	1.94E-04	5.34E-09	7.62E+00	1.94E-04
^{152}Eu	0.00E+00	0.00E+00	0.00E+00	5.42E-13	7.74E-04	9.82E-09	5.42E-13	7.74E-04	9.82E-09
^{154}Eu	0.00E+00	0.00E+00	0.00E+00	2.45E-11	3.50E-02	2.86E-07	2.45E-11	3.50E-02	2.86E-07
^{155}Eu	0.00E+00	0.00E+00	0.00E+00	1.49E-11	2.13E-02	9.68E-08	1.49E-11	2.13E-02	9.68E-08
^{3}H	0.00E+00	0.00E+00	0.00E+00	5.81E-13	8.30E-04	1.90E-10	5.81E-13	8.30E-04	1.90E-10
^{129}I	0.00E+00	0.00E+00	0.00E+00	9.09E-16	1.30E-06	1.62E-05	9.09E-16	1.30E-06	1.62E-05
^{63}Ni	0.00E+00	0.00E+00	0.00E+00	2.75E-12	3.92E-03	1.52E-07	2.75E-12	3.92E-03	1.52E-07
^{237}Np	0.00E+00	0.00E+00	0.00E+00	3.36E-14	4.79E-05	1.50E-04	3.36E-14	4.79E-05	1.50E-04
^{238}Pu	0.00E+00	0.00E+00	0.00E+00	1.58E-13	2.26E-04	2.91E-08	1.58E-13	2.26E-04	2.91E-08
^{239}Pu	0.00E+00	0.00E+00	0.00E+00	1.40E-12	2.01E-03	7.13E-05	1.40E-12	2.01E-03	7.13E-05
^{240}Pu	0.00E+00	0.00E+00	0.00E+00	7.77E-14	1.11E-04	1.08E-06	7.77E-14	1.11E-04	1.08E-06
^{241}Pu	0.00E+00	0.00E+00	0.00E+00	9.95E-12	1.42E-02	3.04E-07	9.95E-12	1.42E-02	3.04E-07
^{125}Sb	0.00E+00	0.00E+00	0.00E+00	1.95E-11	2.79E-02	5.92E-08	1.95E-11	2.79E-02	5.92E-08
^{151}Sm	0.00E+00	0.00E+00	0.00E+00	1.07E-10	1.53E-01	1.28E-05	1.07E-10	1.53E-01	1.28E-05
^{126}Sn	0.00E+00	0.00E+00	0.00E+00	1.05E-13	1.50E-04	2.91E-05	1.05E-13	1.50E-04	2.91E-05
^{90}Sr	0.00E+00	0.00E+00	0.00E+00	4.74E-09	6.77E+00	1.08E-04	4.74E-09	6.77E+00	1.08E-04
^{99}Tc	0.00E+00	0.00E+00	0.00E+00	1.29E-11	1.84E-02	2.40E-03	1.29E-11	1.84E-02	2.40E-03
^{232}Th	0.00E+00	0.00E+00	0.00E+00	4.92E-16	7.03E-07	1.41E-02	4.92E-16	7.03E-07	1.41E-02
^{233}U	0.00E+00	0.00E+00	0.00E+00	2.98E-15	4.25E-06	9.73E-07	2.98E-15	4.25E-06	9.73E-07
^{234}U	0.00E+00	0.00E+00	0.00E+00	2.97E-15	4.24E-06	1.51E-06	2.97E-15	4.24E-06	1.51E-06
^{235}U	0.00E+00	0.00E+00	0.00E+00	1.71E-16	2.44E-07	2.49E-04	1.71E-16	2.44E-07	2.49E-04
^{236}U	0.00E+00	0.00E+00	0.00E+00	2.19E-16	3.13E-07	1.07E-05	2.19E-16	3.13E-07	1.07E-05
^{238}U	0.00E+00	0.00E+00	0.00E+00	1.94E-15	2.78E-06	1.82E-02	1.94E-15	2.78E-06	1.82E-02

Component (CAS)	Organic Components				
	mol/L	Lb/gal	Lb/day	Mt/day	g/sec
Total	7.94E-12	1.07E-11	8.54E-03	3.87965E-06	4.49033E-05
57-14-7	1.05E-12	5.28316E-13	1.99E-04	9.06058E-08	1.04868E-06
58-90-2	2.86E-13	5.53412E-13	2.09E-04	9.49098E-08	1.09849E-06
58-89-9	1.08E-15	2.63158E-15	9.93E-07	4.51313E-10	5.22353E-09
71-43-2	6.07E-14	3.9563E-14	1.49E-05	6.78502E-09	7.85303E-08
75-05-8	4.12E-13	1.41031E-13	5.32E-05	2.41868E-08	2.7994E-07
76-44-8	1.66E-15	5.18252E-15	1.96E-06	8.88798E-10	1.0287E-08
79-01-6	3.57E-14	3.91873E-14	1.48E-05	6.72059E-09	7.77846E-08
84-74-2	4.09E-13	9.50503E-13	3.59E-04	1.6301E-07	1.8867E-06
84-66-2	5.22E-13	9.67668E-13	3.65E-04	1.65954E-07	1.92077E-06
87-86-5	6.40E-13	1.42297E-12	5.37E-04	2.44039E-07	2.82452E-06
87-68-3	1.80E-14	3.92433E-14	1.48E-05	6.7302E-09	7.78958E-08
88-85-7	8.05E-13	1.61406E-12	6.09E-04	2.7681E-07	3.20381E-06
91-20-3	6.85E-15	7.32591E-15	2.76E-06	1.25639E-09	1.45415E-08
95-94-3	0.00E+00	0	0.00E+00	0	0
98-86-2	5.39E-13	5.4157E-13	2.04E-04	9.28789E-08	1.07499E-06
108-95-2	1.42E-12	1.11334E-12	4.20E-04	1.90937E-07	2.20992E-06
108-88-3	5.14E-14	3.94995E-14	1.49E-05	6.77413E-09	7.84043E-08
120-82-1	2.77E-14	4.19707E-14	1.58E-05	7.19794E-09	8.33095E-08
122-66-7	0.00E+00	0	0.00E+00	0	0
122-39-4	1.00E-13	1.41879E-13	5.35E-05	2.43321E-08	2.81622E-07
129-00-0	4.20E-13	7.09312E-13	2.68E-04	1.21647E-07	1.40795E-06
132-64-9	1.90E-13	2.67255E-13	1.01E-04	4.5834E-08	5.30486E-07
218-01-9	3.99E-13	7.60867E-13	2.87E-04	1.30488E-07	1.51028E-06
309-00-2	2.84E-15	8.64963E-15	3.26E-06	1.4834E-09	1.7169E-08
319-85-7	1.95E-15	4.72742E-15	1.78E-06	8.10749E-10	9.38367E-09
534-52-1	0.00E+00	0	0.00E+00	0	0
603-34-9	2.90E-13	5.92935E-13	2.24E-04	1.01688E-07	1.17694E-06
4170-30-3	2.06E-13	1.20594E-13	4.55E-05	2.06819E-08	2.39373E-07
10061-01-5	4.38E-14	4.05993E-14	1.53E-05	6.96275E-09	8.05874E-08
38380-08-4	1.04E-15	3.12843E-15	1.18E-06	5.36523E-10	6.20976E-09
100-21-0	1.05E-12	1.46086E-12	5.51E-04	2.50536E-07	2.89972E-06
106-93-4	1.32E-13	2.06525E-13	7.79E-05	3.54189E-08	4.09941E-07
106-97-8	8.01E-14	3.88355E-14	1.47E-05	6.66026E-09	7.70863E-08
106-99-0	8.62E-14	3.8894E-14	1.47E-05	6.6703E-09	7.72025E-08
108-87-2	4.72E-14	3.87173E-14	1.46E-05	6.63998E-09	7.68516E-08
110-54-3	5.40E-14	3.88017E-14	1.46E-05	6.65446E-09	7.70192E-08
110-82-7	5.52E-14	3.87957E-14	1.46E-05	6.65344E-09	7.70074E-08
111-84-2	3.63E-14	3.88535E-14	1.47E-05	6.66334E-09	7.7122E-08
118-74-1	1.68E-15	3.98944E-15	1.51E-06	6.84186E-10	7.91882E-09
120-12-7	2.71E-13	4.03298E-13	1.52E-04	6.91653E-08	8.00525E-07
127-18-4	2.83E-14	3.91479E-14	1.48E-05	6.71383E-09	7.77064E-08
1336-36-3	2.51E-13	6.74137E-13	2.54E-04	1.15614E-07	1.33812E-06
144-62-7	1.95E-13	1.46254E-13	5.52E-05	2.50825E-08	2.90307E-07
208-96-8	2.57E-13	3.26487E-13	1.23E-04	5.59923E-08	6.48059E-07
50-32-8	8.30E-15	1.74692E-14	6.59E-06	2.99595E-09	3.46753E-08
56-23-5	3.05E-14	3.911E-14	1.48E-05	6.70734E-09	7.76312E-08
60-35-5	6.47E-13	3.18948E-13	1.20E-04	5.46993E-08	6.33093E-07
60-57-1	1.58E-15	5.0144E-15	1.89E-06	8.59965E-10	9.9533E-09
62-75-9	2.21E-12	1.36612E-12	5.15E-04	2.34288E-07	2.71167E-06
75-12-7	3.88E-12	1.45666E-12	5.50E-04	2.49817E-07	2.8914E-06
76-15-3	3.01E-14	3.87801E-14	1.46E-05	6.65076E-09	7.69764E-08
8001-35-2	1.75E-15	6.04898E-15	2.28E-06	1.03739E-09	1.20069E-08
88-89-1	2.71E-12	5.18279E-12	1.96E-03	8.88844E-07	1.02875E-05
126-73-8	5.71E-13	1.26794E-12	4.78E-04	2.1745E-07	2.51679E-06

River Protection Project - Waste Treatment Plant

Stream Number: LMP06
Stream Name: Melter offgas (primary)
Run Data File: H:\Working Folder 11 (Vishal)\Emissions_Case2_Run4_SubEm\MRQ_03_054_run1_Streams.csv
Run Date / Time: 4/15/2003 - 6:40:10 AM

Stream Properties Variable	Value	Units
Density	4.52E-04	g/cm^3
Enthalpy	-1.19E+07	BTU/hr
Mass Flow	6.50E+03	Lb/hr
	1.56E+05	Lb/day
Volumetric Flow	2.80E+04	GPM
Molar Flow	2.46E+02	Lbmol/hr
Volumetric Flow	3.74E+03	ft^3/min
Molecular Weight	2.58E+01	Lb/Lbmol
Pressure	9.83E+02	mbar
Temperature	4.00E+02	C
Viscosity	3.19E-02	cP
Na Molarity	0.00E+00	mol/L
pH	N/A	pH
Total TRU	5.92E-11	Ci/L
Total Activity	2.35E-07	Ci/L

Gaseous Components (1) Component	mol/L	Lb/day	Mt/day
CO	1.29E-05	1.21E+02	0.055041335
CO_2	1.29E-03	1.90E+04	8.64810066
H_2O	7.10E-03	4.31E+04	19.56830477
NO	4.22E-04	4.26E+03	1.936049184
NO_2	3.84E-05	5.95E+02	0.27046549
N_2	6.48E-03	6.10E+04	27.74728371
O_2	2.19E-03	2.36E+04	10.70777218
SO_2	1.13E-05	2.42E+02	0.110215827
NH_3	1.19E-07	6.81E-01	0.00030968
HNO_3	3.25E-59	6.90E-52	3.13442E-55
HCl	1.98E-05	2.43E+02	0.110393746
HF	9.64E-06	6.49E+01	0.029495321

(1) All radionuclides in gaseous streams are assumed to exist as solid particulate.

Component	Aqueous Components mol/L	Lb/gal	Lb/day	Solid Components Lb/day	Total Component Lb/day	Solid Components mt/day	Total Component g/sec
Total	0.00E+00	0.00E+00	0.00E+00	3.67E+03	3.67E+03	1.668650781	19.31308775
Ag^+	0.00E+00	0.00E+00	0.00E+00	1.27E-01	1.27E-01	5.78544E-05	0.000669611
Al^{+3}	0.00E+00	0.00E+00	0.00E+00	3.47E+01	3.47E+01	0.015790516	0.1827606
As^{+3}	0.00E+00	0.00E+00	0.00E+00	1.21E+03	1.21E+03	0.547910033	6.341551307
B^{+3}	0.00E+00	0.00E+00	0.00E+00	1.20E+02	1.20E+02	0.054473818	0.630484
Ba^{+2}	0.00E+00	0.00E+00	0.00E+00	3.94E-02	3.94E-02	1.79003E-05	0.000207179
Bi^{+3}	0.00E+00	0.00E+00	0.00E+00	1.21E-01	1.21E-01	5.50475E-05	0.000637123
$C_2O_4^{-2}$	0.00E+00	0.00E+00	0.00E+00	5.45E+02	5.45E+02	0.247670974	2.866562202
Ca^{+2}	0.00E+00	0.00E+00	0.00E+00	6.36E+01	6.36E+01	0.028899546	0.334485484
Cd^{+2}	0.00E+00	0.00E+00	0.00E+00	1.42E+01	1.42E+01	0.006439439	0.074530548
Ce^{+3}	0.00E+00	0.00E+00	0.00E+00	1.66E-01	1.66E-01	7.56349E-05	0.000875404
Cl^-	0.00E+00	0.00E+00	0.00E+00	8.00E+01	8.00E+01	0.036355115	0.420776792
CO_3^{-2}	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0	0
Cr^{+3}	0.00E+00	0.00E+00	0.00E+00	2.99E+00	2.99E+00	0.001357237	0.015708767
Cu^{+2}	0.00E+00	0.00E+00	0.00E+00	2.00E-02	2.00E-02	9.08879E-06	0.000105194
F^-	0.00E+00	0.00E+00	0.00E+00	1.24E+02	1.24E+02	0.056287724	0.651478284
Fe^{+3}	0.00E+00	0.00E+00	0.00E+00	2.05E+01	2.05E+01	0.009340679	0.108109707
H^+	0.00E+00	0.00E+00	0.00E+00		0.00E+00	0	0
H_2O	0.00E+00	0.00E+00	0.00E+00		0.00E+00	0	0
Hg^{+2}	0.00E+00	0.00E+00	0.00E+00	4.78E+00	4.78E+00	0.002172793	0.025148066
K^+	0.00E+00	0.00E+00	0.00E+00	1.05E+02	1.05E+02	0.047893411	0.554321889
La^{+3}	0.00E+00	0.00E+00	0.00E+00	6.67E-02	6.67E-02	3.03367E-05	0.000351119
Li^+	0.00E+00	0.00E+00	0.00E+00	2.08E+01	2.08E+01	0.009471133	0.109619592
Mg^{+2}	0.00E+00	0.00E+00	0.00E+00	7.77E+00	7.77E+00	0.003531568	0.040874634
Mn^{+3}	0.00E+00	0.00E+00	0.00E+00	1.02E+00	1.02E+00	0.000465502	0.00538776
MnO_4^-	0.00E+00	0.00E+00	0.00E+00		0.00E+00	0	0
Na^+	0.00E+00	0.00E+00	0.00E+00	7.02E+01	7.02E+01	0.031923141	0.369480796
NH_4^+	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0	0
Ni^{+2}	0.00E+00	0.00E+00	0.00E+00	5.71E-01	5.71E-01	0.000259638	0.00300507
NO_2^-	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0	0
NO_3^-	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0	0
O^{-2}				9.87E+02	9.87E+02	0.448497025	5.190937792
OH^-	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0	0
$OH(b)^-$	0.00E+00	0.00E+00	0.00E+00		0.00E+00	0	0
P^{+5}				1.47E+01	1.47E+01	0.00667526	0.077259949
Pb^{+2}	0.00E+00	0.00E+00	0.00E+00	2.01E-01	2.01E-01	9.12777E-05	0.001056455
Pd^{+2}	0.00E+00	0.00E+00	0.00E+00	1.21E-03	1.21E-03	5.50347E-07	6.36976E-06
PO_4^{-3}	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0	0
S^{+6}				0.00E+00	0.00E+00	0	0
Si^{+4}				7.98E+01	7.98E+01	0.036252978	0.419594657
SiO_4^{-4}	0.00E+00	0.00E+00	0.00E+00		0.00E+00	0	0
SO_4^{-2}	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0	0
Sr^{+2}	0.00E+00	0.00E+00	0.00E+00	1.21E-02	1.21E-02	5.51301E-06	6.3808E-05
Ti^{+4}	0.00E+00	0.00E+00	0.00E+00	1.33E+02	1.33E+02	0.060629966	0.701735713
Zn^{+2}	0.00E+00	0.00E+00	0.00E+00	2.70E+01	2.70E+01	0.012278687	0.142114436
Zr^{+4}	0.00E+00	0.00E+00	0.00E+00	8.21E+00	8.21E+00	0.003731395	0.043187438

Rad. Component	Aqueous Rad. Components			Solids Rad. Components (1)			Total Rad. Components (1)		
	Ci/L	Ci/day	Lb/day	Ci/L	Ci/day	Lb/day	Ci/L	Ci/day	Lb/day
Total	0.00E+00	0.00E+00	0.00E+00	2.35E-07	3.58E+01	8.92E-01	2.35E-07	3.58E+01	8.92E-01
^{241}Am	0	0.00E+00	0.00E+00	4.28E-11	6.53E-03	4.20E-06	4.28E-11	6.53E-03	4.20E-06
^{14}C	0.00E+00	0.00E+00	0.00E+00	6.01E-09	9.17E-01	4.53E-04	6.01E-09	9.17E-01	4.53E-04
^{60}Co	0.00E+00	0.00E+00	0.00E+00	4.26E-11	6.51E-03	1.27E-08	4.26E-11	6.51E-03	1.27E-08
^{243}Cm	0.00E+00	0.00E+00	0.00E+00	1.14E-13	1.74E-05	7.57E-10	1.14E-13	1.74E-05	7.57E-10
^{244}Cm	0.00E+00	0.00E+00	0.00E+00	1.22E-13	1.87E-05	5.08E-10	1.22E-13	1.87E-05	5.08E-10
^{137}Cs	0.00E+00	0.00E+00	0.00E+00	3.04E-09	4.64E-01	1.18E-05	3.04E-09	4.64E-01	1.18E-05
^{152}Eu	0.00E+00	0.00E+00	0.00E+00	1.49E-10	2.28E-02	2.89E-07	1.49E-10	2.28E-02	2.89E-07
^{154}Eu	0.00E+00	0.00E+00	0.00E+00	4.95E-10	7.55E-02	6.16E-07	4.95E-10	7.55E-02	6.16E-07
^{155}Eu	0.00E+00	0.00E+00	0.00E+00	8.51E-10	1.30E-01	5.90E-07	8.51E-10	1.30E-01	5.90E-07
^{3}H	0.00E+00	0.00E+00	0.00E+00	2.94E-09	4.49E-01	1.03E-07	2.94E-09	4.49E-01	1.03E-07
^{129}I	0.00E+00	0.00E+00	0.00E+00	7.00E-11	1.07E-02	1.33E-01	7.00E-11	1.07E-02	1.33E-01
^{63}Ni	0.00E+00	0.00E+00	0.00E+00	6.14E-10	9.37E-02	3.64E-06	6.14E-10	9.37E-02	3.64E-06
^{237}Np	0.00E+00	0.00E+00	0.00E+00	1.84E-13	2.81E-05	8.79E-05	1.84E-13	2.81E-05	8.79E-05
^{238}Pu	0.00E+00	0.00E+00	0.00E+00	2.48E-13	3.79E-05	4.87E-09	2.48E-13	3.79E-05	4.87E-09
^{239}Pu	0.00E+00	0.00E+00	0.00E+00	2.90E-12	4.43E-04	1.57E-05	2.90E-12	4.43E-04	1.57E-05
^{240}Pu	0.00E+00	0.00E+00	0.00E+00	5.00E-13	7.63E-05	7.41E-07	5.00E-13	7.63E-05	7.41E-07
^{241}Pu	0.00E+00	0.00E+00	0.00E+00	1.24E-11	1.89E-03	4.04E-08	1.24E-11	1.89E-03	4.04E-08
^{125}Sb	0.00E+00	0.00E+00	0.00E+00	4.58E-09	6.99E-01	1.48E-06	4.58E-09	6.99E-01	1.48E-06
^{151}Sm	0.00E+00	0.00E+00	0.00E+00	2.83E-08	4.32E+00	3.62E-04	2.83E-08	4.32E+00	3.62E-04
^{126}Sn	0.00E+00	0.00E+00	0.00E+00	1.71E-11	2.61E-03	5.07E-04	1.71E-11	2.61E-03	5.07E-04
^{90}Sr	0.00E+00	0.00E+00	0.00E+00	1.85E-07	2.82E+01	4.50E-04	1.85E-07	2.82E+01	4.50E-04
^{99}Tc	0.00E+00	0.00E+00	0.00E+00	2.46E-09	3.75E-01	4.88E-02	2.46E-09	3.75E-01	4.88E-02
^{232}Th	0.00E+00	0.00E+00	0.00E+00	6.34E-14	9.67E-06	1.94E-01	6.34E-14	9.67E-06	1.94E-01
^{233}U	0.00E+00	0.00E+00	0.00E+00	1.18E-12	1.79E-04	4.11E-05	1.18E-12	1.79E-04	4.11E-05
^{234}U	0.00E+00	0.00E+00	0.00E+00	6.84E-13	1.04E-04	3.71E-05	6.84E-13	1.04E-04	3.71E-05
^{235}U	0.00E+00	0.00E+00	0.00E+00	2.64E-14	4.03E-06	4.11E-03	2.64E-14	4.03E-06	4.11E-03
^{236}U	0.00E+00	0.00E+00	0.00E+00	7.92E-14	1.21E-05	4.12E-04	7.92E-14	1.21E-05	4.12E-04
^{238}U	0.00E+00	0.00E+00	0.00E+00	5.09E-13	7.77E-05	5.10E-01	5.09E-13	7.77E-05	5.10E-01

Component (CAS)	Organic Components				
	mol/L	Lb/gal	Lb/day	Mt/day	g/sec
Total	1.68E-07	2.77E-07	8.54E+01	0.038821907	0.449327624
57-14-7	2.95E-10	1.47957E-10	5.96E-03	2.71104E-06	3.13778E-05
58-90-2	1.52E-10	2.94053E-10	1.19E-02	5.38798E-06	6.23608E-05
58-89-9	9.55E-13	2.31886E-12	9.35E-05	4.24888E-08	4.91769E-07
71-43-2	0.00E+00	0	0.00E+00	0	0
75-05-8	1.22E-11	4.17293E-12	1.68E-04	7.64612E-08	8.84968E-07
76-44-8	0.00E+00	0	0.00E+00	0	0
79-01-6	0.00E+00	0	0.00E+00	0	0
84-74-2	3.73E-09	8.65613E-09	3.49E-01	0.000158607	0.001835733
84-66-2	1.35E-08	2.50083E-08	1.01E+00	0.00045823	0.005303585
87-86-5	4.83E-08	1.07313E-07	4.33E+00	0.001966309	0.022758203
87-68-3	0.00E+00	0	0.00E+00	0	0
88-85-7	4.41E-08	8.84721E-08	3.57E+00	0.001621086	0.018762571
91-20-3	0.00E+00	0	0.00E+00	0	0
98-86-2	2.11E-10	2.11877E-10	8.54E-03	3.88224E-06	4.49334E-05
108-95-2	5.65E-08	4.44025E-08	1.79E+00	0.000813593	0.00941658
108-88-3	0.00E+00	0	0.00E+00	0	0
120-82-1	0.00E+00	0	0.00E+00	0	0
122-66-7	0.00E+00	0	0.00E+00	0	0
122-39-4	2.93E-10	4.13642E-10	1.67E-02	7.57922E-06	8.77224E-05
129-00-0	1.27E-10	2.13706E-10	8.61E-03	3.91577E-06	4.53214E-05
132-64-9	1.73E-14	2.43288E-14	9.81E-07	4.4578E-10	5.15949E-09
218-01-9	5.94E-10	1.13199E-09	4.56E-02	2.07415E-05	0.000240064
309-00-2	1.82E-14	5.55198E-14	2.24E-06	1.0173E-09	1.17743E-08
319-85-7	6.04E-11	1.46559E-10	5.91E-03	2.68542E-06	3.10812E-05
534-52-1	0.00E+00	0	0.00E+00	0	0
603-34-9	3.79E-10	7.75727E-10	3.13E-02	1.42137E-05	0.000164511
4170-30-3	9.35E-11	5.46992E-11	2.20E-03	1.00226E-06	1.16002E-05
10061-01-5	0.00E+00	0	0.00E+00	0	0
38380-08-4	7.34E-13	2.21146E-12	8.91E-05	4.05208E-08	4.68991E-07
100-21-0	8.45E-08	1.17118E-07	4.72E+00	0.002145978	0.024837705
106-93-4	3.06E-17	4.79137E-17	1.93E-09	8.7793E-13	1.01612E-11
106-97-8	0.00E+00	0	0.00E+00	0	0
106-99-0	0.00E+00	0	0.00E+00	0	0
108-87-2	0.00E+00	0	0.00E+00	0	0
110-54-3	0.00E+00	0	0.00E+00	0	0
110-82-7	0.00E+00	0	0.00E+00	0	0
111-84-2	0.00E+00	0	0.00E+00	0	0
118-74-1	0.00E+00	0	0.00E+00	0	0
120-12-7	2.71E-12	4.02945E-12	1.62E-04	7.38321E-08	8.54538E-07
127-18-4	0.00E+00	0	0.00E+00	0	0
1336-36-3	9.60E-17	2.58012E-16	1.04E-08	4.72759E-12	5.47175E-11
144-62-7	1.55E-08	1.16812E-08	4.71E-01	0.000214037	0.002477281
208-96-8	3.81E-13	4.83396E-13	1.95E-05	8.85732E-09	1.02515E-07
50-32-8	2.74E-10	5.76523E-10	2.32E-02	1.05637E-05	0.000122265
56-23-5	0.00E+00	0	0.00E+00	0	0
60-35-5	5.05E-08	2.48912E-08	1.00E+00	0.000456084	0.005278749
60-57-1	3.57E-13	1.13585E-12	4.58E-05	2.08124E-08	2.40884E-07
62-75-9	1.68E-08	1.03638E-08	4.18E-01	0.000189898	0.002197891
75-12-7	3.10E-07	1.16475E-07	4.70E+00	0.002134189	0.024701263
76-15-3	0.00E+00	0	0.00E+00	0	0
8001-35-2	1.15E-12	3.98938E-12	1.61E-04	7.3098E-08	8.46042E-07
88-89-1	8.16E-07	1.56037E-06	6.29E+01	0.028590876	0.330912918
126-73-8	3.23E-08	7.17133E-08	2.89E+00	0.001314012	0.015208472

River Protection Project - Waste Treatment Plant

Stream Number: HMP06
Stream Name: Melter offgas (primary)
Run Data File: H:\Working Folder 11 (Vishal)\Emissions_Case2_Run4_SubEm\MRQ_03_054_run1_Streams.csv
Run Date / Time: 4/15/2003 - 6:40:10 AM

Stream Properties Variable	Value	Units
Density	3.64E-04	g/cm^3
Enthalpy	-1.69E+07	BTU/hr
Mass Flow	4.88E+03	Lb/hr
	1.17E+05	Lb/day
Volumetric Flow	2.48E+04	GPM
Molar Flow	2.18E+02	Lbmol/hr
Volumetric Flow	3.32E+03	ft^3/min
Molecular Weight	2.07E+01	Lb/Lbmol
Pressure	9.83E+02	mbar
Temperature	4.00E+02	C
Viscosity	2.82E-02	cP
Na Molarity	0.00E+00	mol/L
pH	N/A	pH
Total TRU	4.80E-08	Ci/L
Total Activity	3.25E-05	Ci/L

Gaseous Components (1) Component	mol/L	Lb/day	Mt/day
CO	2.40E-06	2.00E+01	0.009107806
CO_2	2.40E-04	3.15E+03	1.431019457
H_2O	1.36E-02	7.33E+04	33.30428564
NO	9.21E-05	8.24E+02	0.374450438
NO_2	8.39E-06	1.15E+02	0.052310614
N_2	2.76E-03	2.30E+04	10.46927274
O_2	8.32E-04	7.94E+03	3.606827788
SO_2	1.68E-06	3.21E+01	0.014592218
NH_3	2.15E-06	1.09E+01	0.004971796
HNO_3	3.99E-48	7.49E-41	3.40366E-44
HCl	2.27E-06	2.47E+01	0.011207442
HF	2.45E-06	1.46E+01	0.006630528

(1) All radionuclides in gaseous streams are assumed to exist as solid particulate.

Component	Aqueous Components mol/L	Lb/gal	Lb/day	Solid Components Lb/day	Total Component Lb/day	Solid Components mt/day	Total Component g/sec
Total	0.00E+00	0.00E+00	0.00E+00	8.63E+03	8.63E+03	3.923735222	45.41360211
Ag^+	0.00E+00	0.00E+00	0.00E+00	4.59E-01	4.59E-01	0.000208605	0.002414412
Al^{+3}	0.00E+00	0.00E+00	0.00E+00	5.27E+00	5.27E+00	0.002393896	0.02770713
As^{+3}	0.00E+00	0.00E+00	0.00E+00	6.25E+03	6.25E+03	2.841894403	32.89229634
B^{+3}	0.00E+00	0.00E+00	0.00E+00	1.23E+01	1.23E+01	0.005586492	0.064658468
Ba^{+2}	0.00E+00	0.00E+00	0.00E+00	1.07E+00	1.07E+00	0.000487878	0.005646738
Bi^{+3}	0.00E+00	0.00E+00	0.00E+00	6.78E-01	6.78E-01	0.000307999	0.003564798
$C_2O_4^{-2}$	0.00E+00	0.00E+00	0.00E+00	1.25E+02	1.25E+02	0.056801398	0.657423587
Ca^{+2}	0.00E+00	0.00E+00	0.00E+00	2.88E+00	2.88E+00	0.001307189	0.015129502
Cd^{+2}	0.00E+00	0.00E+00	0.00E+00	1.32E+01	1.32E+01	0.00599277	0.069360762
Ce^{+3}	0.00E+00	0.00E+00	0.00E+00	1.13E-01	1.13E-01	5.11596E-05	0.000592125
Cl^-	0.00E+00	0.00E+00	0.00E+00	8.03E+00	8.03E+00	0.00365186	0.042266896
CO_3^{-2}	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0	0
Cr^{+3}	0.00E+00	0.00E+00	0.00E+00	4.60E-01	4.60E-01	0.000209036	0.0024194
Cu^{+2}	0.00E+00	0.00E+00	0.00E+00	5.88E-02	5.88E-02	2.67249E-05	0.000309316
F^-	0.00E+00	0.00E+00	0.00E+00	2.60E+01	2.60E+01	0.0118039	0.136619209
Fe^{+3}	0.00E+00	0.00E+00	0.00E+00	3.51E+00	3.51E+00	0.001596332	0.018476068
H^+	0.00E+00	0.00E+00	0.00E+00		0.00E+00	0	0
H_2O	0.00E+00	0.00E+00	0.00E+00		0.00E+00	0	0
Hg^{+2}	0.00E+00	0.00E+00	0.00E+00	5.04E+01	5.04E+01	0.022886777	0.264893257
K^+	0.00E+00	0.00E+00	0.00E+00	1.18E+01	1.18E+01	0.005344524	0.061857917
La^{+3}	0.00E+00	0.00E+00	0.00E+00	1.25E+00	1.25E+00	0.000570383	0.006601652
Li^+	0.00E+00	0.00E+00	0.00E+00	1.06E+00	1.06E+00	0.000482155	0.005580497
Mg^{+2}	0.00E+00	0.00E+00	0.00E+00	2.55E-01	2.55E-01	0.000115688	0.001338986
Mn^{+3}	0.00E+00	0.00E+00	0.00E+00	2.17E+00	2.17E+00	0.000986765	0.011420888
MnO_4^-	0.00E+00	0.00E+00	0.00E+00		0.00E+00	0	0
Na^+	0.00E+00	0.00E+00	0.00E+00	1.21E+01	1.21E+01	0.005520495	0.063894623
NH_4^+	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0	0
Ni^{+2}	0.00E+00	0.00E+00	0.00E+00	6.99E-01	6.99E-01	0.000317647	0.003676464
NO_2^-	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0	0
NO_3^-	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0	0
O^{-2}				2.08E+03	2.08E+03	0.944142602	10.92757641
OH^-	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0	0
$OH(b)^-$	0.00E+00	0.00E+00	0.00E+00		0.00E+00	0	0
P^{+5}				3.26E+00	3.26E+00	0.001479944	0.017128987
Pb^{+2}	0.00E+00	0.00E+00	0.00E+00	1.50E-01	1.50E-01	6.826E-05	0.000790046
Pd^{+2}	0.00E+00	0.00E+00	0.00E+00	1.55E-02	1.55E-02	7.04456E-06	8.15343E-05
PO_4^{-3}	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0	0
S^{+6}				0.00E+00	0.00E+00	0	0
Si^{+4}				8.12E+00	8.12E+00	0.00369192	0.042730556
SiO_4^{-4}	0.00E+00	0.00E+00	0.00E+00		0.00E+00	0	0
SO_4^{-2}	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0	0
Sr^{+2}	0.00E+00	0.00E+00	0.00E+00	1.25E-01	1.25E-01	5.67528E-05	0.000656861
Ti^{+4}	0.00E+00	0.00E+00	0.00E+00	9.60E+00	9.60E+00	0.004363962	0.050508824
Zn^{+2}	0.00E+00	0.00E+00	0.00E+00	1.85E+00	1.85E+00	0.000842722	0.009753727
Zr^{+4}	0.00E+00	0.00E+00	0.00E+00	1.18E+00	1.18E+00	0.000537938	0.006226134

Rad.	Aqueous Rad. Components			Solids Rad. Components (1)			Total Rad. Components (1)		
Component	Ci/L	Ci/day	Lb/day	Ci/L	Ci/day	Lb/day	Ci/L	Ci/day	Lb/day
Total	0.00E+00	0.00E+00	0.00E+00	3.25E-05	4.40E+03	1.39E+01	3.25E-05	4.40E+03	1.39E+01
^{241}Am	0	0.00E+00	0.00E+00	3.57E-08	4.83E+00	3.11E-03	3.57E-08	4.83E+00	3.11E-03
^{14}C	0.00E+00	0.00E+00	0.00E+00	1.20E-09	1.62E-01	7.99E-05	1.20E-09	1.62E-01	7.99E-05
^{60}Co	0.00E+00	0.00E+00	0.00E+00	3.97E-09	5.37E-01	1.05E-06	3.97E-09	5.37E-01	1.05E-06
^{243}Cm	0.00E+00	0.00E+00	0.00E+00	1.19E-09	1.61E-01	7.02E-06	1.19E-09	1.61E-01	7.02E-06
^{244}Cm	0.00E+00	0.00E+00	0.00E+00	8.91E-10	1.21E-01	3.28E-06	8.91E-10	1.21E-01	3.28E-06
^{137}Cs	0.00E+00	0.00E+00	0.00E+00	2.36E-05	3.20E+03	8.12E-02	2.36E-05	3.20E+03	8.12E-02
^{152}Eu	0.00E+00	0.00E+00	0.00E+00	2.07E-10	2.80E-02	3.55E-07	2.07E-10	2.80E-02	3.55E-07
^{154}Eu	0.00E+00	0.00E+00	0.00E+00	2.07E-08	2.80E+00	2.28E-05	2.07E-08	2.80E+00	2.28E-05
^{155}Eu	0.00E+00	0.00E+00	0.00E+00	1.16E-08	1.57E+00	7.12E-06	1.16E-08	1.57E+00	7.12E-06
^{3}H	0.00E+00	0.00E+00	0.00E+00	3.72E-08	5.03E+00	1.15E-06	3.72E-08	5.03E+00	1.15E-06
^{129}I	0.00E+00	0.00E+00	0.00E+00	3.26E-11	4.41E-03	5.50E-02	3.26E-11	4.41E-03	5.50E-02
^{63}Ni	0.00E+00	0.00E+00	0.00E+00	4.32E-09	5.84E-01	2.27E-05	4.32E-09	5.84E-01	2.27E-05
^{237}Np	0.00E+00	0.00E+00	0.00E+00	2.93E-11	3.97E-03	1.24E-02	2.93E-11	3.97E-03	1.24E-02
^{238}Pu	0.00E+00	0.00E+00	0.00E+00	1.39E-10	1.88E-02	2.42E-06	1.39E-10	1.88E-02	2.42E-06
^{239}Pu	0.00E+00	0.00E+00	0.00E+00	1.23E-09	1.66E-01	5.91E-03	1.23E-09	1.66E-01	5.91E-03
^{240}Pu	0.00E+00	0.00E+00	0.00E+00	6.74E-11	9.12E-03	8.86E-05	6.74E-11	9.12E-03	8.86E-05
^{241}Pu	0.00E+00	0.00E+00	0.00E+00	8.73E-09	1.18E+00	2.53E-05	8.73E-09	1.18E+00	2.53E-05
^{125}Sb	0.00E+00	0.00E+00	0.00E+00	2.60E-08	3.52E+00	7.48E-06	2.60E-08	3.52E+00	7.48E-06
^{151}Sm	0.00E+00	0.00E+00	0.00E+00	4.29E-08	5.80E+00	4.86E-04	4.29E-08	5.80E+00	4.86E-04
^{126}Sn	0.00E+00	0.00E+00	0.00E+00	6.14E-11	8.31E-03	1.61E-03	6.14E-11	8.31E-03	1.61E-03
^{90}Sr	0.00E+00	0.00E+00	0.00E+00	7.99E-06	1.08E+03	1.73E-02	7.99E-06	1.08E+03	1.73E-02
^{99}Tc	0.00E+00	0.00E+00	0.00E+00	6.89E-07	9.32E+01	1.21E+01	6.89E-07	9.32E+01	1.21E+01
^{232}Th	0.00E+00	0.00E+00	0.00E+00	3.18E-13	4.31E-05	8.63E-01	3.18E-13	4.31E-05	8.63E-01
^{233}U	0.00E+00	0.00E+00	0.00E+00	4.91E-13	6.64E-05	1.52E-05	4.91E-13	6.64E-05	1.52E-05
^{234}U	0.00E+00	0.00E+00	0.00E+00	1.37E-12	1.86E-04	6.60E-05	1.37E-12	1.86E-04	6.60E-05
^{235}U	0.00E+00	0.00E+00	0.00E+00	1.02E-13	1.38E-05	1.41E-02	1.02E-13	1.38E-05	1.41E-02
^{236}U	0.00E+00	0.00E+00	0.00E+00	4.94E-14	6.68E-06	2.28E-04	4.94E-14	6.68E-06	2.28E-04
^{238}U	0.00E+00	0.00E+00	0.00E+00	7.87E-13	1.07E-04	6.99E-01	7.87E-13	1.07E-04	6.99E-01

Component	Organic Components				
(CAS)	mol/L	Lb/gal	Lb/day	Mt/day	g/sec
Total	2.45E-07	3.36E-07	1.88E+01	0.008560596	0.099080976
57-14-7	3.51E-08	1.75921E-08	6.29E-01	0.000285725	0.003307003
58-90-2	1.02E-08	1.97425E-08	7.05E-01	0.000320652	0.003711244
58-89-9	3.96E-11	9.6157E-11	3.44E-03	1.56175E-06	1.80758E-05
71-43-2	2.23E-16	1.45306E-16	5.19E-09	2.36002E-12	2.73151E-11
75-05-8	8.91E-09	3.05131E-09	1.09E-01	4.95585E-05	0.000573594
76-44-8	1.13E-12	3.52338E-12	1.26E-04	5.72256E-08	6.62333E-07
79-01-6	6.45E-18	7.07778E-18	2.53E-10	1.14955E-13	1.3305E-12
84-74-2	1.53E-08	3.54439E-08	1.27E+00	0.000575668	0.006662825
84-66-2	1.82E-08	3.36887E-08	1.20E+00	0.000547161	0.006332886
87-86-5	1.64E-08	3.64705E-08	1.30E+00	0.000592342	0.00685581
87-68-3	2.49E-18	5.41447E-18	1.93E-10	8.79402E-14	1.01783E-12
88-85-7	2.57E-08	5.157E-08	1.84E+00	0.000837583	0.009694247
91-20-3	1.38E-12	1.47578E-12	5.27E-05	2.39691E-08	2.7742E-07
98-86-2	1.87E-08	1.87691E-08	6.71E-01	0.000304841	0.003528253
108-95-2	4.55E-08	3.57127E-08	1.28E+00	0.000580034	0.006713359
108-88-3	7.36E-17	5.65512E-17	2.02E-09	9.18487E-13	1.06306E-11
120-82-1	6.61E-14	1.00086E-13	3.58E-06	1.62557E-09	1.88145E-08
122-66-7	0.00E+00	0	0.00E+00	0	0
122-39-4	3.89E-09	5.4963E-09	1.96E-01	8.92691E-05	0.001033208
129-00-0	1.38E-08	2.32598E-08	8.31E-01	0.000377779	0.004372441
132-64-9	2.99E-10	4.20174E-10	1.50E-02	6.82433E-06	7.89853E-05
218-01-9	1.47E-08	2.79726E-08	1.00E+00	0.000454322	0.005258352
309-00-2	5.27E-11	1.60519E-10	5.74E-03	2.6071E-06	3.01748E-05
319-85-7	6.27E-11	1.52226E-10	5.44E-03	2.4724E-06	2.86158E-05
534-52-1	0.00E+00	0	0.00E+00	0	0
603-34-9	1.10E-08	2.24396E-08	8.02E-01	0.000364456	0.004218246
4170-30-3	7.24E-09	4.23475E-09	1.51E-01	6.87795E-05	0.000796059
10061-01-5	5.62E-15	5.20224E-15	1.86E-07	8.44931E-11	9.77929E-10
38380-08-4	3.76E-11	1.13335E-10	4.05E-03	1.84075E-06	2.13049E-05
100-21-0	2.61E-08	3.62323E-08	1.29E+00	0.000588473	0.006811036
106-93-4	6.34E-12	9.9375E-12	3.55E-04	1.61402E-07	1.86807E-06
106-97-8	0.00E+00	0	0.00E+00	0	0
106-99-0	0.00E+00	0	0.00E+00	0	0
108-87-2	0.00E+00	0	0.00E+00	0	0
110-54-3	0.00E+00	0	0.00E+00	0	0
110-82-7	0.00E+00	0	0.00E+00	0	0
111-84-2	0.00E+00	0	0.00E+00	0	0
118-74-1	1.85E-15	4.3928E-15	1.57E-07	7.13464E-11	8.25769E-10
120-12-7	3.97E-09	5.90628E-09	2.11E-01	9.5928E-05	0.001110277
127-18-4	1.85E-19	2.5602E-19	9.15E-12	4.15819E-15	4.81272E-14
1336-36-3	1.32E-10	3.55983E-10	1.27E-02	5.78177E-06	6.69186E-05
144-62-7	4.83E-09	3.63098E-09	1.30E-01	5.89732E-05	0.00068256
208-96-8	1.47E-09	1.86309E-09	6.66E-02	3.02597E-05	0.000350228
50-32-8	2.69E-10	5.66764E-10	2.03E-02	9.2052E-06	0.000106542
56-23-5	7.59E-26	9.74232E-26	3.48E-18	1.58232E-21	1.83139E-20
60-35-5	1.63E-08	8.03133E-09	2.87E-01	0.000130442	0.00150975
60-57-1	5.33E-11	1.69538E-10	6.06E-03	2.75359E-06	3.18703E-05
62-75-9	8.49E-08	5.25122E-08	1.88E+00	0.000852886	0.00987137
75-12-7	9.63E-08	3.61921E-08	1.29E+00	0.00058782	0.006803477
76-15-3	0.00E+00	0	0.00E+00	0	0
8001-35-2	6.32E-11	2.18442E-10	7.81E-03	3.54786E-06	4.10632E-05
88-89-1	2.35E-08	4.49955E-08	1.61E+00	0.000730803	0.008458373
126-73-8	1.65E-08	3.67265E-08	1.31E+00	0.0005965	0.006903933

River Protection Project - Waste Treatment Plant

Stream Number: PJV32
Stream Name: HLW pulse ventilation header offgas
Run Data File: H:\Working Folder 11 (Vishal)\Emissions_Case2_Run4_SubEm\MRQ_03_054_run1_Streams.csv
Run Date / Time: 4/15/2003 - 6:40:10 AM

Stream Properties Variable	Value	Units
Density	1.16E-03	g/cm^3
Enthalpy	-8.56E+05	BTU/hr
Mass Flow	2.32E+04	Lb/hr
	5.57E+05	Lb/day
Volumetric Flow	4.00E+04	GPM
Molar Flow	8.08E+02	Lbmol/hr
Volumetric Flow	5.34E+03	ft^3/min
Molecular Weight	2.87E+01	Lb/Lbmol
Pressure	1.00E+03	mbar
Temperature	2.50E+01	C
Viscosity	1.83E-02	cP
Na Molarity	0.00E+00	mol/L
pH	N/A	pH
Total TRU	6.32E-16	Ci/L
Total Activity	1.21E-13	Ci/L

Gaseous Components (1) Component	mol/L	Lb/day	Mt/day
CO	2.38E-32	3.20E-25	1.45421E-28
CO_2	6.89E-17	1.46E-09	6.62474E-13
H_2O	4.10E-04	3.54E+03	1.610811375
NO	1.94E-37	2.80E-30	1.27195E-33
NO_2	2.32E-37	5.12E-30	2.32576E-33
N_2	3.16E-02	4.25E+05	193.0529455
O_2	8.39E-03	1.29E+05	58.61857611
SO_2	1.84E-38	5.66E-31	2.57271E-34
NH_3	1.39E-15	1.14E-08	5.17226E-12
HNO_3	6.35E-24	1.92E-16	8.73531E-20
HCl	0.00E+00	0.00E+00	0
HF	5.29E-35	5.09E-28	2.31162E-31

(1) All radionuclides in gaseous streams are assumed to exist as solid particulate.

Component	Aqueous Components mol/L	Lb/gal	Lb/day	Solid Components Lb/day	Total Component Lb/day	Solid Components mt/day	Total Component g/sec
Total	0.00E+00	0.00E+00	0.00E+00	1.27E-05	1.27E-05	5.78178E-09	6.69188E-08
Ag^+	0.00E+00	0.00E+00	0.00E+00	1.96E-09	1.96E-09	8.90612E-13	1.0308E-11
Al^{+3}	0.00E+00	0.00E+00	0.00E+00	5.91E-08	5.91E-08	2.68509E-11	3.10775E-10
As^{+3}	0.00E+00	0.00E+00	0.00E+00	8.34E-06	8.34E-06	3.79294E-09	4.38998E-08
B^{+3}	0.00E+00	0.00E+00	0.00E+00	1.94E-08	1.94E-08	8.84081E-12	1.02324E-10
Ba^{+2}	0.00E+00	0.00E+00	0.00E+00	1.20E-08	1.20E-08	5.47158E-12	6.33285E-11
Bi^{+3}	0.00E+00	0.00E+00	0.00E+00	7.62E-09	7.62E-09	3.46568E-12	4.0112E-11
$C_2O_4^{-2}$	0.00E+00	0.00E+00	0.00E+00	1.25E-07	1.25E-07	5.68014E-11	6.57424E-10
Ca^{+2}	0.00E+00	0.00E+00	0.00E+00	2.51E-08	2.51E-08	1.13972E-11	1.31912E-10
Cd^{+2}	0.00E+00	0.00E+00	0.00E+00	3.00E-08	3.00E-08	1.36417E-11	1.5789E-10
Ce^{+3}	0.00E+00	0.00E+00	0.00E+00	2.39E-09	2.39E-09	1.08542E-12	1.25628E-11
Cl^-	0.00E+00	0.00E+00	0.00E+00	2.31E-08	2.31E-08	1.0514E-11	1.2169E-10
CO_3^{-2}	0.00E+00	0.00E+00	0.00E+00	9.71E-08	9.71E-08	4.41312E-11	5.10778E-10
Cr^{+3}	0.00E+00	0.00E+00	0.00E+00	5.17E-09	5.17E-09	2.3502E-12	2.72013E-11
Cu^{+2}	0.00E+00	0.00E+00	0.00E+00	1.25E-09	1.25E-09	5.67859E-13	6.57244E-12
F^-	0.00E+00	0.00E+00	0.00E+00	6.28E-08	6.28E-08	2.85327E-11	3.30239E-10
Fe^{+3}	0.00E+00	0.00E+00	0.00E+00	7.45E-08	7.45E-08	3.38685E-11	3.91996E-10
H^+	0.00E+00	0.00E+00	0.00E+00		0.00E+00	0	0
H_2O	0.00E+00	0.00E+00	0.00E+00		0.00E+00	0	0
Hg^{+2}	0.00E+00	0.00E+00	0.00E+00	6.38E-08	6.38E-08	2.90216E-11	3.35898E-10
K^+	0.00E+00	0.00E+00	0.00E+00	3.85E-08	3.85E-08	1.74908E-11	2.02439E-10
La^{+3}	0.00E+00	0.00E+00	0.00E+00	7.80E-09	7.80E-09	3.54514E-12	4.10317E-11
Li^+	0.00E+00	0.00E+00	0.00E+00	1.85E-09	1.85E-09	8.42419E-13	9.75022E-12
Mg^{+2}	0.00E+00	0.00E+00	0.00E+00	5.40E-09	5.40E-09	2.45478E-12	2.84118E-11
Mn^{+3}	0.00E+00	0.00E+00	0.00E+00	1.89E-08	1.89E-08	8.60187E-12	9.95587E-11
MnO_4^-	0.00E+00	0.00E+00	0.00E+00		0.00E+00	0	0
Na^+	0.00E+00	0.00E+00	0.00E+00	1.37E-07	1.37E-07	6.21175E-11	7.18953E-10
NH_4^+	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0	0
Ni^{+2}	0.00E+00	0.00E+00	0.00E+00	7.08E-09	7.08E-09	3.21801E-12	3.72455E-11
NO_2^-	0.00E+00	0.00E+00	0.00E+00	3.92E-08	3.92E-08	1.7801E-11	2.0603E-10
NO_3^-	0.00E+00	0.00E+00	0.00E+00	2.70E-07	2.70E-07	1.22889E-10	1.42233E-09
O^{-2}				2.73E-06	2.73E-06	1.24132E-09	1.43672E-08
OH^-	0.00E+00	0.00E+00	0.00E+00	3.39E-07	3.39E-07	1.5387E-10	1.7809E-09
$OH(b)^-$	0.00E+00	0.00E+00	0.00E+00		0.00E+00	0	0
P^{+5}				2.00E-15	2.00E-15	9.11092E-19	1.0545E-17
Pb^{+2}	0.00E+00	0.00E+00	0.00E+00	3.19E-09	3.19E-09	1.45102E-12	1.67942E-11
Pd^{+2}	0.00E+00	0.00E+00	0.00E+00	3.29E-10	3.29E-10	1.4946E-13	1.72987E-12
PO_4^{-3}	0.00E+00	0.00E+00	0.00E+00	3.99E-08	3.99E-08	1.81512E-11	2.10083E-10
S^{+6}				2.72E-15	2.72E-15	1.23846E-18	1.4334E-17
Si^{+4}				5.58E-08	5.58E-08	2.53552E-11	2.93463E-10
SiO_4^{-4}	0.00E+00	0.00E+00	0.00E+00		0.00E+00	0	0
SO_4^{-2}	0.00E+00	0.00E+00	0.00E+00	1.30E-08	1.30E-08	5.90777E-12	6.8377E-11
Sr^{+2}	0.00E+00	0.00E+00	0.00E+00	1.40E-09	1.40E-09	6.36563E-13	7.36763E-12
Ti^{+4}	0.00E+00	0.00E+00	0.00E+00	1.59E-08	1.59E-08	7.21334E-12	8.34877E-11
Zn^{+2}	0.00E+00	0.00E+00	0.00E+00	3.51E-09	3.51E-09	1.59516E-12	1.84625E-11
Zr^{+4}	0.00E+00	0.00E+00	0.00E+00	3.69E-08	3.69E-08	1.67929E-11	1.94363E-10

Rad.	Aqueous Rad. Components			Solids Rad. Components (1)			Total Rad. Components (1)		
Component	Ci/L	Ci/day	Lb/day	Ci/L	Ci/day	Lb/day	Ci/L	Ci/day	Lb/day
Total	0.00E+00	0.00E+00	0.00E+00	1.21E-13	2.63E-05	5.32E-08	1.21E-13	2.63E-05	5.32E-08
^{241}Am	0	0.00E+00	0.00E+00	4.70E-16	1.02E-07	6.59E-11	4.70E-16	1.02E-07	6.59E-11
^{14}C	0.00E+00	0.00E+00	0.00E+00	7.43E-20	1.62E-11	7.99E-15	7.43E-20	1.62E-11	7.99E-15
^{60}Co	0.00E+00	0.00E+00	0.00E+00	5.23E-17	1.14E-08	2.22E-14	5.23E-17	1.14E-08	2.22E-14
^{243}Cm	0.00E+00	0.00E+00	0.00E+00	1.57E-17	3.41E-09	1.49E-13	1.57E-17	3.41E-09	1.49E-13
^{244}Cm	0.00E+00	0.00E+00	0.00E+00	1.17E-17	2.56E-09	6.97E-14	1.17E-17	2.56E-09	6.97E-14
^{137}Cs	0.00E+00	0.00E+00	0.00E+00	6.25E-14	1.36E-05	3.46E-10	6.25E-14	1.36E-05	3.46E-10
^{152}Eu	0.00E+00	0.00E+00	0.00E+00	2.73E-18	5.94E-10	7.54E-15	2.73E-18	5.94E-10	7.54E-15
^{154}Eu	0.00E+00	0.00E+00	0.00E+00	2.72E-16	5.93E-08	4.84E-13	2.72E-16	5.93E-08	4.84E-13
^{155}Eu	0.00E+00	0.00E+00	0.00E+00	1.53E-16	3.33E-08	1.51E-13	1.53E-16	3.33E-08	1.51E-13
^{3}H	0.00E+00	0.00E+00	0.00E+00	2.76E-17	6.01E-09	1.38E-15	2.76E-17	6.01E-09	1.38E-15
^{129}I	0.00E+00	0.00E+00	0.00E+00	6.32E-21	1.38E-12	1.72E-11	6.32E-21	1.38E-12	1.72E-11
^{63}Ni	0.00E+00	0.00E+00	0.00E+00	2.71E-17	5.91E-09	2.29E-13	2.71E-17	5.91E-09	2.29E-13
^{237}Np	0.00E+00	0.00E+00	0.00E+00	3.86E-19	8.42E-11	2.63E-10	3.86E-19	8.42E-11	2.63E-10
^{238}Pu	0.00E+00	0.00E+00	0.00E+00	1.83E-18	3.98E-10	5.13E-14	1.83E-18	3.98E-10	5.13E-14
^{239}Pu	0.00E+00	0.00E+00	0.00E+00	1.62E-17	3.53E-09	1.25E-10	1.62E-17	3.53E-09	1.25E-10
^{240}Pu	0.00E+00	0.00E+00	0.00E+00	8.88E-19	1.94E-10	1.88E-12	8.88E-19	1.94E-10	1.88E-12
^{241}Pu	0.00E+00	0.00E+00	0.00E+00	1.15E-16	2.50E-08	5.36E-13	1.15E-16	2.50E-08	5.36E-13
^{125}Sb	0.00E+00	0.00E+00	0.00E+00	1.82E-16	3.96E-08	8.41E-14	1.82E-16	3.96E-08	8.41E-14
^{151}Sm	0.00E+00	0.00E+00	0.00E+00	5.65E-16	1.23E-07	1.03E-11	5.65E-16	1.23E-07	1.03E-11
^{126}Sn	0.00E+00	0.00E+00	0.00E+00	8.09E-19	1.76E-10	3.42E-11	8.09E-19	1.76E-10	3.42E-11
^{90}Sr	0.00E+00	0.00E+00	0.00E+00	5.57E-14	1.21E-05	1.94E-10	5.57E-14	1.21E-05	1.94E-10
^{99}Tc	0.00E+00	0.00E+00	0.00E+00	6.59E-16	1.43E-07	1.87E-08	6.59E-16	1.43E-07	1.87E-08
^{232}Th	0.00E+00	0.00E+00	0.00E+00	4.19E-21	9.13E-13	1.83E-08	4.19E-21	9.13E-13	1.83E-08
^{233}U	0.00E+00	0.00E+00	0.00E+00	6.46E-21	1.41E-12	3.22E-13	6.46E-21	1.41E-12	3.22E-13
^{234}U	0.00E+00	0.00E+00	0.00E+00	1.81E-20	3.95E-12	1.40E-12	1.81E-20	3.95E-12	1.40E-12
^{235}U	0.00E+00	0.00E+00	0.00E+00	1.34E-21	2.93E-13	2.99E-10	1.34E-21	2.93E-13	2.99E-10
^{236}U	0.00E+00	0.00E+00	0.00E+00	6.51E-22	1.42E-13	4.83E-12	6.51E-22	1.42E-13	4.83E-12
^{238}U	0.00E+00	0.00E+00	0.00E+00	1.04E-20	2.26E-12	1.48E-08	1.04E-20	2.26E-12	1.48E-08

Component	Organic Components				
(CAS)	mol/L	Lb/gal	Lb/day	Mt/day	g/sec
Total	6.95E-17	1.28E-16	1.01E-08	4.60847E-12	5.33388E-11
57-14-7	2.40E-18	1.20428E-18	6.93E-11	3.15085E-14	3.64681E-13
58-90-2	6.98E-19	1.35051E-18	7.77E-11	3.53344E-14	4.08963E-13
58-89-9	3.27E-20	7.94477E-20	4.57E-12	2.07864E-15	2.40583E-14
71-43-2	3.22E-26	2.10027E-26	1.21E-18	5.49508E-22	6.36005E-21
75-05-8	6.12E-19	2.09804E-19	1.21E-11	5.48924E-15	6.35328E-14
76-44-8	8.18E-23	2.5484E-22	1.47E-14	6.66756E-18	7.71708E-17
79-01-6	1.31E-27	1.44185E-27	8.30E-20	3.7724E-23	4.3662E-22
84-74-2	1.26E-17	2.92197E-17	1.68E-09	7.64493E-13	8.8483E-12
84-66-2	1.24E-18	2.30072E-18	1.32E-10	6.01951E-14	6.96703E-13
87-86-5	1.12E-18	2.4904E-18	1.43E-10	6.51579E-14	7.54143E-13
87-68-3	5.21E-28	1.13471E-27	6.53E-20	2.96882E-23	3.43613E-22
88-85-7	2.12E-17	4.24756E-17	2.44E-09	1.11132E-12	1.28625E-11
91-20-3	1.03E-22	1.09704E-22	6.31E-15	2.87026E-18	3.32206E-17
98-86-2	1.28E-18	1.28432E-18	7.39E-11	3.36025E-14	3.88918E-13
108-95-2	3.11E-18	2.43881E-18	1.40E-10	6.3808E-14	7.38519E-13
108-88-3	1.17E-26	9.02754E-27	5.20E-19	2.36193E-22	2.73372E-21
120-82-1	5.80E-24	8.78998E-24	5.06E-16	2.29978E-19	2.66178E-18
122-66-7	0.00E+00	0	0.00E+00	0	0
122-39-4	2.66E-19	3.75571E-19	2.16E-11	9.8263E-15	1.1373E-13
129-00-0	1.14E-17	1.93051E-17	1.11E-09	5.05092E-13	5.84597E-12
132-64-9	2.13E-20	2.99231E-20	1.72E-12	7.82896E-16	9.0613E-15
218-01-9	1.21E-17	2.31131E-17	1.33E-09	6.04723E-13	6.99911E-12
309-00-2	4.47E-20	1.3608E-19	7.83E-12	3.56034E-15	4.12076E-14
319-85-7	5.17E-20	1.2538E-19	7.22E-12	3.28039E-15	3.79674E-14
534-52-1	0.00E+00	0	0.00E+00	0	0
603-34-9	7.49E-19	1.53396E-18	8.83E-11	4.01339E-14	4.64512E-13
4170-30-3	4.95E-19	2.89734E-19	1.67E-11	7.58049E-15	8.77372E-14
10061-01-5	5.93E-25	5.4935E-25	3.16E-17	1.4373E-20	1.66354E-19
38380-08-4	3.11E-20	9.36798E-20	5.39E-12	2.451E-15	2.83681E-14
100-21-0	1.78E-18	2.47412E-18	1.42E-10	6.47321E-14	7.49214E-13
106-93-4	4.91E-22	7.69733E-22	4.43E-14	2.0139E-17	2.33091E-16
106-97-8	0.00E+00	0	0.00E+00	0	0
106-99-0	1.54E-31	6.97182E-32	4.01E-24	1.82408E-27	2.11121E-26
108-87-2	0.00E+00	0	0.00E+00	0	0
110-54-3	0.00E+00	0	0.00E+00	0	0
110-82-7	5.85E-40	4.11008E-40	2.37E-32	1.07535E-35	1.24462E-34
111-84-2	0.00E+00	0	0.00E+00	0	0
118-74-1	1.69E-25	4.02482E-25	2.32E-17	1.05304E-20	1.2188E-19
120-12-7	2.74E-19	4.07823E-19	2.35E-11	1.06701E-14	1.23497E-13
127-18-4	5.91E-29	8.17805E-29	4.71E-21	2.13968E-24	2.47648E-23
1336-36-3	1.41E-19	3.7891E-19	2.18E-11	9.91367E-15	1.14742E-13
144-62-7	3.30E-19	2.47942E-19	1.43E-11	6.48705E-15	7.50816E-14
208-96-8	1.02E-19	1.30128E-19	7.49E-12	3.40463E-15	3.94055E-14
50-32-8	2.22E-19	4.66816E-19	2.69E-11	1.22136E-14	1.41361E-13
56-23-5	7.07E-30	9.08211E-30	5.23E-22	2.37621E-25	2.75024E-24
60-35-5	1.11E-18	5.48421E-19	3.16E-11	1.43487E-14	1.66073E-13
60-57-1	4.42E-20	1.40528E-19	8.09E-12	3.67673E-15	4.25548E-14
62-75-9	5.80E-18	3.58711E-18	2.06E-10	9.38518E-14	1.08625E-12
75-12-7	6.57E-18	2.47138E-18	1.42E-10	6.46603E-14	7.48383E-13
76-15-3	0.00E+00	0	0.00E+00	0	0
8001-35-2	5.23E-20	1.80586E-19	1.04E-11	4.72479E-15	5.46851E-14
88-89-1	1.94E-17	3.70493E-17	2.13E-09	9.69346E-13	1.12193E-11
126-73-8	1.13E-18	2.50794E-18	1.44E-10	6.5617E-14	7.59456E-13

River Protection Project - Waste Treatment Plant

Stream Number: PVP12
Stream Name: Carbon bed adsorber discharge
Run Data File: H:\Working Folder 11 (Vishal)\Emissions_Case2_Run4_SubEm\MRQ_03_054_run1_Streams.csv
Run Date / Time: 4/15/2003 - 6:40:10 AM

Stream Properties Variable	Value	Units
Density	1.10E-03	g/cm^3
Enthalpy	-1.25E+06	BTU/hr
Mass Flow	1.12E+04	Lb/hr
	2.69E+05	Lb/day
Volumetric Flow	2.02E+04	GPM
Molar Flow	3.93E+02	Lbmol/hr
Volumetric Flow	2.70E+03	ft^3/min
Molecular Weight	2.85E+01	Lb/Lbmol
Pressure	1.00E+03	mbar
Temperature	3.73E+01	C
Viscosity	1.88E-02	cP
Na Molarity	0.00E+00	mol/L
pH	N/A	pH
Total TRU	3.15E-19	Ci/L
Total Activity	2.39E-09	Ci/L

Gaseous Components (1) Component	mol/L	Lb/day	Mt/day
CO	5.83E-28	3.97E-21	1.80462E-24
CO_2	1.39E-07	1.49E+00	0.00067671
H_2O	1.24E-03	5.43E+03	2.469914038
NO	4.16E-33	3.04E-26	1.38037E-29
NO_2	1.81E-23	2.02E-16	9.20176E-20
N_2	2.96E-02	2.02E+05	91.76572806
O_2	7.88E-03	6.13E+04	27.85029503
SO_2	9.68E-29	1.51E-21	6.85088E-25
NH_3	2.44E-08	1.01E-01	4.5955E-05
HNO_3	5.46E-10	8.37E-03	3.80448E-06
HCl	7.17E-32	6.36E-25	2.88946E-28
HF	5.67E-32	2.76E-25	1.25383E-28

(1) All radionuclides in gaseous streams are assumed to exist as solid particulate.

Component	Aqueous Components mol/L	Lb/gal	Lb/day	Solid Components Lb/day	Total Component Lb/day	Solid Components mt/day	Total Component g/sec
Total	0.00E+00	0.00E+00	0.00E+00	2.65E-04	2.65E-04	1.20611E-07	1.39596E-06
Ag^{+}	0.00E+00	0.00E+00	0.00E+00	9.74E-13	9.74E-13	4.42849E-16	5.12557E-15
Al^{+3}	0.00E+00	0.00E+00	0.00E+00	2.02E-10	2.02E-10	9.18774E-14	1.0634E-12
As^{+3}	0.00E+00	0.00E+00	0.00E+00	2.55E-10	2.55E-10	1.16004E-13	1.34264E-12
B^{+3}	0.00E+00	0.00E+00	0.00E+00	7.30E-12	7.30E-12	3.31772E-15	3.83995E-14
Ba^{+2}	0.00E+00	0.00E+00	0.00E+00	4.87E-12	4.87E-12	2.21539E-15	2.5641E-14
Bi^{+3}	0.00E+00	0.00E+00	0.00E+00	2.69E-12	2.69E-12	1.22311E-15	1.41564E-14
$C_2O_4^{-2}$	0.00E+00	0.00E+00	0.00E+00	2.75E-12	2.75E-12	1.2502E-15	1.44699E-14
Ca^{+2}	0.00E+00	0.00E+00	0.00E+00	6.91E-10	6.91E-10	3.14193E-13	3.63649E-12
Cd^{+2}	0.00E+00	0.00E+00	0.00E+00	1.36E-11	1.36E-11	6.16083E-15	7.13059E-14
Ce^{+3}	0.00E+00	0.00E+00	0.00E+00	4.32E-12	4.32E-12	1.96561E-15	2.27501E-14
Cl^{-}	0.00E+00	0.00E+00	0.00E+00	4.36E-11	4.36E-11	1.98358E-14	2.29581E-13
CO_3^{-2}	0.00E+00	0.00E+00	0.00E+00	4.61E-10	4.61E-10	2.09565E-13	2.42552E-12
Cr^{+3}	0.00E+00	0.00E+00	0.00E+00	2.37E-11	2.37E-11	1.07578E-14	1.24511E-13
Cu^{+2}	0.00E+00	0.00E+00	0.00E+00	9.24E-13	9.24E-13	4.19846E-16	4.85933E-15
F^{-}	0.00E+00	0.00E+00	0.00E+00	5.04E-11	5.04E-11	2.29221E-14	2.65303E-13
Fe^{+3}	0.00E+00	0.00E+00	0.00E+00	4.79E-11	4.79E-11	2.1787E-14	2.52165E-13
H^{+}	0.00E+00	0.00E+00	0.00E+00		0.00E+00	0	0
H_2O	0.00E+00	0.00E+00	0.00E+00		0.00E+00	0	0
Hg^{+2}	0.00E+00	0.00E+00	0.00E+00	2.65E-04	2.65E-04	1.20609E-07	1.39594E-06
K^{+}	0.00E+00	0.00E+00	0.00E+00	1.78E-10	1.78E-10	8.11116E-14	9.38791E-13
La^{+3}	0.00E+00	0.00E+00	0.00E+00	2.71E-12	2.71E-12	1.23223E-15	1.4262E-14
Li^{+}	0.00E+00	0.00E+00	0.00E+00	1.05E-12	1.05E-12	4.77257E-16	5.52381E-15
Mg^{+2}	0.00E+00	0.00E+00	0.00E+00	2.61E-11	2.61E-11	1.18803E-14	1.37504E-13
Mn^{+3}	0.00E+00	0.00E+00	0.00E+00	1.45E-11	1.45E-11	6.58744E-15	7.62435E-14
MnO_4^{-}	0.00E+00	0.00E+00	0.00E+00		0.00E+00	0	0
Na^{+}	0.00E+00	0.00E+00	0.00E+00	6.96E-10	6.96E-10	3.1654E-13	3.66366E-12
NH_4^{+}	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0	0
Ni^{+2}	0.00E+00	0.00E+00	0.00E+00	5.52E-12	5.52E-12	2.50873E-15	2.90362E-14
NO_2^{-}	0.00E+00	0.00E+00	0.00E+00	2.06E-10	2.06E-10	9.3574E-14	1.08303E-12
NO_3^{-}	0.00E+00	0.00E+00	0.00E+00	1.10E-09	1.10E-09	4.99572E-13	5.78209E-12
O^{-2}				1.03E-10	1.03E-10	4.69001E-14	5.42825E-13
OH^{-}	0.00E+00	0.00E+00	0.00E+00	8.22E-10	8.22E-10	3.73659E-13	4.32476E-12
$OH(b)^{-}$	0.00E+00	0.00E+00	0.00E+00		0.00E+00	0	0
P^{+5}				9.14E-17	9.14E-17	4.15479E-20	4.80878E-19
Pb^{+2}	0.00E+00	0.00E+00	0.00E+00	3.83E-12	3.83E-12	1.73891E-15	2.01263E-14
Pd^{+2}	0.00E+00	0.00E+00	0.00E+00	1.01E-13	1.01E-13	4.58673E-17	5.30871E-16
PO_4^{-3}	0.00E+00	0.00E+00	0.00E+00	2.07E-10	2.07E-10	9.38655E-14	1.08641E-12
S^{+6}				2.05E-13	2.05E-13	9.31857E-17	1.07854E-15
Si^{+4}				3.72E-11	3.72E-11	1.69299E-14	1.95948E-13
SiO_4^{-4}	0.00E+00	0.00E+00	0.00E+00		0.00E+00	0	0
SO_4^{-2}	0.00E+00	0.00E+00	0.00E+00	8.43E-11	8.43E-11	3.83254E-14	4.43581E-13
Sr^{+2}	0.00E+00	0.00E+00	0.00E+00	4.18E-13	4.18E-13	1.90004E-16	2.19912E-15
Ti^{+4}	0.00E+00	0.00E+00	0.00E+00	5.70E-12	5.70E-12	2.59047E-15	2.99823E-14
Zn^{+2}	0.00E+00	0.00E+00	0.00E+00	2.01E-12	2.01E-12	9.14137E-16	1.05803E-14
Zr^{+4}	0.00E+00	0.00E+00	0.00E+00	1.59E-11	1.59E-11	7.22523E-15	8.36253E-14

Rad.	Aqueous Rad. Components			Solids Rad. Components (1)			Total Rad. Components (1)		
Component	Ci/L	Ci/day	Lb/day	Ci/L	Ci/day	Lb/day	Ci/L	Ci/day	Lb/day
Total	0.00E+00	0.00E+00	0.00E+00	2.39E-09	2.63E-01	8.87E-07	2.39E-09	2.63E-01	8.87E-07
^{241}Am	0	0.00E+00	0.00E+00	2.30E-19	2.54E-11	1.63E-14	2.30E-19	2.54E-11	1.63E-14
^{14}C	0.00E+00	0.00E+00	0.00E+00	1.25E-13	1.38E-05	6.81E-09	1.25E-13	1.38E-05	6.81E-09
^{60}Co	0.00E+00	0.00E+00	0.00E+00	3.79E-20	4.18E-12	8.14E-18	3.79E-20	4.18E-12	8.14E-18
^{243}Cm	0.00E+00	0.00E+00	0.00E+00	1.10E-20	1.21E-12	5.28E-17	1.10E-20	1.21E-12	5.28E-17
^{244}Cm	0.00E+00	0.00E+00	0.00E+00	8.24E-21	9.08E-13	2.47E-17	8.24E-21	9.08E-13	2.47E-17
^{137}Cs	0.00E+00	0.00E+00	0.00E+00	4.11E-17	4.53E-09	1.15E-13	4.11E-17	4.53E-09	1.15E-13
^{152}Eu	0.00E+00	0.00E+00	0.00E+00	4.44E-21	4.90E-13	6.22E-18	4.44E-21	4.90E-13	6.22E-18
^{154}Eu	0.00E+00	0.00E+00	0.00E+00	1.43E-19	1.58E-11	1.29E-16	1.43E-19	1.58E-11	1.29E-16
^{155}Eu	0.00E+00	0.00E+00	0.00E+00	9.23E-20	1.02E-11	4.62E-17	9.23E-20	1.02E-11	4.62E-17
^{3}H	0.00E+00	0.00E+00	0.00E+00	2.39E-09	2.63E-01	6.04E-08	2.39E-09	2.63E-01	6.04E-08
^{129}I	0.00E+00	0.00E+00	0.00E+00	5.96E-16	6.57E-08	8.20E-07	5.96E-16	6.57E-08	8.20E-07
^{63}Ni	0.00E+00	0.00E+00	0.00E+00	1.83E-20	2.01E-12	7.82E-17	1.83E-20	2.01E-12	7.82E-17
^{237}Np	0.00E+00	0.00E+00	0.00E+00	2.74E-22	3.02E-14	9.44E-14	2.74E-22	3.02E-14	9.44E-14
^{238}Pu	0.00E+00	0.00E+00	0.00E+00	8.97E-22	9.89E-14	1.27E-17	8.97E-22	9.89E-14	1.27E-17
^{239}Pu	0.00E+00	0.00E+00	0.00E+00	7.96E-21	8.78E-13	3.12E-14	7.96E-21	8.78E-13	3.12E-14
^{240}Pu	0.00E+00	0.00E+00	0.00E+00	4.44E-22	4.89E-14	4.75E-16	4.44E-22	4.89E-14	4.75E-16
^{241}Pu	0.00E+00	0.00E+00	0.00E+00	5.63E-20	6.21E-12	1.33E-16	5.63E-20	6.21E-12	1.33E-16
^{125}Sb	0.00E+00	0.00E+00	0.00E+00	1.32E-19	1.45E-11	3.08E-17	1.32E-19	1.45E-11	3.08E-17
^{151}Sm	0.00E+00	0.00E+00	0.00E+00	8.66E-19	9.55E-11	8.00E-15	8.66E-19	9.55E-11	8.00E-15
^{126}Sn	0.00E+00	0.00E+00	0.00E+00	7.54E-22	8.31E-14	1.61E-14	7.54E-22	8.31E-14	1.61E-14
^{90}Sr	0.00E+00	0.00E+00	0.00E+00	2.76E-17	3.04E-09	4.86E-14	2.76E-17	3.04E-09	4.86E-14
^{99}Tc	0.00E+00	0.00E+00	0.00E+00	1.04E-19	1.15E-11	1.49E-12	1.04E-19	1.15E-11	1.49E-12
^{232}Th	0.00E+00	0.00E+00	0.00E+00	4.80E-24	5.29E-16	1.06E-11	4.80E-24	5.29E-16	1.06E-11
^{233}U	0.00E+00	0.00E+00	0.00E+00	3.90E-23	4.30E-15	9.85E-16	3.90E-23	4.30E-15	9.85E-16
^{234}U	0.00E+00	0.00E+00	0.00E+00	3.28E-23	3.61E-15	1.28E-15	3.28E-23	3.61E-15	1.28E-15
^{235}U	0.00E+00	0.00E+00	0.00E+00	1.72E-24	1.89E-16	1.93E-13	1.72E-24	1.89E-16	1.93E-13
^{236}U	0.00E+00	0.00E+00	0.00E+00	2.78E-24	3.06E-16	1.04E-14	2.78E-24	3.06E-16	1.04E-14
^{238}U	0.00E+00	0.00E+00	0.00E+00	2.22E-23	2.45E-15	1.61E-11	2.22E-23	2.45E-15	1.61E-11

Component	Organic Components				
(CAS)	mol/L	Lb/gal	Lb/day	Mt/day	g/sec
Total	2.99E-09	3.60E-09	2.69E+00	0.001221257	0.01413492
57-14-7	6.37E-12	3.19699E-12	9.31E-05	4.23276E-08	4.89903E-07
58-90-2	3.68E-10	7.12351E-10	2.07E-02	9.43142E-06	0.00010916
58-89-9	1.07E-21	2.59207E-21	7.55E-14	3.43186E-17	3.97206E-16
71-43-2	7.70E-10	5.01632E-10	1.46E-02	6.64153E-06	7.68696E-05
75-05-8	6.86E-11	2.35079E-11	6.85E-04	3.11241E-07	3.60233E-06
76-44-8	4.22E-11	1.31528E-10	3.83E-03	1.74142E-06	2.01553E-05
79-01-6	4.57E-12	5.01436E-12	1.46E-04	6.63894E-08	7.68395E-07
84-74-2	4.57E-22	1.06047E-21	3.09E-14	1.40404E-17	1.62505E-16
84-66-2	2.79E-14	5.17843E-14	1.51E-06	6.85616E-10	7.93537E-09
87-86-5	3.78E-13	8.40661E-13	2.45E-05	1.11302E-08	1.28822E-07
87-68-3	9.24E-11	2.0098E-10	5.85E-03	2.66095E-06	3.0798E-05
88-85-7	6.04E-20	1.2106E-19	3.53E-12	1.60282E-15	1.85511E-14
91-20-3	3.34E-12	3.57381E-12	1.04E-04	4.73167E-08	5.47647E-07
98-86-2	1.36E-10	1.36451E-10	3.97E-03	1.80659E-06	2.09096E-05
108-95-2	5.01E-12	3.93739E-12	1.15E-04	5.21304E-08	6.03361E-07
108-88-3	6.54E-12	5.02578E-12	1.46E-04	6.65405E-08	7.70145E-07
120-82-1	6.60E-11	1.00007E-10	2.91E-03	1.32408E-06	1.5325E-05
122-66-7	0.00E+00	0	0.00E+00	0	0
122-39-4	6.49E-12	9.17046E-12	2.67E-04	1.21415E-07	1.40527E-06
129-00-0	9.35E-19	1.5779E-18	4.60E-11	2.08911E-14	2.41795E-13
132-64-9	8.29E-10	1.16362E-09	3.39E-02	1.54061E-05	0.000178312
218-01-9	3.97E-19	7.57053E-19	2.21E-11	1.00233E-14	1.1601E-13
309-00-2	1.02E-19	3.11038E-19	9.06E-12	4.1181E-15	4.76632E-14
319-85-7	1.49E-22	3.6216E-22	1.05E-14	4.79494E-18	5.5497E-17
534-52-1	0.00E+00	0	0.00E+00	0	0
603-34-9	4.54E-11	9.28926E-11	2.71E-03	1.22988E-06	1.42348E-05
4170-30-3	9.70E-13	5.67455E-13	1.65E-05	7.51301E-09	8.69562E-08
10061-01-5	5.44E-10	5.03525E-10	1.47E-02	6.66659E-06	7.71596E-05
38380-08-4	1.15E-21	3.45538E-21	1.01E-13	4.57486E-17	5.29498E-16
100-21-0	1.43E-16	1.98732E-16	5.79E-09	2.63118E-12	3.04535E-11
106-93-4	1.42E-08	2.22638E-08	6.48E-01	0.00029477	0.003411684
106-97-8	1.04E-11	5.02978E-12	1.47E-04	6.65936E-08	7.70759E-07
106-99-0	1.11E-11	5.02975E-12	1.47E-04	6.65931E-08	7.70754E-07
108-87-2	6.12E-12	5.01369E-12	1.46E-04	6.63805E-08	7.68292E-07
110-54-3	6.99E-12	5.0257E-12	1.46E-04	6.65395E-08	7.70133E-07
110-82-7	7.15E-12	5.02122E-12	1.46E-04	6.64802E-08	7.69446E-07
111-84-2	2.35E-12	2.51628E-12	7.33E-05	3.33152E-08	3.85593E-07
118-74-1	1.22E-11	2.89168E-11	8.42E-04	3.82854E-07	4.43119E-06
120-12-7	1.43E-11	2.12067E-11	6.18E-04	2.80773E-07	3.24969E-06
127-18-4	3.64E-09	5.03659E-09	1.47E-01	6.66837E-05	0.000771802
1336-36-3	6.45E-18	1.73428E-17	5.05E-10	2.29615E-13	2.65759E-12
144-62-7	6.87E-16	5.15933E-16	1.50E-08	6.83087E-12	7.9061E-11
208-96-8	7.44E-10	9.4451E-10	2.75E-02	1.25052E-05	0.000144736
50-32-8	6.58E-22	1.38444E-21	4.03E-14	1.83297E-17	2.1215E-16
56-23-5	7.86E-09	1.0088E-08	2.94E-01	0.000133563	0.00154587
60-35-5	1.45E-15	7.14165E-16	2.08E-08	9.45543E-12	1.09438E-10
60-57-1	2.96E-21	9.41994E-21	2.74E-13	1.24719E-16	1.4435E-15
62-75-9	1.87E-12	1.15527E-12	3.37E-05	1.52956E-08	1.77033E-07
75-12-7	2.21E-15	8.29107E-16	2.41E-08	1.09772E-11	1.27051E-10
76-15-3	3.90E-08	5.02314E-08	1.46E+00	0.000665055	0.0076974
8001-35-2	2.01E-21	6.93954E-21	2.02E-13	9.18784E-17	1.06341E-15
88-89-1	3.54E-26	6.76708E-26	1.97E-18	8.95951E-22	1.03698E-20
126-73-8	7.07E-15	1.57135E-14	4.58E-07	2.08044E-10	2.40792E-09

River Protection Project - Waste Treatment Plant

Stream Number: PJV11
Stream Name: HEPA discharge
Run Data File: H:\Working Folder 11 (Vishal)\Emissions_Case2_Run4_SubEm\MRQ_03_054_run1_Streams.csv
Run Date / Time: 4/15/2003 - 6:40:10 AM

Stream Properties Variable	Value	Units
Density	1.15E-03	g/cm^3
Enthalpy	-8.44E+06	BTU/hr
Mass Flow	1.66E+05	Lb/hr
	3.99E+06	Lb/day
Volumetric Flow	2.88E+05	GPM
Molar Flow	5.79E+03	Lbmol/hr
Volumetric Flow	3.85E+04	ft^3/min
Molecular Weight	2.87E+01	Lb/Lbmol
Pressure	1.00E+03	mbar
Temperature	2.67E+01	C
Viscosity	1.84E-02	cP
Na Molarity	0.00E+00	mol/L
pH	N/A	pH
Total TRU	4.97E-17	Ci/L
Total Activity	6.01E-13	Ci/L

Gaseous Components (1) Component	mol/L	Lb/day	Mt/day
CO	1.09E-27	1.06E-19	4.81932E-23
CO_2	4.92E-13	7.50E-05	3.40721E-08
H_2O	5.69E-04	3.55E+04	16.13505687
NO	1.02E-32	1.06E-24	4.82498E-28
NO_2	2.81E-34	4.47E-26	2.03382E-29
N_2	3.13E-02	3.03E+06	1378.323747
O_2	8.31E-03	9.21E+05	418.5140782
SO_2	1.15E-30	2.54E-22	1.1559E-25
NH_3	4.34E-11	2.56E-03	1.16457E-06
HNO_3	2.15E-11	4.68E-03	2.12861E-06
HCl	2.77E-40	3.50E-32	1.59158E-35
HF	3.20E-59	2.21E-51	1.00665E-54

(1) All radionuclides in gaseous streams are assumed to exist as solid particulate.

Component	Aqueous Components mol/L	Lb/gal	Lb/day	Solid Components Lb/day	Total Component Lb/day	Solid Components mt/day	Total Component g/sec
Total	0.00E+00	0.00E+00	0.00E+00	3.66E-03	3.66E-03	1.6654E-06	1.92754E-05
Ag^+	0.00E+00	0.00E+00	0.00E+00	1.19E-09	1.19E-09	5.4102E-13	6.2618E-12
Al^{+3}	0.00E+00	0.00E+00	0.00E+00	2.17E-07	2.17E-07	9.8667E-11	1.14198E-09
As^{+3}	0.00E+00	0.00E+00	0.00E+00	4.63E-07	4.63E-07	2.10383E-10	2.43499E-09
B^{+3}	0.00E+00	0.00E+00	0.00E+00	7.11E-09	7.11E-09	3.23396E-12	3.74301E-11
Ba^{+2}	0.00E+00	0.00E+00	0.00E+00	6.83E-09	6.83E-09	3.10419E-12	3.59281E-11
Bi^{+3}	0.00E+00	0.00E+00	0.00E+00	5.23E-09	5.23E-09	2.37877E-12	2.75321E-11
$C_2O_4^{-2}$	0.00E+00	0.00E+00	0.00E+00	6.32E-07	6.32E-07	2.87319E-10	3.32545E-09
Ca^{+2}	0.00E+00	0.00E+00	0.00E+00	5.81E-08	5.81E-08	2.64153E-11	3.05733E-10
Cd^{+2}	0.00E+00	0.00E+00	0.00E+00	2.07E-08	2.07E-08	9.3864E-12	1.08639E-10
Ce^{+3}	0.00E+00	0.00E+00	0.00E+00	4.79E-09	4.79E-09	2.17732E-12	2.52004E-11
Cl^-	0.00E+00	0.00E+00	0.00E+00	5.16E-08	5.16E-08	2.34656E-11	2.71593E-10
CO_3^{-2}	0.00E+00	0.00E+00	0.00E+00	3.12E-07	3.12E-07	1.41932E-10	1.64273E-09
Cr^{+3}	0.00E+00	0.00E+00	0.00E+00	3.14E-08	3.14E-08	1.42677E-11	1.65135E-10
Cu^{+2}	0.00E+00	0.00E+00	0.00E+00	1.09E-09	1.09E-09	4.96037E-13	5.74117E-12
F^-	0.00E+00	0.00E+00	0.00E+00	6.86E-08	6.86E-08	3.11823E-11	3.60906E-10
Fe^{+3}	0.00E+00	0.00E+00	0.00E+00	5.81E-08	5.81E-08	2.64126E-11	3.05702E-10
H^+	0.00E+00	0.00E+00	0.00E+00		0.00E+00	0	0
H_2O	0.00E+00	0.00E+00	0.00E+00		0.00E+00	0	0
Hg^{+2}	0.00E+00	0.00E+00	0.00E+00	3.66E-03	3.66E-03	1.66269E-06	1.92441E-05
K^+	0.00E+00	0.00E+00	0.00E+00	2.10E-07	2.10E-07	9.54319E-11	1.10454E-09
La^{+3}	0.00E+00	0.00E+00	0.00E+00	4.10E-09	4.10E-09	1.86138E-12	2.15437E-11
Li^+	0.00E+00	0.00E+00	0.00E+00	1.48E-09	1.48E-09	6.74453E-13	7.80617E-12
Mg^{+2}	0.00E+00	0.00E+00	0.00E+00	4.40E-09	4.40E-09	1.99915E-12	2.31383E-11
Mn^{+3}	0.00E+00	0.00E+00	0.00E+00	1.71E-08	1.71E-08	7.79026E-12	9.01651E-11
MnO_4^-	0.00E+00	0.00E+00	0.00E+00		0.00E+00	0	0
Na^+	0.00E+00	0.00E+00	0.00E+00	7.46E-07	7.46E-07	3.39074E-10	3.92447E-09
NH_4^+	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0	0
Ni^{+2}	0.00E+00	0.00E+00	0.00E+00	8.61E-09	8.61E-09	3.91324E-12	4.52921E-11
NO_2^-	0.00E+00	0.00E+00	0.00E+00	2.70E-07	2.70E-07	1.22849E-10	1.42187E-09
NO_3^-	0.00E+00	0.00E+00	0.00E+00	1.42E-06	1.42E-06	6.47567E-10	7.49499E-09
O^{-2}				1.64E-07	1.64E-07	7.46284E-11	8.63755E-10
OH^-	0.00E+00	0.00E+00	0.00E+00	7.99E-07	7.99E-07	3.63358E-10	4.20553E-09
$OH(b)^-$	0.00E+00	0.00E+00	0.00E+00		0.00E+00	0	0
P^{+5}				5.39E-16	5.39E-16	2.44951E-19	2.83509E-18
Pb^{+2}	0.00E+00	0.00E+00	0.00E+00	5.67E-09	5.67E-09	2.57661E-12	2.98219E-11
Pd^{+2}	0.00E+00	0.00E+00	0.00E+00	2.09E-10	2.09E-10	9.5195E-14	1.10179E-12
PO_4^{-3}	0.00E+00	0.00E+00	0.00E+00	1.98E-07	1.98E-07	9.00342E-11	1.04206E-09
S^{+6}				1.64E-15	1.64E-15	7.43287E-19	8.60286E-18
Si^{+4}				3.32E-08	3.32E-08	1.50745E-11	1.74473E-10
SiO_4^{-4}	0.00E+00	0.00E+00	0.00E+00		0.00E+00	0	0
SO_4^{-2}	0.00E+00	0.00E+00	0.00E+00	1.03E-07	1.03E-07	4.66699E-11	5.40161E-10
Sr^{+2}	0.00E+00	0.00E+00	0.00E+00	8.67E-10	8.67E-10	3.93912E-13	4.55917E-12
Ti^{+4}	0.00E+00	0.00E+00	0.00E+00	5.26E-09	5.26E-09	2.39152E-12	2.76796E-11
Zn^{+2}	0.00E+00	0.00E+00	0.00E+00	2.03E-09	2.03E-09	9.22881E-13	1.06815E-11
Zr^{+4}	0.00E+00	0.00E+00	0.00E+00	2.24E-08	2.24E-08	1.0173E-11	1.17744E-10

Rad.	Aqueous Rad. Components			Solids Rad. Components (1)			Total Rad. Components (1)		
Component	Ci/L	Ci/day	Lb/day	Ci/L	Ci/day	Lb/day	Ci/L	Ci/day	Lb/day
Total	0.00E+00	0.00E+00	0.00E+00	6.01E-13	9.44E-04	1.63E-05	6.01E-13	9.44E-04	1.63E-05
^{241}Am	0	0.00E+00	0.00E+00	3.70E-17	5.81E-08	3.74E-11	3.70E-17	5.81E-08	3.74E-11
^{14}C	0.00E+00	0.00E+00	0.00E+00	6.26E-14	9.84E-05	4.86E-08	6.26E-14	9.84E-05	4.86E-08
^{60}Co	0.00E+00	0.00E+00	0.00E+00	4.18E-18	6.57E-09	1.28E-14	4.18E-18	6.57E-09	1.28E-14
^{243}Cm	0.00E+00	0.00E+00	0.00E+00	1.23E-18	1.93E-09	8.43E-14	1.23E-18	1.93E-09	8.43E-14
^{244}Cm	0.00E+00	0.00E+00	0.00E+00	9.22E-19	1.45E-09	3.95E-14	9.22E-19	1.45E-09	3.95E-14
^{137}Cs	0.00E+00	0.00E+00	0.00E+00	4.85E-15	7.62E-06	1.94E-10	4.85E-15	7.62E-06	1.94E-10
^{152}Eu	0.00E+00	0.00E+00	0.00E+00	4.93E-19	7.74E-10	9.82E-15	4.93E-19	7.74E-10	9.82E-15
^{154}Eu	0.00E+00	0.00E+00	0.00E+00	2.23E-17	3.50E-08	2.86E-13	2.23E-17	3.50E-08	2.86E-13
^{155}Eu	0.00E+00	0.00E+00	0.00E+00	1.36E-17	2.13E-08	9.68E-14	1.36E-17	2.13E-08	9.68E-14
^{3}H	0.00E+00	0.00E+00	0.00E+00	5.28E-13	8.30E-04	1.90E-10	5.28E-13	8.30E-04	1.90E-10
^{129}I	0.00E+00	0.00E+00	0.00E+00	8.26E-16	1.30E-06	1.62E-05	8.26E-16	1.30E-06	1.62E-05
^{63}Ni	0.00E+00	0.00E+00	0.00E+00	2.50E-18	3.92E-09	1.52E-13	2.50E-18	3.92E-09	1.52E-13
^{237}Np	0.00E+00	0.00E+00	0.00E+00	3.05E-20	4.79E-11	1.50E-10	3.05E-20	4.79E-11	1.50E-10
^{238}Pu	0.00E+00	0.00E+00	0.00E+00	1.44E-19	2.26E-10	2.91E-14	1.44E-19	2.26E-10	2.91E-14
^{239}Pu	0.00E+00	0.00E+00	0.00E+00	1.28E-18	2.01E-09	7.13E-11	1.28E-18	2.01E-09	7.13E-11
^{240}Pu	0.00E+00	0.00E+00	0.00E+00	7.07E-20	1.11E-10	1.08E-12	7.07E-20	1.11E-10	1.08E-12
^{241}Pu	0.00E+00	0.00E+00	0.00E+00	9.05E-18	1.42E-08	3.04E-13	9.05E-18	1.42E-08	3.04E-13
^{125}Sb	0.00E+00	0.00E+00	0.00E+00	1.77E-17	2.79E-08	5.92E-14	1.77E-17	2.79E-08	5.92E-14
^{151}Sm	0.00E+00	0.00E+00	0.00E+00	9.72E-17	1.53E-07	1.28E-11	9.72E-17	1.53E-07	1.28E-11
^{126}Sn	0.00E+00	0.00E+00	0.00E+00	9.55E-20	1.50E-10	2.91E-11	9.55E-20	1.50E-10	2.91E-11
^{90}Sr	0.00E+00	0.00E+00	0.00E+00	4.31E-15	6.77E-06	1.08E-10	4.31E-15	6.77E-06	1.08E-10
^{99}Tc	0.00E+00	0.00E+00	0.00E+00	1.17E-17	1.84E-08	2.40E-09	1.17E-17	1.84E-08	2.40E-09
^{232}Th	0.00E+00	0.00E+00	0.00E+00	4.48E-22	7.03E-13	1.41E-08	4.48E-22	7.03E-13	1.41E-08
^{233}U	0.00E+00	0.00E+00	0.00E+00	2.71E-21	4.25E-12	9.73E-13	2.71E-21	4.25E-12	9.73E-13
^{234}U	0.00E+00	0.00E+00	0.00E+00	2.70E-21	4.24E-12	1.51E-12	2.70E-21	4.24E-12	1.51E-12
^{235}U	0.00E+00	0.00E+00	0.00E+00	1.55E-22	2.44E-13	2.49E-10	1.55E-22	2.44E-13	2.49E-10
^{236}U	0.00E+00	0.00E+00	0.00E+00	1.99E-22	3.13E-13	1.07E-11	1.99E-22	3.13E-13	1.07E-11
^{238}U	0.00E+00	0.00E+00	0.00E+00	1.77E-21	2.78E-12	1.82E-08	1.77E-21	2.78E-12	1.82E-08

Component	Organic Components				
(CAS)	mol/L	Lb/gal	Lb/day	Mt/day	g/sec
Total	5.37E-12	6.04E-12	4.79E-03	2.17506E-06	2.51743E-05
57-14-7	9.58E-13	4.80315E-13	1.99E-04	9.06058E-08	1.04868E-06
58-90-2	2.60E-13	5.03131E-13	2.09E-04	9.49098E-08	1.09849E-06
58-89-9	9.86E-22	2.39248E-21	9.93E-13	4.51313E-16	5.22353E-15
71-43-2	5.52E-14	3.59684E-14	1.49E-05	6.78502E-09	7.85303E-08
75-05-8	3.74E-13	1.28218E-13	5.32E-05	2.41868E-08	2.7994E-07
76-44-8	1.51E-15	4.71165E-15	1.96E-06	8.88798E-10	1.0287E-08
79-01-6	3.25E-14	3.56269E-14	1.48E-05	6.72059E-09	7.77846E-08
84-74-2	3.72E-19	8.64143E-19	3.59E-10	1.6301E-13	1.8867E-12
84-66-2	4.74E-13	8.79749E-13	3.65E-04	1.65954E-07	1.92077E-06
87-86-5	5.82E-13	1.29369E-12	5.37E-04	2.44039E-07	2.82452E-06
87-68-3	1.64E-14	3.56778E-14	1.48E-05	6.7302E-09	7.78958E-08
88-85-7	7.32E-19	1.46741E-18	6.09E-10	2.7681E-13	3.20381E-12
91-20-3	6.23E-15	6.6603E-15	2.76E-06	1.25639E-09	1.45415E-08
98-86-2	4.90E-13	4.92365E-13	2.04E-04	9.28789E-08	1.07499E-06
108-95-2	1.29E-12	1.01219E-12	4.20E-04	1.90937E-07	2.20992E-06
108-88-3	4.67E-14	3.59107E-14	1.49E-05	6.77413E-09	7.84043E-08
120-82-1	2.52E-14	3.81574E-14	1.58E-05	7.19794E-09	8.33095E-08
122-66-7	0.00E+00	0	0.00E+00	0	0
122-39-4	9.13E-14	1.28988E-13	5.35E-05	2.43321E-08	2.81622E-07
129-00-0	3.82E-19	6.44867E-19	2.68E-10	1.21647E-13	1.40795E-12
132-64-9	1.73E-13	2.42973E-13	1.01E-04	4.5834E-08	5.30486E-07
218-01-9	3.63E-19	6.91738E-19	2.87E-10	1.30488E-13	1.51028E-12
309-00-2	2.58E-21	7.86376E-21	3.26E-12	1.4834E-15	1.7169E-14
319-85-7	1.77E-21	4.29791E-21	1.78E-12	8.10749E-16	9.38367E-15
534-52-1	0.00E+00	0	0.00E+00	0	0
603-34-9	2.63E-13	5.39063E-13	2.24E-04	1.01688E-07	1.17694E-06
4170-30-3	1.87E-13	1.09638E-13	4.55E-05	2.06819E-08	2.39373E-07
10061-01-5	3.99E-14	3.69106E-14	1.53E-05	6.96275E-09	8.05874E-08
38380-08-4	9.44E-22	2.84419E-21	1.18E-12	5.36523E-16	6.20976E-15
100-21-0	9.58E-13	1.32813E-12	5.51E-04	2.50536E-07	2.89972E-06
106-93-4	1.20E-13	1.87761E-13	7.79E-05	3.54189E-08	4.09941E-07
106-97-8	7.28E-14	3.53071E-14	1.47E-05	6.66026E-09	7.70863E-08
106-99-0	7.83E-14	3.53603E-14	1.47E-05	6.6703E-09	7.72025E-08
108-87-2	4.30E-14	3.51995E-14	1.46E-05	6.63998E-09	7.68516E-08
110-54-3	4.91E-14	3.52763E-14	1.46E-05	6.65446E-09	7.70192E-08
110-82-7	5.02E-14	3.52709E-14	1.46E-05	6.65344E-09	7.70074E-08
111-84-2	3.30E-14	3.53234E-14	1.47E-05	6.66334E-09	7.7122E-08
118-74-1	1.53E-15	3.62698E-15	1.51E-06	6.84186E-10	7.91882E-09
120-12-7	2.47E-13	3.66656E-13	1.52E-04	6.91653E-08	8.00525E-07
127-18-4	2.57E-14	3.55911E-14	1.48E-05	6.71383E-09	7.77064E-08
1336-36-3	2.28E-19	6.12887E-19	2.54E-10	1.15614E-13	1.33812E-12
144-62-7	1.77E-13	1.32966E-13	5.52E-05	2.50825E-08	2.90307E-07
208-96-8	2.34E-13	2.96824E-13	1.23E-04	5.59923E-08	6.48059E-07
50-32-8	7.54E-21	1.5882E-20	6.59E-12	2.99595E-15	3.46753E-14
56-23-5	2.77E-14	3.55566E-14	1.48E-05	6.70734E-09	7.76312E-08
60-35-5	5.88E-13	2.89969E-13	1.20E-04	5.46993E-08	6.33093E-07
60-57-1	1.43E-21	4.55881E-21	1.89E-12	8.59965E-16	9.9533E-15
62-75-9	2.01E-12	1.242E-12	5.15E-04	2.34288E-07	2.71167E-06
75-12-7	3.52E-12	1.32432E-12	5.50E-04	2.49817E-07	2.8914E-06
76-15-3	2.73E-14	3.52567E-14	1.46E-05	6.65076E-09	7.69764E-08
8001-35-2	1.59E-21	5.49939E-21	2.28E-12	1.03739E-15	1.20069E-14
88-89-1	2.46E-18	4.7119E-18	1.96E-09	8.88844E-13	1.02875E-11
126-73-8	5.19E-13	1.15274E-12	4.78E-04	2.1745E-07	2.51679E-06

River Protection Project - Waste Treatment Plant

Stream Number: LVP26
Stream Name: Activated Carbon Column discharge to stack
Run Data File: H:\Working Folder 11 (Vishal)\Emissions_Case2_Run4_SubEm\MRQ_03_054_run1_Streams.csv
Run Date / Time: 4/15/2003 - 6:40:10 AM

Stream Properties		
Variable	Value	Units
Density	9.16E-04	g/cm^3
Enthalpy	-6.56E+06	BTU/hr
Mass Flow	1.56E+04	Lb/hr
	3.75E+05	Lb/day
Volumetric Flow	3.41E+04	GPM
Molar Flow	5.50E+02	Lbmol/hr
Volumetric Flow	4.55E+03	ft^3/min
Molecular Weight	2.84E+01	Lb/Lbmol
Pressure	1.00E+03	mbar
Temperature	1.00E+02	C
Viscosity	2.14E-02	cP
Na Molarity	0.00E+00	mol/L
pH	N/A	pH
Total TRU	6.10E-19	Ci/L
Total Activity	5.28E-09	Ci/L

Gaseous Components (1)			
Component	mol/L	Lb/day	Mt/day
CO	1.06E-06	1.21E+01	0.005504134
CO_2	8.65E-04	1.56E+04	7.083848566
H_2O	2.59E-03	1.91E+04	8.680385732
NO	1.45E-05	1.77E+02	0.080668716
NO_2	1.32E-06	2.48E+01	0.011269395
N_2	2.25E-02	2.58E+05	117.2640051
O_2	6.27E-03	8.21E+04	37.31984506
SO_2	7.71E-07	2.02E+01	0.009184652
NH_3	8.92E-07	6.22E+00	0.002826885
HNO_3	3.45E-27	8.90E-20	4.04659E-23
HCl	5.01E-07	7.47E+00	0.003396731
HF	1.32E-07	1.08E+00	0.000491589

(1) All radionuclides in gaseous streams are assumed to exist as solid particulate.

Component	Aqueous Components mol/L	Lb/gal	Lb/day	Solid Components Lb/day	Total Component Lb/day	Solid Components mt/day	Total Component g/sec
Total	0.00E+00	0.00E+00	0.00E+00	4.22E+01	4.22E+01	0.019168818	0.221861315
Ag^+	0.00E+00	0.00E+00	0.00E+00	7.07E-09	7.07E-09	3.21431E-12	3.72027E-11
Al^{+3}	0.00E+00	0.00E+00	0.00E+00	4.35E-07	4.35E-07	1.97505E-10	2.28594E-09
As^{+3}	0.00E+00	0.00E+00	0.00E+00	6.28E-05	6.28E-05	2.85371E-08	3.3029E-07
B^{+3}	0.00E+00	0.00E+00	0.00E+00	2.00E-06	2.00E-06	9.07985E-10	1.05091E-08
Ba^{+2}	0.00E+00	0.00E+00	0.00E+00	1.99E-10	1.99E-10	9.05853E-14	1.04844E-12
Bi^{+3}	0.00E+00	0.00E+00	0.00E+00	7.76E-09	7.76E-09	3.52924E-12	4.08477E-11
$C_2O_4^{-2}$	0.00E+00	0.00E+00	0.00E+00	2.72E+01	2.72E+01	0.012383551	0.143328139
Ca^{+2}	0.00E+00	0.00E+00	0.00E+00	1.59E-06	1.59E-06	7.2261E-10	8.36354E-09
Cd^{+2}	0.00E+00	0.00E+00	0.00E+00	5.53E-07	5.53E-07	2.51548E-10	2.91143E-09
Ce^{+3}	0.00E+00	0.00E+00	0.00E+00	2.08E-09	2.08E-09	9.46953E-13	1.09601E-11
Cl^-	0.00E+00	0.00E+00	0.00E+00	1.33E-06	1.33E-06	6.0595E-10	7.01331E-09
CO_3^{-2}	0.00E+00	0.00E+00	0.00E+00	7.07E-10	7.07E-10	3.21454E-13	3.72054E-12
Cr^{+3}	0.00E+00	0.00E+00	0.00E+00	3.66E-07	3.66E-07	1.66342E-10	1.92525E-09
Cu^{+2}	0.00E+00	0.00E+00	0.00E+00	1.15E-09	1.15E-09	5.22527E-13	6.04776E-12
F^-	0.00E+00	0.00E+00	0.00E+00	2.06E-06	2.06E-06	9.38167E-10	1.08584E-08
Fe^{+3}	0.00E+00	0.00E+00	0.00E+00	2.57E-07	2.57E-07	1.16856E-10	1.35251E-09
H^+	0.00E+00	0.00E+00	0.00E+00		0.00E+00	0	0
H_2O	0.00E+00	0.00E+00	0.00E+00		0.00E+00	0	0
Hg^{+2}	0.00E+00	0.00E+00	0.00E+00	1.33E-02	1.33E-02	6.03554E-06	6.98558E-05
K^+	0.00E+00	0.00E+00	0.00E+00	5.17E-06	5.17E-06	2.34782E-09	2.71738E-08
La^{+3}	0.00E+00	0.00E+00	0.00E+00	4.34E-10	4.34E-10	1.97145E-13	2.28177E-12
Li^+	0.00E+00	0.00E+00	0.00E+00	1.24E-06	1.24E-06	5.63807E-10	6.52554E-09
Mg^{+2}	0.00E+00	0.00E+00	0.00E+00	1.94E-07	1.94E-07	8.83252E-11	1.02228E-09
Mn^{+3}	0.00E+00	0.00E+00	0.00E+00	1.71E-08	1.71E-08	7.76189E-12	8.98367E-11
MnO_4^-	0.00E+00	0.00E+00	0.00E+00		0.00E+00	0	0
Na^+	0.00E+00	0.00E+00	0.00E+00	6.75E-06	6.75E-06	3.06985E-09	3.55307E-08
NH_4^+	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0	0
Ni^{+2}	0.00E+00	0.00E+00	0.00E+00	2.42E-08	2.42E-08	1.10039E-11	1.2736E-10
NO_2^-	0.00E+00	0.00E+00	0.00E+00	2.55E-10	2.55E-10	1.16089E-13	1.34362E-12
NO_3^-	0.00E+00	0.00E+00	0.00E+00	1.33E-09	1.33E-09	6.02967E-13	6.97879E-12
O^{-2}				1.29E+01	1.29E+01	0.005859724	0.06782088
OH^-	0.00E+00	0.00E+00	0.00E+00	6.10E-10	6.10E-10	2.77332E-13	3.20986E-12
$OH(b)^-$	0.00E+00	0.00E+00	0.00E+00		0.00E+00	0	0
P^{+5}				7.34E-05	7.34E-05	3.33763E-08	3.863E-07
Pb^{+2}	0.00E+00	0.00E+00	0.00E+00	1.46E-08	1.46E-08	6.61616E-12	7.65759E-11
Pd^{+2}	0.00E+00	0.00E+00	0.00E+00	1.52E-11	1.52E-11	6.89037E-15	7.97497E-14
PO_4^{-3}	0.00E+00	0.00E+00	0.00E+00	1.80E-10	1.80E-10	8.18704E-14	9.47574E-13
S^{+6}				2.02E+00	2.02E+00	0.000919429	0.010641535
Si^{+4}				1.33E-06	1.33E-06	6.04765E-10	6.99959E-09
SiO_4^{-4}	0.00E+00	0.00E+00	0.00E+00		0.00E+00	0	0
SO_4^{-2}	0.00E+00	0.00E+00	0.00E+00	9.82E-11	9.82E-11	4.46218E-14	5.16456E-13
Sr^{+2}	0.00E+00	0.00E+00	0.00E+00	1.52E-10	1.52E-10	6.89681E-14	7.98242E-13
Ti^{+4}	0.00E+00	0.00E+00	0.00E+00	1.17E-05	1.17E-05	5.29984E-09	6.13408E-08
Zn^{+2}	0.00E+00	0.00E+00	0.00E+00	6.14E-07	6.14E-07	2.79124E-10	3.2306E-09
Zr^{+4}	0.00E+00	0.00E+00	0.00E+00	1.37E-07	1.37E-07	6.22465E-11	7.20445E-10

Rad.	Aqueous Rad. Components			Solids Rad. Components (1)			Total Rad. Components (1)		
Component	Ci/L	Ci/day	Lb/day	Ci/L	Ci/day	Lb/day	Ci/L	Ci/day	Lb/day
Total	0.00E+00	0.00E+00	0.00E+00	5.28E-09	9.81E-01	1.56E-03	5.28E-09	9.81E-01	1.56E-03
^{241}Am	0	0.00E+00	0.00E+00	4.40E-19	8.17E-11	5.26E-14	4.40E-19	8.17E-11	5.26E-14
^{14}C	0.00E+00	0.00E+00	0.00E+00	4.94E-09	9.17E-01	4.53E-04	4.94E-09	9.17E-01	4.53E-04
^{60}Co	0.00E+00	0.00E+00	0.00E+00	2.74E-18	5.08E-10	9.91E-16	2.74E-18	5.08E-10	9.91E-16
^{243}Cm	0.00E+00	0.00E+00	0.00E+00	1.17E-21	2.17E-13	9.48E-18	1.17E-21	2.17E-13	9.48E-18
^{244}Cm	0.00E+00	0.00E+00	0.00E+00	1.26E-21	2.34E-13	6.36E-18	1.26E-21	2.34E-13	6.36E-18
^{137}Cs	0.00E+00	0.00E+00	0.00E+00	1.74E-16	3.22E-08	8.19E-13	1.74E-16	3.22E-08	8.19E-13
^{152}Eu	0.00E+00	0.00E+00	0.00E+00	1.53E-18	2.85E-10	3.61E-15	1.53E-18	2.85E-10	3.61E-15
^{154}Eu	0.00E+00	0.00E+00	0.00E+00	5.09E-18	9.45E-10	7.71E-15	5.09E-18	9.45E-10	7.71E-15
^{155}Eu	0.00E+00	0.00E+00	0.00E+00	8.76E-18	1.63E-09	7.38E-15	8.76E-18	1.63E-09	7.38E-15
^{3}H	0.00E+00	0.00E+00	0.00E+00	3.43E-10	6.37E-02	1.46E-08	3.43E-10	6.37E-02	1.46E-08
^{129}I	0.00E+00	0.00E+00	0.00E+00	4.79E-13	8.90E-05	1.11E-03	4.79E-13	8.90E-05	1.11E-03
^{63}Ni	0.00E+00	0.00E+00	0.00E+00	2.14E-17	3.97E-09	1.54E-13	2.14E-17	3.97E-09	1.54E-13
^{237}Np	0.00E+00	0.00E+00	0.00E+00	1.89E-21	3.51E-13	1.10E-12	1.89E-21	3.51E-13	1.10E-12
^{238}Pu	0.00E+00	0.00E+00	0.00E+00	2.55E-21	4.74E-13	6.10E-17	2.55E-21	4.74E-13	6.10E-17
^{239}Pu	0.00E+00	0.00E+00	0.00E+00	2.98E-20	5.54E-12	1.97E-13	2.98E-20	5.54E-12	1.97E-13
^{240}Pu	0.00E+00	0.00E+00	0.00E+00	5.15E-21	9.55E-13	9.28E-15	5.15E-21	9.55E-13	9.28E-15
^{241}Pu	0.00E+00	0.00E+00	0.00E+00	1.27E-19	2.36E-11	5.06E-16	1.27E-19	2.36E-11	5.06E-16
^{125}Sb	0.00E+00	0.00E+00	0.00E+00	4.62E-16	8.59E-08	1.82E-13	4.62E-16	8.59E-08	1.82E-13
^{151}Sm	0.00E+00	0.00E+00	0.00E+00	2.91E-16	5.41E-08	4.53E-12	2.91E-16	5.41E-08	4.53E-12
^{126}Sn	0.00E+00	0.00E+00	0.00E+00	1.76E-19	3.27E-11	6.35E-12	1.76E-19	3.27E-11	6.35E-12
^{90}Sr	0.00E+00	0.00E+00	0.00E+00	1.90E-15	3.53E-07	5.63E-12	1.90E-15	3.53E-07	5.63E-12
^{99}Tc	0.00E+00	0.00E+00	0.00E+00	1.30E-16	2.41E-08	3.13E-09	1.30E-16	2.41E-08	3.13E-09
^{232}Th	0.00E+00	0.00E+00	0.00E+00	6.52E-22	1.21E-13	2.43E-09	6.52E-22	1.21E-13	2.43E-09
^{233}U	0.00E+00	0.00E+00	0.00E+00	1.21E-20	2.25E-12	5.14E-13	1.21E-20	2.25E-12	5.14E-13
^{234}U	0.00E+00	0.00E+00	0.00E+00	7.04E-21	1.31E-12	4.64E-13	7.04E-21	1.31E-12	4.64E-13
^{235}U	0.00E+00	0.00E+00	0.00E+00	2.72E-22	5.05E-14	5.15E-11	2.72E-22	5.05E-14	5.15E-11
^{236}U	0.00E+00	0.00E+00	0.00E+00	8.15E-22	1.51E-13	5.16E-12	8.15E-22	1.51E-13	5.16E-12
^{238}U	0.00E+00	0.00E+00	0.00E+00	5.24E-21	9.72E-13	6.38E-09	5.24E-21	9.72E-13	6.38E-09

Component	Organic Components				
(CAS)	mol/L	Lb/gal	Lb/day	Mt/day	g/sec
Total	4.92E-09	7.34E-09	9.25E-01	0.000420663	0.004868781
57-14-7	1.21E-11	6.08126E-12	2.98E-04	1.35552E-07	1.56889E-06
58-90-2	6.25E-12	1.2086E-11	5.93E-04	2.69399E-07	3.11804E-06
58-89-9	4.46E-22	1.08307E-21	5.31E-14	2.41417E-17	2.79418E-16
71-43-2	0.00E+00	0	0.00E+00	0	0
75-05-8	5.01E-13	1.71514E-13	8.41E-06	3.82306E-09	4.42484E-08
76-44-8	0.00E+00	0	0.00E+00	0	0
79-01-6	0.00E+00	0	0.00E+00	0	0
84-74-2	1.74E-18	4.04301E-18	1.98E-10	9.01191E-14	1.04305E-12
84-66-2	5.54E-10	1.02788E-09	5.04E-02	2.29115E-05	0.000265179
87-86-5	1.98E-09	4.41072E-09	2.16E-01	9.83154E-05	0.00113791
87-68-3	0.00E+00	0	0.00E+00	0	0
88-85-7	2.06E-17	4.13226E-17	2.03E-09	9.21085E-13	1.06607E-11
91-20-3	0.00E+00	0	0.00E+00	0	0
98-86-2	8.66E-12	8.70844E-12	4.27E-04	1.94112E-07	2.24667E-06
108-95-2	2.32E-09	1.82501E-09	8.95E-02	4.06796E-05	0.000470829
108-88-3	0.00E+00	0	0.00E+00	0	0
120-82-1	0.00E+00	0	0.00E+00	0	0
122-66-7	0.00E+00	0	0.00E+00	0	0
122-39-4	1.20E-11	1.70013E-11	8.34E-04	3.78961E-07	4.38612E-06
129-00-0	5.91E-20	9.98156E-20	4.89E-12	2.2249E-15	2.57512E-14
132-64-9	7.12E-16	9.9995E-16	4.90E-08	2.2289E-11	2.57974E-10
218-01-9	2.78E-19	5.28715E-19	2.59E-11	1.17851E-14	1.36402E-13
309-00-2	8.51E-24	2.59316E-23	1.27E-15	5.78018E-19	6.69002E-18
319-85-7	2.82E-20	6.84531E-20	3.36E-12	1.52583E-15	1.766E-14
534-52-1	0.00E+00	0	0.00E+00	0	0
603-34-9	1.56E-11	3.18835E-11	1.56E-03	7.10687E-07	8.22555E-06
4170-30-3	3.84E-12	2.24822E-12	1.10E-04	5.0113E-08	5.80012E-07
10061-01-5	0.00E+00	0	0.00E+00	0	0
38380-08-4	3.43E-22	1.0329E-21	5.07E-14	2.30235E-17	2.66476E-16
100-21-0	3.47E-09	4.81375E-09	2.36E-01	0.000107299	0.001241885
106-93-4	1.26E-18	1.96933E-18	9.66E-11	4.38965E-14	5.08061E-13
106-97-8	0.00E+00	0	0.00E+00	0	0
106-99-0	0.00E+00	0	0.00E+00	0	0
108-87-2	0.00E+00	0	0.00E+00	0	0
110-54-3	0.00E+00	0	0.00E+00	0	0
110-82-7	0.00E+00	0	0.00E+00	0	0
111-84-2	0.00E+00	0	0.00E+00	0	0
118-74-1	0.00E+00	0	0.00E+00	0	0
120-12-7	1.11E-13	1.65616E-13	8.12E-06	3.6916E-09	4.27269E-08
127-18-4	0.00E+00	0	0.00E+00	0	0
1336-36-3	4.48E-26	1.2051E-25	5.91E-18	2.68617E-21	3.10899E-20
144-62-7	6.39E-10	4.80117E-10	2.35E-02	1.07019E-05	0.000123864
208-96-8	1.56E-14	1.98683E-14	9.74E-07	4.42866E-10	5.12577E-09
50-32-8	1.28E-19	2.69276E-19	1.32E-11	6.00219E-15	6.94698E-14
56-23-5	0.00E+00	0	0.00E+00	0	0
60-35-5	2.08E-09	1.02306E-09	5.02E-02	2.28042E-05	0.000263937
60-57-1	1.67E-22	5.30523E-22	2.60E-14	1.18254E-17	1.36868E-16
62-75-9	6.89E-10	4.25969E-10	2.09E-02	9.49489E-06	0.000109895
75-12-7	1.27E-08	4.7873E-09	2.35E-01	0.000106709	0.001235063
76-15-3	0.00E+00	0	0.00E+00	0	0
8001-35-2	5.39E-22	1.86332E-21	9.14E-14	4.15335E-17	4.80712E-16
88-89-1	3.81E-16	7.28801E-16	3.57E-08	1.6245E-11	1.88021E-10
126-73-8	1.33E-09	2.94752E-09	1.45E-01	6.57006E-05	0.000760424

River Protection Project - Waste Treatment Plant

Stream Number: HOP33
Stream Name: Activated Carbon Adsorber Discharge
Run Data File: H:\Working Folder 11 (Vishal)\Emissions_Case2_Run4_SubEm\MRQ_03_054_run1_Streams.csv
Run Date / Time: 4/15/2003 - 6:40:10 AM

Stream Properties		
Variable	Value	Units
Density	9.12E-04	g/cm^3
Enthalpy	-4.94E+06	BTU/hr
Mass Flow	5.38E+03	Lb/hr
	1.29E+05	Lb/day
Volumetric Flow	1.18E+04	GPM
Molar Flow	2.01E+02	Lbmol/hr
Volumetric Flow	1.57E+03	ft^3/min
Molecular Weight	2.67E+01	Lb/Lbmol
Pressure	1.00E+03	mbar
Temperature	8.00E+01	C
Viscosity	1.99E-02	cP
Na Molarity	0.00E+00	mol/L
pH	N/A	pH
Total TRU	1.41E-17	Ci/L
Total Activity	1.03E-08	Ci/L

Gaseous Components (1)			
Component	mol/L	Lb/day	Mt/day
CO	5.06E-07	2.00E+00	0.000910781
CO_2	5.30E-04	3.30E+03	1.5014103
H_2O	7.42E-03	1.89E+04	8.596609285
NO	9.70E-06	4.12E+01	0.018722522
NO_2	8.84E-07	5.75E+00	0.002615531
N_2	2.05E-02	8.14E+04	36.9782671
O_2	5.61E-03	2.54E+04	11.55141091
SO_2	2.95E-06	2.68E+01	0.012160182
NH_3	1.49E-06	3.59E+00	0.001631981
HNO_3	4.96E-13	4.43E-06	2.01159E-09
HCl	3.68E-09	1.90E-02	8.62111E-06
HF	6.44E-10	1.82E-03	8.28816E-07

(1) All radionuclides in gaseous streams are assumed to exist as solid particulate.

	Aqueous Components			Solid Components	Total Component	Solid Components	Total Component
Component	mol/L	Lb/gal	Lb/day	Lb/day	Lb/day	mt/day	g/sec
Total	0.00E+00	0.00E+00	0.00E+00	3.54E+01	3.54E+01	0.016109598	0.186453675
Ag^{+}	0.00E+00	0.00E+00	0.00E+00	2.55E-10	2.55E-10	1.16E-13	1.34259E-12
Al^{+3}	0.00E+00	0.00E+00	0.00E+00	7.35E-10	7.35E-10	3.33975E-13	3.86545E-12
As^{+3}	0.00E+00	0.00E+00	0.00E+00	3.26E-06	3.26E-06	1.48158E-09	1.71479E-08
B^{+3}	0.00E+00	0.00E+00	0.00E+00	2.28E-09	2.28E-09	1.03767E-12	1.20101E-11
Ba^{+2}	0.00E+00	0.00E+00	0.00E+00	6.09E-11	6.09E-11	2.76817E-14	3.2039E-13
Bi^{+3}	0.00E+00	0.00E+00	0.00E+00	4.35E-10	4.35E-10	1.97607E-13	2.28712E-12
$C_2O_4^{-2}$	0.00E+00	0.00E+00	0.00E+00	6.25E+00	6.25E+00	0.00284007	0.032871183
Ca^{+2}	0.00E+00	0.00E+00	0.00E+00	8.01E-10	8.01E-10	3.639E-13	4.2118E-12
Cd^{+2}	0.00E+00	0.00E+00	0.00E+00	4.69E-09	4.69E-09	2.13087E-12	2.46629E-11
Ce^{+3}	0.00E+00	0.00E+00	0.00E+00	1.57E-11	1.57E-11	7.14665E-15	8.27158E-14
Cl^{-}	0.00E+00	0.00E+00	0.00E+00	1.50E-12	1.50E-12	6.79715E-16	7.86707E-15
CO_3^{-2}	0.00E+00	0.00E+00	0.00E+00	6.96E-13	6.96E-13	3.16244E-16	3.66024E-15
Cr^{+3}	0.00E+00	0.00E+00	0.00E+00	6.26E-10	6.26E-10	2.84766E-13	3.2959E-12
Cu^{+2}	0.00E+00	0.00E+00	0.00E+00	3.38E-11	3.38E-11	1.53757E-14	1.7796E-13
F^{-}	0.00E+00	0.00E+00	0.00E+00	4.83E-12	4.83E-12	2.19557E-15	2.54117E-14
Fe^{+3}	0.00E+00	0.00E+00	0.00E+00	4.90E-10	4.90E-10	2.22813E-13	2.57885E-12
H^{+}	0.00E+00	0.00E+00	0.00E+00		0.00E+00	0	0
H_2O	0.00E+00	0.00E+00	0.00E+00		0.00E+00	0	0
Hg^{+2}	0.00E+00	0.00E+00	0.00E+00	2.40E-03	2.40E-03	1.08991E-06	1.26147E-05
K^{+}	0.00E+00	0.00E+00	0.00E+00	5.77E-09	5.77E-09	2.6226E-12	3.03542E-11
La^{+3}	0.00E+00	0.00E+00	0.00E+00	9.13E-11	9.13E-11	4.1489E-14	4.80197E-13
Li^{+}	0.00E+00	0.00E+00	0.00E+00	6.32E-10	6.32E-10	2.87244E-13	3.32458E-12
Mg^{+2}	0.00E+00	0.00E+00	0.00E+00	7.09E-11	7.09E-11	3.22154E-14	3.72863E-13
Mn^{+3}	0.00E+00	0.00E+00	0.00E+00	4.03E-10	4.03E-10	1.83332E-13	2.1219E-12
MnO_4^{-}	0.00E+00	0.00E+00	0.00E+00		0.00E+00	0	0
Na^{+}	0.00E+00	0.00E+00	0.00E+00	1.17E-08	1.17E-08	5.31126E-12	6.14729E-11
NH_4^{+}	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0	0
Ni^{+2}	0.00E+00	0.00E+00	0.00E+00	3.29E-10	3.29E-10	1.49746E-13	1.73318E-12
NO_2^{-}	0.00E+00	0.00E+00	0.00E+00	2.61E-13	2.61E-13	1.18675E-16	1.37355E-15
NO_3^{-}	0.00E+00	0.00E+00	0.00E+00	1.82E-12	1.82E-12	8.27427E-16	9.57671E-15
O^{-2}				2.65E+01	2.65E+01	0.012051135	0.139480726
OH^{-}	0.00E+00	0.00E+00	0.00E+00	2.26E-12	2.26E-12	1.02581E-15	1.18728E-14
$OH(b)^{-}$	0.00E+00	0.00E+00	0.00E+00		0.00E+00	0	0
P^{+5}				1.63E-05	1.63E-05	7.39972E-09	8.56449E-08
Pb^{+2}	0.00E+00	0.00E+00	0.00E+00	1.09E-10	1.09E-10	4.95061E-14	5.72987E-13
Pd^{+2}	0.00E+00	0.00E+00	0.00E+00	2.16E-12	2.16E-12	9.83264E-16	1.13804E-14
PO_4^{-3}	0.00E+00	0.00E+00	0.00E+00	2.66E-13	2.66E-13	1.21009E-16	1.40057E-15
S^{+6}				2.68E+00	2.68E+00	0.001217294	0.014089048
Si^{+4}				1.51E-09	1.51E-09	6.85979E-13	7.93957E-12
SiO_4^{-4}	0.00E+00	0.00E+00	0.00E+00		0.00E+00	0	0
SO_4^{-2}	0.00E+00	0.00E+00	0.00E+00	8.66E-14	8.66E-14	3.93855E-17	4.55851E-16
Sr^{+2}	0.00E+00	0.00E+00	0.00E+00	1.74E-11	1.74E-11	7.91764E-15	9.16394E-14
Ti^{+4}	0.00E+00	0.00E+00	0.00E+00	9.33E-09	9.33E-09	4.24094E-12	4.90849E-11
Zn^{+2}	0.00E+00	0.00E+00	0.00E+00	4.69E-10	4.69E-10	2.13289E-13	2.46863E-12
Zr^{+4}	0.00E+00	0.00E+00	0.00E+00	2.20E-10	2.20E-10	1.00025E-13	1.15769E-12

Rad.	Aqueous Rad. Components			Solids Rad. Components (1)			Total Rad. Components (1)		
Component	Ci/L	Ci/day	Lb/day	Ci/L	Ci/day	Lb/day	Ci/L	Ci/day	Lb/day
Total	0.00E+00	0.00E+00	0.00E+00	1.03E-08	6.62E-01	1.26E-04	1.03E-08	6.62E-01	1.26E-04
^{241}Am	0	0.00E+00	0.00E+00	1.05E-17	6.74E-10	4.34E-13	1.05E-17	6.74E-10	4.34E-13
^{14}C	0.00E+00	0.00E+00	0.00E+00	2.52E-09	1.62E-01	7.99E-05	2.52E-09	1.62E-01	7.99E-05
^{60}Co	0.00E+00	0.00E+00	0.00E+00	6.54E-18	4.20E-10	8.18E-16	6.54E-18	4.20E-10	8.18E-16
^{243}Cm	0.00E+00	0.00E+00	0.00E+00	3.50E-19	2.24E-11	9.79E-16	3.50E-19	2.24E-11	9.79E-16
^{244}Cm	0.00E+00	0.00E+00	0.00E+00	2.62E-19	1.68E-11	4.58E-16	2.62E-19	1.68E-11	4.58E-16
^{137}Cs	0.00E+00	0.00E+00	0.00E+00	3.46E-14	2.22E-06	5.64E-11	3.46E-14	2.22E-06	5.64E-11
^{152}Eu	0.00E+00	0.00E+00	0.00E+00	6.09E-20	3.91E-12	4.96E-17	6.09E-20	3.91E-12	4.96E-17
^{154}Eu	0.00E+00	0.00E+00	0.00E+00	6.08E-18	3.90E-10	3.18E-15	6.08E-18	3.90E-10	3.18E-15
^{155}Eu	0.00E+00	0.00E+00	0.00E+00	3.41E-18	2.19E-10	9.94E-16	3.41E-18	2.19E-10	9.94E-16
^{3}H	0.00E+00	0.00E+00	0.00E+00	7.79E-09	5.00E-01	1.15E-07	7.79E-09	5.00E-01	1.15E-07
^{129}I	0.00E+00	0.00E+00	0.00E+00	5.72E-14	3.67E-06	4.58E-05	5.72E-14	3.67E-06	4.58E-05
^{63}Ni	0.00E+00	0.00E+00	0.00E+00	4.29E-18	2.75E-10	1.07E-14	4.29E-18	2.75E-10	1.07E-14
^{237}Np	0.00E+00	0.00E+00	0.00E+00	8.63E-21	5.54E-13	1.73E-12	8.63E-21	5.54E-13	1.73E-12
^{238}Pu	0.00E+00	0.00E+00	0.00E+00	4.08E-20	2.62E-12	3.37E-16	4.08E-20	2.62E-12	3.37E-16
^{239}Pu	0.00E+00	0.00E+00	0.00E+00	3.62E-19	2.32E-11	8.25E-13	3.62E-19	2.32E-11	8.25E-13
^{240}Pu	0.00E+00	0.00E+00	0.00E+00	1.98E-20	1.27E-12	1.24E-14	1.98E-20	1.27E-12	1.24E-14
^{241}Pu	0.00E+00	0.00E+00	0.00E+00	2.57E-18	1.65E-10	3.53E-15	2.57E-18	1.65E-10	3.53E-15
^{125}Sb	0.00E+00	0.00E+00	0.00E+00	6.74E-17	4.33E-09	9.19E-15	6.74E-17	4.33E-09	9.19E-15
^{151}Sm	0.00E+00	0.00E+00	0.00E+00	1.26E-17	8.09E-10	6.78E-14	1.26E-17	8.09E-10	6.78E-14
^{126}Sn	0.00E+00	0.00E+00	0.00E+00	1.81E-20	1.16E-12	2.25E-13	1.81E-20	1.16E-12	2.25E-13
^{90}Sr	0.00E+00	0.00E+00	0.00E+00	2.35E-15	1.51E-07	2.41E-12	2.35E-15	1.51E-07	2.41E-12
^{99}Tc	0.00E+00	0.00E+00	0.00E+00	9.32E-16	5.98E-08	7.78E-09	9.32E-16	5.98E-08	7.78E-09
^{232}Th	0.00E+00	0.00E+00	0.00E+00	9.36E-23	6.01E-15	1.20E-10	9.36E-23	6.01E-15	1.20E-10
^{233}U	0.00E+00	0.00E+00	0.00E+00	1.44E-22	9.26E-15	2.12E-15	1.44E-22	9.26E-15	2.12E-15
^{234}U	0.00E+00	0.00E+00	0.00E+00	4.04E-22	2.60E-14	9.22E-15	4.04E-22	2.60E-14	9.22E-15
^{235}U	0.00E+00	0.00E+00	0.00E+00	3.00E-23	1.93E-15	1.97E-12	3.00E-23	1.93E-15	1.97E-12
^{236}U	0.00E+00	0.00E+00	0.00E+00	1.45E-23	9.33E-16	3.18E-14	1.45E-23	9.33E-16	3.18E-14
^{238}U	0.00E+00	0.00E+00	0.00E+00	2.32E-22	1.49E-14	9.76E-11	2.32E-22	1.49E-14	9.76E-11

Component	Organic Components				
(CAS)	mol/L	Lb/gal	Lb/day	Mt/day	g/sec
Total	1.85E-08	2.08E-08	6.12E-01	0.000278029	0.003217923
57-14-7	3.71E-09	1.85869E-09	3.15E-02	1.43256E-05	0.000165806
58-90-2	1.08E-09	2.08423E-09	3.53E-02	1.60639E-05	0.000185925
58-89-9	1.32E-21	3.20396E-21	5.43E-14	2.46942E-17	2.85812E-16
71-43-2	5.23E-17	3.41172E-17	5.78E-10	2.62954E-13	3.04345E-12
75-05-8	9.46E-10	3.23953E-10	5.49E-03	2.49683E-06	2.88985E-05
76-44-8	1.27E-13	3.9542E-13	6.70E-06	3.04765E-09	3.52737E-08
79-01-6	2.15E-18	2.36014E-18	4.00E-11	1.81905E-14	2.10538E-13
84-74-2	3.10E-19	7.2061E-19	1.22E-11	5.55401E-15	6.42826E-14
84-66-2	1.91E-09	3.55007E-09	6.02E-02	2.73618E-05	0.000316687
87-86-5	1.73E-09	3.84272E-09	6.52E-02	2.96173E-05	0.000342792
87-68-3	8.58E-19	1.86766E-18	3.17E-11	1.43947E-14	1.66606E-13
88-85-7	3.88E-19	7.77541E-19	1.32E-11	5.9928E-15	6.93612E-14
91-20-3	1.60E-13	1.70653E-13	2.89E-06	1.31529E-09	1.52232E-08
98-86-2	1.97E-09	1.98213E-09	3.36E-02	1.5277E-05	0.000176818
108-95-2	4.79E-09	3.76313E-09	6.38E-02	2.90038E-05	0.000335693
108-88-3	1.92E-17	1.4724E-17	2.50E-10	1.13483E-13	1.31347E-12
120-82-1	9.16E-15	1.38648E-14	2.35E-07	1.06861E-10	1.23682E-09
122-66-7	0.00E+00	0	0.00E+00	0	0
122-39-4	4.10E-10	5.79549E-10	9.83E-03	4.4668E-06	5.16991E-05
129-00-0	8.25E-19	1.39178E-18	2.36E-11	1.0727E-14	1.24155E-13
132-64-9	3.30E-11	4.63616E-11	7.86E-04	3.57326E-07	4.13572E-06
218-01-9	4.94E-19	9.41729E-19	1.60E-11	7.25826E-15	8.40077E-14
309-00-2	9.78E-21	2.9793E-20	5.05E-13	2.29626E-16	2.65771E-15
319-85-7	9.42E-22	2.28582E-21	3.88E-14	1.76177E-17	2.03908E-16
534-52-1	0.00E+00	0	0.00E+00	0	0
603-34-9	1.16E-09	2.36717E-09	4.01E-02	1.82447E-05	0.000211165
4170-30-3	7.64E-10	4.47149E-10	7.58E-03	3.44635E-06	3.98883E-05
10061-01-5	9.48E-16	8.77606E-16	1.49E-08	6.76404E-12	7.82875E-11
38380-08-4	1.35E-21	4.05523E-21	6.88E-14	3.12552E-17	3.6175E-16
100-21-0	2.75E-09	3.8176E-09	6.47E-02	2.94237E-05	0.000340552
106-93-4	7.66E-13	1.20177E-12	2.04E-05	9.2625E-09	1.07205E-07
106-97-8	0.00E+00	0	0.00E+00	0	0
106-99-0	0.00E+00	0	0.00E+00	0	0
108-87-2	0.00E+00	0	0.00E+00	0	0
110-54-3	0.00E+00	0	0.00E+00	0	0
110-82-7	0.00E+00	0	0.00E+00	0	0
111-84-2	0.00E+00	0	0.00E+00	0	0
118-74-1	2.68E-16	6.36853E-16	1.08E-08	4.90846E-12	5.68109E-11
120-12-7	4.24E-10	6.29971E-10	1.07E-02	4.85542E-06	5.6197E-05
127-18-4	9.62E-20	1.33155E-19	2.26E-12	1.02628E-15	1.18782E-14
1336-36-3	2.28E-19	6.12628E-19	1.04E-11	4.72176E-15	5.465E-14
144-62-7	5.09E-10	3.82576E-10	6.49E-03	2.94866E-06	3.4128E-05
208-96-8	1.58E-10	2.01238E-10	3.41E-03	1.55102E-06	1.79516E-05
50-32-8	4.06E-21	8.5475E-21	1.45E-13	6.58788E-17	7.62487E-16
56-23-5	5.65E-26	7.25058E-26	1.23E-18	5.5883E-22	6.46794E-21
60-35-5	1.72E-09	8.4622E-10	1.43E-02	6.52213E-06	7.54877E-05
60-57-1	2.78E-21	8.83871E-21	1.50E-13	6.81233E-17	7.88464E-16
62-75-9	8.95E-09	5.53515E-09	9.39E-02	4.26615E-05	0.000493767
75-12-7	1.01E-08	3.81336E-09	6.47E-02	2.9391E-05	0.000340174
76-15-3	3.69E-35	4.75303E-35	8.06E-28	3.66334E-31	4.23998E-30
8001-35-2	2.32E-21	8.00928E-21	1.36E-13	6.17305E-17	7.14474E-16
88-89-1	3.13E-19	5.98606E-19	1.02E-11	4.61369E-15	5.33991E-14
126-73-8	1.74E-09	3.8698E-09	6.56E-02	2.9826E-05	0.000345208

River Protection Project - Waste Treatment Plant

Stream Number: PJV34
Stream Name: Pulse vent HEPA discharge offgas
Run Data File: H:\Working Folder 11 (Vishal)\Emissions_Case2_Run4_SubEm\MRQ_03_054_run1_Streams.csv
Run Date / Time: 4/15/2003 - 6:40:10 AM

Stream Properties Variable	Value	Units
Density	1.14E-03	g/cm^3
Enthalpy	-7.95E+05	BTU/hr
Mass Flow	2.32E+04	Lb/hr
	5.57E+05	Lb/day
Volumetric Flow	4.08E+04	GPM
Molar Flow	8.08E+02	Lbmol/hr
Volumetric Flow	5.45E+03	ft^3/min
Molecular Weight	2.87E+01	Lb/Lbmol
Pressure	1.00E+03	mbar
Temperature	3.10E+01	C
Viscosity	1.86E-02	cP
Na Molarity	0.00E+00	mol/L
pH	N/A	pH
Total TRU	3.10E-21	Ci/L
Total Activity	2.77E-17	Ci/L

Gaseous Components (1) Component	mol/L	Lb/day	Mt/day
CO	5.18E-27	7.11E-20	3.23246E-23
CO_2	1.11E-16	2.39E-09	1.08677E-12
H_2O	4.01E-04	3.54E+03	1.610811376
NO	9.04E-44	1.33E-36	6.04215E-40
NO_2	2.85E-49	6.43E-42	2.92175E-45
N_2	3.09E-02	4.25E+05	193.0529455
O_2	8.22E-03	1.29E+05	58.61857611
SO_2	0.00E+00	0.00E+00	0
NH_3	2.22E-15	1.85E-08	8.42737E-12
HNO_3	6.22E-24	1.92E-16	8.73343E-20
HCl	1.40E-70	2.51E-63	1.14042E-66
HF	0.00E+00	0.00E+00	0

(1) All radionuclides in gaseous streams are assumed to exist as solid particulate.

Component	Aqueous Components mol/L	Lb/gal	Lb/day	Solid Components Lb/day	Total Component Lb/day	Solid Components mt/day	Total Component g/sec
Total	0.00E+00	0.00E+00	0.00E+00	6.39E-08	6.39E-08	2.90504E-11	3.36231E-10
Ag^+	0.00E+00	0.00E+00	0.00E+00	9.80E-15	9.80E-15	4.45306E-18	5.15401E-17
Al^{+3}	0.00E+00	0.00E+00	0.00E+00	2.95E-13	2.95E-13	1.34255E-16	1.55387E-15
As^{+3}	0.00E+00	0.00E+00	0.00E+00	4.17E-11	4.17E-11	1.89647E-14	2.19499E-13
B^{+3}	0.00E+00	0.00E+00	0.00E+00	9.72E-14	9.72E-14	4.42041E-17	5.11621E-16
Ba^{+2}	0.00E+00	0.00E+00	0.00E+00	6.02E-14	6.02E-14	2.73579E-17	3.16642E-16
Bi^{+3}	0.00E+00	0.00E+00	0.00E+00	3.81E-14	3.81E-14	1.73284E-17	2.0056E-16
$C_2O_4^{-2}$	0.00E+00	0.00E+00	0.00E+00	6.25E-13	6.25E-13	2.84007E-16	3.28712E-15
Ca^{+2}	0.00E+00	0.00E+00	0.00E+00	1.25E-13	1.25E-13	5.69862E-17	6.59562E-16
Cd^{+2}	0.00E+00	0.00E+00	0.00E+00	1.50E-13	1.50E-13	6.82086E-17	7.89452E-16
Ce^{+3}	0.00E+00	0.00E+00	0.00E+00	1.19E-14	1.19E-14	5.42712E-18	6.28139E-17
Cl^-	0.00E+00	0.00E+00	0.00E+00	1.16E-13	1.16E-13	5.25699E-17	6.08448E-16
CO_3^{-2}	0.00E+00	0.00E+00	0.00E+00	4.85E-13	4.85E-13	2.20656E-16	2.55389E-15
Cr^{+3}	0.00E+00	0.00E+00	0.00E+00	2.59E-14	2.59E-14	1.1751E-17	1.36007E-16
Cu^{+2}	0.00E+00	0.00E+00	0.00E+00	6.25E-15	6.25E-15	2.83929E-18	3.28622E-17
F^-	0.00E+00	0.00E+00	0.00E+00	3.14E-13	3.14E-13	1.42663E-16	1.6512E-15
Fe^{+3}	0.00E+00	0.00E+00	0.00E+00	3.73E-13	3.73E-13	1.69342E-16	1.95998E-15
H^+	0.00E+00	0.00E+00	0.00E+00		0.00E+00	0	0
H_2O	0.00E+00	0.00E+00	0.00E+00		0.00E+00	0	0
Hg^{+2}	0.00E+00	0.00E+00	0.00E+00	6.38E-08	6.38E-08	2.90216E-11	3.35898E-10
K^+	0.00E+00	0.00E+00	0.00E+00	1.92E-13	1.92E-13	8.74538E-17	1.0122E-15
La^{+3}	0.00E+00	0.00E+00	0.00E+00	3.90E-14	3.90E-14	1.77257E-17	2.05158E-16
Li^+	0.00E+00	0.00E+00	0.00E+00	9.27E-15	9.27E-15	4.21209E-18	4.87511E-17
Mg^{+2}	0.00E+00	0.00E+00	0.00E+00	2.70E-14	2.70E-14	1.22739E-17	1.42059E-16
Mn^{+3}	0.00E+00	0.00E+00	0.00E+00	9.46E-14	9.46E-14	4.30093E-17	4.97793E-16
MnO_4^-	0.00E+00	0.00E+00	0.00E+00		0.00E+00	0	0
Na^+	0.00E+00	0.00E+00	0.00E+00	6.83E-13	6.83E-13	3.10588E-16	3.59477E-15
NH_4^+	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0	0
Ni^{+2}	0.00E+00	0.00E+00	0.00E+00	3.54E-14	3.54E-14	1.609E-17	1.86227E-16
NO_2^-	0.00E+00	0.00E+00	0.00E+00	1.96E-13	1.96E-13	8.90051E-17	1.03015E-15
NO_3^-	0.00E+00	0.00E+00	0.00E+00	1.35E-12	1.35E-12	6.14445E-16	7.11163E-15
O^{-2}				1.37E-11	1.37E-11	6.20662E-15	7.18359E-14
OH^-	0.00E+00	0.00E+00	0.00E+00	1.69E-12	1.69E-12	7.69351E-16	8.90452E-15
$OH(b)^-$	0.00E+00	0.00E+00	0.00E+00		0.00E+00	0	0
P^{+5}				1.00E-20	1.00E-20	4.55546E-24	5.27252E-23
Pb^{+2}	0.00E+00	0.00E+00	0.00E+00	1.60E-14	1.60E-14	7.2551E-18	8.3971E-17
Pd^{+2}	0.00E+00	0.00E+00	0.00E+00	1.64E-15	1.64E-15	7.47302E-19	8.64933E-18
PO_4^{-3}	0.00E+00	0.00E+00	0.00E+00	2.00E-13	2.00E-13	9.07558E-17	1.05041E-15
S^{+6}				1.36E-20	1.36E-20	6.19228E-24	7.16699E-23
Si^{+4}				2.79E-13	2.79E-13	1.26776E-16	1.46732E-15
SiO_4^{-4}	0.00E+00	0.00E+00	0.00E+00		0.00E+00	0	0
SO_4^{-2}	0.00E+00	0.00E+00	0.00E+00	6.50E-14	6.50E-14	2.95389E-17	3.41885E-16
Sr^{+2}	0.00E+00	0.00E+00	0.00E+00	7.00E-15	7.00E-15	3.18282E-18	3.68381E-17
Ti^{+4}	0.00E+00	0.00E+00	0.00E+00	7.93E-14	7.93E-14	3.60667E-17	4.17438E-16
Zn^{+2}	0.00E+00	0.00E+00	0.00E+00	1.75E-14	1.75E-14	7.9758E-18	9.23125E-17
Zr^{+4}	0.00E+00	0.00E+00	0.00E+00	1.85E-13	1.85E-13	8.39647E-17	9.71814E-16

Rad.	Aqueous Rad. Components			Solids Rad. Components (1)			Total Rad. Components (1)		
Component	Ci/L	Ci/day	Lb/day	Ci/L	Ci/day	Lb/day	Ci/L	Ci/day	Lb/day
Total	0.00E+00	0.00E+00	0.00E+00	2.77E-17	6.16E-09	1.75E-11	2.77E-17	6.16E-09	1.75E-11
^{241}Am	0	0.00E+00	0.00E+00	2.30E-21	5.12E-13	3.29E-16	2.30E-21	5.12E-13	3.29E-16
^{14}C	0.00E+00	0.00E+00	0.00E+00	7.28E-20	1.62E-11	7.99E-15	7.28E-20	1.62E-11	7.99E-15
^{60}Co	0.00E+00	0.00E+00	0.00E+00	2.57E-22	5.70E-14	1.11E-19	2.57E-22	5.70E-14	1.11E-19
^{243}Cm	0.00E+00	0.00E+00	0.00E+00	7.68E-23	1.71E-14	7.44E-19	7.68E-23	1.71E-14	7.44E-19
^{244}Cm	0.00E+00	0.00E+00	0.00E+00	5.75E-23	1.28E-14	3.48E-19	5.75E-23	1.28E-14	3.48E-19
^{137}Cs	0.00E+00	0.00E+00	0.00E+00	3.06E-19	6.81E-11	1.73E-15	3.06E-19	6.81E-11	1.73E-15
^{152}Eu	0.00E+00	0.00E+00	0.00E+00	1.34E-23	2.97E-15	3.77E-20	1.34E-23	2.97E-15	3.77E-20
^{154}Eu	0.00E+00	0.00E+00	0.00E+00	1.33E-21	2.97E-13	2.42E-18	1.33E-21	2.97E-13	2.42E-18
^{155}Eu	0.00E+00	0.00E+00	0.00E+00	7.49E-22	1.66E-13	7.55E-19	7.49E-22	1.66E-13	7.55E-19
^{3}H	0.00E+00	0.00E+00	0.00E+00	2.70E-17	6.01E-09	1.38E-15	2.70E-17	6.01E-09	1.38E-15
^{129}I	0.00E+00	0.00E+00	0.00E+00	6.19E-21	1.38E-12	1.72E-11	6.19E-21	1.38E-12	1.72E-11
^{63}Ni	0.00E+00	0.00E+00	0.00E+00	1.33E-22	2.96E-14	1.15E-18	1.33E-22	2.96E-14	1.15E-18
^{237}Np	0.00E+00	0.00E+00	0.00E+00	1.89E-24	4.21E-16	1.32E-15	1.89E-24	4.21E-16	1.32E-15
^{238}Pu	0.00E+00	0.00E+00	0.00E+00	8.96E-24	1.99E-15	2.56E-19	8.96E-24	1.99E-15	2.56E-19
^{239}Pu	0.00E+00	0.00E+00	0.00E+00	7.94E-23	1.76E-14	6.27E-16	7.94E-23	1.76E-14	6.27E-16
^{240}Pu	0.00E+00	0.00E+00	0.00E+00	4.35E-24	9.68E-16	9.40E-18	4.35E-24	9.68E-16	9.40E-18
^{241}Pu	0.00E+00	0.00E+00	0.00E+00	5.63E-22	1.25E-13	2.68E-18	5.63E-22	1.25E-13	2.68E-18
^{125}Sb	0.00E+00	0.00E+00	0.00E+00	8.90E-22	1.98E-13	4.20E-19	8.90E-22	1.98E-13	4.20E-19
^{151}Sm	0.00E+00	0.00E+00	0.00E+00	2.77E-21	6.15E-13	5.15E-17	2.77E-21	6.15E-13	5.15E-17
^{126}Sn	0.00E+00	0.00E+00	0.00E+00	3.96E-24	8.81E-16	1.71E-16	3.96E-24	8.81E-16	1.71E-16
^{90}Sr	0.00E+00	0.00E+00	0.00E+00	2.73E-19	6.06E-11	9.68E-16	2.73E-19	6.06E-11	9.68E-16
^{99}Tc	0.00E+00	0.00E+00	0.00E+00	3.23E-21	7.17E-13	9.33E-14	3.23E-21	7.17E-13	9.33E-14
^{232}Th	0.00E+00	0.00E+00	0.00E+00	2.05E-26	4.57E-18	9.15E-14	2.05E-26	4.57E-18	9.15E-14
^{233}U	0.00E+00	0.00E+00	0.00E+00	3.17E-26	7.04E-18	1.61E-18	3.17E-26	7.04E-18	1.61E-18
^{234}U	0.00E+00	0.00E+00	0.00E+00	8.87E-26	1.97E-17	7.00E-18	8.87E-26	1.97E-17	7.00E-18
^{235}U	0.00E+00	0.00E+00	0.00E+00	6.59E-27	1.47E-18	1.50E-15	6.59E-27	1.47E-18	1.50E-15
^{236}U	0.00E+00	0.00E+00	0.00E+00	3.19E-27	7.09E-19	2.42E-17	3.19E-27	7.09E-19	2.42E-17
^{238}U	0.00E+00	0.00E+00	0.00E+00	5.08E-26	1.13E-17	7.41E-14	5.08E-26	1.13E-17	7.41E-14

Component	Organic Components				
(CAS)	mol/L	Lb/gal	Lb/day	Mt/day	g/sec
Total	1.17E-17	1.32E-17	1.35E-09	6.11624E-13	7.07898E-12
57-14-7	2.35E-18	1.18046E-18	6.93E-11	3.15085E-14	3.64681E-13
58-90-2	6.84E-19	1.3238E-18	7.77E-11	3.53344E-14	4.08963E-13
58-89-9	1.60E-25	3.8938E-25	2.29E-17	1.03932E-20	1.20292E-19
71-43-2	3.16E-26	2.05873E-26	1.21E-18	5.49508E-22	6.36005E-21
75-05-8	6.00E-19	2.05654E-19	1.21E-11	5.48924E-15	6.35328E-14
76-44-8	8.02E-23	2.49799E-22	1.47E-14	6.66756E-18	7.71708E-17
79-01-6	1.29E-27	1.41332E-27	8.30E-20	3.7724E-23	4.3662E-22
84-74-2	6.17E-23	1.43208E-22	8.41E-15	3.82247E-18	4.42415E-17
84-66-2	1.22E-18	2.25521E-18	1.32E-10	6.01951E-14	6.96703E-13
87-86-5	1.10E-18	2.44114E-18	1.43E-10	6.51579E-14	7.54143E-13
87-68-3	5.11E-28	1.11227E-27	6.53E-20	2.96882E-23	3.43613E-22
88-85-7	1.04E-22	2.08177E-22	1.22E-14	5.55659E-18	6.43123E-17
91-20-3	1.01E-22	1.07534E-22	6.31E-15	2.87026E-18	3.32206E-17
98-86-2	1.25E-18	1.25891E-18	7.39E-11	3.36025E-14	3.88918E-13
108-95-2	3.04E-18	2.39056E-18	1.40E-10	6.3808E-14	7.38519E-13
108-88-3	1.15E-26	8.84896E-27	5.20E-19	2.36193E-22	2.73372E-21
120-82-1	5.69E-24	8.6161E-24	5.06E-16	2.29978E-19	2.66178E-18
122-66-7	0.00E+00	0	0.00E+00	0	0
122-39-4	2.61E-19	3.68141E-19	2.16E-11	9.8263E-15	1.1373E-13
129-00-0	5.61E-23	9.46161E-23	5.56E-15	2.52546E-18	2.92299E-17
132-64-9	2.09E-20	2.93311E-20	1.72E-12	7.82896E-16	9.0613E-15
218-01-9	5.95E-23	1.1328E-22	6.65E-15	3.02362E-18	3.49956E-17
309-00-2	2.19E-25	6.66939E-25	3.92E-17	1.78017E-20	2.06038E-19
319-85-7	2.53E-25	6.14497E-25	3.61E-17	1.64019E-20	1.89837E-19
534-52-1	0.00E+00	0	0.00E+00	0	0
603-34-9	7.34E-19	1.50361E-18	8.83E-11	4.01339E-14	4.64512E-13
4170-30-3	4.86E-19	2.84002E-19	1.67E-11	7.58049E-15	8.77372E-14
10061-01-5	5.81E-25	5.38483E-25	3.16E-17	1.4373E-20	1.66354E-19
38380-08-4	1.52E-25	4.59133E-25	2.70E-17	1.2255E-20	1.41841E-19
100-21-0	1.75E-18	2.42518E-18	1.42E-10	6.47321E-14	7.49214E-13
106-93-4	4.81E-22	7.54507E-22	4.43E-14	2.0139E-17	2.33091E-16
106-97-8	0.00E+00	0	0.00E+00	0	0
106-99-0	1.51E-31	6.83391E-32	4.01E-24	1.82408E-27	2.11121E-26
108-87-2	0.00E+00	0	0.00E+00	0	0
110-54-3	0.00E+00	0	0.00E+00	0	0
110-82-7	5.74E-40	4.02878E-40	2.37E-32	1.07535E-35	1.24462E-34
111-84-2	0.00E+00	0	0.00E+00	0	0
118-74-1	1.66E-25	3.9452E-25	2.32E-17	1.05304E-20	1.2188E-19
120-12-7	2.69E-19	3.99755E-19	2.35E-11	1.06701E-14	1.23497E-13
127-18-4	5.79E-29	8.01627E-29	4.71E-21	2.13968E-24	2.47648E-23
1336-36-3	6.91E-25	1.85707E-24	1.09E-16	4.95683E-20	5.73708E-19
144-62-7	3.23E-19	2.43037E-19	1.43E-11	6.48705E-15	7.50816E-14
208-96-8	1.00E-19	1.27554E-19	7.49E-12	3.40463E-15	3.94055E-14
50-32-8	1.09E-24	2.28791E-24	1.34E-16	6.1068E-20	7.06806E-19
56-23-5	6.93E-30	8.90245E-30	5.23E-22	2.37621E-25	2.75024E-24
60-35-5	1.09E-18	5.37572E-19	3.16E-11	1.43487E-14	1.66073E-13
60-57-1	2.17E-25	6.88742E-25	4.04E-17	1.83837E-20	2.12774E-19
62-75-9	5.69E-18	3.51615E-18	2.06E-10	9.38518E-14	1.08625E-12
75-12-7	6.44E-18	2.42249E-18	1.42E-10	6.46603E-14	7.48383E-13
76-15-3	0.00E+00	0	0.00E+00	0	0
8001-35-2	2.56E-25	8.8507E-25	5.20E-17	2.3624E-20	2.73426E-19
88-89-1	9.50E-23	1.81582E-22	1.07E-14	4.84673E-18	5.60964E-17
126-73-8	1.11E-18	2.45833E-18	1.44E-10	6.5617E-14	7.59456E-13

Appendix B
Calculation: Estimation of Non-SSFM Represented Organic Emission Rates Required to Support the Integrated Emissions Baseline Report

24590-WTP-M4C-FRP-00005, Rev A

Calculation Cover Sheet

RIVER PROTECTION PROJECT-WASTE TREATMENT PLANT		JOB NO.:	24590
CALC NO.	24590-WTP-M4C-FRP-00005	GROUP	Process Operations
SUBJECT	Estimation of Non-SSFM Represented Organic Emission Rates Required to Support the Integrated Emissions Baseline Report		

CALCULATION STATUS DESIGNATION	☒ PRELIMINARY	☐ COMMITTED	☐ CONFIRMED
	☐ SUPERSEDED		☐ VOIDED

SOFTWARE APPLICATION	N/A	QAS	PROGRAM NAME	VERSION/RELEASE NO.
	☒	☐ YES ☐ NO		

Notes/Comments

Calculations were performed on a Compaq Personal Computer using the software Microsoft Excel® 97 SR-2.

First checkers, John Cook and Cuong Nguyen, checked the inputs, outputs, mathematical accuracy, and procedural compliance for the whole calculation.

Second checker, Robert Rieck, checked the inputs, format, and procedural compliance.

This calculation does not affect any structures, systems, components, or services of the WTP.

NO.	REASON FOR REVISION	TOTAL NO. OF SHEETS	LAST SHEET NO.	BY	CHECKED	APPROVED/ ACCEPTED	DATE
A	Initial Issue	102	102	E. Berrios	J. Cook/C. Nguyen/R. Rieck	O. Block	5/21/03

RECORD OF REVISIONS

Contents

1 Objective 2
2 Inputs 2
3 Background 29
4 Applicable Codes and Standards 29
5 Methodology 29
6 Assumptions 30
7 Calculations 30
7.1 Feed Rate 31
7.2 Pretreatment Vessel Vent Analysis 32
7.3 Pretreatment PJM/RFD Analysis 34
7.4 LAW Vitrification Analysis 36
7.5 HLW Vitrification Analysis 41
7.6 HLW PJM/RFD Analysis 46
8 Results and Conclusion 48
9 References 52
10 Attachments 52
Appendix A Stream Reports 53
Appendix B Calculations 76

List of Tables

Table A-1 PJV32 Stream Report 54
Table A-2 FRP14 Stream Report 56
Table A-3 PVP01 Stream Report 58
Table A-4 PJV04 Stream Report 60
Table A-5 LMP06 Stream Report 62
Table A-6 LFP06 Stream Report 64
Table A-7 RLD32 Stream Report 66
Table A-8 RLD33 Stream Report 68
Table A-9 RLD34 Stream Report 70
Table A-10 HMP06 Stream Report 72

Table A-11 HOP10 Stream Report 74
Table B-1 Feed Rate 77
Table B-2 PVP01 – Unabated Pretreatment Vessel Vent System 79
Table B-3 PVP12 – Abated Pretreatment Vessel Vent System 81
Table B-4 PJV04 – Unabated Pretreatment PJM/RFD 83
Table B-5 PJV11 - Abated Pretreatment PJM/RFD 85
Table B-6 LMP06 - Unabated LAW Melter 87
Table B-7 LVP01 – LAW Vessel Ventilation 89
Table B-8 LVP26 – Abated LAW Melter Offgas System 91
Table B-9 HMP06 – Unabated HLW Melter 93
Table B-10 HOP10 – HLW Vessel Ventilation 95
Table B-11 HOP33 – Abated HLW Melter Offgas System 97
Table B-12 PJV32 – Unabated HLW PJM/RFD 99
Table B-13 PJV34 – Abated HLW PJM/RFD 101

1 Objective

The objective of this calculation is to estimate the emission rates for all organic constituents that are not tracked through the Steady State Flowsheet Model to support the update of the *Integrated Emissions Baseline Report for the River Protection Project Waste Treatment Plant* (RPT-W375-ES00001). The estimation of the releases is based on the performance of the representative compounds that are tracked.

2 Inputs

- Organic constituent feed concentrations were obtained from Table 8 of the *RPP-WTP Waste Feed Assessment* (RPT-24590-EN00003). These concentrations are shown below in units of milligrams per liter. It should be noted that two CAS#s had to be updated as they were incorrectly represented in this reference. These are CAS# 25551-13-7 (which was represented as 2551-13-7), and 95-50-1 (which was represented as 95-55-1). This change in the CAS#s applies to all the references used as inputs in this calculation. Also the feed concentration of 1336-36-3 should read 29.4 mg/l (as shown below) instead of 0.4 mg/l due to changes in the feed concentrations in the feed vector.

Organic Constituents Feed Concentrations

CAS#	Compound	Conc mg/l	CAS#	Compound	Conc mg/l
100-21-0	p-Phthalic acid	84.8	205-99-2	Benzo(b)fluoranthene	84.8
10061-01-5	cis-1,3-Dichloropropene	18.7	206-44-0	Fluoranthene	84.8
106-93-4	Ethylene dibromide (Dibromethane)	84.8	207-08-9	Benzo(k)fluoranthene	84.8
106-97-8	Butane	18.7	2234-13-1	Octachloronaphthalene	84.8

CALCULATION SHEET

PROJECT: WTP
JOB NO.: 24590
CALC NO.: 24590-WTP-M4C-FRP-00005
SHEET REV: A
SHEET NO.: 3

BY: E. Berrios
DATE: 05/21/03

SUBJECT: Estimation of Non-SSFM Represented Organic Emission Rates Required to Support the Integrated Emissions Baseline Report

CAS#	Compound	Conc mg/l	CAS#	Compound	Conc mg/l
106-99-0	1,3-Butadiene	18.7	224-42-0	Dibenz[a,j]acridine	84.8
108-87-2	Methylcyclohexane	18.7	226-36-8	Dibenz[a,h]acridine	84.8
108-88-3	Toluene	18.7	2385-85-5	Mirex	84.8
108-95-2	Phenol	84.8	25551-13-7	Trimethyl benzene	18.7
110-54-3	n-Hexane	18.7	26140-60-3	Terphenyls	84.8
110-82-7	Cyclohexane	18.7	27154-33-2	Trichlorofluoroethane	18.7
111-84-2	n-Nonane	18.7	287-92-3	Cyclopentane	18.7
118-74-1	Hexachlorobenzene	1.8	319-84-6	Hexachlorocyclohexane (Lindane) Alpha BHC	0.3
120-12-7	Anthracene	84.8	319-86-8	Delta-BHC	0.3
120-82-1	1,2,4-Trichlorobenzene	18.7	3697-24-3	5-Methylchrysene	84.8
122-39-4	N,N-Diphenylamine	18.7	3825-26-1	Ammonium perfluorooctanoate	84.8
126-73-8	Tributyl phosphate	84.8	465-73-6	Isodrin	0.6
127-18-4	Perchloroethylene (tetrachloroethylene)	18.7	50-00-0	Formaldehyde	18.7
129-00-0	Pyrene	84.8	50-29-3	4,4-DDT	0.6
132-64-9	Dibenzofuran	84.8	53-70-3	Dibenzo(a,h)anthracene	0.1
1336-36-3	Polychlorinated biphenyls (PCBs)	29.4	540-59-0	1,2-Dichloroethylene	18.7
144-62-7	Oxalic acid	8.5	540-84-1	2,2,4-Trimethylpentane	18.7
208-96-8	Acenaphthylene	84.8	541-73-1	1,3-Dichlorobenzene	18.7
218-01-9	Chrysene	84.8	563-80-4	3-Methyl-2-butanone	18.7
309-00-2	Aldrin	1	56-49-5	3-Methylcholanthrene	84.8
319-85-7	Hexachlorocyclohexane (Lindane) Beta BHC	0.3	56-55-3	Benzo(a)anthracene	84.8
4170-30-3	2-Butenaldehyde (2-Butenal or Crotonaldehyde)	18.7	591-78-6	2-Hexanone	18.7
50-32-8	Benzo(a)pyrene	1.1	59-50-7	4-Chloro-3-methylphenol	84.8
56-23-5	Carbon tetrachloride	18.7	59-89-2	N-Nitrosomorpholine	84.8
57-14-7	1,1-Dimethylhydrazine	84.8	602-87-9	5-Nitroacenaphthene	84.8
58-89-9	gamma-BHC (Lindane)	0.3	60-29-7	Ethyl ether	84.8
58-90-2	2,3,4,6-Tetrachlorophenol	84.8	60-34-4	Methylhydrazine	18.7
603-34-9	Triphenylamine	84.8	621-64-7	Di-n-Propylnitrosamine (N-Nitroso-di-n-propylamine)	84.8
60-35-5	Acetamide	18.7	624-83-9	Methyl isocyanate	18.7
60-57-1	Dieldrin	0.6	627-13-4	Nitric acid, propyl ester	84.8
62-75-9	N-Nitroso-N,N-dimethylamine (Dimethylnitrosamine)	158.4	630-20-6	1,1,1,2-Tetrachloroethane	18.7
71-43-2	Benzene	18.7	64-17-5	Ethyl alcohol	18.7
75-05-8	Acetonitrile	26.6	64-18-6	Formic acid	84.8
75-12-7	Formamide	84.8	64-19-7	Acetic acid	84.8
76-15-3	Chloropentafluoroethane	18.7	67-56-1	Methyl alcohol (Methanol)	18.7
76-44-8	Heptachlor	1.8	67-63-0	2-Propyl alcohol (Isopropanol; Propan-2-01)	18.7
79-01-6	Trichloroethylene	18.7	67-64-1	2-Propanone (Acetone)	101.8
8001-35-2	Toxaphene	0.7	67-66-3	Chloroform	18.7
84-66-2	Diethyl phthalate	84.8	67-72-1	Hexachloroethane	84.8

CALCULATION SHEET

PROJECT: WTP
JOB NO.: 24590
CALC NO.: 24590-WTP-M4C-FRP-00005
SHEET REV: A
SHEET NO.: 4

BY: E. Berrios
DATE: 05/21/03

SUBJECT: Estimation of Non-SSFM Represented Organic Emission Rates Required to Support the Integrated Emissions Baseline Report

CAS#	Compound	Conc mg/l	CAS#	Compound	Conc mg/l
84-74-2	Dibutyl phthalate	84.8	684-16-2	Hexafluoroacetone	18.7
87-68-3	Hexachlorobutadiene	18.7	71-23-8	n-Propyl alcohol	18.7
87-86-5	Pentachlorophenol	84.8	71-36-3	n-Butyl alcohol	18.7
88-85-7	2-sec-Butyl-4,6-dinitrophenol (Dinoseb)	84.8	71-55-6	Methyl chloroform (1,1,1-Trichloroethane)	18.7
88-89-1	Picric acid	84.8	72-20-8	Endrin	0.6
91-20-3	Naphthalene	2.8	72-43-5	Methoxychlor	2.8
98-86-2	Acetophenone	84.8	72-54-8	4,4-DDD	0.6
100-00-5	p-Nitrochlorobenzene	84.8	72-55-9	4,4-DDE	0.6
100-25-4	1,4-Dinitrobenzene	84.8	74-83-9	Bromomethane (Methyl bromide)	18.7
100-41-4	Ethyl benzene	18.7	74-87-3	Chloromethane (Methyl chloride)	18.7
100-42-5	Styrene	18.7	74-97-5	Bromochloromethane	18.7
10061-02-6	trans-1,3-Dichloropropene	18.7	74-99-7	Methylacetylene	84.8
101-55-3	4-Bromophenylphenyl ether	84.8	75-00-3	Chloroethane	18.7
101-84-8	Diphenyl ether	18.7	75-01-4	Vinyl chloride (1-Chloroethene)	84.8
106-35-4	3-Heptanone	18.7	75-07-0	Acetaldehyde	84.8
106-42-3	p-Xylene (Dimethyl benzene)	18.7	75-09-2	Dichloromethane (Methylene chloride)	18.7
106-46-7	1,4-Dichlorobenzene	18.7	75-15-0	Carbon disulfide	18.7
106-88-7	1,2-Epoxybutane	18.7	75-21-8	Ethylene oxide (Oxirane)	18.7
107-02-8	Acrolein	18.7	75-27-4	Bromodichloromethane	18.7
107-05-1	3-Chloropropene (Allyl chloride)	18.7	75-34-3	1,1-Dichloroethane	18.7
107-06-2	1,2-Dichloroethane (Ethylene chloride)	18.7	75-35-4	1,1-Dichloroethene (Vinylidene chloride)	18.7
107-12-0	Propionitrile	18.7	75-43-4	Dichlorofluoromethane	18.7
107-13-1	Acrylonitrile	18.7	75-45-6	Chlorodifluoromethane	18.7
107-18-6	2-Propene-1-ol	84.8	75-50-3	Trimethylamine	18.7
107-31-3	Formic acid, methyl ester	84.8	75-52-5	Nitromethane	84.8
107-66-4	Dibutylphosphate	84.8	75-55-8	2-Methylaziridine	84.8
107-87-9	2-Pentanone	18.7	75-61-6	Difluorodibromomethane	18.7
108-03-2	1-Nitropropane	84.8	75-63-8	Trifluorobromomethane	18.7
108-05-4	Vinyl acetate	84.8	75-65-0	2-Methyl-2-propanol	18.7
108-10-1	Hexone (4-Methyl-2-pentanone or MIBK)	18.7	75-69-4	Trichlorofluoromethane	18.7
108-20-3	Bis(isopropyl)ether	18.7	75-71-8	Dichlorodifluoromethane	18.7
108-38-3	m-Xylene (Dimethyl benzene)	18.7	75-99-0	2,2-Dichloropropionic acid	84.8
108-39-4	m-Cresol	18.7	76-03-9	Trichloroacetic acid	18.7
108-90-7	Chlorobenzene	18.7	76-11-9	1,1,1,2-Tetrachloro-2,2-difluoroethane	84.8
108-93-0	Cyclohexanol	18.7	76-12-0	1,1,2,2-Tetrachloro-1,2-difluoroethane	84.8
108-94-1	Cyclohexanone	18.7	76-13-1	1,2,2-Trichloro-1,1,2-trifluoroethane (Freon 113)	18.7
109-66-0	n-Pentane	18.7	76-14-2	1,2-Dichloro-1,1,2,2-tetrafluoroethane	18.7
109-99-9	Tetrahydrofuran	39.6	78-83-1	2-Methylpropyl alcohol (Isobutyl alcohol)	84.8
110-12-3	5-Methyl-2-hexanone	18.7	78-87-5	1,2-Dichloropropane	18.7
110-43-0	2-Heptanone	18.7	78-92-2	1-Methylpropyl alcohol (2-Butanol)	18.7
110-62-3	n-Valeraldehyde	84.8	78-93-3	Methyl ethyl ketone (MEK, 2-Butanone)	18.7
110-83-8	Cyclohexene	18.7	79-00-5	1,1,2-Trichloroethane	18.7

CALCULATION SHEET

PROJECT: WTP
JOB NO.: 24590
CALC NO.: 24590-WTP-M4C-FRP-00005
SHEET REV: A
SHEET NO.: 5

BY: E. Berrios
DATE: 05/21/03

SUBJECT: Estimation of Non-SSFM Represented Organic Emission Rates Required to Support the Integrated Emissions Baseline Report

CAS#	Compound	Conc mg/l	CAS#	Compound	Conc mg/l
110-86-1	Pyridine	84.8	79-09-4	Propionic acid	84.8
111-65-9	n-Octane	18.7	79-10-7	2-Propenoic acid	84.8
111-76-2	Ethylene glycol monobutyl ether	84.8	79-20-9	Methyl acetate	84.8
117-81-7	Bis(2-ethylhexyl)phthalate (DEHP)	84.8	79-34-5	1,1,2,2-Tetrachloroethane	18.7
117-84-0	n-Dioctyl phthalate	84.8	82-68-8	Pentachloronitrobenzene (PCBN or quintobenzene)	84.8
120-83-2	2,4-Dichlorophenol	84.8	83-32-9	Acenaphthene	84.8
121-44-8	Triethylamine	18.7	85-01-8	Phenanthrene	84.8
121-69-7	Dimethylaniline	18.7	85-68-7	Butylbenzyl phthalate	84.8
123-19-3	4-Heptanone	18.7	86-73-7	Fluorene	84.8
123-38-6	n-Propionaldehyde	18.7	88-06-2	2,4,6-Trichlorophenol	84.8
123-51-3	3-Methyl-1-butanol	18.7	88-72-2	2-Nitrotoluene	18.7
123-86-4	Acetic acid n-butyl ester	84.8	88-75-5	2-Nitrophenol	84.8
123-91-1	1,4-Dioxane	50.9	91-22-5	Quinoline	84.8
126-98-7	2-Methyl-2-propenenitrile (Methacrylonitrile)	18.7	91-58-7	2-Chloronapthalene	84.8
127-19-5	N,N-Dimethylacetamide	18.7	92-52-4	1,1`-Biphenyl	84.8
128-37-0	2,6-Bis(tert-butyl)-4-methylphenol	84.8	92-93-3	4-Nitrobiphenyl	84.8
1321-64-8	Pentachloronaphthalene	84.8	93-72-1	Silvex (2,4,5-TP)	84.8
1321-65-9	Trichloronaphthalene	84.8	93-76-5	2,4,5-T	84.8
1335-87-1	Hexachloronaphthalene	84.8	94-75-7	2,4-D and esters (160C typed)	84.8
1335-88-2	Tetrachloronaphthalene	84.8	95-13-6	Indene	84.8
141-78-6	Acetic acid ethyl ester (Ethyl acetate)	84.8	95-47-6	o-Xylene	18.7
141-79-7	4-Methyl-3-penten-2-one	84.8	95-48-7	o-Cresol (2-Methylphenol)	18.7
142-82-5	n-Heptane	18.7	95-49-8	2-Chlorotoluene	84.8
156-60-5	trans-1,2-Dichloroethylene	18.7	95-50-1	o-Dichlorobenzene (1,2-Dichlorobenzene)	18.7
1582-09-8	Trifluralin	84.8	95-57-8	2-Chlorophenol	84.8
1634-04-4	Methyl tert-butyl ether	18.7	95-95-4	2,4,5-Trichlorophenol	84.8
1836-75-5	Nitrofen	84.8	96-18-4	1,2,3-Trichloropropane	1.1
189-55-9	Dibenzo[a,i]pyrene	84.8	96-22-0	3-Pentanone	18.7
189-64-0	Dibenzo[a,h]pyrene	84.8	96-69-5	Bis(3-tert-butyl-4-hydroxy-6-methyl-phenyl)sulfide	84.8
191-24-2	Benzo(g,h,i)perylene	84.8	98-51-1	p-tert-Butyltoluene	84.8
191-30-0	Benzo[a,i]pyrene	84.8	98-82-8	Cumene	84.8
192-65-4	Dibenzo[a,e]pyrene	84.8	98-83-9	alpha-Methylstyrene	18.7
193-39-5	Indeno(1,2,3-cd)pyrene	84.8	98-95-3	Nitrobenzene	84.8
205-82-3	Benzo(j)fluoranthene	84.8			

- Constituents were separated into groups based on similar physical and chemical characteristics and expected behavior throughout the flowsheet. The constituents and their respected group numbers are presented below along with the phase that they are expected to be in the offgas. The constituents with an "X" under the Modeled column indicate the constituents that were included in the flowsheet. This data was obtained from the *Integrated Emissions Baseline Report for the River Protection Project Waste Treatment Plant* (RPT-W375-

ES00001), Table 4. There has been some updates to phases and they are reflected on this input table and all other pertaining tables. These updates were obtained from the memorandum titled *Phase Determination for COPCs Potentially Emitted from the Hanford Tank Waste Treatment and Immobilization Plant (WTP)* (CCN# 057415).

Organic Constituents Grouping

CAS#	Compound	Group	Modeled	Phase
100-00-5	p-Nitrochlorobenzene	10		vapor
100-21-0	p-Phthalic acid	1	X	vapor
100-25-4	1,4-Dinitrobenzene	6		particle
100-41-4	Ethyl benzene	20		vapor
100-42-5	Styrene	19		vapor
10061-01-5	cis-1,3-Dichloropropene	19	X	vapor
10061-02-6	trans-1,3-Dichloropropene	17		vapor
101-55-3	4-Bromophenylphenyl ether	14		vapor
101-84-8	Diphenyl ether	16		vapor
106-35-4	3-Heptanone	14		vapor
106-42-3	p-Xylene (Dimethyl benzene)	19		vapor
106-46-7	1,4-Dichlorobenzene	18		vapor
106-88-7	1,2-Epoxybutane	15		vapor
106-93-4	Ethylene dibromide (Dibromethane)	16	X	vapor
106-97-8	Butane	26	X	vapor
106-99-0	1,3-Butadiene	23	X	vapor
107-02-8	Acrolein	14		vapor
107-05-1	3-Chloropropene (Allyl chloride)	20		vapor
107-06-2	1,2-Dichloroethane (Ethylene chloride)	17		vapor
107-12-0	Propionitrile	13		vapor
107-13-1	Acrylonitrile	14		vapor
107-18-6	2-Propene-1-ol	10		vapor
107-31-3	Formic acid, methyl ester	15		vapor
107-66-4	Dibutylphosphate	5		particle
107-87-9	2-Pentanone	14		vapor
108-03-2	1-Nitropropane	14		vapor
108-05-4	Vinyl acetate	16		vapor
108-10-1	Hexone (4-Methyl-2-pentanone or MIBK)	14		vapor
108-20-3	Bis(isopropyl)ether	18		vapor
108-38-3	m-Xylene (Dimethyl benzene)	19		vapor
108-39-4	m-Cresol	9		vapor
108-87-2	Methylcyclohexane	25	X	vapor
108-88-3	Toluene	19	X	vapor
108-90-7	Chlorobenzene	19		vapor
108-93-0	Cyclohexanol	10		vapor
108-94-1	Cyclohexanone	11		vapor
108-95-2	Phenol	8	X	vapor
109-66-0	n-Pentane	26		vapor
109-99-9	Tetrahydrofuran	13		vapor
110-12-3	5-Methyl-2-hexanone	15		vapor

CALCULATION SHEET

PROJECT: WTP
JOB NO.: 24590
CALC NO.: 24590-WTP-M4C-FRP-00005
SHEET REV: A
SHEET NO.: 7

BY: E. Berrios
DATE: 05/21/03

SUBJECT: Estimation of Non-SSFM Represented Organic Emission Rates Required to Support the Integrated Emissions Baseline Report

CAS#	Compound	Group	Modeled	Phase
110-43-0	2-Heptanone	15		vapor
110-54-3	n-Hexane	27	X	vapor
110-62-3	n-Valeraldehyde	15		vapor
110-82-7	Cyclohexane	24	X	vapor
110-83-8	Cyclohexene	22		vapor
110-86-1	Pyridine	11		vapor
111-65-9	n-Octane	28		vapor
111-76-2	Ethylene glycol monobutyl ether	9		vapor
111-84-2	n-Nonane	28	X	vapor
117-81-7	Bis(2-ethylhexyl)phthalate (DEHP)	30		particle
117-84-0	n-Dioctyl phthalate	32		particle
118-74-1	Hexachlorobenzene	18	X	vapor
120-12-7	Anthracene	13	X	vapor
120-82-1	1,2,4-Trichlorobenzene	17	X	vapor
120-83-2	2,4-Dichlorophenol	10		vapor
121-44-8	Triethylamine	15		vapor
121-69-7	Dimethylaniline	13		vapor
122-39-4	N,N-Diphenylamine	10	X	vapor
123-19-3	4-Heptanone	13		vapor
123-38-6	n-Propionaldehyde	14		vapor
123-51-3	3-Methyl-1-butanol	12		vapor
123-86-4	Acetic acid n-butyl ester	16		vapor
123-91-1	1,4-Dioxane	10		vapor
126-73-8	Tributyl phosphate	7	X	vapor
126-98-7	2-Methyl-2-propenenitrile (Methacrylonitrile)	16		vapor
127-18-4	Perchloroethylene (tetrachloroethylene)	21	X	vapor
127-19-5	N,N-Dimethylacetamide	5		vapor
128-37-0	2,6-Bis(tert-butyl)-4-methylphenol	32		vapor
129-00-0	Pyrene	33	X	particle
1321-64-8	Pentachloronaphthalene	14		particle
1321-65-9	Trichloronaphthalene	15		vapor
132-64-9	Dibenzofuran	15	X	vapor
1335-87-1	Hexachloronaphthalene	14		particle
1335-88-2	Tetrachloronaphthalene	15		particle
1336-36-3	Polychlorinated biphenyls (PCBs)	35	X	particle
141-78-6	Acetic acid ethyl ester (Ethyl acetate)	14		vapor
141-79-7	4-Methyl-3-penten-2-one	13		vapor
142-82-5	n-Heptane	27		vapor
144-62-7	Oxalic acid	3	X	vapor
156-60-5	trans-1,2-Dichloroethylene	20		vapor
1582-09-8	Trifluralin	14		particle
1634-04-4	Methyl tert-butyl ether	16		vapor
1836-75-5	Nitrofen	30		particle
189-55-9	Dibenzo[a,i]pyrene	5		particle
189-64-0	Dibenzo[a,h]pyrene	5		particle

CALCULATION SHEET

PROJECT: WTP
JOB NO.: 24590
CALC NO.: 24590-WTP-M4C-FRP-00005
SHEET REV: A
SHEET NO.: 8

BY: E. Berrios
DATE: 05/21/03

SUBJECT: Estimation of Non-SSFM Represented Organic Emission Rates Required to Support the Integrated Emissions Baseline Report

CAS#	Compound	Group	Modeled	Phase
191-24-2	Benzo(g,h,i)perylene	30		particle
191-30-0	Benzo[a,i]pyrene	5		particle
192-65-4	Dibenzo[a,e]pyrene	5		particle
193-39-5	Indeno(1,2,3-cd)pyrene	30		particle
205-82-3	Benzo(j)fluoranthene	7		particle
205-99-2	Benzo(b)fluoranthene	30		particle
206-44-0	Fluoranthene	33		particle
207-08-9	Benzo(k)fluoranthene	30		particle
208-96-8	Acenaphthylene	14	X	vapor
218-01-9	Chrysene	32	X	particle
2234-13-1	Octachloronaphthalene	14		particle
224-42-0	Dibenz[a,j]acridine	4		particle
226-36-8	Dibenz[a,h]acridine	4		particle
2385-85-5	Mirex	17		vapor
25551-13-7	Trimethyl benzene	19		vapor
26140-60-3	Terphenyls	34		particle
27154-33-2	Trichlorofluoroethane	23		vapor
287-92-3	Cyclopentane	24		vapor
309-00-2	Aldrin	34	X	particle
319-84-6	Hexachlorocyclohexane (Lindane) Alpha BHC	33		vapor
319-85-7	Hexachlorocyclohexane (Lindane) Beta BHC	30	X	particle
319-86-8	Delta-BHC	30		particle
3697-24-3	5-Methylchrysene	32		particle
3825-26-1	Ammonium perfluorooctanoate	14		particle
4170-30-3	2-Butenaldehyde (2-Butenal or Crotonaldehyde)	11	X	vapor
465-73-6	Isodrin	35		vapor
50-00-0	Formaldehyde	8		vapor
50-29-3	4,4-DDT	33		particle
50-32-8	Benzo(a)pyrene	30	X	particle
53-70-3	Dibenzo(a,h)anthracene	7		particle
540-59-0	1,2-Dichloroethylene	19		vapor
540-84-1	2,2,4-Trimethylpentane	28		vapor
541-73-1	1,3-Dichlorobenzene	19		vapor
56-23-5	Carbon tetrachloride	22	X	vapor
563-80-4	3-Methyl-2-butanone	14		vapor
56-49-5	3-Methylcholanthrene	28		particle
56-55-3	Benzo(a)anthracene	33		particle
57-14-7	1,1-Dimethylhydrazine	12	X	vapor
58-89-9	gamma-BHC (Lindane)	32	X	particle
58-90-2	2,3,4,6-Tetrachlorophenol	11	X	vapor
591-78-6	2-Hexanone	14		vapor
59-50-7	4-Chloro-3-methylphenol	32		particle
59-89-2	N-Nitrosomorpholine	6		vapor
602-87-9	5-Nitroacenaphthene	9		particle
60-29-7	Ethyl ether	17		vapor

CALCULATION SHEET

PROJECT: WTP
JOB NO.: 24590
CALC NO.: 24590-WTP-M4C-FRP-00005
SHEET REV: A
SHEET NO.: 9

BY: E. Berrios
DATE: 05/21/03

SUBJECT: Estimation of Non-SSFM Represented Organic Emission Rates Required to Support the Integrated Emissions Baseline Report

CAS#	Compound	Group	Modeled	Phase
603-34-9	Triphenylamine	32	X	vapor
60-34-4	Methylhydrazine	10		vapor
60-35-5	Acetamide	5	X	vapor
60-57-1	Dieldrin	33	X	particle
621-64-7	Di-n-Propylnitrosamine (N-Nitroso-di-n-propylamine)	10		vapor
624-83-9	Methyl isocyanate	17		vapor
627-13-4	Nitric acid, propyl ester	17		vapor
62-75-9	N-Nitroso-N,N-dimethylamine (Dimethylnitrosamine)	9	X	vapor
630-20-6	1,1,1,2-Tetrachloroethane	18		vapor
64-17-5	Ethyl alcohol	10		vapor
64-18-6	Formic acid	7		vapor
64-19-7	Acetic acid	6		vapor
67-56-1	Methyl alcohol (Methanol)	10		vapor
67-63-0	2-Propyl alcohol (Isopropanol; Propan-2-01)	11		vapor
67-64-1	2-Propanone (Acetone)	13		vapor
67-66-3	Chloroform	19		vapor
67-72-1	Hexachloroethane	19		vapor
684-16-2	Hexafluoroacetone	19		vapor
71-23-8	n-Propyl alcohol	11		vapor
71-36-3	n-Butyl alcohol	11		vapor
71-43-2	Benzene	19	X	vapor
71-55-6	Methyl chloroform (1,1,1-Trichloroethane)	21		vapor
72-20-8	Endrin	32		particle
72-43-5	Methoxychlor	7		particle
72-54-8	4,4-DDD	32		particle
72-55-9	4,4-DDE	34		particle
74-83-9	Bromomethane (Methyl bromide)	19		vapor
74-87-3	Chloromethane (Methyl chloride)	20		vapor
74-97-5	Bromochloromethane	17		vapor
74-99-7	Methylacetylene	20		vapor
75-00-3	Chloroethane	20		vapor
75-01-4	Vinyl chloride (1-Chloroethene)	22		vapor
75-05-8	Acetonitrile	13	X	vapor
75-07-0	Acetaldehyde	13		vapor
75-09-2	Dichloromethane (Methylene chloride)	19		vapor
75-12-7	Formamide	4	X	vapor
75-15-0	Carbon disulfide	20		vapor
75-21-8	Ethylene oxide (Oxirane)	15		vapor
75-27-4	Bromodichloromethane	18		vapor
75-34-3	1,1-Dichloroethane	19		vapor
75-35-4	1,1-Dichloroethene (Vinylidene chloride)	22		vapor
75-43-4	Dichlorofluoromethane	20		vapor
75-45-6	Chlorodifluoromethane	22		vapor
75-50-3	Trimethylamine	14		vapor

CALCULATION SHEET

PROJECT: WTP
JOB NO.: 24590
CALC NO.: 24590-WTP-M4C-FRP-00005
SHEET REV: A
SHEET NO.: 10

BY: E. Berrios
DATE: 05/21/03

SUBJECT: Estimation of Non-SSFM Represented Organic Emission Rates Required to Support the Integrated Emissions Baseline Report

CAS#	Compound	Group	Modeled	Phase
75-52-5	Nitromethane	13		vapor
75-55-8	2-Methylaziridine	11		vapor
75-61-6	Difluorodibromomethane	22		vapor
75-63-8	Trifluorobromomethane	25		vapor
75-65-0	2-Methyl-2-propanol	11		vapor
75-69-4	Trichlorofluoromethane	23		vapor
75-71-8	Dichlorodifluoromethane	25		vapor
75-99-0	2,2-Dichloropropionic acid	6		vapor
76-03-9	Trichloroacetic acid	5		vapor
76-11-9	1,1,1,2-Tetrachloro-2,2-difluoroethane	24		vapor
76-12-0	1,1,2,2-Tetrachloro-1,2-difluoroethane	23		vapor
76-13-1	1,2,2-Trichloro-1,1,2-trifluoroethane (Freon 113)	25		vapor
76-14-2	1,2-Dichloro-1,1,2,2-tetrafluoroethane	28		vapor
76-15-3	Chloropentafluoroethane	29	X	vapor
76-44-8	Heptachlor	16	X	vapor
78-83-1	2-Methylpropyl alcohol (Isobutyl alcohol)	11		vapor
78-87-5	1,2-Dichloropropane	19		vapor
78-92-2	1-Methylpropyl alcohol (2-Butanol)	11		vapor
78-93-3	Methyl ethyl ketone (MEK, 2-Butanone)	13		vapor
79-00-5	1,1,2-Trichloroethane	17		vapor
79-01-6	Trichloroethylene	20	X	vapor
79-09-4	Propionic acid	8		vapor
79-10-7	2-Propenoic acid	8		vapor
79-20-9	Methyl acetate	14		vapor
79-34-5	1,1,2,2-Tetrachloroethane	16		vapor
8001-35-2	Toxaphene	10	X	particle
82-68-8	Pentachloronitrobenzene (PCBN or quintobenzene)	13		vapor
83-32-9	Acenaphthene	15		vapor
84-66-2	Diethyl phthalate	8	X	vapor
84-74-2	Dibutyl phthalate	31	X	particle
85-01-8	Phenanthrene	13		vapor
85-68-7	Butylbenzyl phthalate	31		particle
86-73-7	Fluorene	14		particle
87-68-3	Hexachlorobutadiene	20	X	vapor
87-86-5	Pentachlorophenol	6	X	vapor
88-06-2	2,4,6-Trichlorophenol	10		vapor
88-72-2	2-Nitrotoluene	12		vapor
88-75-5	2-Nitrophenol	12		vapor
88-85-7	2-sec-Butyl-4,6-dinitrophenol (Dinoseb)	8	X	particle
88-89-1	Picric acid	2	X	particle
91-20-3	Naphthalene	16	X	vapor
91-22-5	Quinoline	9		vapor
91-58-7	2-Chloronapthalene	16		vapor
92-52-4	1,1`-Biphenyl	16		vapor
92-93-3	4-Nitrobiphenyl	10		particle

CAS#	Compound	Group	Modeled	Phase
93-72-1	Silvex (2,4,5-TP)	5		particle
93-76-5	2,4,5-T	5		particle
94-75-7	2,4-D and esters (160C typed)	6		vapor
95-13-6	Indene	18		vapor
95-47-6	o-Xylene	19		vapor
95-48-7	o-Cresol (2-Methylphenol)	9		vapor
95-49-8	2-Chlorotoluene	19		vapor
95-50-1	o-Dichlorobenzene (1,2-Dichlorobenzene)	18		vapor
95-57-8	2-Chlorophenol	11		vapor
95-95-4	2,4,5-Trichlorophenol	9		vapor
96-22-0	3-Pentanone	14		vapor
96-69-5	Bis(3-tert-butyl-4-hydroxy-6-methyl-phenyl)sulfide	19		particle
98-51-1	p-tert-Butyltoluene	21		vapor
98-82-8	Cumene	20		vapor
98-83-9	alpha-Methylstyrene	19		vapor
98-86-2	Acetophenone	11	X	vapor
98-95-3	Nitrobenzene	12		vapor

- Each organic constituent has a specific removal efficiency (i.e. decontamination factor - DF) that has been specified by engineering calculations and Research and Technology testing results. The DFs applied in this calculation are presented below, per facility and unit operation, and are based on the *Updated Basis for the WTP Emissions Profile* (CCN# 044663 and CCN# 053500). For the DFs in the PT HEME and PT Caustic Scrubber, the particle bound constituents are expected to be removed with the same efficiency as any other particulate. Vapor constituents are not expected to be removed. Thus for these two unit operations, the DFs presented in Table 2.13-4 of the *Flowsheet Bases, Assumptions, and Requirements* (24590-WTP-RPT-PT-02-005) are used. For the HEPA filters, the DF is based on the specified value in the *Best Available Radionuclide Control Technology Analysis for the WTP* (24590-WTP-RPT-ENV-01-004). This DF is applied to all particle-bound constituents and it is set at 200,000 (2,000 x 100).

CALCULATION SHEET

PROJECT: WTP
JOB NO.: 24590
CALC NO.: 24590-WTP-M4C-FRP-00005
SHEET REV: A
SHEET NO.: 12

BY: E. Berrios
DATE: 05/21/03

SUBJECT: Estimation of Non-SSFM Represented Organic Emission Rates Required to Support the Integrated Emissions Baseline Report

Pretreatment Facility Organic Constituents DFs per Unit Operation

CAS Registry Number	Phase	PT HEME	PT Thermal Oxidizer	PT Caustic Scrubber	PT Carbon Bed Adsorber	PT PJV Demister	All HEPAs (First)	All HEPAs (Second)
100-00-5	vapor	1	10000	1	5	1	1	1
100-21-0	vapor	1	20	1	50	1	1	1
100-25-4	particle-bound	200	10000	3.3	5	5	2000	100
100-41-4	vapor	1	10000	1	1	1	1	1
100-42-5	vapor	1	10000	1	1	1	1	1
10061-01-5	vapor	1	100	1	1	1	1	1
10061-02-6	vapor	1	50	1	1	1	1	1
101-55-3	vapor	1	3.333333	1	50	1	1	1
101-84-8	vapor	1	50	1	5	1	1	1
106-35-4	vapor	1	10000	1	1	1	1	1
106-42-3	vapor	1	1000	1	1	1	1	1
106-46-7	vapor	1	50	1	2	1	1	1
106-88-7	vapor	1	10000	1	1	1	1	1
106-93-4	vapor	1	1	1	10	1	1	1
106-97-8	vapor	1	10000	1	1	1	1	1
106-99-0	vapor	1	10000	1	1	1	1	1
107-02-8	vapor	1	10000	1	1	1	1	1
107-05-1	vapor	1	10000	1	1	1	1	1
107-06-2	vapor	1	10000	1	1	1	1	1
107-12-0	vapor	1	10000	1	1	1	1	1
107-13-1	vapor	1	10000	1	1	1	1	1
107-18-6	vapor	1	10000	1	1	1	1	1
107-31-3	vapor	1	10000	1	1	1	1	1
107-66-4	particle-bound	200	10000	3.3	1	5	2000	100
107-87-9	vapor	1	10000	1	1	1	1	1
108-03-2	vapor	1	10000	1	1	1	1	1
108-05-4	vapor	1	10000	1	1	1	1	1
108-10-1	vapor	1	10000	1	1	1	1	1

CALCULATION SHEET

PROJECT: WTP
JOB NO.: 24590
CALC NO.: 24590-WTP-M4C-FRP-00005
SHEET REV: A
SHEET NO.: 13

BY: E. Berrios
DATE: 05/21/03

SUBJECT: Estimation of Non-SSFM Represented Organic Emission Rates Required to Support the Integrated Emissions Baseline Report

Pretreatment Facility Organic Constituents DFs per Unit Operation

CAS Registry Number	Phase	PT HEME	PT Thermal Oxidizer	PT Caustic Scrubber	PT Carbon Bed Adsorber	PT PJV Demister	All HEPAs (First)	All HEPAs (Second)
108-20-3	vapor	1	10000	1	1	1	1	1
108-38-3	vapor	1	1000	1	1	1	1	1
108-39-4	vapor	1	1000	1	2	1	1	1
108-87-2	vapor	1	10000	1	1	1	1	1
108-88-3	vapor	1	10000	1	1	1	1	1
108-90-7	vapor	1	20	1	5	1	1	1
108-93-0	vapor	1	10000	1	2	1	1	1
108-94-1	vapor	1	10000	1	2	1	1	1
108-95-2	vapor	1	10	1	20	1	1	1
109-66-0	vapor	1	10000	1	1	1	1	1
109-99-9	vapor	1	10000	1	1	1	1	1
110-12-3	vapor	1	10000	1	1	1	1	1
110-43-0	vapor	1	10000	1	1	1	1	1
110-54-3	vapor	1	10000	1	1	1	1	1
110-62-3	vapor	1	10000	1	1	1	1	1
110-82-7	vapor	1	10000	1	1	1	1	1
110-83-8	vapor	1	10000	1	1	1	1	1
110-86-1	vapor	1	10000	1	1	1	1	1
111-65-9	vapor	1	10000	1	1	1	1	1
111-76-2	vapor	1	10000	1	2	1	1	1
111-84-2	vapor	1	10000	1	2	1	1	1
117-81-7	particle-bound	200	10000	3.3	5	5	2000	100
117-84-0	particle-bound	200	10000	3.3	5	5	2000	100
118-74-1	vapor	1	3.333333	1	50	1	1	1
120-12-7	vapor	1	1000	1	5	1	1	1
120-82-1	vapor	1	100	1	5	1	1	1
120-83-2	vapor	1	3.333333	1	50	1	1	1
121-44-8	vapor	1	10000	1	1	1	1	1
121-69-7	vapor	1	10000	1	2	1	1	1

CALCULATION SHEET

PROJECT: WTP
JOB NO.: 24590
CALC NO.: 24590-WTP-M4C-FRP-00005
SHEET REV: A
SHEET NO.: 14

BY: E. Berrios
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SUBJECT: Estimation of Non-SSFM Represented Organic Emission Rates Required to Support the Integrated Emissions Baseline Report

Pretreatment Facility Organic Constituents DFs per Unit Operation

CAS Registry Number	Phase	PT HEME	PT Thermal Oxidizer	PT Caustic Scrubber	PT Carbon Bed Adsorber	PT PJV Demister	All HEPAs (First)	All HEPAs (Second)
122-39-4	vapor	1	50	1	5	1	1	1
123-19-3	vapor	1	10000	1	1	1	1	1
123-38-6	vapor	1	10000	1	1	1	1	1
123-51-3	vapor	1	10000	1	1	1	1	1
123-86-4	vapor	1	10000	1	1	1	1	1
123-91-1	vapor	1	10000	1	1	1	1	1
126-73-8	vapor	1	10000	1	5	1	1	1
126-98-7	vapor	1	10000	1	1	1	1	1
127-18-4	vapor	1	1	1	10	1	1	1
127-19-5	vapor	1	10000	1	2	1	1	1
128-37-0	vapor	1	10000	1	5	1	1	1
129-00-0	particle-bound	200	3.333333	3.3	50	5	2000	100
1321-64-8	particle-bound	200	3.333333	3.3	50	5	2000	100
1321-65-9	vapor	1	3.333333	1	50	1	1	1
132-64-9	vapor	1	3.333333	1	50	1	1	1
1335-87-1	particle-bound	200	3.333333	3.3	50	5	2000	100
1335-88-2	particle-bound	200	3.333333	3.3	50	5	2000	100
1336-36-3	particle-bound	200	3.333333	3.3	50	5	2000	100
141-78-6	vapor	1	10000	1	1	1	1	1
141-79-7	vapor	1	10000	1	1	1	1	1
142-82-5	vapor	1	10000	1	1	1	1	1
144-62-7	vapor	1	10	1	20	1	1	1
156-60-5	vapor	1	10000	1	1	1	1	1
1582-09-8	particle-bound	200	10000	3.3	1	5	2000	100
1634-04-4	vapor	1	10000	1	1	1	1	1
1836-75-5	particle-bound	200	3.333333	3.3	50	5	2000	100
189-55-9	particle-bound	200	3.333333	3.3	50	5	2000	100
189-64-0	particle-bound	200	3.333333	3.3	50	5	2000	100
191-24-2	particle-bound	200	3.333333	3.3	50	5	2000	100

CALCULATION SHEET

PROJECT: WTP
JOB NO.: 24590
CALC NO.: 24590-WTP-M4C-FRP-00005
SHEET REV: A
SHEET NO.: 15

BY: E. Berrios
DATE: 05/21/03

SUBJECT: Estimation of Non-SSFM Represented Organic Emission Rates Required to Support the Integrated Emissions Baseline Report

Pretreatment Facility Organic Constituents DFs per Unit Operation

CAS Registry Number	Phase	PT HEME	PT Thermal Oxidizer	PT Caustic Scrubber	PT Carbon Bed Adsorber	PT PJV Demister	All HEPAs (First)	All HEPAs (Second)
191-30-0	particle	200	3.333333	3.3	50	5	2000	100
192-65-4	particle	200	3.333333	3.3	50	5	2000	100
193-39-5	particle	200	3.333333	3.3	50	5	2000	100
205-82-3	particle-bound	200	3.333333	3.3	50	5	2000	100
205-99-2	particle-bound	200	3.333333	3.3	50	5	2000	100
206-44-0	particle-bound	200	3.333333	3.3	50	5	2000	100
207-08-9	particle-bound	200	3.333333	3.3	50	5	2000	100
208-96-8	vapor	1	3.333333	1	50	1	1	1
218-01-9	particle-bound	200	3.333333	3.3	50	5	2000	100
2234-13-1	particle-bound	200	3.333333	3.3	50	5	2000	100
224-42-0	particle-bound	200	3.333333	3.3	50	5	2000	100
226-36-8	particle-bound	200	3.333333	3.3	50	5	2000	100
2385-85-5	vapor	1	3.333333	1	50	1	1	1
25551-13-7	vapor	1	1000	1	2	1	1	1
26140-60-3	particle-bound	200	3.333333	3.3	50	5	2000	100
27154-33-2	vapor	1	1	1	10	1	1	1
287-92-3	vapor	1	10000	1	1	1	1	1
309-00-2	particle-bound	200	3.333333	3.3	10	5	2000	100
319-84-6	vapor	1	3.333333	1	50	1	1	1
319-85-7	particle-bound	200	3.333333	3.3	50	5	2000	100
319-86-8	particle-bound	200	3.333333	3.3	50	5	2000	100
3697-24-3	particle-bound	200	3.333333	3.3	50	5	2000	100
3825-26-1	particle-bound	200	3.333333	3.3	50	5	2000	100
4170-30-3	vapor	1	10000	1	1	1	1	1
465-73-6	vapor	1	3.333333	1	50	1	1	1
50-00-0	vapor	1	10000	1	1	1	1	1
50-29-3	particle-bound	200	3.333333	3.3	50	5	2000	100
50-32-8	particle-bound	200	3.333333	3.3	50	5	2000	100
53-70-3	particle	200	3.333333	3.3	50	5	2000	100

CALCULATION SHEET

PROJECT: WTP
JOB NO.: 24590
CALC NO.: 24590-WTP-M4C-FRP-00005
SHEET REV: A
SHEET NO.: 16

BY: E. Berrios
DATE: 05/21/03

SUBJECT: Estimation of Non-SSFM Represented Organic Emission Rates Required to Support the Integrated Emissions Baseline Report

Pretreatment Facility Organic Constituents DFs per Unit Operation

CAS Registry Number	Phase	PT HEME	PT Thermal Oxidizer	PT Caustic Scrubber	PT Carbon Bed Adsorber	PT PJV Demister	All HEPAs (First)	All HEPAs (Second)
540-59-0	vapor	1	10000	1	1	1	1	1
540-84-1	vapor	1	10000	1	1	1	1	1
541-73-1	vapor	1	50	1	2	1	1	1
56-23-5	vapor	1	1	1	5	1	1	1
563-80-4	vapor	1	10000	1	1	1	1	1
56-49-5	particle-bound	200	3.333333	3.3	50	5	2000	100
56-55-3	particle-bound	200	3.333333	3.3	50	5	2000	100
57-14-7	vapor	1	10000	1	1	1	1	1
58-89-9	particle-bound	200	3.333333	3.3	50	5	2000	100
58-90-2	vapor	1	3.333333	1	10	1	1	1
591-78-6	vapor	1	1000	1	1	1	1	1
59-50-7	particle-bound	200	3.333333	3.3	20	5	2000	100
59-89-2	vapor	1	10000	1	2	1	1	1
602-87-9	particle-bound	200	3.333333	3.3	50	5	2000	100
60-29-7	vapor	1	10000	1	1	1	1	1
603-34-9	vapor	1	3.333333	1	50	1	1	1
60-34-4	vapor	1	10000	1	1	1	1	1
60-35-5	vapor	1	10000	1	2	1	1	1
60-57-1	particle-bound	200	3.333333	3.3	50	5	2000	100
621-64-7	vapor	1	10000	1	2	1	1	1
624-83-9	vapor	1	1000	1	1	1	1	1
627-13-4	vapor	1	10000	1	1	1	1	1
62-75-9	vapor	1	10000	1	2	1	1	1
630-20-6	vapor	1	1	1	10	1	1	1
64-17-5	vapor	1	10000	1	1	1	1	1
64-18-6	vapor	1	10000	1	1	1	1	1
64-19-7	vapor	1	10000	1	1	1	1	1
67-56-1	vapor	1	10000	1	1	1	1	1
67-63-0	vapor	1	10000	1	1	1	1	1

CALCULATION SHEET

PROJECT: WTP
JOB NO.: 24590
CALC NO.: 24590-WTP-M4C-FRP-00005
SHEET REV: A
SHEET NO.: 17

BY: E. Berrios
DATE: 05/21/03

SUBJECT: Estimation of Non-SSFM Represented Organic Emission Rates Required to Support the Integrated Emissions Baseline Report

Pretreatment Facility Organic Constituents DFs per Unit Operation

CAS Registry Number	Phase	PT HEME	PT Thermal Oxidizer	PT Caustic Scrubber	PT Carbon Bed Adsorber	PT PJV Demister	All HEPAs (First)	All HEPAs (Second)
67-64-1	vapor	1	10000	1	1	1	1	1
67-66-3	vapor	1	1	1	2	1	1	1
67-72-1	vapor	1	1	1	50	1	1	1
684-16-2	vapor	1	1	1	1	1	1	1
71-23-8	vapor	1	10000	1	1	1	1	1
71-36-3	vapor	1	10000	1	1	1	1	1
71-43-2	vapor	1	100	1	1	1	1	1
71-55-6	vapor	1	1000	1	1	1	1	1
72-20-8	particle-bound	200	3.333333	3.3	50	5	2000	100
72-43-5	particle-bound	200	3.333333	3.3	50	5	2000	100
72-54-8	particle-bound	200	3.333333	3.3	50	5	2000	100
72-55-9	particle-bound	200	3.333333	3.3	50	5	2000	100
74-83-9	vapor	1	1000	1	1	1	1	1
74-87-3	vapor	1	20	1	1	1	1	1
74-97-5	vapor	1	1	1	2	1	1	1
74-99-7	vapor	1	10000	1	1	1	1	1
75-00-3	vapor	1	1000	1	1	1	1	1
75-01-4	vapor	1	10000	1	1	1	1	1
75-05-8	vapor	1	1000	1	1	1	1	1
75-07-0	vapor	1	10000	1	1	1	1	1
75-09-2	vapor	1	20	1	1	1	1	1
75-12-7	vapor	1	10000	1	1	1	1	1
75-15-0	vapor	1	10000	1	1	1	1	1
75-21-8	vapor	1	10000	1	1	1	1	1
75-27-4	vapor	1	1	1	5	1	1	1
75-34-3	vapor	1	10000	1	1	1	1	1
75-35-4	vapor	1	10000	1	1	1	1	1
75-43-4	vapor	1	1000	1	1	1	1	1
75-45-6	vapor	1	50	1	1	1	1	1

CALCULATION SHEET

PROJECT: WTP
JOB NO.: 24590
CALC NO.: 24590-WTP-M4C-FRP-00005
SHEET REV: A
SHEET NO.: 18

BY: E. Berrios
DATE: 05/21/03

SUBJECT: Estimation of Non-SSFM Represented Organic Emission Rates Required to Support the Integrated Emissions Baseline Report

Pretreatment Facility Organic Constituents DFs per Unit Operation

CAS Registry Number	Phase	PT HEME	PT Thermal Oxidizer	PT Caustic Scrubber	PT Carbon Bed Adsorber	PT PJV Demister	All HEPAs (First)	All HEPAs (Second)
75-50-3	vapor	1	10000	1	1	1	1	1
75-52-5	vapor	1	10000	1	1	1	1	1
75-55-8	vapor	1	10000	1	1	1	1	1
75-61-6	vapor	1	1	1	1	1	1	1
75-63-8	vapor	1	1	1	1	1	1	1
75-65-0	vapor	1	10000	1	1	1	1	1
75-69-4	vapor	1	1	1	1	1	1	1
75-71-8	vapor	1	1	1	1	1	1	1
75-99-0	vapor	1	100	1	2	1	1	1
76-03-9	vapor	1	1	1	50	1	1	1
76-11-9	vapor	1	10	1	5	1	1	1
76-12-0	vapor	1	10	1	5	1	1	1
76-13-1	vapor	1	20	1	2	1	1	1
76-14-2	vapor	1	1	1	1	1	1	1
76-15-3	vapor	1	1	1	1	1	1	1
76-44-8	vapor	1	3.333333	1	10	1	1	1
78-83-1	vapor	1	10000	1	1	1	1	1
78-87-5	vapor	1	1000	1	1	1	1	1
78-92-2	vapor	1	10000	1	1	1	1	1
78-93-3	vapor	1	1000	1	1	1	1	1
79-00-5	vapor	1	10000	1	1	1	1	1
79-01-6	vapor	1	10000	1	1	1	1	1
79-09-4	vapor	1	10000	1	1	1	1	1
79-10-7	vapor	1	10000	1	1	1	1	1
79-20-9	vapor	1	10000	1	1	1	1	1
79-34-5	vapor	1	1	1	10	1	1	1
8001-35-2	particle-bound	200	3.333333	3.3	50	5	2000	100
82-68-8	vapor	1	3.333333	1	50	1	1	1
83-32-9	vapor	1	3.333333	1	50	1	1	1

CALCULATION SHEET

PROJECT: WTP
JOB NO.: 24590
CALC NO.: 24590-WTP-M4C-FRP-00005
SHEET REV: A
SHEET NO.: 19

BY: E. Berrios
DATE: 05/21/03

SUBJECT: Estimation of Non-SSFM Represented Organic Emission Rates Required to Support the Integrated Emissions Baseline Report

Pretreatment Facility Organic Constituents DFs per Unit Operation

CAS Registry Number	Phase	PT HEME	PT Thermal Oxidizer	PT Caustic Scrubber	PT Carbon Bed Adsorber	PT PJV Demister	All HEPAs (First)	All HEPAs (Second)
84-66-2	vapor	1	10000	1	5	1	1	1
84-74-2	particle-bound	200	10000	3.3	5	5	2000	100
85-01-8	vapor	1	3.333333	1	50	1	1	1
85-68-7	particle-bound	200	10000	3.3	5	5	2000	100
86-73-7	particle-bound	200	3.333333	3.3	50	5	2000	100
87-68-3	vapor	1	50	1	5	1	1	1
87-86-5	vapor	1	3.333333	1	50	1	1	1
88-06-2	vapor	1	3.333333	1	50	1	1	1
88-72-2	vapor	1	10000	1	2	1	1	1
88-75-5	vapor	1	3.333333	1	20	1	1	1
88-85-7	particle-bound	200	3.333333	3.3	50	5	2000	100
88-89-1	particle-bound	200	10000	3.3	5	5	2000	100
91-20-3	vapor	1	100	1	2	1	1	1
91-22-5	vapor	1	10000	1	2	1	1	1
91-58-7	vapor	1	3.333333	1	50	1	1	1
92-52-4	vapor	1	1000	1	5	1	1	1
92-93-3	particle-bound	200	3.333333	3.3	50	5	2000	100
93-72-1	particle-bound	200	3.333333	3.3	50	5	2000	100
93-76-5	particle-bound	200	3.333333	3.3	50	5	2000	100
94-75-7	vapor	1	3.333333	1	50	1	1	1
95-13-6	vapor	1	1000	1	2	1	1	1
95-47-6	vapor	1	10000	1	1	1	1	1
95-48-7	vapor	1	1000	1	2	1	1	1
95-49-8	vapor	1	10000	1	2	1	1	1
95-50-1	vapor	1	50	1	2	1	1	1
95-57-8	vapor	1	10000	1	2	1	1	1
95-95-4	vapor	1	3.333333	1	50	1	1	1
96-22-0	vapor	1	10000	1	1	1	1	1
96-69-5	particle-bound	200	3.333333	3.3	50	5	2000	100

CALCULATION SHEET

PROJECT: WTP
JOB NO.: 24590
CALC NO.: 24590-WTP-M4C-FRP-00005
SHEET REV: A
SHEET NO.: 20

BY: E. Berrios
DATE: 05/21/03

SUBJECT: Estimation of Non-SSFM Represented Organic Emission Rates Required to Support the Integrated Emissions Baseline Report

Pretreatment Facility Organic Constituents DFs per Unit Operation

CAS Registry Number	Phase	PT HEME	PT Thermal Oxidizer	PT Caustic Scrubber	PT Carbon Bed Adsorber	PT PJV Demister	All HEPAs (First)	All HEPAs (Second)
98-51-1	vapor	1	10000	1	2	1	1	1
98-82-8	vapor	1	10000	1	2	1	1	1
98-83-9	vapor	1	100	1	2	1	1	1
98-86-2	vapor	1	100	1	2	1	1	1
98-95-3	vapor	1	10000	1	2	1	1	1

LAW and HLW Facilities Organic Constituents DFs per Unit Operation

CAS Registry Number	Phase	HLW & LAW Melters	HLW & LAW Submerged Bed Scrubber	HLW & LAW WESP	HLW HEME	LAW Caustic Scrubber	All HEPAs (First)	All HEPAs (Second)	HLW & LAW Thermal Catalytic Oxidizer
100-00-5	vapor	1.1	1	1	1	1	1	1	20
100-21-0	vapor	1.1	1	1	1	1	1	1	20
100-25-4	particle-bound	1.1	40	11	90	1	2000	100	20
100-41-4	vapor	1.1	1	1	1	1	1	1	20
100-42-5	vapor	1.1	1	1	1	1	1	1	20
10061-01-5	vapor	1.1	1	1	1	1	1	1	20
10061-02-6	vapor	1.1	1	1	1	1	1	1	20
101-55-3	vapor	1.1	1	1	1	1	1	1	20
101-84-8	vapor	1.1	1	1	1	1	1	1	20
106-35-4	vapor	1.1	1	1	1	1	1	1	20
106-42-3	vapor	1.1	1	1	1	1	1	1	20
106-46-7	vapor	1.1	1	1	1	1	1	1	20
106-88-7	vapor	1.1	1	1	1	1	1	1	20
106-93-4	vapor	1.1	1	1	1	1	1	1	20
106-97-8	vapor	1.1	1	1	1	1	1	1	20
106-99-0	vapor	1.1	1	1	1	1	1	1	20

CALCULATION SHEET

PROJECT: WTP
JOB NO.: 24590
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SHEET REV: A
SHEET NO.: 21

BY: E. Berrios
DATE: 05/21/03

SUBJECT: Estimation of Non-SSFM Represented Organic Emission Rates Required to Support the Integrated Emissions Baseline Report

LAW and HLW Facilities Organic Constituents DFs per Unit Operation

CAS Registry Number	Phase	HLW & LAW Melters	HLW & LAW Submerged Bed Scrubber	HLW & LAW WESP	HLW HEME	LAW Caustic Scrubber	All HEPAs (First)	All HEPAs (Second)	HLW & LAW Thermal Catalytic Oxidizer
107-02-8	vapor	1.1	1	1	1	1	1	1	20
107-05-1	vapor	1.1	1	1	1	1	1	1	20
107-06-2	vapor	1.1	1	1	1	1	1	1	20
107-12-0	vapor	1.1	1	1	1	1	1	1	20
107-13-1	vapor	1.1	1	1	1	1	1	1	20
107-18-6	vapor	1.1	1	1	1	1	1	1	20
107-31-3	vapor	1.1	1	1	1	1	1	1	20
107-66-4	particle-bound	1.1	40	11	90	1	2000	100	20
107-87-9	vapor	1.1	1	1	1	1	1	1	20
108-03-2	vapor	1.1	1	1	1	1	1	1	20
108-05-4	vapor	1.1	1	1	1	1	1	1	20
108-10-1	vapor	1.1	1	1	1	1	1	1	20
108-20-3	vapor	1.1	1	1	1	1	1	1	20
108-38-3	vapor	1.1	1	1	1	1	1	1	20
108-39-4	vapor	1.1	1	1	1	1	1	1	20
108-87-2	vapor	1.1	1	1	1	1	1	1	20
108-88-3	vapor	1.1	1	1	1	1	1	1	20
108-90-7	vapor	1.1	1	1	1	1	1	1	20
108-93-0	vapor	1.1	1	1	1	1	1	1	20
108-94-1	vapor	1.1	1	1	1	1	1	1	20
108-95-2	vapor	1.1	1	1	1	1	1	1	20
109-66-0	vapor	1.1	1	1	1	1	1	1	20
109-99-9	vapor	1.1	1	1	1	1	1	1	20
110-12-3	vapor	1.1	1	1	1	1	1	1	20
110-43-0	vapor	1.1	1	1	1	1	1	1	20
110-54-3	vapor	1.1	1	1	1	1	1	1	20
110-62-3	vapor	1.1	1	1	1	1	1	1	20
110-82-7	vapor	1.1	1	1	1	1	1	1	20

CALCULATION SHEET

PROJECT: WTP
JOB NO.: 24590
CALC NO.: 24590-WTP-M4C-FRP-00005
SHEET REV: A
SHEET NO.: 22

BY: E. Berrios
DATE: 05/21/03

SUBJECT: Estimation of Non-SSFM Represented Organic Emission Rates Required to Support the Integrated Emissions Baseline Report

LAW and HLW Facilities Organic Constituents DFs per Unit Operation

CAS Registry Number	Phase	HLW & LAW Melters	HLW & LAW Submerged Bed Scrubber	HLW & LAW WESP	HLW HEME	LAW Caustic Scrubber	All HEPAs (First)	All HEPAs (Second)	HLW & LAW Thermal Catalytic Oxidizer
110-83-8	vapor	1.1	1	1	1	1	1	1	20
110-86-1	vapor	1.1	1	1	1	1	1	1	20
111-65-9	vapor	1.1	1	1	1	1	1	1	20
111-76-2	vapor	1.1	1	1	1	1	1	1	20
111-84-2	vapor	1.1	1	1	1	1	1	1	20
117-81-7	particle-bound	1.1	40	11	90	1	2000	100	20
117-84-0	particle-bound	1.1	40	11	90	1	2000	100	20
118-74-1	vapor	1.1	1	1	1	1	1	1	20
120-12-7	vapor	1.1	1	1	1	1	1	1	20
120-82-1	vapor	1.1	1	1	1	1	1	1	20
120-83-2	vapor	1.1	1	1	1	1	1	1	20
121-44-8	vapor	1.1	1	1	1	1	1	1	20
121-69-7	vapor	1.1	1	1	1	1	1	1	20
122-39-4	vapor	1.1	1	1	1	1	1	1	20
123-19-3	vapor	1.1	1	1	1	1	1	1	20
123-38-6	vapor	1.1	1	1	1	1	1	1	20
123-51-3	vapor	1.1	1	1	1	1	1	1	20
123-86-4	vapor	1.1	1	1	1	1	1	1	20
123-91-1	vapor	1.1	1	1	1	1	1	1	20
126-73-8	vapor	1.1	1	1	1	1	1	1	20
126-98-7	vapor	1.1	1	1	1	1	1	1	20
127-18-4	vapor	1.1	1	1	1	1	1	1	20
127-19-5	vapor	1.1	1	1	1	1	1	1	20
128-37-0	vapor	1.1	1	1	1	1	1	1	20
129-00-0	particle-bound	1.1	40	11	90	1	2000	100	20
1321-64-8	particle-bound	1.1	40	11	90	1	2000	100	20
1321-65-9	vapor	1.1	1	1	1	1	1	1	20
132-64-9	vapor	1.1	1	1	1	1	1	1	20

CALCULATION SHEET

PROJECT: WTP
JOB NO.: 24590
CALC NO.: 24590-WTP-M4C-FRP-00005
SHEET REV: A
SHEET NO.: 23

BY: E. Berrios
DATE: 05/21/03

SUBJECT: Estimation of Non-SSFM Represented Organic Emission Rates Required to Support the Integrated Emissions Baseline Report

LAW and HLW Facilities Organic Constituents DFs per Unit Operation

CAS Registry Number	Phase	HLW & LAW Melters	HLW & LAW Submerged Bed Scrubber	HLW & LAW WESP	HLW HEME	LAW Caustic Scrubber	All HEPAs (First)	All HEPAs (Second)	HLW & LAW Thermal Catalytic Oxidizer
1335-87-1	particle-bound	1.1	40	11	90	1	2000	100	20
1335-88-2	particle-bound	1.1	40	11	90	1	2000	100	20
1336-36-3	particle-bound	1.1	40	11	90	1	2000	100	20
141-78-6	vapor	1.1	1	1	1	1	1	1	20
141-79-7	vapor	1.1	1	1	1	1	1	1	20
142-82-5	vapor	1.1	1	1	1	1	1	1	20
144-62-7	vapor	1.1	1	1	1	1	1	1	20
156-60-5	vapor	1.1	1	1	1	1	1	1	20
1582-09-8	particle-bound	1.1	40	11	90	1	2000	100	20
1634-04-4	vapor	1.1	1	1	1	1	1	1	20
1836-75-5	particle-bound	1.1	40	11	90	1	2000	100	20
189-55-9	particle-bound	1.1	40	11	90	1	2000	100	20
189-64-0	particle-bound	1.1	40	11	90	1	2000	100	20
191-24-2	particle-bound	1.1	40	11	90	1	2000	100	20
191-30-0	particle	1.1	40	11	90	1	2000	100	20
192-65-4	particle	1.1	40	11	90	1	2000	100	20
193-39-5	particle	1.1	40	11	90	1	2000	100	20
205-82-3	particle-bound	1.1	40	11	90	1	2000	100	20
205-99-2	particle-bound	1.1	40	11	90	1	2000	100	20
206-44-0	particle-bound	1.1	40	11	90	1	2000	100	20
207-08-9	particle-bound	1.1	40	11	90	1	2000	100	20
208-96-8	vapor	1.1	1	1	1	1	1	1	20
218-01-9	particle-bound	1.1	40	11	90	1	2000	100	20
2234-13-1	particle-bound	1.1	40	11	90	1	2000	100	20
224-42-0	particle-bound	1.1	40	11	90	1	2000	100	20
226-36-8	particle-bound	1.1	40	11	90	1	2000	100	20
2385-85-5	vapor	1.1	1	1	1	1	1	1	20
25551-13-7	vapor	1.1	1	1	1	1	1	1	20

CALCULATION SHEET

PROJECT: WTP
JOB NO.: 24590
CALC NO.: 24590-WTP-M4C-FRP-00005
SHEET REV: A
SHEET NO.: 24

BY: E. Berrios
DATE: 05/21/03

SUBJECT: Estimation of Non-SSFM Represented Organic Emission Rates Required to Support the Integrated Emissions Baseline Report

LAW and HLW Facilities Organic Constituents DFs per Unit Operation

CAS Registry Number	Phase	HLW & LAW Melters	HLW & LAW Submerged Bed Scrubber	HLW & LAW WESP	HLW HEME	LAW Caustic Scrubber	All HEPAs (First)	All HEPAs (Second)	HLW & LAW Thermal Catalytic Oxidizer
26140-60-3	particle-bound	1.1	40	11	90	1	2000	100	20
27154-33-2	vapor	1.1	1	1	1	1	1	1	20
287-92-3	vapor	1.1	1	1	1	1	1	1	20
309-00-2	particle-bound	1.1	40	11	90	1	2000	100	20
319-84-6	vapor	1.1	1	1	1	1	1	1	20
319-85-7	particle-bound	1.1	40	11	90	1	2000	100	20
319-86-8	particle-bound	1.1	40	11	90	1	2000	100	20
3697-24-3	particle-bound	1.1	40	11	90	1	2000	100	20
3825-26-1	particle-bound	1.1	40	11	90	1	2000	100	20
4170-30-3	vapor	1.1	1	1	1	1	1	1	20
465-73-6	vapor	1.1	1	1	1	1	1	1	20
50-00-0	vapor	1.1	1	1	1	1	1	1	20
50-29-3	particle-bound	1.1	40	11	90	1	2000	100	20
50-32-8	particle-bound	1.1	40	11	90	1	2000	100	20
53-70-3	particle	1.1	40	11	90	1	2000	100	20
540-59-0	vapor	1.1	1	1	1	1	1	1	20
540-84-1	vapor	1.1	1	1	1	1	1	1	20
541-73-1	vapor	1.1	1	1	1	1	1	1	20
56-23-5	vapor	1.1	1	1	1	1	1	1	20
563-80-4	vapor	1.1	1	1	1	1	1	1	20
56-49-5	particle-bound	1.1	40	11	90	1	2000	100	20
56-55-3	particle-bound	1.1	40	11	90	1	2000	100	20
57-14-7	vapor	1.1	1	1	1	1	1	1	20
58-89-9	particle-bound	1.1	40	11	90	1	2000	100	20
58-90-2	vapor	1.1	1	1	1	1	1	1	20
591-78-6	vapor	1.1	1	1	1	1	1	1	20
59-50-7	particle-bound	1.1	40	11	90	1	2000	100	20
59-89-2	vapor	1.1	1	1	1	1	1	1	20

CALCULATION SHEET

PROJECT: WTP
JOB NO.: 24590
CALC NO.: 24590-WTP-M4C-FRP-00005
SHEET REV: A
SHEET NO.: 25

BY: E. Berrios
DATE: 05/21/03

SUBJECT: Estimation of Non-SSFM Represented Organic Emission Rates Required to Support the Integrated Emissions Baseline Report

LAW and HLW Facilities Organic Constituents DFs per Unit Operation

CAS Registry Number	Phase	HLW & LAW Melters	HLW & LAW Submerged Bed Scrubber	HLW & LAW WESP	HLW HEME	LAW Caustic Scrubber	All HEPAs (First)	All HEPAs (Second)	HLW & LAW Thermal Catalytic Oxidizer
602-87-9	particle-bound	1.1	40	11	90	1	2000	100	20
60-29-7	vapor	1.1	1	1	1	1	1	1	20
603-34-9	vapor	1.1	1	1	1	1	1	1	20
60-34-4	vapor	1.1	1	1	1	1	1	1	20
60-35-5	vapor	1.1	1	1	1	1	1	1	20
60-57-1	particle-bound	1.1	40	11	90	1	2000	100	20
621-64-7	vapor	1.1	1	1	1	1	1	1	20
624-83-9	vapor	1.1	1	1	1	1	1	1	20
627-13-4	vapor	1.1	1	1	1	1	1	1	20
62-75-9	vapor	1.1	1	1	1	1	1	1	20
630-20-6	vapor	1.1	1	1	1	1	1	1	20
64-17-5	vapor	1.1	1	1	1	1	1	1	20
64-18-6	vapor	1.1	1	1	1	1	1	1	20
64-19-7	vapor	1.1	1	1	1	1	1	1	20
67-56-1	vapor	1.1	1	1	1	1	1	1	20
67-63-0	vapor	1.1	1	1	1	1	1	1	20
67-64-1	vapor	1.1	1	1	1	1	1	1	20
67-66-3	vapor	1.1	1	1	1	1	1	1	20
67-72-1	vapor	1.1	1	1	1	1	1	1	20
684-16-2	vapor	1.1	1	1	1	1	1	1	20
71-23-8	vapor	1.1	1	1	1	1	1	1	20
71-36-3	vapor	1.1	1	1	1	1	1	1	20
71-43-2	vapor	1.1	1	1	1	1	1	1	20
71-55-6	vapor	1.1	1	1	1	1	1	1	20
72-20-8	particle-bound	1.1	40	11	90	1	2000	100	20
72-43-5	particle-bound	1.1	40	11	90	1	2000	100	20
72-54-8	particle-bound	1.1	40	11	90	1	2000	100	20
72-55-9	particle-bound	1.1	40	11	90	1	2000	100	20

CALCULATION SHEET

PROJECT: WTP
JOB NO.: 24590
CALC NO.: 24590-WTP-M4C-FRP-00005
SHEET REV: A
SHEET NO.: 26

BY: E. Berrios
DATE: 05/21/03

SUBJECT: Estimation of Non-SSFM Represented Organic Emission Rates Required to Support the Integrated Emissions Baseline Report

LAW and HLW Facilities Organic Constituents DFs per Unit Operation

CAS Registry Number	Phase	HLW & LAW Melters	HLW & LAW Submerged Bed Scrubber	HLW & LAW WESP	HLW HEME	LAW Caustic Scrubber	All HEPAs (First)	All HEPAs (Second)	HLW & LAW Thermal Catalytic Oxidizer
74-83-9	vapor	1.1	1	1	1	1	1	1	20
74-87-3	vapor	1.1	1	1	1	1	1	1	20
74-97-5	vapor	1.1	1	1	1	1	1	1	20
74-99-7	vapor	1.1	1	1	1	1	1	1	20
75-00-3	vapor	1.1	1	1	1	1	1	1	20
75-01-4	vapor	1.1	1	1	1	1	1	1	20
75-05-8	vapor	1.1	1	1	1	1	1	1	20
75-07-0	vapor	1.1	1	1	1	1	1	1	20
75-09-2	vapor	1.1	1	1	1	1	1	1	20
75-12-7	vapor	1.1	1	1	1	1	1	1	20
75-15-0	vapor	1.1	1	1	1	1	1	1	20
75-21-8	vapor	1.1	1	1	1	1	1	1	20
75-27-4	vapor	1.1	1	1	1	1	1	1	20
75-34-3	vapor	1.1	1	1	1	1	1	1	20
75-35-4	vapor	1.1	1	1	1	1	1	1	20
75-43-4	vapor	1.1	1	1	1	1	1	1	20
75-45-6	vapor	1.1	1	1	1	1	1	1	20
75-50-3	vapor	1.1	1	1	1	1	1	1	20
75-52-5	vapor	1.1	1	1	1	1	1	1	20
75-55-8	vapor	1.1	1	1	1	1	1	1	20
75-61-6	vapor	1.1	1	1	1	1	1	1	20
75-63-8	vapor	1.1	1	1	1	1	1	1	20
75-65-0	vapor	1.1	1	1	1	1	1	1	20
75-69-4	vapor	1.1	1	1	1	1	1	1	20
75-71-8	vapor	1.1	1	1	1	1	1	1	20
75-99-0	vapor	1.1	1	1	1	1	1	1	20
76-03-9	vapor	1.1	1	1	1	1	1	1	20
76-11-9	vapor	1.1	1	1	1	1	1	1	20

CALCULATION SHEET

PROJECT: WTP
JOB NO.: 24590
CALC NO.: 24590-WTP-M4C-FRP-00005
SHEET REV: A
SHEET NO.: 27

BY: E. Berrios
DATE: 05/21/03

SUBJECT: Estimation of Non-SSFM Represented Organic Emission Rates Required to Support the Integrated Emissions Baseline Report

LAW and HLW Facilities Organic Constituents DFs per Unit Operation

CAS Registry Number	Phase	HLW & LAW Melters	HLW & LAW Submerged Bed Scrubber	HLW & LAW WESP	HLW HEME	LAW Caustic Scrubber	All HEPAs (First)	All HEPAs (Second)	HLW & LAW Thermal Catalytic Oxidizer
76-12-0	vapor	1.1	1	1	1	1	1	1	20
76-13-1	vapor	1.1	1	1	1	1	1	1	20
76-14-2	vapor	1.1	1	1	1	1	1	1	20
76-15-3	vapor	1.1	1	1	1	1	1	1	20
76-44-8	vapor	1.1	1	1	1	1	1	1	20
78-83-1	vapor	1.1	1	1	1	1	1	1	20
78-87-5	vapor	1.1	1	1	1	1	1	1	20
78-92-2	vapor	1.1	1	1	1	1	1	1	20
78-93-3	vapor	1.1	1	1	1	1	1	1	20
79-00-5	vapor	1.1	1	1	1	1	1	1	20
79-01-6	vapor	1.1	1	1	1	1	1	1	20
79-09-4	vapor	1.1	1	1	1	1	1	1	20
79-10-7	vapor	1.1	1	1	1	1	1	1	20
79-20-9	vapor	1.1	1	1	1	1	1	1	20
79-34-5	vapor	1.1	1	1	1	1	1	1	20
8001-35-2	particle-bound	1.1	40	11	90	1	2000	100	20
82-68-8	vapor	1.1	1	1	1	1	1	1	20
83-32-9	vapor	1.1	1	1	1	1	1	1	20
84-66-2	vapor	1.1	1	1	1	1	1	1	20
84-74-2	particle-bound	1.1	40	11	90	1	2000	100	20
85-01-8	vapor	1.1	1	1	1	1	1	1	20
85-68-7	particle-bound	1.1	40	11	90	1	2000	100	20
86-73-7	particle-bound	1.1	40	11	90	1	2000	100	20
87-68-3	vapor	1.1	1	1	1	1	1	1	20
87-86-5	vapor	1.1	1	1	1	1	1	1	20
88-06-2	vapor	1.1	1	1	1	1	1	1	20
88-72-2	vapor	1.1	1	1	1	1	1	1	20
88-75-5	vapor	1.1	1	1	1	1	1	1	20

CALCULATION SHEET

PROJECT: WTP
JOB NO.: 24590
CALC NO.: 24590-WTP-M4C-FRP-00005
SHEET REV: A
SHEET NO.: 28

BY: E. Berrios
DATE: 05/21/03

SUBJECT: Estimation of Non-SSFM Represented Organic Emission Rates Required to Support the Integrated Emissions Baseline Report

LAW and HLW Facilities Organic Constituents DFs per Unit Operation

CAS Registry Number	Phase	HLW & LAW Melters	HLW & LAW Submerged Bed Scrubber	HLW & LAW WESP	HLW HEME	LAW Caustic Scrubber	All HEPAs (First)	All HEPAs (Second)	HLW & LAW Thermal Catalytic Oxidizer
88-85-7	particle-bound	1.1	40	11	90	1	2000	100	20
88-89-1	particle-bound	1.1	40	11	90	1	2000	100	20
91-20-3	vapor	1.1	1	1	1	1	1	1	20
91-22-5	vapor	1.1	1	1	1	1	1	1	20
91-58-7	vapor	1.1	1	1	1	1	1	1	20
92-52-4	vapor	1.1	1	1	1	1	1	1	20
92-93-3	particle-bound	1.1	40	11	90	1	2000	100	20
93-72-1	particle-bound	1.1	40	11	90	1	2000	100	20
93-76-5	particle-bound	1.1	40	11	90	1	2000	100	20
94-75-7	vapor	1.1	1	1	1	1	1	1	20
95-13-6	vapor	1.1	1	1	1	1	1	1	20
95-47-6	vapor	1.1	1	1	1	1	1	1	20
95-48-7	vapor	1.1	1	1	1	1	1	1	20
95-49-8	vapor	1.1	1	1	1	1	1	1	20
95-50-1	vapor	1.1	1	1	1	1	1	1	20
95-57-8	vapor	1.1	1	1	1	1	1	1	20
95-95-4	vapor	1.1	1	1	1	1	1	1	20
96-22-0	vapor	1.1	1	1	1	1	1	1	20
96-69-5	particle-bound	1.1	40	11	90	1	2000	100	20
98-51-1	vapor	1.1	1	1	1	1	1	1	20
98-82-8	vapor	1.1	1	1	1	1	1	1	20
98-83-9	vapor	1.1	1	1	1	1	1	1	20
98-86-2	vapor	1.1	1	1	1	1	1	1	20
98-95-3	vapor	1.1	1	1	1	1	1	1	20

- The results from the SSFM used to estimate the organic releases in this calculation were based on the model run request titled *Emissions Vitrification Maximum Case Run with Updated Organic Parameters* (24590-WTP-MRQ-PO-03-054). The stream reports used in this calculation are:
  - PJV32 – Unabated HLW RFD/PJM
  - FRP14 – WTP Waste Feed
  - PVP01 – Unabated Pretreatment Vessel Vent
  - PJV04 – Unabated Pretreatment RFD/PJM
  - LMP06 – Unabated LAW Melter Offgas
  - LVP01 – Unabated LAW Vessel Ventilation Header (which is the summation of streams LFP06, RLD32, RLD33, and RLD34)
  - HMP06 – Unabated HLW Melter Offgas
  - HOP10 – Unabated HLW Vessel Ventilation Header

  These stream reports can be found in Appendix A of this calculation.

3 Background

There are a total of 250 organic constituents (excluding Products of Incomplete Combustion) that are required to be tracked through the WTP for permitting purposes. Emissions profiles for the WTP are generated by using the Steady State Flowsheet Model. In order to simplify the flowsheet, not all organic constituents are tracked. The constituents were segregated into groups based on similar physical and chemical properties. Representatives from each group were selected and are tracked in the flowsheet. Only 51 organic constituents are tracked in the flowsheet. Based on the behavior and results of these representative constituents, the expected emissions rates for the non-tracked constituents can be calculated. This calculation estimates these releases.

4 Applicable Codes and Standards

NA

5 Methodology

The following methodology was used in this calculation:

- Organic feed rates to the WTP were calculated by multiplying the constituent's feed concentration in mg/l by the volumetric flowrate of the feed stream in liters per minute. This mass flowrate was then converted to grams per second.
- The results from the representative compounds were obtained from the Steady State Flowsheet Model for each desired stream (PVP01 is used as an example). The performance factor (PF) for the representative compounds was calculated per stream relative to the feed stream, FRP14. This was done by obtaining the representative compounds mass feed rate from stream report # FRP14 and its mass flowrate at the stream being evaluated. The PF was calculated by dividing the constituent's mass feed rate by the specified stream's constituent mass flowrate.

$$PF = \frac{\text{mass rate at point of interest [representative compound]}}{\text{mass rate at waste feed [representative compound]}}$$

- Once the PF was calculated, it was applied to the feed rate for the non-represented compound in order to obtain the mass flowrate of the constituent at that stream. If more than one compound was used to represent a group, the average PF between the compounds was used to calculate the non-represented compound rate.

- The rate of the 14 coplanar PCBs is 1% of the total PCB (as represented by CAS# 1336-36-3). Thus, to calculate the feed rate for each coplanar PCB, the rate of the total PCB was multiplied by 0.01 and divided by 14.
- For the constituents in the Pretreatment Vessel Vent the stack calculation is easily determined by applying the DFs per unit operation. For example, gas constituents are only removed in the Thermal Catalytic Oxidizer (TCO) and the Carbon Beds while the particulate constituents have removal through the entire system (i.e. caustic scrubber, high efficiency mist eliminator (HEME), high efficiency particulate air (HEPA) filters, TCO, and carbon beds). Thus the feed rate entering the Pretreatment Vessel Vent is divided by all the applicable DFs for each constituent. The final number obtained is the stack emissions estimate. This same process also applies to the Pretreatment PJM/RFD system and the HLW PJM/RFD system. For example, if a constituent had a value of 1.0E-03 g/sec at the entrance to the pretreatment caustic scrubber (stream PVP01) and DFs of 1 for the caustic scrubber, 1 for the HEME, 1 for the HEPA filters, 1000 for the TCO and 5 for the carbon beds, then the stack flowrate would be:
  1.0E-03 / (1*1*1*1000*5) = 2.0E-07 g/sec.
- In the HLW and LAW vitrification facilities, there is generation of offgas in the melter. The offgas goes through the submerged bed scrubber (SBS) and the wet electrostatic precipitator (WESP) before it is joined with the vessel ventilation stream. Thus for the vitrification plants, the estimation of organic constituents generation from the melter is calculated as was done in the Pretreatment vessel vent and PJM/RFD areas. This process was also applied to obtain the overall vessel vent stream composition. When the offgas meets the vessel vent stream, these two streams were added together to obtain the overall constituent mass flowrate at that point. From then on, the specific DFs were used for all unit operations found from the mixing point up to the stack.

6 Assumptions

NA

7 Calculations

Calculations were performed using the Microsoft Excel® 97 spreadsheet on a Compaq PC workstation. The calculation for two groupings of organic constituents having similar chemical and physical properties is shown for all the streams. Of the groups selected, one group has one representative compound while the other group has three representative compounds. The groups selected are:
Group 4: represented by Formamide (75-12-7)
Group 8: represented by Phenol (108-95-2), Diethyl Phthalate (84-66-2), and 2-sec-Butyl—4,6-dinitrophenol (88-85-7)
The entire lists of constituents for these two groups are as follows:
Group 4
- Formamide (75-12-7)
- Dibenz[a,j]acridine (224-42-0)
- Dibenz[a,h]acridine (226-36-8)

Group 8
- Phenol (108-95-2)
- Diethyl Phthalate (84-66-2)
- 2-sec-Butyl—4,6-dinitrophenol (88-85-7)
- Formaldehyde (50-00-0)
- Propionic Acid (79-09-4)

- 2-Propenoic Acid (79-10-7)

Also the calculation for Coplanar PCBs is included for all the streams. The coplanar PCBs are represented by:
2,3',4,4',5-Pentachlorobiphenyl (PBC 118) (31508-00-6)
3,3',4,4'-Tetrachlorobiphenyl (TCB) (32598-13-3)
2,3,3',4,4'-Pentachlorobiphenyl (PCB 105) (32598-14-4)
3,3',4,4',5,5'-Hexachlorobiphenyl (32774-16-6)
2,2',3,4,4',5,5'-Heptachlorobiphenyl (35065-29-3)
2,2',3,3',4,4',5-Heptachlorobiphenyl (35065-30-6)
2,3,3',4,4',5-Hexachlorobiphenyl (PCB 157) (38380-08-4)
2,3,3',4,4',5,5'-Heptachlorobiphenyl (39635-31-9)
2,3',4,4',5,5'-Hexachlorobiphenyl (52663-72-6)
3,3',4,4',5-Pentachlorobiphenyl (57465-28-8)
2',3,4,4',5-Pentachlorobiphenyl (65510-44-3)
2,3,3',4,4',5'-Hexachlorobiphenyl (69782-90-7)
3,4,4',5-Tetrachlorobiphenyl (70362-50-4)
2,3,4,4',5-Pentachlorobiphenyl (74472-37-0)

7.1 Feed Rate

FRP14 is the HLW waste feed stream while FRP01 is the LAW waste feed. Due to the characteristics of the emissions feed vector, there is enough LAW feed entering with the HLW feed in FRP14 to achieve the 50 tonnes/day of LAW glass, thus the stream FRP01 is zero. Therefore all the numbers for the feed stream are based on FRP14.

For all the calculations in this section refer to Table B-1 in Appendix B. From Appendix A, stream FRP14, the total volumetric flowrate for this stream is: 0.871 ft^3/min (cell D1)
Converting to liters per minute: 0.871 ft^3/min * 28.317 l/ft^3 = 24.66 l/min (cell D2)

Group 4 feed rates in grams per second:
Formamide (75-12-7) feed concentration: 84.8 mg/l (cell C171)
84.8 mg/l (cell C171) * 24.66 l/min * 1 g / 1000 mg * 1 min / 60 sec = 3.49E-02 g/sec (cell H171)
The other 2 constituents in this group have the same feed concentration thus the feed rate is the same.

Group 8 feed rates in grams per second:
Phenol (108-95-2) feed concentration: 84.8 mg/l (cell C42)
84.8 mg/l (cell C42) * 24.66 l/min * 1 g / 1000 mg * 1 min / 60 sec = 3.49E-02 g/sec (cell H42)
Constituents Diethyl Phthalate (84-66-2), 2-sec-Butyl—4,6-dinitrophenol (88-85-7), Propionic Acid (79-09-4), and 2-Propenoic Acid (79-10-7) have the same feed concentration thus the feed rate is the same. Formaldehyde's (50-00-0) feed concentration is different.
Formaldehyde feed concentration (50-00-0): 18.7 mg/l (cell C117)
18.7 mg/l (cell C117) * 24.66 l/min * 1 g / 1000 mg * 1 min / 60 sec = 7.67E-03 g/sec (cell H117)

Coplanar PCBs feed rate:
1336-36-3 feed concentration: 29.4 mg/l (cell C80)
29.4 mg/l (cell C80) * 24.66 l/min * 1 g / 1000 mg * 1 min / 60 sec = 1.21E-02 g/sec (cell H80)
Feed rate for the 14 coplanar PCBs is:
1.21E-02 (cell H80) * 0.01/14 = 8.76E-06 g/sec (cells L8 through L21)

7.2 Pretreatment Vessel Vent Analysis

To determine the stack releases from the Pretreatment Vessel Vent System (PVV), first the mass rates of all the constituents are calculated in stream PVP01 (the unabated Pretreatment Vessel Vent stream). Then the corresponding DFs for each constituent within the system are applied to these values to obtain the final stack releases (stream PVP12).

7.2.1 PVP01 Stream

This streams depicts the unabated Pretreatment Vessel Ventilation. For all the calculations in this section refer to Table B-2. First the feed rate is obtained followed by the mass rate of the representative constituent at the stream specified. The performance factor for this constituent is calculated and applied to the non-represented compounds to obtain their mass rate.

Group 4
Formamide (75-12-7) feed rate: 3.49E-02 g/sec (cell C169)
Formamide (75-12-7) rate at PVP01 from the PVP01 stream report in Appendix A: 1.27E-06 g/sec (cell H169)
Performance factor for Formamide: 1.27E-06/3.49E-02 = 3.64E-05 (cell I169, also copied to cell N8)

Dibenz[a,j]acridine (224-42-0) feed rate: 3.49E-02 g/sec (cell C100)
Mass rate at PVP01: 3.49E-02 (cell C100) * 3.64E-05 (cell N8) = 1.27E-06 g/sec (cell K100)
Dibenz[a,h]acridine (226-36-8) feed rate: 3.49E-02 g/sec (cell C101)
Mass rate at PVP01: 3.49E-02 (cell C101) * 3.64E-05 (cell N8) = 1.27E-06 g/sec (cell K101)

Group 8
Phenol (108-95-2) feed rate: 3.49E-02 g/sec (cell C40)
Phenol (108-95-2) rate at PVP01 from the PVP01 stream report in Appendix A: 2.41E-04 g/sec (cell H40)
Performance factor for Phenol: 2.41E-04/3.49E-02 = 6.92E-03 (cell I40)

Diethyl Phthalate (84-66-2) feed rate: 3.49E-02 g/sec (cell C206)
Diethyl Phthalate (84-66-2) rate at PVP01 from the PVP01 stream report in Appendix A: 3.97E-04 g/sec (cell H206)
Performance factor for Diethyl Phthalate: 3.97E-04/3.49E-02 = 1.14E-02 (cell I206)

2-sec-Butyl—4,6-dinitrophenol (88-85-7) feed rate: 3.49E-02 g/sec (cell C216)
2-sec-Butyl—4,6-dinitrophenol (88-85-7) rate at PVP01 from the PVP01 stream report in Appendix A: 4.08E-04 g/sec (cell H216)
Performance factor for 2-sec-Butyl—4,6-dinitrophenol: 4.08E-04/3.49E-02 = 1.17E-02 (cell I216)

Since this group is represented by the above 3 constituents, an average performance factor is then calculated and applied to the other constituents. Average performance factor is:
(6.92E-03 (cell I40) + 1.14E-02 (cell I206) + 1.17E-02 (cell I216))/3 = 1.00E-02 (cell N12)

Formaldehyde (50-00-0) feed rate: 7.67E-03 g/sec (cell C115)
Mass rate at PVP01: 7.67E-03 (cell C115) * 1.00E-02 (cell N12) = 7.67E-05 g/sec (cell K115)

Propionic Acid (79-09-4) feed rate: 3.49E-02 g/sec (cell C199)
Mass rate at PVP01: 3.49E-02 (cell C199) * 1.00E-02 (cell N12) = 3.49E-04 g/sec (cell K199)

2-Propenoic Acid (79-10-7) feed rate: 3.49E-02 g/sec (cell C200)
Mass rate at PVP01: 3.49E-02 (cell C200) * 1.00E-02 (cell N12) = 3.49E-04 g/sec (cell K200)

Coplanar PCBs
1336-36-3 feed rate at PVP01 from the PVP01 stream report in Appendix A: 5.85E-02 g/sec (cell H78)
Mass rate for the 14 coplanar PCBs in PVP01 is:
5.85E-02 (cell H78) * 0.01/14 = 4.18E-05 g/sec (cells S7 through S20)
Thus the corrected mass rate for 1336-36-3 in PVP01 is:
5.85E-02 g/sec * 0.99 = 5.79E-02 g/sec

7.2.2 PVP12 Stream

For all the calculations for this stream refer to Table B-3 of Appendix B. Input to this spreadsheet is the results from PVP01 stream calculations. These numbers are imported to Column C from cells C4 through C239. Also all the DFs are imported from Section 2 of this calculation. The corresponding DFs for this stream are related to the following unit operations: caustic scrubber, HEME, HEPA filters, TCO, and carbon beds. The calculations for Group 4 and Coplanar PCBs are the only ones shown below. The remaining groups are calculated in the same manner.

Group 4
Formamide (75-12-7) mass rate at PVP01: 1.27E-06 g/sec (cell C169)
Formamide (75-12-7) DFs throughout the PVV system:
- Caustic Scrubber: 1 (cell D169)
- HEME: 1 (cell E169)
- HEPA 1: 1 (cell F169)
- HEPA 2: 1 (cell G169)
- TCO: 10,000 (cell H169)
- Carbon Bed: 1 (cell I169)

Formamide PVP12 stack mass rate: 1.27E-06 / (1*1*1*1*10,000*1) = 1.27E-10 g/sec (cell J169)

Dibenz[a,j]acridine (224-42-0) mass rate at PVP01: 1.27E-06 g/sec (cell C100)
Dibenz[a,j]acridine (224-42-0) DFs throughout the PVV system:
- Caustic Scrubber: 3.3 (cell D100)
- HEME: 200 (cell E100)
- HEPA 1: 2,000 (cell F100)
- HEPA 2: 100 (cell G100)
- TCO: 3.3333333 (cell H100)
- Carbon Bed: 50 (cell I100)

Dibenz[a,j]acridine PVP12 stack mass rate: 1.27E-06 / (3.3*200*2,000*100*3.3333333*50) = 5.78E-17 g/sec (cell J100)

Dibenz[a,h]acridine (226-36-8) mass rate at PVP01: 1.27E-06 g/sec (cell C101)
Dibenz[a,h]acridine (226-36-8) DFs throughout the PVV system:
- Caustic Scrubber: 3.3 (cell D101)
- HEME: 200 (cell E101)
- HEPA 1: 2,000 (cell F101)
- HEPA 2: 100 (cell G101)
- TCO: 3.3333333 (cell H101)
- Carbon Bed: 50 (cell I101)

Dibenz[a,h]acridine PVP12 stack mass rate: 1.27E-06 / (3.3*200*2,000*100*3.3333333*50) = 5.78E-17 g/sec (cell J101)

Coplanar PCBs
1336-36-3 corrected mass rate at PVP01: 5.79E-02 (cell C78)
1336-36-3 DFs throughout the PVV system:
- Caustic Scrubber: 3.3 (cell D78)
- HEME: 200 (cell E78)
- HEPA 1: 2,000 (cell F78)
- HEPA 2: 100 (cell G78)
- TCO: 3.3333333 (cell H78)
- Carbon Bed: 50 (cell I78)

1336-36-3 PVP12 stack mass rate: 5.79E-02 / (3.3*200*2,000*100*3.3333333*50) = 2.63E-12 g/sec (cell J78)
Mass rate for the 14 coplanar PCBs in PVP12 is:
2.63E-12 (cell J78) * 0.01/14/0.99 = 1.90E-15 g/sec (cells N6 through N19)

7.3 Pretreatment PJM/RFD Analysis

To determine the stack releases from the Pretreatment PJM/RFD Ventilation System (PJV), first the mass rates of all the constituents are calculated in stream PJV04 (the unabated Pretreatment PJM/RFD Vent stream). Then the corresponding DFs for each constituent within the system are applied to these values to obtain the final stack releases (stream PJV11).

7.3.1 PJV04 Stream

This streams depicts the unabated Pretreatment RFD/PJM Ventilation. For all the calculations in this section refer to Table B-4. First the feed rate is obtained followed by the mass rate of the representative constituent at the stream specified. The performance factor for this constituent is calculated and applied to the non-represented compounds to obtain their mass rate.

Group 4
Formamide (75-12-7) feed rate: 3.49E-02 g/sec (cell C169)
Formamide (75-12-7) rate at PJV04 from the PJV04 stream report in Appendix A: 2.89E-06 g/sec (cell H169)
Performance factor for Formamide: 2.89E-06/3.49E-02 = 8.29E-05 (cell I169, also copied to cell N8)

Dibenz[a,j]acridine (224-42-0) feed rate: 3.49E-02 g/sec (cell C100)
Mass rate at PJV04: 3.49E-02 (cell C100) * 8.29E-05 (cell N8) = 2.89E-06 g/sec (cell K100)
Dibenz[a,h]acridine (226-36-8) feed rate: 3.49E-02 g/sec (cell C101)
Mass rate at PJV04: 3.49E-02 (cell C101) * 8.29E-05 (cell N8) = 2.89E-06 g/sec (cell K101)

Group 8
Phenol (108-95-2) feed rate: 3.49E-02 g/sec (cell C40)
Phenol (108-95-2) rate at PJV04 from the PJV04 stream report in Appendix A: 2.21E-06 g/sec (cell H40)
Performance factor for Phenol: 2.21E-06/3.49E-02 = 6.34E-05 (cell I40)

Diethyl Phthalate (84-66-2) feed rate: 3.49E-02 g/sec (cell C206)
Diethyl Phthalate (84-66-2) rate at PJV04 from the PJV04 stream report in Appendix A: 1.92E-06 g/sec (cell H206)
Performance factor for Diethyl Phthalate: 1.92E-06/3.49E-02 = 5.51E-05 (cell I206)

2-sec-Butyl—4,6-dinitrophenol (88-85-7) feed rate: 3.49E-02 g/sec (cell C216)
2-sec-Butyl—4,6-dinitrophenol (88-85-7) rate at PJV04 from the PJV04 stream report in Appendix A: 3.20E-06 g/sec (cell H216)
Performance factor for 2-sec-Butyl—4,6-dinitrophenol: 3.20E-06/3.49E-02 = 9.19E-05 (cell I216)

Since this group is represented by the above 3 constituents, an average performance factor is then calculated and applied to the other constituents. Average performance factor is:
(6.34E-05 (cell I40) + 5.51E-05 (cell I206) + 9.19E-05 (cell I216))/3 = 7.01E-05 (cell N12)

Formaldehyde (50-00-0) feed rate: 7.67E-03 g/sec (cell C115)
Mass rate at PJV04: 7.67E-03 (cell C115) * 7.01E-05 (cell N12) = 5.38E-07 g/sec (cell K115)

Propionic Acid (79-09-4) feed rate: 3.49E-02 g/sec (cell C199)
Mass rate at PJV04: 3.49E-02 (cell C199) * 7.01E-05 (cell N12) = 2.44E-06 g/sec (cell K199)

2-Propenoic Acid (79-10-7) feed rate: 3.49E-02 g/sec (cell C200)
Mass rate at PJV04: 3.49E-02 (cell C200) * 7.01E-05 (cell N12) = 2.44E-06 g/sec (cell K200)

Coplanar PCBs
1336-36-3 feed rate at PJV04 from the PJV04 stream report in Appendix A: 1.34E-06 g/sec (cell H78)
Mass rate for the 14 coplanar PCBs in PJV04 is:
1.34E-06 (cell H78) * 0.01/14 = 9.56E-10 g/sec (cells S7 through S20)
This means that the corrected mass rate for 1336-36-3 in PJV04 is:
1.34E-06 g/sec * 0.99 = 1.32E-06 g/sec

7.3.2 PJV11 Stream

For all the calculations for this stream refer to Table B-5 of Appendix B. Input to this spreadsheet is the results from PJV04 stream calculations. These numbers are imported to Column C from cells K4 through K239. Also all the DFs are imported from Section 2 of this calculation. The corresponding DFs for this stream are related to the following unit operations: demister and HEPA filters. The calculations for Group 4 and Coplanar PCBs are the only ones shown below. The remaining groups are calculated in the same manner.

Group 4
Formamide (75-12-7) mass rate at PJV04: 2.89E-06 g/sec (cell C169)
Formamide (75-12-7) DFs throughout the PJV system:
- Demister: 1 (cell D169)
- HEPA 1: 1 (cell E169)
- HEPA 2: 1 (cell F169)

Formamide PJV11 stack mass rate: 2.89E-06 / (1*1*1) = 2.89E-06 g/sec (cell G169)

Dibenz[a,j]acridine (224-42-0) mass rate at PJV04: 2.89E-06 g/sec (cell C100)
Dibenz[a,j]acridine (224-42-0) DFs throughout the PJV system:
- Demister: 5 (cell D100)
- HEPA 1: 2,000 (cell E100)
- HEPA 2: 100 (cell F100)

Dibenz[a,j]acridine PJV11 stack mass rate: 2.89E-06 / (5*2,000*100) = 2.89E-12 g/sec (cell G100)

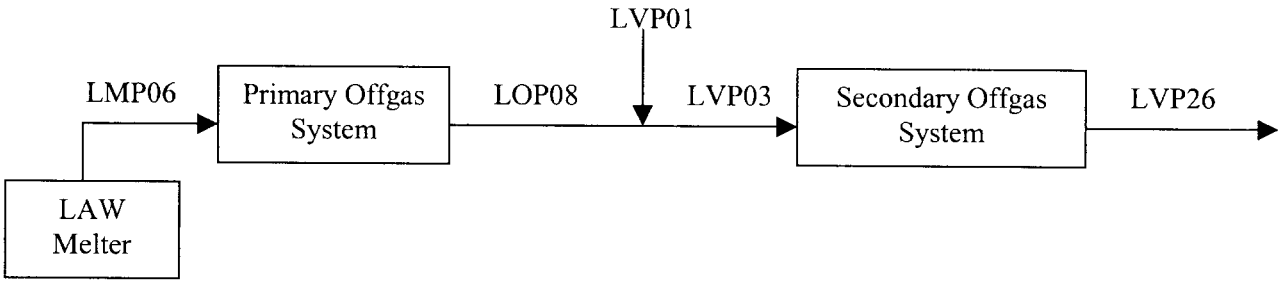
Dibenz[a,h]acridine (226-36-8) feed rate mass rate at PJV04: 2.89E-06 g/sec (cell C101)

Dibenz[a,h]acridine (226-36-8) DFs throughout the PJV system:
Demister: 5 (cell D101)
HEPA 1: 2,000 (cell E101)
HEPA 2: 100 (cell F101)
Dibenz[a,h]acridine PJV11 stack mass rate: 2.89E-06 / (5*2,000*100) = 2.89E-12 g/sec (cell G101)

Coplanar PCBs
1336-36-3 corrected mass rate at PJV04: 1.32E-06 g/sec (cell C78)
1336-36-3 DFs throughout the PJV system:
Demister: 5 (cell D78)
HEPA 1: 2,000 (cell E78)
HEPA 2: 100 (cell F78)
1336-36-3 PJV11 stack mass rate: 1.32E-06 / (5*2,000*100) = 1.32E-12 g/sec (cell G78)
Mass rate for the 14 coplanar PCBs in PJV11 is:
1.32E-12 (cell G78) * 0.01/14/0.99 = 9.56E-16 g/sec (cells K6 through K19)

7.4 LAW Vitrification Analysis

To determine the stack releases from the LAW Melter Offgas System (LVP), first the mass rates of all the constituents are calculated in stream LMP06 (the unabated LAW Melter Offgas stream). From these values, the DFs that correspond to the SBS and WESP are applied to each constituent. These results are representative of LOP08. At this point the LAW Vessel Ventilation header joins the main offgas system. At this point also the mass rates of all the constituents are calculated in stream LVP01 (the unabated LAW Vessel Ventilation Header). The values from these two streams, LOP08 and LVP01, are then added together to represent stream LVP03 (combined offgas stream). From this point on, the corresponding DFs for each constituent within the system are applied to these values to obtain the final stack releases (stream LVP26). See sketch below for a simplified depiction of the process.



7.4.1 LMP06 Stream

This streams depicts the unabated LAW Melter Offgas. For all the calculations in this section refer to Table B-6. First the feed rate is obtained followed by the mass rate of the representative constituent at the stream specified. The performance factor for this constituent is calculated and applied to the non-represented compounds to obtain their mass rate.

Group 4
Formamide (75-12-7) feed rate: 3.49E-02 g/sec (cell C169)

Formamide (75-12-7) rate at LMP06 from the LMP06 stream report in Appendix A: 2.47E-02 g/sec (cell H169)
Performance factor for Formamide: 2.47E-02/3.49E-02 = 7.08E-01 (cell I169, also copied to cell N8)

Dibenz[a,j]acridine (224-42-0) feed rate: 3.49E-02 g/sec (cell C100)
Mass rate at LMP06: 3.49E-02 (cell C100) * 7.08E-01 (cell N8) = 2.47E-02 g/sec (cell K100)
Dibenz[a,h]acridine (226-36-8) feed rate: 3.49E-02 g/sec (cell C101)
Mass rate at LMP06: 3.49E-02 (cell C101) * 7.08E-01 (cell N8) = 2.47E-02 g/sec (cell K101)

Group 8
Phenol (108-95-2) feed rate: 3.49E-02 g/sec (cell C40)
Phenol (108-95-2) rate at LMP06 from the LMP06 stream report in Appendix A: 9.42E-03 g/sec (cell H40)
Performance factor for Phenol: 9.42E-03/3.49E-02 = 2.70E-01 (cell I40)

Diethyl Phthalate (84-66-2) feed rate: 3.49E-02 g/sec (cell C206)
Diethyl Phthalate (84-66-2) rate at LMP06 from the LMP06 stream report in Appendix A: 5.30E-03 g/sec (cell H206)
Performance factor for Diethyl Phthalate: 5.30E-03/3.49E-02 = 1.52E-01 (cell I206)

2-sec-Butyl—4,6-dinitrophenol (88-85-7) feed rate: 3.49E-02 g/sec (cell C216)
2-sec-Butyl—4,6-dinitrophenol (88-85-7) rate at LMP06 from the LMP06 stream report in Appendix A: 1.88E-02 g/sec (cell H216)
Performance factor for 2-sec-Butyl—4,6-dinitrophenol: 1.88E-02/3.49E-02 = 5.38E-01 (cell I216)

Since this group is represented by the above 3 constituents, an average performance factor is then calculated and applied to the other constituents. Average performance factor is:
(2.70E-01 (cell I40) + 1.52E-01 (cell I206) + 5.38E-01 (cell I216))/3 = 3.20E-01 (cell N12)

Formaldehyde (50-00-0) feed rate: 7.67E-03 g/sec (cell C115)
Mass rate at LMP06: 7.67E-03 (cell C115) * 3.20E-01 (cell N12) = 2.46E-03 g/sec (cell K115)

Propionic Acid (79-09-4) feed rate: 3.49E-02 g/sec (cell C199)
Mass rate at LMP06: 3.49E-02 (cell C199) * 3.20E-01 (cell N12) = 1.12E-02 g/sec (cell K199)

2-Propenoic Acid (79-10-7) feed rate: 3.49E-02 g/sec (cell C200)
Mass rate at LMP06: 3.49E-02 (cell C200) * 3.20E-01 (cell N12) = 1.12E-02 g/sec (cell K200)

Coplanar PCBs
1336-36-3 feed rate at LMP06 from the LMP06 stream report in Appendix A: 5.47E-11 g/sec (cell H78)
Mass rate for the 14 coplanar PCBs in LMP06 is:
5.47E-11 (cell H78) * 0.01/14 = 3.91E-14 g/sec (cells S7 through S20)
Thus the corrected mass rate of 1336-36-3 in LMP06 is:
5.47E-11 g/sec * 0.99 = 5.42E-11 g/sec

7.4.2 LVP01 Stream

This streams depicts the unabated LAW Vessel Ventilation. This stream is represented by the addition of streams LFP06, RLD32, RLD33, and RLD34. For all the calculations in this section refer to Table B-7. First the feed rate is obtained followed by the mass rate of the representative constituent at the stream specified. The performance factor for this constituent is calculated and applied to the non-represented compounds to obtain their mass rate.

Group 4

Formamide (75-12-7) feed rate: 3.49E-02 g/sec (cell C169)
Formamide (75-12-7) rate at LVP01 from the addition of stream reports LFP06, RLD32, RLD33, and RLD34 in Appendix A: 5.43E-10 g/sec (cell H169)
Performance factor for Formamide: 5.43E-10/3.49E-02 = 1.56E-08 (cell I169, also copied to cell N8)

Dibenz[a,j]acridine (224-42-0) feed rate: 3.49E-02 g/sec (cell C100)
Mass rate at LVP01: 3.49E-02 (cell C100) * 1.56E-08 (cell N8) = 5.43E-10 g/sec (cell K100)
Dibenz[a,h]acridine (226-36-8) feed rate: 3.49E-02 g/sec (cell C101)
Mass rate at LVP01: 3.49E-02 (cell C101) * 1.56E-08 (cell N8) = 5.43E-10 g/sec (cell K101)

Group 8

Phenol (108-95-2) feed rate: 3.49E-02 g/sec (cell C40)
Phenol (108-95-2) rate at LVP01 from the addition of stream reports LFP06, RLD32, RLD33, and RLD34 in Appendix A: 2.07E-10 g/sec (cell H40)
Performance factor for Phenol: 2.07E-10/3.49E-02 = 5.94E-09 (cell I40)

Diethyl Phthalate (84-66-2) feed rate: 3.49E-02 g/sec (cell C206)
Diethyl Phthalate (84-66-2) rate at LVP01 from the addition of stream reports LFP06, RLD32, RLD33, and RLD34 in Appendix A: 1.17E-10 g/sec (cell H206)
Performance factor for Diethyl Phthalate: 1.17E-10/3.49E-02 = 3.35E-09 (cell I206)

2-sec-Butyl—4,6-dinitrophenol (88-85-7) feed rate: 3.49E-02 g/sec (cell C216)
2-sec-Butyl—4,6-dinitrophenol (88-85-7) rate at LVP01 from the addition of stream reports LFP06, RLD32, RLD33, and RLD34 in Appendix A: 6.04E-10 g/sec (cell H216)
Performance factor for 2-sec-Butyl—4,6-dinitrophenol: 6.04E-10/3.49E-02 = 1.73E-08 (cell I216)

Since this group is represented by the above 3 constituents, an average performance factor is then calculated and applied to the other constituents. Average performance factor is:
(5.94E-09 (cell I40) + 3.35E-09 (cell I206) + 1.73E-08 (cell I216))/3 = 8.87E-09 (cell N12)

Formaldehyde (50-00-0) feed rate: 7.67E-03 g/sec (cell C115)
Mass rate at LVP01: 7.67E-03 (cell C115) * 8.87E-09 (cell N12) = 6.81E-11 g/sec (cell K115)

Propionic Acid (79-09-4) feed rate: 3.49E-02 g/sec (cell C199)
Mass rate at LVP01: 3.49E-02 (cell C199) * 8.87E-09 (cell N12) = 3.09E-10 g/sec (cell K199)

2-Propenoic Acid (79-10-7) feed rate: 3.49E-02 g/sec (cell C200)
Mass rate at LVP01: 3.49E-02 (cell C200) * 8.87E-09 (cell N12) = 3.09E-10 g/sec (cell K200)

Coplanar PCBs

1336-36-3 feed rate at LVP01 from the addition of stream reports LFP06, RLD32, RLD33, and RLD34 in Appendix A: 1.76E-18 g/sec (cell H78)
Mass rate for the 14 coplanar PCBs in LVP01 is:
1.76E-18 (cell H78) * 0.01/14 = 1.26E-21 g/sec (cells S7 through S20)
Thus the corrected mass rate for 1336-36-3 in LVP01 is:
1.76E-18 g/sec * 0.99 = 1.74E-18 g/sec

7.4.3 LVP26 Stream

For all the calculations for this stream refer to Table B-8 of Appendix B. Input to this spreadsheet is the results from LMP06 and LVP01 stream calculations. The numbers for LMP06 were imported to Column D (cells D4 through D239). The ones for stream LVP01 were imported to column H (cells H4 through H239). Also all the DFs were imported from Section 2 of this calculation. The corresponding DFs for this stream are related to the following unit operations: SBS, WESP, HEPA filters, TCO, and caustic scrubber. The calculations for Group 4 and Coplanar PCBs are the only ones shown below. The remaining groups are calculated in the same manner.

First the intermediate stream, LOP08, is calculated by applying the DFs for the SBS and WESP to stream LMP06. At this point, the values calculated for LVP01 are added to LOP08 to represent stream LVP03. The DFs for the rest of the unit operations in the system are then applied to the values in LVP03. Final results represent the composition of stream LVP26.

7.4.3.1 LOP08 Calculation

Group 4
Formamide (75-12-7) mass rate at LMP06: 2.47E-02 g/sec (cell D169)
Formamide (75-12-7) DFs throughout the LAW Primary Offgas system:
SBS: 1 (cell E169)
WESP: 1 (cell F169)
Formamide LOP08 mass rate: 2.47E-02 / (1*1) = 2.47E-02 g/sec (cell G169)

Dibenz[a,j]acridine (224-42-0) mass rate at LMP06: 2.47E-02 g/sec (cell D100)
Dibenz[a,j]acridine (224-42-0) DFs throughout the LAW Primary Offgas system:
SBS: 40 (cell E100)
WESP: 11 (cell F100)
Dibenz[a,j]acridine LOP08 mass rate: 2.47E-02 / (40*11) = 5.61E-05 g/sec (cell G100)

Dibenz[a,h]acridine (226-36-8) feed rate mass rate at LMP06: 2.47E-02 g/sec (cell D101)
Dibenz[a,h]acridine (226-36-8) DFs throughout the LAW Primary Offgas system:
SBS: 40 (cell E101)
WESP: 11 (cell F101)
Dibenz[a,h]acridine LOP08 mass rate: 2.47E-02 / (40*11) = 5.61E-05 g/sec (cell G101)

Coplanar PCBs
1336-36-3 corrected mass rate at LMP06: 5.42E-11 g/sec (cell D78)
1336-36-3 DFs throughout the PJV system:
SBS: 40 (cell E78)
WESP: 11 (cell F78)
1336-36-3 LOP08 mass rate: 5.42E-11 / (40*11) = 1.23E-13 (cell G78)
Mass rate for the 14 coplanar PCBs in LOP08 is:
1.23E-13 (cell G78) * 0.01/14/0.99 = 8.88E-17 g/sec (cells D244 through D257)

7.4.3.2 LVP03 Calculation

The composition of this stream is calculated by summing the mass rates in streams LVP01 and LOP08 for each constituents.

Group 4
Formamide (75-12-7) mass rate at LVP01: 5.43E-10 g/sec (cell H169)
Formamide (75-12-7) mass rate at LOP08: 2.47E-02 g/sec (cell G169)
Formamide (75-12-7) mass rate at LVP03: 5.43E-10 + 2.47E-02 = 2.47E-02 g/sec (cell I169)

Dibenz[a,j]acridine (224-42-0) mass rate at LVP01: 5.43E-10 g/sec (cell H100)
Dibenz[a,j]acridine (224-42-0) mass rate at LOP08: 5.61E-05 g/sec (cell G100)
Dibenz[a,j]acridine (224-42-0) mass rate at LVP03: 5.43E-10 + 5.61E-05 = 5.61E-05 g/sec (cell I100)

Dibenz[a,h]acridine (226-36-8) mass rate at LVP01: 5.43E-10 g/sec (cell H101)
Dibenz[a,h]acridine (226-36-8) mass rate at LOP08: 5.61E-05 g/sec (cell G101)
Dibenz[a,h]acridine (226-36-8) mass rate at LVP03: 5.43E-10 + 5.61E-05 = 5.61E-05 g/sec (cell I101)

Coplanar PCBs
1336-36-3 mass rate at LVP01: 1.74E-18 g/sec (cell H78)
1336-36-3 mass rate at LOP08: 1.23E-13 g/sec (cell G78)
1336-36-3 mass rate at LVP03: 1.74E-18 + 1.23E-13 = 1.23E-13 g/sec (cell I78)
Mass rate for the 14 coplanar PCBs in LVP03 is:
Mass rate at LVP01: 1.26E-21 g/sec (cell H244)
Mass rate at LOP08: 8.88E-17 g/sec (cell D244)
Mass rate at LVP03 = 1.26E-21 g/sec + 8.88E-17 g/sec = 8.88E-17 g/sec (cells I244 through I257)

7.4.3.3 LVP26 Calculation

The composition of this stream is calculated by using the values of stream LVP03 and applying the corresponding DFs from the following units: HEPA Filters, TCO, and Caustic Scrubber. The calculations for Group 4 and Coplanar PCBs are the only ones shown below as all the rest of the calculations are the same.

Group 4
Formamide (75-12-7) mass rate at LVP03: 2.47E-02 g/sec (cell I169)
Formamide (75-12-7) DFs throughout the LVP system:
HEPA 1: 1 (cell J169)
HEPA 2: 1 (cell K169)
TCO: 20 (cell L169)
NaOH Scrubber: 1 (cell M169)
Formamide LVP26 stack mass rate: 2.47E-02 / (1*1*20*1) = 1.24E-03 g/sec (cell N169)

Dibenz[a,j]acridine (224-42-0) mass rate at LVP03: 5.61E-05 g/sec (cell I100)
Dibenz[a,j]acridine (224-42-0) DFs throughout the LVP system:
HEPA 1: 2,000 (cell J100)
HEPA 2: 100 (cell K100)
TCO: 20 (cell L100)
NaOH Scrubber: 1 (cell M100)
Dibenz[a,j]acridine LVP26 stack mass rate: 5.61E-05 / (2,000*100*20*1) = 1.40E-11 g/sec (cell N100)

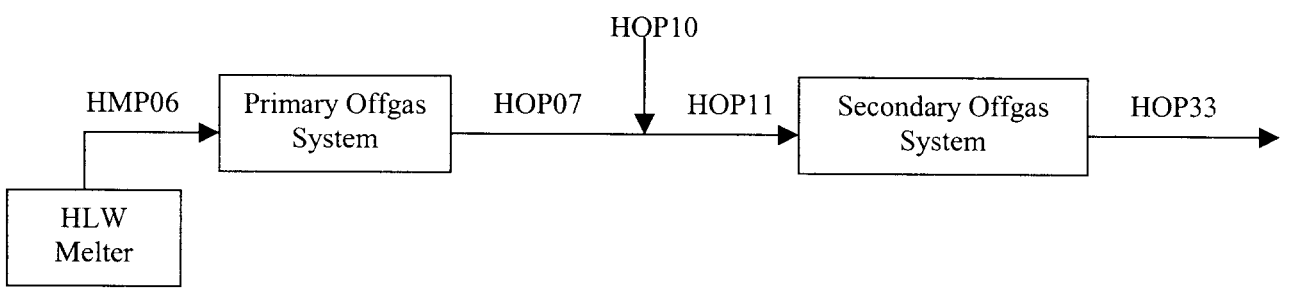
Dibenz[a,h]acridine (226-36-8) feed rate mass rate at LVP03: 5.61E-05 g/sec (cell I101)
Dibenz[a,h]acridine (226-36-8) DFs throughout the LVP system:
HEPA 1: 2,000 (cell J101)
HEPA 2: 100 (cell K101)

TCO: 20 (cell L101)
NaOH Scrubber: 1 (cell M101)
Dibenz[a,h]acridine LVP26 stack mass rate: 5.61E-05 / (2,000*100*20*1) = 1.40E-11 g/sec (cell N101)

Coplanar PCBs
1336-36-3 mass rate at LVP03: 1.23E-13 g/sec (cell I78)
1336-36-3 DFs throughout the LVP system:
HEPA 1: 2,000 (cell J78)
HEPA 2: 100 (cell K78)
TCO: 20 (cell L78)
NaOH Scrubber: 1 (cell M78)
1336-36-3 LPV26 stack mass rate: 1.23E-13 / (2,000*100*20*1) = 3.08E-20 g/sec (cell N78)
Mass rate for the 14 coplanar PCBs in LVP26 is:
3.08E-20 (cell N78) * 0.01/14 = 2.22E-23 g/sec (cells N244 through N257)

7.5 HLW Vitrification Analysis

To determine the stack releases from the HLW Melter Offgas System (HOP), first the mass rates of all the constituents are calculated in stream HMP06 (the unabated HLW Melter Offgas stream). From these values, the DFs that correspond to the SBS and WESP are applied to each constituent. These results are representative of HOP07. At this point the HLW Vessel Ventilation header joins the main offgas system. At this point, the mass rates of all the constituents are calculated in stream HOP10 (the unabated HLW Vessel Ventilation Header). The values from these two streams, HOP07 and HOP10, are then added together to represent stream HOP11 (combined offgas stream). From this point on, the corresponding DFs for each constituent within the system are applied to these values to obtain the final stack releases (stream HOP33).



7.5.1 HMP06 Stream

This streams depicts the unabated HLW Melter Offgas. For all the calculations in this section refer to Table B-9. First the feed rate is obtained followed by the mass rate of the representative constituent at the stream specified. The performance factor for this constituent is calculated and applied to the non-represented compounds to obtain their mass rate.

Group 4
Formamide (75-12-7) feed rate: 3.49E-02 g/sec (cell C169)
Formamide (75-12-7) rate at HMP06 from the HMP06 stream report in Appendix A: 6.80E-03 g/sec (cell H169)
Performance factor for Formamide: 6.80E-03/3.49E-02 = 1.95E-01 (cell I169, also copied to cell N8)

Dibenz[a,j]acridine (224-42-0) feed rate: 3.49E-02 g/sec (cell C100)
Mass rate at HMP06: 3.49E-02 (cell C100) * 1.95E-01 (cell N8) = 6.80E-03 g/sec (cell K100)
Dibenz[a,h]acridine (226-36-8) feed rate: 3.49E-02 g/sec (cell C101)
Mass rate at HMP06: 3.49E-02 (cell C101) * 1.95E-01 (cell N8) = 6.80E-03 g/sec (cell K101)

Group 8
Phenol (108-95-2) feed rate: 3.49E-02 g/sec (cell C40)
Phenol (108-95-2) rate at HMP06 from the HMP06 stream report in Appendix A: 6.71E-03 g/sec (cell H40)
Performance factor for Phenol: 6.71E-03/3.49E-02 = 1.93E-01 (cell I40)

Diethyl Phthalate (84-66-2) feed rate: 3.49E-02 g/sec (cell C206)
Diethyl Phthalate (84-66-2) rate at HMP06 from the HMP06 stream report in Appendix A: 6.33E-03 g/sec (cell H206)
Performance factor for Diethyl Phthalate: 6.33E-03/3.49E-02 = 1.82E-01 (cell I206)

2-sec-Butyl—4,6-dinitrophenol (88-85-7) feed rate: 3.49E-02 g/sec (cell C216)
2-sec-Butyl—4,6-dinitrophenol (88-85-7) rate at HMP06 from the HMP06 stream report in Appendix A: 9.69E-03 g/sec (cell H216)
Performance factor for 2-sec-Butyl—4,6-dinitrophenol: 9.69E-03/3.49E-02 = 2.78E-01 (cell I216)

Since this group is represented by the above 3 constituents, an average performance factor is then calculated and applied to the other constituents. Average performance factor is:
(1.93E-01 (cell I40) + 1.82E-01 (cell I206) + 2.78E-01 (cell I216))/3 = 2.17E-01 (cell N12)

Formaldehyde (50-00-0) feed rate: 7.67E-03 g/sec (cell C115)
Mass rate at HMP06: 7.67E-03 (cell C115) * 2.17E-01 (cell N12) = 1.67E-03 g/sec (cell K115)

Propionic Acid (79-09-4) feed rate: 3.49E-02 g/sec (cell C199)
Mass rate at HMP06: 3.49E-02 (cell C199) * 2.17E-01 (cell N12) = 7.58E-03 g/sec (cell K199)

2-Propenoic Acid (79-10-7) feed rate: 3.49E-02 g/sec (cell C200)
Mass rate at HMP06: 3.49E-02 (cell C200) * 2.17E-01 (cell N12) = 7.58E-03 g/sec (cell K200)

Coplanar PCBs
1336-36-3 feed rate at HMP06 from the HMP06 stream report in Appendix A: 6.69E-05 g/sec (cell H78)
Mass rate for the 14 coplanar PCBs in HMP06 is:
6.69E-05 (cell H78) * 0.01/14 = 4.78E-08 g/sec (cells S7 through S20)
Thus the correct mass rate for 1336-36-3 in HMP06 is:
6.69E-05 g/sec * 0.99 = 6.62E-05 g/sec

7.5.2 HOP10 Stream

This streams depicts the unabated HLW Vessel Ventilation. For all the calculations in this section refer to Table B-10. First the feed rate is obtained followed by the mass rate of the representative constituent at the stream specified. The performance factor for this constituent is calculated and applied to the non-represented compounds to obtain their mass rate.

Group 4
Formamide (75-12-7) feed rate: 3.49E-02 g/sec (cell C169)

Formamide (75-12-7) rate at HOP10 from the HOP10 stream report in Appendix A: 2.11E-09 g/sec (cell H169)
Performance factor for Formamide: 2.11E-09/3.49E-02 = 6.06E-08 (cell I169, also copied to cell N8)

Dibenz[a,j]acridine (224-42-0) feed rate: 3.49E-02 g/sec (cell C100)
Mass rate at HOP10: 3.49E-02 (cell C100) * 6.06E-08 (cell N8) = 2.11E-09 g/sec (cell K100)
Dibenz[a,h]acridine (226-36-8) feed rate: 3.49E-02 g/sec (cell C101)
Mass rate at HOP10: 3.49E-02 (cell C101) * 6.06E-08 (cell N8) = 2.11E-09 g/sec (cell K101)

Group 8
Phenol (108-95-2) feed rate: 3.49E-02 g/sec (cell C40)
Phenol (108-95-2) rate at HOP10 from the HOP10 stream report in Appendix A: 4.95E-07 g/sec (cell H40)
Performance factor for Phenol: 4.95E-07/3.49E-02 = 1.42E-05 (cell I40)

Diethyl Phthalate (84-66-2) feed rate: 3.49E-02 g/sec (cell C206)
Diethyl Phthalate (84-66-2) rate at HOP10 from the HOP10 stream report in Appendix A: 8.55E-07 g/sec (cell H206)
Performance factor for Diethyl Phthalate: 8.57E-07/3.49E-02 = 2.45E-05 (cell I206)

2-sec-Butyl—4,6-dinitrophenol (88-85-7) feed rate: 3.49E-02 g/sec (cell C216)
2-sec-Butyl—4,6-dinitrophenol (88-85-7) rate at HOP10 from the HOP10 stream report in Appendix A: 2.94E-06 g/sec (cell H216)
Performance factor for 2-sec-Butyl—4,6-dinitrophenol: 2.94E-06/3.49E-02 = 8.42E-05 (cell I216)

Since this group is represented by the above 3 constituents, an average performance factor is then calculated and applied to the other constituents. Average performance factor is:
(1.42E-05 (cell I40) + 2.45E-05 (cell I206) + 8.42E-05 (cell I216))/3 = 4.10E-05 (cell N12)

Formaldehyde (50-00-0) feed rate: 7.67E-03 g/sec (cell C115)
Mass rate at HOP10: 7.67E-03 (cell C115) * 4.10E-05 (cell N12) = 3.14E-07 g/sec (cell K115)

Propionic Acid (79-09-4) feed rate: 3.49E-02 g/sec (cell C199)
Mass rate at HOP10: 3.49E-02 (cell C199) * 4.10E-05 (cell N12) = 1.43E-06 g/sec (cell K199)

2-Propenoic Acid (79-10-7) feed rate: 3.49E-02 g/sec (cell C200)
Mass rate at HOP10: 3.49E-02 (cell C200) * 4.10E-05 (cell N12) = 1.43E-06 g/sec (cell K200)

Coplanar PCBs
1336-36-3 feed rate at HOP10 from the HOP10 stream report in Appendix A: 1.95E-05 g/sec (cell H78)
Mass rate for the 14 coplanar PCBs in HOP10 is:
1.95E-05 (cell H78) * 0.01/14 = 1.39E-08 g/sec (cells S7 through S20)
Thus the corrected mass rate for 1336-36-3 in HOP10 is:
1.95E-05 g/sec * 0.99 = 1.93E-05 g/sec

7.5.3 HOP33 Stream

For all the calculations for this stream refer to Table B-11 of Appendix B. Input to this spreadsheet is the results from HMP06 and HOP10 stream calculations. The numbers for HMP06 were imported to Column D (cells D4 through D239). The ones for stream HOP10 are imported to column H (cells H4 through H239). Also all the DFs are imported from Section 2 of this calculation. The corresponding DFs for this stream are related to the following

unit operations: SBS, WESP, HEME, HEPA filters, and TCO. The calculations for Group 4 and Coplanar PCBs are the only ones shown below. The remaining groups are calculated in the same manner.

First the intermediate stream, HOP07, is calculated by applying the DFs for the SBS and WESP to stream LMP06. At this point, the values calculated for HOP10 are added to HOP07 to represent stream HOP11. The DFs for the rest of the unit operations in the system are then applied to the values in HOP11. Final results represent the composition of stream HOP33.

7.5.3.1 HOP07 Calculation

Group 4
Formamide (75-12-7) mass rate at HMP06: 6.80E-03 g/sec (cell D169)
Formamide (75-12-7) DFs throughout the LAW Primary Offgas system:
SBS: 1 (cell E169)
WESP: 1 (cell F169)
Formamide HOP07 mass rate: 6.80E-03 / (1*1) = 6.80E-03 g/sec (cell G169)

Dibenz[a,j]acridine (224-42-0) mass rate at HMP06: 6.80E-03 g/sec (cell D100)
Dibenz[a,j]acridine (224-42-0) DFs throughout the LAW Primary Offgas system:
SBS: 40 (cell E100)
WESP: 11 (cell F100)
Dibenz[a,j]acridine HOP07 mass rate: 6.80E-03 / (40*11) = 1.55E-05 g/sec (cell G100)

Dibenz[a,h]acridine (226-36-8) feed rate mass rate at HMP06: 6.80E-03 g/sec (cell D101)
Dibenz[a,h]acridine (226-36-8) DFs throughout the LAW Primary Offgas system:
SBS: 40 (cell E101)
WESP: 11 (cell F101)
Dibenz[a,h]acridine HOP07 mass rate: 6.80E-03 / (40*11) = 1.55E-05 g/sec (cell G101)

Coplanar PCBs
1336-36-3 mass rate at HMP06: 6.62E-05 g/sec (cell D78)
1336-36-3 DFs throughout the PJV system:
SBS: 40 (cell E78)
WESP: 11 (cell F78)
1336-36-3 HOP07 mass rate: 6.62E-05 / (40*11) = 1.51E-07 g/sec (cell G78)
Mass rate for the 14 coplanar PCBs in HOP07 is:
1.51E-07 (cell G78) * 0.01/14/0.99 = 1.09E-10 g/sec (cells D244 through D257)

7.5.3.2 HOP11 Calculation

The composition of this stream is calculated by summing the mass rates in streams HOP10 and HOP07 for each constituents.

Group 4
Formamide (75-12-7) mass rate at HOP10: 2.11E-09 g/sec (cell H169)
Formamide (75-12-7) mass rate at HOP07: 6.80E-03 g/sec (cell G169)
Formamide (75-12-7) mass rate at HOP11: 2.11E-09 + 6.80E-03 = 6.80E-03 g/sec (cell I169)

Dibenz[a,j]acridine (224-42-0) mass rate at HOP10: 2.11E-09 g/sec (cell H100)

Dibenz[a,j]acridine (224-42-0) mass rate at HOP07: 1.55E-05 g/sec (cell G100)
Dibenz[a,j]acridine (224-42-0) mass rate at HOP11: 2.11E-09 + 1.55E-05 = 1.55E-05 g/sec (cell I100)

Dibenz[a,h]acridine (226-36-8) mass rate at HOP10: 2.11E-09 g/sec (cell H101)
Dibenz[a,h]acridine (226-36-8) mass rate at HOP07: 1.55E-05 g/sec (cell G101)
Dibenz[a,h]acridine (226-36-8) mass rate at HOP11: 2.11E-09 + 1.55E-05 = 1.55E-05 g/sec (cell I101)

Coplanar PCBs
1336-36-3 mass rate at HOP10: 1.93E-05 g/sec (cell H78)
1336-36-3 mass rate at HOP07: 1.51E-07 g/sec (cell G78)
1336-36-3 mass rate at HOP11: 1.93E-05 + 1.51E-07 = 1.95E-05 g/sec (cell I78)
Mass rate for the 14 coplanar PCBs in HOP11 is:
Mass rate at HOP10: 1.39E-08 g/sec (cell H244)
Mass rate at HOP07: 1.09E-10 g/sec (cell D244)
Mass rate at HOP11: 1.39E-08 g/sec + 1.09E-10 g/sec = 1.41E-08 g/sec (cells I244 through I257)

7.5.3.3 HOP33 Calculation

The composition of this stream is calculated by using the values of stream HOP11 and applying the corresponding DFs from the following units: HEME, HEPA Filters, and TCO. The calculations for Group 4 and Coplanar PCBs are the only ones shown below as all the rest of the calculations are the same.

Group 4
Formamide (75-12-7) mass rate at HOP11: 6.80E-03 g/sec (cell I169)
Formamide (75-12-7) DFs throughout the HOP system:
HEME: 1 (cell J169)
HEPA 1: 1 (cell K169)
HEPA 2: 1 (cell L169)
TCO: 20 (cell M169)
Formamide HOP33 stack mass rate: 6.80E-03 / (1*1*1*20) = 3.40E-04 g/sec (cell N169)

Dibenz[a,j]acridine (224-42-0) mass rate at HOP11: 1.55E-05 g/sec (cell I100)
Dibenz[a,j]acridine (224-42-0) DFs throughout the HOP system:
HEME: 90 (cell J100)
HEPA 1: 2,000 (cell K100)
HEPA 2: 100 (cell L100)
TCO: 20 (cell M100)
Dibenz[a,j]acridine HOP33 stack mass rate: 1.55E-05 / (90*2,000*100*20) = 4.30E-14 g/sec (cell N100)

Dibenz[a,h]acridine (226-36-8) feed rate mass rate at HOP11: 1.55E-05 g/sec (cell I101)
Dibenz[a,h]acridine (226-36-8) DFs throughout the HOP system:
HEME: 90 (cell J101)
HEPA 1: 2,000 (cell K101)
HEPA 2: 100 (cell L101)
TCO: 20 (cell M101)
Dibenz[a,h]acridine HOP33 stack mass rate: 1.55E-05 / (90*2,000*100*20) = 4.30E-14 g/sec (cell N101)

Coplanar PCBs
1336-36-3 mass rate at HOP11: 1.95E-05 g/sec (cell I78)

1336-36-3 DFs throughout the HOP system:

HEME: 90 (cell J78)
HEPA 1: 2,000 (cell K78)
HEPA 2: 100 (cell L78)
TCO: 20 (cell M78)

1336-36-3 HOP33 stack mass rate: 1.89E-05 / (90*2,000*100*20) = 5.41E-14 g/sec (cell N78)
Mass rate for the 14 coplanar PCBs in HOP33 is:
5.41E-14 (cell N78) * 0.01/14/0.99 = 3.90E-17 g/sec (cells N244 through N257)

7.6 HLW PJM/RFD Analysis

To determine the stack releases from the HLW PJM/RFD Ventilation System (PJV), first the mass rates of all the constituents are calculated in stream PJV32 (the unabated HLW PJM/RFD Vent stream). Then the corresponding DFs for each constituent within the system are applied to these values to obtain the final stack releases (stream PJV34).

7.6.1 PJV32 Stream

This streams depicts the unabated HLW RFD/PJM Ventilation. For all the calculations in this section refer to Table B-12. First the feed rate is obtained followed by the mass rate of the representative constituent at the stream specified. The performance factor for this constituent is calculated and applied to the non-represented compounds to obtain their mass rate.

Group 4

Formamide (75-12-7) feed rate: 3.49E-02 g/sec (cell C169)
Formamide (75-12-7) rate at PJV32 from the PJV32 stream report in Appendix A: 7.48E-13 g/sec (cell H169)
Performance factor for Formamide: 7.48E-13/3.49E-02 = 2.15E-11 (cell I169, also copied to cell N8)

Dibenz[a,j]acridine (224-42-0) feed rate: 3.49E-02 g/sec (cell C100)
Mass rate at PVP01: 3.49E-02 (cell C100) * 2.15E-11 (cell N8) = 7.48E-13 g/sec (cell K100)
Dibenz[a,h]acridine (226-36-8) feed rate: 3.49E-02 g/sec (cell C101)
Mass rate at PVP01: 3.49E-02 (cell C101) * 2.15E-11 (cell N8) = 7.48E-13 g/sec (cell K101)

Group 8

Phenol (108-95-2) feed rate: 3.49E-02 g/sec (cell C40)
Phenol (108-95-2) rate at PJV32 from the PJV32 stream report in Appendix A: 7.39E-13 g/sec (cell H40)
Performance factor for Phenol: 7.39E-13/3.49E-02 = 2.12E-11 (cell I40)

Diethyl Phthalate (84-66-2) feed rate: 3.49E-02 g/sec (cell C206)
Diethyl Phthalate (84-66-2) rate at PJV32 from the PJV32 stream report in Appendix A: 6.97E-13 g/sec (cell H206)
Performance factor for Diethyl Phthalate: 6.97E-13/3.49E-02 = 2.00E-11 (cell I206)

2-sec-Butyl—4,6-dinitrophenol (88-85-7) feed rate: 3.49E-02 g/sec (cell C216)
2-sec-Butyl—4,6-dinitrophenol (88-85-7) rate at PJV32 from the PJV32 stream report in Appendix A: 1.29E-11 g/sec (cell H216)
Performance factor for 2-sec-Butyl—4,6-dinitrophenol: 1.29E-11/3.49E-02 = 3.69E-10 (cell I216)

Since this group is represented by the above 3 constituents, an average performance factor is then calculated and applied to the other constituents. Average performance factor is:

(2.12E-11 (cell I40) + 2.0E-11 (cell I206) + 3.69E-11 (cell I216))/3 = 1.37E-10 (cell N12)

Formaldehyde (50-00-0) feed rate: 7.67E-03 g/sec (cell C115)
Mass rate at PVP01: 7.67E-03 (cell C115) * 1.37E-10 (cell N12) = 1.05E-12 g/sec (cell K115)

Propionic Acid (79-09-4) feed rate: 3.49E-02 g/sec (cell C199)
Mass rate at PVP01: 3.49E-02 (cell C199) * 1.37E-10 (cell N12) = 4.77E-12 g/sec (cell K199)

2-Propenoic Acid (79-10-7) feed rate: 3.49E-02 g/sec (cell C200)
Mass rate at PVP01: 3.49E-02 (cell C200) * 1.37E-10 (cell N12) = 4.77E-12 g/sec (cell K200)

Coplanar PCBs
1336-36-3 feed rate at PJV32 from the PJV32 stream report in Appendix A: 1.15E-13 g/sec (cell H78)
Mass rate for the 14 coplanar PCBs in PJV32 is:
1.15E-13 (cell H78) * 0.01/14 = 8.20E-17 g/sec (cells S7 through S20)
Thus the corrected mass rate for 1336-36-3 in PJV32 is:
1.15E-13 g/sec * 0.99 = 1.14E-13 g/sec

7.6.2 PJV34 Stream

For all the calculations for this stream refer to Table B-13 of Appendix B. Input to this spreadsheet is the results from PJV32 stream calculations. These numbers are imported to Column C (cells C4 through C239). Also all the DFs are imported from Section 2 of this calculation. The corresponding DFs for this stream are related to the following unit operations: HEPA filters. The calculations for Group 4 and Coplanar PCBs are the only ones shown below as all the rest of the calculations are the same.

Group 4
Formamide (75-12-7) mass rate at PJV32: 7.48E-13 g/sec (cell C169)
Formamide (75-12-7) DFs throughout the PJV system:
HEPA 1: 1 (cell D169)
HEPA 2: 1 (cell E169)
Formamide PJV34 stack mass rate: 7.48E-13 / (1*1) = 7.48E-13 g/sec (cell F169)

Dibenz[a,j]acridine (224-42-0) mass rate at PJV32: 7.48E-13 g/sec (cell C100)
Dibenz[a,j]acridine (224-42-0) DFs throughout the PJV system:
HEPA 1: 2,000 (cell D100)
HEPA 2: 100 (cell E100)
Dibenz[a,j]acridine PJV34 stack mass rate: 7.48E-13 / (2,000*100) = 3.74E-18 g/sec (cell F100)

Dibenz[a,h]acridine (226-36-8) feed rate mass rate at PJV32: 7.48E-13 g/sec (cell C101)
Dibenz[a,h]acridine (226-36-8) DFs throughout the PJV system:
HEPA 1: 2,000 (cell D101)
HEPA 2: 100 (cell E101)
Dibenz[a,h]acridine PJV34 stack mass rate: 7.48E-13 / (2,000*100) = 3.74E-18 g/sec (cell F101)

Coplanar PCBs
1336-36-3 corrected mass rate at PJV32: 1.14E-13 g/sec (cell C78)
1336-36-3 DFs throughout the PJV system:
HEPA 1: 2,000 (cell E78)

HEPA 2: 100 (cell F78)
1336-36-3 PJV34 stack mass rate: 1.14E-13 / (2,000*100) = 5.68E-19 g/sec (cell F78)
Mass rate for the 14 coplanar PCBs in PJV34 is:
5.68E-19 (cell F78) * 0.01/14/0.99 = 4.10E-22 g/sec (cells J6 through J19)

8 Results and Conclusion

A summary of the results per constituent per stream is presented below. Emissions rates from the non-represented organic compounds in the SSFM have been estimated in this calculation. These rates will be reported in the next revision of the *Integrated Emissions Baseline Report for the River Protection Project Waste Treatment Plant* (RPT-W375-ES00001). This calculation will be updated each time a new official emissions profile is generated.

CALCULATION SHEET

BY: E. Berríos
DATE: 05/21/03

PROJECT: WTP
JOB NO.: 24590
CALC NO.: 24590-WTP-M4C-FRP-00005
SHEET REV: A
SHEET NO.: 49

Table 1 Summary of Organic Constituents Emission Rates for the WTP

	A	B	C	D	E	F	G	H	I	J	K	L	M
2	CAS #	COPC	Feed	Unabated Streams					Abated Streams				
3			FRP14	PVP01	PJV04	LMP06	HMP06	PJV32	PVP12	PJV11	LVP26	HOP33	PJV34
4			WTP Feed	PT Vessel Vent	PT RFD/PJM	LAW Melter	HLW Melter	HLW PJM/RFD	PT Vessel Vent	PT RFD/PJM	LAW Melter	HLW Melter	HLW PJM/RFD
5			g/sec	g/sec	g/sec	g/sec	g/sec	g/sec	g/sec	g/sec	g/sec	g/sec	g/sec
6	100-00-5	p-Nitrochlorobenzene	3.49E-02	2.32E-03	1.42E-06	2.55E-04	5.03E-03	3.82E-12	4.65E-08	1.42E-06	1.27E-05	2.52E-04	3.82E-12
7	100-21-0	p-Phthalic acid	3.49E-02	3.05E-08	2.90E-06	2.48E-02	6.81E-03	7.49E-13	3.05E-11	2.90E-06	1.24E-03	3.41E-04	7.49E-13
8	100-25-4	1,4-Dinitrobenzene	3.49E-02	2.15E-05	2.82E-06	2.28E-02	6.86E-03	7.54E-13	3.25E-18	2.82E-12	1.29E-11	4.34E-14	3.77E-18
9	100-41-4	Ethyl benzene	7.67E-03	7.69E-03	7.78E-08	0.00E+00	1.17E-12	3.90E-22	7.69E-07	7.78E-08	0.00E+00	1.89E-13	3.90E-22
10	100-42-5	Styrene	7.67E-03	7.70E-03	7.92E-08	0.00E+00	3.39E-10	5.85E-20	7.70E-07	7.92E-08	0.00E+00	2.75E-11	5.85E-20
11	10061-01-5	cis-1,3-Dichloropropene	7.67E-03	7.72E-03	8.06E-08	0.00E+00	9.78E-10	1.66E-19	7.72E-05	8.06E-08	0.00E+00	7.83E-11	1.66E-19
12	10061-02-6	trans-1,3-Dichloropropene	7.67E-03	7.66E-03	8.33E-08	0.00E+00	1.88E-08	2.66E-18	1.53E-04	8.33E-08	0.00E+00	1.24E-09	2.66E-18
13	101-55-3	4-Bromophenylphenyl ether	3.49E-02	2.41E-02	6.48E-07	1.03E-07	3.50E-04	3.94E-14	1.45E-04	6.48E-07	5.13E-09	1.80E-05	3.94E-14
14	101-84-8	Diphenyl ether	7.67E-03	7.19E-03	9.69E-08	7.45E-13	2.99E-06	3.51E-16	2.87E-05	9.69E-08	3.73E-14	1.61E-07	3.51E-16
15	106-35-4	3-Heptanone	7.67E-03	5.31E-03	1.43E-07	2.26E-08	7.71E-05	8.67E-15	5.31E-07	1.43E-07	1.13E-09	3.95E-06	8.67E-15
16	106-42-3	p-Xylene (Dimethyl benzene)	7.67E-03	7.70E-03	7.92E-08	0.00E+00	3.39E-10	5.85E-20	7.70E-06	7.92E-08	0.00E+00	2.75E-11	5.85E-20
17	106-46-7	1,4-Dichlorobenzene	7.67E-03	7.86E-03	8.43E-08	0.00E+00	8.79E-09	1.30E-18	7.86E-05	8.43E-08	0.00E+00	6.05E-10	1.30E-18
18	106-88-7	1,2-Epoxybutane	7.67E-03	6.54E-03	1.17E-07	1.14E-09	1.74E-05	1.99E-15	6.54E-07	1.17E-07	5.68E-11	9.10E-07	1.99E-15
19	106-93-4	Ethylene dibromide (Dibromethane)	3.49E-02	3.41E-02	4.10E-07	1.02E-11	1.87E-06	2.33E-16	3.41E-03	4.10E-07	5.08E-13	1.07E-07	2.33E-16
20	106-97-8	Butane	7.67E-03	7.71E-03	7.71E-08	0.00E+00	0.00E+00	0.00E+00	7.71E-07	7.71E-08	0.00E+00	0.00E+00	0.00E+00
21	106-99-0	1,3-Butadiene	7.67E-03	7.71E-03	7.72E-08	0.00E+00	0.00E+00	2.11E-26	7.71E-07	7.72E-08	0.00E+00	0.00E+00	2.11E-26
22	107-02-8	Acrolein	7.67E-03	5.31E-03	1.43E-07	2.26E-08	7.71E-05	8.67E-15	5.31E-07	1.43E-07	1.13E-09	3.95E-06	8.67E-15
23	107-05-1	3-Chloropropene (Allyl chloride)	7.67E-03	7.69E-03	7.78E-08	0.00E+00	1.17E-12	3.90E-22	7.69E-07	7.78E-08	0.00E+00	1.89E-13	3.90E-22
24	107-06-2	1,2-Dichloroethane (Ethylene chloride)	7.67E-03	7.66E-03	8.33E-08	0.00E+00	1.88E-08	2.66E-18	7.66E-07	8.33E-08	0.00E+00	1.24E-09	2.66E-18
25	107-12-0	Propionitrile	7.67E-03	3.05E-03	1.86E-07	4.05E-07	3.23E-04	3.59E-14	3.05E-07	1.86E-07	2.02E-08	1.63E-05	3.59E-14
26	107-13-1	Acrylonitrile	7.67E-03	5.31E-03	1.43E-07	2.26E-08	7.71E-05	8.67E-15	5.31E-07	1.43E-07	1.13E-09	3.95E-06	8.67E-15
27	107-18-6	2-Propene-1-ol	3.49E-02	2.32E-03	1.42E-06	2.55E-04	5.03E-03	3.82E-12	2.32E-07	1.42E-06	1.27E-05	2.52E-04	3.82E-12
28	107-31-3	Formic acid, methyl ester	3.49E-02	2.97E-02	5.30E-07	5.16E-09	7.90E-05	9.06E-15	2.97E-06	5.30E-07	2.58E-10	4.14E-06	9.06E-15
29	107-66-4	Dibutylphosphate	3.49E-02	9.95E-06	2.88E-06	2.40E-02	6.86E-03	7.55E-13	7.54E-18	2.88E-12	1.36E-11	4.34E-14	3.77E-18
30	107-87-9	2-Pentanone	7.67E-03	5.31E-03	1.43E-07	2.26E-08	7.71E-05	8.67E-15	5.31E-07	1.43E-07	1.13E-09	3.95E-06	8.67E-15
31	108-03-2	1-Nitropropane	3.49E-02	2.41E-02	6.48E-07	1.03E-07	3.50E-04	3.94E-14	2.41E-06	6.48E-07	5.13E-09	1.80E-05	3.94E-14
32	108-05-4	Vinyl acetate	3.49E-02	3.27E-02	4.40E-07	3.39E-12	1.36E-05	1.60E-15	3.27E-06	4.40E-07	1.69E-13	7.31E-07	1.60E-15
33	108-10-1	Hexone (4-Methyl-2-pentanone or MIBK)	7.67E-03	5.31E-03	1.43E-07	2.26E-08	7.71E-05	8.67E-15	5.31E-07	1.43E-07	1.13E-09	3.95E-06	8.67E-15
34	108-20-3	Bis(isopropyl)ether	7.67E-03	7.86E-03	8.43E-08	0.00E+00	8.79E-09	1.30E-18	7.86E-07	8.43E-08	0.00E+00	6.05E-10	1.30E-18
35	108-38-3	m-Xylene (Dimethyl benzene)	7.67E-03	7.70E-03	7.92E-08	0.00E+00	3.39E-10	5.85E-20	7.70E-06	7.92E-08	0.00E+00	2.75E-11	5.85E-20
36	108-39-4	m-Cresol	7.67E-03	2.09E-04	3.20E-07	2.59E-04	1.16E-03	1.28E-13	1.04E-07	3.20E-07	1.30E-05	5.82E-05	1.28E-13
37	108-87-2	Methylcyclohexane	7.67E-03	7.68E-03	7.69E-08	0.00E+00	0.00E+00	0.00E+00	7.68E-07	7.69E-08	0.00E+00	0.00E+00	0.00E+00
38	108-88-3	Toluene	7.67E-03	7.70E-03	7.84E-08	0.00E+00	1.06E-11	2.73E-21	7.70E-07	7.84E-08	0.00E+00	1.31E-12	2.73E-21
39	108-90-7	Chlorobenzene	7.67E-03	7.70E-03	7.92E-08	0.00E+00	3.39E-10	5.85E-20	7.70E-05	7.92E-08	0.00E+00	2.75E-11	5.85E-20
40	108-93-0	Cyclohexanol	7.67E-03	5.11E-04	3.13E-07	5.60E-05	1.11E-03	8.41E-13	2.56E-08	3.13E-07	2.80E-06	5.54E-05	8.41E-13
41	108-94-1	Cyclohexanone	7.67E-03	8.63E-04	2.39E-07	1.17E-05	7.96E-04	8.78E-14	4.32E-08	2.39E-07	5.87E-07	3.99E-05	8.78E-14
42	108-95-2	Phenol	3.49E-02	2.41E-04	2.21E-06	9.42E-03	6.71E-03	7.39E-13	1.21E-06	2.21E-06	4.71E-04	3.36E-04	7.39E-13
43	109-66-0	n-Pentane	7.67E-03	7.71E-03	7.71E-08	0.00E+00	0.00E+00	0.00E+00	7.71E-07	7.71E-08	0.00E+00	0.00E+00	0.00E+00
44	109-99-9	Tetrahydrofuran	1.63E-02	6.47E-03	3.95E-07	8.58E-07	6.86E-04	7.61E-14	6.47E-07	3.95E-07	4.29E-08	3.46E-05	7.61E-14
45	110-12-3	5-Methyl-2-hexanone	7.67E-03	6.54E-03	1.17E-07	1.14E-09	1.74E-05	1.99E-15	6.54E-07	1.17E-07	5.68E-11	9.10E-07	1.99E-15
46	110-43-0	2-Heptanone	7.67E-03	6.54E-03	1.17E-07	1.14E-09	1.74E-05	1.99E-15	6.54E-07	1.17E-07	5.68E-11	9.10E-07	1.99E-15
47	110-54-3	n-Hexane	7.67E-03	7.70E-03	7.70E-08	0.00E+00	0.00E+00	0.00E+00	7.70E-07	7.70E-08	0.00E+00	0.00E+00	0.00E+00
48	110-62-3	n-Valeraldehyde	3.49E-02	2.97E-02	5.30E-07	5.16E-09	7.90E-05	9.06E-15	2.97E-06	5.30E-07	2.58E-10	4.14E-06	9.06E-15
49	110-82-7	Cyclohexane	7.67E-03	7.69E-03	7.70E-08	0.00E+00	0.00E+00	1.24E-34	7.69E-07	7.70E-08	0.00E+00	0.00E+00	1.24E-34
50	110-83-8	Cyclohexene	7.67E-03	7.73E-03	7.76E-08	0.00E+00	1.83E-20	2.75E-24	7.73E-07	7.76E-08	0.00E+00	6.47E-21	2.75E-24
51	110-86-1	Pyridine	3.49E-02	3.92E-03	1.09E-06	5.33E-05	3.62E-03	3.99E-13	3.92E-07	1.09E-06	2.67E-06	1.81E-04	3.99E-13
52	111-65-9	n-Octane	7.67E-03	7.71E-03	7.71E-08	0.00E+00	0.00E+00	0.00E+00	7.71E-07	7.71E-08	0.00E+00	0.00E+00	0.00E+00
53	111-76-2	Ethylene glycol monobutyl ether	3.49E-02	9.48E-04	1.45E-06	1.18E-03	5.29E-03	5.82E-13	4.74E-08	1.45E-06	5.89E-05	2.65E-04	5.82E-13
54	111-84-2	n-Nonane	7.67E-03	7.71E-03	7.71E-08	0.00E+00	0.00E+00	0.00E+00	3.86E-07	7.71E-08	0.00E+00	0.00E+00	0.00E+00
55	117-81-7	Bis(2-ethylhexyl)phthalate (DEHP)	3.49E-02	3.67E-04	2.78E-06	9.49E-03	8.50E-03	1.13E-11	5.57E-17	2.78E-12	5.39E-12	6.07E-14	5.64E-17
56	117-84-0	n-Dioctyl phthalate	3.49E-02	2.52E-03	1.42E-06	1.84E-04	4.97E-03	4.89E-12	3.81E-16	1.42E-12	1.05E-13	7.01E-14	2.45E-17
57	118-74-1	Hexachlorobenzene	7.21E-04	7.39E-04	7.92E-09	0.00E+00	8.26E-10	1.22E-19	4.43E-06	7.92E-09	0.00E+00	5.68E-11	1.22E-19
58	120-12-7	Anthracene	3.49E-02	1.62E-02	8.01E-07	8.55E-07	1.11E-03	1.23E-13	3.25E-06	8.01E-07	4.27E-08	5.62E-05	1.23E-13
59	120-82-1	1,2,4-Trichlorobenzene	7.67E-03	7.66E-03	8.33E-08	0.00E+00	1.88E-08	2.66E-18	1.53E-05	8.33E-08	0.00E+00	1.24E-09	2.66E-18
60	120-83-2	2,4-Dichlorophenol	3.49E-02	2.32E-03	1.42E-06	2.55E-04	5.03E-03	3.82E-12	1.39E-05	1.42E-06	1.27E-05	2.52E-04	3.82E-12
61	121-44-8	Triethylamine	7.67E-03	6.54E-03	1.17E-07	1.14E-09	1.74E-05	1.99E-15	6.54E-07	1.17E-07	5.68E-11	9.10E-07	1.99E-15
62	121-69-7	Dimethylaniline	7.67E-03	3.05E-03	1.86E-07	4.05E-07	3.23E-04	3.59E-14	1.53E-07	1.86E-07	2.02E-08	1.63E-05	3.59E-14
63	122-39-4	N,N-Diphenylamine	7.67E-03	3.51E-04	2.82E-07	8.77E-05	1.03E-03	1.14E-13	1.41E-06	2.82E-07	4.39E-06	5.17E-05	1.14E-13
64	123-19-3	4-Heptanone	7.67E-03	3.05E-03	1.86E-07	4.05E-07	3.23E-04	3.59E-14	3.05E-07	1.86E-07	2.02E-08	1.63E-05	3.59E-14
65	123-38-6	n-Propionaldehyde	7.67E-03	5.31E-03	1.43E-07	2.26E-08	7.71E-05	8.67E-15	5.31E-07	1.43E-07	1.13E-09	3.95E-06	8.67E-15
66	123-51-3	3-Methyl-1-butanol	7.67E-03	1.08E-03	2.31E-07	6.90E-06	7.28E-04	8.02E-14	1.08E-07	2.31E-07	3.45E-07	3.65E-05	8.02E-14
67	123-86-4	Acetic acid n-butyl ester	3.49E-02	3.27E-02	4.40E-07	3.39E-12	1.36E-05	1.60E-15	3.27E-06	4.40E-07	1.69E-13	7.31E-07	1.60E-15
68	123-91-1	1,4-Dioxane	2.09E-02	1.39E-03	8.54E-07	1.53E-04	3.02E-03	2.29E-12	1.39E-07	8.54E-07	7.64E-06	1.51E-04	2.29E-12
69	126-73-8	Tributyl phosphate	3.49E-02	1.20E-04	2.52E-06	1.52E-02	6.90E-03	7.59E-13	2.41E-09	2.52E-06	7.60E-04	3.45E-04	7.59E-13
70	126-98-7	2-Methyl-2-propenenitrile (Methacrylonitrile)	7.67E-03	7.19E-03	9.69E-08	7.45E-13	2.99E-06	3.51E-16	7.19E-07	9.69E-08	3.73E-14	1.61E-07	3.51E-16
71	127-18-4	Perchloroethylene (tetrachloroethylene)	7.67E-03	7.72E-03	7.77E-08	0.00E+00	4.81E-14	2.48E-23	7.72E-04	7.77E-08	0.00E+00	1.19E-14	2.48E-23
72	127-19-5	N,N-Dimethylacetamide	7.67E-03	2.19E-06	6.33E-07	5.28E-03	1.51E-03	1.66E-13	1.09E-10	6.33E-07	2.64E-04	7.55E-05	1.66E-13
73	128-37-0	2,6-Bis(tert-butyl)-4-methylphenol	3.49E-02	2.52E-03	1.42E-06	1.84E-04	4.97E-03	4.89E-12	5.03E-08	1.42E-06	9.20E-06	2.49E-04	4.89E-12
74	129-00-0	Pyrene	3.49E-02	5.32E-03	1.41E-06	4.53E-05	4.37E-03	5.85E-12	2.42E-13	1.41E-12	2.58E-14	1.24E-13	2.92E-17
75	1321-64-8	Pentachloronaphthalene	3.49E-02	2.41E-02	6.48E-07	1.03E-07	3.50E-04	3.94E-14	1.10E-12	6.48E-13	5.82E-17	2.67E-14	1.97E-19
76	1321-65-9	Trichloronaphthalene	3.49E-02	2.97E-02	5.30E-07	5.16E-09	7.90E-05	9.06E-15	1.78E-04	5.30E-07	2.58E-10	4.14E-06	9.06E-15
77	132-64-9	Dibenzofuran	3.49E-02	2.97E-02	5.30E-07	5.16E-09	7.90E-05	9.06E-15	1.78E-04	5.30E-07	2.58E-10	4.14E-06	9.06E-15
78	1335-87-1	Hexachloronaphthalene	3.49E-02	2.41E-02	6.48E-07	1.03E-07	3.50E-04	3.94E-14	1.10E-12	6.48E-13	5.82E-17	2.67E-14	1.97E-19
79	1335-88-2	Tetrachloronaphthalene	3.49E-02	2.97E-02	5.30E-07	5.16E-09	7.90E-05	9.06E-15	1.35E-12	5.30E-13	2.93E-18	1.09E-14	4.53E-20
80	1336-36-3	Polychlorinated biphenyls (PCBs)	1.21E-02	5.79E-02	1.32E-06	5.42E-11	6.62E-05	1.14E-13	2.63E-12	1.32E-12	3.08E-20	5.41E-14	5.68E-19
81	141-78-6	Acetic acid ethyl ester (Ethyl acetate)	3.49E-02	2.41E-02	6.48E-07	1.03E-07	3.50E-04	3.94E-14	2.41E-06	6.48E-07	5.13E-09	1.80E-05	3.94E-14
82	141-79-7	4-Methyl-3-penten-2-one	3.49E-02	1.39E-02	8.47E-07	1.84E-06	1.47E-03	1.63E-13	1.39E-06	8.47E-07	9.20E-08	7.42E-05	1.63E-13
83	142-82-5	n-Heptane	7.67E-03	7.70E-03	7.70E-08	0.00E+00	0.00E+00	0.00E+00	7.70E-07	7.70E-08	0.00E+00	0.00E+00	0.00E+00
84	144-62-7	Oxalic acid	3.49E-03	1.58E-08	2.90E-07	2.48E-03	6.83E-04	7.51E-14	7.91E-11	2.90E-07	1.24E-04	3.41E-05	7.51E-14
85	156-60-5	trans-1,2-Dichloroethylene	7.67E-03	7.69E-03	7.78E-08	0.00E+00	1.17E-12	3.90E-22	7.69E-07	7.78E-08	0.00E+00	1.89E-13	3.90E-22
86	1582-09-8	Trifluralin	3.49E-02	2.41E-02	6.48E-07	1.03E-07	3.50E-04	3.94E-14	1.83E-14	6.48E-13	5.82E-17	2.67E-14	1.97E-19
87	1634-04-4	Methyl tert-butyl ether	7.67E-03	7.19E-03	9.69E-08	7.45E-13	2.99E-06	3.51E-16	7.19E-07	9.69E-08	3.73E-14	1.61E-07	3.51E-16
88	1836-75-5	Nitrofen	3.49E-02	3.67E-04	2.78E-06	9.49E-03	8.50E-03	1.13E-11	1.67E-14	2.78E-12	5.39E-12	6.07E-14	5.64E-17
89	189-55-9	Dibenzo[a,i]pyrene	3.49E-02	9.95E-06	2.88E-06	2.40E-02	6.86E-03	7.55E-13	4.52E-16	2.88E-12	1.36E-11	4.34E-14	3.77E-18
90	189-64-0	Dibenzo[a,h]pyrene	3.49E-02	9.95E-06	2.88E-06	2.40E-02	6.86E-03	7.55E-13	4.52E-16	2.88E-12	1.36E-11	4.34E-14	3.77E-18
91	191-24-2	Benzo(g,h,i)perylene	3.49E-02	3.67E-04	2.78E-06	9.49E-03	8.50E-03	1.13E-11	1.67E-14	2.78E-12	5.39E-12	6.07E-14	5.64E-17
92	191-30-0	Benzo[a,i]pyrene	3.49E-02	9.95E-06	2.88E-06	2.40E-02	6.86E-03	7.55E-13	4.52E-16	2.88E-12	1.36E-11	4.34E-14	3.77E-18
93	192-65-4	Dibenzo[a,e]pyrene	3.49E-02	9.95E-06	2.88E-06	2.40E-02	6.86E-03	7.55E-13	4.52E-16	2.88E-12	1.36E-11	4.34E-14	3.77E-18
94	193-39-5	Indeno(1,2,3-cd)pyrene	3.49E-02	3.67E-04	2.78E-06	9.49E-03	8.50E-03	1.13E-11	1.67E-14	2.78E-12	5.39E-12	6.07E-14	5.64E-17
95	205-82-3	Benzo(j)fluoranthene	3.49E-02	1.20E-04	2.52E-06	1.52E-02	6.90E-03	7.59E-13	5.47E-15	2.52E-12	8.64E-12	4.42E-14	3.80E-18
96	205-99-2	Benzo(b)fluoranthene	3.49E-02	3.67E-04	2.78E-06	9.49E-03	8.50E-03	1.13E-11	1.67E-14	2.78E-12	5.39E-12	6.07E-14	5.64E-17
97	206-44-0	Fluoranthene	3.49E-02	5.04E-03	1.45E-06	4.07E-05	4.58E-03	6.11E-12	2.29E-13	1.45E-12	2.31E-14	1.21E-13	3.06E-17
98	207-08-9	Benzo(k)fluoranthene	3.49E-02	3.67E-04	2.78E-06	9.49E-03	8.50E-03	1.13E-11	1.67E-14	2.78E-12	5.39E-12	6.07E-14	5.64E-17
99	208-96-8	Acenaphthylene	3.49E-02	2.41E-02	6.48E-07	1.03E-07	3.50E-04	3.94E-14	1.45E-04	6.48E-07	5.13E-09	1.80E-05	3.94E-14
100	218-01-9	Chrysene	3.49E-02	2.55E-03	1.51E-06	2.40E-04	5.26E-03	7.00E-12	1.16E-13	1.51E-12	1.36E-13	8.40E-14	3.50E-17
101	2234-13-1	Octachloronaphthalene	3.49E-02	2.41E-02	6.48E-07	1.03E-07	3.50E-04	3.94E-14	1.10E-12	6.48E-13	5.82E-17	2.67E-14	1.97E-19
102	224-42-0	Dibenz[a,j]acridine	3.49E-02	1.27E-06	2.89E-06	2.47E-02	6.80E-03	7.48E-13	5.78E-17	2.89E-12	1.40E-11	4.30E-14	3.74E-18
103	226-36-8	Dibenz[a,h]acridine	3.49E-02	1.27E-06	2.89E-06	2.47E-02	6.80E-03	7.48E-13	5.78E-17	2.89E-12	1.40E-11	4.30E-14	3.74E-18
104	2385-85-5	Mirex	3.49E-02	3.48E-02	3.79E-07	0.00E+00	8.55E-08	1.21E-17	2.09E-04	3.79E-07	0.00E+00	5.62E-09	1.21E-17
105	2551-13-7	Trimethyl benzene	7.67E-03	7.70E-03	7.92E-08	0.00E+00	3.39E-10	5.85E-20	3.85E-06	7.92E-08	0.00E+00	2.75E-11	5.85E-20
106	26140-60-3	Terphenyls	3.49E-02	1.70E-02	1.39E-06	9.55E-07	2.45E-03	3.34E-12	7.73E-13	1.39E-12	5.42E-16	2.15E-13	1.67E-17
107	27154-33-2	Trichlorofluoroethane	7.67E-03	7.71E-03	7.72E-08	0.00E+00	0.00E+00	2.11E-26	7.71E-04	7.72E-08	0.00E+00	0.00E+00	2.11E-26
108	287-92-3	Cyclopentane	7.67E-03	7.69E-03	7.70E-08	0.00E+00	0.00E+00	1.24E-34	7.69E-07	7.70E-08	0.00E+00	0.00E+00	1.24E-34
109	309-00-2	Aldrin	4.30E-04	2.10E-04	1.72E-08	1.18E-08	3.02E-05	4.12E-14	4.77E-14	1.72E-14	6.69E-18	2.66E-15	2.06E-19

CALCULATION SHEET

BY: E. Berríos
DATE: 05/21/03

PROJECT: WTP
JOB NO.: 24590
CALC NO.: 24590-WTP-M4C-FRP-00005
SHEET REV: A
SHEET NO.: 50

	A	B	C	D	E	F	G	H	I	J	K	L	M
1	**Table 1 Summary of Organic Constituents Emission Rates for the WTP**												
2			Feed	Unabated Streams					Abated Streams				
3	CAS #	COPC	FRP14	PVP01	PJV04	LMP06	HMP06	PJV32	PVP12	PJV11	LVP26	HOP33	PJV34
4			WTP Feed	PT Vessel Vent	PT RFD/PJM	LAW Melter	HLW Melter	HLW PJM/RFD	PT Vessel Vent	PT RFD/PJM	LAW Melter	HLW Melter	HLW PJM/RFD
5			g/sec	g/sec	g/sec	g/sec	g/sec	g/sec	g/sec	g/sec	g/sec	g/sec	g/sec
110	319-84-6	Hexachlorocyclohexane (Lindane) Alpha BHC	1.16E-04	1.68E-05	4.83E-09	1.36E-07	1.53E-05	2.04E-14	1.01E-07	4.83E-09	6.79E-09	7.68E-07	2.04E-14
111	319-85-7	Hexachlorocyclohexane (Lindane) Beta BHC	1.16E-04	1.22E-06	9.38E-09	3.11E-05	2.86E-05	3.80E-14	5.55E-17	9.38E-15	1.77E-14	2.04E-16	1.90E-19
112	319-86-8	Delta-BHC	1.16E-04	1.22E-06	9.25E-09	3.16E-05	2.83E-05	3.76E-14	5.57E-17	9.25E-15	1.80E-14	2.02E-16	1.88E-19
113	3697-24-3	5-Methylchrysene	3.49E-02	2.52E-03	1.42E-06	1.84E-04	4.97E-03	4.89E-12	1.14E-13	1.42E-12	1.05E-13	7.01E-14	2.45E-17
114	3825-26-1	Ammonium perfluorooctanoate	3.49E-02	2.41E-02	6.48E-07	1.03E-07	3.50E-04	3.94E-14	1.10E-12	6.48E-13	5.82E-17	2.67E-14	1.97E-19
115	4170-30-3	2-Butenaldehyde (2-Butenal or Crotonaldehyde)	7.67E-03	8.70E-04	2.39E-07	1.16E-05	7.96E-04	8.77E-14	8.70E-08	2.39E-07	5.80E-07	3.99E-05	8.77E-14
116	465-73-6	Isodrin	2.32E-04	1.12E-03	2.57E-08	1.05E-12	1.29E-06	2.20E-15	6.74E-06	2.57E-08	5.25E-14	8.30E-08	2.20E-15
117	50-00-0	Formaldehyde	7.67E-03	7.67E-05	5.38E-07	2.46E-03	1.67E-03	1.05E-12	7.67E-09	5.38E-07	1.23E-04	8.34E-05	1.05E-12
118	50-29-3	4,4-DDT	2.32E-04	3.36E-05	9.67E-09	2.72E-07	3.05E-05	4.08E-14	1.53E-15	9.67E-15	1.54E-16	8.08E-16	2.04E-19
119	50-32-8	Benzo(a)pyrene	4.42E-04	4.67E-06	3.47E-08	1.22E-04	1.07E-04	1.41E-13	2.12E-16	3.47E-14	6.95E-14	7.62E-16	7.07E-19
120	53-70-3	Dibenzo(a,h)anthracene	5.81E-05	2.01E-07	4.19E-09	2.53E-05	1.15E-05	1.27E-15	9.12E-18	4.19E-15	1.44E-14	7.37E-17	6.33E-21
121	540-59-0	1,2-Dichloroethylene	7.67E-03	7.70E-03	7.92E-08	0.00E+00	3.39E-10	5.85E-20	7.70E-07	7.92E-08	0.00E+00	2.75E-11	5.85E-20
122	540-84-1	2,2,4-Trimethylpentane	7.67E-03	7.71E-03	7.71E-08	0.00E+00	0.00E+00	0.00E+00	7.71E-07	7.71E-08	0.00E+00	0.00E+00	0.00E+00
123	541-73-1	1,3-Dichlorobenzene	7.67E-03	7.70E-03	7.92E-08	0.00E+00	3.39E-10	5.85E-20	7.70E-05	7.92E-08	0.00E+00	2.75E-11	5.85E-20
124	56-23-5	Carbon tetrachloride	7.67E-03	7.73E-03	7.76E-08	0.00E+00	1.83E-20	2.75E-24	1.55E-03	7.76E-08	0.00E+00	6.47E-21	2.75E-24
125	563-80-4	3-Methyl-2-butanone	7.67E-03	5.31E-03	1.43E-07	2.26E-08	7.71E-05	8.67E-15	5.31E-07	1.43E-07	1.13E-09	3.95E-06	8.67E-15
126	56-49-5	3-Methylcholanthrene	3.49E-02	3.51E-02	3.51E-07	0.00E+00	0.00E+00	0.00E+00	1.59E-12	3.51E-13	0.00E+00	0.00E+00	0.00E+00
127	56-55-3	Benzo(a)anthracene	3.49E-02	5.04E-03	1.45E-06	4.07E-05	4.58E-03	6.11E-12	2.29E-13	1.45E-12	2.31E-14	1.21E-13	3.06E-17
128	57-14-7	1,1-Dimethylhydrazine	3.49E-02	4.90E-03	1.05E-06	3.14E-05	3.31E-03	3.65E-13	4.90E-07	1.05E-06	1.57E-06	1.66E-04	3.65E-13
129	58-89-9	gamma-BHC (Lindane)	1.16E-04	8.74E-06	5.22E-09	4.92E-07	1.81E-05	2.41E-14	3.97E-16	5.22E-15	2.79E-16	2.86E-16	1.20E-19
130	58-90-2	2,3,4,6-Tetrachlorophenol	3.49E-02	3.64E-03	1.10E-06	6.24E-05	3.71E-03	4.09E-13	1.09E-04	1.10E-06	3.12E-06	1.86E-04	4.09E-13
131	591-78-6	2-Hexanone	7.67E-03	5.31E-03	1.43E-07	2.26E-08	7.71E-05	8.67E-15	5.31E-06	1.43E-07	1.13E-09	3.95E-06	8.67E-15
132	59-50-7	4-Chloro-3-methylphenol	3.49E-02	2.52E-03	1.42E-06	1.84E-04	4.97E-03	4.89E-12	2.86E-13	1.42E-12	1.05E-13	7.01E-14	2.45E-17
133	59-89-2	N-Nitrosomorpholine	3.49E-02	2.15E-05	2.82E-06	2.28E-02	6.86E-03	7.54E-13	8.13E-18	2.82E-06	1.14E-03	3.43E-04	7.54E-13
134	602-87-9	5-Nitroacenaphthene	3.49E-02	9.48E-04	1.45E-06	1.18E-03	5.29E-03	5.82E-13	4.31E-14	1.45E-12	6.69E-13	3.93E-14	2.91E-18
135	60-29-7	Ethyl ether	3.49E-02	3.48E-02	3.79E-07	0.00E+00	8.55E-08	1.21E-17	3.48E-06	3.79E-07	0.00E+00	5.62E-09	1.21E-17
136	603-34-9	Triphenylamine	3.49E-02	2.37E-03	1.18E-06	1.65E-04	4.22E-03	4.65E-13	1.42E-05	1.18E-06	8.23E-06	2.11E-04	4.65E-13
137	60-34-4	Methylhydrazine	7.67E-03	5.11E-04	3.13E-07	5.60E-05	1.11E-03	8.41E-13	5.11E-08	3.13E-07	2.80E-06	5.54E-05	8.41E-13
138	60-35-5	Acetamide	7.67E-03	2.19E-06	6.33E-07	5.28E-03	1.51E-03	1.66E-13	1.09E-10	6.33E-07	2.64E-04	7.55E-05	1.66E-13
139	60-57-1	Dieldrin	2.32E-04	3.18E-05	9.95E-09	2.41E-07	3.19E-05	4.26E-14	1.44E-15	9.95E-15	1.37E-16	7.88E-16	2.13E-19
140	621-64-7	Di-n-Propylnitrosamine (N-Nitroso-di-n-propylamine)	3.49E-02	2.32E-03	1.42E-06	2.55E-04	5.03E-03	3.82E-12	1.16E-07	1.42E-06	1.27E-05	2.52E-04	3.82E-12
141	624-83-9	Methyl isocyanate	7.67E-03	7.66E-03	8.33E-08	0.00E+00	1.88E-08	2.66E-18	7.66E-06	8.33E-08	0.00E+00	1.24E-09	2.66E-18
142	627-13-4	Nitric acid, propyl ester	3.49E-02	3.48E-02	3.79E-07	0.00E+00	8.55E-08	1.21E-17	3.48E-06	3.79E-07	0.00E+00	5.62E-09	1.21E-17
143	62-75-9	N-Nitroso-N,N-dimethylamine (Dimethylnitrosamine)	6.51E-02	1.77E-03	2.71E-06	2.20E-03	9.87E-03	1.09E-12	8.85E-08	2.71E-06	1.10E-04	4.94E-04	1.09E-12
144	630-20-6	1,1,1,2-Tetrachloroethane	7.67E-03	7.86E-03	8.43E-08	0.00E+00	8.79E-09	1.30E-18	7.86E-04	8.43E-08	0.00E+00	6.05E-10	1.30E-18
145	64-17-5	Ethyl alcohol	7.67E-03	5.11E-04	3.13E-07	5.60E-05	1.11E-03	8.41E-13	5.11E-08	3.13E-07	2.80E-06	5.54E-05	8.41E-13
146	64-18-6	Formic acid	3.49E-02	1.20E-04	2.52E-06	1.52E-02	6.90E-03	7.59E-13	1.20E-08	2.52E-06	7.60E-04	3.45E-04	7.59E-13
147	64-19-7	Acetic acid	3.49E-02	2.15E-05	2.82E-06	2.28E-02	6.86E-03	7.54E-13	2.15E-09	2.82E-06	1.14E-03	3.43E-04	7.54E-13
148	67-56-1	Methyl alcohol (Methanol)	7.67E-03	5.11E-04	3.13E-07	5.60E-05	1.11E-03	8.41E-13	5.11E-08	3.13E-07	2.80E-06	5.54E-05	8.41E-13
149	67-63-0	2-Propyl alcohol (Isopropanol; Propan-2-01)	7.67E-03	8.63E-04	2.39E-07	1.17E-05	7.96E-04	8.78E-14	8.63E-08	2.39E-07	5.87E-07	3.99E-05	8.78E-14
150	67-64-1	2-Propanone (Acetone)	4.18E-02	1.66E-02	1.02E-06	2.21E-06	1.76E-03	1.96E-13	1.66E-06	1.02E-06	1.10E-07	8.91E-05	1.96E-13
151	67-66-3	Chloroform	7.67E-03	7.70E-03	7.92E-08	0.00E+00	3.39E-10	5.85E-20	3.85E-03	7.92E-08	0.00E+00	2.75E-11	5.85E-20
152	67-72-1	Hexachloroethane	3.49E-02	3.50E-02	3.60E-07	0.00E+00	1.54E-09	2.66E-19	7.00E-04	3.60E-07	0.00E+00	1.25E-10	2.66E-19
153	684-16-2	Hexafluoroacetone	7.67E-03	7.70E-03	7.92E-08	0.00E+00	3.39E-10	5.85E-20	7.70E-03	7.92E-08	0.00E+00	2.75E-11	5.85E-20
154	71-23-8	n-Propyl alcohol	7.67E-03	8.63E-04	2.39E-07	1.17E-05	7.96E-04	8.78E-14	8.63E-08	2.39E-07	5.87E-07	3.99E-05	8.78E-14
155	71-36-3	n-Butyl alcohol	7.67E-03	8.63E-04	2.39E-07	1.17E-05	7.96E-04	8.78E-14	8.63E-08	2.39E-07	5.87E-07	3.99E-05	8.78E-14
156	71-43-2	Benzene	7.67E-03	7.69E-03	7.85E-08	0.00E+00	2.73E-11	6.36E-21	7.69E-05	7.85E-08	0.00E+00	3.04E-12	6.36E-21
157	71-55-6	Methyl chloroform (1,1,1-Trichloroethane)	7.67E-03	7.72E-03	7.77E-08	0.00E+00	4.81E-14	2.48E-23	7.72E-06	7.77E-08	0.00E+00	1.19E-14	2.48E-23
158	72-20-8	Endrin	2.32E-04	1.68E-05	9.45E-09	1.23E-06	3.31E-05	3.26E-14	7.62E-16	9.45E-15	6.97E-16	4.68E-16	1.63E-19
159	72-43-5	Methoxychlor	1.16E-03	4.01E-06	8.39E-08	5.07E-04	2.30E-04	2.53E-14	1.82E-16	8.39E-14	2.88E-13	1.47E-15	1.27E-19
160	72-54-8	4,4-DDD	2.32E-04	1.68E-05	9.45E-09	1.23E-06	3.31E-05	3.26E-14	7.62E-16	9.45E-15	6.97E-16	4.68E-16	1.63E-19
161	72-55-9	4,4-DDE	2.32E-04	1.13E-04	9.28E-09	6.36E-09	1.63E-05	2.23E-14	5.15E-15	9.28E-15	3.62E-18	1.44E-15	1.11E-19
162	74-83-9	Bromomethane (Methyl bromide)	7.67E-03	7.70E-03	7.92E-08	0.00E+00	3.39E-10	5.85E-20	7.70E-06	7.92E-08	0.00E+00	2.75E-11	5.85E-20
163	74-87-3	Chloromethane (Methyl chloride)	7.67E-03	7.69E-03	7.78E-08	0.00E+00	1.17E-12	3.90E-22	3.85E-04	7.78E-08	0.00E+00	1.89E-13	3.90E-22
164	74-97-5	Bromochloromethane	7.67E-03	7.66E-03	8.33E-08	0.00E+00	1.88E-08	2.66E-18	3.83E-03	8.33E-08	0.00E+00	1.24E-09	2.66E-18
165	74-99-7	Methylacetylene	3.49E-02	3.50E-02	3.54E-07	0.00E+00	5.34E-12	1.77E-21	3.50E-06	3.54E-07	0.00E+00	8.57E-13	1.77E-21
166	75-00-3	Chloroethane	7.67E-03	7.69E-03	7.78E-08	0.00E+00	1.17E-12	3.90E-22	7.69E-06	7.78E-08	0.00E+00	1.89E-13	3.90E-22
167	75-01-4	Vinyl chloride (1-Chloroethene)	3.49E-02	3.51E-02	3.53E-07	0.00E+00	8.32E-20	1.25E-23	3.51E-06	3.53E-07	0.00E+00	2.94E-20	1.25E-23
168	75-05-8	Acetonitrile	1.09E-02	3.60E-03	2.80E-07	8.85E-07	5.74E-04	6.35E-14	3.60E-06	2.80E-07	4.42E-08	2.89E-05	6.35E-14
169	75-07-0	Acetaldehyde	3.49E-02	1.39E-02	8.47E-07	1.84E-06	1.47E-03	1.63E-13	1.39E-06	8.47E-07	9.20E-08	7.42E-05	1.63E-13
170	75-09-2	Dichloromethane (Methylene chloride)	7.67E-03	7.70E-03	7.92E-08	0.00E+00	3.39E-10	5.85E-20	3.85E-04	7.92E-08	0.00E+00	2.75E-11	5.85E-20
171	75-12-7	Formamide	3.49E-02	1.27E-06	2.89E-06	2.47E-02	6.80E-03	7.48E-13	1.27E-10	2.89E-06	1.24E-03	3.40E-04	7.48E-13
172	75-15-0	Carbon disulfide	7.67E-03	7.69E-03	7.78E-08	0.00E+00	1.17E-12	3.90E-22	7.69E-07	7.78E-08	0.00E+00	1.89E-13	3.90E-22
173	75-21-8	Ethylene oxide (Oxirane)	7.67E-03	6.54E-03	1.17E-07	1.14E-09	1.74E-05	1.99E-15	6.54E-07	1.17E-07	5.68E-11	9.10E-07	1.99E-15
174	75-27-4	Bromodichloromethane	7.67E-03	7.86E-03	8.43E-08	0.00E+00	8.79E-09	1.30E-18	1.57E-03	8.43E-08	0.00E+00	6.05E-10	1.30E-18
175	75-34-3	1,1-Dichloroethane	7.67E-03	7.70E-03	7.92E-08	0.00E+00	3.39E-10	5.85E-20	7.70E-07	7.92E-08	0.00E+00	2.75E-11	5.85E-20
176	75-35-4	1,1-Dichloroethene (Vinylidene chloride)	7.67E-03	7.73E-03	7.76E-08	0.00E+00	1.83E-20	2.75E-24	7.73E-07	7.76E-08	0.00E+00	6.47E-21	2.75E-24
177	75-43-4	Dichlorofluoromethane	7.67E-03	7.69E-03	7.78E-08	0.00E+00	1.17E-12	3.90E-22	7.69E-06	7.78E-08	0.00E+00	1.89E-13	3.90E-22
178	75-45-6	Chlorodifluoromethane	7.67E-03	7.73E-03	7.76E-08	0.00E+00	1.83E-20	2.75E-24	1.55E-04	7.76E-08	0.00E+00	6.47E-21	2.75E-24
179	75-50-3	Trimethylamine	7.67E-03	5.31E-03	1.43E-07	2.26E-08	7.71E-05	8.67E-15	5.31E-07	1.43E-07	1.13E-09	3.95E-06	8.67E-15
180	75-52-5	Nitromethane	3.49E-02	1.39E-02	8.47E-07	1.84E-06	1.47E-03	1.63E-13	1.39E-06	8.47E-07	9.20E-08	7.42E-05	1.63E-13
181	75-55-8	2-Methylaziridine	3.49E-02	3.92E-03	1.09E-06	5.33E-05	3.62E-03	3.99E-13	3.92E-07	1.09E-06	2.67E-06	1.81E-04	3.99E-13
182	75-61-6	Difluorodibromomethane	7.67E-03	7.73E-03	7.76E-08	0.00E+00	1.83E-20	2.75E-24	7.73E-03	7.76E-08	0.00E+00	6.47E-21	2.75E-24
183	75-63-8	Trifluorobromomethane	7.67E-03	7.68E-03	7.69E-08	0.00E+00	0.00E+00	0.00E+00	7.68E-03	7.69E-08	0.00E+00	0.00E+00	0.00E+00
184	75-65-0	2-Methyl-2-propanol	7.67E-03	8.63E-04	2.39E-07	1.17E-05	7.96E-04	8.78E-14	8.63E-08	2.39E-07	5.87E-07	3.99E-05	8.78E-14
185	75-69-4	Trichlorofluoromethane	7.67E-03	7.71E-03	7.72E-08	0.00E+00	0.00E+00	2.11E-26	7.71E-03	7.72E-08	0.00E+00	0.00E+00	2.11E-26
186	75-71-8	Dichlorodifluoromethane	7.67E-03	7.68E-03	7.69E-08	0.00E+00	0.00E+00	0.00E+00	7.68E-03	7.69E-08	0.00E+00	0.00E+00	0.00E+00
187	75-99-0	2,2-Dichloropropionic acid	3.49E-02	2.15E-05	2.82E-06	2.28E-02	6.86E-03	7.54E-13	1.07E-07	2.82E-06	1.14E-03	3.43E-04	7.54E-13
188	76-03-9	Trichloroacetic acid	7.67E-03	2.19E-06	6.33E-07	5.28E-03	1.51E-03	1.66E-13	4.38E-08	6.33E-07	2.64E-04	7.55E-05	1.66E-13
189	76-11-9	1,1,1,2-Tetrachloro-2,2-difluoroethane	3.49E-02	3.50E-02	3.50E-07	0.00E+00	0.00E+00	5.66E-34	6.99E-04	3.50E-07	0.00E+00	0.00E+00	5.66E-34
190	76-12-0	1,1,2,2-Tetrachloro-1,2-difluoroethane	3.49E-02	3.50E-02	3.51E-07	0.00E+00	0.00E+00	9.60E-26	7.01E-04	3.51E-07	0.00E+00	0.00E+00	9.60E-26
191	76-13-1	1,2,2-Trichloro-1,1,2-trifluoroethane (Freon 113)	7.67E-03	7.68E-03	7.69E-08	0.00E+00	0.00E+00	0.00E+00	1.92E-04	7.69E-08	0.00E+00	0.00E+00	0.00E+00
192	76-14-2	1,2-Dichloro-1,1,2,2-tetrafluoroethane	7.67E-03	7.71E-03	7.71E-08	0.00E+00	0.00E+00	0.00E+00	7.71E-03	7.71E-08	0.00E+00	0.00E+00	0.00E+00
193	76-15-3	Chloropentafluoroethane	7.67E-03	7.70E-03	7.70E-08	0.00E+00	0.00E+00	0.00E+00	7.70E-03	7.70E-08	0.00E+00	4.24E-30	0.00E+00
194	76-44-8	Heptachlor	7.56E-04	6.72E-04	1.03E-08	0.00E+00	6.62E-07	7.72E-17	2.02E-05	1.03E-08	0.00E+00	3.53E-08	7.72E-17
195	78-83-1	2-Methylpropyl alcohol (Isobutyl alcohol)	3.49E-02	3.92E-03	1.09E-06	5.33E-05	3.62E-03	3.99E-13	3.92E-07	1.09E-06	2.67E-06	1.81E-04	3.99E-13
196	78-87-5	1,2-Dichloropropane	7.67E-03	7.70E-03	7.92E-08	0.00E+00	3.39E-10	5.85E-20	7.70E-06	7.92E-08	0.00E+00	2.75E-11	5.85E-20
197	78-92-2	1-Methylpropyl alcohol (2-Butanol)	7.67E-03	8.63E-04	2.39E-07	1.17E-05	7.96E-04	8.78E-14	8.63E-08	2.39E-07	5.87E-07	3.99E-05	8.78E-14
198	78-93-3	Methyl ethyl ketone (MEK, 2-Butanone)	7.67E-03	3.05E-03	1.86E-07	4.05E-07	3.23E-04	3.59E-14	3.05E-06	1.86E-07	2.02E-08	1.63E-05	3.59E-14
199	79-00-5	1,1,2-Trichloroethane	7.67E-03	7.66E-03	8.33E-08	0.00E+00	1.88E-08	2.66E-18	7.66E-07	8.33E-08	0.00E+00	1.24E-09	2.66E-18
200	79-01-6	Trichloroethylene	7.67E-03	7.68E-03	7.78E-08	0.00E+00	1.33E-12	4.37E-22	7.68E-07	7.78E-08	0.00E+00	2.11E-13	4.37E-22
201	79-09-4	Propionic acid	3.49E-02	3.49E-04	2.44E-06	1.12E-02	7.58E-03	4.77E-12	3.49E-08	2.44E-06	5.58E-04	3.79E-04	4.77E-12
202	79-10-7	2-Propenoic acid	3.49E-02	3.49E-04	2.44E-06	1.12E-02	7.58E-03	4.77E-12	3.49E-08	2.44E-06	5.58E-04	3.79E-04	4.77E-12
203	79-20-9	Methyl acetate	3.49E-02	2.41E-02	6.48E-07	1.03E-07	3.50E-04	3.94E-14	2.41E-06	6.48E-07	5.13E-09	1.80E-05	3.94E-14
204	79-34-5	1,1,2,2-Tetrachloroethane	7.67E-03	7.19E-03	9.69E-08	7.45E-13	2.99E-06	3.51E-16	7.19E-04	9.69E-08	3.73E-14	1.61E-07	3.51E-16
205	8001-35-2	Toxaphene	2.67E-04	2.34E-05	1.20E-08	8.46E-07	4.11E-05	5.47E-14	1.06E-15	1.20E-14	4.81E-16	7.14E-16	2.73E-19
206	82-68-8	Pentachloronitrobenzene (PCBN or quintobenzene)	3.49E-02	1.39E-02	8.47E-07	1.84E-06	1.47E-03	1.63E-13	8.32E-05	8.47E-07	9.20E-08	7.42E-05	1.63E-13
207	83-32-9	Acenaphthene	3.49E-02	2.97E-02	5.30E-07	5.16E-09	7.90E-05	9.06E-15	1.78E-04	5.30E-07	2.58E-10	4.14E-06	9.06E-15
208	84-66-2	Diethyl phthalate	3.49E-02	3.97E-04	1.92E-06	5.30E-03	6.33E-03	6.97E-13	7.94E-09	1.92E-06	2.65E-04	3.17E-04	6.97E-13
209	84-74-2	Dibutyl phthalate	3.49E-02	1.07E-03	1.89E-06	1.84E-03	6.66E-03	8.85E-12	1.63E-16	1.89E-12	1.04E-12	6.43E-14	4.42E-17
210	85-01-8	Phenanthrene	3.49E-02	1.39E-02	8.47E-07	1.84E-06	1.47E-03	1.63E-13	8.32E-05	8.47E-07	9.20E-08	7.42E-05	1.63E-13
211	85-68-7	Butylbenzyl phthalate	3.49E-02	1.07E-03	1.89E-06	1.84E-03	6.66E-03	8.85E-12	1.63E-16	1.89E-12	1.04E-12	6.43E-14	4.42E-17
212	86-73-7	Fluorene	3.49E-02	2.41E-02	6.48E-07	1.03E-07	3.50E-04	3.94E-14	1.10E-12	6.48E-13	5.82E-17	2.67E-14	1.97E-19
213	87-68-3	Hexachlorobutadiene	7.67E-03	7.70E-03	7.79E-08	0.00E+00	1.02E-12	3.44E-22	3.08E-05	7.79E-08	0.00E+00	1.67E-13	3.44E-22

CALCULATION SHEET

BY: E. Berríos
DATE: 05/21/03

PROJECT: WTP
JOB NO.: 24590
CALC NO.: 24590-WTP-M4C-FRP-00005
SHEET REV: A
SHEET NO.: 51

	A	B	C	D	E	F	G	H	I	J	K	L	M
1	**Table 1 Summary of Organic Constituents Emission Rates for the WTP**												
2			**Feed**	**Unabated Streams**					**Abated Streams**				
3	**CAS #**	**COPC**	**FRP14**	**PVP01**	**PJV04**	**LMP06**	**HMP06**	**PJV32**	**PVP12**	**PJV11**	**LVP26**	**HOP33**	**PJV34**
4			**WTP Feed**	**PT Vessel Vent**	**PT RFD/PJM**	**LAW Melter**	**HLW Melter**	**HLW PJM/RFD**	**PT Vessel Vent**	**PT RFD/PJM**	**LAW Melter**	**HLW Melter**	**HLW PJM/RFD**
5			**g/sec**	**g/sec**	**g/sec**	**g/sec**	**g/sec**	**g/sec**	**g/sec**	**g/sec**	**g/sec**	**g/sec**	**g/sec**
214	87-86-5	Pentachlorophenol	3.49E-02	2.15E-05	2.82E-06	2.28E-02	6.86E-03	7.54E-13	1.29E-07	2.82E-06	1.14E-03	3.43E-04	7.54E-13
215	88-06-2	2,4,6-Trichlorophenol	3.49E-02	2.32E-03	1.42E-06	2.55E-04	5.03E-03	3.82E-12	1.39E-05	1.42E-06	1.27E-05	2.52E-04	3.82E-12
216	88-72-2	2-Nitrotoluene	7.67E-03	1.08E-03	2.31E-07	6.90E-06	7.28E-04	8.02E-14	5.39E-08	2.31E-07	3.45E-07	3.65E-05	8.02E-14
217	88-75-5	2-Nitrophenol	3.49E-02	4.90E-03	1.05E-06	3.14E-05	3.31E-03	3.65E-13	7.35E-05	1.05E-06	1.57E-06	1.66E-04	3.65E-13
218	88-85-7	2-sec-Butyl-4,6-dinitrophenol (Dinoseb)	3.49E-02	4.08E-04	3.20E-06	1.88E-02	9.69E-03	1.29E-11	1.86E-14	3.20E-12	1.07E-11	6.94E-14	6.43E-17
219	88-89-1	Picric acid	3.49E-02	6.84E-08	1.03E-05	3.31E-01	8.46E-03	1.12E-11	1.04E-20	1.03E-11	1.88E-10	5.34E-14	5.61E-17
220	91-20-3	Naphthalene	1.16E-03	1.10E-03	1.45E-08	0.00E+00	2.77E-07	3.32E-17	5.48E-06	1.45E-08	0.00E+00	1.52E-08	3.32E-17
221	91-22-5	Quinoline	3.49E-02	9.48E-04	1.45E-06	1.18E-03	5.29E-03	5.82E-13	4.74E-08	1.45E-06	5.89E-05	2.65E-04	5.82E-13
222	91-58-7	2-Chloronapthalene	3.49E-02	3.27E-02	4.40E-07	3.39E-12	1.36E-05	1.60E-15	1.96E-04	4.40E-07	1.69E-13	7.31E-07	1.60E-15
223	92-52-4	1,1`-Biphenyl	3.49E-02	3.27E-02	4.40E-07	3.39E-12	1.36E-05	1.60E-15	6.53E-06	4.40E-07	1.69E-13	7.31E-07	1.60E-15
224	92-93-3	4-Nitrobiphenyl	3.49E-02	2.32E-03	1.42E-06	2.55E-04	5.03E-03	3.82E-12	1.06E-13	1.42E-12	1.45E-13	6.63E-14	1.91E-17
225	93-72-1	Silvex (2,4,5-TP)	3.49E-02	9.95E-06	2.88E-06	2.40E-02	6.86E-03	7.55E-13	4.52E-16	2.88E-12	1.36E-11	4.34E-14	3.77E-18
226	93-76-5	2,4,5-T	3.49E-02	9.95E-06	2.88E-06	2.40E-02	6.86E-03	7.55E-13	4.52E-16	2.88E-12	1.36E-11	4.34E-14	3.77E-18
227	94-75-7	2,4-D and esters (160C typed)	3.49E-02	2.15E-05	2.82E-06	2.28E-02	6.86E-03	7.54E-13	1.29E-07	2.82E-06	1.14E-03	3.43E-04	7.54E-13
228	95-13-6	Indene	3.49E-02	3.57E-02	3.83E-07	0.00E+00	4.00E-08	5.90E-18	1.79E-05	3.83E-07	0.00E+00	2.75E-09	5.90E-18
229	95-47-6	o-Xylene	7.67E-03	7.70E-03	7.92E-08	0.00E+00	3.39E-10	5.85E-20	7.70E-07	7.92E-08	0.00E+00	2.75E-11	5.85E-20
230	95-48-7	o-Cresol (2-Methylphenol)	7.67E-03	2.09E-04	3.20E-07	2.59E-04	1.16E-03	1.28E-13	1.04E-07	3.20E-07	1.30E-05	5.82E-05	1.28E-13
231	95-49-8	2-Chlorotoluene	3.49E-02	3.50E-02	3.60E-07	0.00E+00	1.54E-09	2.66E-19	1.75E-06	3.60E-07	0.00E+00	1.25E-10	2.66E-19
232	95-50-1	o-Dichlorobenzene (1,2-Dichlorobenzene)	7.67E-03	7.86E-03	8.43E-08	0.00E+00	8.79E-09	1.30E-18	7.86E-05	8.43E-08	0.00E+00	6.05E-10	1.30E-18
233	95-57-8	2-Chlorophenol	3.49E-02	3.92E-03	1.09E-06	5.33E-05	3.62E-03	3.99E-13	1.96E-07	1.09E-06	2.67E-06	1.81E-04	3.99E-13
234	95-95-4	2,4,5-Trichlorophenol	3.49E-02	9.48E-04	1.45E-06	1.18E-03	5.29E-03	5.82E-13	5.69E-06	1.45E-06	5.89E-05	2.65E-04	5.82E-13
235	96-22-0	3-Pentanone	7.67E-03	5.31E-03	1.43E-07	2.26E-08	7.71E-05	8.67E-15	5.31E-07	1.43E-07	1.13E-09	3.95E-06	8.67E-15
236	96-69-5	Bis(3-tert-butyl-4-hydroxy-6-methyl-phenyl)sulfide	3.49E-02	3.50E-02	3.60E-07	0.00E+00	1.54E-09	2.66E-19	1.59E-12	3.60E-13	0.00E+00	2.69E-18	1.33E-24
237	98-51-1	p-tert-Butyltoluene	3.49E-02	3.51E-02	3.53E-07	0.00E+00	2.19E-13	1.13E-22	1.75E-06	3.53E-07	0.00E+00	5.40E-14	1.13E-22
238	98-82-8	Cumene	3.49E-02	3.50E-02	3.54E-07	0.00E+00	5.34E-12	1.77E-21	1.75E-06	3.54E-07	0.00E+00	8.57E-13	1.77E-21
239	98-83-9	alpha-Methylstyrene	7.67E-03	7.70E-03	7.92E-08	0.00E+00	3.39E-10	5.85E-20	3.85E-05	7.92E-08	0.00E+00	2.75E-11	5.85E-20
240	98-86-2	Acetophenone	3.49E-02	4.18E-03	1.07E-06	4.49E-05	3.53E-03	3.89E-13	2.09E-05	1.07E-06	2.25E-06	1.77E-04	3.89E-13
241	98-95-3	Nitrobenzene	3.49E-02	4.90E-03	1.05E-06	3.14E-05	3.31E-03	3.65E-13	2.45E-07	1.05E-06	1.57E-06	1.66E-04	3.65E-13
242	Coplanar PCB's												
243	31508-00-6	2,3',4,4',5-Pentachlorobiphenyl (PBC 118)	8.72E-06	4.18E-05	9.56E-10	3.91E-14	4.78E-08	8.20E-17	1.90E-15	9.56E-16	2.22E-23	3.90E-17	4.10E-22
244	32598-13-3	3,3',4,4'-Tetrachlorobiphenyl (TCB)	8.72E-06	4.18E-05	9.56E-10	3.91E-14	4.78E-08	8.20E-17	1.90E-15	9.56E-16	2.22E-23	3.90E-17	4.10E-22
245	32598-14-4	2,3,3',4,4'-Pentachlorobiphenyl (PCB 105)	8.72E-06	4.18E-05	9.56E-10	3.91E-14	4.78E-08	8.20E-17	1.90E-15	9.56E-16	2.22E-23	3.90E-17	4.10E-22
246	32774-16-6	3,3',4,4',5,5'-Hexachlorobiphenyl	8.72E-06	4.18E-05	9.56E-10	3.91E-14	4.78E-08	8.20E-17	1.90E-15	9.56E-16	2.22E-23	3.90E-17	4.10E-22
247	35065-29-3	2,2',3,4,4',5,5'-Heptachlorobiphenyl	8.72E-06	4.18E-05	9.56E-10	3.91E-14	4.78E-08	8.20E-17	1.90E-15	9.56E-16	2.22E-23	3.90E-17	4.10E-22
248	35065-30-6	2,2',3,3',4,4',5-Heptachlorobiphenyl	8.72E-06	4.18E-05	9.56E-10	3.91E-14	4.78E-08	8.20E-17	1.90E-15	9.56E-16	2.22E-23	3.90E-17	4.10E-22
249	38380-08-4	2,3,3',4,4',5-Hexachlorobiphenyl (PCB 157)	8.72E-06	4.18E-05	9.56E-10	3.91E-14	4.78E-08	8.20E-17	1.90E-15	9.56E-16	2.22E-23	3.90E-17	4.10E-22
250	39635-31-9	2,3,3',4,4',5,5'-Heptachlorobiphenyl	8.72E-06	4.18E-05	9.56E-10	3.91E-14	4.78E-08	8.20E-17	1.90E-15	9.56E-16	2.22E-23	3.90E-17	4.10E-22
251	52663-72-6	2,3',4,4',5,5'-Hexachlorobiphenyl	8.72E-06	4.18E-05	9.56E-10	3.91E-14	4.78E-08	8.20E-17	1.90E-15	9.56E-16	2.22E-23	3.90E-17	4.10E-22
252	57465-28-8	3,3',4,4',5-Pentachlorobiphenyl	8.72E-06	4.18E-05	9.56E-10	3.91E-14	4.78E-08	8.20E-17	1.90E-15	9.56E-16	2.22E-23	3.90E-17	4.10E-22
253	65510-44-3	2',3,4,4',5-Pentachlorobiphenyl	8.72E-06	4.18E-05	9.56E-10	3.91E-14	4.78E-08	8.20E-17	1.90E-15	9.56E-16	2.22E-23	3.90E-17	4.10E-22
254	69782-90-7	2,3,3',4,4',5'-Hexachlorobiphenyl	8.72E-06	4.18E-05	9.56E-10	3.91E-14	4.78E-08	8.20E-17	1.90E-15	9.56E-16	2.22E-23	3.90E-17	4.10E-22
255	70362-50-4	3,4,4',5-Tetrachlorobiphenyl	8.72E-06	4.18E-05	9.56E-10	3.91E-14	4.78E-08	8.20E-17	1.90E-15	9.56E-16	2.22E-23	3.90E-17	4.10E-22
256	74472-37-0	2,3,4,4',5-Pentachlorobiphenyl	8.72E-06	4.18E-05	9.56E-10	3.91E-14	4.78E-08	8.20E-17	1.90E-15	9.56E-16	2.22E-23	3.90E-17	4.10E-22

9 References

Project Documents

CCN#044663, *Updated Basis for the WTP's Emissions Profile*

CCN#053500, *HLW and LAW Vitrification Decontamination Factors for Air Emissions Modeling*

CCN# 057415, *Phase Determination for COPCs Potentially Emitted from the Hanford Tank Waste Treatment and Immobilization Plant (WTP)*

RPT-24590-EN00003, Rev 0, *RPP-WTP Waste Feed Assessment*

RPT-W375-ES00001, Rev 1, *Integrated Emissions Baseline Report for the River Protection Project Waste Treatment Plant*

24590-WTP-MRQ-P0-03-054, *Emissions Vitrification Maximum Case Run with Updated Organic Parameters,* Rev 0

24590-WTP-RPT-ENV-01-004, *Best Available Radionuclide Control Technology Analysis for the WTP*, Rev 1

24590-WTP-RPT-PT-02-005, *Flowsheet Bases, Assumptions, and Requirements*, Rev 1

10 Attachments

NA

Appendix A Stream Reports

Table A-1 PJV32 Stream Report

River Protection Project - Waste Treatment Plant

Stream Number: PJV32
Stream Name: HLW pulse ventilation header offgas
Configuration: 0
0
Run Data File: H:\Working Folder 11 (Vishal)\Emissions_Case2_Run4_SubEm\MRQ_03_054_run1_Streams.csv
Run Date / Time: 4/15/2003 - 6:40:10 AM

Stream Properties Variable	Value	Units
Density	1.16E-03	g/cm^3
Enthalpy	-8.56E+05	BTU/hr
Mass Flow	2.32E+04	Lb/hr
	5.57E+05	Lb/day
Volumetric Flow	4.00E+04	GPM
Molar Flow	8.08E+02	Lbmol/hr
Volumetric Flow	5.34E+03	ft^3/min
Molecular Weight	2.87E+01	Lb/Lbmol
Pressure	1.00E+03	mbar
Temperature	2.50E+01	C
Viscosity	1.83E-02	cP
Na Molarity	0.00E+00	mol/L
pH	#NUM!	pH
Total TRU	6.32E-16	Ci/L
Total Activity	1.21E-13	Ci/L

Gaseous Components (1) Component	mol/L	Lb/day	Mt/day
CO	2.38E-32	3.20E-25	1.45421E-28
CO_2	6.89E-17	1.46E-09	6.62474E-13
H_2O	4.10E-04	3.54E+03	1.610811375
NO	1.94E-37	2.80E-30	1.27195E-33
NO_2	2.32E-37	5.12E-30	2.32576E-33
N_2	3.16E-02	4.25E+05	193.0529455
O_2	8.39E-03	1.29E+05	58.61857611
SO_2	1.84E-38	5.66E-31	2.57271E-34
NH_3	1.39E-15	1.14E-08	5.17226E-12
HNO_3	6.35E-24	1.92E-16	8.73531E-20
HCl	0.00E+00	0.00E+00	0
HF	5.29E-35	5.09E-28	2.31162E-31

(1) All radionuclides in gaseous streams are assumed to exist as solid particulate.

Component	Aqueous Components mol/L	Lb/gal	Lb/day	Solid Components Lb/day	Total Component Lb/day	mt/day	g/sec
Total	0.00E+00	0.00E+00	0.00E+00	1.27E-05	1.27E-05	5.8E-09	6.69188E-08
Ag^+	0.00E+00	0.00E+00	0.00E+00	1.96E-09	1.96E-09	8.9E-13	1.0308E-11
Al^{+3}	0.00E+00	0.00E+00	0.00E+00	5.91E-08	5.91E-08	2.7E-11	3.10775E-10
As^{+3}	0.00E+00	0.00E+00	0.00E+00	8.34E-06	8.34E-06	3.8E-09	4.38998E-08
B^{+3}	0.00E+00	0.00E+00	0.00E+00	1.94E-08	1.94E-08	8.8E-12	1.02324E-10
Ba^{+2}	0.00E+00	0.00E+00	0.00E+00	1.20E-08	1.20E-08	5.5E-12	6.33285E-11
Bi^{+3}	0.00E+00	0.00E+00	0.00E+00	7.62E-09	7.62E-09	3.5E-12	4.0112E-11
$C_2O_4^{-2}$	0.00E+00	0.00E+00	0.00E+00	1.25E-07	1.25E-07	5.7E-11	6.57424E-10
Ca^{+2}	0.00E+00	0.00E+00	0.00E+00	2.51E-08	2.51E-08	1.1E-11	1.31912E-10
Cd^{+2}	0.00E+00	0.00E+00	0.00E+00	3.00E-08	3.00E-08	1.4E-11	1.5789E-10
Ce^{+3}	0.00E+00	0.00E+00	0.00E+00	2.39E-09	2.39E-09	1.1E-12	1.25628E-11
Cl^-	0.00E+00	0.00E+00	0.00E+00	2.31E-08	2.31E-08	1.1E-11	1.2169E-10
CO_3^{-2}	0.00E+00	0.00E+00	0.00E+00	9.71E-08	9.71E-08	4.4E-11	5.10778E-10
Cr^{+3}	0.00E+00	0.00E+00	0.00E+00	5.17E-09	5.17E-09	2.4E-12	2.72013E-11
Cu^{+2}	0.00E+00	0.00E+00	0.00E+00	1.25E-09	1.25E-09	5.7E-13	6.57244E-12
F^-	0.00E+00	0.00E+00	0.00E+00	6.28E-08	6.28E-08	2.9E-11	3.30239E-10
Fe^{+3}	0.00E+00	0.00E+00	0.00E+00	7.45E-08	7.45E-08	3.4E-11	3.91996E-10
H^+	0.00E+00	0.00E+00	0.00E+00		0.00E+00	0	0
H_2O	0.00E+00	0.00E+00	0.00E+00		0.00E+00	0	0
Hg^{+2}	0.00E+00	0.00E+00	0.00E+00	6.38E-08	6.38E-08	2.9E-11	3.35898E-10
K^+	0.00E+00	0.00E+00	0.00E+00	3.85E-08	3.85E-08	1.7E-11	2.02439E-10
La^{+3}	0.00E+00	0.00E+00	0.00E+00	7.80E-09	7.80E-09	3.5E-12	4.10317E-11
Li^+	0.00E+00	0.00E+00	0.00E+00	1.85E-09	1.85E-09	8.4E-13	9.75022E-12
Mg^{+2}	0.00E+00	0.00E+00	0.00E+00	5.40E-09	5.40E-09	2.5E-12	2.84118E-11
Mn^{+3}	0.00E+00	0.00E+00	0.00E+00	1.89E-08	1.89E-08	8.6E-12	9.95587E-11
MnO_4^-	0.00E+00	0.00E+00	0.00E+00		0.00E+00	0	0
Na^+	0.00E+00	0.00E+00	0.00E+00	1.37E-07	1.37E-07	6.2E-11	7.18953E-10
NH_4^+	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0	0
Ni^{+2}	0.00E+00	0.00E+00	0.00E+00	7.08E-09	7.08E-09	3.2E-12	3.72455E-11
NO_2^-	0.00E+00	0.00E+00	0.00E+00	3.92E-08	3.92E-08	1.8E-11	2.0603E-10
NO_3^-	0.00E+00	0.00E+00	0.00E+00	2.70E-07	2.70E-07	1.2E-10	1.42233E-09
O^{-2}				2.73E-06	2.73E-06	1.2E-09	1.43672E-08
OH^-	0.00E+00	0.00E+00	0.00E+00	3.39E-07	3.39E-07	1.5E-10	1.7809E-09
$OH(b)^-$	0.00E+00	0.00E+00	0.00E+00		0.00E+00	0	0
P^{+5}				2.00E-15	2.00E-15	9.1E-19	1.0545E-17
Pb^{+2}	0.00E+00	0.00E+00	0.00E+00	3.19E-09	3.19E-09	1.5E-12	1.67942E-11
Pd^{+2}	0.00E+00	0.00E+00	0.00E+00	3.29E-10	3.29E-10	1.5E-13	1.72987E-12
PO_4^{-3}	0.00E+00	0.00E+00	0.00E+00	3.99E-08	3.99E-08	1.8E-11	2.10083E-10
S^{+6}				2.72E-15	2.72E-15	1.2E-18	1.4334E-17
Si^{+4}				5.58E-08	5.58E-08	2.5E-11	2.93463E-10
SiO_4^{-4}	0.00E+00	0.00E+00	0.00E+00		0.00E+00	0	0
SO_4^{-2}	0.00E+00	0.00E+00	0.00E+00	1.30E-08	1.30E-08	5.9E-12	6.8377E-11
Sr^{+2}	0.00E+00	0.00E+00	0.00E+00	1.40E-09	1.40E-09	6.4E-13	7.36763E-12
Ti^{+4}	0.00E+00	0.00E+00	0.00E+00	1.59E-08	1.59E-08	7.2E-12	8.34877E-11
Zn^{+2}	0.00E+00	0.00E+00	0.00E+00	3.51E-09	3.51E-09	1.6E-12	1.84625E-11
Zr^{+4}	0.00E+00	0.00E+00	0.00E+00	3.69E-08	3.69E-08	1.7E-11	1.94363E-10

Rad. Component	Aqueous Rad. Components Ci/L	Ci/day	Lb/day	Solids Rad. Components (1) Ci/L	Ci/day	Lb/day	Total Rad. Components (1) Ci/L	Ci/day	Lb/day
Total	0.00E+00	0.00E+00	0.00E+00	1.21E-13	2.63E-05	5.32E-08	1.21E-13	2.63E-05	5.32E-08
^{241}Am	0	0.00E+00	0.00E+00	4.70E-16	1.02E-07	6.59E-11	4.70E-16	1.02E-07	6.59E-11
^{14}C	0.00E+00	0.00E+00	0.00E+00	7.43E-20	1.62E-11	7.99E-15	7.43E-20	1.62E-11	7.99E-15
^{60}Co	0.00E+00	0.00E+00	0.00E+00	5.23E-17	1.14E-08	2.22E-14	5.23E-17	1.14E-08	2.22E-14
^{243}Cm	0.00E+00	0.00E+00	0.00E+00	1.57E-17	3.41E-09	1.49E-13	1.57E-17	3.41E-09	1.49E-13
^{244}Cm	0.00E+00	0.00E+00	0.00E+00	1.17E-17	2.56E-09	6.97E-14	1.17E-17	2.56E-09	6.97E-14

^{137}Cs	0.00E+00	0.00E+00	0.00E+00	6.25E-14	1.36E-05	3.46E-10	6.25E-14	1.36E-05	3.46E-10
^{152}Eu	0.00E+00	0.00E+00	0.00E+00	2.73E-18	5.94E-10	7.54E-15	2.73E-18	5.94E-10	7.54E-15
^{154}Eu	0.00E+00	0.00E+00	0.00E+00	2.72E-16	5.93E-08	4.84E-13	2.72E-16	5.93E-08	4.84E-13
^{155}Eu	0.00E+00	0.00E+00	0.00E+00	1.53E-16	3.33E-08	1.51E-13	1.53E-16	3.33E-08	1.51E-13
^{3}H	0.00E+00	0.00E+00	0.00E+00	2.76E-17	6.01E-09	1.38E-15	2.76E-17	6.01E-09	1.38E-15
^{129}I	0.00E+00	0.00E+00	0.00E+00	6.32E-21	1.38E-12	1.72E-11	6.32E-21	1.38E-12	1.72E-11
^{63}Ni	0.00E+00	0.00E+00	0.00E+00	2.71E-17	5.91E-09	2.29E-13	2.71E-17	5.91E-09	2.29E-13
^{237}Np	0.00E+00	0.00E+00	0.00E+00	3.86E-19	8.42E-11	2.63E-10	3.86E-19	8.42E-11	2.63E-10
^{238}Pu	0.00E+00	0.00E+00	0.00E+00	1.83E-18	3.98E-10	5.13E-14	1.83E-18	3.98E-10	5.13E-14
^{239}Pu	0.00E+00	0.00E+00	0.00E+00	1.62E-17	3.53E-09	1.25E-10	1.62E-17	3.53E-09	1.25E-10
^{240}Pu	0.00E+00	0.00E+00	0.00E+00	8.88E-19	1.94E-10	1.88E-12	8.88E-19	1.94E-10	1.88E-12
^{241}Pu	0.00E+00	0.00E+00	0.00E+00	1.15E-16	2.50E-08	5.36E-13	1.15E-16	2.50E-08	5.36E-13
^{125}Sb	0.00E+00	0.00E+00	0.00E+00	1.82E-16	3.96E-08	8.41E-14	1.82E-16	3.96E-08	8.41E-14
^{151}Sm	0.00E+00	0.00E+00	0.00E+00	5.65E-16	1.23E-07	1.03E-11	5.65E-16	1.23E-07	1.03E-11
^{126}Sn	0.00E+00	0.00E+00	0.00E+00	8.09E-19	1.76E-10	3.42E-11	8.09E-19	1.76E-10	3.42E-11
^{90}Sr	0.00E+00	0.00E+00	0.00E+00	5.57E-14	1.21E-05	1.94E-10	5.57E-14	1.21E-05	1.94E-10
^{99}Tc	0.00E+00	0.00E+00	0.00E+00	6.59E-16	1.43E-07	1.87E-08	6.59E-16	1.43E-07	1.87E-08
^{232}Th	0.00E+00	0.00E+00	0.00E+00	4.19E-21	9.13E-13	1.83E-08	4.19E-21	9.13E-13	1.83E-08
^{233}U	0.00E+00	0.00E+00	0.00E+00	6.46E-21	1.41E-12	3.22E-13	6.46E-21	1.41E-12	3.22E-13
^{234}U	0.00E+00	0.00E+00	0.00E+00	1.81E-20	3.95E-12	1.40E-12	1.81E-20	3.95E-12	1.40E-12
^{235}U	0.00E+00	0.00E+00	0.00E+00	1.34E-21	2.93E-13	2.99E-10	1.34E-21	2.93E-13	2.99E-10
^{236}U	0.00E+00	0.00E+00	0.00E+00	6.51E-22	1.42E-13	4.83E-12	6.51E-22	1.42E-13	4.83E-12
^{238}U	0.00E+00	0.00E+00	0.00E+00	1.04E-20	2.26E-12	1.48E-08	1.04E-20	2.26E-12	1.48E-08

Component (CAS)	Organic Components mol/L	Lb/gal	Lb/day	Mt/day	g/sec
Total	6.95E-17	1.28E-16	1.01E-08	4.60847E-12	5.33388E-11
57-14-7	2.40E-18	1.2E-18	6.93E-11	3.15085E-14	3.64681E-13
58-90-2	6.98E-19	1.4E-18	7.77E-11	3.53344E-14	4.08963E-13
58-89-9	3.27E-20	7.9E-20	4.57E-12	2.07864E-15	2.40583E-14
71-43-2	3.22E-26	2.1E-26	1.21E-18	5.49508E-22	6.36005E-21
75-69-4	0.00E+00	0	0.00E+00	0	0
75-05-8	6.12E-19	2.1E-19	1.21E-11	5.48924E-15	6.35328E-14
76-44-8	8.18E-23	2.5E-22	1.47E-14	6.66756E-18	7.71708E-17
79-01-6	1.31E-27	1.4E-27	8.30E-20	3.7724E-23	4.3662E-22
80-62-6	0.00E+00	0	0.00E+00	0	0
84-74-2	1.26E-17	2.9E-17	1.68E-09	7.64493E-13	8.8483E-12
84-66-2	1.24E-18	2.3E-18	1.32E-10	6.01951E-14	6.96703E-13
87-86-5	1.12E-18	2.5E-18	1.43E-10	6.51579E-14	7.54143E-13
87-68-3	5.21E-28	1.1E-27	6.53E-20	2.96882E-23	3.43613E-22
87-61-6	0.00E+00	0	0.00E+00	0	0
88-85-7	2.12E-17	4.2E-17	2.44E-09	1.11132E-12	1.28625E-11
91-57-6	0.00E+00	0	0.00E+00	0	0
91-20-3	1.03E-22	1.1E-22	6.31E-15	2.87026E-18	3.32206E-17
95-94-3	0.00E+00	0	0.00E+00	0	0
98-86-2	1.28E-18	1.3E-18	7.39E-11	3.36025E-14	3.88918E-13
99-87-6	0.00E+00	0	0.00E+00	0	0
100-51-6	0.00E+00	0	0.00E+00	0	0
107-21-1	0.00E+00	0	0.00E+00	0	0
108-95-2	3.11E-18	2.4E-18	1.40E-10	6.3808E-14	7.38519E-13
108-88-3	1.17E-26	9E-27	5.20E-19	2.36193E-22	2.73372E-21
120-82-1	5.80E-24	8.8E-24	5.06E-16	2.29978E-19	2.66178E-18
122-66-7	0.00E+00	0	0.00E+00	0	0
122-39-4	2.66E-19	3.8E-19	2.16E-11	9.8263E-15	1.1373E-13
129-00-0	1.14E-17	1.9E-17	1.11E-09	5.05092E-13	5.84597E-12
131-11-3	0.00E+00	0	0.00E+00	0	0
132-64-9	2.13E-20	3E-20	1.72E-12	7.82896E-16	9.0613E-15
156-59-2	0.00E+00	0	0.00E+00	0	0
218-01-9	1.21E-17	2.3E-17	1.33E-09	6.04723E-13	6.99911E-12
309-00-2	4.47E-20	1.4E-19	7.83E-12	3.56034E-15	4.12076E-14
319-85-7	5.17E-20	1.3E-19	7.22E-12	3.28039E-15	3.79674E-14
534-52-1	0.00E+00	0	0.00E+00	0	0
603-34-9	7.49E-19	1.5E-18	8.83E-11	4.01339E-14	4.64512E-13
4170-30-3	4.95E-19	2.9E-19	1.67E-11	7.58049E-15	8.77372E-14
10061-01-5	5.93E-25	5.5E-25	3.16E-17	1.4373E-20	1.66354E-19
23950-58-5	0.00E+00	0	0.00E+00	0	0
38380-08-4	3.11E-20	9.4E-20	5.39E-12	2.451E-15	2.83681E-14
100-21-0	1.78E-18	2.5E-18	1.42E-10	6.47321E-14	7.49214E-13
106-93-4	4.91E-22	7.7E-22	4.43E-14	2.0139E-17	2.33091E-16
106-97-8	0.00E+00	0	0.00E+00	0	0
106-99-0	1.54E-31	7E-32	4.01E-24	1.82408E-27	2.11121E-26
108-87-2	0.00E+00	0	0.00E+00	0	0
110-54-3	0.00E+00	0	0.00E+00	0	0
110-82-7	5.85E-40	4.1E-40	2.37E-32	1.07535E-35	1.24462E-34
111-84-2	0.00E+00	0	0.00E+00	0	0
118-74-1	1.69E-25	4E-25	2.32E-17	1.05304E-20	1.2188E-19
120-12-7	2.74E-19	4.1E-19	2.35E-11	1.06701E-14	1.23497E-13
127-18-4	5.91E-29	8.2E-29	4.71E-21	2.13968E-24	2.47648E-23
1336-36-3	1.41E-19	3.8E-19	2.18E-11	9.91367E-15	1.14742E-13
144-62-7	3.30E-19	2.5E-19	1.43E-11	6.48705E-15	7.50816E-14
208-96-8	1.02E-19	1.3E-19	7.49E-12	3.40463E-15	3.94055E-14
50-32-8	2.22E-19	4.7E-19	2.69E-11	1.22136E-14	1.41361E-13
56-23-5	7.07E-30	9.1E-30	5.23E-22	2.37621E-25	2.75024E-24
60-35-5	1.11E-18	5.5E-19	3.16E-11	1.43487E-14	1.66073E-13
60-57-1	4.42E-20	1.4E-19	8.09E-12	3.67673E-15	4.25548E-14
62-75-9	5.80E-18	3.6E-18	2.06E-10	9.38518E-14	1.08625E-12
75-12-7	6.57E-18	2.5E-18	1.42E-10	6.46603E-14	7.48383E-13
76-15-3	0.00E+00	0	0.00E+00	0	0
8001-35-2	5.23E-20	1.8E-19	1.04E-11	4.72479E-15	5.46851E-14
88-89-1	1.94E-17	3.7E-17	2.13E-09	9.69346E-13	1.12193E-11
126-73-8	1.13E-18	2.5E-18	1.44E-10	6.5617E-14	7.59456E-13

Table A-2 FRP14 Stream Report

River Protection Project - Waste Treatment Plant

Stream Number:	FRP14
Stream Name:	Waste feed from DOE to HLW Feed Receipt
Configuration:	0
	0
Run Data File:	H:\Working Folder 11 (Vishal)\Emissions_Case2_Run4_SubEm\MRQ_03_054_run1_Streams.csv
Run Date / Time:	4/15/2003 - 6:40:10 AM

Stream Properties		
Variable	Value	Units
Density	1.40E+00	g/cm^3
Enthalpy	-2.57E+07	BTU/hr
Mass Flow	4.97E+03	Lb/hr
	1.19E+05	Lb/day
Volumetric Flow	6.51E+00	GPM
Molar Flow	2.03E+02	Lbmol/hr
Volumetric Flow	8.71E-01	ft^3/min
Molecular Weight	2.25E+01	Lb/Lbmol
Pressure	1.00E+03	mbar
Temperature	4.90E+01	C
Viscosity	1.28E+00	cP
Na Molarity	4.00E+00	mol/L
pH	1.48E+01	pH
Total TRU	3.64E-02	Ci/L
Total Activity	5.85E+00	Ci/L

Component	Aqueous Components mol/L	Lb/gal	Lb/day	Solid Components Lb/day	Total Component Lb/day	mt/day	g/sec
Total	6.23E+01	1.17E+01	1.10E+05	8.38E+03	1.18E+05	53.6486	620.9333349
Ag^+	4.83E-04	4.35E-04	4.08E+00	1.29E+01	1.70E+01	0.00774	0.089585679
Al^{+3}	1.00E+00	2.25E-01	2.11E+03	3.29E+02	2.44E+03	1.10973	12.8440931
As^{+3}	2.44E-03	1.53E-03	1.43E+01	3.77E+00	1.81E+01	0.00822	0.095150424
B^{+3}	2.58E-02	2.33E-03	2.19E+01	3.06E+01	5.25E+01	0.02385	0.275997561
Ba^{+2}	4.00E-04	4.58E-04	4.30E+00	1.06E+02	1.10E+02	0.05011	0.579996625
Bi^{+3}	8.09E-04	1.41E-03	1.32E+01	6.59E+01	7.91E+01	0.03597	0.416311146
$C_2O_4^{-2}$	1.03E+00	7.57E-01	7.10E+03	2.59E+02	7.36E+03	3.34511	38.71653456
Ca^{+2}	1.60E-01	5.35E-02	5.02E+02	1.67E+02	6.69E+02	0.30409	3.519552508
Cd^{+2}	1.60E-02	1.50E-02	1.41E+02	1.06E+02	2.47E+02	0.11215	1.298011292
Ce^{+3}	1.21E-03	1.41E-03	1.32E+01	1.91E+01	3.23E+01	0.01468	0.169934501
Cl^-	1.83E-01	5.43E-02	5.09E+02	7.76E+00	5.17E+02	0.23492	2.71895616
CO_3^{-2}	6.18E-01	3.10E-01	2.90E+03	7.06E+02	3.61E+03	1.64097	18.99268337
Cr^{+3}	8.00E-02	3.47E-02	3.26E+02	1.60E+01	3.42E+02	0.15528	1.797249561
Cu^{+2}	8.84E-04	4.69E-04	4.40E+00	1.13E+01	1.57E+01	0.00714	0.082630473
F^-	4.12E-01	6.54E-02	6.13E+02	8.24E+01	6.95E+02	0.31608	3.65837645
Fe^{+3}	4.00E-02	1.86E-02	1.75E+02	6.83E+02	8.58E+02	0.39003	4.514221108
H^+	0.00E+00	0.00E+00	0.00E+00		0.00E+00	0	0
H_2O	4.48E+01	6.74E+00	6.32E+04		6.32E+04	28.7292	332.5134121
Hg^{+2}	5.60E-05	9.37E-05	8.79E-01	2.35E+00	3.23E+00	0.00147	0.01700906
K^+	7.20E-01	2.35E-01	2.20E+03	3.06E+01	2.23E+03	1.01555	11.7540616
La^{+3}	3.32E-04	3.85E-04	3.61E+00	6.12E+01	6.48E+01	0.02946	0.340980099
Li^+	1.58E-02	9.16E-04	8.59E+00	3.32E+00	1.19E+01	0.00541	0.062643552
Mg^{+2}	7.13E-03	1.45E-03	1.36E+01	4.94E+01	6.30E+01	0.02864	0.331494911
Mn^{+3}	1.95E-02	8.93E-03	8.38E+01	1.53E+02	2.37E+02	0.10769	1.246354787
MnO_4^-	0.00E+00	0.00E+00	0.00E+00		0.00E+00	0	0
Na^+	4.00E+00	7.67E-01	7.20E+03	4.47E+02	7.65E+03	3.47523	40.22253235
NH_4^+	4.09E-02	6.15E-03	5.77E+01	0.00E+00	5.77E+01	0.02622	0.303491205
Ni^{+2}	1.20E-02	5.88E-03	5.51E+01	5.65E+01	1.12E+02	0.05074	0.587228885
NO_2^-	7.83E-01	3.01E-01	2.82E+03	1.36E+02	2.96E+03	1.34363	15.55125544
NO_3^-	1.65E+00	8.53E-01	8.00E+03	8.47E+02	8.85E+03	4.02289	46.56127632
O^{-2}				0.00E+00	0.00E+00	0	0
OH^-	6.19E+00	8.79E-01	8.24E+03	2.86E+03	1.11E+04	5.0468	58.41201035
$OH(b)^-$	0.00E+00	0.00E+00	0.00E+00		0.00E+00	0	0
P^{+5}				0.00E+00	0.00E+00	0	0
Pb^{+2}	2.72E-03	4.70E-03	4.41E+01	2.59E+01	7.00E+01	0.03182	0.368298379
Pd^{+2}	3.19E-05	2.83E-05	2.66E-01	3.06E+00	3.33E+00	0.00151	0.017498618
PO_4^{-3}	2.68E-01	2.12E-01	1.99E+03	2.18E+02	2.21E+03	1.00433	11.62424723
S^{+6}				0.00E+00	0.00E+00	0	0
Si^{+4}				4.47E+02	4.47E+02	0.20319	2.351684151
SiO_4^{-4}	2.06E-02	1.58E-02	1.48E+02		1.48E+02	0.06734	0.779357285
SO_4^{-2}	1.44E-01	1.16E-01	1.08E+03	3.12E+01	1.12E+03	0.50732	5.871715175
Sr^{+2}	1.93E-04	1.41E-04	1.32E+00	1.22E+01	1.36E+01	0.00617	0.071372135
Ti^{+4}	3.86E-04	1.54E-04	1.45E+00	3.06E+01	3.20E+01	0.01456	0.168493178
Zn^{+2}	1.62E-03	8.84E-04	8.29E+00	9.88E+00	1.82E+01	0.00826	0.095611531
Zr^{+4}	1.44E-03	1.09E-03	1.03E+01	3.53E+02	3.63E+02	0.1652	1.912022011

Rad. Component	Aqueous Rad. Components Ci/L	Ci/day	Lb/day	Solids Rad. Components (1) Ci/L	Ci/day	Lb/day	Total Rad. Components (1) Ci/L	Ci/day	Lb/day
Total	2.280385293	8.10E+04	1.62E+02	3.57E+00	1.27E+05	3.27E+02	5.85E+00	2.08E+05	4.89E+02
^{241}Am	3.73834E-05	1.33E+00	8.54E-04	2.71E-02	9.61E+02	6.18E-01	2.71E-02	9.62E+02	6.19E-01
^{14}C	2.86E-05	1.01E+00	5.01E-04	1.95E-06	6.94E-02	3.43E-05	3.05E-05	1.08E+00	5.35E-04
^{60}Co	4.00E-05	1.42E+00	2.77E-06	3.01E-03	1.07E+02	2.08E-04	3.05E-03	1.08E+02	2.11E-04
^{243}Cm	7.84E-09	2.78E-04	1.21E-08	9.02E-04	3.20E+01	1.40E-03	9.02E-04	3.20E+01	1.40E-03
^{244}Cm	4.08E-08	1.45E-03	3.95E-08	6.76E-04	2.40E+01	6.54E-04	6.76E-04	2.40E+01	6.54E-04
^{137}Cs	2.16E+00	7.68E+04	1.95E+00	4.51E-01	1.60E+04	4.07E-01	2.61E+00	9.28E+04	2.36E+00
^{152}Eu	1.41E-04	4.99E+00	6.34E-05	1.44E-04	5.12E+00	6.50E-05	2.85E-04	1.01E+01	1.28E-04
^{154}Eu	4.65E-04	1.65E+01	1.35E-04	1.56E-02	5.55E+02	4.53E-03	1.61E-02	5.72E+02	4.66E-03
^{155}Eu	8.02E-04	2.85E+01	1.29E-04	8.72E-03	3.10E+02	1.41E-03	9.52E-03	3.38E+02	1.53E-03
^{3}H	3.82E-04	1.36E+01	3.11E-06	1.95E-05	6.94E-01	1.59E-07	4.01E-04	1.43E+01	3.27E-06
^{129}I	3.11E-07	1.11E-02	1.38E-01	8.72E-08	3.10E-03	3.86E-02	3.99E-07	1.42E-02	1.77E-01

^{63}Ni	2.56E-04	9.10E+00	3.53E-04	1.42E-03	5.06E+01	1.96E-03	1.68E-03	5.96E+01	2.31E-03
^{237}Np	8.42E-08	2.99E-03	9.35E-03	2.23E-05	7.90E-01	2.47E+00	2.23E-05	7.93E-01	2.48E+00
^{238}Pu	2.22E-07	7.90E-03	1.02E-06	1.05E-04	3.74E+00	4.81E-04	1.05E-04	3.74E+00	4.82E-04
^{239}Pu	2.63E-06	9.35E-02	3.32E-03	9.32E-04	3.31E+01	1.18E+00	9.35E-04	3.32E+01	1.18E+00
^{240}Pu	4.66E-07	1.66E-02	1.61E-04	5.11E-05	1.81E+00	1.76E-02	5.15E-05	1.83E+00	1.78E-02
^{241}Pu	1.09E-05	3.89E-01	8.32E-06	6.62E-03	2.35E+02	5.03E-03	6.63E-03	2.35E+02	5.04E-03
^{125}Sb	2.15E-03	7.63E+01	1.62E-04	9.62E-03	3.42E+02	7.26E-04	1.18E-02	4.18E+02	8.88E-04
^{151}Sm	2.67E-02	9.48E+02	7.94E-02	3.01E-02	1.07E+03	8.95E-02	5.68E-02	2.02E+03	1.69E-01
^{126}Sn	1.62E-05	5.74E-01	1.11E-01	4.51E-05	1.60E+00	3.11E-01	6.13E-05	2.18E+00	4.22E-01
^{90}Sr	8.65E-02	3.07E+03	4.90E-02	3.01E+00	1.07E+05	1.70E+00	3.09E+00	1.10E+05	1.75E+00
^{99}Tc	7.68E-04	2.73E+01	3.55E+00	4.51E-03	1.60E+02	2.08E+01	5.28E-03	1.87E+02	2.44E+01
^{232}Th	5.99E-08	2.13E-03	4.26E+01	2.36E-07	8.38E-03	1.68E+02	2.96E-07	1.05E-02	2.10E+02
^{233}U	1.11E-06	3.95E-02	9.04E-03	2.71E-07	9.61E-03	2.20E-03	1.38E-06	4.91E-02	1.12E-02
^{234}U	6.47E-07	2.30E-02	8.16E-03	9.84E-07	3.49E-02	1.24E-02	1.63E-06	5.79E-02	2.06E-02
^{235}U	2.50E-08	8.87E-04	9.05E-01	7.52E-08	2.67E-03	2.72E+00	1.00E-07	3.56E-03	3.63E+00
^{236}U	7.49E-08	2.66E-03	9.06E-02	3.06E-08	1.09E-03	3.71E-02	1.06E-07	3.75E-03	1.28E-01
^{238}U	4.81E-07	1.71E-02	1.12E+02	5.53E-07	1.96E-02	1.29E+02	1.03E-06	3.67E-02	2.41E+02

Component (CAS)	Organic Components mol/L	Lb/gal	Lb/day	Mt/day	g/sec
Total	8.37E-03	1.00E-02	1.64E+02	0.07460656	0.863501849
57-14-7	1.41E-03	0.00071	6.63E+00	0.00301522	0.034898378
58-90-2	3.66E-04	0.00071	6.64E+00	0.003020052	0.034954309
58-89-9	1.03E-06	2.5E-06	2.34E-02	1.06588E-05	0.000123366
71-43-2	2.39E-04	0.00016	1.46E+00	0.000664259	0.007688178
75-69-4	0.00E+00	0	0.00E+00	0	0
75-05-8	6.48E-04	0.00022	2.08E+00	0.0009465	0.010954865
76-44-8	4.82E-06	1.5E-05	1.41E-01	6.40318E-05	0.000741109
79-01-6	1.42E-04	0.00016	1.46E+00	0.000663921	0.00768427
80-62-6	0.00E+00	0	0.00E+00	0	0
84-74-2	3.05E-04	0.00071	6.65E+00	0.003020703	0.034961845
84-66-2	3.82E-04	0.00071	6.65E+00	0.003020774	0.034962661
87-86-5	3.18E-04	0.00071	6.63E+00	0.003013673	0.034880476
87-68-3	7.17E-05	0.00016	1.46E+00	0.000665262	0.007699792
87-61-6	0.00E+00	0	0.00E+00	0	0
88-85-7	3.53E-04	0.00071	6.64E+00	0.003017286	0.034922293
91-57-6	0.00E+00	0	0.00E+00	0	0
91-20-3	2.18E-05	2.3E-05	2.19E-01	9.94126E-05	0.001150609
95-94-3	0.00E+00	0	0.00E+00	0	0
98-86-2	7.04E-04	0.00071	6.64E+00	0.003018508	0.034936435
99-87-6	0.00E+00	0	0.00E+00	0	0
100-51-6	0.00E+00	0	0.00E+00	0	0
107-21-1	0.00E+00	0	0.00E+00	0	0
108-95-2	9.01E-04	0.00071	6.64E+00	0.003017124	0.034920419
108-88-3	2.03E-04	0.00016	1.46E+00	0.000665472	0.007702221
120-82-1	1.03E-04	0.00016	1.46E+00	0.000665045	0.007697275
122-66-7	0.00E+00	0	0.00E+00	0	0
122-39-4	1.11E-04	0.00016	1.47E+00	0.000668395	0.007736049
129-00-0	4.19E-04	0.00071	6.63E+00	0.003015183	0.034897954
131-11-3	0.00E+00	0	0.00E+00	0	0
132-64-9	5.04E-04	0.00071	6.64E+00	0.003016222	0.034909979
156-59-2	0.00E+00	0	0.00E+00	0	0
218-01-9	3.71E-04	0.00071	6.63E+00	0.003013522	0.034878729
309-00-2	2.74E-06	8.3E-06	7.83E-02	3.55789E-05	0.000411793
319-85-7	1.03E-06	2.5E-06	2.34E-02	1.06588E-05	0.000123366
534-52-1	0.00E+00	0	0.00E+00	0	0
603-34-9	3.46E-04	0.00071	6.64E+00	0.003020242	0.0349565
4170-30-3	2.67E-04	0.00016	1.46E+00	0.000665896	0.007707125
10061-01-5	1.69E-04	0.00016	1.47E+00	0.000667306	0.007723447
23950-58-5	0.00E+00	0	0.00E+00	0	0
38380-08-4	9.99E-07	3E-06	2.82E-02	1.28281E-05	0.000148473
100-21-0	5.10E-04	0.00071	6.63E+00	0.003014747	0.034892905
106-93-4	4.51E-04	0.00071	6.63E+00	0.003015017	0.034896026
106-97-8	3.22E-04	0.00016	1.47E+00	0.000665942	0.007707664
106-99-0	3.46E-04	0.00016	1.47E+00	0.000665938	0.007707615
108-87-2	1.90E-04	0.00016	1.46E+00	0.000663811	0.007683001
110-54-3	2.17E-04	0.00016	1.46E+00	0.000665401	0.007701405
110-82-7	2.22E-04	0.00016	1.46E+00	0.000664808	0.007694541
111-84-2	1.46E-04	0.00016	1.47E+00	0.000666311	0.007711928
118-74-1	6.32E-06	1.5E-05	1.41E-01	6.40007E-05	0.000740749
120-12-7	4.76E-04	0.00071	6.64E+00	0.003018534	0.034936732
127-18-4	1.13E-04	0.00016	1.47E+00	0.000666848	0.007718143
1336-36-3	9.13E-05	0.00025	2.30E+00	0.001046066	0.012107251
144-62-7	9.44E-05	7.1E-05	6.65E-01	0.000302424	0.003500276
208-96-8	5.57E-04	0.00071	6.64E+00	0.003016692	0.034915419
50-32-8	4.36E-06	9.2E-06	8.61E-02	3.91414E-05	0.000453025
56-23-5	1.22E-04	0.00016	1.47E+00	0.000667824	0.007729439
60-35-5	3.17E-04	0.00016	1.47E+00	0.000666283	0.007711611
60-57-1	1.58E-06	5E-06	4.71E-02	2.14158E-05	0.000247868
62-75-9	2.14E-03	0.00132	1.24E+01	0.00564241	0.065305666
75-12-7	1.88E-03	0.00071	6.63E+00	0.003012929	0.03487186
76-15-3	1.21E-04	0.00016	1.46E+00	0.000665062	0.007697477
8001-35-2	1.69E-06	5.8E-06	5.48E-02	2.48954E-05	0.000288142
88-89-1	3.70E-04	0.00071	6.64E+00	0.003016327	0.03491119
126-73-8	3.18E-04	0.00071	6.63E+00	0.00301322	0.034875237

Component	Aqueous Components mol/L	Lb/gal	Lb/day	Solid Components Lb/day	Total Component Lb/day	Mt/day	g/sec
$C_2O_4^{-2}$	1.03E+00	7.57E-01	7.10E+03	2.59E+02	7.36E+03	3.34511	38.71653456
Formate	4.13E-02	1.55E-02	1.46E+02	0.00E+00	1.46E+02	0.06615	0.76558785
Acetate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0	0
Glycolate	1.34E-02	8.39E-03	7.87E+01	0.00E+00	7.87E+01	0.03578	0.414131235
IDA	3.85E-04	4.28E-04	4.02E+00	0.00E+00	4.02E+00	0.00183	0.021125547
Citrate	1.06E-02	1.70E-02	1.60E+02	0.00E+00	1.60E+02	0.07264	0.840720993
HEDTA	5.18E-03	1.20E-02	1.13E+02	0.00E+00	1.13E+02	0.05125	0.593158265
EDTA	8.83E-05	2.15E-04	2.02E+00	0.00E+00	2.02E+00	0.00092	0.010630203

Table A-3 PVP01 Stream Report

River Protection Project - Waste Treatment Plant

Stream Number:	PVP01
Stream Name:	Pretreatment vessel vents feed to caustic scrubber
Configuration:	0
	0
Run Data File:	H:\Working Folder 11 (Vishal)\Emissions_Case2_Run4_SubEm\MRQ_03_054_run1_Streams.csv
Run Date / Time:	4/15/2003 - 6:40:10 AM

Stream Properties Variable	Value	Units
Density	1.13E-03	g/cm^3
Enthalpy	-1.63E+06	BTU/hr
Mass Flow	1.13E+04	Lb/hr
	2.70E+05	Lb/day
Volumetric Flow	1.98E+04	GPM
Molar Flow	3.96E+02	Lbmol/hr
Volumetric Flow	2.65E+03	ft^3/min
Molecular Weight	2.84E+01	Lb/Lbmol
Pressure	1.00E+03	mbar
Temperature	2.87E+01	C
Viscosity	1.84E-02	cP
Na Molarity	0.00E+00	mol/L
pH	#NUM!	pH
Total TRU	4.29E-11	Ci/L
Total Activity	1.26E-08	Ci/L

Gaseous Components (1) Component	mol/L	Lb/day	Mt/day
CO	2.16E-26	1.44E-19	6.54528E-23
CO_2	2.40E-07	2.52E+00	0.001143265
H_2O	1.59E-03	6.82E+03	3.098916416
NO	9.86E-32	7.05E-25	3.20254E-28
NO_2	4.73E-26	5.19E-19	2.35788E-22
N_2	3.03E-02	2.02E+05	91.76572837
O_2	8.04E-03	6.13E+04	27.85029459
SO_2	1.75E-28	2.66E-21	1.21113E-24
NH_3	7.48E-08	3.03E-01	0.000137852
HNO_3	1.67E-09	2.51E-02	1.14135E-05
HCl	1.63E-51	1.42E-44	6.45101E-48
HF	1.57E-33	7.50E-27	3.41023E-30

(1) All radionuclides in gaseous streams are assumed to exist as solid particulate.

Component	Aqueous Components mol/L	Lb/gal	Lb/day	Solid Components Lb/day	Total Component Lb/day	mt/day	g/sec
Total	0.00E+00	0.00E+00	0.00E+00	7.69E-01	7.69E-01	0.000349523	0.004045407
Ag^+	0.00E+00	0.00E+00	0.00E+00	1.30E-04	1.30E-04	5.89875E-08	6.82726E-07
Al^{+3}	0.00E+00	0.00E+00	0.00E+00	2.69E-02	2.69E-02	1.22381E-05	0.000141644
As^{+3}	0.00E+00	0.00E+00	0.00E+00	3.40E-02	3.40E-02	1.54518E-05	0.00017884
B^{+3}	0.00E+00	0.00E+00	0.00E+00	9.72E-04	9.72E-04	4.4192E-07	5.11482E-06
Ba^{+2}	0.00E+00	0.00E+00	0.00E+00	6.49E-04	6.49E-04	2.95089E-07	3.41539E-06
Bi^{+3}	0.00E+00	0.00E+00	0.00E+00	3.58E-04	3.58E-04	1.62918E-07	1.88563E-06
$C_2O_4^{-2}$	0.00E+00	0.00E+00	0.00E+00	6.60E-02	6.60E-02	3.00047E-05	0.000347277
Ca^{+2}	0.00E+00	0.00E+00	0.00E+00	9.21E-02	9.21E-02	4.18505E-05	0.00048438
Cd^{+2}	0.00E+00	0.00E+00	0.00E+00	1.81E-03	1.81E-03	8.20623E-07	9.49795E-06
Ce^{+3}	0.00E+00	0.00E+00	0.00E+00	5.76E-04	5.76E-04	2.61819E-07	3.03031E-06
Cl^-	0.00E+00	0.00E+00	0.00E+00	5.81E-03	5.81E-03	2.64213E-06	3.05802E-05
CO_3^{-2}	0.00E+00	0.00E+00	0.00E+00	5.53E-02	5.53E-02	2.51478E-05	0.000291062
Cr^{+3}	0.00E+00	0.00E+00	0.00E+00	3.15E-03	3.15E-03	1.43293E-06	1.65849E-05
Cu^{+2}	0.00E+00	0.00E+00	0.00E+00	1.23E-04	1.23E-04	5.59235E-08	6.47262E-07
F^-	0.00E+00	0.00E+00	0.00E+00	6.72E-03	6.72E-03	3.05323E-06	3.53383E-05
Fe^{+3}	0.00E+00	0.00E+00	0.00E+00	6.38E-03	6.38E-03	2.90203E-06	3.35883E-05
H^+	0.00E+00	0.00E+00	0.00E+00		0.00E+00	0	0
H_2O	0.00E+00	0.00E+00	0.00E+00		0.00E+00	0	0
Hg^{+2}	0.00E+00	0.00E+00	0.00E+00	2.65E-04	2.65E-04	1.20609E-07	1.39594E-06
K^+	0.00E+00	0.00E+00	0.00E+00	2.38E-02	2.38E-02	1.08041E-05	0.000125047
La^{+3}	0.00E+00	0.00E+00	0.00E+00	3.61E-04	3.61E-04	1.64133E-07	1.89969E-06
Li^+	0.00E+00	0.00E+00	0.00E+00	1.40E-04	1.40E-04	6.35706E-08	7.35771E-07
Mg^{+2}	0.00E+00	0.00E+00	0.00E+00	3.48E-03	3.48E-03	1.58246E-06	1.83155E-05
Mn^{+3}	0.00E+00	0.00E+00	0.00E+00	1.93E-03	1.93E-03	8.77447E-07	1.01556E-05
MnO_4^-	0.00E+00	0.00E+00	0.00E+00		0.00E+00	0	0
Na^+	0.00E+00	0.00E+00	0.00E+00	9.28E-02	9.28E-02	4.21632E-05	0.000488
NH_4^+	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0	0
Ni^{+2}	0.00E+00	0.00E+00	0.00E+00	7.35E-04	7.35E-04	3.34163E-07	3.86763E-06
NO_2^-	0.00E+00	0.00E+00	0.00E+00	2.74E-02	2.74E-02	1.24641E-05	0.00014426
NO_3^-	0.00E+00	0.00E+00	0.00E+00	1.46E-01	1.46E-01	6.6543E-05	0.000770174
O^{-2}				1.37E-02	1.37E-02	6.24709E-06	7.23043E-05
OH^-	0.00E+00	0.00E+00	0.00E+00	1.09E-01	1.09E-01	4.97714E-05	0.000576058
$OH(b)^-$	0.00E+00	0.00E+00	0.00E+00		0.00E+00	0	0
P^{+5}				1.22E-08	1.22E-08	5.53418E-12	6.4053E-11
Pb^{+2}	0.00E+00	0.00E+00	0.00E+00	5.10E-04	5.10E-04	2.31623E-07	2.68082E-06
Pd^{+2}	0.00E+00	0.00E+00	0.00E+00	1.34E-05	1.34E-05	6.10952E-09	7.07121E-08
PO_4^{-3}	0.00E+00	0.00E+00	0.00E+00	2.75E-02	2.75E-02	1.25029E-05	0.000144709
S^{+6}				2.73E-05	2.73E-05	1.24123E-08	1.43661E-07
Si^{+4}				4.96E-03	4.96E-03	2.25506E-06	2.61003E-05
SiO_4^{-4}	0.00E+00	0.00E+00	0.00E+00		0.00E+00	0	0
SO_4^{-2}	0.00E+00	0.00E+00	0.00E+00	1.12E-02	1.12E-02	5.10494E-06	5.90849E-05
Sr^{+2}	0.00E+00	0.00E+00	0.00E+00	5.57E-05	5.57E-05	2.53085E-08	2.92923E-07
Ti^{+4}	0.00E+00	0.00E+00	0.00E+00	7.59E-04	7.59E-04	3.45051E-07	3.99365E-06
Zn^{+2}	0.00E+00	0.00E+00	0.00E+00	2.68E-04	2.68E-04	1.21763E-07	1.40929E-06
Zr^{+4}	0.00E+00	0.00E+00	0.00E+00	2.12E-03	2.12E-03	9.624E-07	1.11389E-05

Rad. Component	Aqueous Rad. Components Ci/L	Ci/day	Lb/day	Solids Rad. Components (1) Ci/L	Ci/day	Lb/day	Total Rad. Components (1) Ci/L	Ci/day	Lb/day
Total	0.00E+00	0.00E+00	0.00E+00	1.26E-08	1.36E+00	3.83E-03	1.26E-08	1.36E+00	3.83E-03
^{241}Am	0	0.00E+00	0.00E+00	3.13E-11	3.38E-03	2.18E-06	3.13E-11	3.38E-03	2.18E-06
^{14}C	0.00E+00	0.00E+00	0.00E+00	1.28E-13	1.38E-05	6.81E-09	1.28E-13	1.38E-05	6.81E-09
^{60}Co	0.00E+00	0.00E+00	0.00E+00	5.15E-12	5.57E-04	1.08E-09	5.15E-12	5.57E-04	1.08E-09
^{243}Cm	0.00E+00	0.00E+00	0.00E+00	1.49E-12	1.61E-04	7.04E-09	1.49E-12	1.61E-04	7.04E-09
^{244}Cm	0.00E+00	0.00E+00	0.00E+00	1.12E-12	1.21E-04	3.30E-09	1.12E-12	1.21E-04	3.30E-09
^{137}Cs	0.00E+00	0.00E+00	0.00E+00	5.58E-09	6.03E-01	1.53E-05	5.58E-09	6.03E-01	1.53E-05
^{152}Eu	0.00E+00	0.00E+00	0.00E+00	6.04E-13	6.53E-05	8.28E-10	6.04E-13	6.53E-05	8.28E-10
^{154}Eu	0.00E+00	0.00E+00	0.00E+00	1.95E-11	2.10E-03	1.72E-08	1.95E-11	2.10E-03	1.72E-08
^{155}Eu	0.00E+00	0.00E+00	0.00E+00	1.25E-11	1.36E-03	6.15E-09	1.25E-11	1.36E-03	6.15E-09
^{3}H	0.00E+00	0.00E+00	0.00E+00	3.06E-09	3.30E-01	7.58E-08	3.06E-09	3.30E-01	7.58E-08
^{129}I	0.00E+00	0.00E+00	0.00E+00	2.02E-15	2.19E-07	2.73E-06	2.02E-15	2.19E-07	2.73E-06
^{63}Ni	0.00E+00	0.00E+00	0.00E+00	2.48E-12	2.68E-04	1.04E-08	2.48E-12	2.68E-04	1.04E-08
^{237}Np	0.00E+00	0.00E+00	0.00E+00	3.72E-14	4.02E-06	1.26E-05	3.72E-14	4.02E-06	1.26E-05
^{238}Pu	0.00E+00	0.00E+00	0.00E+00	1.22E-13	1.32E-05	1.70E-09	1.22E-13	1.32E-05	1.70E-09

^{239}Pu	0.00E+00	0.00E+00	0.00E+00	1.08E-12	1.17E-04	4.16E-06	1.08E-12	1.17E-04	4.16E-06
^{240}Pu	0.00E+00	0.00E+00	0.00E+00	6.03E-14	6.52E-06	6.33E-08	6.03E-14	6.52E-06	6.33E-08
^{241}Pu	0.00E+00	0.00E+00	0.00E+00	7.66E-12	8.27E-04	1.77E-08	7.66E-12	8.27E-04	1.77E-08
^{125}Sb	0.00E+00	0.00E+00	0.00E+00	1.79E-11	1.93E-03	4.10E-09	1.79E-11	1.93E-03	4.10E-09
^{151}Sm	0.00E+00	0.00E+00	0.00E+00	1.18E-10	1.27E-02	1.07E-06	1.18E-10	1.27E-02	1.07E-06
^{126}Sn	0.00E+00	0.00E+00	0.00E+00	1.02E-13	1.11E-05	2.15E-06	1.02E-13	1.11E-05	2.15E-06
^{90}Sr	0.00E+00	0.00E+00	0.00E+00	3.75E-09	4.05E-01	6.47E-06	3.75E-09	4.05E-01	6.47E-06
^{99}Tc	0.00E+00	0.00E+00	0.00E+00	1.42E-11	1.53E-03	1.99E-04	1.42E-11	1.53E-03	1.99E-04
^{232}Th	0.00E+00	0.00E+00	0.00E+00	6.52E-16	7.05E-08	1.41E-03	6.52E-16	7.05E-08	1.41E-03
^{233}U	0.00E+00	0.00E+00	0.00E+00	5.30E-15	5.73E-07	1.31E-07	5.30E-15	5.73E-07	1.31E-07
^{234}U	0.00E+00	0.00E+00	0.00E+00	4.45E-15	4.81E-07	1.71E-07	4.45E-15	4.81E-07	1.71E-07
^{235}U	0.00E+00	0.00E+00	0.00E+00	2.33E-16	2.52E-08	2.57E-05	2.33E-16	2.52E-08	2.57E-05
^{236}U	0.00E+00	0.00E+00	0.00E+00	3.78E-16	4.08E-08	1.39E-06	3.78E-16	4.08E-08	1.39E-06
^{238}U	0.00E+00	0.00E+00	0.00E+00	3.02E-15	3.26E-07	2.14E-03	3.02E-15	3.26E-07	2.14E-03

Component	Organic Components				
(CAS)	mol/L	Lb/gal	Lb/day	Mt/day	g/sec
Total	6.87E-07	7.18E-07	5.94E+01	0.027014765	0.312670887
57-14-7	6.50E-08	3.26217E-08	9.31E-01	0.000423276	0.004899027
58-90-2	1.25E-08	2.42289E-08	6.92E-01	0.000314377	0.003638628
58-89-9	2.40E-11	5.81876E-11	1.66E-03	7.55002E-07	8.73844E-06
71-43-2	7.85E-08	5.1186E-08	1.46E+00	0.000664153	0.007686962
75-69-4	0.00E+00	0	0.00E+00	0	0
75-05-8	7.00E-08	2.39872E-08	6.85E-01	0.000311241	0.003602328
76-44-8	1.44E-09	4.47363E-09	1.28E-01	5.80466E-05	0.000671836
79-01-6	4.67E-08	5.1166E-08	1.46E+00	0.000663894	0.007683954
80-62-6	0.00E+00	0	0.00E+00	0	0
84-74-2	3.07E-09	7.14178E-09	2.04E-01	9.26668E-05	0.001072532
84-66-2	1.42E-09	2.642E-09	7.54E-02	3.42808E-05	0.000396769
87-86-5	6.43E-11	1.42965E-10	4.08E-03	1.85502E-06	2.14701E-05
87-68-3	2.36E-08	5.12695E-08	1.46E+00	0.000665237	0.007699507
87-61-6	0.00E+00	0	0.00E+00	0	0
88-85-7	1.36E-09	2.7176E-09	7.76E-02	3.52617E-05	0.000408121
91-57-6	0.00E+00	0	0.00E+00	0	0
91-20-3	6.82E-09	7.29335E-09	2.08E-01	9.46334E-05	0.001095294
95-94-3	0.00E+00	0	0.00E+00	0	0
98-86-2	2.77E-08	2.78467E-08	7.95E-01	0.000361319	0.004181929
99-87-6	0.00E+00	0	0.00E+00	0	0
100-51-6	0.00E+00	0	0.00E+00	0	0
107-21-1	0.00E+00	0	0.00E+00	0	0
108-95-2	2.05E-09	1.60707E-09	4.59E-02	2.08522E-05	0.000241345
108-88-3	6.67E-08	5.12824E-08	1.46E+00	0.000665405	0.007701446
120-82-1	3.37E-08	5.10229E-08	1.46E+00	0.000662038	0.007662477
122-66-7	0.00E+00	0	0.00E+00	0	0
122-39-4	1.66E-09	2.33936E-09	6.68E-02	3.03539E-05	0.000351318
129-00-0	2.10E-08	3.54211E-08	1.01E+00	0.0004596	0.00531944
131-11-3	0.00E+00	0	0.00E+00	0	0
132-64-9	1.41E-07	1.97889E-07	5.65E+00	0.002567666	0.029718351
156-59-2	0.00E+00	0	0.00E+00	0	0
218-01-9	8.92E-09	1.69946E-08	4.85E-01	0.00022051	0.002552196
309-00-2	4.59E-10	1.39646E-09	3.99E-02	1.81194E-05	0.000209716
319-85-7	3.35E-12	8.12988E-12	2.32E-04	1.05488E-07	1.22092E-06
534-52-1	0.00E+00	0	0.00E+00	0	0
603-34-9	7.72E-09	1.57976E-08	4.51E-01	0.000204978	0.002372436
4170-30-3	9.90E-09	5.79024E-09	1.65E-01	7.51301E-05	0.000869562
10061-01-5	5.55E-08	5.13791E-08	1.47E+00	0.000666659	0.007715964
23950-58-5	0.00E+00	0	0.00E+00	0	0
38380-08-4	2.58E-11	7.75674E-11	2.21E-03	1.00646E-06	1.16488E-05
100-21-0	1.46E-13	2.02784E-13	5.79E-06	2.63118E-09	3.04535E-08
106-93-4	1.45E-07	2.27177E-07	6.48E+00	0.002947695	0.034116845
106-97-8	1.06E-07	5.13233E-08	1.47E+00	0.000665936	0.007707587
106-99-0	1.14E-07	5.1323E-08	1.47E+00	0.000665931	0.007707537
108-87-2	6.24E-08	5.11591E-08	1.46E+00	0.000663805	0.007682924
110-54-3	7.13E-08	5.12816E-08	1.46E+00	0.000665395	0.007701328
110-82-7	7.29E-08	5.12359E-08	1.46E+00	0.000664802	0.007694464
111-84-2	4.80E-08	5.13517E-08	1.47E+00	0.000666304	0.007711851
118-74-1	2.07E-09	4.91768E-09	1.40E-01	6.38084E-05	0.000738523
120-12-7	7.27E-08	1.08195E-07	3.09E+00	0.001403865	0.016248441
127-18-4	3.71E-08	5.13928E-08	1.47E+00	0.000666837	0.007718021
1336-36-3	1.45E-07	3.89316E-07	1.11E+01	0.005051489	0.058466306
144-62-7	1.40E-13	1.0529E-13	3.01E-06	1.36617E-09	1.58122E-08
208-96-8	1.26E-07	1.60626E-07	4.59E+00	0.002084173	0.024122374
50-32-8	1.48E-11	3.10783E-11	8.87E-04	4.0325E-07	4.66724E-06
56-23-5	4.01E-08	5.14682E-08	1.47E+00	0.000667816	0.00772935
60-35-5	2.96E-11	1.45745E-11	4.16E-04	1.89109E-07	2.18876E-06
60-57-1	6.65E-11	2.11462E-10	6.04E-03	2.74378E-06	3.17567E-05
62-75-9	1.91E-08	1.17883E-08	3.37E-01	0.000152956	0.001770326
75-12-7	2.25E-11	8.46011E-12	2.41E-04	1.09772E-07	1.27051E-06
76-15-3	3.98E-08	5.12555E-08	1.46E+00	0.000665055	0.0076974
8001-35-2	4.51E-11	1.55781E-10	4.45E-03	2.0213E-06	2.33947E-05
88-89-1	2.38E-13	4.55733E-13	1.30E-05	5.91327E-09	6.84407E-08
126-73-8	3.61E-10	8.01694E-10	2.29E-02	1.04022E-05	0.000120396

	Aqueous Components			Solid Components	Total Component		
Component	mol/L	Lb/gal	Lb/day	Lb/day	Lb/day	Mt/day	g/sec
$C_2O_4^{-2}$	0.00E+00	0.00E+00	0.00E+00	6.60E-02	6.60E-02	3.00047E-05	0.000347277
Formate	0.00E+00	0.00E+00	0.00E+00	1.32E-03	1.32E-03	5.98688E-07	6.92926E-06
Acetate	0.00E+00	0.00E+00	0.00E+00	7.24E-09	7.24E-09	3.29172E-12	3.80987E-11
Glycolate	0.00E+00	0.00E+00	0.00E+00	7.12E-04	7.12E-04	3.23853E-07	3.7483E-06
IDA	0.00E+00	0.00E+00	0.00E+00	3.68E-05	3.68E-05	1.67326E-08	1.93664E-07
Citrate	0.00E+00	0.00E+00	0.00E+00	1.46E-03	1.46E-03	6.65788E-07	7.70588E-06
HEDTA	0.00E+00	0.00E+00	0.00E+00	1.03E-03	1.03E-03	4.69728E-07	5.43666E-06
EDTA	0.00E+00	0.00E+00	0.00E+00	1.85E-05	1.85E-05	8.42991E-09	9.75684E-08

Table A-4 PJV04 Stream Report

River Protection Project - Waste Treatment Plant

Stream Number:	PJV04
Stream Name:	Vapor feed to demister
Configuration:	0
	0
Run Data File:	H:\Working Folder 11 (Vishal)\Emissions_Case2_Run4_SubEm\MRQ_03_054_run1_Streams.csv
Run Date / Time:	4/15/2003 - 6:40:10 AM

Stream Properties Variable	Value	Units
Density	1.16E-03	g/cm^3
Enthalpy	-7.83E+06	BTU/hr
Mass Flow	1.52E+05	Lb/hr
	3.65E+06	Lb/day
Volumetric Flow	2.62E+05	GPM
Molar Flow	5.30E+03	Lbmol/hr
Volumetric Flow	3.50E+04	ft^3/min
Molecular Weight	2.87E+01	Lb/Lbmol
Pressure	1.00E+03	mbar
Temperature	2.50E+01	C
Viscosity	1.83E-02	cP
Na Molarity	0.00E+00	mol/L
pH	#NUM!	pH
Total TRU	5.47E-11	Ci/L
Total Activity	1.03E-08	Ci/L

Gaseous Components (1) Component	mol/L	Lb/day	Mt/day
CO	1.20E-27	1.05E-19	4.79109E-23
CO_2	5.28E-13	7.32E-05	3.32582E-08
H_2O	5.72E-04	3.25E+04	14.75494908
NO	1.16E-32	1.10E-24	4.98335E-28
NO_2	3.35E-34	4.85E-26	2.20602E-29
N_2	3.14E-02	2.77E+06	1260.313993
O_2	8.36E-03	8.42E+05	382.6816086
SO_2	4.25E-33	8.58E-25	3.89794E-28
NH_3	4.68E-11	2.51E-03	1.14081E-06
HNO_3	2.30E-11	4.57E-03	2.0767E-06
HCl	1.17E-44	1.34E-36	6.10866E-40
HF	2.53E-83	1.60E-75	7.25621E-79

(1) All radionuclides in gaseous streams are assumed to exist as solid particulate.

Component	Aqueous Components mol/L	Lb/gal	Lb/day	Solid Components Lb/day	Total Component Lb/day	mt/day	g/sec
Total	0.00E+00	0.00E+00	0.00E+00	5.96E+00	5.96E+00	0.002710504	0.03137157
Ag^+	0.00E+00	0.00E+00	0.00E+00	1.19E-03	1.19E-03	5.4102E-07	6.2618E-06
Al^{+3}	0.00E+00	0.00E+00	0.00E+00	2.17E-01	2.17E-01	9.8667E-05	0.00114198
As^{+3}	0.00E+00	0.00E+00	0.00E+00	4.63E-01	4.63E-01	0.000210383	0.002434986
B^{+3}	0.00E+00	0.00E+00	0.00E+00	7.11E-03	7.11E-03	3.23396E-06	3.74301E-05
Ba^{+2}	0.00E+00	0.00E+00	0.00E+00	6.83E-03	6.83E-03	3.10419E-06	3.59281E-05
Bi^{+3}	0.00E+00	0.00E+00	0.00E+00	5.23E-03	5.23E-03	2.37877E-06	2.75321E-05
$C_2O_4^{-2}$	0.00E+00	0.00E+00	0.00E+00	6.32E-01	6.32E-01	0.000287319	0.003325449
Ca^{+2}	0.00E+00	0.00E+00	0.00E+00	5.81E-02	5.81E-02	2.64153E-05	0.000305733
Cd^{+2}	0.00E+00	0.00E+00	0.00E+00	2.07E-02	2.07E-02	9.3864E-06	0.000108639
Ce^{+3}	0.00E+00	0.00E+00	0.00E+00	4.79E-03	4.79E-03	2.17732E-06	2.52004E-05
Cl^-	0.00E+00	0.00E+00	0.00E+00	5.16E-02	5.16E-02	2.34656E-05	0.000271593
CO_3^{-2}	0.00E+00	0.00E+00	0.00E+00	3.12E-01	3.12E-01	0.000141932	0.00164273
Cr^{+3}	0.00E+00	0.00E+00	0.00E+00	3.14E-02	3.14E-02	1.42677E-05	0.000165135
Cu^{+2}	0.00E+00	0.00E+00	0.00E+00	1.09E-03	1.09E-03	4.96037E-07	5.74117E-06
F^-	0.00E+00	0.00E+00	0.00E+00	6.86E-02	6.86E-02	3.11823E-05	0.000360906
Fe^{+3}	0.00E+00	0.00E+00	0.00E+00	5.81E-02	5.81E-02	2.64126E-05	0.000305702
H^+	0.00E+00	0.00E+00	0.00E+00		0.00E+00	0	0
H_2O	0.00E+00	0.00E+00	0.00E+00		0.00E+00	0	0
Hg^{+2}	0.00E+00	0.00E+00	0.00E+00	3.66E-03	3.66E-03	1.66269E-06	1.92441E-05
K^+	0.00E+00	0.00E+00	0.00E+00	2.10E-01	2.10E-01	9.54319E-05	0.001104536
La^{+3}	0.00E+00	0.00E+00	0.00E+00	4.10E-03	4.10E-03	1.86138E-06	2.15437E-05
Li^+	0.00E+00	0.00E+00	0.00E+00	1.48E-03	1.48E-03	6.74453E-07	7.80617E-06
Mg^{+2}	0.00E+00	0.00E+00	0.00E+00	4.40E-03	4.40E-03	1.99915E-06	2.31383E-05
Mn^{+3}	0.00E+00	0.00E+00	0.00E+00	1.71E-02	1.71E-02	7.79026E-06	9.01651E-05
MnO_4^-	0.00E+00	0.00E+00	0.00E+00		0.00E+00	0	0
Na^+	0.00E+00	0.00E+00	0.00E+00	7.46E-01	7.46E-01	0.000339074	0.003924468
NH_4^+	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0	0
Ni^{+2}	0.00E+00	0.00E+00	0.00E+00	8.61E-03	8.61E-03	3.91324E-06	4.52921E-05
NO_2^-	0.00E+00	0.00E+00	0.00E+00	2.70E-01	2.70E-01	0.000122849	0.001421868
NO_3^-	0.00E+00	0.00E+00	0.00E+00	1.42E+00	1.42E+00	0.000647567	0.00749499
O^{-2}				1.64E-01	1.64E-01	7.46284E-05	0.000863755
OH^-	0.00E+00	0.00E+00	0.00E+00	7.99E-01	7.99E-01	0.000363358	0.004205533
$OH(b)^-$	0.00E+00	0.00E+00	0.00E+00		0.00E+00	0	0
P^{+5}				5.39E-10	5.39E-10	2.44951E-13	2.83509E-12
Pb^{+2}	0.00E+00	0.00E+00	0.00E+00	5.67E-03	5.67E-03	2.57661E-06	2.98219E-05
Pd^{+2}	0.00E+00	0.00E+00	0.00E+00	2.09E-04	2.09E-04	9.5195E-08	1.10179E-06
PO_4^{-3}	0.00E+00	0.00E+00	0.00E+00	1.98E-01	1.98E-01	9.00342E-05	0.001042062
S^{+6}				1.64E-09	1.64E-09	7.43287E-13	8.60286E-12
Si^{+4}				3.32E-02	3.32E-02	1.50745E-05	0.000174473
SiO_4^{-4}	0.00E+00	0.00E+00	0.00E+00		0.00E+00	0	0
SO_4^{-2}	0.00E+00	0.00E+00	0.00E+00	1.03E-01	1.03E-01	4.66699E-05	0.000540161
Sr^{+2}	0.00E+00	0.00E+00	0.00E+00	8.67E-04	8.67E-04	3.93912E-07	4.55917E-06
Ti^{+4}	0.00E+00	0.00E+00	0.00E+00	5.26E-03	5.26E-03	2.39152E-06	2.76796E-05
Zn^{+2}	0.00E+00	0.00E+00	0.00E+00	2.03E-03	2.03E-03	9.22881E-07	1.06815E-05
Zr^{+4}	0.00E+00	0.00E+00	0.00E+00	2.24E-02	2.24E-02	1.0173E-05	0.000117744

Rad. Component	Aqueous Rad. Components Ci/L	Ci/day	Lb/day	Solids Rad. Components (1) Ci/L	Ci/day	Lb/day	Total Rad. Components (1) Ci/L	Ci/day	Lb/day
Total	0.00E+00	0.00E+00	0.00E+00	1.03E-08	1.47E+01	3.56E-02	1.03E-08	1.47E+01	3.56E-02
^{241}Am	0	0.00E+00	0.00E+00	4.07E-11	5.81E-02	3.74E-05	4.07E-11	5.81E-02	3.74E-05
^{14}C	0.00E+00	0.00E+00	0.00E+00	6.89E-14	9.84E-05	4.86E-08	6.89E-14	9.84E-05	4.86E-08
^{60}Co	0.00E+00	0.00E+00	0.00E+00	4.60E-12	6.57E-03	1.28E-08	4.60E-12	6.57E-03	1.28E-08
^{243}Cm	0.00E+00	0.00E+00	0.00E+00	1.35E-12	1.93E-03	8.43E-08	1.35E-12	1.93E-03	8.43E-08
^{244}Cm	0.00E+00	0.00E+00	0.00E+00	1.01E-12	1.45E-03	3.95E-08	1.01E-12	1.45E-03	3.95E-08
^{137}Cs	0.00E+00	0.00E+00	0.00E+00	5.34E-09	7.62E+00	1.94E-04	5.34E-09	7.62E+00	1.94E-04
^{152}Eu	0.00E+00	0.00E+00	0.00E+00	5.42E-13	7.74E-04	9.82E-09	5.42E-13	7.74E-04	9.82E-09
^{154}Eu	0.00E+00	0.00E+00	0.00E+00	2.45E-11	3.50E-02	2.86E-07	2.45E-11	3.50E-02	2.86E-07
^{155}Eu	0.00E+00	0.00E+00	0.00E+00	1.49E-11	2.13E-02	9.68E-08	1.49E-11	2.13E-02	9.68E-08
^{3}H	0.00E+00	0.00E+00	0.00E+00	5.81E-13	8.30E-04	1.90E-10	5.81E-13	8.30E-04	1.90E-10
^{129}I	0.00E+00	0.00E+00	0.00E+00	9.09E-16	1.30E-06	1.62E-05	9.09E-16	1.30E-06	1.62E-05
^{63}Ni	0.00E+00	0.00E+00	0.00E+00	2.75E-12	3.92E-03	1.52E-07	2.75E-12	3.92E-03	1.52E-07
^{237}Np	0.00E+00	0.00E+00	0.00E+00	3.36E-14	4.79E-05	1.50E-04	3.36E-14	4.79E-05	1.50E-04
^{238}Pu	0.00E+00	0.00E+00	0.00E+00	1.58E-13	2.26E-04	2.91E-08	1.58E-13	2.26E-04	2.91E-08

^{239}Pu	0.00E+00	0.00E+00	0.00E+00	1.40E-12	2.01E-03	7.13E-05	1.40E-12	2.01E-03	7.13E-05
^{240}Pu	0.00E+00	0.00E+00	0.00E+00	7.77E-14	1.11E-04	1.08E-06	7.77E-14	1.11E-04	1.08E-06
^{241}Pu	0.00E+00	0.00E+00	0.00E+00	9.95E-12	1.42E-02	3.04E-07	9.95E-12	1.42E-02	3.04E-07
^{125}Sb	0.00E+00	0.00E+00	0.00E+00	1.95E-11	2.79E-02	5.92E-08	1.95E-11	2.79E-02	5.92E-08
^{151}Sm	0.00E+00	0.00E+00	0.00E+00	1.07E-10	1.53E-01	1.28E-05	1.07E-10	1.53E-01	1.28E-05
^{126}Sn	0.00E+00	0.00E+00	0.00E+00	1.05E-13	1.50E-04	2.91E-05	1.05E-13	1.50E-04	2.91E-05
^{90}Sr	0.00E+00	0.00E+00	0.00E+00	4.74E-09	6.77E+00	1.08E-04	4.74E-09	6.77E+00	1.08E-04
^{99}Tc	0.00E+00	0.00E+00	0.00E+00	1.29E-11	1.84E-02	2.40E-03	1.29E-11	1.84E-02	2.40E-03
^{232}Th	0.00E+00	0.00E+00	0.00E+00	4.92E-16	7.03E-07	1.41E-02	4.92E-16	7.03E-07	1.41E-02
^{233}U	0.00E+00	0.00E+00	0.00E+00	2.98E-15	4.25E-06	9.73E-07	2.98E-15	4.25E-06	9.73E-07
^{234}U	0.00E+00	0.00E+00	0.00E+00	2.97E-15	4.24E-06	1.51E-06	2.97E-15	4.24E-06	1.51E-06
^{235}U	0.00E+00	0.00E+00	0.00E+00	1.71E-16	2.44E-07	2.49E-04	1.71E-16	2.44E-07	2.49E-04
^{236}U	0.00E+00	0.00E+00	0.00E+00	2.19E-16	3.13E-07	1.07E-05	2.19E-16	3.13E-07	1.07E-05
^{238}U	0.00E+00	0.00E+00	0.00E+00	1.94E-15	2.78E-06	1.82E-02	1.94E-15	2.78E-06	1.82E-02

Component	Organic Components				
(CAS)	mol/L	Lb/gal	Lb/day	Mt/day	g/sec
Total	7.94E-12	1.07E-11	8.54E-03	3.87965E-06	4.49033E-05
57-14-7	1.05E-12	5.28316E-13	1.99E-04	9.06058E-08	1.04868E-06
58-90-2	2.86E-13	5.53412E-13	2.09E-04	9.49098E-08	1.09849E-06
58-89-9	1.08E-15	2.63158E-15	9.93E-07	4.51313E-10	5.22353E-09
71-43-2	6.07E-14	3.9563E-14	1.49E-05	6.78502E-09	7.85303E-08
75-69-4	0.00E+00	0	0.00E+00	0	0
75-05-8	4.12E-13	1.41031E-13	5.32E-05	2.41868E-08	2.7994E-07
76-44-8	1.66E-15	5.18252E-15	1.96E-06	8.88798E-10	1.0287E-08
79-01-6	3.57E-14	3.91873E-14	1.48E-05	6.72059E-09	7.77846E-08
80-62-6	0.00E+00	0	0.00E+00	0	0
84-74-2	4.09E-13	9.50503E-13	3.59E-04	1.6301E-07	1.8867E-06
84-66-2	5.22E-13	9.67668E-13	3.65E-04	1.65954E-07	1.92077E-06
87-86-5	6.40E-13	1.42297E-12	5.37E-04	2.44039E-07	2.82452E-06
87-68-3	1.80E-14	3.92433E-14	1.48E-05	6.7302E-09	7.78958E-08
87-61-6	0.00E+00	0	0.00E+00	0	0
88-85-7	8.05E-13	1.61406E-12	6.09E-04	2.7681E-07	3.20381E-06
91-57-6	0.00E+00	0	0.00E+00	0	0
91-20-3	6.85E-15	7.32591E-15	2.76E-06	1.25639E-09	1.45415E-08
95-94-3	0.00E+00	0	0.00E+00	0	0
98-86-2	5.39E-13	5.4157E-13	2.04E-04	9.28789E-08	1.07499E-06
99-87-6	0.00E+00	0	0.00E+00	0	0
100-51-6	0.00E+00	0	0.00E+00	0	0
107-21-1	0.00E+00	0	0.00E+00	0	0
108-95-2	1.42E-12	1.11334E-12	4.20E-04	1.90937E-07	2.20992E-06
108-88-3	5.14E-14	3.94995E-14	1.49E-05	6.77413E-09	7.84043E-08
120-82-1	2.77E-14	4.19707E-14	1.58E-05	7.19794E-09	8.33095E-08
122-66-7	0.00E+00	0	0.00E+00	0	0
122-39-4	1.00E-13	1.41879E-13	5.35E-05	2.43321E-08	2.81622E-07
129-00-0	4.20E-13	7.09312E-13	2.68E-04	1.21647E-07	1.40795E-06
131-11-3	0.00E+00	0	0.00E+00	0	0
132-64-9	1.90E-13	2.67255E-13	1.01E-04	4.5834E-08	5.30486E-07
156-59-2	0.00E+00	0	0.00E+00	0	0
218-01-9	3.99E-13	7.60867E-13	2.87E-04	1.30488E-07	1.51028E-06
309-00-2	2.84E-15	8.64963E-15	3.26E-06	1.4834E-09	1.7169E-08
319-85-7	1.95E-15	4.72742E-15	1.78E-06	8.10749E-10	9.38367E-09
534-52-1	0.00E+00	0	0.00E+00	0	0
603-34-9	2.90E-13	5.92935E-13	2.24E-04	1.01688E-07	1.17694E-06
4170-30-3	2.06E-13	1.20594E-13	4.55E-05	2.06819E-08	2.39373E-07
10061-01-5	4.38E-14	4.05993E-14	1.53E-05	6.96275E-09	8.05874E-08
23950-58-5	0.00E+00	0	0.00E+00	0	0
38380-08-4	1.04E-15	3.12843E-15	1.18E-06	5.36523E-10	6.20976E-09
100-21-0	1.05E-12	1.46086E-12	5.51E-04	2.50536E-07	2.89972E-06
106-93-4	1.32E-13	2.06525E-13	7.79E-05	3.54189E-08	4.09941E-07
106-97-8	8.01E-14	3.88355E-14	1.47E-05	6.66026E-09	7.70863E-08
106-99-0	8.62E-14	3.8894E-14	1.47E-05	6.6703E-09	7.72025E-08
108-87-2	4.72E-14	3.87173E-14	1.46E-05	6.63998E-09	7.68516E-08
110-54-3	5.40E-14	3.88017E-14	1.46E-05	6.65446E-09	7.70192E-08
110-82-7	5.52E-14	3.87957E-14	1.46E-05	6.65344E-09	7.70074E-08
111-84-2	3.63E-14	3.88535E-14	1.47E-05	6.66334E-09	7.7122E-08
118-74-1	1.68E-15	3.98944E-15	1.51E-06	6.84186E-10	7.91882E-09
120-12-7	2.71E-13	4.03298E-13	1.52E-04	6.91653E-08	8.00525E-07
127-18-4	2.83E-14	3.91479E-14	1.48E-05	6.71383E-09	7.77064E-08
1336-36-3	2.51E-13	6.74137E-13	2.54E-04	1.15614E-07	1.33812E-06
144-62-7	1.95E-13	1.46254E-13	5.52E-05	2.50825E-08	2.90307E-07
208-96-8	2.57E-13	3.26487E-13	1.23E-04	5.59923E-08	6.48059E-07
50-32-8	8.30E-15	1.74692E-14	6.59E-06	2.99595E-09	3.46753E-08
56-23-5	3.05E-14	3.911E-14	1.48E-05	6.70734E-09	7.76312E-08
60-35-5	6.47E-13	3.18948E-13	1.20E-04	5.46993E-08	6.33093E-07
60-57-1	1.58E-15	5.0144E-15	1.89E-06	8.59965E-10	9.9533E-09
62-75-9	2.21E-12	1.36612E-12	5.15E-04	2.34288E-07	2.71167E-06
75-12-7	3.88E-12	1.45666E-12	5.50E-04	2.49817E-07	2.8914E-06
76-15-3	3.01E-14	3.87801E-14	1.46E-05	6.65076E-09	7.69764E-08
8001-35-2	1.75E-15	6.04898E-15	2.28E-06	1.03739E-09	1.20069E-08
88-89-1	2.71E-12	5.18279E-12	1.96E-03	8.88844E-07	1.02875E-05
126-73-8	5.71E-13	1.26794E-12	4.78E-04	2.1745E-07	2.51679E-06

	Aqueous Components			Solid Components	Total Component		
Component	mol/L	Lb/gal	Lb/day	Lb/day	Lb/day	Mt/day	g/sec
$C_2O_4^{-2}$	0.00E+00	0.00E+00	0.00E+00	6.32E-01	6.32E-01	0.000287319	0.003325449
Formate	0.00E+00	0.00E+00	0.00E+00	1.23E-02	1.23E-02	5.59381E-06	6.47432E-05
Acetate	0.00E+00	0.00E+00	0.00E+00	4.47E-08	4.47E-08	2.03191E-11	2.35175E-10
Glycolate	0.00E+00	0.00E+00	0.00E+00	6.66E-03	6.66E-03	3.02588E-06	3.50218E-05
IDA	0.00E+00	0.00E+00	0.00E+00	3.49E-04	3.49E-04	1.58634E-07	1.83604E-06
Citrate	0.00E+00	0.00E+00	0.00E+00	1.39E-02	1.39E-02	6.31253E-06	7.30617E-05
HEDTA	0.00E+00	0.00E+00	0.00E+00	9.80E-03	9.80E-03	4.45365E-06	5.15469E-05
EDTA	0.00E+00	0.00E+00	0.00E+00	1.76E-04	1.76E-04	7.98662E-08	9.24378E-07

Table A-5 LMP06 Stream Report

River Protection Project - Waste Treatment Plant

Stream Number:	LMP06
Stream Name:	Melter offgas (primary)
Configuration:	0
	0
Run Data File:	H:\Working Folder 11 (Vishal)\Emissions_Case2_Run4_SubEm\MRQ_03_054_run1_Streams.csv
Run Date / Time:	4/15/2003 - 6:40:10 AM

Stream Properties Variable	Value	Units
Density	4.52E-04	g/cm^3
Enthalpy	-1.19E+07	BTU/hr
Mass Flow	6.50E+03	Lb/hr
	1.56E+05	Lb/day
Volumetric Flow	2.80E+04	GPM
Molar Flow	2.46E+02	Lbmol/hr
Volumetric Flow	3.74E+03	ft^3/min
Molecular Weight	2.58E+01	Lb/Lbmol
Pressure	9.83E+02	mbar
Temperature	4.00E+02	C
Viscosity	3.19E-02	cP
Na Molarity	0.00E+00	mol/L
pH	#NUM!	pH
Total TRU	5.92E-11	Ci/L
Total Activity	2.35E-07	Ci/L

Gaseous Components (1) Component	mol/L	Lb/day	Mt/day
CO	1.29E-05	1.21E+02	0.055041335
CO_2	1.29E-03	1.90E+04	8.64810066
H_2O	7.10E-03	4.31E+04	19.56830477
NO	4.22E-04	4.26E+03	1.936049184
NO_2	3.84E-05	5.95E+02	0.27046549
N_2	6.48E-03	6.10E+04	27.74728371
O_2	2.19E-03	2.36E+04	10.70777218
SO_2	1.13E-05	2.42E+02	0.110215827
NH_3	1.19E-07	6.81E-01	0.00030968
HNO_3	3.25E-59	6.90E-52	3.13442E-55
HCl	1.98E-05	2.43E+02	0.110393746
HF	9.64E-06	6.49E+01	0.029495321

(1) All radionuclides in gaseous streams are assumed to exist as solid particulate.

Component	Aqueous Components mol/L	Lb/gal	Lb/day	Solid Components Lb/day	Total Component Lb/day	mt/day	g/sec
Total	0.00E+00	0.00E+00	0.00E+00	3.67E+03	3.67E+03	1.668650781	19.31308775
Ag^+	0.00E+00	0.00E+00	0.00E+00	1.27E-01	1.27E-01	5.78544E-05	0.000669611
Al^{+3}	0.00E+00	0.00E+00	0.00E+00	3.47E+01	3.47E+01	0.015790516	0.1827606
As^{+3}	0.00E+00	0.00E+00	0.00E+00	1.21E+03	1.21E+03	0.547910033	6.341551307
B^{+3}	0.00E+00	0.00E+00	0.00E+00	1.20E+02	1.20E+02	0.054473818	0.630484
Ba^{+2}	0.00E+00	0.00E+00	0.00E+00	3.94E-02	3.94E-02	1.79003E-05	0.000207179
Bi^{+3}	0.00E+00	0.00E+00	0.00E+00	1.21E-01	1.21E-01	5.50475E-05	0.000637123
$C_2O_4^{-2}$	0.00E+00	0.00E+00	0.00E+00	5.45E+02	5.45E+02	0.247670974	2.866562202
Ca^{+2}	0.00E+00	0.00E+00	0.00E+00	6.36E+01	6.36E+01	0.028899546	0.334485484
Cd^{+2}	0.00E+00	0.00E+00	0.00E+00	1.42E+01	1.42E+01	0.006439439	0.074530548
Ce^{+3}	0.00E+00	0.00E+00	0.00E+00	1.66E-01	1.66E-01	7.56349E-05	0.000875404
Cl^-	0.00E+00	0.00E+00	0.00E+00	8.00E+01	8.00E+01	0.036355115	0.420776792
CO_3^{-2}	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0	0
Cr^{+3}	0.00E+00	0.00E+00	0.00E+00	2.99E+00	2.99E+00	0.001357237	0.015708767
Cu^{+2}	0.00E+00	0.00E+00	0.00E+00	2.00E-02	2.00E-02	9.08879E-06	0.000105194
F^-	0.00E+00	0.00E+00	0.00E+00	1.24E+02	1.24E+02	0.056287724	0.651478284
Fe^{+3}	0.00E+00	0.00E+00	0.00E+00	2.05E+01	2.05E+01	0.009340679	0.108109707
H^+	0.00E+00	0.00E+00	0.00E+00		0.00E+00	0	0
H_2O	0.00E+00	0.00E+00	0.00E+00		0.00E+00	0	0
Hg^{+2}	0.00E+00	0.00E+00	0.00E+00	4.78E+00	4.78E+00	0.002172793	0.025148066
K^+	0.00E+00	0.00E+00	0.00E+00	1.05E+02	1.05E+02	0.047893411	0.554321889
La^{+3}	0.00E+00	0.00E+00	0.00E+00	6.67E-02	6.67E-02	3.03367E-05	0.000351119
Li^+	0.00E+00	0.00E+00	0.00E+00	2.08E+01	2.08E+01	0.009471133	0.109619592
Mg^{+2}	0.00E+00	0.00E+00	0.00E+00	7.77E+00	7.77E+00	0.003531568	0.040874634
Mn^{+3}	0.00E+00	0.00E+00	0.00E+00	1.02E+00	1.02E+00	0.000465502	0.00538776
MnO_4^-	0.00E+00	0.00E+00	0.00E+00		0.00E+00	0	0
Na^+	0.00E+00	0.00E+00	0.00E+00	7.02E+01	7.02E+01	0.031923141	0.369480796
NH_4^+	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0	0
Ni^{+2}	0.00E+00	0.00E+00	0.00E+00	5.71E-01	5.71E-01	0.000259638	0.00300507
NO_2^-	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0	0
NO_3^-	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0	0
O^{-2}				9.87E+02	9.87E+02	0.448497025	5.190937792
OH^-	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0	0
$OH(b)^-$	0.00E+00	0.00E+00	0.00E+00		0.00E+00	0	0
P^{+5}				1.47E+01	1.47E+01	0.00667526	0.077259949
Pb^{+2}	0.00E+00	0.00E+00	0.00E+00	2.01E-01	2.01E-01	9.12777E-05	0.001056455
Pd^{+2}	0.00E+00	0.00E+00	0.00E+00	1.21E-03	1.21E-03	5.50347E-07	6.36976E-06
PO_4^{-3}	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0	0
S^{+6}				0.00E+00	0.00E+00	0	0
Si^{+4}				7.98E+01	7.98E+01	0.036252978	0.419594657
SiO_4^{-4}	0.00E+00	0.00E+00	0.00E+00		0.00E+00	0	0
SO_4^{-2}	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0	0
Sr^{+2}	0.00E+00	0.00E+00	0.00E+00	1.21E-02	1.21E-02	5.51301E-06	6.3808E-05
Ti^{+4}	0.00E+00	0.00E+00	0.00E+00	1.33E+02	1.33E+02	0.060629966	0.701735713
Zn^{+2}	0.00E+00	0.00E+00	0.00E+00	2.70E+01	2.70E+01	0.012278687	0.142114436
Zr^{+4}	0.00E+00	0.00E+00	0.00E+00	8.21E+00	8.21E+00	0.003731395	0.043187438

Rad. Component	Aqueous Rad. Components Ci/L	Ci/day	Lb/day	Solids Rad. Components (1) Ci/L	Ci/day	Lb/day	Total Rad. Components (1) Ci/L	Ci/day	Lb/day
Total	0.00E+00	0.00E+00	0.00E+00	2.35E-07	3.58E+01	8.92E-01	2.35E-07	3.58E+01	8.92E-01
^{241}Am	0	0.00E+00	0.00E+00	4.28E-11	6.53E-03	4.20E-06	4.28E-11	6.53E-03	4.20E-06
^{14}C	0.00E+00	0.00E+00	0.00E+00	6.01E-09	9.17E-01	4.53E-04	6.01E-09	9.17E-01	4.53E-04
^{60}Co	0.00E+00	0.00E+00	0.00E+00	4.26E-11	6.51E-03	1.27E-08	4.26E-11	6.51E-03	1.27E-08
^{243}Cm	0.00E+00	0.00E+00	0.00E+00	1.14E-13	1.74E-05	7.57E-10	1.14E-13	1.74E-05	7.57E-10
^{244}Cm	0.00E+00	0.00E+00	0.00E+00	1.22E-13	1.87E-05	5.08E-10	1.22E-13	1.87E-05	5.08E-10
^{137}Cs	0.00E+00	0.00E+00	0.00E+00	3.04E-09	4.64E-01	1.18E-05	3.04E-09	4.64E-01	1.18E-05
^{152}Eu	0.00E+00	0.00E+00	0.00E+00	1.49E-10	2.28E-02	2.89E-07	1.49E-10	2.28E-02	2.89E-07
^{154}Eu	0.00E+00	0.00E+00	0.00E+00	4.95E-10	7.55E-02	6.16E-07	4.95E-10	7.55E-02	6.16E-07
^{155}Eu	0.00E+00	0.00E+00	0.00E+00	8.51E-10	1.30E-01	5.90E-07	8.51E-10	1.30E-01	5.90E-07
^{3}H	0.00E+00	0.00E+00	0.00E+00	2.94E-09	4.49E-01	1.03E-07	2.94E-09	4.49E-01	1.03E-07
^{129}I	0.00E+00	0.00E+00	0.00E+00	7.00E-11	1.07E-02	1.33E-01	7.00E-11	1.07E-02	1.33E-01
^{63}Ni	0.00E+00	0.00E+00	0.00E+00	6.14E-10	9.37E-02	3.64E-06	6.14E-10	9.37E-02	3.64E-06
^{237}Np	0.00E+00	0.00E+00	0.00E+00	1.84E-13	2.81E-05	8.79E-05	1.84E-13	2.81E-05	8.79E-05
^{238}Pu	0.00E+00	0.00E+00	0.00E+00	2.48E-13	3.79E-05	4.87E-09	2.48E-13	3.79E-05	4.87E-09

^{239}Pu	0.00E+00	0.00E+00	0.00E+00	2.90E-12	4.43E-04	1.57E-05	2.90E-12	4.43E-04	1.57E-05
^{240}Pu	0.00E+00	0.00E+00	0.00E+00	5.00E-13	7.63E-05	7.41E-07	5.00E-13	7.63E-05	7.41E-07
^{241}Pu	0.00E+00	0.00E+00	0.00E+00	1.24E-11	1.89E-03	4.04E-08	1.24E-11	1.89E-03	4.04E-08
^{125}Sb	0.00E+00	0.00E+00	0.00E+00	4.58E-09	6.99E-01	1.48E-06	4.58E-09	6.99E-01	1.48E-06
^{151}Sm	0.00E+00	0.00E+00	0.00E+00	2.83E-08	4.32E+00	3.62E-04	2.83E-08	4.32E+00	3.62E-04
^{126}Sn	0.00E+00	0.00E+00	0.00E+00	1.71E-11	2.61E-03	5.07E-04	1.71E-11	2.61E-03	5.07E-04
^{90}Sr	0.00E+00	0.00E+00	0.00E+00	1.85E-07	2.82E+01	4.50E-04	1.85E-07	2.82E+01	4.50E-04
^{99}Tc	0.00E+00	0.00E+00	0.00E+00	2.46E-09	3.75E-01	4.88E-02	2.46E-09	3.75E-01	4.88E-02
^{232}Th	0.00E+00	0.00E+00	0.00E+00	6.34E-14	9.67E-06	1.94E-01	6.34E-14	9.67E-06	1.94E-01
^{233}U	0.00E+00	0.00E+00	0.00E+00	1.18E-12	1.79E-04	4.11E-05	1.18E-12	1.79E-04	4.11E-05
^{234}U	0.00E+00	0.00E+00	0.00E+00	6.84E-13	1.04E-04	3.71E-05	6.84E-13	1.04E-04	3.71E-05
^{235}U	0.00E+00	0.00E+00	0.00E+00	2.64E-14	4.03E-06	4.11E-03	2.64E-14	4.03E-06	4.11E-03
^{236}U	0.00E+00	0.00E+00	0.00E+00	7.92E-14	1.21E-05	4.12E-04	7.92E-14	1.21E-05	4.12E-04
^{238}U	0.00E+00	0.00E+00	0.00E+00	5.09E-13	7.77E-05	5.10E-01	5.09E-13	7.77E-05	5.10E-01

Component (CAS)	Organic Components mol/L	Lb/gal	Lb/day	Mt/day	g/sec
Total	1.68E-07	2.77E-07	8.54E+01	0.038821907	0.449327624
57-14-7	2.95E-10	1.47957E-10	5.96E-03	2.71104E-06	3.13778E-05
58-90-2	1.52E-10	2.94053E-10	1.19E-02	5.38798E-06	6.23608E-05
58-89-9	9.55E-13	2.31886E-12	9.35E-05	4.24888E-08	4.91769E-07
71-43-2	0.00E+00	0	0.00E+00	0	0
75-69-4	0.00E+00	0	0.00E+00	0	0
75-05-8	1.22E-11	4.17293E-12	1.68E-04	7.64612E-08	8.84968E-07
76-44-8	0.00E+00	0	0.00E+00	0	0
79-01-6	0.00E+00	0	0.00E+00	0	0
80-62-6	0.00E+00	0	0.00E+00	0	0
84-74-2	3.73E-09	8.65613E-09	3.49E-01	0.000158607	0.001835733
84-66-2	1.35E-08	2.50083E-08	1.01E+00	0.00045823	0.005303585
87-86-5	4.83E-08	1.07313E-07	4.33E+00	0.001966309	0.022758203
87-68-3	0.00E+00	0	0.00E+00	0	0
87-61-6	0.00E+00	0	0.00E+00	0	0
88-85-7	4.41E-08	8.84721E-08	3.57E+00	0.001621086	0.018762571
91-57-6	0.00E+00	0	0.00E+00	0	0
91-20-3	0.00E+00	0	0.00E+00	0	0
95-94-3	0.00E+00	0	0.00E+00	0	0
98-86-2	2.11E-10	2.11877E-10	8.54E-03	3.88224E-06	4.49334E-05
99-87-6	0.00E+00	0	0.00E+00	0	0
100-51-6	0.00E+00	0	0.00E+00	0	0
107-21-1	0.00E+00	0	0.00E+00	0	0
108-95-2	5.65E-08	4.44025E-08	1.79E+00	0.000813593	0.00941658
108-88-3	0.00E+00	0	0.00E+00	0	0
120-82-1	0.00E+00	0	0.00E+00	0	0
122-66-7	0.00E+00	0	0.00E+00	0	0
122-39-4	2.93E-10	4.13642E-10	1.67E-02	7.57922E-06	8.77224E-05
129-00-0	1.27E-10	2.13706E-10	8.61E-03	3.91577E-06	4.53214E-05
131-11-3	0.00E+00	0	0.00E+00	0	0
132-64-9	1.73E-14	2.43288E-14	9.81E-07	4.4578E-10	5.15949E-09
156-59-2	0.00E+00	0	0.00E+00	0	0
218-01-9	5.94E-10	1.13199E-09	4.56E-02	2.07415E-05	0.000240064
309-00-2	1.82E-14	5.55198E-14	2.24E-06	1.0173E-09	1.17743E-08
319-85-7	6.04E-11	1.46559E-10	5.91E-03	2.68542E-06	3.10812E-05
534-52-1	0.00E+00	0	0.00E+00	0	0
603-34-9	3.79E-10	7.75727E-10	3.13E-02	1.42137E-05	0.000164511
4170-30-3	9.35E-11	5.46992E-11	2.20E-03	1.00226E-06	1.16002E-05
10061-01-5	0.00E+00	0	0.00E+00	0	0
23950-58-5	0.00E+00	0	0.00E+00	0	0
38380-08-4	7.34E-13	2.21146E-12	8.91E-05	4.05208E-08	4.68991E-07
100-21-0	8.45E-08	1.17118E-07	4.72E+00	0.002145978	0.024837705
106-93-4	3.06E-17	4.79137E-17	1.93E-09	8.7793E-13	1.01612E-11
106-97-8	0.00E+00	0	0.00E+00	0	0
106-99-0	0.00E+00	0	0.00E+00	0	0
108-87-2	0.00E+00	0	0.00E+00	0	0
110-54-3	0.00E+00	0	0.00E+00	0	0
110-82-7	0.00E+00	0	0.00E+00	0	0
111-84-2	0.00E+00	0	0.00E+00	0	0
118-74-1	0.00E+00	0	0.00E+00	0	0
120-12-7	2.71E-12	4.02945E-12	1.62E-04	7.38321E-08	8.54538E-07
127-18-4	0.00E+00	0	0.00E+00	0	0
1336-36-3	9.60E-17	2.58012E-16	1.04E-08	4.72759E-12	5.47175E-11
144-62-7	1.55E-08	1.16812E-08	4.71E-01	0.000214037	0.002477281
208-96-8	3.81E-13	4.83396E-13	1.95E-05	8.85732E-09	1.02515E-07
50-32-8	2.74E-10	5.76523E-10	2.32E-02	1.05637E-05	0.000122265
56-23-5	0.00E+00	0	0.00E+00	0	0
60-35-5	5.05E-08	2.48912E-08	1.00E+00	0.000456084	0.005278749
60-57-1	3.57E-13	1.13585E-12	4.58E-05	2.08124E-08	2.40884E-07
62-75-9	1.68E-08	1.03638E-08	4.18E-01	0.000189898	0.002197891
75-12-7	3.10E-07	1.16475E-07	4.70E+00	0.002134189	0.024701263
76-15-3	0.00E+00	0	0.00E+00	0	0
8001-35-2	1.15E-12	3.98938E-12	1.61E-04	7.3098E-08	8.46042E-07
88-89-1	8.16E-07	1.56037E-06	6.29E+01	0.028590876	0.330912918
126-73-8	3.23E-08	7.17133E-08	2.89E+00	0.001314012	0.015208472

Component	Aqueous Components mol/L	Lb/gal	Lb/day	Solid Components Lb/day	Total Component Lb/day	Mt/day	g/sec
$C_2O_4^{-2}$	0.00E+00	0.00E+00	0.00E+00	5.45E+02	5.45E+02	0.247670974	2.866562202
Formate	0.00E+00	0.00E+00	0.00E+00	1.04E+01	1.04E+01	0.004736494	0.054820534
Acetate	0.00E+00	0.00E+00	0.00E+00	1.92E-04	1.92E-04	8.74756E-08	1.01245E-06
Glycolate	0.00E+00	0.00E+00	0.00E+00	5.64E+00	5.64E+00	0.002562105	0.029653995
IDA	0.00E+00	0.00E+00	0.00E+00	3.08E-01	3.08E-01	0.000140105	0.00162159
Citrate	0.00E+00	0.00E+00	0.00E+00	1.23E+01	1.23E+01	0.005574523	0.064519947
HEDTA	0.00E+00	0.00E+00	0.00E+00	8.65E+00	8.65E+00	0.003932772	0.045518197
EDTA	0.00E+00	0.00E+00	0.00E+00	1.55E-01	1.55E-01	7.06076E-05	0.000817217

Table A-6 LFP06 Stream Report

River Protection Project - Waste Treatment Plant

Stream Number:	LFP06
Stream Name:	LAW LFP Vents
Configuration:	0
	0
Run Data File:	H:\Working Folder 11 (Vishal)\Emissions_Case2_Run4_SubEm\MRQ_03_054_run1_Streams.csv
Run Date / Time:	4/15/2003 - 6:40:10 AM

Stream Properties Variable	Value	Units
Density	1.13E-03	g/cm^3
Enthalpy	-9.49E+04	BTU/hr
Mass Flow	6.15E+02	Lb/hr
	1.48E+04	Lb/day
Volumetric Flow	1.09E+03	GPM
Molar Flow	2.17E+01	Lbmol/hr
Volumetric Flow	1.46E+02	ft^3/min
Molecular Weight	2.84E+01	Lb/Lbmol
Pressure	1.00E+03	mbar
Temperature	3.00E+01	C
Viscosity	1.84E-02	cP
Na Molarity	0.00E+00	mol/L
pH	#NUM!	pH
Total TRU	6.07E-15	Ci/L
Total Activity	1.29E-11	Ci/L

Gaseous Components (1) Component	mol/L	Lb/day	Mt/day
CO	2.55E-46	9.37E-41	4.26125E-44
CO_2	1.11E-35	6.38E-30	2.89892E-33
H_2O	1.69E-03	4.00E+02	0.181634522
NO	1.88E-54	7.39E-49	3.36058E-52
NO_2	2.19E-54	1.32E-48	5.99681E-52
N_2	3.00E-02	1.10E+04	5.008999025
O_2	7.98E-03	3.35E+03	1.520931938
SO_2	2.32E-52	1.95E-46	8.84358E-50
NH_3	6.11E-14	1.36E-08	6.1936E-12
HNO_3	9.26E-26	7.64E-20	3.47379E-23
HCl	4.01E-70	1.92E-64	8.70664E-68
HF	3.96E-75	1.04E-69	4.71821E-73

(1) All radionuclides in gaseous streams are assumed to exist as solid particulate.

Component	Aqueous Components mol/L	Lb/gal	Lb/day	Solid Components Lb/day	Total Component Lb/day	mt/day	g/sec
Total	0.00E+00	0.00E+00	0.00E+00	1.96E-03	1.96E-03	8.89907E-07	1.02998E-05
Ag^+	0.00E+00	0.00E+00	0.00E+00	7.64E-08	7.64E-08	3.47126E-11	4.01766E-10
Al^{+3}	0.00E+00	0.00E+00	0.00E+00	5.42E-05	5.42E-05	2.46361E-08	2.8514E-07
As^{+3}	0.00E+00	0.00E+00	0.00E+00	2.41E-05	2.41E-05	1.09582E-08	1.26831E-07
B^{+3}	0.00E+00	0.00E+00	0.00E+00	3.73E-05	3.73E-05	1.69745E-08	1.96464E-07
Ba^{+2}	0.00E+00	0.00E+00	0.00E+00	7.88E-08	7.88E-08	3.58005E-11	4.14358E-10
Bi^{+3}	0.00E+00	0.00E+00	0.00E+00	2.42E-07	2.42E-07	1.10095E-10	1.27425E-09
$C_2O_4^{-2}$	0.00E+00	0.00E+00	0.00E+00	1.09E-04	1.09E-04	4.95342E-08	5.73312E-07
Ca^{+2}	0.00E+00	0.00E+00	0.00E+00	5.29E-05	5.29E-05	2.40251E-08	2.78068E-07
Cd^{+2}	0.00E+00	0.00E+00	0.00E+00	2.83E-06	2.83E-06	1.28789E-09	1.49061E-08
Ce^{+3}	0.00E+00	0.00E+00	0.00E+00	6.66E-07	6.66E-07	3.0254E-10	3.50162E-09
Cl^-	0.00E+00	0.00E+00	0.00E+00	1.20E-05	1.20E-05	5.46049E-09	6.32001E-08
CO_3^{-2}	0.00E+00	0.00E+00	0.00E+00	1.41E-04	1.41E-04	6.42793E-08	7.43973E-07
Cr^{+3}	0.00E+00	0.00E+00	0.00E+00	5.97E-06	5.97E-06	2.71448E-09	3.14175E-08
Cu^{+2}	0.00E+00	0.00E+00	0.00E+00	8.00E-08	8.00E-08	3.63552E-11	4.20777E-10
F^-	0.00E+00	0.00E+00	0.00E+00	1.48E-05	1.48E-05	6.74376E-09	7.80528E-08
Fe^{+3}	0.00E+00	0.00E+00	0.00E+00	4.29E-05	4.29E-05	1.95029E-08	2.25728E-07
H^+	0.00E+00	0.00E+00	0.00E+00		0.00E+00	0	0
H_2O	0.00E+00	0.00E+00	0.00E+00		0.00E+00	0	0
Hg^{+2}	0.00E+00	0.00E+00	0.00E+00	9.56E-08	9.56E-08	4.34559E-11	5.02961E-10
K^+	0.00E+00	0.00E+00	0.00E+00	4.21E-05	4.21E-05	1.91574E-08	2.21729E-07
La^{+3}	0.00E+00	0.00E+00	0.00E+00	6.67E-08	6.67E-08	3.03367E-11	3.51119E-10
Li^+	0.00E+00	0.00E+00	0.00E+00	2.11E-05	2.11E-05	9.60011E-09	1.11112E-07
Mg^{+2}	0.00E+00	0.00E+00	0.00E+00	1.57E-05	1.57E-05	7.15404E-09	8.28014E-08
Mn^{+3}	0.00E+00	0.00E+00	0.00E+00	1.54E-06	1.54E-06	6.98254E-10	8.08164E-09
MnO_4^-	0.00E+00	0.00E+00	0.00E+00		0.00E+00	0	0
Na^+	0.00E+00	0.00E+00	0.00E+00	1.40E-04	1.40E-04	6.38463E-08	7.38962E-07
NH_4^+	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0	0
Ni^{+2}	0.00E+00	0.00E+00	0.00E+00	1.02E-06	1.02E-06	4.62156E-10	5.34902E-09
NO_2^-	0.00E+00	0.00E+00	0.00E+00	5.11E-05	5.11E-05	2.32177E-08	2.68724E-07
NO_3^-	0.00E+00	0.00E+00	0.00E+00	2.65E-04	2.65E-04	1.20593E-07	1.39576E-06
O^{-2}				4.43E-04	4.43E-04	2.01164E-07	2.32828E-06
OH^-	0.00E+00	0.00E+00	0.00E+00	1.22E-04	1.22E-04	5.54647E-08	6.41953E-07
$OH(b)^-$	0.00E+00	0.00E+00	0.00E+00		0.00E+00	0	0
P^{+5}				1.64E-14	1.64E-14	7.45198E-18	8.62498E-17
Pb^{+2}	0.00E+00	0.00E+00	0.00E+00	8.03E-07	8.03E-07	3.65111E-10	4.22582E-09
Pd^{+2}	0.00E+00	0.00E+00	0.00E+00	4.84E-09	4.84E-09	2.20139E-12	2.5479E-11
PO_4^{-3}	0.00E+00	0.00E+00	0.00E+00	3.60E-05	3.60E-05	1.63741E-08	1.89515E-07
S^{+6}				5.43E-17	5.43E-17	2.46602E-20	2.85419E-19
Si^{+4}				2.40E-04	2.40E-04	1.09306E-07	1.26511E-06
SiO_4^{-4}	0.00E+00	0.00E+00	0.00E+00		0.00E+00	0	0
SO_4^{-2}	0.00E+00	0.00E+00	0.00E+00	1.96E-05	1.96E-05	8.92436E-09	1.03291E-07
Sr^{+2}	0.00E+00	0.00E+00	0.00E+00	2.43E-08	2.43E-08	1.1026E-11	1.27616E-10
Ti^{+4}	0.00E+00	0.00E+00	0.00E+00	6.92E-06	6.92E-06	3.14762E-09	3.64308E-08
Zn^{+2}	0.00E+00	0.00E+00	0.00E+00	2.74E-05	2.74E-05	1.24349E-08	1.43922E-07
Zr^{+4}	0.00E+00	0.00E+00	0.00E+00	2.48E-05	2.48E-05	1.12737E-08	1.30482E-07

Rad. Component	Aqueous Rad. Components Ci/L	Ci/day	Lb/day	Solids Rad. Components (1) Ci/L	Ci/day	Lb/day	Total Rad. Components (1) Ci/L	Ci/day	Lb/day
Total	0.00E+00	0.00E+00	0.00E+00	1.29E-11	7.66E-05	2.84E-06	1.29E-11	7.66E-05	2.84E-06
^{241}Am	0	0.00E+00	0.00E+00	4.39E-15	2.61E-08	1.68E-11	4.39E-15	2.61E-08	1.68E-11
^{14}C	0.00E+00	0.00E+00	0.00E+00	3.09E-15	1.83E-08	9.05E-12	3.09E-15	1.83E-08	9.05E-12
^{60}Co	0.00E+00	0.00E+00	0.00E+00	4.38E-15	2.60E-08	5.07E-14	4.38E-15	2.60E-08	5.07E-14
^{243}Cm	0.00E+00	0.00E+00	0.00E+00	1.17E-17	6.94E-11	3.03E-15	1.17E-17	6.94E-11	3.03E-15
^{244}Cm	0.00E+00	0.00E+00	0.00E+00	1.26E-17	7.46E-11	2.03E-15	1.26E-17	7.46E-11	2.03E-15
^{137}Cs	0.00E+00	0.00E+00	0.00E+00	4.69E-14	2.79E-07	7.07E-12	4.69E-14	2.79E-07	7.07E-12
^{152}Eu	0.00E+00	0.00E+00	0.00E+00	1.53E-14	9.10E-08	1.15E-12	1.53E-14	9.10E-08	1.15E-12
^{154}Eu	0.00E+00	0.00E+00	0.00E+00	5.08E-14	3.02E-07	2.46E-12	5.08E-14	3.02E-07	2.46E-12
^{155}Eu	0.00E+00	0.00E+00	0.00E+00	8.74E-14	5.20E-07	2.36E-12	8.74E-14	5.20E-07	2.36E-12
^{3}H	0.00E+00	0.00E+00	0.00E+00	1.51E-15	8.99E-09	2.06E-15	1.51E-15	8.99E-09	2.06E-15
^{129}I	0.00E+00	0.00E+00	0.00E+00	3.95E-17	2.35E-10	2.93E-09	3.95E-17	2.35E-10	2.93E-09
^{63}Ni	0.00E+00	0.00E+00	0.00E+00	2.81E-14	1.67E-07	6.48E-12	2.81E-14	1.67E-07	6.48E-12
^{237}Np	0.00E+00	0.00E+00	0.00E+00	9.45E-18	5.62E-11	1.76E-10	9.45E-18	5.62E-11	1.76E-10
^{238}Pu	0.00E+00	0.00E+00	0.00E+00	2.55E-17	1.51E-10	1.95E-14	2.55E-17	1.51E-10	1.95E-14

^{239}Pu	0.00E+00	0.00E+00	0.00E+00	2.98E-16	1.77E-09	6.29E-11	2.98E-16	1.77E-09	6.29E-11
^{240}Pu	0.00E+00	0.00E+00	0.00E+00	5.14E-17	3.05E-10	2.96E-12	5.14E-17	3.05E-10	2.96E-12
^{241}Pu	0.00E+00	0.00E+00	0.00E+00	1.27E-15	7.55E-09	1.62E-13	1.27E-15	7.55E-09	1.62E-13
^{125}Sb	0.00E+00	0.00E+00	0.00E+00	2.35E-13	1.40E-06	2.97E-12	2.35E-13	1.40E-06	2.97E-12
^{151}Sm	0.00E+00	0.00E+00	0.00E+00	2.91E-12	1.73E-05	1.45E-09	2.91E-12	1.73E-05	1.45E-09
^{126}Sn	0.00E+00	0.00E+00	0.00E+00	1.76E-15	1.04E-08	2.03E-09	1.76E-15	1.04E-08	2.03E-09
^{90}Sr	0.00E+00	0.00E+00	0.00E+00	9.50E-12	5.64E-05	9.01E-10	9.50E-12	5.64E-05	9.01E-10
^{99}Tc	0.00E+00	0.00E+00	0.00E+00	3.79E-15	2.25E-08	2.93E-09	3.79E-15	2.25E-08	2.93E-09
^{232}Th	0.00E+00	0.00E+00	0.00E+00	6.51E-18	3.87E-11	7.75E-07	6.51E-18	3.87E-11	7.75E-07
^{233}U	0.00E+00	0.00E+00	0.00E+00	1.21E-16	7.18E-10	1.64E-10	1.21E-16	7.18E-10	1.64E-10
^{234}U	0.00E+00	0.00E+00	0.00E+00	7.03E-17	4.18E-10	1.48E-10	7.03E-17	4.18E-10	1.48E-10
^{235}U	0.00E+00	0.00E+00	0.00E+00	2.71E-18	1.61E-11	1.65E-08	2.71E-18	1.61E-11	1.65E-08
^{236}U	0.00E+00	0.00E+00	0.00E+00	8.13E-18	4.83E-11	1.65E-09	8.13E-18	4.83E-11	1.65E-09
^{238}U	0.00E+00	0.00E+00	0.00E+00	5.23E-17	3.11E-10	2.04E-06	5.23E-17	3.11E-10	2.04E-06

Component (CAS)	Organic Components mol/L	Lb/gal	Lb/day	Mt/day	g/sec
Total	9.51E-14	1.57E-13	1.88E-06	8.54082E-10	9.88521E-09
57-14-7	1.67E-16	8.35856E-17	1.31E-10	5.96428E-14	6.90311E-13
58-90-2	8.58E-17	1.6612E-16	2.61E-10	1.18535E-13	1.37194E-12
58-89-9	5.40E-19	1.31E-18	2.06E-12	9.34754E-16	1.08189E-14
71-43-2	0.00E+00	0	0.00E+00	0	0
75-69-4	0.00E+00	0	0.00E+00	0	0
75-05-8	6.88E-18	2.35742E-18	3.70E-12	1.68215E-15	1.94693E-14
76-44-8	0.00E+00	0	0.00E+00	0	0
79-01-6	0.00E+00	0	0.00E+00	0	0
80-62-6	0.00E+00	0	0.00E+00	0	0
84-74-2	2.11E-15	4.89011E-15	7.68E-09	3.48936E-12	4.03861E-11
84-66-2	7.62E-15	1.41279E-14	2.22E-08	1.00811E-11	1.16679E-10
87-86-5	2.73E-14	6.06244E-14	9.52E-08	4.32588E-11	5.0068E-10
87-68-3	0.00E+00	0	0.00E+00	0	0
87-61-6	0.00E+00	0	0.00E+00	0	0
88-85-7	2.49E-14	4.99806E-14	7.85E-08	3.56639E-11	4.12777E-10
91-57-6	0.00E+00	0	0.00E+00	0	0
91-20-3	0.00E+00	0	0.00E+00	0	0
95-94-3	0.00E+00	0	0.00E+00	0	0
98-86-2	1.19E-16	1.19696E-16	1.88E-10	8.54093E-14	9.88534E-13
99-87-6	0.00E+00	0	0.00E+00	0	0
100-51-6	0.00E+00	0	0.00E+00	0	0
107-21-1	0.00E+00	0	0.00E+00	0	0
108-95-2	3.19E-14	2.50843E-14	3.94E-08	1.7899E-11	2.07165E-10
108-88-3	0.00E+00	0	0.00E+00	0	0
120-82-1	0.00E+00	0	0.00E+00	0	0
122-66-7	0.00E+00	0	0.00E+00	0	0
122-39-4	1.65E-16	2.33679E-16	3.67E-10	1.66743E-13	1.92989E-12
129-00-0	7.15E-17	1.20729E-16	1.90E-10	8.61469E-14	9.97071E-13
131-11-3	0.00E+00	0	0.00E+00	0	0
132-64-9	9.79E-21	1.37441E-20	2.16E-14	9.80716E-18	1.13509E-16
156-59-2	0.00E+00	0	0.00E+00	0	0
218-01-9	3.36E-16	6.39493E-16	1.00E-09	4.56313E-13	5.2814E-12
309-00-2	1.03E-20	3.13649E-20	4.92E-14	2.23805E-17	2.59034E-16
319-85-7	3.41E-17	8.27956E-17	1.30E-10	5.90791E-14	6.83786E-13
534-52-1	0.00E+00	0	0.00E+00	0	0
603-34-9	2.14E-16	4.38232E-16	6.88E-10	3.12702E-13	3.61924E-12
4170-30-3	5.28E-17	3.09012E-17	4.85E-11	2.20497E-14	2.55205E-13
10061-01-5	0.00E+00	0	0.00E+00	0	0
23950-58-5	0.00E+00	0	0.00E+00	0	0
38380-08-4	4.15E-19	1.24932E-18	1.96E-12	8.91458E-16	1.03178E-14
100-21-0	4.77E-14	6.61638E-14	1.04E-07	4.72115E-11	5.4643E-10
106-93-4	1.73E-23	2.7068E-23	4.25E-17	1.93145E-20	2.23547E-19
106-97-8	0.00E+00	0	0.00E+00	0	0
106-99-0	0.00E+00	0	0.00E+00	0	0
108-87-2	0.00E+00	0	0.00E+00	0	0
110-54-3	0.00E+00	0	0.00E+00	0	0
110-82-7	0.00E+00	0	0.00E+00	0	0
111-84-2	0.00E+00	0	0.00E+00	0	0
118-74-1	0.00E+00	0	0.00E+00	0	0
120-12-7	1.53E-18	2.27636E-18	3.57E-12	1.62431E-15	1.87998E-14
127-18-4	0.00E+00	0	0.00E+00	0	0
1336-36-3	5.42E-23	1.45759E-22	2.29E-16	1.04007E-19	1.20379E-18
144-62-7	8.78E-15	6.5991E-15	1.04E-08	4.70882E-12	5.45002E-11
208-96-8	2.15E-19	2.73085E-19	4.29E-13	1.94861E-16	2.25534E-15
50-32-8	1.55E-16	3.25695E-16	5.11E-10	2.32401E-13	2.68983E-12
56-23-5	0.00E+00	0	0.00E+00	0	0
60-35-5	2.85E-14	1.40618E-14	2.21E-08	1.00338E-11	1.16132E-10
60-57-1	2.02E-19	6.41679E-19	1.01E-12	4.57873E-16	5.29946E-15
62-75-9	9.47E-15	5.85484E-15	9.19E-09	4.17775E-12	4.83536E-11
75-12-7	1.75E-13	6.58004E-14	1.03E-07	4.69522E-11	5.43428E-10
76-15-3	0.00E+00	0	0.00E+00	0	0
8001-35-2	6.52E-19	2.25373E-18	3.54E-12	1.60816E-15	1.86129E-14
88-89-1	4.61E-13	8.81501E-13	1.38E-06	6.28999E-10	7.28008E-09
126-73-8	1.82E-14	4.0513E-14	6.36E-08	2.89083E-11	3.34586E-10

Component	Aqueous Components mol/L	Lb/gal	Lb/day	Solid Components Lb/day	Total Component Lb/day	Mt/day	g/sec
$C_2O_4^{-2}$	0.00E+00	0.00E+00	0.00E+00	1.09E-04	1.09E-04	4.95342E-08	5.73312E-07
Formate	0.00E+00	0.00E+00	0.00E+00	2.08E-06	2.08E-06	9.47299E-10	1.09641E-08
Acetate	0.00E+00	0.00E+00	0.00E+00	3.85E-11	3.85E-11	1.74951E-14	2.0249E-13
Glycolate	0.00E+00	0.00E+00	0.00E+00	1.13E-06	1.13E-06	5.12421E-10	5.9308E-09
IDA	0.00E+00	0.00E+00	0.00E+00	6.16E-08	6.16E-08	2.80211E-11	3.24318E-10
Citrate	0.00E+00	0.00E+00	0.00E+00	2.45E-06	2.45E-06	1.1149E-09	1.2904E-08
HEDTA	0.00E+00	0.00E+00	0.00E+00	1.73E-06	1.73E-06	7.86554E-10	9.10364E-09
EDTA	0.00E+00	0.00E+00	0.00E+00	3.11E-08	3.11E-08	1.41215E-11	1.63443E-10

Table A-7 RLD32 Stream Report

River Protection Project - Waste Treatment Plant

Stream Number:	RLD32
Stream Name:	LAW SBS condensate vessel vent
Configuration:	0
	0
Run Data File:	H:\Working Folder 11 (Vishal)\Emissions_Case2_Run4_SubEm\MRQ_03_054_run1_Streams.csv
Run Date / Time:	4/15/2003 - 6:40:10 AM

Stream Properties Variable	Value	Units
Density	1.13E-03	g/cm^3
Enthalpy	-1.44E+04	BTU/hr
Mass Flow	9.34E+01	Lb/hr
	2.24E+03	Lb/day
Volumetric Flow	1.66E+02	GPM
Molar Flow	3.29E+00	Lbmol/hr
Volumetric Flow	2.21E+01	ft^3/min
Molecular Weight	2.84E+01	Lb/Lbmol
Pressure	1.00E+03	mbar
Temperature	3.00E+01	C
Viscosity	1.84E-02	cP
Na Molarity	0.00E+00	mol/L
pH	#NUM!	pH
Total TRU	9.99E-17	Ci/L
Total Activity	3.84E-13	Ci/L

Gaseous Components (1) Component	mol/L	Lb/day	Mt/day
CO	1.24E-28	6.90E-24	3.13659E-27
CO_2	2.69E-13	2.36E-08	1.07112E-11
H_2O	1.69E-03	6.07E+01	0.027582625
NO	0.00E+00	0.00E+00	0
NO_2	0.00E+00	0.00E+00	0
N_2	3.00E-02	1.67E+03	0.760655748
O_2	7.98E-03	5.08E+02	0.230965432
SO_2	0.00E+00	0.00E+00	0
NH_3	1.55E-13	5.26E-09	2.39298E-12
HNO_3	6.52E-26	8.18E-21	3.71733E-24
HCl	0.00E+00	0.00E+00	0
HF	0.00E+00	0.00E+00	0

(1) All radionuclides in gaseous streams are assumed to exist as solid particulate.

Component	Aqueous Components mol/L	Lb/gal	Lb/day	Solid Components Lb/day	Total Component Lb/day	mt/day	g/sec
Total	0.00E+00	0.00E+00	0.00E+00	3.16E-05	3.16E-05	1.43704E-08	1.66324E-07
Ag^{+}	0.00E+00	0.00E+00	0.00E+00	1.26E-09	1.26E-09	5.72115E-13	6.62171E-12
Al^{+3}	0.00E+00	0.00E+00	0.00E+00	3.47E-07	3.47E-07	1.5751E-10	1.82304E-09
As^{+3}	0.00E+00	0.00E+00	0.00E+00	1.19E-05	1.19E-05	5.42203E-09	6.27549E-08
B^{+3}	0.00E+00	0.00E+00	0.00E+00	1.19E-06	1.19E-06	5.42922E-10	6.28382E-09
Ba^{+2}	0.00E+00	0.00E+00	0.00E+00	3.93E-10	3.93E-10	1.78822E-13	2.0697E-12
Bi^{+3}	0.00E+00	0.00E+00	0.00E+00	1.20E-09	1.20E-09	5.43417E-13	6.28955E-12
$C_2O_4^{-2}$	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0	0
Ca^{+2}	0.00E+00	0.00E+00	0.00E+00	6.33E-07	6.33E-07	2.8755E-10	3.32813E-09
Cd^{+2}	0.00E+00	0.00E+00	0.00E+00	1.41E-07	1.41E-07	6.38913E-11	7.39483E-10
Ce^{+3}	0.00E+00	0.00E+00	0.00E+00	1.66E-09	1.66E-09	7.54458E-13	8.73216E-12
Cl^{-}	0.00E+00	0.00E+00	0.00E+00	1.34E-06	1.34E-06	6.1005E-10	7.06077E-09
CO_3^{-2}	0.00E+00	0.00E+00	0.00E+00	1.28E-08	1.28E-08	5.79838E-12	6.71109E-11
Cr^{+3}	0.00E+00	0.00E+00	0.00E+00	2.91E-08	2.91E-08	1.32397E-11	1.53237E-10
Cu^{+2}	0.00E+00	0.00E+00	0.00E+00	1.98E-10	1.98E-10	8.98432E-14	1.03985E-12
F^{-}	0.00E+00	0.00E+00	0.00E+00	1.70E-06	1.70E-06	7.7107E-10	8.92442E-09
Fe^{+3}	0.00E+00	0.00E+00	0.00E+00	2.05E-07	2.05E-07	9.31733E-11	1.07839E-09
H^{+}	0.00E+00	0.00E+00	0.00E+00		0.00E+00	0	0
H_2O	0.00E+00	0.00E+00	0.00E+00		0.00E+00	0	0
Hg^{+2}	0.00E+00	0.00E+00	0.00E+00	3.98E-08	3.98E-08	1.81066E-11	2.09567E-10
K^{+}	0.00E+00	0.00E+00	0.00E+00	1.04E-06	1.04E-06	4.74239E-10	5.48887E-09
La^{+3}	0.00E+00	0.00E+00	0.00E+00	6.67E-10	6.67E-10	3.02973E-13	3.50663E-12
Li^{+}	0.00E+00	0.00E+00	0.00E+00	2.06E-07	2.06E-07	9.35838E-11	1.08315E-09
Mg^{+2}	0.00E+00	0.00E+00	0.00E+00	7.73E-08	7.73E-08	3.51391E-11	4.06703E-10
Mn^{+3}	0.00E+00	0.00E+00	0.00E+00	1.02E-08	1.02E-08	4.63951E-12	5.3698E-11
MnO_4^{-}	0.00E+00	0.00E+00	0.00E+00		0.00E+00	0	0
Na^{+}	0.00E+00	0.00E+00	0.00E+00	6.89E-07	6.89E-07	3.13092E-10	3.62375E-09
NH_4^{+}	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0	0
Ni^{+2}	0.00E+00	0.00E+00	0.00E+00	5.66E-09	5.66E-09	2.57438E-12	2.9796E-11
NO_2^{-}	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0	0
NO_3^{-}	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0	0
O^{-2}				9.55E-06	9.55E-06	4.34197E-09	5.02543E-08
OH^{-}	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0	0
$OH(b)^{-}$	0.00E+00	0.00E+00	0.00E+00		0.00E+00	0	0
P^{+5}				0.00E+00	0.00E+00	0	0
Pb^{+2}	0.00E+00	0.00E+00	0.00E+00	1.98E-09	1.98E-09	8.99549E-13	1.04114E-11
Pd^{+2}	0.00E+00	0.00E+00	0.00E+00	1.21E-11	1.21E-11	5.48971E-15	6.35383E-14
PO_4^{-3}	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0	0
S^{+6}				0.00E+00	0.00E+00	0	0
Si^{+4}				7.95E-07	7.95E-07	3.61321E-10	4.18196E-09
SiO_4^{-4}	0.00E+00	0.00E+00	0.00E+00		0.00E+00	0	0
SO_4^{-2}	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0	0
Sr^{+2}	0.00E+00	0.00E+00	0.00E+00	1.21E-10	1.21E-10	5.49923E-14	6.36485E-13
Ti^{+4}	0.00E+00	0.00E+00	0.00E+00	1.31E-06	1.31E-06	5.957E-10	6.89468E-09
Zn^{+2}	0.00E+00	0.00E+00	0.00E+00	2.69E-07	2.69E-07	1.22229E-10	1.41468E-09
Zr^{+4}	0.00E+00	0.00E+00	0.00E+00	8.18E-08	8.18E-08	3.71896E-11	4.30435E-10

Rad. Component	Aqueous Rad. Components Ci/L	Ci/day	Lb/day	Solids Rad. Components (1) Ci/L	Ci/day	Lb/day	Total Rad. Components (1) Ci/L	Ci/day	Lb/day
Total	0.00E+00	0.00E+00	0.00E+00	3.84E-13	3.46E-07	7.78E-09	3.84E-13	3.46E-07	7.78E-09
^{241}Am	0	0.00E+00	0.00E+00	7.22E-17	6.51E-11	4.19E-14	7.22E-17	6.51E-11	4.19E-14
^{14}C	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
^{60}Co	0.00E+00	0.00E+00	0.00E+00	7.10E-17	6.41E-11	1.25E-16	7.10E-17	6.41E-11	1.25E-16
^{243}Cm	0.00E+00	0.00E+00	0.00E+00	1.92E-19	1.73E-13	7.55E-18	1.92E-19	1.73E-13	7.55E-18
^{244}Cm	0.00E+00	0.00E+00	0.00E+00	2.06E-19	1.86E-13	5.07E-18	2.06E-19	1.86E-13	5.07E-18
^{137}Cs	0.00E+00	0.00E+00	0.00E+00	5.07E-15	4.58E-09	1.16E-13	5.07E-15	4.58E-09	1.16E-13
^{152}Eu	0.00E+00	0.00E+00	0.00E+00	2.52E-16	2.27E-10	2.88E-15	2.52E-16	2.27E-10	2.88E-15
^{154}Eu	0.00E+00	0.00E+00	0.00E+00	8.34E-16	7.53E-10	6.14E-15	8.34E-16	7.53E-10	6.14E-15
^{155}Eu	0.00E+00	0.00E+00	0.00E+00	1.44E-15	1.30E-09	5.88E-15	1.44E-15	1.30E-09	5.88E-15
^{3}H	0.00E+00	0.00E+00	0.00E+00	3.44E-15	3.10E-09	7.12E-16	3.44E-15	3.10E-09	7.12E-16
^{129}I	0.00E+00	0.00E+00	0.00E+00	1.97E-17	1.78E-11	2.22E-10	1.97E-17	1.78E-11	2.22E-10
^{63}Ni	0.00E+00	0.00E+00	0.00E+00	1.03E-15	9.30E-10	3.61E-14	1.03E-15	9.30E-10	3.61E-14
^{237}Np	0.00E+00	0.00E+00	0.00E+00	3.10E-19	2.80E-13	8.77E-13	3.10E-19	2.80E-13	8.77E-13
^{238}Pu	0.00E+00	0.00E+00	0.00E+00	4.18E-19	3.78E-13	4.86E-17	4.18E-19	3.78E-13	4.86E-17

^{239}Pu	0.00E+00	0.00E+00	0.00E+00	4.89E-18	4.41E-12	1.57E-13	4.89E-18	4.41E-12	1.57E-13
^{240}Pu	0.00E+00	0.00E+00	0.00E+00	8.43E-19	7.61E-13	7.39E-15	8.43E-19	7.61E-13	7.39E-15
^{241}Pu	0.00E+00	0.00E+00	0.00E+00	2.09E-17	1.88E-11	4.03E-16	2.09E-17	1.88E-11	4.03E-16
^{125}Sb	0.00E+00	0.00E+00	0.00E+00	7.55E-15	6.82E-09	1.45E-14	7.55E-15	6.82E-09	1.45E-14
^{151}Sm	0.00E+00	0.00E+00	0.00E+00	4.77E-14	4.31E-08	3.61E-12	4.77E-14	4.31E-08	3.61E-12
^{126}Sn	0.00E+00	0.00E+00	0.00E+00	2.89E-17	2.61E-11	5.06E-12	2.89E-17	2.61E-11	5.06E-12
^{90}Sr	0.00E+00	0.00E+00	0.00E+00	3.12E-13	2.82E-07	4.49E-12	3.12E-13	2.82E-07	4.49E-12
^{99}Tc	0.00E+00	0.00E+00	0.00E+00	4.11E-15	3.71E-09	4.82E-10	4.11E-15	3.71E-09	4.82E-10
^{232}Th	0.00E+00	0.00E+00	0.00E+00	1.07E-19	9.65E-14	1.93E-09	1.07E-19	9.65E-14	1.93E-09
^{233}U	0.00E+00	0.00E+00	0.00E+00	1.98E-18	1.79E-12	4.10E-13	1.98E-18	1.79E-12	4.10E-13
^{234}U	0.00E+00	0.00E+00	0.00E+00	1.15E-18	1.04E-12	3.70E-13	1.15E-18	1.04E-12	3.70E-13
^{235}U	0.00E+00	0.00E+00	0.00E+00	4.46E-20	4.02E-14	4.10E-11	4.46E-20	4.02E-14	4.10E-11
^{236}U	0.00E+00	0.00E+00	0.00E+00	1.34E-19	1.21E-13	4.11E-12	1.34E-19	1.21E-13	4.11E-12
^{238}U	0.00E+00	0.00E+00	0.00E+00	8.59E-19	7.75E-13	5.08E-09	8.59E-19	7.75E-13	5.08E-09

Component (CAS)	Organic Components mol/L	Lb/gal	Lb/day	Mt/day	g/sec
Total	8.21E-14	1.66E-13	6.67E-07	3.03395E-10	3.51152E-09
57-14-7	0.00E+00	0	0.00E+00	0	0
58-90-2	0.00E+00	0	0.00E+00	0	0
58-89-9	1.61E-18	3.91222E-18	9.33E-13	4.23923E-16	4.90651E-15
71-43-2	0.00E+00	0	0.00E+00	0	0
75-69-4	0.00E+00	0	0.00E+00	0	0
75-05-8	0.00E+00	0	0.00E+00	0	0
76-44-8	0.00E+00	0	0.00E+00	0	0
79-01-6	0.00E+00	0	0.00E+00	0	0
80-62-6	0.00E+00	0	0.00E+00	0	0
84-74-2	6.29E-15	1.4604E-14	3.48E-09	1.58247E-12	1.83156E-11
84-66-2	0.00E+00	0	0.00E+00	0	0
87-86-5	0.00E+00	0	0.00E+00	0	0
87-68-3	0.00E+00	0	0.00E+00	0	0
87-61-6	0.00E+00	0	0.00E+00	0	0
88-85-7	7.45E-14	1.49264E-13	3.56E-08	1.6174E-11	1.87199E-10
91-57-6	0.00E+00	0	0.00E+00	0	0
91-20-3	0.00E+00	0	0.00E+00	0	0
95-94-3	0.00E+00	0	0.00E+00	0	0
98-86-2	0.00E+00	0	0.00E+00	0	0
99-87-6	0.00E+00	0	0.00E+00	0	0
100-51-6	0.00E+00	0	0.00E+00	0	0
107-21-1	0.00E+00	0	0.00E+00	0	0
108-95-2	0.00E+00	0	0.00E+00	0	0
108-88-3	0.00E+00	0	0.00E+00	0	0
120-82-1	0.00E+00	0	0.00E+00	0	0
122-66-7	0.00E+00	0	0.00E+00	0	0
122-39-4	0.00E+00	0	0.00E+00	0	0
129-00-0	2.14E-16	3.6055E-16	8.60E-11	3.90687E-14	4.52184E-13
131-11-3	0.00E+00	0	0.00E+00	0	0
132-64-9	0.00E+00	0	0.00E+00	0	0
156-59-2	0.00E+00	0	0.00E+00	0	0
218-01-9	1.00E-15	1.90981E-15	4.55E-10	2.06944E-13	2.39518E-12
309-00-2	3.08E-20	9.36691E-20	2.23E-14	1.01499E-17	1.17475E-16
319-85-7	1.02E-16	2.47264E-16	5.89E-11	2.67931E-14	3.10106E-13
534-52-1	0.00E+00	0	0.00E+00	0	0
603-34-9	0.00E+00	0	0.00E+00	0	0
4170-30-3	0.00E+00	0	0.00E+00	0	0
10061-01-5	0.00E+00	0	0.00E+00	0	0
23950-58-5	0.00E+00	0	0.00E+00	0	0
38380-08-4	1.24E-18	3.73101E-18	8.89E-13	4.04287E-16	4.67925E-15
100-21-0	0.00E+00	0	0.00E+00	0	0
106-93-4	0.00E+00	0	0.00E+00	0	0
106-97-8	0.00E+00	0	0.00E+00	0	0
106-99-0	0.00E+00	0	0.00E+00	0	0
108-87-2	0.00E+00	0	0.00E+00	0	0
110-54-3	0.00E+00	0	0.00E+00	0	0
110-82-7	0.00E+00	0	0.00E+00	0	0
111-84-2	0.00E+00	0	0.00E+00	0	0
118-74-1	0.00E+00	0	0.00E+00	0	0
120-12-7	0.00E+00	0	0.00E+00	0	0
127-18-4	0.00E+00	0	0.00E+00	0	0
1336-36-3	1.62E-22	4.353E-22	1.04E-16	4.71685E-20	5.45932E-19
144-62-7	0.00E+00	0	0.00E+00	0	0
208-96-8	4.66E-56	5.91757E-56	1.41E-50	6.41219E-54	7.42152E-53
50-32-8	4.62E-16	9.72668E-16	2.32E-10	1.05397E-13	1.21987E-12
56-23-5	0.00E+00	0	0.00E+00	0	0
60-35-5	0.00E+00	0	0.00E+00	0	0
60-57-1	6.03E-19	1.91633E-18	4.57E-13	2.07651E-16	2.40337E-15
62-75-9	0.00E+00	0	0.00E+00	0	0
75-12-7	0.00E+00	0	0.00E+00	0	0
76-15-3	0.00E+00	0	0.00E+00	0	0
8001-35-2	1.95E-18	6.73061E-18	1.60E-12	7.29319E-16	8.44119E-15
88-89-1	1.38E-12	2.63255E-12	6.28E-07	2.85259E-10	3.30161E-09
126-73-8	0.00E+00	0	0.00E+00	0	0

Component	Aqueous Components mol/L	Lb/gal	Lb/day	Solid Components Lb/day	Total Component Lb/day	Mt/day	g/sec
$C_2O_4^{-2}$	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0	0
Formate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0	0
Acetate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0	0
Glycolate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0	0
IDA	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0	0
Citrate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0	0
HEDTA	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0	0
EDTA	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0	0

Table A-8 RLD33 Stream Report

River Protection Project - Waste Treatment Plant

Stream Number:	RLD33
Stream Name:	LAW Plant wash vessel vent
Configuration:	0
	0
Run Data File:	H:\Working Folder 11 (Vishal)\Emissions_Case2_Run4_SubEm\MRQ_03_054_run1_Streams.csv
Run Date / Time:	4/15/2003 - 6:40:10 AM

Stream Properties Variable	Value	Units
Density	1.13E-03	g/cm³
Enthalpy	-3.83E+02	BTU/hr
Mass Flow	2.48E+00	Lb/hr
	5.96E+01	Lb/day
Volumetric Flow	4.40E+00	GPM
Molar Flow	8.75E-02	Lbmol/hr
Volumetric Flow	5.89E-01	ft³/min
Molecular Weight	2.84E+01	Lb/Lbmol
Pressure	1.00E+03	mbar
Temperature	3.00E+01	C
Viscosity	1.84E-02	cP
Na Molarity	0.00E+00	mol/L
pH	#NUM!	pH
Total TRU	0.00E+00	Ci/L
Total Activity	0.00E+00	Ci/L

Gaseous Components (1) Component	mol/L	Lb/day	Mt/day
CO	0.00E+00	0.00E+00	0
CO_2	0.00E+00	0.00E+00	0
H_2O	1.69E-03	1.61E+00	0.00073358
NO	0.00E+00	0.00E+00	0
NO_2	0.00E+00	0.00E+00	0
N_2	3.00E-02	4.45E+01	0.020230206
O_2	7.98E-03	1.35E+01	0.006142698
SO_2	0.00E+00	0.00E+00	0
NH_3	0.00E+00	0.00E+00	0
HNO_3	0.00E+00	0.00E+00	0
HCl	0.00E+00	0.00E+00	0
HF	0.00E+00	0.00E+00	0

(1) All radionuclides in gaseous streams are assumed to exist as solid particulate.

Component	Aqueous Components mol/L	Lb/gal	Lb/day	Solid Components Lb/day	Total Component Lb/day	mt/day	g/sec
Total	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0	0
Ag^{+}	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0	0
Al^{+3}	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0	0
As^{+3}	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0	0
B^{+3}	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0	0
Ba^{+2}	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0	0
Bi^{+3}	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0	0
$C_2O_4^{-2}$	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0	0
Ca^{+2}	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0	0
Cd^{+2}	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0	0
Ce^{+3}	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0	0
Cl^{-}	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0	0
CO_3^{-2}	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0	0
Cr^{+3}	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0	0
Cu^{+2}	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0	0
F^{-}	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0	0
Fe^{+3}	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0	0
H^{+}	0.00E+00	0.00E+00	0.00E+00		0.00E+00	0	0
H_2O	0.00E+00	0.00E+00	0.00E+00		0.00E+00	0	0
Hg^{+2}	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0	0
K^{+}	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0	0
La^{+3}	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0	0
Li^{+}	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0	0
Mg^{+2}	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0	0
Mn^{+3}	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0	0
MnO_4^{-}	0.00E+00	0.00E+00	0.00E+00		0.00E+00	0	0
Na^{+}	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0	0
NH_4^{+}	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0	0
Ni^{+2}	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0	0
NO_2^{-}	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0	0
NO_3^{-}	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0	0
O^{-2}				0.00E+00	0.00E+00	0	0
OH^{-}	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0	0
$OH(b)^{-}$	0.00E+00	0.00E+00	0.00E+00		0.00E+00	0	0
P^{+5}				0.00E+00	0.00E+00	0	0
Pb^{+2}	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0	0
Pd^{+2}	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0	0
PO_4^{-3}	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0	0
S^{+6}				0.00E+00	0.00E+00	0	0
Si^{+4}				0.00E+00	0.00E+00	0	0
SiO_4^{-4}	0.00E+00	0.00E+00	0.00E+00		0.00E+00	0	0
SO_4^{-2}	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0	0
Sr^{+2}	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0	0
Ti^{+4}	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0	0
Zn^{+2}	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0	0
Zr^{+4}	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0	0

Rad. Component	Aqueous Rad. Components Ci/L	Ci/day	Lb/day	Solids Rad. Components (1) Ci/L	Ci/day	Lb/day	Total Rad. Components (1) Ci/L	Ci/day	Lb/day
Total	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
^{241}Am	0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
^{14}C	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
^{60}Co	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
^{243}Cm	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
^{244}Cm	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
^{137}Cs	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
^{152}Eu	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
^{154}Eu	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
^{155}Eu	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
^{3}H	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
^{129}I	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
^{63}Ni	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
^{237}Np	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
^{238}Pu	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

^{239}Pu	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
^{240}Pu	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
^{241}Pu	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
^{125}Sb	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
^{151}Sm	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
^{126}Sn	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
^{90}Sr	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
^{99}Tc	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
^{232}Th	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
^{233}U	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
^{234}U	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
^{235}U	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
^{236}U	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
^{238}U	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

Component (CAS)	Organic Components mol/L	Lb/gal	Lb/day	Mt/day	g/sec
Total	0.00E+00	0.00E+00	0.00E+00	0	0
57-14-7	0.00E+00	0	0.00E+00	0	0
58-90-2	0.00E+00	0	0.00E+00	0	0
58-89-9	0.00E+00	0	0.00E+00	0	0
71-43-2	0.00E+00	0	0.00E+00	0	0
75-69-4	0.00E+00	0	0.00E+00	0	0
75-05-8	0.00E+00	0	0.00E+00	0	0
76-44-8	0.00E+00	0	0.00E+00	0	0
79-01-6	0.00E+00	0	0.00E+00	0	0
80-62-6	0.00E+00	0	0.00E+00	0	0
84-74-2	0.00E+00	0	0.00E+00	0	0
84-66-2	0.00E+00	0	0.00E+00	0	0
87-86-5	0.00E+00	0	0.00E+00	0	0
87-68-3	0.00E+00	0	0.00E+00	0	0
87-61-6	0.00E+00	0	0.00E+00	0	0
88-85-7	0.00E+00	0	0.00E+00	0	0
91-57-6	0.00E+00	0	0.00E+00	0	0
91-20-3	0.00E+00	0	0.00E+00	0	0
95-94-3	0.00E+00	0	0.00E+00	0	0
98-86-2	0.00E+00	0	0.00E+00	0	0
99-87-6	0.00E+00	0	0.00E+00	0	0
100-51-6	0.00E+00	0	0.00E+00	0	0
107-21-1	0.00E+00	0	0.00E+00	0	0
108-95-2	0.00E+00	0	0.00E+00	0	0
108-88-3	0.00E+00	0	0.00E+00	0	0
120-82-1	0.00E+00	0	0.00E+00	0	0
122-66-7	0.00E+00	0	0.00E+00	0	0
122-39-4	0.00E+00	0	0.00E+00	0	0
129-00-0	0.00E+00	0	0.00E+00	0	0
131-11-3	0.00E+00	0	0.00E+00	0	0
132-64-9	0.00E+00	0	0.00E+00	0	0
156-59-2	0.00E+00	0	0.00E+00	0	0
218-01-9	0.00E+00	0	0.00E+00	0	0
309-00-2	0.00E+00	0	0.00E+00	0	0
319-85-7	0.00E+00	0	0.00E+00	0	0
534-52-1	0.00E+00	0	0.00E+00	0	0
603-34-9	0.00E+00	0	0.00E+00	0	0
4170-30-3	0.00E+00	0	0.00E+00	0	0
10061-01-5	0.00E+00	0	0.00E+00	0	0
23950-58-5	0.00E+00	0	0.00E+00	0	0
38380-08-4	0.00E+00	0	0.00E+00	0	0
100-21-0	0.00E+00	0	0.00E+00	0	0
106-93-4	0.00E+00	0	0.00E+00	0	0
106-97-8	0.00E+00	0	0.00E+00	0	0
106-99-0	0.00E+00	0	0.00E+00	0	0
108-87-2	0.00E+00	0	0.00E+00	0	0
110-54-3	0.00E+00	0	0.00E+00	0	0
110-82-7	0.00E+00	0	0.00E+00	0	0
111-84-2	0.00E+00	0	0.00E+00	0	0
118-74-1	0.00E+00	0	0.00E+00	0	0
120-12-7	0.00E+00	0	0.00E+00	0	0
127-18-4	0.00E+00	0	0.00E+00	0	0
1336-36-3	0.00E+00	0	0.00E+00	0	0
144-62-7	0.00E+00	0	0.00E+00	0	0
208-96-8	0.00E+00	0	0.00E+00	0	0
50-32-8	0.00E+00	0	0.00E+00	0	0
56-23-5	0.00E+00	0	0.00E+00	0	0
60-35-5	0.00E+00	0	0.00E+00	0	0
60-57-1	0.00E+00	0	0.00E+00	0	0
62-75-9	0.00E+00	0	0.00E+00	0	0
75-12-7	0.00E+00	0	0.00E+00	0	0
76-15-3	0.00E+00	0	0.00E+00	0	0
8001-35-2	0.00E+00	0	0.00E+00	0	0
88-89-1	0.00E+00	0	0.00E+00	0	0
126-73-8	0.00E+00	0	0.00E+00	0	0

Component	Aqueous Components mol/L	Lb/gal	Lb/day	Solid Components Lb/day	Total Component Lb/day	Mt/day	g/sec
$C_2O_4^{-2}$	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0	0
Formate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0	0
Acetate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0	0
Glycolate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0	0
IDA	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0	0
Citrate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0	0
HEDTA	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0	0
EDTA	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0	0

Table A-9 RLD34 Stream Report

River Protection Project - Waste Treatment Plant

Stream Number:	RLD34
Stream Name:	LAW C3/C5 drain/sump collection vessel vent
Configuration:	0
	0
Run Data File:	H:\Working Folder 11 (Vishal)\Emissions_Case2_Run4_SubEm\MRQ_03_054_run1_Streams.csv
Run Date / Time:	4/15/2003 - 6:40:10 AM

Stream Properties Variable	Value	Units
Density	1.13E-03	g/cm^3
Enthalpy	-3.83E+02	BTU/hr
Mass Flow	2.48E+00	Lb/hr
	5.96E+01	Lb/day
Volumetric Flow	4.40E+00	GPM
Molar Flow	8.75E-02	Lbmol/hr
Volumetric Flow	5.89E-01	ft^3/min
Molecular Weight	2.84E+01	Lb/Lbmol
Pressure	1.00E+03	mbar
Temperature	3.00E+01	C
Viscosity	1.84E-02	cP
Na Molarity	0.00E+00	mol/L
pH	#NUM!	pH
Total TRU	8.47E-17	Ci/L
Total Activity	5.03E-13	Ci/L

Gaseous Components (1) Component	mol/L	Lb/day	Mt/day
CO	4.66E-27	6.90E-24	3.13659E-27
CO_2	3.51E-12	8.17E-09	3.7132E-12
H_2O	1.69E-03	1.61E+00	0.00073358
NO	0.00E+00	0.00E+00	0
NO_2	0.00E+00	0.00E+00	0
N_2	3.00E-02	4.45E+01	0.020230206
O_2	7.98E-03	1.35E+01	0.006142698
SO_2	0.00E+00	0.00E+00	0
NH_3	1.72E-13	1.55E-10	7.03857E-14
HNO_3	1.33E-24	4.42E-21	2.01068E-24
HCl	0.00E+00	0.00E+00	0
HF	0.00E+00	0.00E+00	0

(1) All radionuclides in gaseous streams are assumed to exist as solid particulate.

Component	Aqueous Components mol/L	Lb/gal	Lb/day	Solid Components Lb/day	Total Component Lb/day	mt/day	g/sec
Total	0.00E+00	0.00E+00	0.00E+00	4.68E-06	4.68E-06	2.12695E-09	2.46175E-08
Ag^+	0.00E+00	0.00E+00	0.00E+00	6.93E-10	6.93E-10	3.14985E-13	3.64566E-12
Al^{+3}	0.00E+00	0.00E+00	0.00E+00	7.82E-09	7.82E-09	3.55287E-12	4.11211E-11
As^{+3}	0.00E+00	0.00E+00	0.00E+00	2.39E-06	2.39E-06	1.08441E-09	1.2551E-08
B^{+3}	0.00E+00	0.00E+00	0.00E+00	3.60E-08	3.60E-08	1.63421E-11	1.89145E-10
Ba^{+2}	0.00E+00	0.00E+00	0.00E+00	3.98E-12	3.98E-12	1.80811E-15	2.09272E-14
Bi^{+3}	0.00E+00	0.00E+00	0.00E+00	4.50E-10	4.50E-10	2.04664E-13	2.36879E-12
$C_2O_4^{-2}$	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0	0
Ca^{+2}	0.00E+00	0.00E+00	0.00E+00	2.86E-08	2.86E-08	1.30048E-11	1.50518E-10
Cd^{+2}	0.00E+00	0.00E+00	0.00E+00	8.74E-08	8.74E-08	3.97434E-11	4.59993E-10
Ce^{+3}	0.00E+00	0.00E+00	0.00E+00	3.74E-11	3.74E-11	1.70179E-14	1.96966E-13
Cl^-	0.00E+00	0.00E+00	0.00E+00	5.69E-07	5.69E-07	2.58619E-10	2.99327E-09
CO_3^{-2}	0.00E+00	0.00E+00	0.00E+00	1.28E-08	1.28E-08	5.79721E-12	6.70973E-11
Cr^{+3}	0.00E+00	0.00E+00	0.00E+00	8.05E-09	8.05E-09	3.65922E-12	4.23521E-11
Cu^{+2}	0.00E+00	0.00E+00	0.00E+00	6.67E-11	6.67E-11	3.0296E-14	3.50648E-13
F^-	0.00E+00	0.00E+00	0.00E+00	1.91E-07	1.91E-07	8.69096E-11	1.0059E-09
Fe^{+3}	0.00E+00	0.00E+00	0.00E+00	4.62E-09	4.62E-09	2.10165E-12	2.43247E-11
H^+	0.00E+00	0.00E+00	0.00E+00		0.00E+00	0	0
H_2O	0.00E+00	0.00E+00	0.00E+00		0.00E+00	0	0
Hg^{+2}	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0	0
K^+	0.00E+00	0.00E+00	0.00E+00	6.09E-07	6.09E-07	2.77031E-10	3.20637E-09
La^{+3}	0.00E+00	0.00E+00	0.00E+00	8.67E-12	8.67E-12	3.93983E-15	4.55998E-14
Li^+	0.00E+00	0.00E+00	0.00E+00	9.67E-08	9.67E-08	4.39731E-11	5.08948E-10
Mg^{+2}	0.00E+00	0.00E+00	0.00E+00	3.50E-09	3.50E-09	1.58921E-12	1.83936E-11
Mn^{+3}	0.00E+00	0.00E+00	0.00E+00	3.07E-10	3.07E-10	1.39651E-13	1.61633E-12
MnO_4^-	0.00E+00	0.00E+00	0.00E+00		0.00E+00	0	0
Na^+	0.00E+00	0.00E+00	0.00E+00	2.57E-07	2.57E-07	1.16642E-10	1.35003E-09
NH_4^+	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0	0
Ni^{+2}	0.00E+00	0.00E+00	0.00E+00	9.20E-10	9.20E-10	4.18061E-13	4.83867E-12
NO_2^-	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0	0
NO_3^-	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0	0
O^{-2}				1.03E-07	1.03E-07	4.68509E-11	5.42256E-10
OH^-	0.00E+00	0.00E+00	0.00E+00	3.62E-09	3.62E-09	1.64334E-12	1.90201E-11
$OH(b)^-$	0.00E+00	0.00E+00	0.00E+00		0.00E+00	0	0
P^{+5}				0.00E+00	0.00E+00	0	0
Pb^{+2}	0.00E+00	0.00E+00	0.00E+00	8.44E-10	8.44E-10	3.83631E-13	4.44017E-12
Pd^{+2}	0.00E+00	0.00E+00	0.00E+00	2.72E-13	2.72E-13	1.23828E-16	1.4332E-15
PO_4^{-3}	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0	0
S^{+6}				0.00E+00	0.00E+00	0	0
Si^{+4}				2.39E-08	2.39E-08	1.08759E-11	1.25878E-10
SiO_4^{-4}	0.00E+00	0.00E+00	0.00E+00		0.00E+00	0	0
SO_4^{-2}	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0	0
Sr^{+2}	0.00E+00	0.00E+00	0.00E+00	2.73E-12	2.73E-12	1.24043E-15	1.43568E-14
Ti^{+4}	0.00E+00	0.00E+00	0.00E+00	2.33E-07	2.33E-07	1.05996E-10	1.22681E-09
Zn^{+2}	0.00E+00	0.00E+00	0.00E+00	1.23E-08	1.23E-08	5.58122E-12	6.45975E-11
Zr^{+4}	0.00E+00	0.00E+00	0.00E+00	2.46E-09	2.46E-09	1.11942E-12	1.29562E-11

Rad. Component	Aqueous Rad. Components Ci/L	Ci/day	Lb/day	Solids Rad. Components (1) Ci/L	Ci/day	Lb/day	Total Rad. Components (1) Ci/L	Ci/day	Lb/day
Total	0.00E+00	0.00E+00	0.00E+00	5.03E-13	1.21E-08	2.79E-10	5.03E-13	1.21E-08	2.79E-10
^{241}Am	0	0.00E+00	0.00E+00	6.12E-17	1.47E-12	9.45E-16	6.12E-17	1.47E-12	9.45E-16
^{14}C	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
^{60}Co	0.00E+00	0.00E+00	0.00E+00	8.05E-16	1.93E-11	3.76E-17	8.05E-16	1.93E-11	3.76E-17
^{243}Cm	0.00E+00	0.00E+00	0.00E+00	1.63E-19	3.91E-15	1.70E-19	1.63E-19	3.91E-15	1.70E-19
^{244}Cm	0.00E+00	0.00E+00	0.00E+00	1.75E-19	4.20E-15	1.14E-19	1.75E-19	4.20E-15	1.14E-19
^{137}Cs	0.00E+00	0.00E+00	0.00E+00	7.79E-14	1.87E-09	4.75E-14	7.79E-14	1.87E-09	4.75E-14
^{152}Eu	0.00E+00	0.00E+00	0.00E+00	2.13E-16	5.12E-12	6.49E-17	2.13E-16	5.12E-12	6.49E-17
^{154}Eu	0.00E+00	0.00E+00	0.00E+00	7.07E-16	1.70E-11	1.38E-16	7.07E-16	1.70E-11	1.38E-16
^{155}Eu	0.00E+00	0.00E+00	0.00E+00	1.22E-15	2.92E-11	1.33E-16	1.22E-15	2.92E-11	1.33E-16
^{3}H	0.00E+00	0.00E+00	0.00E+00	7.57E-16	1.82E-11	4.17E-18	7.57E-16	1.82E-11	4.17E-18
^{129}I	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
^{63}Ni	0.00E+00	0.00E+00	0.00E+00	6.29E-15	1.51E-10	5.86E-15	6.29E-15	1.51E-10	5.86E-15
^{237}Np	0.00E+00	0.00E+00	0.00E+00	2.63E-19	6.32E-15	1.98E-14	2.63E-19	6.32E-15	1.98E-14
^{238}Pu	0.00E+00	0.00E+00	0.00E+00	3.55E-19	8.52E-15	1.10E-18	3.55E-19	8.52E-15	1.10E-18

^{239}Pu	0.00E+00	0.00E+00	0.00E+00	4.15E-18	9.96E-14	3.54E-15	4.15E-18	9.96E-14	3.54E-15
^{240}Pu	0.00E+00	0.00E+00	0.00E+00	7.15E-19	1.72E-14	1.67E-16	7.15E-19	1.72E-14	1.67E-16
^{241}Pu	0.00E+00	0.00E+00	0.00E+00	1.77E-17	4.25E-13	9.09E-18	1.77E-17	4.25E-13	9.09E-18
^{125}Sb	0.00E+00	0.00E+00	0.00E+00	7.15E-14	1.72E-09	3.65E-15	7.15E-14	1.72E-09	3.65E-15
^{151}Sm	0.00E+00	0.00E+00	0.00E+00	4.05E-14	9.71E-10	8.14E-14	4.05E-14	9.71E-10	8.14E-14
^{126}Sn	0.00E+00	0.00E+00	0.00E+00	2.45E-17	5.88E-13	1.14E-13	2.45E-17	5.88E-13	1.14E-13
^{90}Sr	0.00E+00	0.00E+00	0.00E+00	2.65E-13	6.35E-09	1.01E-13	2.65E-13	6.35E-09	1.01E-13
^{99}Tc	0.00E+00	0.00E+00	0.00E+00	3.81E-14	9.15E-10	1.19E-10	3.81E-14	9.15E-10	1.19E-10
^{232}Th	0.00E+00	0.00E+00	0.00E+00	9.06E-20	2.18E-15	4.36E-11	9.06E-20	2.18E-15	4.36E-11
^{233}U	0.00E+00	0.00E+00	0.00E+00	1.68E-18	4.04E-14	9.24E-15	1.68E-18	4.04E-14	9.24E-15
^{234}U	0.00E+00	0.00E+00	0.00E+00	9.79E-19	2.35E-14	8.34E-15	9.79E-19	2.35E-14	8.34E-15
^{235}U	0.00E+00	0.00E+00	0.00E+00	3.78E-20	9.07E-16	9.26E-13	3.78E-20	9.07E-16	9.26E-13
^{236}U	0.00E+00	0.00E+00	0.00E+00	1.13E-19	2.72E-15	9.27E-14	1.13E-19	2.72E-15	9.27E-14
^{238}U	0.00E+00	0.00E+00	0.00E+00	7.28E-19	1.75E-14	1.15E-10	7.28E-19	1.75E-14	1.15E-10

Component (CAS)	Organic Components mol/L	Lb/gal	Lb/day	Mt/day	g/sec
Total	7.03E-14	1.43E-13	1.52E-08	6.91106E-12	7.99891E-11
57-14-7	0.00E+00	0	0.00E+00	0	0
58-90-2	0.00E+00	0	0.00E+00	0	0
58-89-9	1.38E-18	3.35079E-18	2.12E-14	9.65655E-18	1.11766E-16
71-43-2	0.00E+00	0	0.00E+00	0	0
75-69-4	0.00E+00	0	0.00E+00	0	0
75-05-8	0.00E+00	0	0.00E+00	0	0
76-44-8	0.00E+00	0	0.00E+00	0	0
79-01-6	0.00E+00	0	0.00E+00	0	0
80-62-6	0.00E+00	0	0.00E+00	0	0
84-74-2	5.38E-15	1.25082E-14	7.93E-11	3.60471E-14	4.17212E-13
84-66-2	0.00E+00	0	0.00E+00	0	0
87-86-5	0.00E+00	0	0.00E+00	0	0
87-68-3	0.00E+00	0	0.00E+00	0	0
87-61-6	0.00E+00	0	0.00E+00	0	0
88-85-7	6.38E-14	1.27843E-13	8.11E-10	3.68429E-13	4.26422E-12
91-57-6	0.00E+00	0	0.00E+00	0	0
91-20-3	0.00E+00	0	0.00E+00	0	0
95-94-3	0.00E+00	0	0.00E+00	0	0
98-86-2	0.00E+00	0	0.00E+00	0	0
99-87-6	0.00E+00	0	0.00E+00	0	0
100-51-6	0.00E+00	0	0.00E+00	0	0
107-21-1	0.00E+00	0	0.00E+00	0	0
108-95-2	0.00E+00	0	0.00E+00	0	0
108-88-3	0.00E+00	0	0.00E+00	0	0
120-82-1	0.00E+00	0	0.00E+00	0	0
122-66-7	0.00E+00	0	0.00E+00	0	0
122-39-4	0.00E+00	0	0.00E+00	0	0
129-00-0	1.83E-16	3.08808E-16	1.96E-12	8.89948E-16	1.03003E-14
131-11-3	0.00E+00	0	0.00E+00	0	0
132-64-9	0.00E+00	0	0.00E+00	0	0
156-59-2	0.00E+00	0	0.00E+00	0	0
218-01-9	8.59E-16	1.63573E-15	1.04E-11	4.71398E-15	5.456E-14
309-00-2	2.63E-20	8.02269E-20	5.09E-16	2.31204E-19	2.67597E-18
319-85-7	8.73E-17	2.11779E-16	1.34E-12	6.10322E-16	7.06391E-15
534-52-1	0.00E+00	0	0.00E+00	0	0
603-34-9	0.00E+00	0	0.00E+00	0	0
4170-30-3	0.00E+00	0	0.00E+00	0	0
10061-01-5	0.00E+00	0	0.00E+00	0	0
23950-58-5	0.00E+00	0	0.00E+00	0	0
38380-08-4	1.06E-18	3.19558E-18	2.03E-14	9.20928E-18	1.06589E-16
100-21-0	0.00E+00	0	0.00E+00	0	0
106-93-4	0.00E+00	0	0.00E+00	0	0
106-97-8	0.00E+00	0	0.00E+00	0	0
106-99-0	0.00E+00	0	0.00E+00	0	0
108-87-2	0.00E+00	0	0.00E+00	0	0
110-54-3	0.00E+00	0	0.00E+00	0	0
110-82-7	0.00E+00	0	0.00E+00	0	0
111-84-2	0.00E+00	0	0.00E+00	0	0
118-74-1	0.00E+00	0	0.00E+00	0	0
120-12-7	0.00E+00	0	0.00E+00	0	0
127-18-4	0.00E+00	0	0.00E+00	0	0
1336-36-3	1.39E-22	3.72831E-22	2.36E-18	1.07445E-21	1.24358E-20
144-62-7	0.00E+00	0	0.00E+00	0	0
208-96-8	1.75E-54	2.22501E-54	1.41E-50	6.41219E-54	7.42152E-53
50-32-8	3.96E-16	8.33083E-16	5.28E-12	2.40084E-15	2.77875E-14
56-23-5	0.00E+00	0	0.00E+00	0	0
60-35-5	0.00E+00	0	0.00E+00	0	0
60-57-1	5.16E-19	1.64132E-18	1.04E-14	4.73009E-18	5.47465E-17
62-75-9	0.00E+00	0	0.00E+00	0	0
75-12-7	0.00E+00	0	0.00E+00	0	0
76-15-3	0.00E+00	0	0.00E+00	0	0
8001-35-2	1.67E-18	5.76471E-18	3.65E-14	1.66132E-17	1.92282E-16
88-89-1	1.18E-12	2.25475E-12	1.43E-08	6.49793E-12	7.52075E-11
126-73-8	0.00E+00	0	0.00E+00	0	0

Component	Aqueous Components mol/L	Lb/gal	Lb/day	Solid Components Lb/day	Total Component Lb/day	Mt/day	g/sec
$C_2O_4^{-2}$	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0	0
Formate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0	0
Acetate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0	0
Glycolate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0	0
IDA	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0	0
Citrate	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0	0
HEDTA	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0	0
EDTA	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0	0

BY: E. Berrios
DATE: 05/21/03

Table A-10 HMP06 Stream Report

River Protection Project - Waste Treatment Plant

Stream Number: HMP06
Stream Name: Melter offgas (primary)
Configuration: 0
0
Run Data File: H:\Working Folder 11 (Vishal)\Emissions_Case2_Run4_SubEm\MRQ_03_054_run1_Streams.csv
Run Date / Time: 4/15/2003 - 6:40:10 AM

Stream Properties Variable	Value	Units
Density	3.64E-04	g/cm^3
Enthalpy	-1.69E+07	BTU/hr
Mass Flow	4.88E+03	Lb/hr
	1.17E+05	Lb/day
Volumetric Flow	2.48E+04	GPM
Molar Flow	2.18E+02	Lbmol/hr
Volumetric Flow	3.32E+03	ft^3/min
Molecular Weight	2.07E+01	Lb/Lbmol
Pressure	9.83E+02	mbar
Temperature	4.00E+02	C
Viscosity	2.82E-02	cP
Na Molarity	0.00E+00	mol/L
pH	#NUM!	pH
Total TRU	4.80E-08	Ci/L
Total Activity	3.25E-05	Ci/L

Gaseous Components (1) Component	mol/L	Lb/day	Mt/day
CO	2.40E-06	2.00E+01	0.009107806
CO_2	2.40E-04	3.15E+03	1.431019457
H_2O	1.36E-02	7.33E+04	33.30428564
NO	9.21E-05	8.24E+02	0.374450438
NO_2	8.39E-06	1.15E+02	0.052310614
N_2	2.76E-03	2.30E+04	10.46927274
O_2	8.32E-04	7.94E+03	3.606827788
SO_2	1.68E-06	3.21E+01	0.014592218
NH_3	2.15E-06	1.09E+01	0.004971796
HNO_3	3.99E-48	7.49E-41	3.40366E-44
HCl	2.27E-06	2.47E+01	0.011207442
HF	2.45E-06	1.46E+01	0.006630528

(1) All radionuclides in gaseous streams are assumed to exist as solid particulate.

Component	Aqueous Components mol/L	Lb/gal	Lb/day	Solid Components Lb/day	Total Component Lb/day	mt/day	g/sec
Total	0.00E+00	0.00E+00	0.00E+00	8.63E+03	8.63E+03	3.923735222	45.41360211
Ag^+	0.00E+00	0.00E+00	0.00E+00	4.59E-01	4.59E-01	0.000208605	0.002414412
Al^{+3}	0.00E+00	0.00E+00	0.00E+00	5.27E+00	5.27E+00	0.002393896	0.02770713
As^{+3}	0.00E+00	0.00E+00	0.00E+00	6.25E+03	6.25E+03	2.841894403	32.89229634
B^{+3}	0.00E+00	0.00E+00	0.00E+00	1.23E+01	1.23E+01	0.005586492	0.064658468
Ba^{+2}	0.00E+00	0.00E+00	0.00E+00	1.07E+00	1.07E+00	0.000487878	0.005646738
Bi^{+3}	0.00E+00	0.00E+00	0.00E+00	6.78E-01	6.78E-01	0.000307999	0.003564798
$C_2O_4^{-2}$	0.00E+00	0.00E+00	0.00E+00	1.25E+02	1.25E+02	0.056801398	0.657423587
Ca^{+2}	0.00E+00	0.00E+00	0.00E+00	2.88E+00	2.88E+00	0.001307189	0.015129502
Cd^{+2}	0.00E+00	0.00E+00	0.00E+00	1.32E+01	1.32E+01	0.00599277	0.069360762
Ce^{+3}	0.00E+00	0.00E+00	0.00E+00	1.13E-01	1.13E-01	5.11596E-05	0.000592125
Cl^-	0.00E+00	0.00E+00	0.00E+00	8.03E+00	8.03E+00	0.00365186	0.042266896
CO_3^{-2}	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0	0
Cr^{+3}	0.00E+00	0.00E+00	0.00E+00	4.60E-01	4.60E-01	0.000209036	0.0024194
Cu^{+2}	0.00E+00	0.00E+00	0.00E+00	5.88E-02	5.88E-02	2.67249E-05	0.000309316
F^-	0.00E+00	0.00E+00	0.00E+00	2.60E+01	2.60E+01	0.0118039	0.136619209
Fe^{+3}	0.00E+00	0.00E+00	0.00E+00	3.51E+00	3.51E+00	0.001596332	0.018476068
H^+	0.00E+00	0.00E+00	0.00E+00		0.00E+00	0	0
H_2O	0.00E+00	0.00E+00	0.00E+00		0.00E+00	0	0
Hg^{+2}	0.00E+00	0.00E+00	0.00E+00	5.04E+01	5.04E+01	0.022886777	0.264893257
K^+	0.00E+00	0.00E+00	0.00E+00	1.18E+01	1.18E+01	0.005344524	0.061857917
La^{+3}	0.00E+00	0.00E+00	0.00E+00	1.25E+00	1.25E+00	0.000570383	0.006601652
Li^+	0.00E+00	0.00E+00	0.00E+00	1.06E+00	1.06E+00	0.000482155	0.005580497
Mg^{+2}	0.00E+00	0.00E+00	0.00E+00	2.55E-01	2.55E-01	0.000115688	0.001338986
Mn^{+3}	0.00E+00	0.00E+00	0.00E+00	2.17E+00	2.17E+00	0.000986765	0.011420888
MnO_4^-	0.00E+00	0.00E+00	0.00E+00		0.00E+00	0	0
Na^+	0.00E+00	0.00E+00	0.00E+00	1.21E+01	1.21E+01	0.005520495	0.063894623
NH_4^+	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0	0
Ni^{+2}	0.00E+00	0.00E+00	0.00E+00	6.99E-01	6.99E-01	0.000317647	0.003676464
NO_2^-	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0	0
NO_3^-	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0	0
O^{-2}				2.08E+03	2.08E+03	0.944142602	10.92757641
OH^-	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0	0
$OH(b)^-$	0.00E+00	0.00E+00	0.00E+00		0.00E+00	0	0
P^{+5}				3.26E+00	3.26E+00	0.001479944	0.017128987
Pb^{+2}	0.00E+00	0.00E+00	0.00E+00	1.50E-01	1.50E-01	6.826E-05	0.000790046
Pd^{+2}	0.00E+00	0.00E+00	0.00E+00	1.55E-02	1.55E-02	7.04456E-06	8.15343E-05
PO_4^{-3}	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0	0
S^{+6}				0.00E+00	0.00E+00	0	0
Si^{+4}				8.12E+00	8.12E+00	0.00369192	0.042730556
SiO_4^{-4}	0.00E+00	0.00E+00	0.00E+00		0.00E+00	0	0
SO_4^{-2}	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0	0
Sr^{+2}	0.00E+00	0.00E+00	0.00E+00	1.25E-01	1.25E-01	5.67528E-05	0.000656861
Ti^{+4}	0.00E+00	0.00E+00	0.00E+00	9.60E+00	9.60E+00	0.004363962	0.050508824
Zn^{+2}	0.00E+00	0.00E+00	0.00E+00	1.85E+00	1.85E+00	0.000842722	0.009753727
Zr^{+4}	0.00E+00	0.00E+00	0.00E+00	1.18E+00	1.18E+00	0.000537938	0.006226134

Rad. Component	Aqueous Rad. Components Ci/L	Ci/day	Lb/day	Solids Rad. Components (1) Ci/L	Ci/day	Lb/day	Total Rad. Components (1) Ci/L	Ci/day	Lb/day
Total	0.00E+00	0.00E+00	0.00E+00	3.25E-05	4.40E+03	1.39E+01	3.25E-05	4.40E+03	1.39E+01
^{241}Am	0	0.00E+00	0.00E+00	3.57E-08	4.83E+00	3.11E-03	3.57E-08	4.83E+00	3.11E-03
^{14}C	0.00E+00	0.00E+00	0.00E+00	1.20E-09	1.62E-01	7.99E-05	1.20E-09	1.62E-01	7.99E-05
^{60}Co	0.00E+00	0.00E+00	0.00E+00	3.97E-09	5.37E-01	1.05E-06	3.97E-09	5.37E-01	1.05E-06
^{243}Cm	0.00E+00	0.00E+00	0.00E+00	1.19E-09	1.61E-01	7.02E-06	1.19E-09	1.61E-01	7.02E-06
^{244}Cm	0.00E+00	0.00E+00	0.00E+00	8.91E-10	1.21E-01	3.28E-06	8.91E-10	1.21E-01	3.28E-06
^{137}Cs	0.00E+00	0.00E+00	0.00E+00	2.36E-05	3.20E+03	8.12E-02	2.36E-05	3.20E+03	8.12E-02
^{152}Eu	0.00E+00	0.00E+00	0.00E+00	2.07E-10	2.80E-02	3.55E-07	2.07E-10	2.80E-02	3.55E-07
^{154}Eu	0.00E+00	0.00E+00	0.00E+00	2.07E-08	2.80E+00	2.28E-05	2.07E-08	2.80E+00	2.28E-05
^{155}Eu	0.00E+00	0.00E+00	0.00E+00	1.16E-08	1.57E+00	7.12E-06	1.16E-08	1.57E+00	7.12E-06
^{3}H	0.00E+00	0.00E+00	0.00E+00	3.72E-08	5.03E+00	1.15E-06	3.72E-08	5.03E+00	1.15E-06
^{129}I	0.00E+00	0.00E+00	0.00E+00	3.26E-11	4.41E-03	5.50E-02	3.26E-11	4.41E-03	5.50E-02
^{63}Ni	0.00E+00	0.00E+00	0.00E+00	4.32E-09	5.84E-01	2.27E-05	4.32E-09	5.84E-01	2.27E-05
^{237}Np	0.00E+00	0.00E+00	0.00E+00	2.93E-11	3.97E-03	1.24E-02	2.93E-11	3.97E-03	1.24E-02
^{238}Pu	0.00E+00	0.00E+00	0.00E+00	1.39E-10	1.88E-02	2.42E-06	1.39E-10	1.88E-02	2.42E-06

^{239}Pu	0.00E+00	0.00E+00	0.00E+00	1.23E-09	1.66E-01	5.91E-03	1.23E-09	1.66E-01	5.91E-03
^{240}Pu	0.00E+00	0.00E+00	0.00E+00	6.74E-11	9.12E-03	8.86E-05	6.74E-11	9.12E-03	8.86E-05
^{241}Pu	0.00E+00	0.00E+00	0.00E+00	8.73E-09	1.18E+00	2.53E-05	8.73E-09	1.18E+00	2.53E-05
^{125}Sb	0.00E+00	0.00E+00	0.00E+00	2.60E-08	3.52E+00	7.48E-06	2.60E-08	3.52E+00	7.48E-06
^{151}Sm	0.00E+00	0.00E+00	0.00E+00	4.29E-08	5.80E+00	4.86E-04	4.29E-08	5.80E+00	4.86E-04
^{126}Sn	0.00E+00	0.00E+00	0.00E+00	6.14E-11	8.31E-03	1.61E-03	6.14E-11	8.31E-03	1.61E-03
^{90}Sr	0.00E+00	0.00E+00	0.00E+00	7.99E-06	1.08E+03	1.73E-02	7.99E-06	1.08E+03	1.73E-02
^{99}Tc	0.00E+00	0.00E+00	0.00E+00	6.89E-07	9.32E+01	1.21E+01	6.89E-07	9.32E+01	1.21E+01
^{232}Th	0.00E+00	0.00E+00	0.00E+00	3.18E-13	4.31E-05	8.63E-01	3.18E-13	4.31E-05	8.63E-01
^{233}U	0.00E+00	0.00E+00	0.00E+00	4.91E-13	6.64E-05	1.52E-05	4.91E-13	6.64E-05	1.52E-05
^{234}U	0.00E+00	0.00E+00	0.00E+00	1.37E-12	1.86E-04	6.60E-05	1.37E-12	1.86E-04	6.60E-05
^{235}U	0.00E+00	0.00E+00	0.00E+00	1.02E-13	1.38E-05	1.41E-02	1.02E-13	1.38E-05	1.41E-02
^{236}U	0.00E+00	0.00E+00	0.00E+00	4.94E-14	6.68E-06	2.28E-04	4.94E-14	6.68E-06	2.28E-04
^{238}U	0.00E+00	0.00E+00	0.00E+00	7.87E-13	1.07E-04	6.99E-01	7.87E-13	1.07E-04	6.99E-01

Component (CAS)	Organic Components mol/L	Lb/gal	Lb/day	Mt/day	g/sec
Total	2.45E-07	3.36E-07	1.88E+01	0.008560596	0.099080976
57-14-7	3.51E-08	1.75921E-08	6.29E-01	0.000285725	0.003307003
58-90-2	1.02E-08	1.97425E-08	7.05E-01	0.000320652	0.003711244
58-89-9	3.96E-11	9.6157E-11	3.44E-03	1.56175E-06	1.80758E-05
71-43-2	2.23E-16	1.45306E-16	5.19E-09	2.36002E-12	2.73151E-11
75-69-4	0.00E+00	0	0.00E+00	0	0
75-05-8	8.91E-09	3.05131E-09	1.09E-01	4.95585E-05	0.000573594
76-44-8	1.13E-12	3.52338E-12	1.26E-04	5.72256E-08	6.62333E-07
79-01-6	6.45E-18	7.07778E-18	2.53E-10	1.14955E-13	1.3305E-12
80-62-6	0.00E+00	0	0.00E+00	0	0
84-74-2	1.53E-08	3.54439E-08	1.27E+00	0.000575668	0.006662825
84-66-2	1.82E-08	3.36887E-08	1.20E+00	0.000547161	0.006332886
87-86-5	1.64E-08	3.64705E-08	1.30E+00	0.000592342	0.00685581
87-68-3	2.49E-18	5.41447E-18	1.93E-10	8.79402E-14	1.01783E-12
87-61-6	0.00E+00	0	0.00E+00	0	0
88-85-7	2.57E-08	5.157E-08	1.84E+00	0.000837583	0.009694247
91-57-6	0.00E+00	0	0.00E+00	0	0
91-20-3	1.38E-12	1.47578E-12	5.27E-05	2.39691E-08	2.7742E-07
95-94-3	0.00E+00	0	0.00E+00	0	0
98-86-2	1.87E-08	1.87691E-08	6.71E-01	0.000304841	0.003528253
99-87-6	0.00E+00	0	0.00E+00	0	0
100-51-6	0.00E+00	0	0.00E+00	0	0
107-21-1	0.00E+00	0	0.00E+00	0	0
108-95-2	4.55E-08	3.57127E-08	1.28E+00	0.000580034	0.006713359
108-88-3	7.36E-17	5.65512E-17	2.02E-09	9.18487E-13	1.06306E-11
120-82-1	6.61E-14	1.00086E-13	3.58E-06	1.62557E-09	1.88145E-08
122-66-7	0.00E+00	0	0.00E+00	0	0
122-39-4	3.89E-09	5.4963E-09	1.96E-01	8.92691E-05	0.001033208
129-00-0	1.38E-08	2.32598E-08	8.31E-01	0.000377779	0.004372441
131-11-3	0.00E+00	0	0.00E+00	0	0
132-64-9	2.99E-10	4.20174E-10	1.50E-02	6.82433E-06	7.89853E-05
156-59-2	0.00E+00	0	0.00E+00	0	0
218-01-9	1.47E-08	2.79726E-08	1.00E+00	0.000454322	0.005258352
309-00-2	5.27E-11	1.60519E-10	5.74E-03	2.6071E-06	3.01748E-05
319-85-7	6.27E-11	1.52226E-10	5.44E-03	2.4724E-06	2.86158E-05
534-52-1	0.00E+00	0	0.00E+00	0	0
603-34-9	1.10E-08	2.24396E-08	8.02E-01	0.000364456	0.004218246
4170-30-3	7.24E-09	4.23475E-09	1.51E-01	6.87795E-05	0.000796059
10061-01-5	5.62E-15	5.20224E-15	1.86E-07	8.44931E-11	9.77929E-10
23950-58-5	0.00E+00	0	0.00E+00	0	0
38380-08-4	3.76E-11	1.13335E-10	4.05E-03	1.84075E-06	2.13049E-05
100-21-0	2.61E-08	3.62323E-08	1.29E+00	0.000588473	0.006811036
106-93-4	6.34E-12	9.9375E-12	3.55E-04	1.61402E-07	1.86807E-06
106-97-8	0.00E+00	0	0.00E+00	0	0
106-99-0	0.00E+00	0	0.00E+00	0	0
108-87-2	0.00E+00	0	0.00E+00	0	0
110-54-3	0.00E+00	0	0.00E+00	0	0
110-82-7	0.00E+00	0	0.00E+00	0	0
111-84-2	0.00E+00	0	0.00E+00	0	0
118-74-1	1.85E-15	4.3928E-15	1.57E-07	7.13464E-11	8.25769E-10
120-12-7	3.97E-09	5.90628E-09	2.11E-01	9.5928E-05	0.001110277
127-18-4	1.85E-19	2.5602E-19	9.15E-12	4.15819E-15	4.81272E-14
1336-36-3	1.32E-10	3.55983E-10	1.27E-02	5.78177E-06	6.69186E-05
144-62-7	4.83E-09	3.63098E-09	1.30E-01	5.89732E-05	0.00068256
208-96-8	1.47E-09	1.86309E-09	6.66E-02	3.02597E-05	0.000350228
50-32-8	2.69E-10	5.66764E-10	2.03E-02	9.2052E-06	0.000106542
56-23-5	7.59E-26	9.74232E-26	3.48E-18	1.58232E-21	1.83139E-20
60-35-5	1.63E-08	8.03133E-09	2.87E-01	0.000130442	0.00150975
60-57-1	5.33E-11	1.69538E-10	6.06E-03	2.75359E-06	3.18703E-05
62-75-9	8.49E-08	5.25122E-08	1.88E+00	0.000852886	0.00987137
75-12-7	9.63E-08	3.61921E-08	1.29E+00	0.00058782	0.006803477
76-15-3	0.00E+00	0	0.00E+00	0	0
8001-35-2	6.32E-11	2.18442E-10	7.81E-03	3.54786E-06	4.10632E-05
88-89-1	2.35E-08	4.49955E-08	1.61E+00	0.000730803	0.008458373
126-73-8	1.65E-08	3.67265E-08	1.31E+00	0.0005965	0.006903933

Component	Aqueous Components mol/L	Lb/gal	Lb/day	Solid Components Lb/day	Total Component Lb/day	Mt/day	g/sec
$C_2O_4^{-2}$	0.00E+00	0.00E+00	0.00E+00	1.25E+02	1.25E+02	0.056801398	0.657423587
Formate	0.00E+00	0.00E+00	0.00E+00	2.32E+00	2.32E+00	0.001052657	0.012183536
Acetate	0.00E+00	0.00E+00	0.00E+00	1.53E-05	1.53E-05	6.97417E-09	8.07195E-08
Glycolate	0.00E+00	0.00E+00	0.00E+00	1.25E+00	1.25E+00	0.000569454	0.006590909
IDA	0.00E+00	0.00E+00	0.00E+00	5.66E-02	5.66E-02	2.5749E-05	0.000298021
Citrate	0.00E+00	0.00E+00	0.00E+00	2.25E+00	2.25E+00	0.001024043	0.011852345
HEDTA	0.00E+00	0.00E+00	0.00E+00	1.59E+00	1.59E+00	0.00072246	0.008361803
EDTA	0.00E+00	0.00E+00	0.00E+00	2.87E-02	2.87E-02	1.30287E-05	0.000150796

Table A-11 HOP10 Stream Report

River Protection Project - Waste Treatment Plant

Stream Number:	HOP10
Stream Name:	HLW vessel ventilation header offgas
Configuration:	0
	0
Run Data File:	H:\Working Folder 11 (Vishal)\Emissions_Case2_Run4_SubEm\MRQ_03_054_run1_Streams.csv
Run Date / Time:	4/15/2003 - 6:40:10 AM

Stream Properties Variable	Value	Units
Density	1.14E-03	g/cm^3
Enthalpy	-2.56E+04	BTU/hr
Mass Flow	1.88E+02	Lb/hr
	4.51E+03	Lb/day
Volumetric Flow	3.30E+02	GPM
Molar Flow	6.60E+00	Lbmol/hr
Volumetric Flow	4.41E+01	ft^3/min
Molecular Weight	2.84E+01	Lb/Lbmol
Pressure	1.00E+03	mbar
Temperature	2.76E+01	C
Viscosity	1.83E-02	cP
Na Molarity	0.00E+00	mol/L
pH	#NUM!	pH
Total TRU	4.48E-11	Ci/L
Total Activity	2.59E-08	Ci/L

Gaseous Components (1) Component	mol/L	Lb/day	Mt/day
CO	2.23E-26	2.47E-21	1.12421E-24
CO_2	6.75E-11	1.18E-05	5.35125E-09
H_2O	1.50E-03	1.07E+02	0.048787814
NO	2.82E-33	3.36E-28	1.52634E-31
NO_2	3.37E-33	6.14E-28	2.79091E-31
N_2	3.04E-02	3.38E+03	1.534617849
O_2	8.09E-03	1.03E+03	0.465971203
SO_2	7.51E-34	1.91E-28	8.66034E-32
NH_3	1.25E-09	8.47E-05	3.84781E-08
HNO_3	1.77E-11	4.43E-06	2.01159E-09
HCl	0.00E+00	0.00E+00	0
HF	5.29E-29	4.19E-24	1.90421E-27

(1) All radionuclides in gaseous streams are assumed to exist as solid particulate.

Component	Aqueous Components mol/L	Lb/gal	Lb/day	Solid Components Lb/day	Total Component Lb/day	mt/day	g/sec
Total	0.00E+00	0.00E+00	0.00E+00	8.54E-02	8.54E-02	3.88326E-05	0.000449451
Ag^+	0.00E+00	0.00E+00	0.00E+00	4.75E-06	4.75E-06	2.16094E-09	2.50109E-08
Al^{+3}	0.00E+00	0.00E+00	0.00E+00	5.90E-05	5.90E-05	2.68112E-08	3.10315E-07
As^{+3}	0.00E+00	0.00E+00	0.00E+00	6.26E-02	6.26E-02	2.84504E-05	0.000329287
B^{+3}	0.00E+00	0.00E+00	0.00E+00	1.24E-04	1.24E-04	5.64027E-08	6.52809E-07
Ba^{+2}	0.00E+00	0.00E+00	0.00E+00	1.20E-05	1.20E-05	5.46423E-09	6.32435E-08
Bi^{+3}	0.00E+00	0.00E+00	0.00E+00	7.59E-06	7.59E-06	3.44922E-09	3.99216E-08
$C_2O_4^{-2}$	0.00E+00	0.00E+00	0.00E+00	1.50E-05	1.50E-05	6.81617E-09	7.88908E-08
Ca^{+2}	0.00E+00	0.00E+00	0.00E+00	3.13E-05	3.13E-05	1.42478E-08	1.64905E-07
Cd^{+2}	0.00E+00	0.00E+00	0.00E+00	1.33E-04	1.33E-04	6.06432E-08	7.01889E-07
Ce^{+3}	0.00E+00	0.00E+00	0.00E+00	1.63E-06	1.63E-06	7.40674E-10	8.57262E-09
Cl^-	0.00E+00	0.00E+00	0.00E+00	1.36E-04	1.36E-04	6.19979E-08	7.17569E-07
CO_3^{-2}	0.00E+00	0.00E+00	0.00E+00	1.25E-05	1.25E-05	5.6924E-09	6.58843E-08
Cr^{+3}	0.00E+00	0.00E+00	0.00E+00	5.16E-06	5.16E-06	2.34344E-09	2.71232E-08
Cu^{+2}	0.00E+00	0.00E+00	0.00E+00	7.29E-07	7.29E-07	3.31361E-10	3.8352E-09
F^-	0.00E+00	0.00E+00	0.00E+00	3.83E-04	3.83E-04	1.73999E-07	2.01388E-06
Fe^{+3}	0.00E+00	0.00E+00	0.00E+00	4.36E-05	4.36E-05	1.98047E-08	2.29221E-07
H^+	0.00E+00	0.00E+00	0.00E+00		0.00E+00	0	0
H_2O	0.00E+00	0.00E+00	0.00E+00		0.00E+00	0	0
Hg^{+2}	0.00E+00	0.00E+00	0.00E+00	4.80E-04	4.80E-04	2.18246E-07	2.52599E-06
K^+	0.00E+00	0.00E+00	0.00E+00	1.20E-04	1.20E-04	5.47232E-08	6.33371E-07
La^{+3}	0.00E+00	0.00E+00	0.00E+00	1.33E-05	1.33E-05	6.04603E-09	6.99772E-08
Li^+	0.00E+00	0.00E+00	0.00E+00	1.09E-05	1.09E-05	4.94088E-09	5.71861E-08
Mg^{+2}	0.00E+00	0.00E+00	0.00E+00	3.16E-06	3.16E-06	1.43449E-09	1.66028E-08
Mn^{+3}	0.00E+00	0.00E+00	0.00E+00	2.37E-05	2.37E-05	1.07555E-08	1.24485E-07
MnO_4^-	0.00E+00	0.00E+00	0.00E+00		0.00E+00	0	0
Na^+	0.00E+00	0.00E+00	0.00E+00	1.36E-04	1.36E-04	6.18195E-08	7.15504E-07
NH_4^+	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0	0
Ni^{+2}	0.00E+00	0.00E+00	0.00E+00	7.74E-06	7.74E-06	3.51693E-09	4.07052E-08
NO_2^-	0.00E+00	0.00E+00	0.00E+00	4.70E-06	4.70E-06	2.13614E-09	2.47239E-08
NO_3^-	0.00E+00	0.00E+00	0.00E+00	3.28E-05	3.28E-05	1.48937E-08	1.72381E-07
O^{-2}				2.08E-02	2.08E-02	9.43882E-06	0.000109246
OH^-	0.00E+00	0.00E+00	0.00E+00	4.06E-05	4.06E-05	1.84646E-08	2.13711E-07
$OH(b)^-$	0.00E+00	0.00E+00	0.00E+00		0.00E+00	0	0
P^{+5}				2.41E-13	2.41E-13	1.09331E-16	1.2654E-15
Pb^{+2}	0.00E+00	0.00E+00	0.00E+00	1.86E-06	1.86E-06	8.46333E-10	9.79553E-09
Pd^{+2}	0.00E+00	0.00E+00	0.00E+00	1.92E-07	1.92E-07	8.73515E-11	1.01101E-09
PO_4^{-3}	0.00E+00	0.00E+00	0.00E+00	4.79E-06	4.79E-06	2.17816E-09	2.52102E-08
S^{+6}				3.28E-13	3.28E-13	1.49011E-16	1.72467E-15
Si^{+4}				9.07E-05	9.07E-05	4.12195E-08	4.77078E-07
SiO_4^{-4}	0.00E+00	0.00E+00	0.00E+00		0.00E+00	0	0
SO_4^{-2}	0.00E+00	0.00E+00	0.00E+00	1.56E-06	1.56E-06	7.0894E-10	8.20532E-09
Sr^{+2}	0.00E+00	0.00E+00	0.00E+00	1.40E-06	1.40E-06	6.35622E-10	7.35673E-09
Ti^{+4}	0.00E+00	0.00E+00	0.00E+00	9.65E-05	9.65E-05	4.38515E-08	5.07541E-07
Zn^{+2}	0.00E+00	0.00E+00	0.00E+00	1.90E-05	1.90E-05	8.65222E-09	1.00141E-07
Zr^{+4}	0.00E+00	0.00E+00	0.00E+00	1.61E-05	1.61E-05	7.31583E-09	8.4674E-08

Rad. Component	Aqueous Rad. Components Ci/L	Ci/day	Lb/day	Solids Rad. Components (1) Ci/L	Ci/day	Lb/day	Total Rad. Components (1) Ci/L	Ci/day	Lb/day
Total	0.00E+00	0.00E+00	0.00E+00	2.59E-08	4.65E-02	1.43E-04	2.59E-08	4.65E-02	1.43E-04
^{241}Am	0	0.00E+00	0.00E+00	3.33E-11	5.99E-05	3.85E-08	3.33E-11	5.99E-05	3.85E-08
^{14}C	0.00E+00	0.00E+00	0.00E+00	1.08E-15	1.94E-09	9.59E-13	1.08E-15	1.94E-09	9.59E-13
^{60}Co	0.00E+00	0.00E+00	0.00E+00	3.70E-12	6.66E-06	1.30E-11	3.70E-12	6.66E-06	1.30E-11
^{243}Cm	0.00E+00	0.00E+00	0.00E+00	1.11E-12	1.99E-06	8.70E-11	1.11E-12	1.99E-06	8.70E-11
^{244}Cm	0.00E+00	0.00E+00	0.00E+00	8.32E-13	1.50E-06	4.07E-11	8.32E-13	1.50E-06	4.07E-11
^{137}Cs	0.00E+00	0.00E+00	0.00E+00	1.84E-08	3.31E-02	8.41E-07	1.84E-08	3.31E-02	8.41E-07
^{152}Eu	0.00E+00	0.00E+00	0.00E+00	1.93E-13	3.47E-07	4.41E-12	1.93E-13	3.47E-07	4.41E-12
^{154}Eu	0.00E+00	0.00E+00	0.00E+00	1.93E-11	3.47E-05	2.83E-10	1.93E-11	3.47E-05	2.83E-10
^{155}Eu	0.00E+00	0.00E+00	0.00E+00	1.08E-11	1.95E-05	8.83E-11	1.08E-11	1.95E-05	8.83E-11
^{3}H	0.00E+00	0.00E+00	0.00E+00	2.53E-11	4.54E-05	1.04E-11	2.53E-11	4.54E-05	1.04E-11
^{129}I	0.00E+00	0.00E+00	0.00E+00	4.12E-15	7.40E-09	9.24E-08	4.12E-15	7.40E-09	9.24E-08
^{63}Ni	0.00E+00	0.00E+00	0.00E+00	3.59E-12	6.46E-06	2.51E-10	3.59E-12	6.46E-06	2.51E-10
^{237}Np	0.00E+00	0.00E+00	0.00E+00	2.74E-14	4.92E-08	1.54E-07	2.74E-14	4.92E-08	1.54E-07
^{238}Pu	0.00E+00	0.00E+00	0.00E+00	1.30E-13	2.33E-07	3.00E-11	1.30E-13	2.33E-07	3.00E-11

^{239}Pu	0.00E+00	0.00E+00	0.00E+00	1.15E-12	2.06E-06	7.33E-08	1.15E-12	2.06E-06	7.33E-08
^{240}Pu	0.00E+00	0.00E+00	0.00E+00	6.29E-14	1.13E-07	1.10E-09	6.29E-14	1.13E-07	1.10E-09
^{241}Pu	0.00E+00	0.00E+00	0.00E+00	8.14E-12	1.46E-05	3.13E-10	8.14E-12	1.46E-05	3.13E-10
^{125}Sb	0.00E+00	0.00E+00	0.00E+00	2.19E-11	3.94E-05	8.37E-11	2.19E-11	3.94E-05	8.37E-11
^{151}Sm	0.00E+00	0.00E+00	0.00E+00	4.00E-11	7.19E-05	6.02E-09	4.00E-11	7.19E-05	6.02E-09
^{126}Sn	0.00E+00	0.00E+00	0.00E+00	5.73E-14	1.03E-07	2.00E-08	5.73E-14	1.03E-07	2.00E-08
^{90}Sr	0.00E+00	0.00E+00	0.00E+00	6.74E-09	1.21E-02	1.93E-07	6.74E-09	1.21E-02	1.93E-07
^{99}Tc	0.00E+00	0.00E+00	0.00E+00	5.21E-10	9.35E-04	1.22E-04	5.21E-10	9.35E-04	1.22E-04
^{232}Th	0.00E+00	0.00E+00	0.00E+00	2.97E-16	5.34E-10	1.07E-05	2.97E-16	5.34E-10	1.07E-05
^{233}U	0.00E+00	0.00E+00	0.00E+00	4.58E-16	8.23E-10	1.88E-10	4.58E-16	8.23E-10	1.88E-10
^{234}U	0.00E+00	0.00E+00	0.00E+00	1.28E-15	2.31E-09	8.19E-10	1.28E-15	2.31E-09	8.19E-10
^{235}U	0.00E+00	0.00E+00	0.00E+00	9.53E-17	1.71E-10	1.75E-07	9.53E-17	1.71E-10	1.75E-07
^{236}U	0.00E+00	0.00E+00	0.00E+00	4.61E-17	8.29E-11	2.83E-09	4.61E-17	8.29E-11	2.83E-09
^{238}U	0.00E+00	0.00E+00	0.00E+00	7.35E-16	1.32E-09	8.67E-06	7.35E-16	1.32E-09	8.67E-06

Component (CAS)	Organic Components mol/L	Lb/gal	Lb/day	Mt/day	g/sec
Total	3.52E-08	4.27E-08	2.91E-02	1.32403E-05	0.000153244
57-14-7	7.27E-09	3.64688E-09	1.73E-03	7.86908E-07	9.10773E-06
58-90-2	1.50E-09	2.90709E-09	1.38E-03	6.2728E-07	7.26019E-06
58-89-9	1.02E-11	2.475E-11	1.17E-05	5.34046E-09	6.18109E-08
71-43-2	2.06E-14	1.34355E-14	6.38E-09	2.89906E-12	3.35539E-11
75-69-4	0.00E+00	0	0.00E+00	0	0
75-05-8	5.11E-09	1.75204E-09	8.32E-04	3.78049E-07	4.37557E-06
76-44-8	5.54E-12	1.72746E-11	8.20E-06	3.72744E-09	4.31417E-08
79-01-6	1.05E-15	1.1533E-15	5.47E-10	2.48854E-13	2.88026E-12
80-62-6	0.00E+00	0	0.00E+00	0	0
84-74-2	1.38E-09	3.2029E-09	1.52E-03	6.91109E-07	7.99894E-06
84-66-2	1.85E-10	3.42541E-10	1.63E-04	7.39121E-08	8.55464E-07
87-86-5	6.70E-12	1.48868E-11	7.07E-06	3.21222E-09	3.71785E-08
87-68-3	4.26E-16	9.26676E-16	4.40E-10	1.99954E-13	2.31429E-12
87-61-6	0.00E+00	0	0.00E+00	0	0
88-85-7	5.87E-10	1.17627E-09	5.58E-04	2.53812E-07	2.93764E-06
91-57-6	0.00E+00	0	0.00E+00	0	0
91-20-3	1.01E-11	1.0829E-11	5.14E-06	2.33663E-09	2.70444E-08
95-94-3	0.00E+00	0	0.00E+00	0	0
98-86-2	3.22E-09	3.24239E-09	1.54E-03	6.99629E-07	8.09756E-06
99-87-6	0.00E+00	0	0.00E+00	0	0
100-51-6	0.00E+00	0	0.00E+00	0	0
107-21-1	0.00E+00	0	0.00E+00	0	0
108-95-2	2.52E-10	1.98015E-10	9.40E-05	4.27269E-08	4.94524E-07
108-88-3	8.14E-15	6.26197E-15	2.97E-09	1.35118E-12	1.56387E-11
120-82-1	1.57E-12	2.37121E-12	1.13E-06	5.1165E-10	5.92188E-09
122-66-7	0.00E+00	0	0.00E+00	0	0
122-39-4	2.20E-10	3.10169E-10	1.47E-04	6.6927E-08	7.74618E-07
129-00-0	8.25E-09	1.39178E-08	6.61E-03	3.00312E-06	3.47584E-05
131-11-3	0.00E+00	0	0.00E+00	0	0
132-64-9	1.06E-09	1.49319E-09	7.09E-04	3.22195E-07	3.72911E-06
156-59-2	0.00E+00	0	0.00E+00	0	0
218-01-9	3.84E-09	7.32438E-09	3.48E-03	1.58043E-06	1.8292E-05
309-00-2	1.17E-10	3.55647E-10	1.69E-04	7.67401E-08	8.88196E-07
319-85-7	1.38E-12	3.35191E-12	1.59E-06	7.23261E-10	8.37108E-09
534-52-1	0.00E+00	0	0.00E+00	0	0
603-34-9	9.88E-10	2.02315E-09	9.60E-04	4.36548E-07	5.05263E-06
4170-30-3	1.17E-09	6.83487E-10	3.24E-04	1.4748E-07	1.70694E-06
10061-01-5	2.54E-13	2.35372E-13	1.12E-07	5.07877E-11	5.87821E-10
23950-58-5	0.00E+00	0	0.00E+00	0	0
38380-08-4	1.09E-11	3.27578E-11	1.56E-05	7.06835E-09	8.18096E-08
100-21-0	4.50E-15	6.23421E-15	2.96E-09	1.34519E-12	1.55694E-11
106-93-4	7.05E-11	1.10524E-10	5.25E-05	2.38484E-08	2.76023E-07
106-97-8	0.00E+00	0	0.00E+00	0	0
106-99-0	0.00E+00	0	0.00E+00	0	0
108-87-2	0.00E+00	0	0.00E+00	0	0
110-54-3	0.00E+00	0	0.00E+00	0	0
110-82-7	0.00E+00	0	0.00E+00	0	0
111-84-2	0.00E+00	0	0.00E+00	0	0
118-74-1	5.23E-14	1.24309E-13	5.90E-08	2.68229E-11	3.1045E-10
120-12-7	3.68E-09	5.47086E-09	2.60E-03	1.18048E-06	1.3663E-05
127-18-4	5.48E-17	7.58534E-17	3.60E-11	1.63673E-14	1.89437E-13
1336-36-3	2.91E-09	7.81687E-09	3.71E-03	1.68669E-06	1.95219E-05
144-62-7	1.23E-14	9.2634E-15	4.40E-09	1.99882E-12	2.31345E-11
208-96-8	2.78E-09	3.52504E-09	1.67E-03	7.6062E-07	8.80347E-06
50-32-8	6.15E-12	1.29555E-11	6.15E-06	2.79548E-09	3.23551E-08
56-23-5	3.46E-23	4.44641E-23	2.11E-17	9.59428E-21	1.11045E-19
60-35-5	3.03E-12	1.49446E-12	7.09E-07	3.22469E-10	3.73228E-09
60-57-1	2.66E-11	8.46536E-11	4.02E-05	1.82662E-08	2.11415E-07
62-75-9	2.57E-09	1.58969E-09	7.55E-04	3.43017E-07	3.97011E-06
75-12-7	2.25E-12	8.4558E-13	4.01E-07	1.82456E-10	2.11176E-09
76-15-3	2.63E-32	3.39551E-32	1.61E-26	7.32668E-30	8.47996E-29
8001-35-2	1.90E-11	6.56221E-11	3.12E-05	1.41597E-08	1.63885E-07
88-89-1	2.39E-14	4.56575E-14	2.17E-08	9.85179E-12	1.14025E-10
126-73-8	4.13E-11	9.18511E-11	4.36E-05	1.98193E-08	2.2939E-07

Component	Aqueous Components mol/L	Lb/gal	Lb/day	Solid Components Lb/day	Total Component Lb/day	Mt/day	g/sec
$C_2O_4^{-2}$	0.00E+00	0.00E+00	0.00E+00	1.50E-05	1.50E-05	6.81617E-09	7.88908E-08
Formate	0.00E+00	0.00E+00	0.00E+00	2.78E-07	2.78E-07	1.26319E-10	1.46202E-09
Acetate	0.00E+00	0.00E+00	0.00E+00	1.84E-12	1.84E-12	8.369E-16	9.68634E-15
Glycolate	0.00E+00	0.00E+00	0.00E+00	1.50E-07	1.50E-07	6.83345E-11	7.90909E-10
IDA	0.00E+00	0.00E+00	0.00E+00	6.80E-09	6.80E-09	3.08988E-12	3.57625E-11
Citrate	0.00E+00	0.00E+00	0.00E+00	2.70E-07	2.70E-07	1.22885E-10	1.42228E-09
HEDTA	0.00E+00	0.00E+00	0.00E+00	1.91E-07	1.91E-07	8.66952E-11	1.00342E-09
EDTA	0.00E+00	0.00E+00	0.00E+00	3.44E-09	3.44E-09	1.56345E-12	1.80955E-11

Appendix B Calculations

CALCULATION SHEET

BY: E. Berríos
DATE: 05/21/03

PROJECT: WTP
JOB NO.: 24590
CALC NO.: 24590-WTP-M4C-FRP-00005
SHEET REV: A
SHEET NO.: 77

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P
1	**Table B-1 Feed Rate**		Feed rate:	0.871	ft3/min											
2				24.66411	l/min											
3																
4								Feed Rate								
5	CAS #	COPC	Conc (mg/L)	In ACM	Group	Grouping	Phase	g/sec								
6	100-00-5	p-Nitrochlorobenzene	84.8	No		10	vapor	3.49E-02		Coplanar PCBs		PVP01				
7	100-21-0	p-Phthalic acid	84.8	Yes	1	1	vapor	3.49E-02				g/sec				
8	100-25-4	1,4-Dinitrobenzene	84.8	No		6	particle	3.49E-02		31508-00-6	2,3',4,4',5-Pentachlorobiphenyl (PBC 118)	8.72E-06				
9	100-41-4	Ethyl benzene	18.7	No		20	vapor	7.67E-03		32598-13-3	3,3',4,4'-Tetrachlorobiphenyl (TCB)	8.72E-06		Correction for Coplanar PCBs		
10	100-42-5	Styrene	18.7	No		19	vapor	7.67E-03		32598-14-4	2,3,3',4,4'-Pentachlorobiphenyl (PCB 105)	8.72E-06		0.99	as parent	
11	10061-01-5	cis-1,3-Dichloropropene	18.7	Yes	19	19	vapor	7.67E-03		32774-16-6	3,3',4,4',5,5'-Hexachlorobiphenyl	8.72E-06		0.01	as coplanar sum	
12	10061-02-6	trans-1,3-Dichloropropene	18.7	No		17	vapor	7.67E-03		35065-29-3	2,2',3,4,4',5,5'-Heptachlorobiphenyl	8.72E-06				
13	101-55-3	4-Bromophenylphenyl ether	84.8	No		14	vapor	3.49E-02		35065-30-6	2,2',3,3',4,4',5-Heptachlorobiphenyl	8.72E-06				
14	101-84-8	Diphenyl ether	18.7	No		16	vapor	7.67E-03		38380-08-4	2,3,3',4,4',5-Hexachlorobiphenyl (PCB 157)	8.72E-06				
15	106-35-4	3-Heptanone	18.7	No		14	vapor	7.67E-03		39635-31-9	2,3,3',4,4',5,5'-Heptachlorobiphenyl	8.72E-06				
16	106-42-3	p-Xylene (Dimethyl benzene)	18.7	No		19	vapor	7.67E-03		52663-72-6	2,3',4,4',5,5'-Hexachlorobiphenyl	8.72E-06				
17	106-46-7	1,4-Dichlorobenzene	18.7	No		18	vapor	7.67E-03		57465-28-8	3,3',4,4',5-Pentachlorobiphenyl	8.72E-06				
18	106-88-7	1,2-Epoxybutane	18.7	No		15	vapor	7.67E-03		65510-44-3	2',3,4,4',5-Pentachlorobiphenyl	8.72E-06				
19	106-93-4	Ethylene dibromide (Dibromethane)	84.8	Yes	16	16	vapor	3.49E-02		69782-90-7	2,3,3',4,4',5'-Hexachlorobiphenyl	8.72E-06				
20	106-97-8	Butane	18.7	Yes	26	26	vapor	7.67E-03		70362-50-4	3,4,4',5-Tetrachlorobiphenyl	8.72E-06				
21	106-99-0	1,3-Butadiene	18.7	Yes	23	23	vapor	7.67E-03		74472-37-0	2,3,4,4',5-Pentachlorobiphenyl	8.72E-06				
22	107-02-8	Acrolein	18.7	No		14	vapor	7.67E-03								
23	107-05-1	3-Chloropropene (Allyl chloride)	18.7	No		20	vapor	7.67E-03		1336-36-3	Polychlorinated biphenyls (PCBs)	1.21E-02				
24	107-06-2	1,2-Dichloroethane (Ethylene chloride)	18.7	No		17	vapor	7.67E-03		1336-36-3	UnCorrected (for coplanar PCBs)	1.22E-02				
25	107-12-0	Propionitrile	18.7	No		13	vapor	7.67E-03								
26	107-13-1	Acrylonitrile	18.7	No		14	vapor	7.67E-03								
27	107-18-6	2-Propene-1-ol	84.8	No		10	vapor	3.49E-02								
28	107-31-3	Formic acid, methyl ester	84.8	No		15	vapor	3.49E-02								
29	107-66-4	Dibutylphosphate	84.8	No		5	particle	3.49E-02								
30	107-87-9	2-Pentanone	18.7	No		14	vapor	7.67E-03								
31	108-03-2	1-Nitropropane	84.8	No		14	vapor	3.49E-02								
32	108-05-4	Vinyl acetate	84.8	No		16	vapor	3.49E-02								
33	108-10-1	Hexone (4-Methyl-2-pentanone or MIBK)	18.7	No		14	vapor	7.67E-03								
34	108-20-3	Bis(isopropyl)ether	18.7	No		18	vapor	7.67E-03								
35	108-38-3	m-Xylene (Dimethyl benzene)	18.7	No		19	vapor	7.67E-03								
36	108-39-4	m-Cresol	18.7	No		9	vapor	7.67E-03								
37	108-87-2	Methylcyclohexane	18.7	Yes	25	25	vapor	7.67E-03								
38	108-88-3	Toluene	18.7	Yes	19	19	vapor	7.67E-03								
39	108-90-7	Chlorobenzene	18.7	No		19	vapor	7.67E-03								
40	108-93-0	Cyclohexanol	18.7	No		10	vapor	7.67E-03								
41	108-94-1	Cyclohexanone	18.7	No		11	vapor	7.67E-03								
42	108-95-2	Phenol	84.8	Yes	8	8	vapor	3.49E-02								
43	109-66-0	n-Pentane	18.7	No		26	vapor	7.67E-03								
44	109-99-9	Tetrahydrofuran	39.6	No		13	vapor	1.63E-02								
45	110-12-3	5-Methyl-2-hexanone	18.7	No		15	vapor	7.67E-03								
46	110-43-0	2-Heptanone	18.7	No		15	vapor	7.67E-03								
47	110-54-3	n-Hexane	18.7	Yes	27	27	vapor	7.67E-03								
48	110-62-3	n-Valeraldehyde	84.8	No		15	vapor	3.49E-02								
49	110-82-7	Cyclohexane	18.7	Yes	24	24	vapor	7.67E-03								
50	110-83-8	Cyclohexene	18.7	No		22	vapor	7.67E-03								
51	110-86-1	Pyridine	84.8	No		11	vapor	3.49E-02								
52	111-65-9	n-Octane	18.7	No		28	vapor	7.67E-03								
53	111-76-2	Ethylene glycol monobutyl ether	84.8	No		9	vapor	3.49E-02								
54	111-84-2	n-Nonane	18.7	Yes	28	28	vapor	7.67E-03								
55	117-81-7	Bis(2-ethylhexyl)phthalate (DEHP)	84.8	No		30	particle	3.49E-02								
56	117-84-0	n-Dioctyl phthalate	84.8	No		32	particle	3.49E-02								
57	118-74-1	Hexachlorobenzene	1.8	Yes	18	18	vapor	7.21E-04								
58	120-12-7	Anthracene	84.8	Yes	13	13	vapor	3.49E-02								
59	120-82-1	1,2,4-Trichlorobenzene	18.7	Yes	17	17	vapor	7.67E-03								
60	120-83-2	2,4-Dichlorophenol	84.8	No		10	vapor	3.49E-02								
61	121-44-8	Triethylamine	18.7	No		15	vapor	7.67E-03								
62	121-69-7	Dimethylaniline	18.7	No		13	vapor	7.67E-03								
63	122-39-4	N,N-Diphenylamine	18.7	Yes	10	10	vapor	7.67E-03								
64	123-19-3	4-Heptanone	18.7	No		13	vapor	7.67E-03								
65	123-38-6	n-Propionaldehyde	18.7	No		14	vapor	7.67E-03								
66	123-51-3	3-Methyl-1-butanol	18.7	No		12	vapor	7.67E-03								
67	123-86-4	Acetic acid n-butyl ester	84.8	No		16	vapor	3.49E-02								
68	123-91-1	1,4-Dioxane	50.9	No		10	vapor	2.09E-02								
69	126-73-8	Tributyl phosphate	84.8	Yes	7	7	vapor	3.49E-02								
70	126-98-7	2-Methyl-2-propenenitrile (Methacrylonitrile)	18.7	No		16	vapor	7.67E-03								
71	127-18-4	Perchloroethylene (tetrachloroethylene)	18.7	Yes	21	21	vapor	7.67E-03								
72	127-19-5	N,N-Dimethylacetamide	18.7	No		5	vapor	7.67E-03								
73	128-37-0	2,6-Bis(tert-butyl)-4-methylphenol	84.8	No		32	vapor	3.49E-02								
74	129-00-0	Pyrene	84.8	Yes	33	33	particle	3.49E-02								
75	1321-64-8	Pentachloronaphthalene	84.8	No		14	particle	3.49E-02								
76	1321-65-9	Trichloronaphthalene	84.8	No		15	vapor	3.49E-02								
77	132-64-9	Dibenzofuran	84.8	Yes	15	15	vapor	3.49E-02								
78	1335-87-1	Hexachloronaphthalene	84.8	No		14	particle	3.49E-02								
79	1335-88-2	Tetrachloronaphthalene	84.8	No		15	particle	3.49E-02								
80	1336-36-3	Polychlorinated biphenyls (PCBs)	29.4	Yes	35	35	particle	1.21E-02								
81	141-78-6	Acetic acid ethyl ester (Ethyl acetate)	84.8	No		14	vapor	3.49E-02								
82	141-79-7	4-Methyl-3-penten-2-one	84.8	No		13	vapor	3.49E-02								
83	142-82-5	n-Heptane	18.7	No		27	vapor	7.67E-03								
84	144-62-7	Oxalic acid	8.5	Yes	3	3	vapor	3.49E-03								
85	156-60-5	trans-1,2-Dichloroethylene	18.7	No		20	vapor	7.67E-03								
86	1582-09-8	Trifluralin	84.8	No		14	particle	3.49E-02								
87	1634-04-4	Methyl tert-butyl ether	18.7	No		16	vapor	7.67E-03								
88	1836-75-5	Nitrofen	84.8	No		30	particle	3.49E-02								
89	189-55-9	Dibenzo[a,i]pyrene	84.8	No		5	particle	3.49E-02								
90	189-64-0	Dibenzo[a,h]pyrene	84.8	No		5	particle	3.49E-02								
91	191-24-2	Benzo(g,h,i)perylene	84.8	No		30	particle	3.49E-02								
92	191-30-0	Benzo[a,l]pyrene	84.8	No		5	particle	3.49E-02								
93	192-65-4	Dibenzo[a,e]pyrene	84.8	No		5	particle	3.49E-02								
94	193-39-5	Indeno(1,2,3-cd)pyrene	84.8	No		30	particle	3.49E-02								
95	205-82-3	Benzo(j)fluoranthene	84.8	No		7	particle	3.49E-02								
96	205-99-2	Benzo(b)fluoranthene	84.8	No		30	particle	3.49E-02								
97	206-44-0	Fluoranthene	84.8	No		33	particle	3.49E-02								
98	207-08-9	Benzo(k)fluoranthene	84.8	No		30	particle	3.49E-02								
99	208-96-8	Acenaphthylene	84.8	Yes	14	14	vapor	3.49E-02								
100	218-01-9	Chrysene	84.8	Yes	32	32	particle	3.49E-02								
101	2234-13-1	Octachloronaphthalene	84.8	No		14	particle	3.49E-02								
102	224-42-0	Dibenz[a,j]acridine	84.8	No		4	particle	3.49E-02								
103	226-36-8	Dibenz[a,h]acridine	84.8	No		4	particle	3.49E-02								
104	2385-85-5	Mirex	84.8	No		17	vapor	3.49E-02								
105	25551-13-7	Trimethyl benzene	18.7	No		19	vapor	7.67E-03								
106	26140-60-3	Terphenyls	84.8	No		34	particle	3.49E-02								
107	27154-33-2	Trichlorofluoroethane	18.7	No		23	vapor	7.67E-03								
108	287-92-3	Cyclopentane	18.7	No		24	vapor	7.67E-03								
109	309-00-2	Aldrin	1.0	Yes	34	34	particle	4.30E-04								
110	319-84-6	Hexachlorocyclohexane (Lindane) Alpha BHC	0.3	No		33	vapor	1.16E-04								
111	319-85-7	Hexachlorocyclohexane (Lindane) Beta BHC	0.3	Yes	30	30	particle	1.16E-04								
112	319-86-8	Delta-BHC	0.3	No		30	particle	1.16E-04								
113	3697-24-3	5-Methylchrysene	84.8	No		32	particle	3.49E-02								
114	3825-26-1	Ammonium perfluorooctanoate	84.8	No		14	particle	3.49E-02								
115	4170-30-3	2-Butenaldehyde (2-Butenal or Crotonaldehyde)	18.7	Yes	11	11	vapor	7.67E-03								
116	465-73-6	Isodrin	0.6	No		35	vapor	2.32E-04								
117	50-00-0	Formaldehyde	18.7	No		8	vapor	7.67E-03								
118	50-29-3	4,4-DDT	0.6	No		33	particle	2.32E-04								
119	50-32-8	Benzo(a)pyrene	1.1	Yes	30	30	particle	4.42E-04								
120	53-70-3	Dibenzo(a,h)anthracene	0.1	No		7	particle	5.81E-05								
121	540-59-0	1,2-Dichloroethylene	18.7	No		19	vapor	7.67E-03								
122	540-84-1	2,2,4-Trimethylpentane	18.7	No		28	vapor	7.67E-03								
123	541-73-1	1,3-Dichlorobenzene	18.7	No		19	vapor	7.67E-03								
124	56-23-5	Carbon tetrachloride	18.7	Yes	22	22	vapor	7.67E-03								
125	563-80-4	3-Methyl-2-butanone	18.7	No		14	vapor	7.67E-03								
126	56-49-5	3-Methylcholanthrene	84.8	No		28	particle	3.49E-02								
127	56-55-3	Benzo(a)anthracene	84.8	No		33	particle	3.49E-02								
128	57-14-7	1,1-Dimethylhydrazine	84.8	Yes	12	12	vapor	3.49E-02								
129	58-89-9	gamma-BHC (Lindane)	0.3	Yes	32	32	particle	1.16E-04								
130	58-90-2	2,3,4,6-Tetrachlorophenol	84.8	Yes	11	11	vapor	3.49E-02								
131	591-78-6	2-Hexanone	18.7	No		14	vapor	7.67E-03								
132	59-50-7	4-Chloro-3-methylphenol	84.8	No		32	particle	3.49E-02								
133	59-89-2	N-Nitrosomorpholine	84.8	No		6	vapor	3.49E-02								
134	602-87-9	5-Nitroacenaphthene	84.8	No		9	particle	3.49E-02								
135	60-29-7	Ethyl ether	84.8	No		17	vapor	3.49E-02								
136	603-34-9	Triphenylamine	84.8	Yes	32	32	vapor	3.49E-02								
137	60-34-4	Methylhydrazine	18.7	No		10	vapor	7.67E-03								
138	60-35-5	Acetamide	18.7	Yes	5	5	vapor	7.67E-03								
139	60-57-1	Dieldrin	0.6	Yes	33	33	particle	2.32E-04								
140	621-64-7	Di-n-Propylnitrosamine (N-Nitroso-di-n-propylamine)	84.8	No		10	vapor	3.49E-02								
141	624-83-9	Methyl isocyanate	18.7	No		17	vapor	7.67E-03								
142	627-13-4	Nitric acid, propyl ester	84.8	No		17	vapor	3.49E-02								
143	62-75-9	N-Nitroso-N,N-dimethylamine (Dimethylnitrosamine)	158.4	Yes	9	9	vapor	6.51E-02								
144	630-20-6	1,1,1,2-Tetrachloroethane	18.7	No		18	vapor	7.67E-03								
145	64-17-5	Ethyl alcohol	18.7	No		10	vapor	7.67E-03								
146	64-18-6	Formic acid	84.8	No		7	vapor	3.49E-02								
147	64-19-7	Acetic acid	84.8	No		6	vapor	3.49E-02								
148	67-56-1	Methyl alcohol (Methanol)	18.7	No		10	vapor	7.67E-03								
149	67-63-0	2-Propyl alcohol (Isopropanol; Propan-2-01)	18.7	No		11	vapor	7.67E-03								
150	67-64-1	2-Propanone (Acetone)	101.8	No		13	vapor	4.18E-02								
151	67-66-3	Chloroform	18.7	No		19	vapor	7.67E-03								

CALCULATION SHEET

BY: E. Berrios
DATE: 05/21/03

PROJECT: WTP
JOB NO.: 24590
CALC NO.: 24590-WTP-M4C-FRP-00005
SHEET REV: A
SHEET NO.: 78

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P
4								Feed Rate								
5	CAS #	COPC	Conc (mg/L)	In ACM	Group	Grouping	Phase	g/sec								
152	67-72-1	Hexachloroethane	84.8	No		19	vapor	3.49E-02								
153	684-16-2	Hexafluoroacetone	18.7	No		19	vapor	7.67E-03								
154	71-23-8	n-Propyl alcohol	18.7	No		11	vapor	7.67E-03								
155	71-36-3	n-Butyl alcohol	18.7	No		11	vapor	7.67E-03								
156	71-43-2	Benzene	18.7	Yes	19	19	vapor	7.67E-03								
157	71-55-6	Methyl chloroform (1,1,1-Trichloroethane)	18.7	No		21	vapor	7.67E-03								
158	72-20-8	Endrin	0.6	No		32	particle	2.32E-04								
159	72-43-5	Methoxychlor	2.8	No		7	particle	1.16E-03								
160	72-54-8	4,4-DDD	0.6	No		32	particle	2.32E-04								
161	72-55-9	4,4-DDE	0.6	No		34	particle	2.32E-04								
162	74-83-9	Bromomethane (Methyl bromide)	18.7	No		19	vapor	7.67E-03								
163	74-87-3	Chloromethane (Methyl chloride)	18.7	No		20	vapor	7.67E-03								
164	74-97-5	Bromochloromethane	18.7	No		17	vapor	7.67E-03								
165	74-99-7	Methylacetylene	84.8	No		20	vapor	3.49E-02								
166	75-00-3	Chloroethane	18.7	No		20	vapor	7.67E-03								
167	75-01-4	Vinyl chloride (1-Chloroethene)	84.8	No		22	vapor	3.49E-02								
168	75-05-8	Acetonitrile	26.6	Yes	13	13	vapor	1.09E-02								
169	75-07-0	Acetaldehyde	84.8	No		13	vapor	3.49E-02								
170	75-09-2	Dichloromethane (Methylene chloride)	18.7	No		19	vapor	7.67E-03								
171	75-12-7	Formamide	84.8	Yes	4	4	vapor	3.49E-02								
172	75-15-0	Carbon disulfide	18.7	No		20	vapor	7.67E-03								
173	75-21-8	Ethylene oxide (Oxirane)	18.7	No		15	vapor	7.67E-03								
174	75-27-4	Bromodichloromethane	18.7	No		18	vapor	7.67E-03								
175	75-34-3	1,1-Dichloroethane	18.7	No		19	vapor	7.67E-03								
176	75-35-4	1,1-Dichloroethene (Vinylidene chloride)	18.7	No		22	vapor	7.67E-03								
177	75-43-4	Dichlorofluoromethane	18.7	No		20	vapor	7.67E-03								
178	75-45-6	Chlorodifluoromethane	18.7	No		22	vapor	7.67E-03								
179	75-50-3	Trimethylamine	18.7	No		14	vapor	7.67E-03								
180	75-52-5	Nitromethane	84.8	No		13	vapor	3.49E-02								
181	75-55-8	2-Methylaziridine	84.8	No		11	vapor	3.49E-02								
182	75-61-6	Difluorodibromomethane	18.7	No		22	vapor	7.67E-03								
183	75-63-8	Trifluorobromomethane	18.7	No		25	vapor	7.67E-03								
184	75-65-0	2-Methyl-2-propanol	18.7	No		11	vapor	7.67E-03								
185	75-69-4	Trichlorofluoromethane	18.7	No		23	vapor	7.67E-03								
186	75-71-8	Dichlorodifluoromethane	18.7	No		25	vapor	7.67E-03								
187	75-99-0	2,2-Dichloropropionic acid	84.8	No		6	vapor	3.49E-02								
188	76-03-9	Trichloroacetic acid	18.7	No		5	vapor	7.67E-03								
189	76-11-9	1,1,1,2-Tetrachloro-2,2-difluoroethane	84.8	No		24	vapor	3.49E-02								
190	76-12-0	1,1,2,2-Tetrachloro-1,2-difluoroethane	84.8	No		23	vapor	3.49E-02								
191	76-13-1	1,2,2-Trichloro-1,1,2-trifluoroethane (Freon 113)	18.7	No		25	vapor	7.67E-03								
192	76-14-2	1,2-Dichloro-1,1,2,2-tetrafluoroethane	18.7	No		28	vapor	7.67E-03								
193	76-15-3	Chloropentafluoroethane	18.7	Yes	29	29	vapor	7.67E-03								
194	76-44-8	Heptachlor	1.8	Yes	16	16	vapor	7.56E-04								
195	78-83-1	2-Methylpropyl alcohol (Isobutyl alcohol)	84.8	No		11	vapor	3.49E-02								
196	78-87-5	1,2-Dichloropropane	18.7	No		19	vapor	7.67E-03								
197	78-92-2	1-Methylpropyl alcohol (2-Butanol)	18.7	No		11	vapor	7.67E-03								
198	78-93-3	Methyl ethyl ketone (MEK, 2-Butanone)	18.7	No		13	vapor	7.67E-03								
199	79-00-5	1,1,2-Trichloroethane	18.7	No		17	vapor	7.67E-03								
200	79-01-6	Trichloroethylene	18.7	Yes	20	20	vapor	7.67E-03								
201	79-09-4	Propionic acid	84.8	No		8	vapor	3.49E-02								
202	79-10-7	2-Propenoic acid	84.8	No		8	vapor	3.49E-02								
203	79-20-9	Methyl acetate	84.8	No		14	vapor	3.49E-02								
204	79-34-5	1,1,2,2-Tetrachloroethane	18.7	No		16	vapor	7.67E-03								
205	8001-35-2	Toxaphene	0.7	Yes	10	10	particle	2.67E-04								
206	82-68-8	Pentachloronitrobenzene (PCBN or quintobenzene)	84.8	No		13	vapor	3.49E-02								
207	83-32-9	Acenaphthene	84.8	No		15	vapor	3.49E-02								
208	84-66-2	Diethyl phthalate	84.8	Yes	8	8	vapor	3.49E-02								
209	84-74-2	Dibutyl phthalate	84.8	Yes	31	31	particle	3.49E-02								
210	85-01-8	Phenanthrene	84.8	No		13	vapor	3.49E-02								
211	85-68-7	Butylbenzyl phthalate	84.8	No		31	particle	3.49E-02								
212	86-73-7	Fluorene	84.8	No		14	particle	3.49E-02								
213	87-68-3	Hexachlorobutadiene	18.7	Yes	20	20	vapor	7.67E-03								
214	87-86-5	Pentachlorophenol	84.8	Yes	6	6	vapor	3.49E-02								
215	88-06-2	2,4,6-Trichlorophenol	84.8	No		10	vapor	3.49E-02								
216	88-72-2	2-Nitrotoluene	18.7	No		12	vapor	7.67E-03								
217	88-75-5	2-Nitrophenol	84.8	No		12	vapor	3.49E-02								
218	88-85-7	2-sec-Butyl-4,6-dinitrophenol (Dinoseb)	84.8	Yes	8	8	particle	3.49E-02								
219	88-89-1	Picric acid	84.8	Yes	2	2	particle	3.49E-02								
220	91-20-3	Naphthalene	2.8	Yes	16	16	vapor	1.16E-03								
221	91-22-5	Quinoline	84.8	No		9	vapor	3.49E-02								
222	91-58-7	2-Chloronapthalene	84.8	No		16	vapor	3.49E-02								
223	92-52-4	1,1`-Biphenyl	84.8	No		16	vapor	3.49E-02								
224	92-93-3	4-Nitrobiphenyl	84.8	No		10	particle	3.49E-02								
225	93-72-1	Silvex (2,4,5-TP)	84.8	No		5	particle	3.49E-02								
226	93-76-5	2,4,5-T	84.8	No		5	particle	3.49E-02								
227	94-75-7	2,4-D and esters (160C typed)	84.8	No		6	vapor	3.49E-02								
228	95-13-6	Indene	84.8	No		18	vapor	3.49E-02								
229	95-47-6	o-Xylene	18.7	No		19	vapor	7.67E-03								
230	95-48-7	o-Cresol (2-Methylphenol)	18.7	No		9	vapor	7.67E-03								
231	95-49-8	2-Chlorotoluene	84.8	No		19	vapor	3.49E-02								
232	95-50-1	o-Dichlorobenzene (1,2-Dichlorobenzene)	18.7	No		18	vapor	7.67E-03								
233	95-57-8	2-Chlorophenol	84.8	No		11	vapor	3.49E-02								
234	95-95-4	2,4,5-Trichlorophenol	84.8	No		9	vapor	3.49E-02								
235	96-22-0	3-Pentanone	18.7	No		14	vapor	7.67E-03								
236	96-69-5	Bis(3-tert-butyl-4-hydroxy-6-methyl-phenyl)sulfide	84.8	No		19	particle	3.49E-02								
237	98-51-1	p-tert-Butyltoluene	84.8	No		21	vapor	3.49E-02								
238	98-82-8	Cumene	84.8	No		20	vapor	3.49E-02								
239	98-83-9	alpha-Methylstyrene	18.7	No		19	vapor	7.67E-03								
240	98-86-2	Acetophenone	84.8	Yes	11	11	vapor	3.49E-02								
241	98-95-3	Nitrobenzene	84.8	No		12	vapor	3.49E-02								

CALCULATION SHEET

BY: E. Berrios
DATE: 05/21/03

PROJECT: WTP
JOB NO.: 24590
CALC NO.: 24590-WTP-M4C-FRP-00005
SHEET REV: A
SHEET NO.: 79

Table B-2 PVP01 - Unabated Pretreatment Vessel Vent System

	CAS #	COPC	Feed Rate g/sec	In ACM	Group	Grouping	Phase	PVP01 rate g/sec	Performance Factor	Adjusted PF	Calc'd PVP01 rate g/sec
4	100-00-5	p-Nitrochlorobenzene	3.49E-02	No		10	vapor			6.66E-02	2.32E-03
5	100-21-0	p-Phthalic acid	3.49E-02	Yes	1	1	vapor	3.05E-08	8.73E-07		3.05E-08
6	100-25-4	1,4-Dinitrobenzene	3.49E-02	No		6	particle			6.16E-04	2.15E-05
7	100-41-4	Ethyl benzene	7.67E-03	No		20	vapor			1.00E+00	7.69E-03
8	100-42-5	Styrene	7.67E-03	No		19	vapor			1.00E+00	7.70E-03
9	10061-01-5	cis-1,3-Dichloropropene	7.67E-03	Yes	19	19	vapor	7.72E-03	1.01E+00		7.72E-03
10	10061-02-6	trans-1,3-Dichloropropene	7.67E-03	No		17	vapor			9.99E-01	7.66E-03
11	101-55-3	4-Bromophenylphenyl ether	3.49E-02	No		14	vapor			6.92E-01	2.41E-02
12	101-84-8	Diphenyl ether	7.67E-03	No		16	vapor			9.37E-01	7.19E-03
13	106-35-4	3-Heptanone	7.67E-03	No		14	vapor			6.92E-01	5.31E-03
14	106-42-3	p-Xylene (Dimethyl benzene)	7.67E-03	No		19	vapor			1.00E+00	7.70E-03
15	106-46-7	1,4-Dichlorobenzene	7.67E-03	No		18	vapor			1.02E+00	7.86E-03
16	106-88-7	1,2-Epoxybutane	7.67E-03	No		15	vapor			8.52E-01	6.54E-03
17	106-93-4	Ethylene dibromide (Dibromethane)	3.49E-02	Yes	16	16	vapor	3.41E-02	9.78E-01		3.41E-02
18	106-97-8	Butane	7.67E-03	Yes	26	26	vapor	7.71E-03	1.00E+00		7.71E-03
19	106-99-0	1,3-Butadiene	7.67E-03	Yes	23	23	vapor	7.71E-03	1.00E+00		7.71E-03
20	107-02-8	Acrolein	7.67E-03	No		14	vapor			6.92E-01	5.31E-03
21	107-05-1	3-Chloropropene (Allyl chloride)	7.67E-03	No		20	vapor			1.00E+00	7.69E-03
22	107-06-2	1,2-Dichloroethane (Ethylene chloride)	7.67E-03	No		17	vapor			9.99E-01	7.66E-03
23	107-12-0	Propionitrile	7.67E-03	No		13	vapor			3.98E-01	3.05E-03
24	107-13-1	Acrylonitrile	7.67E-03	No		14	vapor			6.92E-01	5.31E-03
25	107-18-6	2-Propene-1-ol	3.49E-02	No		10	vapor			6.66E-02	2.32E-03
26	107-31-3	Formic acid, methyl ester	3.49E-02	No		15	vapor			8.52E-01	2.97E-02
27	107-66-4	Dibutylphosphate	3.49E-02	No		5	particle			2.85E-04	9.95E-06
28	107-87-9	2-Pentanone	7.67E-03	No		14	vapor			6.92E-01	5.31E-03
29	108-03-2	1-Nitropropane	3.49E-02	No		14	vapor			6.92E-01	2.41E-02
30	108-05-4	Vinyl acetate	3.49E-02	No		16	vapor			9.37E-01	3.27E-02
31	108-10-1	Hexone (4-Methyl-2-pentanone or MIBK)	7.67E-03	No		14	vapor			6.92E-01	5.31E-03
32	108-20-3	Bis(isopropyl)ether	7.67E-03	No		18	vapor			1.02E+00	7.86E-03
33	108-38-3	m-Xylene (Dimethyl benzene)	7.67E-03	No		19	vapor			1.00E+00	7.70E-03
34	108-39-4	m-Cresol	7.67E-03	No		9	vapor			2.72E-02	2.09E-04
35	108-87-2	Methylcyclohexane	7.67E-03	Yes	25	25	vapor	7.68E-03	1.00E+00		7.68E-03
36	108-88-3	Toluene	7.67E-03	Yes	19	19	vapor	7.70E-03	1.00E+00		7.70E-03
37	108-90-7	Chlorobenzene	7.67E-03	No		19	vapor			1.00E+00	7.70E-03
38	108-93-0	Cyclohexanol	7.67E-03	No		10	vapor			6.66E-02	5.11E-04
39	108-94-1	Cyclohexanone	7.67E-03	No		11	vapor			1.13E-01	8.63E-04
40	108-95-2	Phenol	3.49E-02	Yes	8	8	vapor	2.41E-04	6.92E-03		2.41E-04
41	109-66-0	n-Pentane	7.67E-03	No		26	vapor			1.00E+00	7.71E-03
42	109-99-9	Tetrahydrofuran	1.63E-02	No		13	vapor			3.98E-01	6.47E-03
43	110-12-3	5-Methyl-2-hexanone	7.67E-03	No		15	vapor			8.52E-01	6.54E-03
44	110-43-0	2-Heptanone	7.67E-03	No		15	vapor			8.52E-01	6.54E-03
45	110-54-3	n-Hexane	7.67E-03	Yes	27	27	vapor	7.70E-03	1.00E+00		7.70E-03
46	110-62-3	n-Valeraldehyde	3.49E-02	No		15	vapor			8.52E-01	2.97E-02
47	110-82-7	Cyclohexane	7.67E-03	Yes	24	24	vapor	7.69E-03	1.00E+00		7.69E-03
48	110-83-8	Cyclohexene	7.67E-03	No		22	vapor			1.01E+00	7.73E-03
49	110-86-1	Pyridine	3.49E-02	No		11	vapor			1.13E-01	3.92E-03
50	111-65-9	n-Octane	7.67E-03	No		28	vapor			1.01E+00	7.71E-03
51	111-76-2	Ethylene glycol monobutyl ether	3.49E-02	No		9	vapor			2.72E-02	9.48E-04
52	111-84-2	n-Nonane	7.67E-03	Yes	28	28	vapor	7.71E-03	1.01E+00		7.71E-03
53	117-81-7	Bis(2-ethylhexyl)phthalate (DEHP)	3.49E-02	No		30	particle			1.05E-02	3.67E-04
54	117-84-0	n-Dioctyl phthalate	3.49E-02	No		32	particle			7.21E-02	2.52E-03
55	118-74-1	Hexachlorobenzene	7.21E-04	Yes	18	18	vapor	7.39E-04	1.02E+00		7.39E-04
56	120-12-7	Anthracene	3.49E-02	Yes	13	13	vapor	1.62E-02	4.66E-01		1.62E-02
57	120-82-1	1,2,4-Trichlorobenzene	7.67E-03	Yes	17	17	vapor	7.66E-03	9.99E-01		7.66E-03
58	120-83-2	2,4-Dichlorophenol	3.49E-02	No		10	vapor			6.66E-02	2.32E-03
59	121-44-8	Triethylamine	7.67E-03	No		15	vapor			8.52E-01	6.54E-03
60	121-69-7	Dimethylaniline	7.67E-03	No		13	vapor			3.98E-01	3.05E-03
61	122-39-4	N,N-Diphenylamine	7.67E-03	Yes	10	10	vapor	3.51E-04	4.58E-02		3.51E-04
62	123-19-3	4-Heptanone	7.67E-03	No		13	vapor			3.98E-01	3.05E-03
63	123-38-6	n-Propionaldehyde	7.67E-03	No		14	vapor			6.92E-01	5.31E-03
64	123-51-3	3-Methyl-1-butanol	7.67E-03	No		12	vapor			1.40E-01	1.08E-03
65	123-86-4	Acetic acid n-butyl ester	3.49E-02	No		16	vapor			9.37E-01	3.27E-02
66	123-91-1	1,4-Dioxane	2.09E-02	No		10	vapor			6.66E-02	1.39E-03
67	126-73-8	Tributyl phosphate	3.49E-02	Yes	7	7	vapor	1.20E-04	3.45E-03		1.20E-04
68	126-98-7	2-Methyl-2-propenenitrile (Methacrylonitrile)	7.67E-03	No		16	vapor			9.37E-01	7.19E-03
69	127-18-4	Perchloroethylene (tetrachloroethylene)	7.67E-03	Yes	21	21	vapor	7.72E-03	1.01E+00		7.72E-03
70	127-19-5	N,N-Dimethylacetamide	7.67E-03	No		5	vapor			2.85E-04	2.19E-06
71	128-37-0	2,6-Bis(tert-butyl)-4-methylphenol	3.49E-02	No		32	vapor			7.21E-02	2.52E-03
72	129-00-0	Pyrene	3.49E-02	Yes	33	33	particle	5.32E-03	1.53E-01		5.32E-03
73	1321-64-8	Pentachloronaphthalene	3.49E-02	No		14	particle			6.92E-01	2.41E-02
74	1321-65-9	Trichloronaphthalene	3.49E-02	No		15	vapor			8.52E-01	2.97E-02
75	132-64-9	Dibenzofuran	3.49E-02	Yes	15	15	vapor	2.97E-02	8.52E-01		2.97E-02
76	1335-87-1	Hexachloronaphthalene	3.49E-02	No		14	particle			6.92E-01	2.41E-02
77	1335-88-2	Tetrachloronaphthalene	3.49E-02	No		15	particle			8.52E-01	2.97E-02
78	1336-36-3	Polychlorinated biphenyls (PCBs)	1.21E-02	Yes	35	35	particle	5.85E-02	4.83E+00		5.79E-02
79	141-78-6	Acetic acid ethyl ester (Ethyl acetate)	3.49E-02	No		14	vapor			6.92E-01	2.41E-02
80	141-79-7	4-Methyl-3-penten-2-one	3.49E-02	No		13	vapor			3.98E-01	1.39E-02
81	142-82-5	n-Heptane	7.67E-03	No		27	vapor			1.00E+00	7.70E-03
82	144-62-7	Oxalic acid	3.49E-03	Yes	3	3	vapor	1.58E-08	4.53E-06		1.58E-08
83	156-60-5	trans-1,2-Dichloroethylene	7.67E-03	No		20	vapor			1.00E+00	7.69E-03
84	1582-09-8	Trifluralin	3.49E-02	No		14	particle			6.92E-01	2.41E-02
85	1634-04-4	Methyl tert-butyl ether	7.67E-03	No		16	vapor			9.37E-01	7.19E-03
86	1836-75-5	Nitrofen	3.49E-02	No		30	particle			1.05E-02	3.67E-04
87	189-55-9	Dibenzo[a,i]pyrene	3.49E-02	No		5	particle			2.85E-04	9.95E-06
88	189-64-0	Dibenzo[a,h]pyrene	3.49E-02	No		5	particle			2.85E-04	9.95E-06
89	191-24-2	Benzo(g,h,i)perylene	3.49E-02	No		30	particle			1.05E-02	3.67E-04
90	191-30-0	Benzo[a,l]pyrene	3.49E-02	No		5	particle			2.85E-04	9.95E-06
91	192-65-4	Dibenzo[a,e]pyrene	3.49E-02	No		5	particle			2.85E-04	9.95E-06
92	193-39-5	Indeno(1,2,3-cd)pyrene	3.49E-02	No		30	particle			1.05E-02	3.67E-04
93	205-82-3	Benzo(j)fluoranthene	3.49E-02	No		7	particle			3.45E-03	1.20E-04
94	205-99-2	Benzo(b)fluoranthene	3.49E-02	No		30	particle			1.05E-02	3.67E-04
95	206-44-0	Fluoranthene	3.49E-02	No		33	particle			1.45E-01	5.04E-03
96	207-08-9	Benzo(k)fluoranthene	3.49E-02	No		30	particle			1.05E-02	3.67E-04
97	208-96-8	Acenaphthylene	3.49E-02	Yes	14	14	vapor	2.41E-02	5.92E-01		2.41E-02
98	218-01-9	Chrysene	3.49E-02	Yes	32	32	particle	2.55E-03	7.32E-02		2.55E-03
99	2234-13-1	Octachloronaphthalene	3.49E-02	No		14	particle			6.92E-01	2.41E-02
100	224-42-0	Dibenz[a,j]acridine	3.49E-02	No		4	particle			3.64E-05	1.27E-06
101	226-36-8	Dibenz[a,h]acridine	3.49E-02	No		4	particle			3.64E-05	1.27E-06
102	2385-85-5	Mirex	3.49E-02	No		17	vapor			9.99E-01	3.48E-02
103	25551-13-7	Trimethyl benzene	7.67E-03	No		19	vapor			1.00E+00	7.70E-03
104	26140-60-3	Terphenyls	3.49E-02	No		34	particle			4.88E-01	1.70E-02
105	27154-33-2	Trichlorofluoroethane	7.67E-03	No		23	vapor			1.00E+00	7.71E-03
106	287-92-3	Cyclopentane	7.67E-03	No		24	vapor			1.00E+00	7.69E-03
107	309-00-2	Aldrin	4.30E-04	Yes	34	34	particle	2.10E-04	4.88E-01		2.10E-04
108	319-84-6	Hexachlorocyclohexane (Lindane) Alpha BHC	1.16E-04	No		33	vapor			1.45E-01	1.68E-05
109	319-85-7	Hexachlorocyclohexane (Lindane) Beta BHC	1.16E-04	Yes	30	30	particle	1.22E-06	1.05E-02		1.22E-06
110	319-86-8	Delta-BHC	1.16E-04	No		30	particle			1.05E-02	1.22E-06
111	3697-24-3	5-Methylchrysene	3.49E-02	No		32	particle			7.21E-02	2.52E-03
112	3825-26-1	Ammonium perfluorooctanoate	3.49E-02	No		14	particle			6.92E-01	2.41E-02
113	4170-30-3	2-Butenaldehyde (2-Butenal or Crotonaldehyde)	7.67E-03	Yes	11	11	vapor	8.70E-04	1.13E-01		8.70E-04
114	465-73-6	Isodrin	2.32E-04	No		35	vapor			4.83E+00	1.12E-03
115	50-00-0	Formaldehyde	7.67E-03	No		8	vapor			1.00E-02	7.67E-05
116	50-29-3	4,4-DDT	2.32E-04	No		33	particle			1.45E-01	3.36E-05
117	50-32-8	Benzo(a)pyrene	4.42E-04	Yes	30	30	particle	4.67E-06	1.06E-02		4.67E-06
118	53-70-3	Dibenzo(a,h)anthracene	5.81E-05	No		7	particle			3.45E-03	2.01E-07
119	540-59-0	1,2-Dichloroethylene	7.67E-03	No		19	vapor			1.00E+00	7.70E-03
120	540-84-1	2,2,4-Trimethylpentane	7.67E-03	No		28	vapor			1.01E+00	7.71E-03
121	541-73-1	1,3-Dichlorobenzene	7.67E-03	No		19	vapor			1.00E+00	7.70E-03
122	56-23-5	Carbon tetrachloride	7.67E-03	Yes	22	22	vapor	7.73E-03	1.01E+00		7.73E-03
123	563-80-4	3-Methyl-2-butanone	7.67E-03	No		14	vapor			6.92E-01	5.31E-03
124	56-49-5	3-Methylcholanthrene	3.49E-02	No		28	particle			1.01E+00	3.51E-02
125	56-55-3	Benzo(a)anthracene	3.49E-02	No		33	particle			1.45E-01	5.04E-03
126	57-14-7	1,1-Dimethylhydrazine	3.49E-02	Yes	12	12	vapor	4.90E-03	1.40E-01		4.90E-03
127	58-89-9	gamma-BHC (Lindane)	1.16E-04	Yes	32	32	particle	8.74E-06	7.52E-02		8.74E-06
128	58-90-2	2,3,4,6-Tetrachlorophenol	3.49E-02	Yes	11	11	vapor	3.64E-03	1.04E-01		3.64E-03
129	591-78-6	2-Hexanone	7.67E-03	No		14	vapor			6.92E-01	5.31E-03
130	59-50-7	4-Chloro-3-methylphenol	3.49E-02	No		32	particle			7.21E-02	2.52E-03
131	59-89-2	N-Nitrosomorpholine	3.49E-02	No		6	vapor			6.16E-04	2.15E-05
132	602-87-9	5-Nitroacenaphthene	3.49E-02	No		9	particle			2.72E-02	9.48E-04
133	60-29-7	Ethyl ether	3.49E-02	No		17	vapor			9.99E-01	3.48E-02
134	603-34-9	Triphenylamine	3.49E-02	Yes	32	32	vapor	2.37E-03	6.80E-02		2.37E-03
135	60-34-4	Methylhydrazine	7.67E-03	No		10	vapor			6.66E-02	5.11E-04
136	60-35-5	Acetamide	7.67E-03	Yes	5	5	vapor	2.19E-06	2.85E-04		2.19E-06
137	60-57-1	Dieldrin	2.32E-04	Yes	33	33	particle	3.18E-05	1.37E-01		3.18E-05
138	621-64-7	Di-n-Propylnitrosamine (N-Nitroso-di-n-propylamine)	3.49E-02	No		10	vapor			6.66E-02	2.32E-03
139	624-83-9	Methyl isocyanate	7.67E-03	No		17	vapor			9.99E-01	7.66E-03
140	627-13-4	Nitric acid, propyl ester	3.49E-02	No		17	vapor			9.99E-01	3.48E-02
141	62-75-9	N-Nitroso-N,N-dimethylamine (Dimethylnitrosamine)	6.51E-02	Yes	9	9	vapor	1.77E-03	2.72E-02		1.77E-03
142	630-20-6	1,1,1,2-Tetrachloroethane	7.67E-03	No		18	vapor			1.02E+00	7.86E-03
143	64-17-5	Ethyl alcohol	7.67E-03	No		10	vapor			6.66E-02	5.11E-04
144	64-18-6	Formic acid	3.49E-02	No		7	vapor			3.45E-03	1.20E-04
145	64-19-7	Acetic acid	3.49E-02	No		6	vapor			6.16E-04	2.15E-05
146	67-56-1	Methyl alcohol (Methanol)	7.67E-03	No		10	vapor			6.66E-02	5.11E-04
147	67-63-0	2-Propyl alcohol (Isopropanol; Propan-2-01)	7.67E-03	No		11	vapor			1.13E-01	8.63E-04
148	67-64-1	2-Propanone (Acetone)	4.18E-02	No		13	vapor			3.98E-01	1.66E-02
149	67-66-3	Chloroform	7.67E-03	No		19	vapor			1.00E+00	7.70E-03
150	67-72-1	Hexachloroethane	3.49E-02	No		19	vapor			1.00E+00	3.50E-02
151	684-16-2	Hexafluoroacetone	7.67E-03	No		19	vapor			1.00E+00	7.70E-03
152	71-23-8	n-Propyl alcohol	7.67E-03	No		11	vapor			1.13E-01	8.63E-04
153	71-36-3	n-Butyl alcohol	7.67E-03	No		11	vapor			1.13E-01	8.63E-04
154	71-43-2	Benzene	7.67E-03	Yes	19	19	vapor	7.69E-03	1.00E+00		7.69E-03
155	71-55-6	Methyl chloroform (1,1,1-Trichloroethane)	7.67E-03	No		21	vapor			1.01E+00	7.72E-03
156	72-20-8	Endrin	2.32E-04	No		32	particle			7.21E-02	1.68E-05
157	72-43-5	Methoxychlor	1.16E-03	No		7	particle			3.45E-03	4.01E-06
158	72-54-8	4,4-DDD	2.32E-04	No		32	particle			7.21E-02	1.68E-05
159	72-55-9	4,4-DDE	2.32E-04	No		34	particle			4.88E-01	1.13E-04
160	74-83-9	Bromomethane (Methyl bromide)	7.67E-03	No		19	vapor			1.00E+00	7.70E-03
161	74-87-3	Chloromethane (Methyl chloride)	7.67E-03	No		20	vapor			1.00E+00	7.69E-03
162	74-97-5	Bromochloromethane	7.67E-03	No		17	vapor			9.99E-01	7.66E-03
163	74-99-7	Methylacetylene	3.49E-02	No		20	vapor			1.00E+00	3.50E-02
164	75-00-3	Chloroethane	7.67E-03	No		20	vapor			1.00E+00	7.69E-03
165	75-01-4	Vinyl chloride (1-Chloroethene)	3.49E-02	No		22	vapor			1.01E+00	3.51E-02
166	75-05-8	Acetonitrile	1.09E-02	Yes	13	13	vapor	3.60E-03	3.30E-01		3.60E-03
167	75-07-0	Acetaldehyde	3.49E-02	No		13	vapor			3.98E-01	1.39E-02
168	75-09-2	Dichloromethane (Methylene chloride)	7.67E-03	No		19	vapor			1.00E+00	7.70E-03
169	75-12-7	Formamide	3.49E-02	Yes	4	4	vapor	1.27E-06	3.64E-05		1.27E-06
170	75-15-0	Carbon disulfide	7.67E-03	No		20	vapor			1.00E+00	7.69E-03
171	75-21-8	Ethylene oxide (Oxirane)	7.67E-03	No		15	vapor			8.52E-01	6.54E-03
172	75-27-4	Bromodichloromethane	7.67E-03	No		18	vapor			1.02E+00	7.86E-03
173	75-34-3	1,1-Dichloroethane	7.67E-03	No		19	vapor			1.00E+00	7.70E-03
174	75-35-4	1,1-Dichloroethene (Vinylidene chloride)	7.67E-03	No		22	vapor			1.01E+00	7.73E-03
175	75-43-4	Dichlorofluoromethane	7.67E-03	No		20	vapor			1.00E+00	7.69E-03
176	75-45-6	Chlorodifluoromethane	7.67E-03	No		22	vapor			1.01E+00	7.73E-03
177	75-50-3	Trimethylamine	7.67E-03	No		14	vapor			6.92E-01	5.31E-03
178	75-52-5	Nitromethane	3.49E-02	No		13	vapor			3.98E-01	1.39E-02
179	75-55-8	2-Methylaziridine	3.49E-02	No		11	vapor			1.13E-01	3.92E-03
180	75-61-6	Difluorodibromomethane	7.67E-03	No		22	vapor			1.01E+00	7.73E-03
181	75-63-8	Trifluorobromomethane	7.67E-03	No		25	vapor			1.00E+00	7.68E-03
182	75-65-0	2-Methyl-2-propanol	7.67E-03	No		11	vapor			1.13E-01	8.63E-04
183	75-69-4	Trichlorofluoromethane	7.67E-03	No		23	vapor			1.00E+00	7.71E-03
184	75-71-8	Dichlorodifluoromethane	7.67E-03	No		25	vapor			1.00E+00	7.68E-03
185	75-99-0	2,2-Dichloropropionic acid	3.49E-02	No		6	vapor			6.16E-04	2.15E-05
186	76-03-9	Trichloroacetic acid	7.67E-03	No		5	vapor			2.85E-04	2.19E-06
187	76-11-9	1,1,1,2-Tetrachloro-2,2-difluoroethane	3.49E-02	No		24	vapor			1.00E+00	3.50E-02
188	76-12-0	1,1,2,2-Tetrachloro-1,2-difluoroethane	3.49E-02	No		23	vapor			1.00E+00	3.50E-02
189	76-13-1	1,2,2-Trichloro-1,1,2-trifluoroethane (Freon 113)	7.67E-03	No		25	vapor			1.00E+00	7.68E-03
190	76-14-2	1,2-Dichloro-1,1,2,2-tetrafluoroethane	7.67E-03	No		28	vapor			1.01E+00	7.71E-03
191	76-15-3	Chloropentafluoroethane	7.67E-03	Yes	29	29	vapor	7.70E-03	1.00E+00		7.70E-03
192	76-44-8	Heptachlor	7.56E-04	Yes	16	16	vapor	6.72E-04	8.89E-01		6.72E-04
193	78-83-1	2-Methylpropyl alcohol (Isobutyl alcohol)	3.49E-02	No		11	vapor			1.13E-01	3.92E-03
194	78-87-5	1,2-Dichloropropane	7.67E-03	No		19	vapor			1.00E+00	7.70E-03
195	78-92-2	1-Methylpropyl alcohol (2-Butanol)	7.67E-03	No		11	vapor			1.13E-01	8.63E-04
196	78-93-3	Methyl ethyl ketone (MEK, 2-Butanone)	7.67E-03	No		13	vapor			3.98E-01	3.05E-03
197	79-00-5	1,1,2-Trichloroethane	7.67E-03	No		17	vapor			9.99E-01	7.66E-03
198	79-01-6	Trichloroethylene	7.67E-03	Yes	20	20	vapor	7.68E-03	1.00E+00		7.68E-03
199	79-09-4	Propionic acid	3.49E-02	No		8	vapor			1.00E-02	3.49E-04
200	79-10-7	2-Propenoic acid	3.49E-02	No		8	vapor			1.00E-02	3.49E-04
201	79-20-9	Methyl acetate	3.49E-02	No		14	vapor			6.92E-01	2.41E-02

Adjusted Performance Factors

Group	PF
1	8.73E-07
2	1.96E-06
3	4.53E-06
4	3.64E-05
5	2.85E-04
6	6.16E-04
7	3.45E-03
8	1.00E-02
9	2.72E-02
10	6.66E-02
11	1.13E-01
12	1.40E-01
13	3.98E-01
14	6.92E-01
15	8.52E-01
16	9.37E-01
17	9.99E-01
18	1.02E+00
19	1.00E+00
20	1.00E+00
21	1.01E+00
22	1.01E+00
23	1.00E+00
24	1.00E+00
25	1.00E+00
26	1.00E+00
27	1.00E+00
28	1.01E+00
29	1.00E+00
30	1.05E-02
31	3.08E-02
32	7.21E-02
33	1.45E-01
34	4.88E-01
35	4.83E+00

Coplanar PCBs		PVP01 g/sec
31508-00-6	2,3',4,4',5-Pentachlorobiphenyl (PBC 118)	4.18E-05
32598-13-3	3,3',4,4'-Tetrachlorobiphenyl (TCB)	4.18E-05
32598-14-4	2,3,3',4,4'-Pentachlorobiphenyl (PCB 105)	4.18E-05
32774-16-6	3,3',4,4',5,5'-Hexachlorobiphenyl	4.18E-05
35065-29-3	2,2',3,4,4',5,5'-Heptachlorobiphenyl	4.18E-05
35065-30-6	2,2',3,3',4,4',5-Heptachlorobiphenyl	4.18E-05
38380-08-4	2,3,3',4,4',5-Hexachlorobiphenyl (PCB 157)	4.18E-05
39635-31-9	2,3,3',4,4',5,5'-Heptachlorobiphenyl	4.18E-05
52663-72-6	2,3',4,4',5,5'-Hexachlorobiphenyl	4.18E-05
57465-28-8	3,3',4,4',5-Pentachlorobiphenyl	4.18E-05
65510-44-3	2',3,4,4',5-Pentachlorobiphenyl	4.18E-05
69782-90-7	2,3,3',4,4',5'-Hexachlorobiphenyl	4.18E-05
70362-50-4	3,4,4',5-Tetrachlorobiphenyl	4.18E-05
74472-37-0	2,3,4,4',5-Pentachlorobiphenyl	4.18E-05
1336-36-3	Polychlorinated biphenyls (PCBs)	5.79E-02
1336-36-3	UnCorrected (for coplanar PCBs)	5.85E-02

Correction for Coplanar PCBs	
0.99	as parent
0.01	as coplanar sum

CALCULATION SHEET

BY: E. Berrios
DATE: 05/21/03

PROJECT: WTP
JOB NO.: 24590
CALC NO.: 24590-WTP-M4C-FRP-00005
SHEET REV: A
SHEET NO.: 80

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W
1	**Table B-2 PVP01 - Unabated Pretreatment Vessel Vent System**										Calc'd rate												
2			Feed Rate					PVP01 rate	Performan	Adjusted	PVP01												
3	CAS #	COPC	g/sec	In ACM	Group	Grouping	Phase	g/sec	Factor	PF	g/sec		Adjusted Performance Factors										
202	79-34-5	1,1,2,2-Tetrachloroethane	7.67E-03	No		16	vapor			9.37E-01	7.19E-03												
203	8001-35-2	Toxaphene	2.67E-04	Yes	10	10	particle	2.34E-05	8.75E-02		2.34E-05												
204	82-68-8	Pentachloronitrobenzene (PCBN or quintobenzene)	3.49E-02	No		13	vapor			3.98E-01	1.39E-02												
205	83-32-9	Acenaphthene	3.49E-02	No		15	vapor			8.52E-01	2.97E-02												
206	84-66-2	Diethyl phthalate	3.49E-02	Yes	8	8	vapor	3.97E-04	1.14E-02		3.97E-04												
207	84-74-2	Dibutyl phthalate	3.49E-02	Yes	31	31	particle	1.07E-03	3.08E-02		1.07E-03												
208	85-01-8	Phenanthrene	3.49E-02	No		13	vapor			3.98E-01	1.39E-02												
209	85-68-7	Butylbenzyl phthalate	3.49E-02	No		31	particle			3.08E-02	1.07E-03												
210	86-73-7	Fluorene	3.49E-02	No		14	particle			6.92E-01	2.41E-02												
211	87-68-3	Hexachlorobutadiene	7.67E-03	Yes	20	20	vapor	7.70E-03	1.00E+00		7.70E-03												
212	87-86-5	Pentachlorophenol	3.49E-02	Yes	6	6	vapor	2.15E-05	6.16E-04		2.15E-05												
213	88-06-2	2,4,6-Trichlorophenol	3.49E-02	No		10	vapor			6.66E-02	2.32E-03												
214	88-72-2	2-Nitrotoluene	7.67E-03	No		12	vapor			1.40E-01	1.08E-03												
215	88-75-5	2-Nitrophenol	3.49E-02	No		12	vapor			1.40E-01	4.90E-03												
216	88-85-7	2-sec-Butyl-4,6-dinitrophenol (Dinoseb)	3.49E-02	Yes	8	8	particle	4.08E-04	1.17E-02		4.08E-04												
217	88-89-1	Picric acid	3.49E-02	Yes	2	2	particle	6.84E-08	1.96E-06		6.84E-08												
218	91-20-3	Naphthalene	1.16E-03	Yes	16	16	vapor	1.10E-03	9.42E-01		1.10E-03												
219	91-22-5	Quinoline	3.49E-02	No		9	vapor			2.72E-02	9.48E-04												
220	91-58-7	2-Chloronapthalene	3.49E-02	No		16	vapor			9.37E-01	3.27E-02												
221	92-52-4	1,1'-Biphenyl	3.49E-02	No		16	vapor			9.37E-01	3.27E-02												
222	92-93-3	4-Nitrobiphenyl	3.49E-02	No		10	particle			6.66E-02	2.32E-03												
223	93-72-1	Silvex (2,4,5-TP)	3.49E-02	No		5	particle			2.85E-04	9.95E-06												
224	93-76-5	2,4,5-T	3.49E-02	No		5	particle			2.85E-04	9.95E-06												
225	94-75-7	2,4-D and esters (160C typed)	3.49E-02	No		6	vapor			6.16E-04	2.15E-05												
226	95-13-6	Indene	3.49E-02	No		18	vapor			1.02E+00	3.57E-02												
227	95-47-6	o-Xylene	7.67E-03	No		19	vapor			1.00E+00	7.70E-03												
228	95-48-7	o-Cresol (2-Methylphenol)	7.67E-03	No		9	vapor			2.72E-02	2.09E-04												
229	95-49-8	2-Chlorotoluene	3.49E-02	No		19	vapor			1.00E+00	3.50E-02												
230	95-50-1	o-Dichlorobenzene (1,2-Dichlorobenzene)	7.67E-03	No		18	vapor			1.02E+00	7.86E-03												
231	95-57-8	2-Chlorophenol	3.49E-02	No		11	vapor			1.13E-01	3.92E-03												
232	95-95-4	2,4,5-Trichlorophenol	3.49E-02	No		9	vapor			2.72E-02	9.48E-04												
233	96-22-0	3-Pentanone	7.67E-03	No		14	vapor			6.92E-01	5.31E-03												
234	96-69-5	Bis(3-tert-butyl-4-hydroxy-6-methyl-phenyl)sulfide	3.49E-02	No		19	particle			1.00E+00	3.50E-02												
235	98-51-1	p-tert-Butyltoluene	3.49E-02	No		21	vapor			1.01E+00	3.51E-02												
236	98-82-8	Cumene	3.49E-02	No		20	vapor			1.00E+00	3.50E-02												
237	98-83-9	alpha-Methylstyrene	7.67E-03	No		19	vapor			1.00E+00	7.70E-03												
238	98-86-2	Acetophenone	3.49E-02	Yes	11	11	vapor	4.18E-03	1.20E-01		4.18E-03												
239	98-95-3	Nitrobenzene	3.49E-02	No		12	vapor			1.40E-01	4.90E-03												
240											2.01E+00												

CALCULATION SHEET

BY: E. Berrios
DATE: 05/21/03

PROJECT: WTP
JOB NO.: 24590
CALC NO.: 24590-WTP-M4C-FRP-00005
SHEET REV: A
SHEET NO.: 81

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R
1	Table B-3 PVP12 - Abated Pretreatment Vessel Vent System			NaOH														
2			PVP01	Scrubber	HEME	HEPA 1	HEPA 2	TCO	Carbon Bed	PVP12								
3	CAS #	COPC	g/sec	DF	DF	DF	DF	DF	DF	g/sec								
4	100-00-5	p-Nitrochlorobenzene	2.32E-03	1	1	1	1	10000	5	4.65E-08		Coplanar PCBs		PVP12				
5	100-21-0	p-Phthalic acid	3.05E-08	1	1	1	1	20	50	3.05E-11				g/sec				
6	100-25-4	1,4-Dinitrobenzene	2.15E-05	3.3	200	2000	100	10000	5	3.25E-18		31508-00-6	2,3',4,4',5-Pentachlorobiphenyl (PBC 118)	1.90E-15				
7	100-41-4	Ethyl benzene	7.69E-03	1	1	1	1	10000	1	7.69E-07		32598-13-3	3,3',4,4'-Tetrachlorobiphenyl (TCB)	1.90E-15		Correction for Coplanar PCBs		
8	100-42-5	Styrene	7.70E-03	1	1	1	1	10000	1	7.70E-07		32598-14-4	2,3,3',4,4'-Pentachlorobiphenyl (PCB 105)	1.90E-15		0.99	as parent	
9	10061-01-5	cis-1,3-Dichloropropene	7.72E-03	1	1	1	1	100	1	7.72E-05		32774-16-6	3,3',4,4',5,5'-Hexachlorobiphenyl	1.90E-15		0.01	as coplanar sum	
10	10061-02-6	trans-1,3-Dichloropropene	7.66E-03	1	1	1	1	50	1	1.53E-04		35065-29-3	2,2',3,4,4',5,5'-Heptachlorobiphenyl	1.90E-15				
11	101-55-3	4-Bromophenylphenyl ether	2.41E-02	1	1	1	1	3.333333	50	1.45E-04		35065-30-6	2,2',3,3',4,4',5-Heptachlorobiphenyl	1.90E-15				
12	101-84-8	Diphenyl ether	7.19E-03	1	1	1	1	50	5	2.87E-05		38380-08-4	2,3,3',4,4',5-Hexachlorobiphenyl (PCB 157)	1.90E-15				
13	106-35-4	3-Heptanone	5.31E-03	1	1	1	1	10000	1	5.31E-07		39635-31-9	2,3,3',4,4',5,5'-Heptachlorobiphenyl	1.90E-15				
14	106-42-3	p-Xylene (Dimethyl benzene)	7.70E-03	1	1	1	1	1000	1	7.70E-06		52663-72-6	2,3',4,4',5,5'-Hexachlorobiphenyl	1.90E-15				
15	106-46-7	1,4-Dichlorobenzene	7.86E-03	1	1	1	1	50	2	7.86E-05		57465-28-8	3,3',4,4',5-Pentachlorobiphenyl	1.90E-15				
16	106-88-7	1,2-Epoxybutane	6.54E-03	1	1	1	1	10000	1	6.54E-07		65510-44-3	2',3,4,4',5-Pentachlorobiphenyl	1.90E-15				
17	106-93-4	Ethylene dibromide (Dibromethane)	3.41E-02	1	1	1	1	1	10	3.41E-03		69782-90-7	2,3,3',4,4',5'-Hexachlorobiphenyl	1.90E-15				
18	106-97-8	Butane	7.71E-03	1	1	1	1	10000	1	7.71E-07		70362-50-4	3,4,4',5-Tetrachlorobiphenyl	1.90E-15				
19	106-99-0	1,3-Butadiene	7.71E-03	1	1	1	1	10000	1	7.71E-07		74472-37-0	2,3,4,4',5-Pentachlorobiphenyl	1.90E-15				
20	107-02-8	Acrolein	5.31E-03	1	1	1	1	10000	1	5.31E-07								
21	107-05-1	3-Chloropropene (Allyl chloride)	7.69E-03	1	1	1	1	10000	1	7.69E-07		1336-36-3	Polychlorinated biphenyls (PCBs)	2.63E-12				
22	107-06-2	1,2-Dichloroethane (Ethylene chloride)	7.66E-03	1	1	1	1	10000	1	7.66E-07		1336-36-3	UnCorrected (for coplanar PCBs)	2.66E-12				
23	107-12-0	Propionitrile	3.05E-03	1	1	1	1	10000	1	3.05E-07								
24	107-13-1	Acrylonitrile	5.31E-03	1	1	1	1	10000	1	5.31E-07								
25	107-18-6	2-Propene-1-ol	2.32E-03	1	1	1	1	10000	1	2.32E-07								
26	107-31-3	Formic acid, methyl ester	2.97E-02	1	1	1	1	10000	1	2.97E-06								
27	107-66-4	Dibutylphosphate	9.95E-06	3.3	200	2000	100	10000	1	7.54E-18								
28	107-87-9	2-Pentanone	5.31E-03	1	1	1	1	10000	1	5.31E-07								
29	108-03-2	1-Nitropropane	2.41E-02	1	1	1	1	10000	1	2.41E-06								
30	108-05-4	Vinyl acetate	3.27E-02	1	1	1	1	10000	1	3.27E-06								
31	108-10-1	Hexone (4-Methyl-2-pentanone or MIBK)	5.31E-03	1	1	1	1	10000	1	5.31E-07								
32	108-20-3	Bis(isopropyl)ether	7.86E-03	1	1	1	1	10000	1	7.86E-07								
33	108-38-3	m-Xylene (Dimethyl benzene)	7.70E-03	1	1	1	1	1000	1	7.70E-06								
34	108-39-4	m-Cresol	2.09E-04	1	1	1	1	1000	2	1.04E-07								
35	108-87-2	Methylcyclohexane	7.68E-03	1	1	1	1	10000	1	7.68E-07								
36	108-88-3	Toluene	7.70E-03	1	1	1	1	10000	1	7.70E-07								
37	108-90-7	Chlorobenzene	7.70E-03	1	1	1	1	20	5	7.70E-05								
38	108-93-0	Cyclohexanol	5.11E-04	1	1	1	1	10000	2	2.56E-08								
39	108-94-1	Cyclohexanone	8.63E-04	1	1	1	1	10000	2	4.32E-08								
40	108-95-2	Phenol	2.41E-04	1	1	1	1	10	20	1.21E-06								
41	109-66-0	n-Pentane	7.71E-03	1	1	1	1	10000	1	7.71E-07								
42	109-99-9	Tetrahydrofuran	6.47E-03	1	1	1	1	10000	1	6.47E-07								
43	110-12-3	5-Methyl-2-hexanone	6.54E-03	1	1	1	1	10000	1	6.54E-07								
44	110-43-0	2-Heptanone	6.54E-03	1	1	1	1	10000	1	6.54E-07								
45	110-54-3	n-Hexane	7.70E-03	1	1	1	1	10000	1	7.70E-07								
46	110-62-3	n-Valeraldehyde	2.97E-02	1	1	1	1	10000	1	2.97E-06								
47	110-82-7	Cyclohexane	7.69E-03	1	1	1	1	10000	1	7.69E-07								
48	110-83-8	Cyclohexene	7.73E-03	1	1	1	1	10000	1	7.73E-07								
49	110-86-1	Pyridine	3.92E-03	1	1	1	1	10000	1	3.92E-07								
50	111-65-9	n-Octane	7.71E-03	1	1	1	1	10000	1	7.71E-07								
51	111-76-2	Ethylene glycol monobutyl ether	9.48E-04	1	1	1	1	10000	2	4.74E-08								
52	111-84-2	n-Nonane	7.71E-03	1	1	1	1	10000	2	3.86E-07								
53	117-81-7	Bis(2-ethylhexyl)phthalate (DEHP)	3.67E-04	3.3	200	2000	100	10000	5	5.57E-17								
54	117-84-0	n-Dioctyl phthalate	2.52E-03	3.3	200	2000	100	10000	5	3.81E-16								
55	118-74-1	Hexachlorobenzene	7.39E-04	1	1	1	1	3.333333	50	4.43E-06								
56	120-12-7	Anthracene	1.62E-02	1	1	1	1	1000	5	3.25E-06								
57	120-82-1	1,2,4-Trichlorobenzene	7.66E-03	1	1	1	1	100	5	1.53E-05								
58	120-83-2	2,4-Dichlorophenol	2.32E-03	1	1	1	1	3.333333	50	1.39E-05								
59	121-44-8	Triethylamine	6.54E-03	1	1	1	1	10000	1	6.54E-07								
60	121-69-7	Dimethylaniline	3.05E-03	1	1	1	1	10000	2	1.53E-07								
61	122-39-4	N,N-Diphenylamine	3.51E-04	1	1	1	1	50	5	1.41E-06								
62	123-19-3	4-Heptanone	3.05E-03	1	1	1	1	10000	1	3.05E-07								
63	123-38-6	n-Propionaldehyde	5.31E-03	1	1	1	1	10000	1	5.31E-07								
64	123-51-3	3-Methyl-1-butanol	1.08E-03	1	1	1	1	10000	1	1.08E-07								
65	123-86-4	Acetic acid n-butyl ester	3.27E-02	1	1	1	1	10000	1	3.27E-06								
66	123-91-1	1,4-Dioxane	1.39E-03	1	1	1	1	10000	1	1.39E-07								
67	126-73-8	Tributyl phosphate	1.20E-04	1	1	1	1	10000	5	2.41E-09								
68	126-98-7	2-Methyl-2-propenenitrile (Methacrylonitrile)	7.19E-03	1	1	1	1	10000	1	7.19E-07								
69	127-18-4	Perchloroethylene (tetrachloroethylene)	7.72E-03	1	1	1	1	1	10	7.72E-04								
70	127-19-5	N,N-Dimethylacetamide	2.19E-06	1	1	1	1	10000	2	1.09E-10								
71	128-37-0	2,6-Bis(tert-butyl)-4-methylphenol	2.52E-03	1	1	1	1	10000	5	5.03E-08								
72	129-00-0	Pyrene	5.32E-03	3.3	200	2000	100	3.333333	50	2.42E-13								
73	1321-64-8	Pentachloronaphthalene	2.41E-02	3.3	200	2000	100	3.333333	50	1.10E-12								
74	1321-65-9	Trichloronaphthalene	2.97E-02	1	1	1	1	3.333333	50	1.78E-04								
75	132-64-9	Dibenzofuran	2.97E-02	1	1	1	1	3.333333	50	1.78E-04								
76	1335-87-1	Hexachloronaphthalene	2.41E-02	3.3	200	2000	100	3.333333	50	1.10E-12								
77	1335-88-2	Tetrachloronaphthalene	2.97E-02	3.3	200	2000	100	3.333333	50	1.35E-12								
78	1336-36-3	Polychlorinated biphenyls (PCBs)	5.79E-02	3.3	200	2000	100	3.333333	50	2.63E-12								
79	141-78-6	Acetic acid ethyl ester (Ethyl acetate)	2.41E-02	1	1	1	1	10000	1	2.41E-06								
80	141-79-7	4-Methyl-3-penten-2-one	1.39E-02	1	1	1	1	10000	1	1.39E-06								
81	142-82-5	n-Heptane	7.70E-03	1	1	1	1	10000	1	7.70E-07								
82	144-62-7	Oxalic acid	1.58E-08	1	1	1	1	10	20	7.91E-11								
83	156-60-5	trans-1,2-Dichloroethylene	7.69E-03	1	1	1	1	10000	1	7.69E-07								
84	1582-09-8	Trifluralin	2.41E-02	3.3	200	2000	100	10000	1	1.83E-14								
85	1634-04-4	Methyl tert-butyl ether	7.19E-03	1	1	1	1	10000	1	7.19E-07								
86	1836-75-5	Nitrofen	3.67E-04	3.3	200	2000	100	3.333333	50	1.67E-14								
87	189-55-9	Dibenzo[a,i]pyrene	9.95E-06	3.3	200	2000	100	3.333333	50	4.52E-16								
88	189-64-0	Dibenzo[a,h]pyrene	9.95E-06	3.3	200	2000	100	3.333333	50	4.52E-16								
89	191-24-2	Benzo(g,h,i)perylene	3.67E-04	3.3	200	2000	100	3.333333	50	1.67E-14								
90	191-30-0	Benzo[a,l]pyrene	9.95E-06	3.3	200	2000	100	3.333333	50	4.52E-16								
91	192-65-4	Dibenzo[a,e]pyrene	9.95E-06	3.3	200	2000	100	3.333333	50	4.52E-16								
92	193-39-5	Indeno(1,2,3-cd)pyrene	3.67E-04	3.3	200	2000	100	3.333333	50	1.67E-14								
93	205-82-3	Benzo(j)fluoranthene	1.20E-04	3.3	200	2000	100	3.333333	50	5.47E-15								
94	205-99-2	Benzo(b)fluoranthene	3.67E-04	3.3	200	2000	100	3.333333	50	1.67E-14								
95	206-44-0	Fluoranthene	5.04E-03	3.3	200	2000	100	3.333333	50	2.29E-13								
96	207-08-9	Benzo(k)fluoranthene	3.67E-04	3.3	200	2000	100	3.333333	50	1.67E-14								
97	208-96-8	Acenaphthylene	2.41E-02	1	1	1	1	3.333333	50	1.45E-04								
98	218-01-9	Chrysene	2.55E-03	3.3	200	2000	100	3.333333	50	1.16E-13								
99	2234-13-1	Octachloronaphthalene	2.41E-02	3.3	200	2000	100	3.333333	50	1.10E-12								
100	224-42-0	Dibenz[a,j]acridine	1.27E-06	3.3	200	2000	100	3.333333	50	5.78E-17								
101	226-36-8	Dibenz[a,h]acridine	1.27E-06	3.3	200	2000	100	3.333333	50	5.78E-17								
102	2385-85-5	Mirex	3.48E-02	1	1	1	1	3.333333	50	2.09E-04								
103	25551-13-7	Trimethyl benzene	7.70E-03	1	1	1	1	1000	2	3.85E-06								
104	26140-60-3	Terphenyls	1.70E-02	3.3	200	2000	100	3.333333	50	7.73E-13								
105	27154-33-2	Trichlorofluoroethane	7.71E-03	1	1	1	1	1	10	7.71E-04								
106	287-92-3	Cyclopentane	7.69E-03	1	1	1	1	10000	1	7.69E-07								
107	309-00-2	Aldrin	2.10E-04	3.3	200	2000	100	3.333333	10	4.77E-14								
108	319-84-6	Hexachlorocyclohexane (Lindane) Alpha BHC	1.68E-05	1	1	1	1	3.333333	50	1.01E-07								
109	319-85-7	Hexachlorocyclohexane (Lindane) Beta BHC	1.22E-06	3.3	200	2000	100	3.333333	50	5.55E-17								
110	319-86-8	Delta-BHC	1.22E-06	3.3	200	2000	100	3.333333	50	5.57E-17								
111	3697-24-3	5-Methylchrysene	2.52E-03	3.3	200	2000	100	3.333333	50	1.14E-13								
112	3825-26-1	Ammonium perfluorooctanoate	2.41E-02	3.3	200	2000	100	3.333333	50	1.10E-12								
113	4170-30-3	2-Butenaldehyde (2-Butenal or Crotonaldehyde)	8.70E-04	1	1	1	1	10000	1	8.70E-08								
114	465-73-6	Isodrin	1.12E-03	1	1	1	1	3.333333	50	6.74E-06								
115	50-00-0	Formaldehyde	7.67E-05	1	1	1	1	10000	1	7.67E-09								
116	50-29-3	4,4-DDT	3.36E-05	3.3	200	2000	100	3.333333	50	1.53E-15								
117	50-32-8	Benzo(a)pyrene	4.67E-06	3.3	200	2000	100	3.333333	50	2.12E-16								
118	53-70-3	Dibenzo(a,h)anthracene	2.01E-07	3.3	200	2000	100	3.333333	50	9.12E-18								
119	540-59-0	1,2-Dichloroethylene	7.70E-03	1	1	1	1	10000	1	7.70E-07								
120	540-84-1	2,2,4-Trimethylpentane	7.71E-03	1	1	1	1	10000	1	7.71E-07								
121	541-73-1	1,3-Dichlorobenzene	7.70E-03	1	1	1	1	50	2	7.70E-05								
122	56-23-5	Carbon tetrachloride	7.73E-03	1	1	1	1	1	5	1.55E-03								
123	563-80-4	3-Methyl-2-butanone	5.31E-03	1	1	1	1	10000	1	5.31E-07								
124	56-49-5	3-Methylcholanthrene	3.51E-02	3.3	200	2000	100	3.333333	50	1.59E-12								
125	56-55-3	Benzo(a)anthracene	5.04E-03	3.3	200	2000	100	3.333333	50	2.29E-13								
126	57-14-7	1,1-Dimethylhydrazine	4.90E-03	1	1	1	1	10000	1	4.90E-07								
127	58-89-9	gamma-BHC (Lindane)	8.74E-06	3.3	200	2000	100	3.333333	50	3.97E-16								
128	58-90-2	2,3,4,6-Tetrachlorophenol	3.64E-03	1	1	1	1	3.333333	10	1.09E-04								
129	591-78-6	2-Hexanone	5.31E-03	1	1	1	1	1000	1	5.31E-06								
130	59-50-7	4-Chloro-3-methylphenol	2.52E-03	3.3	200	2000	100	3.333333	20	2.86E-13								
131	59-89-2	N-Nitrosomorpholine	2.15E-05	3.3	200	2000	100	10000	2	8.13E-18								
132	602-87-9	5-Nitroacenaphthene	9.48E-04	3.3	200	2000	100	3.333333	50	4.31E-14								
133	60-29-7	Ethyl ether	3.48E-02	1	1	1	1	10000	1	3.48E-06								
134	603-34-9	Triphenylamine	2.37E-03	1	1	1	1	3.333333	50	1.42E-05								
135	60-34-4	Methylhydrazine	5.11E-04	1	1	1	1	10000	1	5.11E-08								
136	60-35-5	Acetamide	2.19E-06	1	1	1	1	10000	2	1.09E-10								
137	60-57-1	Dieldrin	3.18E-05	3.3	200	2000	100	3.333333	50	1.44E-15								
138	621-64-7	Di-n-Propylnitrosamine (N-Nitroso-di-n-propylamine)	2.32E-03	1	1	1	1	10000	2	1.16E-07								
139	624-83-9	Methyl isocyanate	7.66E-03	1	1	1	1	1000	1	7.66E-06								
140	627-13-4	Nitric acid, propyl ester	3.48E-02	1	1	1	1	10000	1	3.48E-06								
141	62-75-9	N-Nitroso-N,N-dimethylamine (Dimethylnitrosamine)	1.77E-03	1	1	1	1	10000	2	8.85E-08								
142	630-20-6	1,1,1,2-Tetrachloroethane	7.86E-03	1	1	1	1	1	10	7.86E-04								
143	64-17-5	Ethyl alcohol	5.11E-04	1	1	1	1	10000	1	5.11E-08								
144	64-18-6	Formic acid	1.20E-04	1	1	1	1	10000	1	1.20E-08								
145	64-19-7	Acetic acid	2.15E-05	1	1	1	1	10000	1	2.15E-09								
146	67-56-1	Methyl alcohol (Methanol)	5.11E-04	1	1	1	1	10000	1	5.11E-08								
147	67-63-0	2-Propyl alcohol (Isopropanol; Propan-2-01)	8.63E-04	1	1	1	1	10000	1	8.63E-08								
148	67-64-1	2-Propanone (Acetone)	1.66E-02	1	1	1	1	10000	1	1.66E-06								
149	67-66-3	Chloroform	7.70E-03	1	1	1	1	1	2	3.85E-03								
150	67-72-1	Hexachloroethane	3.50E-02	1	1	1	1	1	50	7.00E-04								
151	684-16-2	Hexafluoroacetone	7.70E-03	1	1	1	1	1	1	7.70E-03								
152	71-23-8	n-Propyl alcohol	8.63E-04	1	1	1	1	10000	1	8.63E-08								
153	71-36-3	n-Butyl alcohol	8.63E-04	1	1	1	1	10000	1	8.63E-08								
154	71-43-2	Benzene	7.69E-03	1	1	1	1	100	1	7.69E-05								
155	71-55-6	Methyl chloroform (1,1,1-Trichloroethane)	7.72E-03	1	1	1	1	1000	1	7.72E-06								
156	72-20-8	Endrin	1.68E-05	3.3	200	2000	100	3.333333	50	7.62E-16								
157	72-43-5	Methoxychlor	4.01E-06	3.3	200	2000	100	3.333333	50	1.82E-16								
158	72-54-8	4,4-DDD	1.68E-05	3.3	200	2000	100	3.333333	50	7.62E-16								
159	72-55-9	4,4-DDE	1.13E-04	3.3	200	2000	100	3.333333	50	5.15E-15								
160	74-83-9	Bromomethane (Methyl bromide)	7.70E-03	1	1	1	1	1000	1	7.70E-06								
161	74-87-3	Chloromethane (Methyl chloride)	7.69E-03	1	1	1	1	20	1	3.85E-04								
162	74-97-5	Bromochloromethane	7.66E-03	1	1	1	1	1	2	3.83E-03								
163	74-99-7	Methylacetylene	3.50E-02	1	1	1	1	10000	1	3.50E-06								
164	75-00-3	Chloroethane	7.69E-03	1	1	1	1	1000	1	7.69E-06								
165	75-01-4	Vinyl chloride (1-Chloroethene)	3.51E-02	1	1	1	1	10000	1	3.51E-06								
166	75-05-8	Acetonitrile	3.60E-03	1	1	1	1	1000	1	3.60E-06								
167	75-07-0	Acetaldehyde	1.39E-02	1	1	1	1	10000	1	1.39E-06								
168	75-09-2	Dichloromethane (Methylene chloride)	7.70E-03	1	1	1	1	20	1	3.85E-04								

CALCULATION SHEET

BY: E. Berrios
DATE: 05/21/03

PROJECT: WTP
JOB NO.: 24590
CALC NO.: 24590-WTP-M4C-FRP-00005
SHEET REV: A
SHEET NO.: 82

	A	B	C	D	E	F	G	H	I	J
1	Table B-3 PVP12 - Abated Pretreatment Vessel Vent System			NaOH						
2			PVP01	Scrubber	HEME	HEPA 1	HEPA 2	TCO	Carbon Bed	PVP12
3	CAS #	COPC	g/sec	DF	DF	DF	DF	DF	DF	g/sec
169	75-12-7	Formamide	1.27E-06	1	1	1	1	10000	1	1.27E-10
170	75-15-0	Carbon disulfide	7.69E-03	1	1	1	1	10000	1	7.69E-07
171	75-21-8	Ethylene oxide (Oxirane)	6.54E-03	1	1	1	1	10000	1	6.54E-07
172	75-27-4	Bromodichloromethane	7.86E-03	1	1	1	1	1	5	1.57E-03
173	75-34-3	1,1-Dichloroethane	7.70E-03	1	1	1	1	10000	1	7.70E-07
174	75-35-4	1,1-Dichloroethene (Vinylidene chloride)	7.73E-03	1	1	1	1	10000	1	7.73E-07
175	75-43-4	Dichlorofluoromethane	7.69E-03	1	1	1	1	1000	1	7.69E-06
176	75-45-6	Chlorodifluoromethane	7.73E-03	1	1	1	1	50	1	1.55E-04
177	75-50-3	Trimethylamine	5.31E-03	1	1	1	1	10000	1	5.31E-07
178	75-52-5	Nitromethane	1.39E-02	1	1	1	1	10000	1	1.39E-06
179	75-55-8	2-Methylaziridine	3.92E-03	1	1	1	1	10000	1	3.92E-07
180	75-61-6	Difluorodibromomethane	7.73E-03	1	1	1	1	1	1	7.73E-03
181	75-63-8	Trifluorobromomethane	7.68E-03	1	1	1	1	1	1	7.68E-03
182	75-65-0	2-Methyl-2-propanol	8.63E-04	1	1	1	1	10000	1	8.63E-08
183	75-69-4	Trichlorofluoromethane	7.71E-03	1	1	1	1	1	1	7.71E-03
184	75-71-8	Dichlorodifluoromethane	7.68E-03	1	1	1	1	1	1	7.68E-03
185	75-99-0	2,2-Dichloropropionic acid	2.15E-05	1	1	1	1	100	2	1.07E-07
186	76-03-9	Trichloroacetic acid	2.19E-06	1	1	1	1	1	50	4.38E-08
187	76-11-9	1,1,1,2-Tetrachloro-2,2-difluoroethane	3.50E-02	1	1	1	1	10	5	6.99E-04
188	76-12-0	1,1,2,2-Tetrachloro-1,2-difluoroethane	3.50E-02	1	1	1	1	10	5	7.01E-04
189	76-13-1	1,2,2-Trichloro-1,1,2-trifluoroethane (Freon 113)	7.68E-03	1	1	1	1	20	2	1.92E-04
190	76-14-2	1,2-Dichloro-1,1,2,2-tetrafluoroethane	7.71E-03	1	1	1	1	1	1	7.71E-03
191	76-15-3	Chloropentafluoroethane	7.70E-03	1	1	1	1	1	1	7.70E-03
192	76-44-8	Heptachlor	6.72E-04	1	1	1	1	3.333333	10	2.02E-05
193	78-83-1	2-Methylpropyl alcohol (Isobutyl alcohol)	3.92E-03	1	1	1	1	10000	1	3.92E-07
194	78-87-5	1,2-Dichloropropane	7.70E-03	1	1	1	1	1000	1	7.70E-06
195	78-92-2	1-Methylpropyl alcohol (2-Butanol)	8.63E-04	1	1	1	1	10000	1	8.63E-08
196	78-93-3	Methyl ethyl ketone (MEK, 2-Butanone)	3.05E-03	1	1	1	1	1000	1	3.05E-06
197	79-00-5	1,1,2-Trichloroethane	7.66E-03	1	1	1	1	10000	1	7.66E-07
198	79-01-6	Trichloroethylene	7.68E-03	1	1	1	1	10000	1	7.68E-07
199	79-09-4	Propionic acid	3.49E-04	1	1	1	1	10000	1	3.49E-08
200	79-10-7	2-Propenoic acid	3.49E-04	1	1	1	1	10000	1	3.49E-08
201	79-20-9	Methyl acetate	2.41E-02	1	1	1	1	10000	1	2.41E-06
202	79-34-5	1,1,2,2-Tetrachloroethane	7.19E-03	1	1	1	1	1	10	7.19E-04
203	8001-35-2	Toxaphene	2.34E-05	3.3	200	2000	100	3.333333	50	1.06E-15
204	82-68-8	Pentachloronitrobenzene (PCBN or quintobenzene)	1.39E-02	1	1	1	1	3.333333	50	8.32E-05
205	83-32-9	Acenaphthene	2.97E-02	1	1	1	1	3.333333	50	1.78E-04
206	84-66-2	Diethyl phthalate	3.97E-04	1	1	1	1	10000	5	7.94E-09
207	84-74-2	Dibutyl phthalate	1.07E-03	3.3	200	2000	100	10000	5	1.63E-16
208	85-01-8	Phenanthrene	1.39E-02	1	1	1	1	3.333333	50	8.32E-05
209	85-68-7	Butylbenzyl phthalate	1.07E-03	3.3	200	2000	100	10000	5	1.63E-16
210	86-73-7	Fluorene	2.41E-02	3.3	200	2000	100	3.333333	50	1.10E-12
211	87-68-3	Hexachlorobutadiene	7.70E-03	1	1	1	1	50	5	3.08E-05
212	87-86-5	Pentachlorophenol	2.15E-05	1	1	1	1	3.333333	50	1.29E-07
213	88-06-2	2,4,6-Trichlorophenol	2.32E-03	1	1	1	1	3.333333	50	1.39E-05
214	88-72-2	2-Nitrotoluene	1.08E-03	1	1	1	1	10000	2	5.39E-08
215	88-75-5	2-Nitrophenol	4.90E-03	1	1	1	1	3.333333	20	7.35E-05
216	88-85-7	2-sec-Butyl-4,6-dinitrophenol (Dinoseb)	4.08E-04	3.3	200	2000	100	3.333333	50	1.86E-14
217	88-89-1	Picric acid	6.84E-08	3.3	200	2000	100	10000	5	1.04E-20
218	91-20-3	Naphthalene	1.10E-03	1	1	1	1	100	2	5.48E-06
219	91-22-5	Quinoline	9.48E-04	1	1	1	1	10000	2	4.74E-08
220	91-58-7	2-Chloronapthalene	3.27E-02	1	1	1	1	3.333333	50	1.96E-04
221	92-52-4	1,1`-Biphenyl	3.27E-02	1	1	1	1	1000	5	6.53E-06
222	92-93-3	4-Nitrobiphenyl	2.32E-03	3.3	200	2000	100	3.333333	50	1.06E-13
223	93-72-1	Silvex (2,4,5-TP)	9.95E-06	3.3	200	2000	100	3.333333	50	4.52E-16
224	93-76-5	2,4,5-T	9.95E-06	3.3	200	2000	100	3.333333	50	4.52E-16
225	94-75-7	2,4-D and esters (160C typed)	2.15E-05	1	1	1	1	3.333333	50	1.29E-07
226	95-13-6	Indene	3.57E-02	1	1	1	1	1000	2	1.79E-05
227	95-47-6	o-Xylene	7.70E-03	1	1	1	1	10000	1	7.70E-07
228	95-48-7	o-Cresol (2-Methylphenol)	2.09E-04	1	1	1	1	1000	2	1.04E-07
229	95-49-8	2-Chlorotoluene	3.50E-02	1	1	1	1	10000	2	1.75E-06
230	95-50-1	o-Dichlorobenzene (1,2-Dichlorobenzene)	7.86E-03	1	1	1	1	50	2	7.86E-05
231	95-57-8	2-Chlorophenol	3.92E-03	1	1	1	1	10000	2	1.96E-07
232	95-95-4	2,4,5-Trichlorophenol	9.48E-04	1	1	1	1	3.333333	50	5.69E-06
233	96-22-0	3-Pentanone	5.31E-03	1	1	1	1	10000	1	5.31E-07
234	96-69-5	Bis(3-tert-butyl-4-hydroxy-6-methyl-phenyl)sulfide	3.50E-02	3.3	200	2000	100	3.333333	50	1.59E-12
235	98-51-1	p-tert-Butyltoluene	3.51E-02	1	1	1	1	10000	2	1.75E-06
236	98-82-8	Cumene	3.50E-02	1	1	1	1	10000	2	1.75E-06
237	98-83-9	alpha-Methylstyrene	7.70E-03	1	1	1	1	100	2	3.85E-05
238	98-86-2	Acetophenone	4.18E-03	1	1	1	1	100	2	2.09E-05
239	98-95-3	Nitrobenzene	4.90E-03	1	1	1	1	10000	2	2.45E-07
240										7.70E-02

CALCULATION SHEET

BY: E. Berrios
DATE: 05/21/03

PROJECT: WTP
JOB NO.: 24590
CALC NO.: 24590-WTP-M4C-FRP-00005
SHEET REV: A
SHEET NO.: 83

Table B-4 PJV04 - Unabated Pretreatment PJM/RFD

	A	B	C	D	E	F	G	H	I	J	K
1											Calc'd rate
2			Feed Rate					PJV04 rate	Performan	Adjusted	PJV04
3	CAS #	COPC	g/sec	In ACM	Group	Grouping	Phase	g/sec	Factor	PF	g/sec
4	100-00-5	p-Nitrochlorobenzene	3.49E-02	No		10	vapor			4.08E-05	1.42E-06
5	100-21-0	p-Phthalic acid	3.49E-02	Yes	1	1	vapor	2.90E-06	8.31E-05		2.90E-06
6	100-25-4	1,4-Dinitrobenzene	3.49E-02	No		6	particle			8.10E-05	2.82E-06
7	100-41-4	Ethyl benzene	7.67E-03	No		20	vapor			1.01E-05	7.78E-08
8	100-42-5	Styrene	7.67E-03	No		19	vapor			1.03E-05	7.92E-08
9	10061-01-5	cis-1,3-Dichloropropene	7.67E-03	Yes	19	19	vapor	8.06E-08	1.05E-05		8.06E-08
10	10061-02-6	trans-1,3-Dichloropropene	7.67E-03	No		17	vapor			1.09E-05	8.33E-08
11	101-55-3	4-Bromophenylphenyl ether	3.49E-02	No		14	vapor			1.86E-05	6.48E-07
12	101-84-8	Diphenyl ether	7.67E-03	No		16	vapor			1.26E-05	9.69E-08
13	106-35-4	3-Heptanone	7.67E-03	No		14	vapor			1.86E-05	1.43E-07
14	106-42-3	p-Xylene (Dimethyl benzene)	7.67E-03	No		19	vapor			1.03E-05	7.92E-08
15	106-46-7	1,4-Dichlorobenzene	7.67E-03	No		18	vapor			1.10E-05	8.43E-08
16	106-88-7	1,2-Epoxybutane	7.67E-03	No		15	vapor			1.52E-05	1.17E-07
17	106-93-4	Ethylene dibromide (Dibromethane)	3.49E-02	Yes	16	16	vapor	4.10E-07	1.18E-05		4.10E-07
18	106-97-8	Butane	7.67E-03	Yes	26	26	vapor	7.71E-08	1.00E-05		7.71E-08
19	106-99-0	1,3-Butadiene	7.67E-03	Yes	23	23	vapor	7.72E-08	1.01E-05		7.72E-08
20	107-02-8	Acrolein	7.67E-03	No		14	vapor			1.86E-05	1.43E-07
21	107-05-1	3-Chloropropene (Allyl chloride)	7.67E-03	No		20	vapor			1.01E-05	7.78E-08
22	107-06-2	1,2-Dichloroethane (Ethylene chloride)	7.67E-03	No		17	vapor			1.09E-05	8.33E-08
23	107-12-0	Propionitrile	7.67E-03	No		13	vapor			2.43E-05	1.86E-07
24	107-13-1	Acrylonitrile	7.67E-03	No		14	vapor			1.86E-05	1.43E-07
25	107-18-6	2-Propene-1-ol	3.49E-02	No		10	vapor			4.08E-05	1.42E-06
26	107-31-3	Formic acid, methyl ester	3.49E-02	No		15	vapor			1.52E-05	5.30E-07
27	107-66-4	Dibutylphosphate	3.49E-02	No		5	particle			8.25E-05	2.88E-06
28	107-87-9	2-Pentanone	7.67E-03	No		14	vapor			1.86E-05	1.43E-07
29	108-03-2	1-Nitropropane	3.49E-02	No		14	vapor			1.86E-05	6.48E-07
30	108-05-4	Vinyl acetate	3.49E-02	No		16	vapor			1.26E-05	4.40E-07
31	108-10-1	Hexone (4-Methyl-2-pentanone or MIBK)	7.67E-03	No		14	vapor			1.86E-05	1.43E-07
32	108-20-3	Bis(isopropyl)ether	7.67E-03	No		18	vapor			1.10E-05	8.43E-08
33	108-38-3	m-Xylene (Dimethyl benzene)	7.67E-03	No		19	vapor			1.03E-05	7.92E-08
34	108-39-4	m-Cresol	7.67E-03	No		9	vapor			4.17E-05	3.20E-07
35	108-87-2	Methylcyclohexane	7.67E-03	Yes	25	25	vapor	7.69E-08	1.00E-05		7.69E-08
36	108-88-3	Toluene	7.67E-03	Yes	19	19	vapor	7.84E-08	1.02E-05		7.84E-08
37	108-90-7	Chlorobenzene	7.67E-03	No		19	vapor			1.03E-05	7.92E-08
38	108-93-0	Cyclohexanol	7.67E-03	No		10	vapor			4.08E-05	3.13E-07
39	108-94-1	Cyclohexanone	7.67E-03	No		11	vapor			3.12E-05	2.39E-07
40	108-95-2	Phenol	3.49E-02	Yes	8	8	vapor	2.21E-06	6.34E-05		2.21E-06
41	109-66-0	n-Pentane	7.67E-03	No		26	vapor			1.00E-05	7.71E-08
42	109-99-9	Tetrahydrofuran	1.63E-02	No		13	vapor			2.43E-05	3.95E-07
43	110-12-3	5-Methyl-2-hexanone	7.67E-03	No		15	vapor			1.52E-05	1.17E-07
44	110-43-0	2-Heptanone	7.67E-03	No		15	vapor			1.52E-05	1.17E-07
45	110-54-3	n-Hexane	7.67E-03	Yes	27	27	vapor	7.70E-08	1.00E-05		7.70E-08
46	110-62-3	n-Valeraldehyde	3.49E-02	No		15	vapor			1.52E-05	5.30E-07
47	110-82-7	Cyclohexane	7.67E-03	Yes	24	24	vapor	7.70E-08	1.00E-05		7.70E-08
48	110-83-8	Cyclohexene	7.67E-03	No		22	vapor			1.01E-05	7.76E-08
49	110-86-1	Pyridine	3.49E-02	No		11	vapor			3.12E-05	1.09E-06
50	111-65-9	n-Octane	7.67E-03	No		28	vapor			1.01E-05	7.71E-08
51	111-76-2	Ethylene glycol monobutyl ether	3.49E-02	No		9	vapor			4.17E-05	1.45E-06
52	111-84-2	n-Nonane	7.67E-03	Yes	28	28	vapor	7.71E-08	1.01E-05		7.71E-08
53	117-81-7	Bis(2-ethylhexyl)phthalate (DEHP)	3.49E-02	No		30	particle			7.96E-05	2.78E-06
54	117-84-0	n-Dioctyl phthalate	3.49E-02	No		32	particle			4.07E-05	1.42E-06
55	118-74-1	Hexachlorobenzene	7.21E-04	Yes	18	18	vapor	7.92E-09	1.10E-05		7.92E-09
56	120-12-7	Anthracene	3.49E-02	Yes	13	13	vapor	8.01E-07	2.30E-05		8.01E-07
57	120-82-1	1,2,4-Trichlorobenzene	7.67E-03	Yes	17	17	vapor	8.33E-08	1.09E-05		8.33E-08
58	120-83-2	2,4-Dichlorophenol	3.49E-02	No		10	vapor			4.08E-05	1.42E-06
59	121-44-8	Triethylamine	7.67E-03	No		15	vapor			1.52E-05	1.17E-07
60	121-69-7	Dimethylaniline	7.67E-03	No		13	vapor			2.43E-05	1.86E-07
61	122-39-4	N,N-Diphenylamine	7.67E-03	Yes	10	10	vapor	2.82E-07	3.67E-05		2.82E-07
62	123-19-3	4-Heptanone	7.67E-03	No		13	vapor			2.43E-05	1.86E-07
63	123-38-6	n-Propionaldehyde	7.67E-03	No		14	vapor			1.86E-05	1.43E-07
64	123-51-3	3-Methyl-1-butanol	7.67E-03	No		12	vapor			3.01E-05	2.31E-07
65	123-86-4	Acetic acid n-butyl ester	3.49E-02	No		16	vapor			1.26E-05	4.40E-07
66	123-91-1	1,4-Dioxane	2.09E-02	No		10	vapor			4.08E-05	8.54E-07
67	126-73-8	Tributyl phosphate	3.49E-02	Yes	7	7	vapor	2.52E-06	7.22E-05		2.52E-06
68	126-98-7	2-Methyl-2-propenenitrile (Methacrylonitrile)	7.67E-03	No		16	vapor			1.26E-05	9.69E-08
69	127-18-4	Perchloroethylene (tetrachloroethylene)	7.67E-03	Yes	21	21	vapor	7.77E-08	1.01E-05		7.77E-08
70	127-19-5	N,N-Dimethylacetamide	7.67E-03	No		5	vapor			8.25E-05	6.33E-07
71	128-37-0	2,6-Bis(tert-butyl)-4-methylphenol	3.49E-02	No		32	vapor			4.07E-05	1.42E-06
72	129-00-0	Pyrene	3.49E-02	Yes	33	33	particle	1.41E-06	4.04E-05		1.41E-06
73	1321-64-8	Pentachloronaphthalene	3.49E-02	No		14	particle			1.86E-05	6.48E-07
74	1321-65-9	Trichloronaphthalene	3.49E-02	No		15	vapor			1.52E-05	5.30E-07
75	132-64-9	Dibenzofuran	3.49E-02	Yes	15	15	vapor	5.30E-07	1.52E-05		5.30E-07
76	1335-87-1	Hexachloronaphthalene	3.49E-02	No		14	particle			1.86E-05	6.48E-07
77	1335-88-2	Tetrachloronaphthalene	3.49E-02	No		15	particle			1.52E-05	5.30E-07
78	1336-36-3	Polychlorinated biphenyls (PCBs)	1.21E-02	Yes	35	35	particle	1.34E-06	1.11E-04		1.32E-06
79	141-78-6	Acetic acid ethyl ester (Ethyl acetate)	3.49E-02	No		14	vapor			1.86E-05	6.48E-07
80	141-79-7	4-Methyl-3-penten-2-one	3.49E-02	No		13	vapor			2.43E-05	8.47E-07
81	142-82-5	n-Heptane	7.67E-03	No		27	vapor			1.00E-05	7.70E-08
82	144-62-7	Oxalic acid	3.49E-03	Yes	3	3	vapor	2.90E-07	8.32E-05		2.90E-07
83	156-60-5	trans-1,2-Dichloroethylene	7.67E-03	No		20	vapor			1.01E-05	7.78E-08
84	1582-09-8	Trifluralin	3.49E-02	No		14	particle			1.86E-05	6.48E-07
85	1634-04-4	Methyl tert-butyl ether	7.67E-03	No		16	vapor			1.26E-05	9.69E-08
86	1836-75-5	Nitrofen	3.49E-02	No		30	particle			7.96E-05	2.78E-06
87	189-55-9	Dibenzo[a,i]pyrene	3.49E-02	No		5	particle			8.25E-05	2.88E-06
88	189-64-0	Dibenzo[a,h]pyrene	3.49E-02	No		5	particle			8.25E-05	2.88E-06
89	191-24-2	Benzo(g,h,i)perylene	3.49E-02	No		30	particle			7.96E-05	2.78E-06
90	191-30-0	Benzo[a,l]pyrene	3.49E-02	No		5	particle			8.25E-05	2.88E-06
91	192-65-4	Dibenzo[a,e]pyrene	3.49E-02	No		5	particle			8.25E-05	2.88E-06
92	193-39-5	Indeno(1,2,3-cd)pyrene	3.49E-02	No		30	particle			7.96E-05	2.78E-06
93	205-82-3	Benzo(j)fluoranthene	3.49E-02	No		7	particle			7.22E-05	2.52E-06
94	205-99-2	Benzo(b)fluoranthene	3.49E-02	No		30	particle			7.96E-05	2.78E-06
95	206-44-0	Fluoranthene	3.49E-02	No		33	particle			4.16E-05	1.45E-06
96	207-08-9	Benzo(k)fluoranthene	3.49E-02	No		30	particle			7.96E-05	2.78E-06
97	208-96-8	Acenaphthylene	3.49E-02	Yes	14	14	vapor	6.48E-07	1.86E-05		6.48E-07
98	218-01-9	Chrysene	3.49E-02	Yes	32	32	particle	1.51E-06	4.33E-05		1.51E-06
99	2234-13-1	Octachloronaphthalene	3.49E-02	No		14	particle			1.86E-05	6.48E-07
100	224-42-0	Dibenz[a,j]acridine	3.49E-02	No		4	particle			8.29E-05	2.89E-06
101	226-36-8	Dibenz[a,h]acridine	3.49E-02	No		4	particle			8.29E-05	2.89E-06
102	2385-85-5	Mirex	3.49E-02	No		17	vapor			1.09E-05	3.79E-07
103	25551-13-7	Trimethyl benzene	7.67E-03	No		19	vapor			1.03E-05	7.92E-08
104	26140-60-3	Terphenyls	3.49E-02	No		34	particle			3.99E-05	1.39E-06
105	27154-33-2	Trichlorofluoroethane	7.67E-03	No		23	vapor			1.01E-05	7.72E-08
106	287-92-3	Cyclopentane	7.67E-03	No		24	vapor			1.00E-05	7.70E-08
107	309-00-2	Aldrin	4.30E-04	Yes	34	34	particle	1.72E-08	3.99E-05		1.72E-08
108	319-84-6	Hexachlorocyclohexane (Lindane) Alpha BHC	1.16E-04	No		33	vapor			4.16E-05	4.83E-09
109	319-85-7	Hexachlorocyclohexane (Lindane) Beta BHC	1.16E-04	Yes	30	30	particle	9.38E-09	8.07E-05		9.38E-09
110	319-86-8	Delta-BHC	1.16E-04	No		30	particle			7.96E-05	9.25E-09
111	3697-24-3	5-Methylchrysene	3.49E-02	No		32	particle			4.07E-05	1.42E-06
112	3825-26-1	Ammonium perfluorooctanoate	3.49E-02	No		14	particle			1.86E-05	6.48E-07
113	4170-30-3	2-Butenaldehyde (2-Butenal or Crotonaldehyde)	7.67E-03	Yes	11	11	vapor	2.39E-07	3.12E-05		2.39E-07
114	465-73-6	Isodrin	2.32E-04	No		35	vapor			1.11E-04	2.57E-08
115	50-00-0	Formaldehyde	7.67E-03	No		8	vapor			7.01E-05	5.38E-07
116	50-29-3	4,4-DDT	2.32E-04	No		33	particle			4.16E-05	9.67E-09
117	50-32-8	Benzo(a)pyrene	4.42E-04	Yes	30	30	particle	3.47E-08	7.85E-05		3.47E-08
118	53-70-3	Dibenzo(a,h)anthracene	5.81E-05	No		7	particle			7.22E-05	4.19E-09
119	540-59-0	1,2-Dichloroethylene	7.67E-03	No		19	vapor			1.03E-05	7.92E-08
120	540-84-1	2,2,4-Trimethylpentane	7.67E-03	No		28	vapor			1.01E-05	7.71E-08
121	541-73-1	1,3-Dichlorobenzene	7.67E-03	No		19	vapor			1.03E-05	7.92E-08
122	56-23-5	Carbon tetrachloride	7.67E-03	Yes	22	22	vapor	7.76E-08	1.01E-05		7.76E-08
123	563-80-4	3-Methyl-2-butanone	7.67E-03	No		14	vapor			1.86E-05	1.43E-07
124	56-49-5	3-Methylcholanthrene	3.49E-02	No		28	particle			1.01E-05	3.51E-07
125	56-55-3	Benzo(a)anthracene	3.49E-02	No		33	particle			4.16E-05	1.45E-06
126	57-14-7	1,1-Dimethylhydrazine	3.49E-02	Yes	12	12	vapor	1.05E-06	3.01E-05		1.05E-06
127	58-89-9	gamma-BHC (Lindane)	1.16E-04	Yes	32	32	particle	5.22E-09	4.49E-05		5.22E-09
128	58-90-2	2,3,4,6-Tetrachlorophenol	3.49E-02	Yes	11	11	vapor	1.10E-06	3.15E-05		1.10E-06
129	591-78-6	2-Hexanone	7.67E-03	No		14	vapor			1.86E-05	1.43E-07
130	59-50-7	4-Chloro-3-methylphenol	3.49E-02	No		32	particle			4.07E-05	1.42E-06
131	59-89-2	N-Nitrosomorpholine	3.49E-02	No		6	vapor			8.10E-05	2.82E-06
132	602-87-9	5-Nitroacenaphthene	3.49E-02	No		9	particle			4.17E-05	1.45E-06
133	60-29-7	Ethyl ether	3.49E-02	No		17	vapor			1.09E-05	3.79E-07
134	603-34-9	Triphenylamine	3.49E-02	Yes	32	32	vapor	1.18E-06	3.37E-05		1.18E-06
135	60-34-4	Methylhydrazine	7.67E-03	No		10	vapor			4.08E-05	3.13E-07
136	60-35-5	Acetamide	7.67E-03	Yes	5	5	vapor	6.33E-07	8.25E-05		6.33E-07
137	60-57-1	Dieldrin	2.32E-04	Yes	33	33	particle	9.95E-09	4.28E-05		9.95E-09
138	621-64-7	Di-n-Propylnitrosamine (N-Nitroso-di-n-propylamine)	3.49E-02	No		10	vapor			4.08E-05	1.42E-06
139	624-83-9	Methyl isocyanate	7.67E-03	No		17	vapor			1.09E-05	8.33E-08
140	627-13-4	Nitric acid, propyl ester	3.49E-02	No		17	vapor			1.09E-05	3.79E-07
141	62-75-9	N-Nitroso-N,N-dimethylamine (Dimethylnitrosamine)	6.51E-02	Yes	9	9	vapor	2.71E-06	4.17E-05		2.71E-06
142	630-20-6	1,1,1,2-Tetrachloroethane	7.67E-03	No		18	vapor			1.10E-05	8.43E-08
143	64-17-5	Ethyl alcohol	7.67E-03	No		10	vapor			4.08E-05	3.13E-07
144	64-18-6	Formic acid	3.49E-02	No		7	vapor			7.22E-05	2.52E-06
145	64-19-7	Acetic acid	3.49E-02	No		6	vapor			8.10E-05	2.82E-06
146	67-56-1	Methyl alcohol (Methanol)	7.67E-03	No		10	vapor			4.08E-05	3.13E-07
147	67-63-0	2-Propyl alcohol (Isopropanol; Propan-2-01)	7.67E-03	No		11	vapor			3.12E-05	2.39E-07
148	67-64-1	2-Propanone (Acetone)	4.18E-02	No		13	vapor			2.43E-05	1.02E-06
149	67-66-3	Chloroform	7.67E-03	No		19	vapor			1.03E-05	7.92E-08
150	67-72-1	Hexachloroethane	3.49E-02	No		19	vapor			1.03E-05	3.60E-07
151	684-16-2	Hexafluoroacetone	7.67E-03	No		19	vapor			1.03E-05	7.92E-08
152	71-23-8	n-Propyl alcohol	7.67E-03	No		11	vapor			3.12E-05	2.39E-07
153	71-36-3	n-Butyl alcohol	7.67E-03	No		11	vapor			3.12E-05	2.39E-07
154	71-43-2	Benzene	7.67E-03	Yes	19	19	vapor	7.85E-08	1.02E-05		7.85E-08
155	71-55-6	Methyl chloroform (1,1,1-Trichloroethane)	7.67E-03	No		21	vapor			1.01E-05	7.77E-08
156	72-20-8	Endrin	2.32E-04	No		32	particle			4.07E-05	9.45E-09
157	72-43-5	Methoxychlor	1.16E-03	No		7	particle			7.22E-05	8.39E-08
158	72-54-8	4,4-DDD	2.32E-04	No		32	particle			4.07E-05	9.45E-09
159	72-55-9	4,4-DDE	2.32E-04	No		34	particle			3.99E-05	9.28E-09
160	74-83-9	Bromomethane (Methyl bromide)	7.67E-03	No		19	vapor			1.03E-05	7.92E-08
161	74-87-3	Chloromethane (Methyl chloride)	7.67E-03	No		20	vapor			1.01E-05	7.78E-08
162	74-97-5	Bromochloromethane	7.67E-03	No		17	vapor			1.09E-05	8.33E-08
163	74-99-7	Methylacetylene	3.49E-02	No		20	vapor			1.01E-05	3.54E-07
164	75-00-3	Chloroethane	7.67E-03	No		20	vapor			1.01E-05	7.78E-08
165	75-01-4	Vinyl chloride (1-Chloroethene)	3.49E-02	No		22	vapor			1.01E-05	3.53E-07
166	75-05-8	Acetonitrile	1.09E-02	Yes	13	13	vapor	2.80E-07	2.56E-05		2.80E-07
167	75-07-0	Acetaldehyde	3.49E-02	No		13	vapor			2.43E-05	8.47E-07
168	75-09-2	Dichloromethane (Methylene chloride)	7.67E-03	No		19	vapor			1.03E-05	7.92E-08
169	75-12-7	Formamide	3.49E-02	Yes	4	4	vapor	2.89E-06	8.29E-05		2.89E-06
170	75-15-0	Carbon disulfide	7.67E-03	No		20	vapor			1.01E-05	7.78E-08
171	75-21-8	Ethylene oxide (Oxirane)	7.67E-03	No		15	vapor			1.52E-05	1.17E-07
172	75-27-4	Bromodichloromethane	7.67E-03	No		18	vapor			1.10E-05	8.43E-08
173	75-34-3	1,1-Dichloroethane	7.67E-03	No		19	vapor			1.03E-05	7.92E-08
174	75-35-4	1,1-Dichloroethene (Vinylidene chloride)	7.67E-03	No		22	vapor			1.01E-05	7.76E-08
175	75-43-4	Dichlorofluoromethane	7.67E-03	No		20	vapor			1.01E-05	7.78E-08
176	75-45-6	Chlorodifluoromethane	7.67E-03	No		22	vapor			1.01E-05	7.76E-08
177	75-50-3	Trimethylamine	7.67E-03	No		14	vapor			1.86E-05	1.43E-07
178	75-52-5	Nitromethane	3.49E-02	No		13	vapor			2.43E-05	8.47E-07
179	75-55-8	2-Methylaziridine	3.49E-02	No		11	vapor			3.12E-05	1.09E-06
180	75-61-6	Difluorodibromomethane	7.67E-03	No		22	vapor			1.01E-05	7.76E-08
181	75-63-8	Trifluorobromomethane	7.67E-03	No		25	vapor			1.00E-05	7.69E-08
182	75-65-0	2-Methyl-2-propanol	7.67E-03	No		11	vapor			3.12E-05	2.39E-07
183	75-69-4	Trichlorofluoromethane	7.67E-03	No		23	vapor			1.01E-05	7.72E-08
184	75-71-8	Dichlorodifluoromethane	7.67E-03	No		25	vapor			1.00E-05	7.69E-08
185	75-99-0	2,2-Dichloropropionic acid	3.49E-02	No		6	vapor			8.10E-05	2.82E-06
186	76-03-9	Trichloroacetic acid	7.67E-03	No		5	vapor			8.25E-05	6.33E-07
187	76-11-9	1,1,1,2-Tetrachloro-2,2-difluoroethane	3.49E-02	No		24	vapor			1.00E-05	3.50E-07
188	76-12-0	1,1,2,2-Tetrachloro-1,2-difluoroethane	3.49E-02	No		23	vapor			1.01E-05	3.51E-07
189	76-13-1	1,2,2-Trichloro-1,1,2-trifluoroethane (Freon 113)	7.67E-03	No		25	vapor			1.00E-05	7.69E-08
190	76-14-2	1,2-Dichloro-1,1,2,2-tetrafluoroethane	7.67E-03	No		28	vapor			1.01E-05	7.71E-08
191	76-15-3	Chloropentafluoroethane	7.67E-03	Yes	29	29	vapor	7.70E-08	1.00E-05		7.70E-08
192	76-44-8	Heptachlor	7.56E-04	Yes	16	16	vapor	1.03E-08	1.36E-05		1.03E-08
193	78-83-1	2-Methylpropyl alcohol (Isobutyl alcohol)	3.49E-02	No		11	vapor			3.12E-05	1.09E-06
194	78-87-5	1,2-Dichloropropane	7.67E-03	No		19	vapor			1.03E-05	7.92E-08
195	78-92-2	1-Methylpropyl alcohol (2-Butanol)	7.67E-03	No		11	vapor			3.12E-05	2.39E-07
196	78-93-3	Methyl ethyl ketone (MEK, 2-Butanone)	7.67E-03	No		13	vapor			2.43E-05	1.86E-07
197	79-00-5	1,1,2-Trichloroethane	7.67E-03	No		17	vapor			1.09E-05	8.33E-08
198	79-01-6	Trichloroethylene	7.67E-03	Yes	20	20	vapor	7.78E-08	1.01E-05		7.78E-08
199	79-09-4	Propionic acid	3.49E-02	No		8	vapor			7.01E-05	2.44E-06
200	79-10-7	2-Propenoic acid	3.49E-02	No		8	vapor			7.01E-05	2.44E-06
201	79-20-9	Methyl acetate	3.49E-02	No		14	vapor			1.86E-05	6.48E-07
202	79-34-5	1,1,2,2-Tetrachloroethane	7.67E-03	No		16	vapor			1.26E-05	9.69E-08

Adjusted Performance Factors

Group	PF
1	8.31E-05
2	2.95E-04
3	8.32E-05
4	8.29E-05
5	8.25E-05
6	8.10E-05
7	7.22E-05
8	7.01E-05
9	4.17E-05
10	4.08E-05
11	3.12E-05
12	3.01E-05
13	2.43E-05
14	1.86E-05
15	1.52E-05
16	1.26E-05
17	1.09E-05
18	1.10E-05
19	1.03E-05
20	1.01E-05
21	1.01E-05
22	1.01E-05
23	1.01E-05
24	1.00E-05
25	1.00E-05
26	1.00E-05
27	1.00E-05
28	1.01E-05
29	1.00E-05
30	7.96E-05
31	5.41E-05
32	4.07E-05
33	4.16E-05
34	3.99E-05
35	1.11E-04

Coplanar PCBs		PJV04 g/sec
31508-00-6	2,3',4,4',5-Pentachlorobiphenyl (PBC 118)	9.56E-10
32598-13-3	3,3',4,4'-Tetrachlorobiphenyl (TCB)	9.56E-10
32598-14-4	2,3,3',4,4'-Pentachlorobiphenyl (PCB 105)	9.56E-10
32774-16-6	3,3',4,4',5,5'-Hexachlorobiphenyl	9.56E-10
35065-29-3	2,2',3,4,4',5,5'-Heptachlorobiphenyl	9.56E-10
35065-30-6	2,2',3,3',4,4',5-Heptachlorobiphenyl	9.56E-10
38380-08-4	2,3,3',4,4',5-Hexachlorobiphenyl (PCB 157)	9.56E-10
39635-31-9	2,3,3',4,4',5,5'-Heptachlorobiphenyl	9.56E-10
52663-72-6	2,3',4,4',5,5'-Hexachlorobiphenyl	9.56E-10
57465-28-8	3,3',4,4',5-Pentachlorobiphenyl	9.56E-10
65510-44-3	2',3,4,4',5-Pentachlorobiphenyl	9.56E-10
69782-90-7	2,3,3',4,4',5'-Hexachlorobiphenyl	9.56E-10
70362-50-4	3,4,4',5-Tetrachlorobiphenyl	9.56E-10
74472-37-0	2,3,4,4',5-Pentachlorobiphenyl	9.56E-10
1336-36-3	Polychlorinated biphenyls (PCBs)	1.32E-06
1336-36-3	UnCorrected (for coplanar PCBs)	1.34E-06

Correction for Coplanar PCBs

0.99	as parent
0.01	as coplanar sum

CALCULATION SHEET

BY: E. Berrios
DATE: 05/21/03

PROJECT: WTP
JOB NO.: 24590
CALC NO.: 24590-WTP-M4C-FRP-00005
SHEET REV: A
SHEET NO.: 84

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W
1	**Table B-4 PJV04 - Unabated Pretreatment PJM/RFD**										Calc'd rate												
2			Feed Rate					PJV04 rate	Performan	Adjusted	PJV04												
3	CAS #	COPC	g/sec	In ACM	Group	Grouping	Phase	g/sec	Factor	PF	g/sec		Adjusted Performance Factors										
203	8001-35-2	Toxaphene	2.67E-04	Yes	10	10	particle	1.20E-08	4.49E-05		1.20E-08												
204	82-68-8	Pentachloronitrobenzene (PCBN or quintobenzene)	3.49E-02	No		13	vapor			2.43E-05	8.47E-07												
205	83-32-9	Acenaphthene	3.49E-02	No		15	vapor			1.52E-05	5.30E-07												
206	84-66-2	Diethyl phthalate	3.49E-02	Yes	8	8	vapor	1.92E-06	5.51E-05		1.92E-06												
207	84-74-2	Dibutyl phthalate	3.49E-02	Yes	31	31	particle	1.89E-06	5.41E-05		1.89E-06												
208	85-01-8	Phenanthrene	3.49E-02	No		13	vapor			2.43E-05	8.47E-07												
209	85-68-7	Butylbenzyl phthalate	3.49E-02	No		31	particle			5.41E-05	1.89E-06												
210	86-73-7	Fluorene	3.49E-02	No		14	particle			1.86E-05	6.48E-07												
211	87-68-3	Hexachlorobutadiene	7.67E-03	Yes	20	20	vapor	7.79E-08	1.02E-05		7.79E-08												
212	87-86-5	Pentachlorophenol	3.49E-02	Yes	6	6	vapor	2.82E-06	8.10E-05		2.82E-06												
213	88-06-2	2,4,6-Trichlorophenol	3.49E-02	No		10	vapor			4.08E-05	1.42E-06												
214	88-72-2	2-Nitrotoluene	7.67E-03	No		12	vapor			3.01E-05	2.31E-07												
215	88-75-5	2-Nitrophenol	3.49E-02	No		12	vapor			3.01E-05	1.05E-06												
216	88-85-7	2-sec-Butyl-4,6-dinitrophenol (Dinoseb)	3.49E-02	Yes	8	8	particle	3.20E-06	9.19E-05		3.20E-06												
217	88-89-1	Picric acid	3.49E-02	Yes	2	2	particle	1.03E-05	2.95E-04		1.03E-05												
218	91-20-3	Naphthalene	1.16E-03	Yes	16	16	vapor	1.45E-08	1.25E-05		1.45E-08												
219	91-22-5	Quinoline	3.49E-02	No		9	vapor			4.17E-05	1.45E-06												
220	91-58-7	2-Chloronapthalene	3.49E-02	No		16	vapor			1.26E-05	4.40E-07												
221	92-52-4	1,1'-Biphenyl	3.49E-02	No		16	vapor			1.26E-05	4.40E-07												
222	92-93-3	4-Nitrobiphenyl	3.49E-02	No		10	particle			4.08E-05	1.42E-06												
223	93-72-1	Silvex (2,4,5-TP)	3.49E-02	No		5	particle			8.25E-05	2.88E-06												
224	93-76-5	2,4,5-T	3.49E-02	No		5	particle			8.25E-05	2.88E-06												
225	94-75-7	2,4-D and esters (160C typed)	3.49E-02	No		6	vapor			8.10E-05	2.82E-06												
226	95-13-6	Indene	3.49E-02	No		18	vapor			1.10E-05	3.83E-07												
227	95-47-6	o-Xylene	7.67E-03	No		19	vapor			1.03E-05	7.92E-08												
228	95-48-7	o-Cresol (2-Methylphenol)	7.67E-03	No		9	vapor			4.17E-05	3.20E-07												
229	95-49-8	2-Chlorotoluene	3.49E-02	No		19	vapor			1.03E-05	3.60E-07												
230	95-50-1	o-Dichlorobenzene (1,2-Dichlorobenzene)	7.67E-03	No		18	vapor			1.10E-05	8.43E-08												
231	95-57-8	2-Chlorophenol	3.49E-02	No		11	vapor			3.12E-05	1.09E-06												
232	95-95-4	2,4,5-Trichlorophenol	3.49E-02	No		9	vapor			4.17E-05	1.45E-06												
233	96-22-0	3-Pentanone	7.67E-03	No		14	vapor			1.86E-05	1.43E-07												
234	96-69-5	Bis(3-tert-butyl-4-hydroxy-6-methyl-phenyl)sulfide	3.49E-02	No		19	particle			1.03E-05	3.60E-07												
235	98-51-1	p-tert-Butyltoluene	3.49E-02	No		21	vapor			1.01E-05	3.53E-07												
236	98-82-8	Cumene	3.49E-02	No		20	vapor			1.01E-05	3.54E-07												
237	98-83-9	alpha-Methylstyrene	7.67E-03	No		19	vapor			1.03E-05	7.92E-08												
238	98-86-2	Acetophenone	3.49E-02	Yes	11	11	vapor	1.07E-06	3.08E-05		1.07E-06												
239	98-95-3	Nitrobenzene	3.49E-02	No		12	vapor			3.01E-05	1.05E-06												
240											1.82E-04												

CALCULATION SHEET

BY: E. Berrios
DATE: 05/21/03

PROJECT: WTP
JOB NO.: 24590
CALC NO.: 24590-WTP-M4C-FRP-00005
SHEET REV: A
SHEET NO.: 85

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O
1	**Table B-5 PJV11 - Abated Pretreatment PJM/RFD**			PT PJM											
2			PJV04	Demister	HEPA 1	HEPA 2	PJV11								
3	CAS #	COPC	g/sec	DF	DF	DF	g/sec								
4	100-00-5	p-Nitrochlorobenzene	1.42E-06	1	1	1	1.42E-06		Coplanar PCBs		PJV11				
5	100-21-0	p-Phthalic acid	2.90E-06	1	1	1	2.90E-06				g/sec				
6	100-25-4	1,4-Dinitrobenzene	2.82E-06	5	2000	100	2.82E-12		31508-00-6	2,3',4,4',5-Pentachlorobiphenyl (PBC 118)	9.56E-16				
7	100-41-4	Ethyl benzene	7.78E-08	1	1	1	7.78E-08		32598-13-3	3,3',4,4'-Tetrachlorobiphenyl (TCB)	9.56E-16		Correction for Coplanar PCBs		
8	100-42-5	Styrene	7.92E-08	1	1	1	7.92E-08		32598-14-4	2,3,3',4,4'-Pentachlorobiphenyl (PCB 105)	9.56E-16		0.99	as parent	
9	10061-01-5	cis-1,3-Dichloropropene	8.06E-08	1	1	1	8.06E-08		32774-16-6	3,3',4,4',5,5'-Hexachlorobiphenyl	9.56E-16		0.01	as coplanar sum	
10	10061-02-6	trans-1,3-Dichloropropene	8.33E-08	1	1	1	8.33E-08		35065-29-3	2,2',3,4,4',5,5'-Heptachlorobiphenyl	9.56E-16				
11	101-55-3	4-Bromophenylphenyl ether	6.48E-07	1	1	1	6.48E-07		35065-30-6	2,2',3,3',4,4',5-Heptachlorobiphenyl	9.56E-16				
12	101-84-8	Diphenyl ether	9.69E-08	1	1	1	9.69E-08		38380-08-4	2,3,3',4,4',5-Hexachlorobiphenyl (PCB 157)	9.56E-16				
13	106-35-4	3-Heptanone	1.43E-07	1	1	1	1.43E-07		39635-31-9	2,3,3',4,4',5,5'-Heptachlorobiphenyl	9.56E-16				
14	106-42-3	p-Xylene (Dimethyl benzene)	7.92E-08	1	1	1	7.92E-08		52663-72-6	2,3',4,4',5,5'-Hexachlorobiphenyl	9.56E-16				
15	106-46-7	1,4-Dichlorobenzene	8.43E-08	1	1	1	8.43E-08		57465-28-8	3,3',4,4',5-Pentachlorobiphenyl	9.56E-16				
16	106-88-7	1,2-Epoxybutane	1.17E-07	1	1	1	1.17E-07		65510-44-3	2',3,4,4',5-Pentachlorobiphenyl	9.56E-16				
17	106-93-4	Ethylene dibromide (Dibromethane)	4.10E-07	1	1	1	4.10E-07		69782-90-7	2,3,3',4,4',5'-Hexachlorobiphenyl	9.56E-16				
18	106-97-8	Butane	7.71E-08	1	1	1	7.71E-08		70362-50-4	3,4,4',5-Tetrachlorobiphenyl	9.56E-16				
19	106-99-0	1,3-Butadiene	7.72E-08	1	1	1	7.72E-08		74472-37-0	2,3,4,4',5-Pentachlorobiphenyl	9.56E-16				
20	107-02-8	Acrolein	1.43E-07	1	1	1	1.43E-07								
21	107-05-1	3-Chloropropene (Allyl chloride)	7.78E-08	1	1	1	7.78E-08		1336-36-3	Polychlorinated biphenyls (PCBs)	1.32E-12				
22	107-06-2	1,2-Dichloroethane (Ethylene chloride)	8.33E-08	1	1	1	8.33E-08		1336-36-3	UnCorrected (for coplanar PCBs)	1.34E-12				
23	107-12-0	Propionitrile	1.86E-07	1	1	1	1.86E-07								
24	107-13-1	Acrylonitrile	1.43E-07	1	1	1	1.43E-07								
25	107-18-6	2-Propene-1-ol	1.42E-06	1	1	1	1.42E-06								
26	107-31-3	Formic acid, methyl ester	5.30E-07	1	1	1	5.30E-07								
27	107-66-4	Dibutylphosphate	2.88E-06	5	2000	100	2.88E-12								
28	107-87-9	2-Pentanone	1.43E-07	1	1	1	1.43E-07								
29	108-03-2	1-Nitropropane	6.48E-07	1	1	1	6.48E-07								
30	108-05-4	Vinyl acetate	4.40E-07	1	1	1	4.40E-07								
31	108-10-1	Hexone (4-Methyl-2-pentanone or MIBK)	1.43E-07	1	1	1	1.43E-07								
32	108-20-3	Bis(isopropyl)ether	8.43E-08	1	1	1	8.43E-08								
33	108-38-3	m-Xylene (Dimethyl benzene)	7.92E-08	1	1	1	7.92E-08								
34	108-39-4	m-Cresol	3.20E-07	1	1	1	3.20E-07								
35	108-87-2	Methylcyclohexane	7.69E-08	1	1	1	7.69E-08								
36	108-88-3	Toluene	7.84E-08	1	1	1	7.84E-08								
37	108-90-7	Chlorobenzene	7.92E-08	1	1	1	7.92E-08								
38	108-93-0	Cyclohexanol	3.13E-07	1	1	1	3.13E-07								
39	108-94-1	Cyclohexanone	2.39E-07	1	1	1	2.39E-07								
40	108-95-2	Phenol	2.21E-06	1	1	1	2.21E-06								
41	109-66-0	n-Pentane	7.71E-08	1	1	1	7.71E-08								
42	109-99-9	Tetrahydrofuran	3.95E-07	1	1	1	3.95E-07								
43	110-12-3	5-Methyl-2-hexanone	1.17E-07	1	1	1	1.17E-07								
44	110-43-0	2-Heptanone	1.17E-07	1	1	1	1.17E-07								
45	110-54-3	n-Hexane	7.70E-08	1	1	1	7.70E-08								
46	110-62-3	n-Valeraldehyde	5.30E-07	1	1	1	5.30E-07								
47	110-82-7	Cyclohexane	7.70E-08	1	1	1	7.70E-08								
48	110-83-8	Cyclohexene	7.76E-08	1	1	1	7.76E-08								
49	110-86-1	Pyridine	1.09E-06	1	1	1	1.09E-06								
50	111-65-9	n-Octane	7.71E-08	1	1	1	7.71E-08								
51	111-76-2	Ethylene glycol monobutyl ether	1.45E-06	1	1	1	1.45E-06								
52	111-84-2	n-Nonane	7.71E-08	1	1	1	7.71E-08								
53	117-81-7	Bis(2-ethylhexyl)phthalate (DEHP)	2.78E-06	5	2000	100	2.78E-12								
54	117-84-0	n-Dioctyl phthalate	1.42E-06	5	2000	100	1.42E-12								
55	118-74-1	Hexachlorobenzene	7.92E-09	1	1	1	7.92E-09								
56	120-12-7	Anthracene	8.01E-07	1	1	1	8.01E-07								
57	120-82-1	1,2,4-Trichlorobenzene	8.33E-08	1	1	1	8.33E-08								
58	120-83-2	2,4-Dichlorophenol	1.42E-06	1	1	1	1.42E-06								
59	121-44-8	Triethylamine	1.17E-07	1	1	1	1.17E-07								
60	121-69-7	Dimethylaniline	1.86E-07	1	1	1	1.86E-07								
61	122-39-4	N,N-Diphenylamine	2.82E-07	1	1	1	2.82E-07								
62	123-19-3	4-Heptanone	1.86E-07	1	1	1	1.86E-07								
63	123-38-6	n-Propionaldehyde	1.43E-07	1	1	1	1.43E-07								
64	123-51-3	3-Methyl-1-butanol	2.31E-07	1	1	1	2.31E-07								
65	123-86-4	Acetic acid n-butyl ester	4.40E-07	1	1	1	4.40E-07								
66	123-91-1	1,4-Dioxane	8.54E-07	1	1	1	8.54E-07								
67	126-73-8	Tributyl phosphate	2.52E-06	1	1	1	2.52E-06								
68	126-98-7	2-Methyl-2-propenenitrile (Methacrylonitrile)	9.69E-08	1	1	1	9.69E-08								
69	127-18-4	Perchloroethylene (tetrachloroethylene)	7.77E-08	1	1	1	7.77E-08								
70	127-19-5	N,N-Dimethylacetamide	6.33E-07	1	1	1	6.33E-07								
71	128-37-0	2,6-Bis(tert-butyl)-4-methylphenol	1.42E-06	1	1	1	1.42E-06								
72	129-00-0	Pyrene	1.41E-06	5	2000	100	1.41E-12								
73	1321-64-8	Pentachloronaphthalene	6.48E-07	5	2000	100	6.48E-13								
74	1321-65-9	Trichloronaphthalene	5.30E-07	1	1	1	5.30E-07								
75	132-64-9	Dibenzofuran	5.30E-07	1	1	1	5.30E-07								
76	1335-87-1	Hexachloronaphthalene	6.48E-07	5	2000	100	6.48E-13								
77	1335-88-2	Tetrachloronaphthalene	5.30E-07	5	2000	100	5.30E-13								
78	1336-36-3	Polychlorinated biphenyls (PCBs)	1.32E-06	5	2000	100	1.32E-12								
79	141-78-6	Acetic acid ethyl ester (Ethyl acetate)	6.48E-07	1	1	1	6.48E-07								
80	141-79-7	4-Methyl-3-penten-2-one	8.47E-07	1	1	1	8.47E-07								
81	142-82-5	n-Heptane	7.70E-08	1	1	1	7.70E-08								
82	144-62-7	Oxalic acid	2.90E-07	1	1	1	2.90E-07								
83	156-60-5	trans-1,2-Dichloroethylene	7.78E-08	1	1	1	7.78E-08								
84	1582-09-8	Trifluralin	6.48E-07	5	2000	100	6.48E-13								
85	1634-04-4	Methyl tert-butyl ether	9.69E-08	1	1	1	9.69E-08								
86	1836-75-5	Nitrofen	2.78E-06	5	2000	100	2.78E-12								
87	189-55-9	Dibenzo[a,i]pyrene	2.88E-06	5	2000	100	2.88E-12								
88	189-64-0	Dibenzo[a,h]pyrene	2.88E-06	5	2000	100	2.88E-12								
89	191-24-2	Benzo(g,h,i)perylene	2.78E-06	5	2000	100	2.78E-12								
90	191-30-0	Benzo[a,i]pyrene	2.88E-06	5	2000	100	2.88E-12								
91	192-65-4	Dibenzo[a,e]pyrene	2.88E-06	5	2000	100	2.88E-12								
92	193-39-5	Indeno(1,2,3-cd)pyrene	2.78E-06	5	2000	100	2.78E-12								
93	205-82-3	Benzo(j)fluoranthene	2.52E-06	5	2000	100	2.52E-12								
94	205-99-2	Benzo(b)fluoranthene	2.78E-06	5	2000	100	2.78E-12								
95	206-44-0	Fluoranthene	1.45E-06	5	2000	100	1.45E-12								
96	207-08-9	Benzo(k)fluoranthene	2.78E-06	5	2000	100	2.78E-12								
97	208-96-8	Acenaphthylene	6.48E-07	1	1	1	6.48E-07								
98	218-01-9	Chrysene	1.51E-06	5	2000	100	1.51E-12								
99	2234-13-1	Octachloronaphthalene	6.48E-07	5	2000	100	6.48E-13								
100	224-42-0	Dibenz[a,j]acridine	2.89E-06	5	2000	100	2.89E-12								
101	226-36-8	Dibenz[a,h]acridine	2.89E-06	5	2000	100	2.89E-12								
102	2385-85-5	Mirex	3.79E-07	1	1	1	3.79E-07								
103	25551-13-7	Trimethyl benzene	7.92E-08	1	1	1	7.92E-08								
104	26140-60-3	Terphenyls	1.39E-06	5	2000	100	1.39E-12								
105	27154-33-2	Trichlorofluoroethane	7.72E-08	1	1	1	7.72E-08								
106	287-92-3	Cyclopentane	7.70E-08	1	1	1	7.70E-08								
107	309-00-2	Aldrin	1.72E-08	5	2000	100	1.72E-14								
108	319-84-6	Hexachlorocyclohexane (Lindane) Alpha BHC	4.83E-09	1	1	1	4.83E-09								
109	319-85-7	Hexachlorocyclohexane (Lindane) Beta BHC	9.38E-09	5	2000	100	9.38E-15								
110	319-86-8	Delta-BHC	9.25E-09	5	2000	100	9.25E-15								
111	3697-24-3	5-Methylchrysene	1.42E-06	5	2000	100	1.42E-12								
112	3825-26-1	Ammonium perfluorooctanoate	6.48E-07	5	2000	100	6.48E-13								
113	4170-30-3	2-Butenaldehyde (2-Butenal or Crotonaldehyde)	2.39E-07	1	1	1	2.39E-07								
114	465-73-6	Isodrin	2.57E-08	1	1	1	2.57E-08								
115	50-00-0	Formaldehyde	5.38E-07	1	1	1	5.38E-07								
116	50-29-3	4,4-DDT	9.67E-09	5	2000	100	9.67E-15								
117	50-32-8	Benzo(a)pyrene	3.47E-08	5	2000	100	3.47E-14								
118	53-70-3	Dibenzo(a,h)anthracene	4.19E-09	5	2000	100	4.19E-15								
119	540-59-0	1,2-Dichloroethylene	7.92E-08	1	1	1	7.92E-08								
120	540-84-1	2,2,4-Trimethylpentane	7.71E-08	1	1	1	7.71E-08								
121	541-73-1	1,3-Dichlorobenzene	7.92E-08	1	1	1	7.92E-08								
122	56-23-5	Carbon tetrachloride	7.76E-08	1	1	1	7.76E-08								
123	563-80-4	3-Methyl-2-butanone	1.43E-07	1	1	1	1.43E-07								
124	56-49-5	3-Methylcholanthrene	3.51E-07	5	2000	100	3.51E-13								
125	56-55-3	Benzo(a)anthracene	1.45E-06	5	2000	100	1.45E-12								
126	57-14-7	1,1-Dimethylhydrazine	1.05E-06	1	1	1	1.05E-06								
127	58-89-9	gamma-BHC (Lindane)	5.22E-09	5	2000	100	5.22E-15								
128	58-90-2	2,3,4,6-Tetrachlorophenol	1.10E-06	1	1	1	1.10E-06								
129	591-78-6	2-Hexanone	1.43E-07	1	1	1	1.43E-07								
130	59-50-7	4-Chloro-3-methylphenol	1.42E-06	5	2000	100	1.42E-12								
131	59-89-2	N-Nitrosomorpholine	2.82E-06	1	1	1	2.82E-06								
132	602-87-9	5-Nitroacenaphthene	1.45E-06	5	2000	100	1.45E-12								
133	60-29-7	Ethyl ether	3.79E-07	1	1	1	3.79E-07								
134	603-34-9	Triphenylamine	1.18E-06	1	1	1	1.18E-06								
135	60-34-4	Methylhydrazine	3.13E-07	1	1	1	3.13E-07								
136	60-35-5	Acetamide	6.33E-07	1	1	1	6.33E-07								
137	60-57-1	Dieldrin	9.95E-09	5	2000	100	9.95E-15								
138	621-64-7	Di-n-Propylnitrosamine (N-Nitroso-di-n-propylamine)	1.42E-06	1	1	1	1.42E-06								
139	624-83-9	Methyl isocyanate	8.33E-08	1	1	1	8.33E-08								
140	627-13-4	Nitric acid, propyl ester	3.79E-07	1	1	1	3.79E-07								
141	62-75-9	N-Nitroso-N,N-dimethylamine (Dimethylnitrosamine)	2.71E-06	1	1	1	2.71E-06								
142	630-20-6	1,1,1,2-Tetrachloroethane	8.43E-08	1	1	1	8.43E-08								
143	64-17-5	Ethyl alcohol	3.13E-07	1	1	1	3.13E-07								
144	64-18-6	Formic acid	2.52E-06	1	1	1	2.52E-06								
145	64-19-7	Acetic acid	2.82E-06	1	1	1	2.82E-06								
146	67-56-1	Methyl alcohol (Methanol)	3.13E-07	1	1	1	3.13E-07								
147	67-63-0	2-Propyl alcohol (Isopropanol; Propan-2-01)	2.39E-07	1	1	1	2.39E-07								

CALCULATION SHEET

BY: E. Berrios
DATE: 05/21/03

PROJECT: WTP
JOB NO.: 24590
CALC NO.: 24590-WTP-M4C-FRP-00005
SHEET REV: A
SHEET NO.: 86

	A	B	C	D	E	F	G
1	**Table B-5 PJV11 - Abated Pretreatment PJM/RFD**			PT PJM			
2			PJV04	Demister	HEPA 1	HEPA 2	PJV11
3	CAS #	COPC	g/sec	DF	DF	DF	g/sec
148	67-64-1	2-Propanone (Acetone)	1.02E-06	1	1	1	1.02E-06
149	67-66-3	Chloroform	7.92E-08	1	1	1	7.92E-08
150	67-72-1	Hexachloroethane	3.60E-07	1	1	1	3.60E-07
151	684-16-2	Hexafluoroacetone	7.92E-08	1	1	1	7.92E-08
152	71-23-8	n-Propyl alcohol	2.39E-07	1	1	1	2.39E-07
153	71-36-3	n-Butyl alcohol	2.39E-07	1	1	1	2.39E-07
154	71-43-2	Benzene	7.85E-08	1	1	1	7.85E-08
155	71-55-6	Methyl chloroform (1,1,1-Trichloroethane)	7.77E-08	1	1	1	7.77E-08
156	72-20-8	Endrin	9.45E-09	5	2000	100	9.45E-15
157	72-43-5	Methoxychlor	8.39E-08	5	2000	100	8.39E-14
158	72-54-8	4,4-DDD	9.45E-09	5	2000	100	9.45E-15
159	72-55-9	4,4-DDE	9.28E-09	5	2000	100	9.28E-15
160	74-83-9	Bromomethane (Methyl bromide)	7.92E-08	1	1	1	7.92E-08
161	74-87-3	Chloromethane (Methyl chloride)	7.78E-08	1	1	1	7.78E-08
162	74-97-5	Bromochloromethane	8.33E-08	1	1	1	8.33E-08
163	74-99-7	Methylacetylene	3.54E-07	1	1	1	3.54E-07
164	75-00-3	Chloroethane	7.78E-08	1	1	1	7.78E-08
165	75-01-4	Vinyl chloride (1-Chloroethene)	3.53E-07	1	1	1	3.53E-07
166	75-05-8	Acetonitrile	2.80E-07	1	1	1	2.80E-07
167	75-07-0	Acetaldehyde	8.47E-07	1	1	1	8.47E-07
168	75-09-2	Dichloromethane (Methylene chloride)	7.92E-08	1	1	1	7.92E-08
169	75-12-7	Formamide	2.89E-06	1	1	1	2.89E-06
170	75-15-0	Carbon disulfide	7.78E-08	1	1	1	7.78E-08
171	75-21-8	Ethylene oxide (Oxirane)	1.17E-07	1	1	1	1.17E-07
172	75-27-4	Bromodichloromethane	8.43E-08	1	1	1	8.43E-08
173	75-34-3	1,1-Dichloroethane	7.92E-08	1	1	1	7.92E-08
174	75-35-4	1,1-Dichloroethene (Vinylidene chloride)	7.76E-08	1	1	1	7.76E-08
175	75-43-4	Dichlorofluoromethane	7.78E-08	1	1	1	7.78E-08
176	75-45-6	Chlorodifluoromethane	7.76E-08	1	1	1	7.76E-08
177	75-50-3	Trimethylamine	1.43E-07	1	1	1	1.43E-07
178	75-52-5	Nitromethane	8.47E-07	1	1	1	8.47E-07
179	75-55-8	2-Methylaziridine	1.09E-06	1	1	1	1.09E-06
180	75-61-6	Difluorodibromomethane	7.76E-08	1	1	1	7.76E-08
181	75-63-8	Trifluorobromomethane	7.69E-08	1	1	1	7.69E-08
182	75-65-0	2-Methyl-2-propanol	2.39E-07	1	1	1	2.39E-07
183	75-69-4	Trichlorofluoromethane	7.72E-08	1	1	1	7.72E-08
184	75-71-8	Dichlorodifluoromethane	7.69E-08	1	1	1	7.69E-08
185	75-99-0	2,2-Dichloropropionic acid	2.82E-06	1	1	1	2.82E-06
186	76-03-9	Trichloroacetic acid	6.33E-07	1	1	1	6.33E-07
187	76-11-9	1,1,1,2-Tetrachloro-2,2-difluoroethane	3.50E-07	1	1	1	3.50E-07
188	76-12-0	1,1,2,2-Tetrachloro-1,2-difluoroethane	3.51E-07	1	1	1	3.51E-07
189	76-13-1	1,2,2-Trichloro-1,1,2-trifluoroethane (Freon 113)	7.69E-08	1	1	1	7.69E-08
190	76-14-2	1,2-Dichloro-1,1,2,2-tetrafluoroethane	7.71E-08	1	1	1	7.71E-08
191	76-15-3	Chloropentafluoroethane	7.70E-08	1	1	1	7.70E-08
192	76-44-8	Heptachlor	1.03E-08	1	1	1	1.03E-08
193	78-83-1	2-Methylpropyl alcohol (Isobutyl alcohol)	1.09E-06	1	1	1	1.09E-06
194	78-87-5	1,2-Dichloropropane	7.92E-08	1	1	1	7.92E-08
195	78-92-2	1-Methylpropyl alcohol (2-Butanol)	2.39E-07	1	1	1	2.39E-07
196	78-93-3	Methyl ethyl ketone (MEK, 2-Butanone)	1.86E-07	1	1	1	1.86E-07
197	79-00-5	1,1,2-Trichloroethane	8.33E-08	1	1	1	8.33E-08
198	79-01-6	Trichloroethylene	7.78E-08	1	1	1	7.78E-08
199	79-09-4	Propionic acid	2.44E-06	1	1	1	2.44E-06
200	79-10-7	2-Propenoic acid	2.44E-06	1	1	1	2.44E-06
201	79-20-9	Methyl acetate	6.48E-07	1	1	1	6.48E-07
202	79-34-5	1,1,2,2-Tetrachloroethane	9.69E-08	1	1	1	9.69E-08
203	8001-35-2	Toxaphene	1.20E-08	5	2000	100	1.20E-14
204	82-68-8	Pentachloronitrobenzene (PCBN or quintobenzene)	8.47E-07	1	1	1	8.47E-07
205	83-32-9	Acenaphthene	5.30E-07	1	1	1	5.30E-07
206	84-66-2	Diethyl phthalate	1.92E-06	1	1	1	1.92E-06
207	84-74-2	Dibutyl phthalate	1.89E-06	5	2000	100	1.89E-12
208	85-01-8	Phenanthrene	8.47E-07	1	1	1	8.47E-07
209	85-68-7	Butylbenzyl phthalate	1.89E-06	5	2000	100	1.89E-12
210	86-73-7	Fluorene	6.48E-07	5	2000	100	6.48E-13
211	87-68-3	Hexachlorobutadiene	7.79E-08	1	1	1	7.79E-08
212	87-86-5	Pentachlorophenol	2.82E-06	1	1	1	2.82E-06
213	88-06-2	2,4,6-Trichlorophenol	1.42E-06	1	1	1	1.42E-06
214	88-72-2	2-Nitrotoluene	2.31E-07	1	1	1	2.31E-07
215	88-75-5	2-Nitrophenol	1.05E-06	1	1	1	1.05E-06
216	88-85-7	2-sec-Butyl-4,6-dinitrophenol (Dinoseb)	3.20E-06	5	2000	100	3.20E-12
217	88-89-1	Picric acid	1.03E-05	5	2000	100	1.03E-11
218	91-20-3	Naphthalene	1.45E-08	1	1	1	1.45E-08
219	91-22-5	Quinoline	1.45E-06	1	1	1	1.45E-06
220	91-58-7	2-Chloronapthalene	4.40E-07	1	1	1	4.40E-07
221	92-52-4	1,1`-Biphenyl	4.40E-07	1	1	1	4.40E-07
222	92-93-3	4-Nitrobiphenyl	1.42E-06	5	2000	100	1.42E-12
223	93-72-1	Silvex (2,4,5-TP)	2.88E-06	5	2000	100	2.88E-12
224	93-76-5	2,4,5-T	2.88E-06	5	2000	100	2.88E-12
225	94-75-7	2,4-D and esters (160C typed)	2.82E-06	1	1	1	2.82E-06
226	95-13-6	Indene	3.83E-07	1	1	1	3.83E-07
227	95-47-6	o-Xylene	7.92E-08	1	1	1	7.92E-08
228	95-48-7	o-Cresol (2-Methylphenol)	3.20E-07	1	1	1	3.20E-07
229	95-49-8	2-Chlorotoluene	3.60E-07	1	1	1	3.60E-07
230	95-50-1	o-Dichlorobenzene (1,2-Dichlorobenzene)	8.43E-08	1	1	1	8.43E-08
231	95-57-8	2-Chlorophenol	1.09E-06	1	1	1	1.09E-06
232	95-95-4	2,4,5-Trichlorophenol	1.45E-06	1	1	1	1.45E-06
233	96-22-0	3-Pentanone	1.43E-07	1	1	1	1.43E-07
234	96-69-5	Bis(3-tert-butyl-4-hydroxy-6-methyl-phenyl)sulfide	3.60E-07	5	2000	100	3.60E-13
235	98-51-1	p-tert-Butyltoluene	3.53E-07	1	1	1	3.53E-07
236	98-82-8	Cumene	3.54E-07	1	1	1	3.54E-07
237	98-83-9	alpha-Methylstyrene	7.92E-08	1	1	1	7.92E-08
238	98-86-2	Acetophenone	1.07E-06	1	1	1	1.07E-06
239	98-95-3	Nitrobenzene	1.05E-06	1	1	1	1.05E-06
240							9.56E-05

BY: E. Berrios
DATE: 05/21/03

PROJECT: WTP
JOB NO.: 24590
CALC NO.: 24590-WTP-M4C-FRP-00005
SHEET REV: A
SHEET NO.: 87

Table B-6 LMP06 - Unabated LAW Melter

CAS #	COPC	Feed Rate g/sec	In ACM	Group	Grouping	Phase	LMP06 rate g/sec	Performance Factor	Adjusted PF	Calc'd rate LMP06 g/sec
100-00-5	p-Nitrochlorobenzene	3.49E-02	No		10	vapor			7.30E-03	2.55E-04
100-21-0	p-Phthalic acid	3.49E-02	Yes	1	1	vapor	2.48E-02	7.12E-01		2.48E-02
100-25-4	1,4-Dinitrobenzene	3.49E-02	No		6	particle			6.53E-01	2.28E-02
100-41-4	Ethyl benzene	7.67E-03	No		20	vapor			0.00E+00	0.00E+00
100-42-5	Styrene	7.67E-03	No		19	vapor			0.00E+00	0.00E+00
10061-01-5	cis-1,3-Dichloropropene	7.67E-03	Yes	19	19	vapor	0.00E+00	0.00E+00		0.00E+00
10061-02-6	trans-1,3-Dichloropropene	7.67E-03	No		17	vapor			0.00E+00	0.00E+00
101-55-3	4-Bromophenylphenyl ether	3.49E-02	No		14	vapor			2.94E-06	1.03E-07
101-84-8	Diphenyl ether	7.67E-03	No		16	vapor			9.71E-11	7.45E-13
106-35-4	3-Heptanone	7.67E-03	No		14	vapor			2.94E-06	2.26E-08
106-42-3	p-Xylene (Dimethyl benzene)	7.67E-03	No		19	vapor			0.00E+00	0.00E+00
106-46-7	1,4-Dichlorobenzene	7.67E-03	No		18	vapor			0.00E+00	0.00E+00
106-88-7	1,2-Epoxybutane	7.67E-03	No		15	vapor			1.48E-07	1.14E-09
106-93-4	Ethylene dibromide (Dibromethane)	3.49E-02	Yes	16	16	vapor	1.02E-11	2.91E-10		1.02E-11
106-97-8	Butane	7.67E-03	Yes	26	26	vapor	0.00E+00	0.00E+00		0.00E+00
106-99-0	1,3-Butadiene	7.67E-03	Yes	23	23	vapor	0.00E+00	0.00E+00		0.00E+00
107-02-8	Acrolein	7.67E-03	No		14	vapor			2.94E-06	2.26E-08
107-05-1	3-Chloropropene (Allyl chloride)	7.67E-03	No		20	vapor			0.00E+00	0.00E+00
107-06-2	1,2-Dichloroethane (Ethylene chloride)	7.67E-03	No		17	vapor			0.00E+00	0.00E+00
107-12-0	Propionitrile	7.67E-03	No		13	vapor			5.27E-05	4.05E-07
107-13-1	Acrylonitrile	7.67E-03	No		14	vapor			2.94E-06	2.26E-08
107-18-6	2-Propene-1-ol	3.49E-02	No		10	vapor			7.30E-03	2.55E-04
107-31-3	Formic acid, methyl ester	3.49E-02	No		15	vapor			1.48E-07	5.16E-09
107-66-4	Dibutylphosphate	3.49E-02	No		5	particle			6.88E-01	2.40E-02
107-87-9	2-Pentanone	7.67E-03	No		14	vapor			2.94E-06	2.26E-08
108-03-2	1-Nitropropane	3.49E-02	No		14	vapor			2.94E-06	1.03E-07
108-05-4	Vinyl acetate	3.49E-02	No		16	vapor			9.71E-11	3.39E-12
108-10-1	Hexone (4-Methyl-2-pentanone or MIBK)	7.67E-03	No		14	vapor			2.94E-06	2.26E-08
108-20-3	Bis(isopropyl)ether	7.67E-03	No		18	vapor			0.00E+00	0.00E+00
108-38-3	m-Xylene (Dimethyl benzene)	7.67E-03	No		19	vapor			0.00E+00	0.00E+00
108-39-4	m-Cresol	7.67E-03	No		9	vapor			3.38E-02	2.59E-04
108-87-2	Methylcyclohexane	7.67E-03	Yes	25	25	vapor	0.00E+00	0.00E+00		0.00E+00
108-88-3	Toluene	7.67E-03	Yes	19	19	vapor	0.00E+00	0.00E+00		0.00E+00
108-90-7	Chlorobenzene	7.67E-03	No		19	vapor			0.00E+00	0.00E+00
108-93-0	Cyclohexanol	7.67E-03	No		10	vapor			7.30E-03	5.60E-05
108-94-1	Cyclohexanone	7.67E-03	No		11	vapor			1.53E-03	1.17E-05
108-95-2	Phenol	3.49E-02	Yes	8	8	vapor	9.42E-03	2.70E-01		9.42E-03
109-66-0	n-Pentane	7.67E-03	No		26	vapor			0.00E+00	0.00E+00
109-99-9	Tetrahydrofuran	1.63E-02	No		13	vapor			5.27E-05	8.58E-07
110-12-3	5-Methyl-2-hexanone	7.67E-03	No		15	vapor			1.48E-07	1.14E-09
110-43-0	2-Heptanone	7.67E-03	No		15	vapor			1.48E-07	1.14E-09
110-54-3	n-Hexane	7.67E-03	Yes	27	27	vapor	0.00E+00	0.00E+00		0.00E+00
110-62-3	n-Valeraldehyde	3.49E-02	No		15	vapor			1.48E-07	5.16E-09
110-82-7	Cyclohexane	7.67E-03	Yes	24	24	vapor	0.00E+00	0.00E+00		0.00E+00
110-83-8	Cyclohexene	7.67E-03	No		22	vapor			0.00E+00	0.00E+00
110-86-1	Pyridine	3.49E-02	No		11	vapor			1.53E-03	5.33E-05
111-65-9	n-Octane	7.67E-03	No		28	vapor			0.00E+00	0.00E+00
111-76-2	Ethylene glycol monobutyl ether	3.49E-02	No		9	vapor			3.38E-02	1.18E-03
111-84-2	n-Nonane	7.67E-03	Yes	28	28	vapor	0.00E+00	0.00E+00		0.00E+00
117-81-7	Bis(2-ethylhexyl)phthalate (DEHP)	3.49E-02	No		30	particle			2.72E-01	9.49E-03
117-84-0	n-Dioctyl phthalate	3.49E-02	No		32	particle			5.28E-03	1.84E-04
118-74-1	Hexachlorobenzene	7.21E-04	Yes	18	18	vapor	0.00E+00	0.00E+00		0.00E+00
120-12-7	Anthracene	3.49E-02	Yes	13	13	vapor	8.55E-07	2.45E-05		8.55E-07
120-82-1	1,2,4-Trichlorobenzene	7.67E-03	Yes	17	17	vapor	0.00E+00	0.00E+00		0.00E+00
120-83-2	2,4-Dichlorophenol	3.49E-02	No		10	vapor			7.30E-03	2.55E-04
121-44-8	Triethylamine	7.67E-03	No		15	vapor			1.48E-07	1.14E-09
121-69-7	Dimethylaniline	7.67E-03	No		13	vapor			5.27E-05	4.05E-07
122-39-4	N,N-Diphenylamine	7.67E-03	Yes	10	10	vapor	8.77E-05	1.14E-02		8.77E-05
123-19-3	4-Heptanone	7.67E-03	No		13	vapor			5.27E-05	4.05E-07
123-38-6	n-Propionaldehyde	7.67E-03	No		14	vapor			2.94E-06	2.26E-08
123-51-3	3-Methyl-1-butanol	7.67E-03	No		12	vapor			9.00E-04	6.90E-06
123-86-4	Acetic acid n-butyl ester	3.49E-02	No		16	vapor			9.71E-11	3.39E-12
123-91-1	1,4-Dioxane	2.09E-02	No		10	vapor			7.30E-03	1.53E-04
126-73-8	Tributyl phosphate	3.49E-02	Yes	7	7	vapor	1.52E-02	4.36E-01		1.52E-02
126-98-7	2-Methyl-2-propenenitrile (Methacrylonitrile)	7.67E-03	No		16	vapor			9.71E-11	7.45E-13
127-18-4	Perchloroethylene (tetrachloroethylene)	7.67E-03	Yes	21	21	vapor	0.00E+00	0.00E+00		0.00E+00
127-19-5	N,N-Dimethylacetamide	7.67E-03	No		5	vapor			6.88E-01	5.28E-03
128-37-0	2,6-Bis(tert-butyl)-4-methylphenol	3.49E-02	No		32	vapor			5.28E-03	1.84E-04
129-00-0	Pyrene	3.49E-02	Yes	33	33	particle	4.53E-05	1.30E-03		4.53E-05
1321-64-8	Pentachloronaphthalene	3.49E-02	No		14	particle			2.94E-06	1.03E-07
1321-65-9	Trichloronaphthalene	3.49E-02	No		15	vapor			1.48E-07	5.16E-09
132-64-9	Dibenzofuran	3.49E-02	Yes	15	15	vapor	5.16E-09	1.48E-07		5.16E-09
1335-87-1	Hexachloronaphthalene	3.49E-02	No		14	particle			2.94E-06	1.03E-07
1335-88-2	Tetrachloronaphthalene	3.49E-02	No		15	particle			1.48E-07	5.16E-09
1336-36-3	Polychlorinated biphenyls (PCBs)	1.21E-02	Yes	35	35	particle	5.47E-11	4.52E-09		5.42E-11
141-78-6	Acetic acid ethyl ester (Ethyl acetate)	3.49E-02	No		14	vapor			2.94E-06	1.03E-07
141-79-7	4-Methyl-3-penten-2-one	3.49E-02	No		13	vapor			5.27E-05	1.84E-06
142-82-5	n-Heptane	7.67E-03	No		27	vapor			0.00E+00	0.00E+00
144-62-7	Oxalic acid	3.49E-03	Yes	3	3	vapor	2.48E-03	7.10E-01		2.48E-03
156-60-5	trans-1,2-Dichloroethylene	7.67E-03	No		20	vapor			0.00E+00	0.00E+00
1582-09-8	Trifluralin	3.49E-02	No		14	particle			2.94E-06	1.03E-07
1634-04-4	Methyl tert-butyl ether	7.67E-03	No		16	vapor			9.71E-11	7.45E-13
1836-75-5	Nitrofen	3.49E-02	No		30	particle			2.72E-01	9.49E-03
189-55-9	Dibenzo[a,i]pyrene	3.49E-02	No		5	particle			6.88E-01	2.40E-02
189-64-0	Dibenzo[a,h]pyrene	3.49E-02	No		5	particle			6.88E-01	2.40E-02
191-24-2	Benzo(g,h,i)perylene	3.49E-02	No		30	particle			2.72E-01	9.49E-03
191-30-0	Benzo[a,l]pyrene	3.49E-02	No		5	particle			6.88E-01	2.40E-02
192-65-4	Dibenzo[a,e]pyrene	3.49E-02	No		5	particle			6.88E-01	2.40E-02
193-39-5	Indeno(1,2,3-cd)pyrene	3.49E-02	No		30	particle			2.72E-01	9.49E-03
205-82-3	Benzo(j)fluoranthene	3.49E-02	No		7	particle			4.36E-01	1.52E-02
205-99-2	Benzo(b)fluoranthene	3.49E-02	No		30	particle			2.72E-01	9.49E-03
206-44-0	Fluoranthene	3.49E-02	No		33	particle			1.17E-03	4.07E-05
207-08-9	Benzo(k)fluoranthene	3.49E-02	No		30	particle			2.72E-01	9.49E-03
208-96-8	Acenaphthylene	3.49E-02	Yes	14	14	vapor	1.03E-07	2.94E-06		1.03E-07
218-01-9	Chrysene	3.49E-02	Yes	32	32	particle	2.40E-04	6.88E-03		2.40E-04
2234-13-1	Octachloronaphthalene	3.49E-02	No		14	particle			2.94E-06	1.03E-07
224-42-0	Dibenz[a,j]acridine	3.49E-02	No		4	particle			7.08E-01	2.47E-02
226-36-8	Dibenz[a,h]acridine	3.49E-02	No		4	particle			7.08E-01	2.47E-02
2385-85-5	Mirex	3.49E-02	No		17	vapor			0.00E+00	0.00E+00
25551-13-7	Trimethyl benzene	7.67E-03	No		19	vapor			0.00E+00	0.00E+00
26140-60-3	Terphenyls	3.49E-02	No		34	particle			2.74E-05	9.55E-07
27154-33-2	Trichlorofluoroethane	7.67E-03	No		23	vapor			0.00E+00	0.00E+00
287-92-3	Cyclopentane	7.67E-03	No		24	vapor			0.00E+00	0.00E+00
309-00-2	Aldrin	4.30E-04	Yes	34	34	particle	1.18E-08	2.74E-05		1.18E-08
319-84-6	Hexachlorocyclohexane (Lindane) Alpha BHC	1.16E-04	No		33	vapor			1.17E-03	1.36E-07
319-85-7	Hexachlorocyclohexane (Lindane) Beta BHC	1.16E-04	Yes	30	30	particle	3.11E-05	2.67E-01		3.11E-05
319-86-8	Delta-BHC	1.16E-04	No		30	particle			2.72E-01	3.16E-05
3697-24-3	5-Methylchrysene	3.49E-02	No		32	particle			5.28E-03	1.84E-04
3825-26-1	Ammonium perfluorooctanoate	3.49E-02	No		14	particle			2.94E-06	1.03E-07
4170-30-3	2-Butenaldehyde (2-Butenal or Crotonaldehyde)	7.67E-03	Yes	11	11	vapor	1.16E-05	1.51E-03		1.16E-05
465-73-6	Isodrin	2.32E-04	No		35	vapor			4.52E-09	1.05E-12
50-00-0	Formaldehyde	7.67E-03	No		8	vapor			3.20E-01	2.46E-03
50-29-3	4,4-DDT	2.32E-04	No		33	particle			1.17E-03	2.72E-07
50-32-8	Benzo(a)pyrene	4.42E-04	Yes	30	30	particle	1.22E-04	2.77E-01		1.22E-04
53-70-3	Dibenzo(a,h)anthracene	5.81E-05	No		7	particle			4.36E-01	2.53E-05
540-59-0	1,2-Dichloroethylene	7.67E-03	No		19	vapor			0.00E+00	0.00E+00
540-84-1	2,2,4-Trimethylpentane	7.67E-03	No		28	vapor			0.00E+00	0.00E+00
541-73-1	1,3-Dichlorobenzene	7.67E-03	No		19	vapor			0.00E+00	0.00E+00
56-23-5	Carbon tetrachloride	7.67E-03	Yes	22	22	vapor	0.00E+00	0.00E+00		0.00E+00
563-80-4	3-Methyl-2-butanone	7.67E-03	No		14	vapor			2.94E-06	2.26E-08
56-49-5	3-Methylcholanthrene	3.49E-02	No		28	particle			0.00E+00	0.00E+00
56-55-3	Benzo(a)anthracene	3.49E-02	No		33	particle			1.17E-03	4.07E-05
57-14-7	1,1-Dimethylhydrazine	3.49E-02	Yes	12	12	vapor	3.14E-05	9.00E-04		3.14E-05
58-89-9	gamma-BHC (Lindane)	1.16E-04	Yes	32	32	particle	4.92E-07	4.23E-03		4.92E-07
58-90-2	2,3,4,6-Tetrachlorophenol	3.49E-02	Yes	11	11	vapor	6.24E-05	1.79E-03		6.24E-05
591-78-6	2-Hexanone	7.67E-03	No		14	vapor			2.94E-06	2.26E-08
59-50-7	4-Chloro-3-methylphenol	3.49E-02	No		32	particle			5.28E-03	1.84E-04
59-89-2	N-Nitrosomorpholine	3.49E-02	No		6	vapor			6.53E-01	2.28E-02
602-87-9	5-Nitroacenaphthene	3.49E-02	No		9	particle			3.38E-02	1.18E-03
60-29-7	Ethyl ether	3.49E-02	No		17	vapor			0.00E+00	0.00E+00
603-34-9	Triphenylamine	3.49E-02	Yes	32	32	vapor	1.65E-04	4.72E-03		1.65E-04
60-34-4	Methylhydrazine	7.67E-03	No		10	vapor			7.30E-03	5.60E-05
60-35-5	Acetamide	7.67E-03	Yes	5	5	vapor	5.28E-03	6.88E-01		5.28E-03
60-57-1	Dieldrin	2.32E-04	Yes	33	33	particle	2.41E-07	1.04E-03		2.41E-07
621-64-7	Di-n-Propylnitrosamine (N-Nitroso-di-n-propylamine)	3.49E-02	No		10	vapor			7.30E-03	2.55E-04
624-83-9	Methyl isocyanate	7.67E-03	No		17	vapor			0.00E+00	0.00E+00
627-13-4	Nitric acid, propyl ester	3.49E-02	No		17	vapor			0.00E+00	0.00E+00
62-75-9	N-Nitroso-N,N-dimethylamine (Dimethylnitrosamine)	6.51E-02	Yes	9	9	vapor	2.20E-03	3.38E-02		2.20E-03
630-20-6	1,1,1,2-Tetrachloroethane	7.67E-03	No		18	vapor			0.00E+00	0.00E+00
64-17-5	Ethyl alcohol	7.67E-03	No		10	vapor			7.30E-03	5.60E-05
64-18-6	Formic acid	3.49E-02	No		7	vapor			4.36E-01	1.52E-02
64-19-7	Acetic acid	3.49E-02	No		6	vapor			6.53E-01	2.28E-02
67-56-1	Methyl alcohol (Methanol)	7.67E-03	No		10	vapor			7.30E-03	5.60E-05
67-63-0	2-Propyl alcohol (Isopropanol; Propan-2-01)	7.67E-03	No		11	vapor			1.53E-03	1.17E-05
67-64-1	2-Propanone (Acetone)	4.18E-02	No		13	vapor			5.27E-05	2.21E-06
67-66-3	Chloroform	7.67E-03	No		19	vapor			0.00E+00	0.00E+00
67-72-1	Hexachloroethane	3.49E-02	No		19	vapor			0.00E+00	0.00E+00
684-16-2	Hexafluoroacetone	7.67E-03	No		19	vapor			0.00E+00	0.00E+00
71-23-8	n-Propyl alcohol	7.67E-03	No		11	vapor			1.53E-03	1.17E-05
71-36-3	n-Butyl alcohol	7.67E-03	No		11	vapor			1.53E-03	1.17E-05
71-43-2	Benzene	7.67E-03	Yes	19	19	vapor	0.00E+00	0.00E+00		0.00E+00
71-55-6	Methyl chloroform (1,1,1-Trichloroethane)	7.67E-03	No		21	vapor			0.00E+00	0.00E+00
72-20-8	Endrin	2.32E-04	No		32	particle			5.28E-03	1.23E-06
72-43-5	Methoxychlor	1.16E-03	No		7	particle			4.36E-01	5.07E-04
72-54-8	4,4-DDD	2.32E-04	No		32	particle			5.28E-03	1.23E-06
72-55-9	4,4-DDE	2.32E-04	No		34	particle			2.74E-05	6.36E-09
74-83-9	Bromomethane (Methyl bromide)	7.67E-03	No		19	vapor			0.00E+00	0.00E+00
74-87-3	Chloromethane (Methyl chloride)	7.67E-03	No		20	vapor			0.00E+00	0.00E+00
74-97-5	Bromochloromethane	7.67E-03	No		17	vapor			0.00E+00	0.00E+00
74-99-7	Methylacetylene	3.49E-02	No		20	vapor			0.00E+00	0.00E+00
75-00-3	Chloroethane	7.67E-03	No		20	vapor			0.00E+00	0.00E+00
75-01-4	Vinyl chloride (1-Chloroethene)	3.49E-02	No		22	vapor			0.00E+00	0.00E+00
75-05-8	Acetonitrile	1.09E-02	Yes	13	13	vapor	8.85E-07	8.10E-05		8.85E-07
75-07-0	Acetaldehyde	3.49E-02	No		13	vapor			5.27E-05	1.84E-06
75-09-2	Dichloromethane (Methylene chloride)	7.67E-03	No		19	vapor			0.00E+00	0.00E+00
75-12-7	Formamide	3.49E-02	Yes	4	4	vapor	2.47E-02	7.08E-01		2.47E-02
75-15-0	Carbon disulfide	7.67E-03	No		20	vapor			0.00E+00	0.00E+00
75-21-8	Ethylene oxide (Oxirane)	7.67E-03	No		15	vapor			1.48E-07	1.14E-09
75-27-4	Bromodichloromethane	7.67E-03	No		18	vapor			0.00E+00	0.00E+00
75-34-3	1,1-Dichloroethane	7.67E-03	No		19	vapor			0.00E+00	0.00E+00
75-35-4	1,1-Dichloroethene (Vinylidene chloride)	7.67E-03	No		22	vapor			0.00E+00	0.00E+00
75-43-4	Dichlorofluoromethane	7.67E-03	No		20	vapor			0.00E+00	0.00E+00
75-45-6	Chlorodifluoromethane	7.67E-03	No		22	vapor			0.00E+00	0.00E+00
75-50-3	Trimethylamine	7.67E-03	No		14	vapor			2.94E-06	2.26E-08
75-52-5	Nitromethane	3.49E-02	No		13	vapor			5.27E-05	1.84E-06
75-55-8	2-Methylaziridine	3.49E-02	No		11	vapor			1.53E-03	5.33E-05
75-61-6	Difluorodibromomethane	7.67E-03	No		22	vapor			0.00E+00	0.00E+00
75-63-8	Trifluorobromomethane	7.67E-03	No		25	vapor			0.00E+00	0.00E+00
75-65-0	2-Methyl-2-propanol	7.67E-03	No		11	vapor			1.53E-03	1.17E-05
75-69-4	Trichlorofluoromethane	7.67E-03	No		23	vapor			0.00E+00	0.00E+00
75-71-8	Dichlorodifluoromethane	7.67E-03	No		25	vapor			0.00E+00	0.00E+00
75-99-0	2,2-Dichloropropionic acid	3.49E-02	No		6	vapor			6.53E-01	2.28E-02
76-03-9	Trichloroacetic acid	7.67E-03	No		5	vapor			6.88E-01	5.28E-03
76-11-9	1,1,1,2-Tetrachloro-2,2-difluoroethane	3.49E-02	No		24	vapor			0.00E+00	0.00E+00
76-12-0	1,1,2,2-Tetrachloro-1,2-difluoroethane	3.49E-02	No		23	vapor			0.00E+00	0.00E+00
76-13-1	1,2,2-Trichloro-1,1,2-trifluoroethane (Freon 113)	7.67E-03	No		25	vapor			0.00E+00	0.00E+00
76-14-2	1,2-Dichloro-1,1,2,2-tetrafluoroethane	7.67E-03	No		28	vapor			0.00E+00	0.00E+00
76-15-3	Chloropentafluoroethane	7.67E-03	Yes	29	29	vapor	0.00E+00	0.00E+00		0.00E+00
76-44-8	Heptachlor	7.56E-04	Yes	16	16	vapor	0.00E+00	0.00E+00		0.00E+00
78-83-1	2-Methylpropyl alcohol (Isobutyl alcohol)	3.49E-02	No		11	vapor			1.53E-03	5.33E-05
78-87-5	1,2-Dichloropropane	7.67E-03	No		19	vapor			0.00E+00	0.00E+00
78-92-2	1-Methylpropyl alcohol (2-Butanol)	7.67E-03	No		11	vapor			1.53E-03	1.17E-05
78-93-3	Methyl ethyl ketone (MEK, 2-Butanone)	7.67E-03	No		13	vapor			5.27E-05	4.05E-07
79-00-5	1,1,2-Trichloroethane	7.67E-03	No		17	vapor			0.00E+00	0.00E+00
79-01-6	Trichloroethylene	7.67E-03	Yes	20	20	vapor	0.00E+00	0.00E+00		0.00E+00
79-09-4	Propionic acid	3.49E-02	No		8	vapor			3.20E-01	1.12E-02
79-10-7	2-Propenoic acid	3.49E-02	No		8	vapor			3.20E-01	1.12E-02
79-20-9	Methyl acetate	3.49E-02	No		14	vapor			2.94E-06	1.03E-07

Adjusted Performance Factors

Group	PF
1	7.12E-01
2	9.49E+00
3	7.10E-01
4	7.08E-01
5	6.88E-01
6	6.53E-01
7	4.36E-01
8	3.20E-01
9	3.38E-02
10	7.30E-03
11	1.53E-03
12	9.00E-04
13	5.27E-05
14	2.94E-06
15	1.48E-07
16	9.71E-11
17	0.00E+00
18	0.00E+00
19	0.00E+00
20	0.00E+00
21	0.00E+00
22	0.00E+00
23	0.00E+00
24	0.00E+00
25	0.00E+00
26	0.00E+00
27	0.00E+00
28	0.00E+00
29	0.00E+00
30	2.72E-01
31	5.26E-02
32	5.28E-03
33	1.17E-03
34	2.74E-05
35	4.52E-09

Coplanar PCBs		LMP06 g/sec
31508-00-6	2,3',4,4',5-Pentachlorobiphenyl (PBC 118)	3.91E-14
32598-13-3	3,3',4,4'-Tetrachlorobiphenyl (TCB)	3.91E-14
32598-14-4	2,3,3',4,4'-Pentachlorobiphenyl (PCB 105)	3.91E-14
32774-16-6	3,3',4,4',5,5'-Hexachlorobiphenyl	3.91E-14
35065-29-3	2,2',3,4,4',5,5'-Heptachlorobiphenyl	3.91E-14
35065-30-6	2,2',3,3',4,4',5-Heptachlorobiphenyl	3.91E-14
38380-08-4	2,3,3',4,4',5-Hexachlorobiphenyl (PCB 157)	3.91E-14
39635-31-9	2,3,3',4,4',5,5'-Heptachlorobiphenyl	3.91E-14
52663-72-6	2,3',4,4',5,5'-Hexachlorobiphenyl	3.91E-14
57465-28-8	3,3',4,4',5-Pentachlorobiphenyl	3.91E-14
65510-44-3	2',3,4,4',5-Pentachlorobiphenyl	3.91E-14
69782-90-7	2,3,3',4,4',5'-Hexachlorobiphenyl	3.91E-14
70362-50-4	3,4,4',5-Tetrachlorobiphenyl	3.91E-14
74472-37-0	2,3,4,4',5-Pentachlorobiphenyl	3.91E-14
1336-36-3	Polychlorinated biphenyls (PCBs)	5.42E-11
1336-36-3	UnCorrected (for coplanar PCBs)	5.47E-11

Correction for Coplanar PCBs	
0.99	as parent
0.01	as coplanar sum

CALCULATION SHEET

BY: E. Berrios
DATE: 05/21/03

PROJECT: WTP
JOB NO.: 24590
CALC NO.: 24590-WTP-M4C-FRP-00005
SHEET REV: A
SHEET NO.: 88

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W
1	**Table B-6 LMP06 - Unabated LAW Melter**										Calc'd rate												
2			Feed Rate					LMP06 rate	Performan	Adjusted	LMP06												
3	CAS #	COPC	g/sec	In ACM	Group	Grouping	Phase	g/sec	Factor	PF	g/sec		Adjusted Performance Factors										
202	79-34-5	1,1,2,2-Tetrachloroethane	7.67E-03	No		16	vapor			9.71E-11	7.45E-13												
203	8001-35-2	Toxaphene	2.67E-04	Yes	10	10	particle	8.46E-07	3.16E-03		8.46E-07												
204	82-68-8	Pentachloronitrobenzene (PCBN or quintobenzene)	3.49E-02	No		13	vapor			5.27E-05	1.84E-06												
205	83-32-9	Acenaphthene	3.49E-02	No		15	vapor			1.48E-07	5.16E-09												
206	84-66-2	Diethyl phthalate	3.49E-02	Yes	8	8	vapor	5.30E-03	1.52E-01		5.30E-03												
207	84-74-2	Dibutyl phthalate	3.49E-02	Yes	31	31	particle	1.84E-03	5.26E-02		1.84E-03												
208	85-01-8	Phenanthrene	3.49E-02	No		13	vapor			5.27E-05	1.84E-06												
209	85-68-7	Butylbenzyl phthalate	3.49E-02	No		31	particle			5.26E-02	1.84E-03												
210	86-73-7	Fluorene	3.49E-02	No		14	particle			2.94E-06	1.03E-07												
211	87-68-3	Hexachlorobutadiene	7.67E-03	Yes	20	20	vapor	0.00E+00	0.00E+00		0.00E+00												
212	87-86-5	Pentachlorophenol	3.49E-02	Yes	6	6	vapor	2.28E-02	6.53E-01		2.28E-02												
213	88-06-2	2,4,6-Trichlorophenol	3.49E-02	No		10	vapor			7.30E-03	2.55E-04												
214	88-72-2	2-Nitrotoluene	7.67E-03	No		12	vapor			9.00E-04	6.90E-06												
215	88-75-5	2-Nitrophenol	3.49E-02	No		12	vapor			9.00E-04	3.14E-05												
216	88-85-7	2-sec-Butyl-4,6-dinitrophenol (Dinoseb)	3.49E-02	Yes	8	8	particle	1.88E-02	5.38E-01		1.88E-02												
217	88-89-1	Picric acid	3.49E-02	Yes	2	2	particle	3.31E-01	9.49E+00		3.31E-01												
218	91-20-3	Naphthalene	1.16E-03	Yes	16	16	vapor	0.00E+00	0.00E+00		0.00E+00												
219	91-22-5	Quinoline	3.49E-02	No		9	vapor			3.38E-02	1.18E-03												
220	91-58-7	2-Chloronapthalene	3.49E-02	No		16	vapor			9.71E-11	3.39E-12												
221	92-52-4	1,1'-Biphenyl	3.49E-02	No		16	vapor			9.71E-11	3.39E-12												
222	92-93-3	4-Nitrobiphenyl	3.49E-02	No		10	particle			7.30E-03	2.55E-04												
223	93-72-1	Silvex (2,4,5-TP)	3.49E-02	No		5	particle			6.88E-01	2.40E-02												
224	93-76-5	2,4,5-T	3.49E-02	No		5	particle			6.88E-01	2.40E-02												
225	94-75-7	2,4-D and esters (160C typed)	3.49E-02	No		6	vapor			6.53E-01	2.28E-02												
226	95-13-6	Indene	3.49E-02	No		18	vapor			0.00E+00	0.00E+00												
227	95-47-6	o-Xylene	7.67E-03	No		19	vapor			0.00E+00	0.00E+00												
228	95-48-7	o-Cresol (2-Methylphenol)	7.67E-03	No		9	vapor			3.38E-02	2.59E-04												
229	95-49-8	2-Chlorotoluene	3.49E-02	No		19	vapor			0.00E+00	0.00E+00												
230	95-50-1	o-Dichlorobenzene (1,2-Dichlorobenzene)	7.67E-03	No		18	vapor			0.00E+00	0.00E+00												
231	95-57-8	2-Chlorophenol	3.49E-02	No		11	vapor			1.53E-03	5.33E-05												
232	95-95-4	2,4,5-Trichlorophenol	3.49E-02	No		9	vapor			3.38E-02	1.18E-03												
233	96-22-0	3-Pentanone	7.67E-03	No		14	vapor			2.94E-06	2.26E-08												
234	96-69-5	Bis(3-tert-butyl-4-hydroxy-6-methyl-phenyl)sulfide	3.49E-02	No		19	particle			0.00E+00	0.00E+00												
235	98-51-1	p-tert-Butyltoluene	3.49E-02	No		21	vapor			0.00E+00	0.00E+00												
236	98-82-8	Cumene	3.49E-02	No		20	vapor			0.00E+00	0.00E+00												
237	98-83-9	alpha-Methylstyrene	7.67E-03	No		19	vapor			0.00E+00	0.00E+00												
238	98-86-2	Acetophenone	3.49E-02	Yes	11	11	vapor	4.49E-05	1.29E-03		4.49E-05												
239	98-95-3	Nitrobenzene	3.49E-02	No		12	vapor			9.00E-04	3.14E-05												
240											9.29E-01												

CALCULATION SHEET

BY: E. Berrios
DATE: 05/21/03

PROJECT: WTP
JOB NO.: 24590
CALC NO.: 24590-WTP-M4C-FRP-00005
SHEET REV: A
SHEET NO.: 89

Table B-7 LVP01 - LAW Vessel Ventilation

	A	B	C	D	E	F	G	H	I	J	K
2			Feed Rate					LVP01 rate	Performan	Adjusted	Calc'd rate LVP01
3	CAS #	COPC	g/sec	In ACM	Group	Grouping	Phase	g/sec	Factor	PF	g/sec
4	100-00-5	p-Nitrochlorobenzene	3.49E-02	No		10	vapor			1.77E-10	6.16E-12
5	100-21-0	p-Phthalic acid	3.49E-02	Yes	1	1	vapor	5.46E-10	1.57E-08		5.46E-10
6	100-25-4	1,4-Dinitrobenzene	3.49E-02	No		6	particle			1.44E-08	5.01E-10
7	100-41-4	Ethyl benzene	7.67E-03	No		20	vapor			0.00E+00	0.00E+00
8	100-42-5	Styrene	7.67E-03	No		19	vapor			0.00E+00	0.00E+00
9	10061-01-5	cis-1,3-Dichloropropene	7.67E-03	Yes	19	19	vapor	0.00E+00	0.00E+00		0.00E+00
10	10061-02-6	trans-1,3-Dichloropropene	7.67E-03	No		17	vapor			0.00E+00	0.00E+00
11	101-55-3	4-Bromophenylphenyl ether	3.49E-02	No		14	vapor			6.47E-14	2.26E-15
12	101-84-8	Diphenyl ether	7.67E-03	No		16	vapor			2.14E-18	1.64E-20
13	106-35-4	3-Heptanone	7.67E-03	No		14	vapor			6.47E-14	4.96E-16
14	106-42-3	p-Xylene (Dimethyl benzene)	7.67E-03	No		19	vapor			0.00E+00	0.00E+00
15	106-46-7	1,4-Dichlorobenzene	7.67E-03	No		18	vapor			0.00E+00	0.00E+00
16	106-88-7	1,2-Epoxybutane	7.67E-03	No		15	vapor			3.25E-15	2.50E-17
17	106-93-4	Ethylene dibromide (Dibromethane)	3.49E-02	Yes	16	16	vapor	2.24E-19	6.41E-18		2.24E-19
18	106-97-8	Butane	7.67E-03	Yes	26	26	vapor	0.00E+00	0.00E+00		0.00E+00
19	106-99-0	1,3-Butadiene	7.67E-03	Yes	23	23	vapor	0.00E+00	0.00E+00		0.00E+00
20	107-02-8	Acrolein	7.67E-03	No		14	vapor			6.47E-14	4.96E-16
21	107-05-1	3-Chloropropene (Allyl chloride)	7.67E-03	No		20	vapor			0.00E+00	0.00E+00
22	107-06-2	1,2-Dichloroethane (Ethylene chloride)	7.67E-03	No		17	vapor			0.00E+00	0.00E+00
23	107-12-0	Propionitrile	7.67E-03	No		13	vapor			1.16E-12	8.90E-15
24	107-13-1	Acrylonitrile	7.67E-03	No		14	vapor			6.47E-14	4.96E-16
25	107-18-6	2-Propene-1-ol	3.49E-02	No		10	vapor			1.77E-10	6.16E-12
26	107-31-3	Formic acid, methyl ester	3.49E-02	No		15	vapor			3.25E-15	1.14E-16
27	107-66-4	Dibutylphosphate	3.49E-02	No		5	particle			1.51E-08	5.28E-10
28	107-87-9	2-Pentanone	7.67E-03	No		14	vapor			6.47E-14	4.96E-16
29	108-03-2	1-Nitropropane	3.49E-02	No		14	vapor			6.47E-14	2.26E-15
30	108-05-4	Vinyl acetate	3.49E-02	No		16	vapor			2.14E-18	7.45E-20
31	108-10-1	Hexone (4-Methyl-2-pentanone or MIBK)	7.67E-03	No		14	vapor			6.47E-14	4.96E-16
32	108-20-3	Bis(isopropyl)ether	7.67E-03	No		18	vapor			0.00E+00	0.00E+00
33	108-38-3	m-Xylene (Dimethyl benzene)	7.67E-03	No		19	vapor			0.00E+00	0.00E+00
34	108-39-4	m-Cresol	7.67E-03	No		9	vapor			7.43E-10	5.70E-12
35	108-87-2	Methylcyclohexane	7.67E-03	Yes	25	25	vapor	0.00E+00	0.00E+00		0.00E+00
36	108-88-3	Toluene	7.67E-03	Yes	19	19	vapor	0.00E+00	0.00E+00		0.00E+00
37	108-90-7	Chlorobenzene	7.67E-03	No		19	vapor			0.00E+00	0.00E+00
38	108-93-0	Cyclohexanol	7.67E-03	No		10	vapor			1.77E-10	1.36E-12
39	108-94-1	Cyclohexanone	7.67E-03	No		11	vapor			3.36E-11	2.58E-13
40	108-95-2	Phenol	3.49E-02	Yes	8	8	vapor	2.07E-10	5.94E-09		2.07E-10
41	109-66-0	n-Pentane	7.67E-03	No		26	vapor			0.00E+00	0.00E+00
42	109-99-9	Tetrahydrofuran	1.63E-02	No		13	vapor			1.16E-12	1.89E-14
43	110-12-3	5-Methyl-2-hexanone	7.67E-03	No		15	vapor			3.25E-15	2.50E-17
44	110-43-0	2-Heptanone	7.67E-03	No		15	vapor			3.25E-15	2.50E-17
45	110-54-3	n-Hexane	7.67E-03	Yes	27	27	vapor	0.00E+00	0.00E+00		0.00E+00
46	110-62-3	n-Valeraldehyde	3.49E-02	No		15	vapor			3.25E-15	1.14E-16
47	110-82-7	Cyclohexane	7.67E-03	Yes	24	24	vapor	0.00E+00	0.00E+00		0.00E+00
48	110-83-8	Cyclohexene	7.67E-03	No		22	vapor			0.00E+00	0.00E+00
49	110-86-1	Pyridine	3.49E-02	No		11	vapor			3.36E-11	1.17E-12
50	111-65-9	n-Octane	7.67E-03	No		28	vapor			0.00E+00	0.00E+00
51	111-76-2	Ethylene glycol monobutyl ether	3.49E-02	No		9	vapor			7.43E-10	2.59E-11
52	111-84-2	n-Nonane	7.67E-03	Yes	28	28	vapor	0.00E+00	0.00E+00		0.00E+00
53	117-81-7	Bis(2-ethylhexyl)phthalate (DEHP)	3.49E-02	No		30	particle			8.76E-09	3.06E-10
54	117-84-0	n-Dioctyl phthalate	3.49E-02	No		32	particle			1.54E-10	5.37E-12
55	118-74-1	Hexachlorobenzene	7.21E-04	Yes	18	18	vapor	0.00E+00	0.00E+00		0.00E+00
56	120-12-7	Anthracene	3.49E-02	Yes	13	13	vapor	1.88E-14	5.39E-13		1.88E-14
57	120-82-1	1,2,4-Trichlorobenzene	7.67E-03	Yes	17	17	vapor	0.00E+00	0.00E+00		0.00E+00
58	120-83-2	2,4-Dichlorophenol	3.49E-02	No		10	vapor			1.77E-10	6.16E-12
59	121-44-8	Triethylamine	7.67E-03	No		15	vapor			3.25E-15	2.50E-17
60	121-69-7	Dimethylaniline	7.67E-03	No		13	vapor			1.16E-12	8.90E-15
61	122-39-4	N,N-Diphenylamine	7.67E-03	Yes	10	10	vapor	1.93E-12	2.52E-10		1.93E-12
62	123-19-3	4-Heptanone	7.67E-03	No		13	vapor			1.16E-12	8.90E-15
63	123-38-6	n-Propionaldehyde	7.67E-03	No		14	vapor			6.47E-14	4.96E-16
64	123-51-3	3-Methyl-1-butanol	7.67E-03	No		12	vapor			1.98E-11	1.52E-13
65	123-86-4	Acetic acid n-butyl ester	3.49E-02	No		16	vapor			2.14E-18	7.45E-20
66	123-91-1	1,4-Dioxane	2.09E-02	No		10	vapor			1.77E-10	3.70E-12
67	126-73-8	Tributyl phosphate	3.49E-02	Yes	7	7	vapor	3.35E-10	9.59E-09		3.35E-10
68	126-98-7	2-Methyl-2-propenenitrile (Methacrylonitrile)	7.67E-03	No		16	vapor			2.14E-18	1.64E-20
69	127-18-4	Perchloroethylene (tetrachloroethylene)	7.67E-03	Yes	21	21	vapor	0.00E+00	0.00E+00		0.00E+00
70	127-19-5	N,N-Dimethylacetamide	7.67E-03	No		5	vapor			1.51E-08	1.16E-10
71	128-37-0	2,6-Bis(tert-butyl)-4-methylphenol	3.49E-02	No		32	vapor			1.54E-10	5.37E-12
72	129-00-0	Pyrene	3.49E-02	Yes	33	33	particle	1.46E-12	4.19E-11		1.46E-12
73	1321-64-8	Pentachloronaphthalene	3.49E-02	No		14	particle			6.47E-14	2.26E-15
74	1321-65-9	Trichloronaphthalene	3.49E-02	No		15	vapor			3.25E-15	1.14E-16
75	132-64-9	Dibenzofuran	3.49E-02	Yes	15	15	vapor	1.14E-16	3.25E-15		1.14E-16
76	1335-87-1	Hexachloronaphthalene	3.49E-02	No		14	particle			6.47E-14	2.26E-15
77	1335-88-2	Tetrachloronaphthalene	3.49E-02	No		15	particle			3.25E-15	1.14E-16
78	1336-36-3	Polychlorinated biphenyls (PCBs)	1.21E-02	Yes	35	35	particle	1.76E-18	1.46E-16		1.74E-18
79	141-78-6	Acetic acid ethyl ester (Ethyl acetate)	3.49E-02	No		14	vapor			6.47E-14	2.26E-15
80	141-79-7	4-Methyl-3-penten-2-one	3.49E-02	No		13	vapor			1.16E-12	4.05E-14
81	142-82-5	n-Heptane	7.67E-03	No		27	vapor			0.00E+00	0.00E+00
82	144-62-7	Oxalic acid	3.49E-03	Yes	3	3	vapor	5.45E-11	1.56E-08		5.45E-11
83	156-60-5	trans-1,2-Dichloroethylene	7.67E-03	No		20	vapor			0.00E+00	0.00E+00
84	1582-09-8	Trifluralin	3.49E-02	No		14	particle			6.47E-14	2.26E-15
85	1634-04-4	Methyl tert-butyl ether	7.67E-03	No		16	vapor			2.14E-18	1.64E-20
86	1836-75-5	Nitrofen	3.49E-02	No		30	particle			8.76E-09	3.06E-10
87	189-55-9	Dibenzo[a,i]pyrene	3.49E-02	No		5	particle			1.51E-08	5.28E-10
88	189-64-0	Dibenzo[a,h]pyrene	3.49E-02	No		5	particle			1.51E-08	5.28E-10
89	191-24-2	Benzo(g,h,i)perylene	3.49E-02	No		30	particle			8.76E-09	3.06E-10
90	191-30-0	Benzo[a,l]pyrene	3.49E-02	No		5	particle			1.51E-08	5.28E-10
91	192-65-4	Dibenzo[a,e]pyrene	3.49E-02	No		5	particle			1.51E-08	5.28E-10
92	193-39-5	Indeno(1,2,3-cd)pyrene	3.49E-02	No		30	particle			8.76E-09	3.06E-10
93	205-82-3	Benzo(j)fluoranthene	3.49E-02	No		7	particle			9.59E-09	3.35E-10
94	205-99-2	Benzo(b)fluoranthene	3.49E-02	No		30	particle			8.76E-09	3.06E-10
95	206-44-0	Fluoranthene	3.49E-02	No		33	particle			3.76E-11	1.31E-12
96	207-08-9	Benzo(k)fluoranthene	3.49E-02	No		30	particle			8.76E-09	3.06E-10
97	208-96-8	Acenaphthylene	3.49E-02	Yes	14	14	vapor	2.26E-15	6.47E-14		2.26E-15
98	218-01-9	Chrysene	3.49E-02	Yes	32	32	particle	7.73E-12	2.22E-10		7.73E-12
99	2234-13-1	Octachloronaphthalene	3.49E-02	No		14	particle			6.47E-14	2.26E-15
100	224-42-0	Dibenz[a,j]acridine	3.49E-02	No		4	particle			1.56E-08	5.43E-10
101	226-36-8	Dibenz[a,h]acridine	3.49E-02	No		4	particle			1.56E-08	5.43E-10
102	2385-85-5	Mirex	3.49E-02	No		17	vapor			0.00E+00	0.00E+00
103	25551-13-7	Trimethyl benzene	7.67E-03	No		19	vapor			0.00E+00	0.00E+00
104	26140-60-3	Terphenyls	3.49E-02	No		34	particle			8.82E-13	3.07E-14
105	27154-33-2	Trichlorofluoroethane	7.67E-03	No		23	vapor			0.00E+00	0.00E+00
106	287-92-3	Cyclopentane	7.67E-03	No		24	vapor			0.00E+00	0.00E+00
107	309-00-2	Aldrin	4.30E-04	Yes	34	34	particle	3.79E-16	8.82E-13		3.79E-16
108	319-84-6	Hexachlorocyclohexane (Lindane) Alpha BHC	1.16E-04	No		33	vapor			3.76E-11	4.37E-15
109	319-85-7	Hexachlorocyclohexane (Lindane) Beta BHC	1.16E-04	Yes	30	30	particle	1.00E-12	8.61E-09		1.00E-12
110	319-86-8	Delta-BHC	1.16E-04	No		30	particle			8.76E-09	1.02E-12
111	3697-24-3	5-Methylchrysene	3.49E-02	No		32	particle			1.54E-10	5.37E-12
112	3825-26-1	Ammonium perfluorooctanoate	3.49E-02	No		14	particle			6.47E-14	2.26E-15
113	4170-30-3	2-Butenaldehyde (2-Butenal or Crotonaldehyde)	7.67E-03	Yes	11	11	vapor	2.55E-13	3.33E-11		2.55E-13
114	465-73-6	Isodrin	2.32E-04	No		35	vapor			1.46E-16	3.38E-20
115	50-00-0	Formaldehyde	7.67E-03	No		8	vapor			8.87E-09	6.81E-11
116	50-29-3	4,4-DDT	2.32E-04	No		33	particle			3.76E-11	8.74E-15
117	50-32-8	Benzo(a)pyrene	4.42E-04	Yes	30	30	particle	3.94E-12	8.91E-09		3.94E-12
118	53-70-3	Dibenzo(a,h)anthracene	5.81E-05	No		7	particle			9.59E-09	5.58E-13
119	540-59-0	1,2-Dichloroethylene	7.67E-03	No		19	vapor			0.00E+00	0.00E+00
120	540-84-1	2,2,4-Trimethylpentane	7.67E-03	No		28	vapor			0.00E+00	0.00E+00
121	541-73-1	1,3-Dichlorobenzene	7.67E-03	No		19	vapor			0.00E+00	0.00E+00
122	56-23-5	Carbon tetrachloride	7.67E-03	Yes	22	22	vapor	0.00E+00	0.00E+00		0.00E+00
123	563-80-4	3-Methyl-2-butanone	7.67E-03	No		14	vapor			6.47E-14	4.96E-16
124	56-49-5	3-Methylcholanthrene	3.49E-02	No		28	particle			0.00E+00	0.00E+00
125	56-55-3	Benzo(a)anthracene	3.49E-02	No		33	particle			3.76E-11	1.31E-12
126	57-14-7	1,1-Dimethylhydrazine	3.49E-02	Yes	12	12	vapor	6.90E-13	1.98E-11		6.90E-13
127	58-89-9	gamma-BHC (Lindane)	1.16E-04	Yes	32	32	particle	1.58E-14	1.36E-10		1.58E-14
128	58-90-2	2,3,4,6-Tetrachlorophenol	3.49E-02	Yes	11	11	vapor	1.37E-12	3.93E-11		1.37E-12
129	591-78-6	2-Hexanone	7.67E-03	No		14	vapor			6.47E-14	4.96E-16
130	59-50-7	4-Chloro-3-methylphenol	3.49E-02	No		32	particle			1.54E-10	5.37E-12
131	59-89-2	N-Nitrosomorpholine	3.49E-02	No		6	vapor			1.44E-08	5.01E-10
132	602-87-9	5-Nitroacenaphthene	3.49E-02	No		9	particle			7.43E-10	2.59E-11
133	60-29-7	Ethyl ether	3.49E-02	No		17	vapor			0.00E+00	0.00E+00
134	603-34-9	Triphenylamine	3.49E-02	Yes	32	32	vapor	3.62E-12	1.04E-10		3.62E-12
135	60-34-4	Methylhydrazine	7.67E-03	No		10	vapor			1.77E-10	1.36E-12
136	60-35-5	Acetamide	7.67E-03	Yes	5	5	vapor	1.16E-10	1.51E-08		1.16E-10
137	60-57-1	Dieldrin	2.32E-04	Yes	33	33	particle	7.76E-15	3.34E-11		7.76E-15
138	621-64-7	Di-n-Propylnitrosamine (N-Nitroso-di-n-propylamine)	3.49E-02	No		10	vapor			1.77E-10	6.16E-12
139	624-83-9	Methyl isocyanate	7.67E-03	No		17	vapor			0.00E+00	0.00E+00
140	627-13-4	Nitric acid, propyl ester	3.49E-02	No		17	vapor			0.00E+00	0.00E+00
141	62-75-9	N-Nitroso-N,N-dimethylamine (Dimethylnitrosamine)	6.51E-02	Yes	9	9	vapor	4.84E-11	7.43E-10		4.84E-11
142	630-20-6	1,1,1,2-Tetrachloroethane	7.67E-03	No		18	vapor			0.00E+00	0.00E+00
143	64-17-5	Ethyl alcohol	7.67E-03	No		10	vapor			1.77E-10	1.36E-12
144	64-18-6	Formic acid	3.49E-02	No		7	vapor			9.59E-09	3.35E-10
145	64-19-7	Acetic acid	3.49E-02	No		6	vapor			1.44E-08	5.01E-10
146	67-56-1	Methyl alcohol (Methanol)	7.67E-03	No		10	vapor			1.77E-10	1.36E-12
147	67-63-0	2-Propyl alcohol (Isopropanol; Propan-2-01)	7.67E-03	No		11	vapor			3.36E-11	2.58E-13
148	67-64-1	2-Propanone (Acetone)	4.18E-02	No		13	vapor			1.16E-12	4.86E-14
149	67-66-3	Chloroform	7.67E-03	No		19	vapor			0.00E+00	0.00E+00
150	67-72-1	Hexachloroethane	3.49E-02	No		19	vapor			0.00E+00	0.00E+00
151	684-16-2	Hexafluoroacetone	7.67E-03	No		19	vapor			0.00E+00	0.00E+00
152	71-23-8	n-Propyl alcohol	7.67E-03	No		11	vapor			3.36E-11	2.58E-13
153	71-36-3	n-Butyl alcohol	7.67E-03	No		11	vapor			3.36E-11	2.58E-13
154	71-43-2	Benzene	7.67E-03	Yes	19	19	vapor	0.00E+00	0.00E+00		0.00E+00
155	71-55-6	Methyl chloroform (1,1,1-Trichloroethane)	7.67E-03	No		21	vapor			0.00E+00	0.00E+00
156	72-20-8	Endrin	2.32E-04	No		32	particle			1.54E-10	3.58E-14
157	72-43-5	Methoxychlor	1.16E-03	No		7	particle			9.59E-09	1.12E-11
158	72-54-8	4,4-DDD	2.32E-04	No		32	particle			1.54E-10	3.58E-14
159	72-55-9	4,4-DDE	2.32E-04	No		34	particle			8.82E-13	2.05E-16
160	74-83-9	Bromomethane (Methyl bromide)	7.67E-03	No		19	vapor			0.00E+00	0.00E+00
161	74-87-3	Chloromethane (Methyl chloride)	7.67E-03	No		20	vapor			0.00E+00	0.00E+00
162	74-97-5	Bromochloromethane	7.67E-03	No		17	vapor			0.00E+00	0.00E+00
163	74-99-7	Methylacetylene	3.49E-02	No		20	vapor			0.00E+00	0.00E+00
164	75-00-3	Chloroethane	7.67E-03	No		20	vapor			0.00E+00	0.00E+00
165	75-01-4	Vinyl chloride (1-Chloroethene)	3.49E-02	No		22	vapor			0.00E+00	0.00E+00
166	75-05-8	Acetonitrile	1.09E-02	Yes	13	13	vapor	1.95E-14	1.78E-12		1.95E-14
167	75-07-0	Acetaldehyde	3.49E-02	No		13	vapor			1.16E-12	4.05E-14
168	75-09-2	Dichloromethane (Methylene chloride)	7.67E-03	No		19	vapor			0.00E+00	0.00E+00
169	75-12-7	Formamide	3.49E-02	Yes	4	4	vapor	5.43E-10	1.56E-08		5.43E-10
170	75-15-0	Carbon disulfide	7.67E-03	No		20	vapor			0.00E+00	0.00E+00
171	75-21-8	Ethylene oxide (Oxirane)	7.67E-03	No		15	vapor			3.25E-15	2.50E-17
172	75-27-4	Bromodichloromethane	7.67E-03	No		18	vapor			0.00E+00	0.00E+00
173	75-34-3	1,1-Dichloroethane	7.67E-03	No		19	vapor			0.00E+00	0.00E+00
174	75-35-4	1,1-Dichloroethene (Vinylidene chloride)	7.67E-03	No		22	vapor			0.00E+00	0.00E+00
175	75-43-4	Dichlorofluoromethane	7.67E-03	No		20	vapor			0.00E+00	0.00E+00
176	75-45-6	Chlorodifluoromethane	7.67E-03	No		22	vapor			0.00E+00	0.00E+00
177	75-50-3	Trimethylamine	7.67E-03	No		14	vapor			6.47E-14	4.96E-16
178	75-52-5	Nitromethane	3.49E-02	No		13	vapor			1.16E-12	4.05E-14
179	75-55-8	2-Methylaziridine	3.49E-02	No		11	vapor			3.36E-11	1.17E-12
180	75-61-6	Difluorodibromomethane	7.67E-03	No		22	vapor			0.00E+00	0.00E+00
181	75-63-8	Trifluorobromomethane	7.67E-03	No		25	vapor			0.00E+00	0.00E+00
182	75-65-0	2-Methyl-2-propanol	7.67E-03	No		11	vapor			3.36E-11	2.58E-13
183	75-69-4	Trichlorofluoromethane	7.67E-03	No		23	vapor			0.00E+00	0.00E+00
184	75-71-8	Dichlorodifluoromethane	7.67E-03	No		25	vapor			0.00E+00	0.00E+00
185	75-99-0	2,2-Dichloropropionic acid	3.49E-02	No		6	vapor			1.44E-08	5.01E-10
186	76-03-9	Trichloroacetic acid	7.67E-03	No		5	vapor			1.51E-08	1.16E-10
187	76-11-9	1,1,1,2-Tetrachloro-2,2-difluoroethane	3.49E-02	No		24	vapor			0.00E+00	0.00E+00
188	76-12-0	1,1,2,2-Tetrachloro-1,2-difluoroethane	3.49E-02	No		23	vapor			0.00E+00	0.00E+00
189	76-13-1	1,2,2-Trichloro-1,1,2-trifluoroethane (Freon 113)	7.67E-03	No		25	vapor			0.00E+00	0.00E+00
190	76-14-2	1,2-Dichloro-1,1,2,2-tetrafluoroethane	7.67E-03	No		28	vapor			0.00E+00	0.00E+00
191	76-15-3	Chloropentafluoroethane	7.67E-03	Yes	29	29	vapor	0.00E+00	0.00E+00		0.00E+00
192	76-44-8	Heptachlor	7.56E-04	Yes	16	16	vapor	0.00E+00	0.00E+00		0.00E+00
193	78-83-1	2-Methylpropyl alcohol (Isobutyl alcohol)	3.49E-02	No		11	vapor			3.36E-11	1.17E-12
194	78-87-5	1,2-Dichloropropane	7.67E-03	No		19	vapor			0.00E+00	0.00E+00
195	78-92-2	1-Methylpropyl alcohol (2-Butanol)	7.67E-03	No		11	vapor			3.36E-11	2.58E-13
196	78-93-3	Methyl ethyl ketone (MEK, 2-Butanone)	7.67E-03	No		13	vapor			1.16E-12	8.90E-15
197	79-00-5	1,1,2-Trichloroethane	7.67E-03	No		17	vapor			0.00E+00	0.00E+00
198	79-01-6	Trichloroethylene	7.67E-03	Yes	20	20	vapor	0.00E+00	0.00E+00		0.00E+00
199	79-09-4	Propionic acid	3.49E-02	No		8	vapor			8.87E-09	3.09E-10
200	79-10-7	2-Propenoic acid	3.49E-02	No		8	vapor			8.87E-09	3.09E-10
201	79-20-9	Methyl acetate	3.49E-02	No		14	vapor			6.47E-14	2.26E-15
202	79-34-5	1,1,2,2-Tetrachloroethane	7.67E-03	No		16	vapor			2.14E-18	1.64E-20

Adjusted Performance Factors

Group	PF
1	1.57E-08
2	3.06E-07
3	1.56E-08
4	1.56E-08
5	1.51E-08
6	1.44E-08
7	9.59E-09
8	8.87E-09
9	7.43E-10
10	1.77E-10
11	3.36E-11
12	1.98E-11
13	1.16E-12
14	6.47E-14
15	3.25E-15
16	2.14E-18
17	0.00E+00
18	0.00E+00
19	0.00E+00
20	0.00E+00
21	0.00E+00
22	0.00E+00
23	0.00E+00
24	0.00E+00
25	0.00E+00
26	0.00E+00
27	0.00E+00
28	0.00E+00
29	0.00E+00
30	8.76E-09
31	1.70E-09
32	1.54E-10
33	3.76E-11
34	8.82E-13
35	1.46E-16

Coplanar PCBs		LVP01 g/sec	Correction for Coplanar PCBs	
31508-00-6	2,3',4,4',5-Pentachlorobiphenyl (PBC 118)	1.26E-21		
32598-13-3	3,3',4,4'-Tetrachlorobiphenyl (TCB)	1.26E-21	0.99	as parent
32598-14-4	2,3,3',4,4'-Pentachlorobiphenyl (PCB 105)	1.26E-21	0.01	as coplanar sum
32774-16-6	3,3',4,4',5,5'-Hexachlorobiphenyl	1.26E-21		
35065-29-3	2,2',3,4,4',5,5'-Heptachlorobiphenyl	1.26E-21		
35065-30-6	2,2',3,3',4,4',5-Heptachlorobiphenyl	1.26E-21		
38380-08-4	2,3,3',4,4',5-Hexachlorobiphenyl (PCB 157)	1.26E-21		
39635-31-9	2,3,3',4,4',5,5'-Heptachlorobiphenyl	1.26E-21		
52663-72-6	2,3',4,4',5,5'-Hexachlorobiphenyl	1.26E-21		
57465-28-8	3,3',4,4',5-Pentachlorobiphenyl	1.26E-21		
65510-44-3	2',3,4,4',5-Pentachlorobiphenyl	1.26E-21		
69782-90-7	2,3,3',4,4',5'-Hexachlorobiphenyl	1.26E-21		
70362-50-4	3,4,4',5-Tetrachlorobiphenyl	1.26E-21		
74472-37-0	2,3,4,4',5-Pentachlorobiphenyl	1.26E-21		
1336-36-3	Polychlorinated biphenyls (PCBs)	1.74E-18		
1336-36-3	UnCorrected (for coplanar PCBs)	1.76E-18		

CALCULATION SHEET

BY: E. Berrios
DATE: 05/21/03

PROJECT: WTP
JOB NO.: 24590
CALC NO.: 24590-WTP-M4C-FRP-00005
SHEET REV: A
SHEET NO.: 90

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W
1	**Table B-7 LVP01 - LAW Vessel Ventilation**										Calc'd rate												
2			Feed Rate					LVP01 rate	Performan	Adjusted	LVP01												
3	CAS #	COPC	g/sec	In ACM	Group	Grouping	Phase	g/sec	Factor	PF	g/sec		Adjusted Performance Factors										
203	8001-35-2	Toxaphene	2.67E-04	Yes	10	10	particle	2.72E-14	1.02E-10		2.72E-14												
204	82-68-8	Pentachloronitrobenzene (PCBN or quintobenzene)	3.49E-02	No		13	vapor			1.16E-12	4.05E-14												
205	83-32-9	Acenaphthene	3.49E-02	No		15	vapor			3.25E-15	1.14E-16												
206	84-66-2	Diethyl phthalate	3.49E-02	Yes	8	8	vapor	1.17E-10	3.35E-09		1.17E-10												
207	84-74-2	Dibutyl phthalate	3.49E-02	Yes	31	31	particle	5.91E-11	1.70E-09		5.91E-11												
208	85-01-8	Phenanthrene	3.49E-02	No		13	vapor			1.16E-12	4.05E-14												
209	85-68-7	Butylbenzyl phthalate	3.49E-02	No		31	particle			1.70E-09	5.91E-11												
210	86-73-7	Fluorene	3.49E-02	No		14	particle			6.47E-14	2.26E-15												
211	87-68-3	Hexachlorobutadiene	7.67E-03	Yes	20	20	vapor	0.00E+00	0.00E+00		0.00E+00												
212	87-86-5	Pentachlorophenol	3.49E-02	Yes	6	6	vapor	5.01E-10	1.44E-08		5.01E-10												
213	88-06-2	2,4,6-Trichlorophenol	3.49E-02	No		10	vapor			1.77E-10	6.16E-12												
214	88-72-2	2-Nitrotoluene	7.67E-03	No		12	vapor			1.98E-11	1.52E-13												
215	88-75-5	2-Nitrophenol	3.49E-02	No		12	vapor			1.98E-11	6.90E-13												
216	88-85-7	2-sec-Butyl-4,6-dinitrophenol (Dinoseb)	3.49E-02	Yes	8	8	particle	6.04E-10	1.73E-08		6.04E-10												
217	88-89-1	Picric acid	3.49E-02	Yes	2	2	particle	1.07E-08	3.06E-07		1.07E-08												
218	91-20-3	Naphthalene	1.16E-03	Yes	16	16	vapor	0.00E+00	0.00E+00		0.00E+00												
219	91-22-5	Quinoline	3.49E-02	No		9	vapor			7.43E-10	2.59E-11												
220	91-58-7	2-Chloronapthalene	3.49E-02	No		16	vapor			2.14E-18	7.45E-20												
221	92-52-4	1,1'-Biphenyl	3.49E-02	No		16	vapor			2.14E-18	7.45E-20												
222	92-93-3	4-Nitrobiphenyl	3.49E-02	No		10	particle			1.77E-10	6.16E-12												
223	93-72-1	Silvex (2,4,5-TP)	3.49E-02	No		5	particle			1.51E-08	5.28E-10												
224	93-76-5	2,4,5-T	3.49E-02	No		5	particle			1.51E-08	5.28E-10												
225	94-75-7	2,4-D and esters (160C typed)	3.49E-02	No		6	vapor			1.44E-08	5.01E-10												
226	95-13-6	Indene	3.49E-02	No		18	vapor			0.00E+00	0.00E+00												
227	95-47-6	o-Xylene	7.67E-03	No		19	vapor			0.00E+00	0.00E+00												
228	95-48-7	o-Cresol (2-Methylphenol)	7.67E-03	No		9	vapor			7.43E-10	5.70E-12												
229	95-49-8	2-Chlorotoluene	3.49E-02	No		19	vapor			0.00E+00	0.00E+00												
230	95-50-1	o-Dichlorobenzene (1,2-Dichlorobenzene)	7.67E-03	No		18	vapor			0.00E+00	0.00E+00												
231	95-57-8	2-Chlorophenol	3.49E-02	No		11	vapor			3.36E-11	1.17E-12												
232	95-95-4	2,4,5-Trichlorophenol	3.49E-02	No		9	vapor			7.43E-10	2.59E-11												
233	96-22-0	3-Pentanone	7.67E-03	No		14	vapor			6.47E-14	4.96E-16												
234	96-69-5	Bis(3-tert-butyl-4-hydroxy-6-methyl-phenyl)sulfide	3.49E-02	No		19	particle			0.00E+00	0.00E+00												
235	98-51-1	p-tert-Butyltoluene	3.49E-02	No		21	vapor			0.00E+00	0.00E+00												
236	98-82-8	Cumene	3.49E-02	No		20	vapor			0.00E+00	0.00E+00												
237	98-83-9	alpha-Methylstyrene	7.67E-03	No		19	vapor			0.00E+00	0.00E+00												
238	98-86-2	Acetophenone	3.49E-02	Yes	11	11	vapor	9.89E-13	2.83E-11		9.89E-13												
239	98-95-3	Nitrobenzene	3.49E-02	No		12	vapor			1.98E-11	6.90E-13												
240											2.48E-08												

CALCULATION SHEET

BY: E. Berrios
DATE: 05/21/03

PROJECT: WTP
JOB NO.: 24590
CALC NO.: 24590-WTP-M4C-FRP-00005
SHEET REV: A
SHEET NO.: 91

	A	B	C	D	E	F	G	H	I	J	K	L	M	N
1	Table B-8 LVP26 - Abated LAW Melter Offgas System													
2				LMP06	SBS	WESP	LOP08	LVP01	LVP03	HEPA 1	HEPA 2	VOC Ox	NaOH Scr	LVP26
3	CAS #	COPC	Grouping	g/sec	DF	DF	g/sec	g/sec	g/sec	DF	DF	DF	DF	g/sec
4	100-00-5	p-Nitrochlorobenzene	10	2.55E-04	1	1	2.55E-04	6.16E-12	2.55E-04	1	1	20	1	1.27E-05
5	100-21-0	p-Phthalic acid	1	2.48E-02	1	1	2.48E-02	5.46E-10	2.48E-02	1	1	20	1	1.24E-03
6	100-25-4	1,4-Dinitrobenzene	6	2.28E-02	40	11	5.17E-05	5.01E-10	5.17E-05	2000	100	20	1	1.29E-11
7	100-41-4	Ethyl benzene	20	0.00E+00	1	1	0.00E+00	0.00E+00	0.00E+00	1	1	20	1	0.00E+00
8	100-42-5	Styrene	19	0.00E+00	1	1	0.00E+00	0.00E+00	0.00E+00	1	1	20	1	0.00E+00
9	10061-01-5	cis-1,3-Dichloropropene	19	0.00E+00	1	1	0.00E+00	0.00E+00	0.00E+00	1	1	20	1	0.00E+00
10	10061-02-6	trans-1,3-Dichloropropene	17	0.00E+00	1	1	0.00E+00	0.00E+00	0.00E+00	1	1	20	1	0.00E+00
11	101-55-3	4-Bromophenylphenyl ether	14	1.03E-07	1	1	1.03E-07	2.26E-15	1.03E-07	1	1	20	1	5.13E-09
12	101-84-8	Diphenyl ether	16	7.45E-13	1	1	7.45E-13	1.64E-20	7.45E-13	1	1	20	1	3.73E-14
13	106-35-4	3-Heptanone	14	2.26E-08	1	1	2.26E-08	4.96E-16	2.26E-08	1	1	20	1	1.13E-09
14	106-42-3	p-Xylene (Dimethyl benzene)	19	0.00E+00	1	1	0.00E+00	0.00E+00	0.00E+00	1	1	20	1	0.00E+00
15	106-46-7	1,4-Dichlorobenzene	18	0.00E+00	1	1	0.00E+00	0.00E+00	0.00E+00	1	1	20	1	0.00E+00
16	106-88-7	1,2-Epoxybutane	15	1.14E-09	1	1	1.14E-09	2.50E-17	1.14E-09	1	1	20	1	5.68E-11
17	106-93-4	Ethylene dibromide (Dibromethane)	16	1.02E-11	1	1	1.02E-11	2.24E-19	1.02E-11	1	1	20	1	5.08E-13
18	106-97-8	Butane	26	0.00E+00	1	1	0.00E+00	0.00E+00	0.00E+00	1	1	20	1	0.00E+00
19	106-99-0	1,3-Butadiene	23	0.00E+00	1	1	0.00E+00	0.00E+00	0.00E+00	1	1	20	1	0.00E+00
20	107-02-8	Acrolein	14	2.26E-08	1	1	2.26E-08	4.96E-16	2.26E-08	1	1	20	1	1.13E-09
21	107-05-1	3-Chloropropene (Allyl chloride)	20	0.00E+00	1	1	0.00E+00	0.00E+00	0.00E+00	1	1	20	1	0.00E+00
22	107-06-2	1,2-Dichloroethane (Ethylene chloride)	17	0.00E+00	1	1	0.00E+00	0.00E+00	0.00E+00	1	1	20	1	0.00E+00
23	107-12-0	Propionitrile	13	4.05E-07	1	1	4.05E-07	8.90E-15	4.05E-07	1	1	20	1	2.02E-08
24	107-13-1	Acrylonitrile	14	2.26E-08	1	1	2.26E-08	4.96E-16	2.26E-08	1	1	20	1	1.13E-09
25	107-18-6	2-Propene-1-ol	10	2.55E-04	1	1	2.55E-04	6.16E-12	2.55E-04	1	1	20	1	1.27E-05
26	107-31-3	Formic acid, methyl ester	15	5.16E-09	1	1	5.16E-09	1.14E-16	5.16E-09	1	1	20	1	2.58E-10
27	107-66-4	Dibutylphosphate	5	2.40E-02	40	11	5.45E-05	5.28E-10	5.45E-05	2000	100	20	1	1.36E-11
28	107-87-9	2-Pentanone	14	2.26E-08	1	1	2.26E-08	4.96E-16	2.26E-08	1	1	20	1	1.13E-09
29	108-03-2	1-Nitropropane	14	1.03E-07	1	1	1.03E-07	2.26E-15	1.03E-07	1	1	20	1	5.13E-09
30	108-05-4	Vinyl acetate	16	3.39E-12	1	1	3.39E-12	7.45E-20	3.39E-12	1	1	20	1	1.69E-13
31	108-10-1	Hexone (4-Methyl-2-pentanone or MIBK)	14	2.26E-08	1	1	2.26E-08	4.96E-16	2.26E-08	1	1	20	1	1.13E-09
32	108-20-3	Bis(isopropyl)ether	18	0.00E+00	1	1	0.00E+00	0.00E+00	0.00E+00	1	1	20	1	0.00E+00
33	108-38-3	m-Xylene (Dimethyl benzene)	19	0.00E+00	1	1	0.00E+00	0.00E+00	0.00E+00	1	1	20	1	0.00E+00
34	108-39-4	m-Cresol	9	2.59E-04	1	1	2.59E-04	5.70E-12	2.59E-04	1	1	20	1	1.30E-05
35	108-87-2	Methylcyclohexane	25	0.00E+00	1	1	0.00E+00	0.00E+00	0.00E+00	1	1	20	1	0.00E+00
36	108-88-3	Toluene	19	0.00E+00	1	1	0.00E+00	0.00E+00	0.00E+00	1	1	20	1	0.00E+00
37	108-90-7	Chlorobenzene	19	0.00E+00	1	1	0.00E+00	0.00E+00	0.00E+00	1	1	20	1	0.00E+00
38	108-93-0	Cyclohexanol	10	5.60E-05	1	1	5.60E-05	1.36E-12	5.60E-05	1	1	20	1	2.80E-06
39	108-94-1	Cyclohexanone	11	1.17E-05	1	1	1.17E-05	2.58E-13	1.17E-05	1	1	20	1	5.87E-07
40	108-95-2	Phenol	8	9.42E-03	1	1	9.42E-03	2.07E-10	9.42E-03	1	1	20	1	4.71E-04
41	109-66-0	n-Pentane	26	0.00E+00	1	1	0.00E+00	0.00E+00	0.00E+00	1	1	20	1	0.00E+00
42	109-99-9	Tetrahydrofuran	13	8.58E-07	1	1	8.58E-07	1.89E-14	8.58E-07	1	1	20	1	4.29E-08
43	110-12-3	5-Methyl-2-hexanone	15	1.14E-09	1	1	1.14E-09	2.50E-17	1.14E-09	1	1	20	1	5.68E-11
44	110-43-0	2-Heptanone	15	1.14E-09	1	1	1.14E-09	2.50E-17	1.14E-09	1	1	20	1	5.68E-11
45	110-54-3	n-Hexane	27	0.00E+00	1	1	0.00E+00	0.00E+00	0.00E+00	1	1	20	1	0.00E+00
46	110-62-3	n-Valeraldehyde	15	5.16E-09	1	1	5.16E-09	1.14E-16	5.16E-09	1	1	20	1	2.58E-10
47	110-82-7	Cyclohexane	24	0.00E+00	1	1	0.00E+00	0.00E+00	0.00E+00	1	1	20	1	0.00E+00
48	110-83-8	Cyclohexene	22	0.00E+00	1	1	0.00E+00	0.00E+00	0.00E+00	1	1	20	1	0.00E+00
49	110-86-1	Pyridine	11	5.33E-05	1	1	5.33E-05	1.17E-12	5.33E-05	1	1	20	1	2.67E-06
50	111-65-9	n-Octane	28	0.00E+00	1	1	0.00E+00	0.00E+00	0.00E+00	1	1	20	1	0.00E+00
51	111-76-2	Ethylene glycol monobutyl ether	9	1.18E-03	1	1	1.18E-03	2.59E-11	1.18E-03	1	1	20	1	5.89E-05
52	111-84-2	n-Nonane	28	0.00E+00	1	1	0.00E+00	0.00E+00	0.00E+00	1	1	20	1	0.00E+00
53	117-81-7	Bis(2-ethylhexyl)phthalate (DEHP)	30	9.49E-03	40	11	2.16E-05	3.06E-10	2.16E-05	2000	100	20	1	5.39E-12
54	117-84-0	n-Dioctyl phthalate	32	1.84E-04	40	11	4.18E-07	5.37E-12	4.18E-07	2000	100	20	1	1.05E-13
55	118-74-1	Hexachlorobenzene	18	0.00E+00	1	1	0.00E+00	0.00E+00	0.00E+00	1	1	20	1	0.00E+00
56	120-12-7	Anthracene	13	8.55E-07	1	1	8.55E-07	1.88E-14	8.55E-07	1	1	20	1	4.27E-08
57	120-82-1	1,2,4-Trichlorobenzene	17	0.00E+00	1	1	0.00E+00	0.00E+00	0.00E+00	1	1	20	1	0.00E+00
58	120-83-2	2,4-Dichlorophenol	10	2.55E-04	1	1	2.55E-04	6.16E-12	2.55E-04	1	1	20	1	1.27E-05
59	121-44-8	Triethylamine	15	1.14E-09	1	1	1.14E-09	2.50E-17	1.14E-09	1	1	20	1	5.68E-11
60	121-69-7	Dimethylaniline	13	4.05E-07	1	1	4.05E-07	8.90E-15	4.05E-07	1	1	20	1	2.02E-08
61	122-39-4	N,N-Diphenylamine	10	8.77E-05	1	1	8.77E-05	1.93E-12	8.77E-05	1	1	20	1	4.39E-06
62	123-19-3	4-Heptanone	13	4.05E-07	1	1	4.05E-07	8.90E-15	4.05E-07	1	1	20	1	2.02E-08
63	123-38-6	n-Propionaldehyde	14	2.26E-08	1	1	2.26E-08	4.96E-16	2.26E-08	1	1	20	1	1.13E-09
64	123-51-3	3-Methyl-1-butanol	12	6.90E-06	1	1	6.90E-06	1.52E-13	6.90E-06	1	1	20	1	3.45E-07
65	123-86-4	Acetic acid n-butyl ester	16	3.39E-12	1	1	3.39E-12	7.45E-20	3.39E-12	1	1	20	1	1.69E-13
66	123-91-1	1,4-Dioxane	10	1.53E-04	1	1	1.53E-04	3.70E-12	1.53E-04	1	1	20	1	7.64E-06
67	126-73-8	Tributyl phosphate	7	1.52E-02	1	1	1.52E-02	3.35E-10	1.52E-02	1	1	20	1	7.60E-04
68	126-98-7	2-Methyl-2-propenenitrile (Methacrylonitrile)	16	7.45E-13	1	1	7.45E-13	1.64E-20	7.45E-13	1	1	20	1	3.73E-14
69	127-18-4	Perchloroethylene (tetrachloroethylene)	21	0.00E+00	1	1	0.00E+00	0.00E+00	0.00E+00	1	1	20	1	0.00E+00
70	127-19-5	N,N-Dimethylacetamide	5	5.28E-03	1	1	5.28E-03	1.16E-10	5.28E-03	1	1	20	1	2.64E-04
71	128-37-0	2,6-Bis(tert-butyl)-4-methylphenol	32	1.84E-04	1	1	1.84E-04	5.37E-12	1.84E-04	1	1	20	1	9.20E-06
72	129-00-0	Pyrene	33	4.53E-05	40	11	1.03E-07	1.46E-12	1.03E-07	2000	100	20	1	2.58E-14
73	1321-64-8	Pentachloronaphthalene	14	1.03E-07	40	11	2.33E-10	2.26E-15	2.33E-10	2000	100	20	1	5.82E-17
74	1321-65-9	Trichloronaphthalene	15	5.16E-09	1	1	5.16E-09	1.14E-16	5.16E-09	1	1	20	1	2.58E-10
75	132-64-9	Dibenzofuran	15	5.16E-09	1	1	5.16E-09	1.14E-16	5.16E-09	1	1	20	1	2.58E-10
76	1335-87-1	Hexachloronaphthalene	14	1.03E-07	40	11	2.33E-10	2.26E-15	2.33E-10	2000	100	20	1	5.82E-17
77	1335-88-2	Tetrachloronaphthalene	15	5.16E-09	40	11	1.17E-11	1.14E-16	1.17E-11	2000	100	20	1	2.93E-18
78	1336-36-3	Polychlorinated biphenyls (PCBs)	35	5.42E-11	40	11	1.23E-13	1.74E-18	1.23E-13	2000	100	20	1	3.08E-20
79	141-78-6	Acetic acid ethyl ester (Ethyl acetate)	14	1.03E-07	1	1	1.03E-07	2.26E-15	1.03E-07	1	1	20	1	5.13E-09
80	141-79-7	4-Methyl-3-penten-2-one	13	1.84E-06	1	1	1.84E-06	4.05E-14	1.84E-06	1	1	20	1	9.20E-08
81	142-82-5	n-Heptane	27	0.00E+00	1	1	0.00E+00	0.00E+00	0.00E+00	1	1	20	1	0.00E+00
82	144-62-7	Oxalic acid	3	2.48E-03	1	1	2.48E-03	5.45E-11	2.48E-03	1	1	20	1	1.24E-04
83	156-60-5	trans-1,2-Dichloroethylene	20	0.00E+00	1	1	0.00E+00	0.00E+00	0.00E+00	1	1	20	1	0.00E+00
84	1582-09-8	Trifluralin	14	1.03E-07	40	11	2.33E-10	2.26E-15	2.33E-10	2000	100	20	1	5.82E-17
85	1634-04-4	Methyl tert-butyl ether	16	7.45E-13	1	1	7.45E-13	1.64E-20	7.45E-13	1	1	20	1	3.73E-14
86	1836-75-5	Nitrofen	30	9.49E-03	40	11	2.16E-05	3.06E-10	2.16E-05	2000	100	20	1	5.39E-12
87	189-55-9	Dibenzo[a,i]pyrene	5	2.40E-02	40	11	5.45E-05	5.28E-10	5.45E-05	2000	100	20	1	1.36E-11
88	189-64-0	Dibenzo[a,h]pyrene	5	2.40E-02	40	11	5.45E-05	5.28E-10	5.45E-05	2000	100	20	1	1.36E-11
89	191-24-2	Benzo(g,h,i)perylene	30	9.49E-03	40	11	2.16E-05	3.06E-10	2.16E-05	2000	100	20	1	5.39E-12
90	191-30-0	Benzo[a,i]pyrene	5	2.40E-02	40	11	5.45E-05	5.28E-10	5.45E-05	2000	100	20	1	1.36E-11
91	192-65-4	Dibenzo[a,e]pyrene	5	2.40E-02	40	11	5.45E-05	5.28E-10	5.45E-05	2000	100	20	1	1.36E-11
92	193-39-5	Indeno(1,2,3-cd)pyrene	30	9.49E-03	40	11	2.16E-05	3.06E-10	2.16E-05	2000	100	20	1	5.39E-12
93	205-82-3	Benzo(j)fluoranthene	7	1.52E-02	40	11	3.46E-05	3.35E-10	3.46E-05	2000	100	20	1	8.64E-12
94	205-99-2	Benzo(b)fluoranthene	30	9.49E-03	40	11	2.16E-05	3.06E-10	2.16E-05	2000	100	20	1	5.39E-12
95	206-44-0	Fluoranthene	33	4.07E-05	40	11	9.26E-08	1.31E-12	9.26E-08	2000	100	20	1	2.31E-14
96	207-08-9	Benzo(k)fluoranthene	30	9.49E-03	40	11	2.16E-05	3.06E-10	2.16E-05	2000	100	20	1	5.39E-12
97	208-96-8	Acenaphthylene	14	1.03E-07	1	1	1.03E-07	2.26E-15	1.03E-07	1	1	20	1	5.13E-09
98	218-01-9	Chrysene	32	2.40E-04	40	11	5.46E-07	7.73E-12	5.46E-07	2000	100	20	1	1.36E-13
99	2234-13-1	Octachloronaphthalene	14	1.03E-07	40	11	2.33E-10	2.26E-15	2.33E-10	2000	100	20	1	5.82E-17
100	224-42-0	Dibenz[a,j]acridine	4	2.47E-02	40	11	5.61E-05	5.43E-10	5.61E-05	2000	100	20	1	1.40E-11
101	226-36-8	Dibenz[a,h]acridine	4	2.47E-02	40	11	5.61E-05	5.43E-10	5.61E-05	2000	100	20	1	1.40E-11
102	2385-85-5	Mirex	17	0.00E+00	1	1	0.00E+00	0.00E+00	0.00E+00	1	1	20	1	0.00E+00
103	25551-13-7	Trimethyl benzene	19	0.00E+00	1	1	0.00E+00	0.00E+00	0.00E+00	1	1	20	1	0.00E+00
104	26140-60-3	Terphenyls	34	9.55E-07	40	11	2.17E-09	3.07E-14	2.17E-09	2000	100	20	1	5.42E-16
105	27154-33-2	Trichlorofluoroethane	23	0.00E+00	1	1	0.00E+00	0.00E+00	0.00E+00	1	1	20	1	0.00E+00
106	287-92-3	Cyclopentane	24	0.00E+00	1	1	0.00E+00	0.00E+00	0.00E+00	1	1	20	1	0.00E+00
107	309-00-2	Aldrin	34	1.18E-08	40	11	2.68E-11	3.79E-16	2.68E-11	2000	100	20	1	6.69E-18
108	319-84-6	Hexachlorocyclohexane (Lindane) Alpha BHC	33	1.36E-07	1	1	1.36E-07	4.37E-15	1.36E-07	1	1	20	1	6.79E-09
109	319-85-7	Hexachlorocyclohexane (Lindane) Beta BHC	30	3.11E-05	40	11	7.06E-08	1.00E-12	7.06E-08	2000	100	20	1	1.77E-14
110	319-86-8	Delta-BHC	30	3.16E-05	40	11	7.19E-08	1.02E-12	7.19E-08	2000	100	20	1	1.80E-14
111	3697-24-3	5-Methylchrysene	32	1.84E-04	40	11	4.18E-07	5.37E-12	4.18E-07	2000	100	20	1	1.05E-13
112	3825-26-1	Ammonium perfluorooctanoate	14	1.03E-07	40	11	2.33E-10	2.26E-15	2.33E-10	2000	100	20	1	5.82E-17
113	4170-30-3	2-Butenaldehyde (2-Butenal or Crotonaldehyde)	11	1.16E-05	1	1	1.16E-05	2.55E-13	1.16E-05	1	1	20	1	5.80E-07
114	465-73-6	Isodrin	35	1.05E-12	1	1	1.05E-12	3.38E-20	1.05E-12	1	1	20	1	5.25E-14
115	50-00-0	Formaldehyde	8	2.46E-03	1	1	2.46E-03	6.81E-11	2.46E-03	1	1	20	1	1.23E-04
116	50-29-3	4,4-DDT	33	2.72E-07	40	11	6.17E-10	8.74E-15	6.17E-10	2000	100	20	1	1.54E-16
117	50-32-8	Benzo(a)pyrene	30	1.22E-04	40	11	2.78E-07	3.94E-12	2.78E-07	2000	100	20	1	6.95E-14
118	53-70-3	Dibenzo(a,h)anthracene	7	2.53E-05	40	11	5.76E-08	5.58E-13	5.76E-08	2000	100	20	1	1.44E-14
119	540-59-0	1,2-Dichloroethylene	19	0.00E+00	1	1	0.00E+00	0.00E+00	0.00E+00	1	1	20	1	0.00E+00
120	540-84-1	2,2,4-Trimethylpentane	28	0.00E+00	1	1	0.00E+00	0.00E+00	0.00E+00	1	1	20	1	0.00E+00
121	541-73-1	1,3-Dichlorobenzene	19	0.00E+00	1	1	0.00E+00	0.00E+00	0.00E+00	1	1	20	1	0.00E+00
122	56-23-5	Carbon tetrachloride	22	0.00E+00	1	1	0.00E+00	0.00E+00	0.00E+00	1	1	20	1	0.00E+00
123	563-80-4	3-Methyl-2-butanone	14	2.26E-08	1	1	2.26E-08	4.96E-16	2.26E-08	1	1	20	1	1.13E-09
124	56-49-5	3-Methylcholanthrene	28	0.00E+00	40	11	0.00E+00	0.00E+00	0.00E+00	2000	100	20	1	0.00E+00
125	56-55-3	Benzo(a)anthracene	33	4.07E-05	40	11	9.26E-08	1.31E-12	9.26E-08	2000	100	20	1	2.31E-14
126	57-14-7	1,1-Dimethylhydrazine	12	3.14E-05	1	1	3.14E-05	6.90E-13	3.14E-05	1	1	20	1	1.57E-06
127	58-89-9	gamma-BHC (Lindane)	32	4.92E-07	40	11	1.12E-09	1.58E-14	1.12E-09	2000	100	20	1	2.79E-16
128	58-90-2	2,3,4,6-Tetrachlorophenol	11	6.24E-05	1	1	6.24E-05	1.37E-12	6.24E-05	1	1	20	1	3.12E-06
129	591-78-6	2-Hexanone	14	2.26E-08	1	1	2.26E-08	4.96E-16	2.26E-08	1	1	20	1	1.13E-09
130	59-50-7	4-Chloro-3-methylphenol	32	1.84E-04	40	11	4.18E-07	5.37E-12	4.18E-07	2000	100	20	1	1.05E-13
131	59-89-2	N-Nitrosomorpholine	6	2.28E-02	1	1	2.28E-02	5.01E-10	2.28E-02	1	1	20	1	1.14E-03
132	602-87-9	5-Nitroacenaphthene	9	1.18E-03	40	11	2.68E-06	2.59E-11	2.68E-06	2000	100	20	1	6.69E-13
133	60-29-7	Ethyl ether	17	0.00E+00	1	1	0.00E+00	0.00E+00	0.00E+00	1	1	20	1	0.00E+00
134	603-34-9	Triphenylamine	32	1.65E-04	1	1	1.65E-04	3.62E-12	1.65E-04	1	1	20	1	8.23E-06

CALCULATION SHEET

BY: E. Berríos
DATE: 05/21/03

PROJECT: WTP
JOB NO.: 24590
CALC NO.: 24590-WTP-M4C-FRP-00005
SHEET REV: A
SHEET NO.: 92

	A	B	C	D	E	F	G	H	I	J	K	L	M	N
1	Table B-8 LVP26 - Abated LAW Melter Offgas System													
2				LMP06	SBS	WESP	LOP08	LVP01	LVP03	HEPA 1	HEPA 2	VOC Ox	NaOH Scr	LVP26
3	CAS #	COPC	Grouping	g/sec	DF	DF	g/sec	g/sec	g/sec	DF	DF	DF	DF	g/sec
135	60-34-4	Methylhydrazine	10	5.60E-05	1	1	5.60E-05	1.36E-12	5.60E-05	1	1	20	1	2.80E-06
136	60-35-5	Acetamide	5	5.28E-03	1	1	5.28E-03	1.16E-10	5.28E-03	1	1	20	1	2.64E-04
137	60-57-1	Dieldrin	33	2.41E-07	40	11	5.47E-10	7.76E-15	5.47E-10	2000	100	20	1	1.37E-16
138	621-64-7	Di-n-Propylnitrosamine (N-Nitroso-di-n-propylamine)	10	2.55E-04	1	1	2.55E-04	6.16E-12	2.55E-04	1	1	20	1	1.27E-05
139	624-83-9	Methyl isocyanate	17	0.00E+00	1	1	0.00E+00	0.00E+00	0.00E+00	1	1	20	1	0.00E+00
140	627-13-4	Nitric acid, propyl ester	17	0.00E+00	1	1	0.00E+00	0.00E+00	0.00E+00	1	1	20	1	0.00E+00
141	62-75-9	N-Nitroso-N,N-dimethylamine (Dimethylnitrosamine)	9	2.20E-03	1	1	2.20E-03	4.84E-11	2.20E-03	1	1	20	1	1.10E-04
142	630-20-6	1,1,1,2-Tetrachloroethane	18	0.00E+00	1	1	0.00E+00	0.00E+00	0.00E+00	1	1	20	1	0.00E+00
143	64-17-5	Ethyl alcohol	10	5.60E-05	1	1	5.60E-05	1.36E-12	5.60E-05	1	1	20	1	2.80E-06
144	64-18-6	Formic acid	7	1.52E-02	1	1	1.52E-02	3.35E-10	1.52E-02	1	1	20	1	7.60E-04
145	64-19-7	Acetic acid	6	2.28E-02	1	1	2.28E-02	5.01E-10	2.28E-02	1	1	20	1	1.14E-03
146	67-56-1	Methyl alcohol (Methanol)	10	5.60E-05	1	1	5.60E-05	1.36E-12	5.60E-05	1	1	20	1	2.80E-06
147	67-63-0	2-Propyl alcohol (Isopropanol; Propan-2-01)	11	1.17E-05	1	1	1.17E-05	2.58E-13	1.17E-05	1	1	20	1	5.87E-07
148	67-64-1	2-Propanone (Acetone)	13	2.21E-06	1	1	2.21E-06	4.86E-14	2.21E-06	1	1	20	1	1.10E-07
149	67-66-3	Chloroform	19	0.00E+00	1	1	0.00E+00	0.00E+00	0.00E+00	1	1	20	1	0.00E+00
150	67-72-1	Hexachloroethane	19	0.00E+00	1	1	0.00E+00	0.00E+00	0.00E+00	1	1	20	1	0.00E+00
151	684-16-2	Hexafluoroacetone	19	0.00E+00	1	1	0.00E+00	0.00E+00	0.00E+00	1	1	20	1	0.00E+00
152	71-23-8	n-Propyl alcohol	11	1.17E-05	1	1	1.17E-05	2.58E-13	1.17E-05	1	1	20	1	5.87E-07
153	71-36-3	n-Butyl alcohol	11	1.17E-05	1	1	1.17E-05	2.58E-13	1.17E-05	1	1	20	1	5.87E-07
154	71-43-2	Benzene	19	0.00E+00	1	1	0.00E+00	0.00E+00	0.00E+00	1	1	20	1	0.00E+00
155	71-55-6	Methyl chloroform (1,1,1-Trichloroethane)	21	0.00E+00	1	1	0.00E+00	0.00E+00	0.00E+00	1	1	20	1	0.00E+00
156	72-20-8	Endrin	32	1.23E-06	40	11	2.79E-09	3.58E-14	2.79E-09	2000	100	20	1	6.97E-16
157	72-43-5	Methoxychlor	7	5.07E-04	40	11	1.15E-06	1.12E-11	1.15E-06	2000	100	20	1	2.88E-13
158	72-54-8	4,4-DDD	32	1.23E-06	40	11	2.79E-09	3.58E-14	2.79E-09	2000	100	20	1	6.97E-16
159	72-55-9	4,4-DDE	34	6.36E-09	40	11	1.45E-11	2.05E-16	1.45E-11	2000	100	20	1	3.62E-18
160	74-83-9	Bromomethane (Methyl bromide)	19	0.00E+00	1	1	0.00E+00	0.00E+00	0.00E+00	1	1	20	1	0.00E+00
161	74-87-3	Chloromethane (Methyl chloride)	20	0.00E+00	1	1	0.00E+00	0.00E+00	0.00E+00	1	1	20	1	0.00E+00
162	74-97-5	Bromochloromethane	17	0.00E+00	1	1	0.00E+00	0.00E+00	0.00E+00	1	1	20	1	0.00E+00
163	74-99-7	Methylacetylene	20	0.00E+00	1	1	0.00E+00	0.00E+00	0.00E+00	1	1	20	1	0.00E+00
164	75-00-3	Chloroethane	20	0.00E+00	1	1	0.00E+00	0.00E+00	0.00E+00	1	1	20	1	0.00E+00
165	75-01-4	Vinyl chloride (1-Chloroethene)	22	0.00E+00	1	1	0.00E+00	0.00E+00	0.00E+00	1	1	20	1	0.00E+00
166	75-05-8	Acetonitrile	13	8.85E-07	1	1	8.85E-07	1.95E-14	8.85E-07	1	1	20	1	4.42E-08
167	75-07-0	Acetaldehyde	13	1.84E-06	1	1	1.84E-06	4.05E-14	1.84E-06	1	1	20	1	9.20E-08
168	75-09-2	Dichloromethane (Methylene chloride)	19	0.00E+00	1	1	0.00E+00	0.00E+00	0.00E+00	1	1	20	1	0.00E+00
169	75-12-7	Formamide	4	2.47E-02	1	1	2.47E-02	5.43E-10	2.47E-02	1	1	20	1	1.24E-03
170	75-15-0	Carbon disulfide	20	0.00E+00	1	1	0.00E+00	0.00E+00	0.00E+00	1	1	20	1	0.00E+00
171	75-21-8	Ethylene oxide (Oxirane)	15	1.14E-09	1	1	1.14E-09	2.50E-17	1.14E-09	1	1	20	1	5.68E-11
172	75-27-4	Bromodichloromethane	18	0.00E+00	1	1	0.00E+00	0.00E+00	0.00E+00	1	1	20	1	0.00E+00
173	75-34-3	1,1-Dichloroethane	19	0.00E+00	1	1	0.00E+00	0.00E+00	0.00E+00	1	1	20	1	0.00E+00
174	75-35-4	1,1-Dichloroethene (Vinylidene chloride)	22	0.00E+00	1	1	0.00E+00	0.00E+00	0.00E+00	1	1	20	1	0.00E+00
175	75-43-4	Dichlorofluoromethane	20	0.00E+00	1	1	0.00E+00	0.00E+00	0.00E+00	1	1	20	1	0.00E+00
176	75-45-6	Chlorodifluoromethane	22	0.00E+00	1	1	0.00E+00	0.00E+00	0.00E+00	1	1	20	1	0.00E+00
177	75-50-3	Trimethylamine	14	2.26E-08	1	1	2.26E-08	4.96E-16	2.26E-08	1	1	20	1	1.13E-09
178	75-52-5	Nitromethane	13	1.84E-06	1	1	1.84E-06	4.05E-14	1.84E-06	1	1	20	1	9.20E-08
179	75-55-8	2-Methylaziridine	11	5.33E-05	1	1	5.33E-05	1.17E-12	5.33E-05	1	1	20	1	2.67E-06
180	75-61-6	Difluorodibromomethane	22	0.00E+00	1	1	0.00E+00	0.00E+00	0.00E+00	1	1	20	1	0.00E+00
181	75-63-8	Trifluorobromomethane	25	0.00E+00	1	1	0.00E+00	0.00E+00	0.00E+00	1	1	20	1	0.00E+00
182	75-65-0	2-Methyl-2-propanol	11	1.17E-05	1	1	1.17E-05	2.58E-13	1.17E-05	1	1	20	1	5.87E-07
183	75-69-4	Trichlorofluoromethane	23	0.00E+00	1	1	0.00E+00	0.00E+00	0.00E+00	1	1	20	1	0.00E+00
184	75-71-8	Dichlorodifluoromethane	25	0.00E+00	1	1	0.00E+00	0.00E+00	0.00E+00	1	1	20	1	0.00E+00
185	75-99-0	2,2-Dichloropropionic acid	6	2.28E-02	1	1	2.28E-02	5.01E-10	2.28E-02	1	1	20	1	1.14E-03
186	76-03-9	Trichloroacetic acid	5	5.28E-03	1	1	5.28E-03	1.16E-10	5.28E-03	1	1	20	1	2.64E-04
187	76-11-9	1,1,1,2-Tetrachloro-2,2-difluoroethane	24	0.00E+00	1	1	0.00E+00	0.00E+00	0.00E+00	1	1	20	1	0.00E+00
188	76-12-0	1,1,2,2-Tetrachloro-1,2-difluoroethane	23	0.00E+00	1	1	0.00E+00	0.00E+00	0.00E+00	1	1	20	1	0.00E+00
189	76-13-1	1,2,2-Trichloro-1,1,2-trifluoroethane (Freon 113)	25	0.00E+00	1	1	0.00E+00	0.00E+00	0.00E+00	1	1	20	1	0.00E+00
190	76-14-2	1,2-Dichloro-1,1,2,2-tetrafluoroethane	28	0.00E+00	1	1	0.00E+00	0.00E+00	0.00E+00	1	1	20	1	0.00E+00
191	76-15-3	Chloropentafluoroethane	29	0.00E+00	1	1	0.00E+00	0.00E+00	0.00E+00	1	1	20	1	0.00E+00
192	76-44-8	Heptachlor	16	0.00E+00	1	1	0.00E+00	0.00E+00	0.00E+00	1	1	20	1	0.00E+00
193	78-83-1	2-Methylpropyl alcohol (Isobutyl alcohol)	11	5.33E-05	1	1	5.33E-05	1.17E-12	5.33E-05	1	1	20	1	2.67E-06
194	78-87-5	1,2-Dichloropropane	19	0.00E+00	1	1	0.00E+00	0.00E+00	0.00E+00	1	1	20	1	0.00E+00
195	78-92-2	1-Methylpropyl alcohol (2-Butanol)	11	1.17E-05	1	1	1.17E-05	2.58E-13	1.17E-05	1	1	20	1	5.87E-07
196	78-93-3	Methyl ethyl ketone (MEK, 2-Butanone)	13	4.05E-07	1	1	4.05E-07	8.90E-15	4.05E-07	1	1	20	1	2.02E-08
197	79-00-5	1,1,2-Trichloroethane	17	0.00E+00	1	1	0.00E+00	0.00E+00	0.00E+00	1	1	20	1	0.00E+00
198	79-01-6	Trichloroethylene	20	0.00E+00	1	1	0.00E+00	0.00E+00	0.00E+00	1	1	20	1	0.00E+00
199	79-09-4	Propionic acid	8	1.12E-02	1	1	1.12E-02	3.09E-10	1.12E-02	1	1	20	1	5.58E-04
200	79-10-7	2-Propenoic acid	8	1.12E-02	1	1	1.12E-02	3.09E-10	1.12E-02	1	1	20	1	5.58E-04
201	79-20-9	Methyl acetate	14	1.03E-07	1	1	1.03E-07	2.26E-15	1.03E-07	1	1	20	1	5.13E-09
202	79-34-5	1,1,2,2-Tetrachloroethane	16	7.45E-13	1	1	7.45E-13	1.64E-20	7.45E-13	1	1	20	1	3.73E-14
203	8001-35-2	Toxaphene	10	8.46E-07	40	11	1.92E-09	2.72E-14	1.92E-09	2000	100	20	1	4.81E-16
204	82-68-8	Pentachloronitrobenzene (PCBN or quintobenzene)	13	1.84E-06	1	1	1.84E-06	4.05E-14	1.84E-06	1	1	20	1	9.20E-08
205	83-32-9	Acenaphthene	15	5.16E-09	1	1	5.16E-09	1.14E-16	5.16E-09	1	1	20	1	2.58E-10
206	84-66-2	Diethyl phthalate	8	5.30E-03	1	1	5.30E-03	1.17E-10	5.30E-03	1	1	20	1	2.65E-04
207	84-74-2	Dibutyl phthalate	31	1.84E-03	40	11	4.17E-06	5.91E-11	4.17E-06	2000	100	20	1	1.04E-12
208	85-01-8	Phenanthrene	13	1.84E-06	1	1	1.84E-06	4.05E-14	1.84E-06	1	1	20	1	9.20E-08
209	85-68-7	Butylbenzyl phthalate	31	1.84E-03	40	11	4.17E-06	5.91E-11	4.17E-06	2000	100	20	1	1.04E-12
210	86-73-7	Fluorene	14	1.03E-07	40	11	2.33E-10	2.26E-15	2.33E-10	2000	100	20	1	5.82E-17
211	87-68-3	Hexachlorobutadiene	20	0.00E+00	1	1	0.00E+00	0.00E+00	0.00E+00	1	1	20	1	0.00E+00
212	87-86-5	Pentachlorophenol	6	2.28E-02	1	1	2.28E-02	5.01E-10	2.28E-02	1	1	20	1	1.14E-03
213	88-06-2	2,4,6-Trichlorophenol	10	2.55E-04	1	1	2.55E-04	6.16E-12	2.55E-04	1	1	20	1	1.27E-05
214	88-72-2	2-Nitrotoluene	12	6.90E-06	1	1	6.90E-06	1.52E-13	6.90E-06	1	1	20	1	3.45E-07
215	88-75-5	2-Nitrophenol	12	3.14E-05	1	1	3.14E-05	6.90E-13	3.14E-05	1	1	20	1	1.57E-06
216	88-85-7	2-sec-Butyl-4,6-dinitrophenol (Dinoseb)	8	1.88E-02	40	11	4.26E-05	6.04E-10	4.26E-05	2000	100	20	1	1.07E-11
217	88-89-1	Picric acid	2	3.31E-01	40	11	7.52E-04	1.07E-08	7.52E-04	2000	100	20	1	1.88E-10
218	91-20-3	Naphthalene	16	0.00E+00	1	1	0.00E+00	0.00E+00	0.00E+00	1	1	20	1	0.00E+00
219	91-22-5	Quinoline	9	1.18E-03	1	1	1.18E-03	2.59E-11	1.18E-03	1	1	20	1	5.89E-05
220	91-58-7	2-Chloronapthalene	16	3.39E-12	1	1	3.39E-12	7.45E-20	3.39E-12	1	1	20	1	1.69E-13
221	92-52-4	1,1`-Biphenyl	16	3.39E-12	1	1	3.39E-12	7.45E-20	3.39E-12	1	1	20	1	1.69E-13
222	92-93-3	4-Nitrobiphenyl	10	2.55E-04	40	11	5.79E-07	6.16E-12	5.79E-07	2000	100	20	1	1.45E-13
223	93-72-1	Silvex (2,4,5-TP)	5	2.40E-02	40	11	5.45E-05	5.28E-10	5.45E-05	2000	100	20	1	1.36E-11
224	93-76-5	2,4,5-T	5	2.40E-02	40	11	5.45E-05	5.28E-10	5.45E-05	2000	100	20	1	1.36E-11
225	94-75-7	2,4-D and esters (160C typed)	6	2.28E-02	1	1	2.28E-02	5.01E-10	2.28E-02	1	1	20	1	1.14E-03
226	95-13-6	Indene	18	0.00E+00	1	1	0.00E+00	0.00E+00	0.00E+00	1	1	20	1	0.00E+00
227	95-47-6	o-Xylene	19	0.00E+00	1	1	0.00E+00	0.00E+00	0.00E+00	1	1	20	1	0.00E+00
228	95-48-7	o-Cresol (2-Methylphenol)	9	2.59E-04	1	1	2.59E-04	5.70E-12	2.59E-04	1	1	20	1	1.30E-05
229	95-49-8	2-Chlorotoluene	19	0.00E+00	1	1	0.00E+00	0.00E+00	0.00E+00	1	1	20	1	0.00E+00
230	95-50-1	o-Dichlorobenzene (1,2-Dichlorobenzene)	18	0.00E+00	1	1	0.00E+00	0.00E+00	0.00E+00	1	1	20	1	0.00E+00
231	95-57-8	2-Chlorophenol	11	5.33E-05	1	1	5.33E-05	1.17E-12	5.33E-05	1	1	20	1	2.67E-06
232	95-95-4	2,4,5-Trichlorophenol	9	1.18E-03	1	1	1.18E-03	2.59E-11	1.18E-03	1	1	20	1	5.89E-05
233	96-22-0	3-Pentanone	14	2.26E-08	1	1	2.26E-08	4.96E-16	2.26E-08	1	1	20	1	1.13E-09
234	96-69-5	Bis(3-tert-butyl-4-hydroxy-6-methyl-phenyl)sulfide	19	0.00E+00	40	11	0.00E+00	0.00E+00	0.00E+00	2000	100	20	1	0.00E+00
235	98-51-1	p-tert-Butyltoluene	21	0.00E+00	1	1	0.00E+00	0.00E+00	0.00E+00	1	1	20	1	0.00E+00
236	98-82-8	Cumene	20	0.00E+00	1	1	0.00E+00	0.00E+00	0.00E+00	1	1	20	1	0.00E+00
237	98-83-9	alpha-Methylstyrene	19	0.00E+00	1	1	0.00E+00	0.00E+00	0.00E+00	1	1	20	1	0.00E+00
238	98-86-2	Acetophenone	11	4.49E-05	1	1	4.49E-05	9.89E-13	4.49E-05	1	1	20	1	2.25E-06
239	98-95-3	Nitrobenzene	12	3.14E-05	1	1	3.14E-05	6.90E-13	3.14E-05	1	1	20	1	1.57E-06
240							2.62E-01							
241														
242	Coplanar PCBs			LOP08				LVP01	LVP03	HEPA 1	HEPA 2	VOC Ox	NaOH Scr	LVP26
243				g/sec				g/sec	g/sec	DF	DF	DF	DF	g/sec
244	31508-00-6	2,3',4,4',5-Pentachlorobiphenyl (PBC 118)		8.88E-17				1.26E-21	8.88E-17	2000	100	20	1	2.22E-23
245	32598-13-3	3,3',4,4'-Tetrachlorobiphenyl (TCB)		8.88E-17		Correction for Coplanar		1.26E-21	8.88E-17	2000	100	20	1	2.22E-23
246	32598-14-4	2,3,3',4,4'-Pentachlorobiphenyl (PCB 105)		8.88E-17		0.99	as parent	1.26E-21	8.88E-17	2000	100	20	1	2.22E-23
247	32774-16-6	3,3',4,4',5,5'-Hexachlorobiphenyl		8.88E-17		0.01	as coplanar	1.26E-21	8.88E-17	2000	100	20	1	2.22E-23
248	35065-29-3	2,2',3,4,4',5,5'-Heptachlorobiphenyl		8.88E-17				1.26E-21	8.88E-17	2000	100	20	1	2.22E-23
249	35065-30-6	2,2',3,3',4,4',5-Heptachlorobiphenyl		8.88E-17				1.26E-21	8.88E-17	2000	100	20	1	2.22E-23
250	38380-08-4	2,3,3',4,4',5-Hexachlorobiphenyl (PCB 157)		8.88E-17				1.26E-21	8.88E-17	2000	100	20	1	2.22E-23
251	39635-31-9	2,3,3',4,4',5,5'-Heptachlorobiphenyl		8.88E-17				1.26E-21	8.88E-17	2000	100	20	1	2.22E-23
252	52663-72-6	2,3',4,4',5,5'-Hexachlorobiphenyl		8.88E-17				1.26E-21	8.88E-17	2000	100	20	1	2.22E-23
253	57465-28-8	3,3',4,4',5-Pentachlorobiphenyl		8.88E-17				1.26E-21	8.88E-17	2000	100	20	1	2.22E-23
254	65510-44-3	2',3,4,4',5-Pentachlorobiphenyl		8.88E-17				1.26E-21	8.88E-17	2000	100	20	1	2.22E-23
255	69782-90-7	2,3,3',4,4',5'-Hexachlorobiphenyl		8.88E-17				1.26E-21	8.88E-17	2000	100	20	1	2.22E-23
256	70362-50-4	3,4,4',5-Tetrachlorobiphenyl		8.88E-17				1.26E-21	8.88E-17	2000	100	20	1	2.22E-23
257	74472-37-0	2,3,4,4',5-Pentachlorobiphenyl		8.88E-17				1.26E-21	8.88E-17	2000	100	20	1	2.22E-23
258														
259	1336-36-3	Polychlorinated biphenyls (PCBs)		1.23E-13										
260	1336-36-3	UnCorrected (for coplanar PCBs)		1.24E-13										

CALCULATION SHEET

BY: E. Berrios
DATE: 05/21/03

PROJECT: WTP
JOB NO.: 24590
CALC NO.: 24590-WTP-M4C-FRP-00005
SHEET REV: A
SHEET NO.: 93

Table B-9 HMP06 - Unabated HLW Melter

	A	B	C	D	E	F	G	H	I	J	K
1											Calc'd rate
2			Feed Rate					HMP06 rate	Performan	Adjusted	HMP06
3	CAS #	COPC	g/sec	In ACM	Group	Grouping	Phase	g/sec	Factor	PF	g/sec
4	100-00-5	p-Nitrochlorobenzene	3.49E-02	No		10	vapor			1.44E-01	5.03E-03
5	100-21-0	p-Phthalic acid	3.49E-02	Yes	1	1	vapor	6.81E-03	1.95E-01		6.81E-03
6	100-25-4	1,4-Dinitrobenzene	3.49E-02	No		6	particle			1.97E-01	6.86E-03
7	100-41-4	Ethyl benzene	7.67E-03	No		20	vapor			1.53E-10	1.17E-12
8	100-42-5	Styrene	7.67E-03	No		19	vapor			4.41E-08	3.39E-10
9	10061-01-5	cis-1,3-Dichloropropene	7.67E-03	Yes	19	19	vapor	9.78E-10	1.27E-07		9.78E-10
10	10061-02-6	trans-1,3-Dichloropropene	7.67E-03	No		17	vapor			2.45E-06	1.88E-08
11	101-55-3	4-Bromophenylphenyl ether	3.49E-02	No		14	vapor			1.00E-02	3.50E-04
12	101-84-8	Diphenyl ether	7.67E-03	No		16	vapor			3.90E-04	2.99E-06
13	106-35-4	3-Heptanone	7.67E-03	No		14	vapor			1.00E-02	7.71E-05
14	106-42-3	p-Xylene (Dimethyl benzene)	7.67E-03	No		19	vapor			4.41E-08	3.39E-10
15	106-46-7	1,4-Dichlorobenzene	7.67E-03	No		18	vapor			1.15E-06	8.79E-09
16	106-88-7	1,2-Epoxybutane	7.67E-03	No		15	vapor			2.26E-03	1.74E-05
17	106-93-4	Ethylene dibromide (Dibromethane)	3.49E-02	Yes	16	16	vapor	1.87E-06	5.36E-05		1.87E-06
18	106-97-8	Butane	7.67E-03	Yes	26	26	vapor	0.00E+00	0.00E+00		0.00E+00
19	106-99-0	1,3-Butadiene	7.67E-03	Yes	23	23	vapor	0.00E+00	0.00E+00		0.00E+00
20	107-02-8	Acrolein	7.67E-03	No		14	vapor			1.00E-02	7.71E-05
21	107-05-1	3-Chloropropene (Allyl chloride)	7.67E-03	No		20	vapor			1.53E-10	1.17E-12
22	107-06-2	1,2-Dichloroethane (Ethylene chloride)	7.67E-03	No		17	vapor			2.45E-06	1.88E-08
23	107-12-0	Propionitrile	7.67E-03	No		13	vapor			4.22E-02	3.23E-04
24	107-13-1	Acrylonitrile	7.67E-03	No		14	vapor			1.00E-02	7.71E-05
25	107-18-6	2-Propene-1-ol	3.49E-02	No		10	vapor			1.44E-01	5.03E-03
26	107-31-3	Formic acid, methyl ester	3.49E-02	No		15	vapor			2.26E-03	7.90E-05
27	107-66-4	Dibutylphosphate	3.49E-02	No		5	particle			1.97E-01	6.86E-03
28	107-87-9	2-Pentanone	7.67E-03	No		14	vapor			1.00E-02	7.71E-05
29	108-03-2	1-Nitropropane	3.49E-02	No		14	vapor			1.00E-02	3.50E-04
30	108-05-4	Vinyl acetate	3.49E-02	No		16	vapor			3.90E-04	1.36E-05
31	108-10-1	Hexone (4-Methyl-2-pentanone or MIBK)	7.67E-03	No		14	vapor			1.00E-02	7.71E-05
32	108-20-3	Bis(isopropyl)ether	7.67E-03	No		18	vapor			1.15E-06	8.79E-09
33	108-38-3	m-Xylene (Dimethyl benzene)	7.67E-03	No		19	vapor			4.41E-08	3.39E-10
34	108-39-4	m-Cresol	7.67E-03	No		9	vapor			1.52E-01	1.16E-03
35	108-87-2	Methylcyclohexane	7.67E-03	Yes	25	25	vapor	0.00E+00	0.00E+00		0.00E+00
36	108-88-3	Toluene	7.67E-03	Yes	19	19	vapor	1.06E-11	1.39E-09		1.06E-11
37	108-90-7	Chlorobenzene	7.67E-03	No		19	vapor			4.41E-08	3.39E-10
38	108-93-0	Cyclohexanol	7.67E-03	No		10	vapor			1.44E-01	1.11E-03
39	108-94-1	Cyclohexanone	7.67E-03	No		11	vapor			1.04E-01	7.96E-04
40	108-95-2	Phenol	3.49E-02	Yes	8	8	vapor	6.71E-03	1.93E-01		6.71E-03
41	109-66-0	n-Pentane	7.67E-03	No		26	vapor			0.00E+00	0.00E+00
42	109-99-9	Tetrahydrofuran	1.63E-02	No		13	vapor			4.22E-02	6.86E-04
43	110-12-3	5-Methyl-2-hexanone	7.67E-03	No		15	vapor			2.26E-03	1.74E-05
44	110-43-0	2-Heptanone	7.67E-03	No		15	vapor			2.26E-03	1.74E-05
45	110-54-3	n-Hexane	7.67E-03	Yes	27	27	vapor	0.00E+00	0.00E+00		0.00E+00
46	110-62-3	n-Valeraldehyde	3.49E-02	No		15	vapor			2.26E-03	7.90E-05
47	110-82-7	Cyclohexane	7.67E-03	Yes	24	24	vapor	0.00E+00	0.00E+00		0.00E+00
48	110-83-8	Cyclohexene	7.67E-03	No		22	vapor			2.39E-18	1.83E-20
49	110-86-1	Pyridine	3.49E-02	No		11	vapor			1.04E-01	3.62E-03
50	111-65-9	n-Octane	7.67E-03	No		28	vapor			0.00E+00	0.00E+00
51	111-76-2	Ethylene glycol monobutyl ether	3.49E-02	No		9	vapor			1.52E-01	5.29E-03
52	111-84-2	n-Nonane	7.67E-03	Yes	28	28	vapor	0.00E+00	0.00E+00		0.00E+00
53	117-81-7	Bis(2-ethylhexyl)phthalate (DEHP)	3.49E-02	No		30	particle			2.44E-01	8.50E-03
54	117-84-0	n-Dioctyl phthalate	3.49E-02	No		32	particle			1.42E-01	4.97E-03
55	118-74-1	Hexachlorobenzene	7.21E-04	Yes	18	18	vapor	8.26E-10	1.15E-06		8.26E-10
56	120-12-7	Anthracene	3.49E-02	Yes	13	13	vapor	1.11E-03	3.18E-02		1.11E-03
57	120-82-1	1,2,4-Trichlorobenzene	7.67E-03	Yes	17	17	vapor	1.88E-08	2.45E-06		1.88E-08
58	120-83-2	2,4-Dichlorophenol	3.49E-02	No		10	vapor			1.44E-01	5.03E-03
59	121-44-8	Triethylamine	7.67E-03	No		15	vapor			2.26E-03	1.74E-05
60	121-69-7	Dimethylaniline	7.67E-03	No		13	vapor			4.22E-02	3.23E-04
61	122-39-4	N,N-Diphenylamine	7.67E-03	Yes	10	10	vapor	1.03E-03	1.35E-01		1.03E-03
62	123-19-3	4-Heptanone	7.67E-03	No		13	vapor			4.22E-02	3.23E-04
63	123-38-6	n-Propionaldehyde	7.67E-03	No		14	vapor			1.00E-02	7.71E-05
64	123-51-3	3-Methyl-1-butanol	7.67E-03	No		12	vapor			9.48E-02	7.28E-04
65	123-86-4	Acetic acid n-butyl ester	3.49E-02	No		16	vapor			3.90E-04	1.36E-05
66	123-91-1	1,4-Dioxane	2.09E-02	No		10	vapor			1.44E-01	3.02E-03
67	126-73-8	Tributyl phosphate	3.49E-02	Yes	7	7	vapor	6.90E-03	1.98E-01		6.90E-03
68	126-98-7	2-Methyl-2-propenenitrile (Methacrylonitrile)	7.67E-03	No		16	vapor			3.90E-04	2.99E-06
69	127-18-4	Perchloroethylene (tetrachloroethylene)	7.67E-03	Yes	21	21	vapor	4.81E-14	6.27E-12		4.81E-14
70	127-19-5	N,N-Dimethylacetamide	7.67E-03	No		5	vapor			1.97E-01	1.51E-03
71	128-37-0	2,6-Bis(tert-butyl)-4-methylphenol	3.49E-02	No		32	vapor			1.42E-01	4.97E-03
72	129-00-0	Pyrene	3.49E-02	Yes	33	33	particle	4.37E-03	1.25E-01		4.37E-03
73	1321-64-8	Pentachloronaphthalene	3.49E-02	No		14	particle			1.00E-02	3.50E-04
74	1321-65-9	Trichloronaphthalene	3.49E-02	No		15	vapor			2.26E-03	7.90E-05
75	132-64-9	Dibenzofuran	3.49E-02	Yes	15	15	vapor	7.90E-05	2.26E-03		7.90E-05
76	1335-87-1	Hexachloronaphthalene	3.49E-02	No		14	particle			1.00E-02	3.50E-04
77	1335-88-2	Tetrachloronaphthalene	3.49E-02	No		15	particle			2.26E-03	7.90E-05
78	1336-36-3	Polychlorinated biphenyls (PCBs)	1.21E-02	Yes	35	35	particle	6.69E-05	5.53E-03		6.62E-05
79	141-78-6	Acetic acid ethyl ester (Ethyl acetate)	3.49E-02	No		14	vapor			1.00E-02	3.50E-04
80	141-79-7	4-Methyl-3-penten-2-one	3.49E-02	No		13	vapor			4.22E-02	1.47E-03
81	142-82-5	n-Heptane	7.67E-03	No		27	vapor			0.00E+00	0.00E+00
82	144-62-7	Oxalic acid	3.49E-03	Yes	3	3	vapor	6.83E-04	1.96E-01		6.83E-04
83	156-60-5	trans-1,2-Dichloroethylene	7.67E-03	No		20	vapor			1.53E-10	1.17E-12
84	1582-09-8	Trifluralin	3.49E-02	No		14	particle			1.00E-02	3.50E-04
85	1634-04-4	Methyl tert-butyl ether	7.67E-03	No		16	vapor			3.90E-04	2.99E-06
86	1836-75-5	Nitrofen	3.49E-02	No		30	particle			2.44E-01	8.50E-03
87	189-55-9	Dibenzo[a,i]pyrene	3.49E-02	No		5	particle			1.97E-01	6.86E-03
88	189-64-0	Dibenzo[a,h]pyrene	3.49E-02	No		5	particle			1.97E-01	6.86E-03
89	191-24-2	Benzo(g,h,i)perylene	3.49E-02	No		30	particle			2.44E-01	8.50E-03
90	191-30-0	Benzo[a,l]pyrene	3.49E-02	No		5	particle			1.97E-01	6.86E-03
91	192-65-4	Dibenzo[a,e]pyrene	3.49E-02	No		5	particle			1.97E-01	6.86E-03
92	193-39-5	Indeno(1,2,3-cd)pyrene	3.49E-02	No		30	particle			2.44E-01	8.50E-03
93	205-82-3	Benzo(j)fluoranthene	3.49E-02	No		7	particle			1.98E-01	6.90E-03
94	205-99-2	Benzo(b)fluoranthene	3.49E-02	No		30	particle			2.44E-01	8.50E-03
95	206-44-0	Fluoranthene	3.49E-02	No		33	particle			1.31E-01	4.58E-03
96	207-08-9	Benzo(k)fluoranthene	3.49E-02	No		30	particle			2.44E-01	8.50E-03
97	208-96-8	Acenaphthylene	3.49E-02	Yes	14	14	vapor	3.50E-04	1.00E-02		3.50E-04
98	218-01-9	Chrysene	3.49E-02	Yes	32	32	particle	5.26E-03	1.51E-01		5.26E-03
99	2234-13-1	Octachloronaphthalene	3.49E-02	No		14	particle			1.00E-02	3.50E-04
100	224-42-0	Dibenz[a,j]acridine	3.49E-02	No		4	particle			1.95E-01	6.80E-03
101	226-36-8	Dibenz[a,h]acridine	3.49E-02	No		4	particle			1.95E-01	6.80E-03
102	2385-85-5	Mirex	3.49E-02	No		17	vapor			2.45E-06	8.55E-08
103	25551-13-7	Trimethyl benzene	7.67E-03	No		19	vapor			4.41E-08	3.39E-10
104	26140-60-3	Terphenyls	3.49E-02	No		34	particle			7.02E-02	2.45E-03
105	27154-33-2	Trichlorofluoroethane	7.67E-03	No		23	vapor			0.00E+00	0.00E+00
106	287-92-3	Cyclopentane	7.67E-03	No		24	vapor			0.00E+00	0.00E+00
107	309-00-2	Aldrin	4.30E-04	Yes	34	34	particle	3.02E-05	7.02E-02		3.02E-05
108	319-84-6	Hexachlorocyclohexane (Lindane) Alpha BHC	1.16E-04	No		33	vapor			1.31E-01	1.53E-05
109	319-85-7	Hexachlorocyclohexane (Lindane) Beta BHC	1.16E-04	Yes	30	30	particle	2.86E-05	2.46E-01		2.86E-05
110	319-86-8	Delta-BHC	1.16E-04	No		30	particle			2.44E-01	2.83E-05
111	3697-24-3	5-Methylchrysene	3.49E-02	No		32	particle			1.42E-01	4.97E-03
112	3825-26-1	Ammonium perfluorooctanoate	3.49E-02	No		14	particle			1.00E-02	3.50E-04
113	4170-30-3	2-Butenaldehyde (2-Butenal or Crotonaldehyde)	7.67E-03	Yes	11	11	vapor	7.96E-04	1.04E-01		7.96E-04
114	465-73-6	Isodrin	2.32E-04	No		35	vapor			5.53E-03	1.29E-06
115	50-00-0	Formaldehyde	7.67E-03	No		8	vapor			2.17E-01	1.67E-03
116	50-29-3	4,4-DDT	2.32E-04	No		33	particle			1.31E-01	3.05E-05
117	50-32-8	Benzo(a)pyrene	4.42E-04	Yes	30	30	particle	1.07E-04	2.41E-01		1.07E-04
118	53-70-3	Dibenzo(a,h)anthracene	5.81E-05	No		7	particle			1.98E-01	1.15E-05
119	540-59-0	1,2-Dichloroethylene	7.67E-03	No		19	vapor			4.41E-08	3.39E-10
120	540-84-1	2,2,4-Trimethylpentane	7.67E-03	No		28	vapor			0.00E+00	0.00E+00
121	541-73-1	1,3-Dichlorobenzene	7.67E-03	No		19	vapor			4.41E-08	3.39E-10
122	56-23-5	Carbon tetrachloride	7.67E-03	Yes	22	22	vapor	1.83E-20	2.39E-18		1.83E-20
123	563-80-4	3-Methyl-2-butanone	7.67E-03	No		14	vapor			1.00E-02	7.71E-05
124	56-49-5	3-Methylcholanthrene	3.49E-02	No		28	particle			0.00E+00	0.00E+00
125	56-55-3	Benzo(a)anthracene	3.49E-02	No		33	particle			1.31E-01	4.58E-03
126	57-14-7	1,1-Dimethylhydrazine	3.49E-02	Yes	12	12	vapor	3.31E-03	9.48E-02		3.31E-03
127	58-89-9	gamma-BHC (Lindane)	1.16E-04	Yes	32	32	particle	1.81E-05	1.55E-01		1.81E-05
128	58-90-2	2,3,4,6-Tetrachlorophenol	3.49E-02	Yes	11	11	vapor	3.71E-03	1.06E-01		3.71E-03
129	591-78-6	2-Hexanone	7.67E-03	No		14	vapor			1.00E-02	7.71E-05
130	59-50-7	4-Chloro-3-methylphenol	3.49E-02	No		32	particle			1.42E-01	4.97E-03
131	59-89-2	N-Nitrosomorpholine	3.49E-02	No		6	vapor			1.97E-01	6.86E-03
132	602-87-9	5-Nitroacenaphthene	3.49E-02	No		9	particle			1.52E-01	5.29E-03
133	60-29-7	Ethyl ether	3.49E-02	No		17	vapor			2.45E-06	8.55E-08
134	603-34-9	Triphenylamine	3.49E-02	Yes	32	32	vapor	4.22E-03	1.21E-01		4.22E-03
135	60-34-4	Methylhydrazine	7.67E-03	No		10	vapor			1.44E-01	1.11E-03
136	60-35-5	Acetamide	7.67E-03	Yes	5	5	vapor	1.51E-03	1.97E-01		1.51E-03
137	60-57-1	Dieldrin	2.32E-04	Yes	33	33	particle	3.19E-05	1.37E-01		3.19E-05
138	621-64-7	Di-n-Propylnitrosamine (N-Nitroso-di-n-propylamine)	3.49E-02	No		10	vapor			1.44E-01	5.03E-03
139	624-83-9	Methyl isocyanate	7.67E-03	No		17	vapor			2.45E-06	1.88E-08
140	627-13-4	Nitric acid, propyl ester	3.49E-02	No		17	vapor			2.45E-06	8.55E-08
141	62-75-9	N-Nitroso-N,N-dimethylamine (Dimethylnitrosamine)	6.51E-02	Yes	9	9	vapor	9.87E-03	1.52E-01		9.87E-03
142	630-20-6	1,1,1,2-Tetrachloroethane	7.67E-03	No		18	vapor			1.15E-06	8.79E-09
143	64-17-5	Ethyl alcohol	7.67E-03	No		10	vapor			1.44E-01	1.11E-03
144	64-18-6	Formic acid	3.49E-02	No		7	vapor			1.98E-01	6.90E-03
145	64-19-7	Acetic acid	3.49E-02	No		6	vapor			1.97E-01	6.86E-03
146	67-56-1	Methyl alcohol (Methanol)	7.67E-03	No		10	vapor			1.44E-01	1.11E-03
147	67-63-0	2-Propyl alcohol (Isopropanol; Propan-2-01)	7.67E-03	No		11	vapor			1.04E-01	7.96E-04
148	67-64-1	2-Propanone (Acetone)	4.18E-02	No		13	vapor			4.22E-02	1.76E-03
149	67-66-3	Chloroform	7.67E-03	No		19	vapor			4.41E-08	3.39E-10
150	67-72-1	Hexachloroethane	3.49E-02	No		19	vapor			4.41E-08	1.54E-09
151	684-16-2	Hexafluoroacetone	7.67E-03	No		19	vapor			4.41E-08	3.39E-10
152	71-23-8	n-Propyl alcohol	7.67E-03	No		11	vapor			1.04E-01	7.96E-04
153	71-36-3	n-Butyl alcohol	7.67E-03	No		11	vapor			1.04E-01	7.96E-04
154	71-43-2	Benzene	7.67E-03	Yes	19	19	vapor	2.73E-11	3.56E-09		2.73E-11
155	71-55-6	Methyl chloroform (1,1,1-Trichloroethane)	7.67E-03	No		21	vapor			6.27E-12	4.81E-14
156	72-20-8	Endrin	2.32E-04	No		32	particle			1.42E-01	3.31E-05
157	72-43-5	Methoxychlor	1.16E-03	No		7	particle			1.98E-01	2.30E-04
158	72-54-8	4,4-DDD	2.32E-04	No		32	particle			1.42E-01	3.31E-05
159	72-55-9	4,4-DDE	2.32E-04	No		34	particle			7.02E-02	1.63E-05
160	74-83-9	Bromomethane (Methyl bromide)	7.67E-03	No		19	vapor			4.41E-08	3.39E-10
161	74-87-3	Chloromethane (Methyl chloride)	7.67E-03	No		20	vapor			1.53E-10	1.17E-12
162	74-97-5	Bromochloromethane	7.67E-03	No		17	vapor			2.45E-06	1.88E-08
163	74-99-7	Methylacetylene	3.49E-02	No		20	vapor			1.53E-10	5.34E-12
164	75-00-3	Chloroethane	7.67E-03	No		20	vapor			1.53E-10	1.17E-12
165	75-01-4	Vinyl chloride (1-Chloroethene)	3.49E-02	No		22	vapor			2.39E-18	8.32E-20
166	75-05-8	Acetonitrile	1.09E-02	Yes	13	13	vapor	5.74E-04	5.25E-02		5.74E-04
167	75-07-0	Acetaldehyde	3.49E-02	No		13	vapor			4.22E-02	1.47E-03
168	75-09-2	Dichloromethane (Methylene chloride)	7.67E-03	No		19	vapor			4.41E-08	3.39E-10
169	75-12-7	Formamide	3.49E-02	Yes	4	4	vapor	6.80E-03	1.95E-01		6.80E-03
170	75-15-0	Carbon disulfide	7.67E-03	No		20	vapor			1.53E-10	1.17E-12
171	75-21-8	Ethylene oxide (Oxirane)	7.67E-03	No		15	vapor			2.26E-03	1.74E-05
172	75-27-4	Bromodichloromethane	7.67E-03	No		18	vapor			1.15E-06	8.79E-09
173	75-34-3	1,1-Dichloroethane	7.67E-03	No		19	vapor			4.41E-08	3.39E-10
174	75-35-4	1,1-Dichloroethene (Vinylidene chloride)	7.67E-03	No		22	vapor			2.39E-18	1.83E-20
175	75-43-4	Dichlorofluoromethane	7.67E-03	No		20	vapor			1.53E-10	1.17E-12
176	75-45-6	Chlorodifluoromethane	7.67E-03	No		22	vapor			2.39E-18	1.83E-20
177	75-50-3	Trimethylamine	7.67E-03	No		14	vapor			1.00E-02	7.71E-05
178	75-52-5	Nitromethane	3.49E-02	No		13	vapor			4.22E-02	1.47E-03
179	75-55-8	2-Methylaziridine	3.49E-02	No		11	vapor			1.04E-01	3.62E-03
180	75-61-6	Difluorodibromomethane	7.67E-03	No		22	vapor			2.39E-18	1.83E-20
181	75-63-8	Trifluorobromomethane	7.67E-03	No		25	vapor			0.00E+00	0.00E+00
182	75-65-0	2-Methyl-2-propanol	7.67E-03	No		11	vapor			1.04E-01	7.96E-04
183	75-69-4	Trichlorofluoromethane	7.67E-03	No		23	vapor			0.00E+00	0.00E+00
184	75-71-8	Dichlorodifluoromethane	7.67E-03	No		25	vapor			0.00E+00	0.00E+00
185	75-99-0	2,2-Dichloropropionic acid	3.49E-02	No		6	vapor			1.97E-01	6.86E-03
186	76-03-9	Trichloroacetic acid	7.67E-03	No		5	vapor			1.97E-01	1.51E-03
187	76-11-9	1,1,1,2-Tetrachloro-2,2-difluoroethane	3.49E-02	No		24	vapor			0.00E+00	0.00E+00
188	76-12-0	1,1,2,2-Tetrachloro-1,2-difluoroethane	3.49E-02	No		23	vapor			0.00E+00	0.00E+00
189	76-13-1	1,2,2-Trichloro-1,1,2-trifluoroethane (Freon 113)	7.67E-03	No		25	vapor			0.00E+00	0.00E+00
190	76-14-2	1,2-Dichloro-1,1,2,2-tetrafluoroethane	7.67E-03	No		28	vapor			0.00E+00	0.00E+00
191	76-15-3	Chloropentafluoroethane	7.67E-03	Yes	29	29	vapor	0.00E+00	0.00E+00		0.00E+00
192	76-44-8	Heptachlor	7.56E-04	Yes	16	16	vapor	6.62E-07	8.77E-04		6.62E-07
193	78-83-1	2-Methylpropyl alcohol (Isobutyl alcohol)	3.49E-02	No		11	vapor			1.04E-01	3.62E-03
194	78-87-5	1,2-Dichloropropane	7.67E-03	No		19	vapor			4.41E-08	3.39E-10
195	78-92-2	1-Methylpropyl alcohol (2-Butanol)	7.67E-03	No		11	vapor			1.04E-01	7.96E-04
196	78-93-3	Methyl ethyl ketone (MEK, 2-Butanone)	7.67E-03	No		13	vapor			4.22E-02	3.23E-04
197	79-00-5	1,1,2-Trichloroethane	7.67E-03	No		17	vapor			2.45E-06	1.88E-08
198	79-01-6	Trichloroethylene	7.67E-03	Yes	20	20	vapor	1.33E-12	1.73E-10		1.33E-12
199	79-09-4	Propionic acid	3.49E-02	No		8	vapor			2.17E-01	7.58E-03
200	79-10-7	2-Propenoic acid	3.49E-02	No		8	vapor			2.17E-01	7.58E-03
201	79-20-9	Methyl acetate	3.49E-02	No		14	vapor			1.00E-02	3.50E-04

Adjusted Performance Factors

Group	PF
1	1.95E-01
2	2.43E-01
3	1.96E-01
4	1.95E-01
5	1.97E-01
6	1.97E-01
7	1.98E-01
8	2.17E-01
9	1.52E-01
10	1.44E-01
11	1.04E-01
12	9.48E-02
13	4.22E-02
14	1.00E-02
15	2.26E-03
16	3.90E-04
17	2.45E-06
18	1.15E-06
19	4.41E-08
20	1.53E-10
21	6.27E-12
22	2.39E-18
23	0.00E+00
24	0.00E+00
25	0.00E+00
26	0.00E+00
27	0.00E+00
28	0.00E+00
29	0.00E+00
30	2.44E-01
31	1.91E-01
32	1.42E-01
33	1.31E-01
34	7.02E-02
35	5.53E-03

Coplanar PCBs		HMP06 g/sec
31508-00-6	2,3',4,4',5-Pentachlorobiphenyl (PBC 118)	4.78E-08
32598-13-3	3,3',4,4'-Tetrachlorobiphenyl (TCB)	4.78E-08
32598-14-4	2,3,3',4,4'-Pentachlorobiphenyl (PCB 105)	4.78E-08
32774-16-6	3,3',4,4',5,5'-Hexachlorobiphenyl	4.78E-08
35065-29-3	2,2',3,4,4',5,5'-Heptachlorobiphenyl	4.78E-08
35065-30-6	2,2',3,3',4,4',5-Heptachlorobiphenyl	4.78E-08
38380-08-4	2,3,3',4,4',5-Hexachlorobiphenyl (PCB 157)	4.78E-08
39635-31-9	2,3,3',4,4',5,5'-Heptachlorobiphenyl	4.78E-08
52663-72-6	2,3',4,4',5,5'-Hexachlorobiphenyl	4.78E-08
57465-28-8	3,3',4,4',5-Pentachlorobiphenyl	4.78E-08
65510-44-3	2',3,4,4',5-Pentachlorobiphenyl	4.78E-08
69782-90-7	2,3,3',4,4',5'-Hexachlorobiphenyl	4.78E-08
70362-50-4	3,4,4',5-Tetrachlorobiphenyl	4.78E-08
74472-37-0	2,3,4,4',5-Pentachlorobiphenyl	4.78E-08
1336-36-3	Polychlorinated biphenyls (PCBs)	6.62E-05
1336-36-3	UnCorrected (for coplanar PCBs)	6.69E-05

Correction for Coplanar PCBs	
0.99	as parent
0.01	as coplanar sum

CALCULATION SHEET

BY: E. Berrios
DATE: 05/21/03

PROJECT: WTP
JOB NO.: 24590
CALC NO.: 24590-WTP-M4C-FRP-00005
SHEET REV: A
SHEET NO.: 94

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W
1	**Table B-9 HMP06 - Unabated HLW Melter**										Calc'd rate												
2			Feed Rate					HMP06 rate	Performan	Adjusted	HMP06												
3	CAS #	COPC	g/sec	In ACM	Group	Grouping	Phase	g/sec	Factor	PF	g/sec		Adjusted Performance Factors										
202	79-34-5	1,1,2,2-Tetrachloroethane	7.67E-03	No		16	vapor			3.90E-04	2.99E-06												
203	8001-35-2	Toxaphene	2.67E-04	Yes	10	10	particle	4.11E-05	1.54E-01		4.11E-05												
204	82-68-8	Pentachloronitrobenzene (PCBN or quintobenzene)	3.49E-02	No		13	vapor			4.22E-02	1.47E-03												
205	83-32-9	Acenaphthene	3.49E-02	No		15	vapor			2.26E-03	7.90E-05												
206	84-66-2	Diethyl phthalate	3.49E-02	Yes	8	8	vapor	6.33E-03	1.82E-01		6.33E-03												
207	84-74-2	Dibutyl phthalate	3.49E-02	Yes	31	31	particle	6.66E-03	1.91E-01		6.66E-03												
208	85-01-8	Phenanthrene	3.49E-02	No		13	vapor			4.22E-02	1.47E-03												
209	85-68-7	Butylbenzyl phthalate	3.49E-02	No		31	particle			1.91E-01	6.66E-03												
210	86-73-7	Fluorene	3.49E-02	No		14	particle			1.00E-02	3.50E-04												
211	87-68-3	Hexachlorobutadiene	7.67E-03	Yes	20	20	vapor	1.02E-12	1.33E-10		1.02E-12												
212	87-86-5	Pentachlorophenol	3.49E-02	Yes	6	6	vapor	6.86E-03	1.97E-01		6.86E-03												
213	88-06-2	2,4,6-Trichlorophenol	3.49E-02	No		10	vapor			1.44E-01	5.03E-03												
214	88-72-2	2-Nitrotoluene	7.67E-03	No		12	vapor			9.48E-02	7.28E-04												
215	88-75-5	2-Nitrophenol	3.49E-02	No		12	vapor			9.48E-02	3.31E-03												
216	88-85-7	2-sec-Butyl-4,6-dinitrophenol (Dinoseb)	3.49E-02	Yes	8	8	particle	9.69E-03	2.78E-01		9.69E-03												
217	88-89-1	Picric acid	3.49E-02	Yes	2	2	particle	8.46E-03	2.43E-01		8.46E-03												
218	91-20-3	Naphthalene	1.16E-03	Yes	16	16	vapor	2.77E-07	2.39E-04		2.77E-07												
219	91-22-5	Quinoline	3.49E-02	No		9	vapor			1.52E-01	5.29E-03												
220	91-58-7	2-Chloronapthalene	3.49E-02	No		16	vapor			3.90E-04	1.36E-05												
221	92-52-4	1,1'-Biphenyl	3.49E-02	No		16	vapor			3.90E-04	1.36E-05												
222	92-93-3	4-Nitrobiphenyl	3.49E-02	No		10	particle			1.44E-01	5.03E-03												
223	93-72-1	Silvex (2,4,5-TP)	3.49E-02	No		5	particle			1.97E-01	6.86E-03												
224	93-76-5	2,4,5-T	3.49E-02	No		5	particle			1.97E-01	6.86E-03												
225	94-75-7	2,4-D and esters (160C typed)	3.49E-02	No		6	vapor			1.97E-01	6.86E-03												
226	95-13-6	Indene	3.49E-02	No		18	vapor			1.15E-06	4.00E-08												
227	95-47-6	o-Xylene	7.67E-03	No		19	vapor			4.41E-08	3.39E-10												
228	95-48-7	o-Cresol (2-Methylphenol)	7.67E-03	No		9	vapor			1.52E-01	1.16E-03												
229	95-49-8	2-Chlorotoluene	3.49E-02	No		19	vapor			4.41E-08	1.54E-09												
230	95-50-1	o-Dichlorobenzene (1,2-Dichlorobenzene)	7.67E-03	No		18	vapor			1.15E-06	8.79E-09												
231	95-57-8	2-Chlorophenol	3.49E-02	No		11	vapor			1.04E-01	3.62E-03												
232	95-95-4	2,4,5-Trichlorophenol	3.49E-02	No		9	vapor			1.52E-01	5.29E-03												
233	96-22-0	3-Pentanone	7.67E-03	No		14	vapor			1.00E-02	7.71E-05												
234	96-69-5	Bis(3-tert-butyl-4-hydroxy-6-methyl-phenyl)sulfide	3.49E-02	No		19	particle			4.41E-08	1.54E-09												
235	98-51-1	p-tert-Butyltoluene	3.49E-02	No		21	vapor			6.27E-12	2.19E-13												
236	98-82-8	Cumene	3.49E-02	No		20	vapor			1.53E-10	5.34E-12												
237	98-83-9	alpha-Methylstyrene	7.67E-03	No		19	vapor			4.41E-08	3.39E-10												
238	98-86-2	Acetophenone	3.49E-02	Yes	11	11	vapor	3.53E-03	1.01E-01		3.53E-03												
239	98-95-3	Nitrobenzene	3.49E-02	No		12	vapor			9.48E-02	3.31E-03												
240											4.29E-01												

CALCULATION SHEET

BY: E. Berrios
DATE: 05/21/03

PROJECT: WTP
JOB NO.: 24590
CALC NO.: 24590-WTP-M4C-FRP-00005
SHEET REV: A
SHEET NO.: 95

Table B-10 HOP10 - HLW Vessel Ventilation

CAS #	COPC	Feed Rate g/sec	In ACM	Group	Grouping	Phase	HOP10 rate g/sec	Performance Factor	Adjusted PF	Calc'd rate g/sec
100-00-5	p-Nitrochlorobenzene	3.49E-02	No		10	vapor			3.57E-04	1.24E-05
100-21-0	p-Phthalic acid	3.49E-02	Yes	1	1	vapor	1.56E-11	4.46E-10		1.56E-11
100-25-4	1,4-Dinitrobenzene	3.49E-02	No		6	particle			1.07E-06	3.72E-08
100-41-4	Ethyl benzene	7.67E-03	No		20	vapor			3.39E-10	2.60E-12
100-42-5	Styrene	7.67E-03	No		19	vapor			2.77E-08	2.12E-10
10061-01-5	cis-1,3-Dichloropropene	7.67E-03	Yes	19	19	vapor	5.88E-10	7.66E-08		5.88E-10
10061-02-6	trans-1,3-Dichloropropene	7.67E-03	No		17	vapor			7.72E-07	5.92E-09
101-55-3	4-Bromophenylphenyl ether	3.49E-02	No		14	vapor			2.52E-04	8.80E-06
101-84-8	Diphenyl ether	7.67E-03	No		16	vapor			2.94E-05	2.26E-07
106-35-4	3-Heptanone	7.67E-03	No		14	vapor			2.52E-04	1.94E-06
106-42-3	p-Xylene (Dimethyl benzene)	7.67E-03	No		19	vapor			2.77E-08	2.12E-10
106-46-7	1,4-Dichlorobenzene	7.67E-03	No		18	vapor			4.31E-07	3.30E-09
106-88-7	1,2-Epoxybutane	7.67E-03	No		15	vapor			1.07E-04	8.20E-07
106-93-4	Ethylene dibromide (Dibromethane)	3.49E-02	Yes	16	16	vapor	2.76E-07	7.91E-06		2.76E-07
106-97-8	Butane	7.67E-03	Yes	26	26	vapor	0.00E+00	0.00E+00		0.00E+00
106-99-0	1,3-Butadiene	7.67E-03	Yes	23	23	vapor	0.00E+00	0.00E+00		0.00E+00
107-02-8	Acrolein	7.67E-03	No		14	vapor			2.52E-04	1.94E-06
107-05-1	3-Chloropropene (Allyl chloride)	7.67E-03	No		20	vapor			3.39E-10	2.60E-12
107-06-2	1,2-Dichloroethane (Ethylene chloride)	7.67E-03	No		17	vapor			7.72E-07	5.92E-09
107-12-0	Propionitrile	7.67E-03	No		13	vapor			3.96E-04	3.04E-06
107-13-1	Acrylonitrile	7.67E-03	No		14	vapor			2.52E-04	1.94E-06
107-18-6	2-Propene-1-ol	3.49E-02	No		10	vapor			3.57E-04	1.24E-05
107-31-3	Formic acid, methyl ester	3.49E-02	No		15	vapor			1.07E-04	3.73E-06
107-66-4	Dibutylphosphate	3.49E-02	No		5	particle			4.86E-07	1.70E-08
107-87-9	2-Pentanone	7.67E-03	No		14	vapor			2.52E-04	1.94E-06
108-03-2	1-Nitropropane	3.49E-02	No		14	vapor			2.52E-04	8.80E-06
108-05-4	Vinyl acetate	3.49E-02	No		16	vapor			2.94E-05	1.03E-06
108-10-1	Hexone (4-Methyl-2-pentanone or MIBK)	7.67E-03	No		14	vapor			2.52E-04	1.94E-06
108-20-3	Bis(isopropyl)ether	7.67E-03	No		18	vapor			4.31E-07	3.30E-09
108-38-3	m-Xylene (Dimethyl benzene)	7.67E-03	No		19	vapor			2.77E-08	2.12E-10
108-39-4	m-Cresol	7.67E-03	No		9	vapor			6.10E-05	4.68E-07
108-87-2	Methylcyclohexane	7.67E-03	Yes	25	25	vapor	0.00E+00	0.00E+00		0.00E+00
108-88-3	Toluene	7.67E-03	Yes	19	19	vapor	1.56E-11	2.04E-09		1.56E-11
108-90-7	Chlorobenzene	7.67E-03	No		19	vapor			2.77E-08	2.12E-10
108-93-0	Cyclohexanol	7.67E-03	No		10	vapor			3.57E-04	2.74E-06
108-94-1	Cyclohexanone	7.67E-03	No		11	vapor			2.21E-04	1.70E-06
108-95-2	Phenol	3.49E-02	Yes	8	8	vapor	4.95E-07	1.42E-05		4.95E-07
109-66-0	n-Pentane	7.67E-03	No		26	vapor			0.00E+00	0.00E+00
109-99-9	Tetrahydrofuran	1.63E-02	No		13	vapor			3.96E-04	6.45E-06
110-12-3	5-Methyl-2-hexanone	7.67E-03	No		15	vapor			1.07E-04	8.20E-07
110-43-0	2-Heptanone	7.67E-03	No		15	vapor			1.07E-04	8.20E-07
110-54-3	n-Hexane	7.67E-03	Yes	27	27	vapor	0.00E+00	0.00E+00		0.00E+00
110-62-3	n-Valeraldehyde	3.49E-02	No		15	vapor			1.07E-04	3.73E-06
110-82-7	Cyclohexane	7.67E-03	Yes	24	24	vapor	0.00E+00	0.00E+00		0.00E+00
110-83-8	Cyclohexene	7.67E-03	No		22	vapor			1.45E-17	1.11E-19
110-86-1	Pyridine	3.49E-02	No		11	vapor			2.21E-04	7.71E-06
111-65-9	n-Octane	7.67E-03	No		28	vapor			0.00E+00	0.00E+00
111-76-2	Ethylene glycol monobutyl ether	3.49E-02	No		9	vapor			6.10E-05	2.13E-06
111-84-2	n-Nonane	7.67E-03	Yes	28	28	vapor	0.00E+00	0.00E+00		0.00E+00
117-81-7	Bis(2-ethylhexyl)phthalate (DEHP)	3.49E-02	No		30	particle			7.26E-05	2.53E-06
117-84-0	n-Dioctyl phthalate	3.49E-02	No		32	particle			4.00E-04	1.40E-05
118-74-1	Hexachlorobenzene	7.21E-04	Yes	18	18	vapor	3.10E-10	4.31E-07		3.10E-10
120-12-7	Anthracene	3.49E-02	Yes	13	13	vapor	1.37E-05	3.92E-04		1.37E-05
120-82-1	1,2,4-Trichlorobenzene	7.67E-03	Yes	17	17	vapor	5.92E-09	7.72E-07		5.92E-09
120-83-2	2,4-Dichlorophenol	3.49E-02	No		10	vapor			3.57E-04	1.24E-05
121-44-8	Triethylamine	7.67E-03	No		15	vapor			1.07E-04	8.20E-07
121-69-7	Dimethylaniline	7.67E-03	No		13	vapor			3.96E-04	3.04E-06
122-39-4	N,N-Diphenylamine	7.67E-03	Yes	10	10	vapor	7.75E-07	1.01E-04		7.75E-07
123-19-3	4-Heptanone	7.67E-03	No		13	vapor			3.96E-04	3.04E-06
123-38-6	n-Propionaldehyde	7.67E-03	No		14	vapor			2.52E-04	1.94E-06
123-51-3	3-Methyl-1-butanol	7.67E-03	No		12	vapor			2.61E-04	2.00E-06
123-86-4	Acetic acid n-butyl ester	3.49E-02	No		16	vapor			2.94E-05	1.03E-06
123-91-1	1,4-Dioxane	2.09E-02	No		10	vapor			3.57E-04	7.47E-06
126-73-8	Tributyl phosphate	3.49E-02	Yes	7	7	vapor	2.29E-07	6.58E-06		2.29E-07
126-98-7	2-Methyl-2-propenenitrile (Methacrylonitrile)	7.67E-03	No		16	vapor			2.94E-05	2.26E-07
127-18-4	Perchloroethylene (tetrachloroethylene)	7.67E-03	Yes	21	21	vapor	1.89E-13	2.47E-11		1.89E-13
127-19-5	N,N-Dimethylacetamide	7.67E-03	No		5	vapor			4.86E-07	3.73E-09
128-37-0	2,6-Bis(tert-butyl)-4-methylphenol	3.49E-02	No		32	vapor			4.00E-04	1.40E-05
129-00-0	Pyrene	3.49E-02	Yes	33	33	particle	3.48E-05	9.97E-04		3.48E-05
1321-64-8	Pentachloronaphthalene	3.49E-02	No		14	particle			2.52E-04	8.80E-06
1321-65-9	Trichloronaphthalene	3.49E-02	No		15	vapor			1.07E-04	3.73E-06
132-64-9	Dibenzofuran	3.49E-02	Yes	15	15	vapor	3.73E-06	1.07E-04		3.73E-06
1335-87-1	Hexachloronaphthalene	3.49E-02	No		14	particle			2.52E-04	8.80E-06
1335-88-2	Tetrachloronaphthalene	3.49E-02	No		15	particle			1.07E-04	3.73E-06
1336-36-3	Polychlorinated biphenyls (PCBs)	1.21E-02	Yes	35	35	particle	1.95E-05	1.61E-03		1.93E-05
141-78-6	Acetic acid ethyl ester (Ethyl acetate)	3.49E-02	No		14	vapor			2.52E-04	8.80E-06
141-79-7	4-Methyl-3-penten-2-one	3.49E-02	No		13	vapor			3.96E-04	1.38E-05
142-82-5	n-Heptane	7.67E-03	No		27	vapor			0.00E+00	0.00E+00
144-62-7	Oxalic acid	3.49E-03	Yes	3	3	vapor	2.31E-11	6.63E-09		2.31E-11
156-60-5	trans-1,2-Dichloroethylene	7.67E-03	No		20	vapor			3.39E-10	2.60E-12
1582-09-8	Trifluralin	3.49E-02	No		14	particle			2.52E-04	8.80E-06
1634-04-4	Methyl tert-butyl ether	7.67E-03	No		16	vapor			2.94E-05	2.26E-07
1836-75-5	Nitrofen	3.49E-02	No		30	particle			7.26E-05	2.53E-06
189-55-9	Dibenzo[a,i]pyrene	3.49E-02	No		5	particle			4.86E-07	1.70E-08
189-64-0	Dibenzo[a,h]pyrene	3.49E-02	No		5	particle			4.86E-07	1.70E-08
191-24-2	Benzo(g,h,i)perylene	3.49E-02	No		30	particle			7.26E-05	2.53E-06
191-30-0	Benzo[a,l]pyrene	3.49E-02	No		5	particle			4.86E-07	1.70E-08
192-65-4	Dibenzo[a,e]pyrene	3.49E-02	No		5	particle			4.86E-07	1.70E-08
193-39-5	Indeno(1,2,3-cd)pyrene	3.49E-02	No		30	particle			7.26E-05	2.53E-06
205-82-3	Benzo(j)fluoranthene	3.49E-02	No		7	particle			6.58E-06	2.29E-07
205-99-2	Benzo(b)fluoranthene	3.49E-02	No		30	particle			7.26E-05	2.53E-06
206-44-0	Fluoranthene	3.49E-02	No		33	particle			9.53E-04	3.32E-05
207-08-9	Benzo(k)fluoranthene	3.49E-02	No		30	particle			7.26E-05	2.53E-06
208-96-8	Acenaphthylene	3.49E-02	Yes	14	14	vapor	8.80E-06	2.52E-04		8.80E-06
218-01-9	Chrysene	3.49E-02	Yes	32	32	particle	1.83E-05	5.25E-04		1.83E-05
2234-13-1	Octachloronaphthalene	3.49E-02	No		14	particle			2.52E-04	8.80E-06
224-42-0	Dibenz[a,j]acridine	3.49E-02	No		4	particle			6.06E-08	2.11E-09
226-36-8	Dibenz[a,h]acridine	3.49E-02	No		4	particle			6.06E-08	2.11E-09
2385-85-5	Mirex	3.49E-02	No		17	vapor			7.72E-07	2.69E-08
25551-13-7	Trimethyl benzene	7.67E-03	No		19	vapor			2.77E-08	2.12E-10
26140-60-3	Terphenyls	3.49E-02	No		34	particle			2.07E-03	7.20E-05
27154-33-2	Trichlorofluoroethane	7.67E-03	No		23	vapor			0.00E+00	0.00E+00
287-92-3	Cyclopentane	7.67E-03	No		24	vapor			0.00E+00	0.00E+00
309-00-2	Aldrin	4.30E-04	Yes	34	34	particle	8.88E-07	2.07E-03		8.88E-07
319-84-6	Hexachlorocyclohexane (Lindane) Alpha BHC	1.16E-04	No		33	vapor			9.53E-04	1.11E-07
319-85-7	Hexachlorocyclohexane (Lindane) Beta BHC	1.16E-04	Yes	30	30	particle	8.37E-09	7.20E-05		8.37E-09
319-86-8	Delta-BHC	1.16E-04	No		30	particle			7.26E-05	8.44E-09
3697-24-3	5-Methylchrysene	3.49E-02	No		32	particle			4.00E-04	1.40E-05
3825-26-1	Ammonium perfluorooctanoate	3.49E-02	No		14	particle			2.52E-04	8.80E-06
4170-30-3	2-Butenaldehyde (2-Butenal or Crotonaldehyde)	7.67E-03	Yes	11	11	vapor	1.71E-06	2.22E-04		1.71E-06
465-73-6	Isodrin	2.32E-04	No		35	vapor			1.61E-03	3.75E-07
50-00-0	Formaldehyde	7.67E-03	No		8	vapor			4.10E-05	3.14E-07
50-29-3	4,4-DDT	2.32E-04	No		33	particle			9.53E-04	2.22E-07
50-32-8	Benzo(a)pyrene	4.42E-04	Yes	30	30	particle	3.24E-08	7.32E-05		3.24E-08
53-70-3	Dibenzo(a,h)anthracene	5.81E-05	No		7	particle			6.58E-06	3.82E-10
540-59-0	1,2-Dichloroethylene	7.67E-03	No		19	vapor			2.77E-08	2.12E-10
540-84-1	2,2,4-Trimethylpentane	7.67E-03	No		28	vapor			0.00E+00	0.00E+00
541-73-1	1,3-Dichlorobenzene	7.67E-03	No		19	vapor			2.77E-08	2.12E-10
56-23-5	Carbon tetrachloride	7.67E-03	Yes	22	22	vapor	1.11E-19	1.45E-17		1.11E-19
563-80-4	3-Methyl-2-butanone	7.67E-03	No		14	vapor			2.52E-04	1.94E-06
56-49-5	3-Methylcholanthrene	3.49E-02	No		28	particle			0.00E+00	0.00E+00
56-55-3	Benzo(a)anthracene	3.49E-02	No		33	particle			9.53E-04	3.32E-05
57-14-7	1,1-Dimethylhydrazine	3.49E-02	Yes	12	12	vapor	9.11E-06	2.61E-04		9.11E-06
58-89-9	gamma-BHC (Lindane)	1.16E-04	Yes	32	32	particle	6.18E-08	5.32E-04		6.18E-08
58-90-2	2,3,4,6-Tetrachlorophenol	3.49E-02	Yes	11	11	vapor	7.26E-06	2.08E-04		7.26E-06
591-78-6	2-Hexanone	7.67E-03	No		14	vapor			2.52E-04	1.94E-06
59-50-7	4-Chloro-3-methylphenol	3.49E-02	No		32	particle			4.00E-04	1.40E-05
59-89-2	N-Nitrosomorpholine	3.49E-02	No		6	vapor			1.07E-06	3.72E-08
602-87-9	5-Nitroacenaphthene	3.49E-02	No		9	particle			6.10E-05	2.13E-06
60-29-7	Ethyl ether	3.49E-02	No		17	vapor			7.72E-07	2.69E-08
603-34-9	Triphenylamine	3.49E-02	Yes	32	32	vapor	5.05E-06	1.45E-04		5.05E-06
60-34-4	Methylhydrazine	7.67E-03	No		10	vapor			3.57E-04	2.74E-06
60-35-5	Acetamide	7.67E-03	Yes	5	5	vapor	3.73E-09	4.86E-07		3.73E-09
60-57-1	Dieldrin	2.32E-04	Yes	33	33	particle	2.11E-07	9.09E-04		2.11E-07
621-64-7	Di-n-Propylnitrosamine (N-Nitroso-di-n-propylamine)	3.49E-02	No		10	vapor			3.57E-04	1.24E-05
624-83-9	Methyl isocyanate	7.67E-03	No		17	vapor			7.72E-07	5.92E-09
627-13-4	Nitric acid, propyl ester	3.49E-02	No		17	vapor			7.72E-07	2.69E-08
62-75-9	N-Nitroso-N,N-dimethylamine (Dimethylnitrosamine)	6.51E-02	Yes	9	9	vapor	3.97E-06	6.10E-05		3.97E-06
630-20-6	1,1,1,2-Tetrachloroethane	7.67E-03	No		18	vapor			4.31E-07	3.30E-09
64-17-5	Ethyl alcohol	7.67E-03	No		10	vapor			3.57E-04	2.74E-06
64-18-6	Formic acid	3.49E-02	No		7	vapor			6.58E-06	2.29E-07
64-19-7	Acetic acid	3.49E-02	No		6	vapor			1.07E-06	3.72E-08
67-56-1	Methyl alcohol (Methanol)	7.67E-03	No		10	vapor			3.57E-04	2.74E-06
67-63-0	2-Propyl alcohol (Isopropanol; Propan-2-01)	7.67E-03	No		11	vapor			2.21E-04	1.70E-06
67-64-1	2-Propanone (Acetone)	4.18E-02	No		13	vapor			3.96E-04	1.66E-05
67-66-3	Chloroform	7.67E-03	No		19	vapor			2.77E-08	2.12E-10
67-72-1	Hexachloroethane	3.49E-02	No		19	vapor			2.77E-08	9.65E-10
684-16-2	Hexafluoroacetone	7.67E-03	No		19	vapor			2.77E-08	2.12E-10
71-23-8	n-Propyl alcohol	7.67E-03	No		11	vapor			2.21E-04	1.70E-06
71-36-3	n-Butyl alcohol	7.67E-03	No		11	vapor			2.21E-04	1.70E-06
71-43-2	Benzene	7.67E-03	Yes	19	19	vapor	3.36E-11	4.37E-09		3.36E-11
71-55-6	Methyl chloroform (1,1,1-Trichloroethane)	7.67E-03	No		21	vapor			2.47E-11	1.89E-13
72-20-8	Endrin	2.32E-04	No		32	particle			4.00E-04	9.31E-08
72-43-5	Methoxychlor	1.16E-03	No		7	particle			6.58E-06	7.65E-09
72-54-8	4,4-DDD	2.32E-04	No		32	particle			4.00E-04	9.31E-08
72-55-9	4,4-DDE	2.32E-04	No		34	particle			2.07E-03	4.80E-07
74-83-9	Bromomethane (Methyl bromide)	7.67E-03	No		19	vapor			2.77E-08	2.12E-10
74-87-3	Chloromethane (Methyl chloride)	7.67E-03	No		20	vapor			3.39E-10	2.60E-12
74-97-5	Bromochloromethane	7.67E-03	No		17	vapor			7.72E-07	5.92E-09
74-99-7	Methylacetylene	3.49E-02	No		20	vapor			3.39E-10	1.18E-11
75-00-3	Chloroethane	7.67E-03	No		20	vapor			3.39E-10	2.60E-12
75-01-4	Vinyl chloride (1-Chloroethene)	3.49E-02	No		22	vapor			1.45E-17	5.05E-19
75-05-8	Acetonitrile	1.09E-02	Yes	13	13	vapor	4.38E-06	4.00E-04		4.38E-06
75-07-0	Acetaldehyde	3.49E-02	No		13	vapor			3.96E-04	1.38E-05
75-09-2	Dichloromethane (Methylene chloride)	7.67E-03	No		19	vapor			2.77E-08	2.12E-10
75-12-7	Formamide	3.49E-02	Yes	4	4	vapor	2.11E-09	6.06E-08		2.11E-09
75-15-0	Carbon disulfide	7.67E-03	No		20	vapor			3.39E-10	2.60E-12
75-21-8	Ethylene oxide (Oxirane)	7.67E-03	No		15	vapor			1.07E-04	8.20E-07
75-27-4	Bromodichloromethane	7.67E-03	No		18	vapor			4.31E-07	3.30E-09
75-34-3	1,1-Dichloroethane	7.67E-03	No		19	vapor			2.77E-08	2.12E-10
75-35-4	1,1-Dichloroethene (Vinylidene chloride)	7.67E-03	No		22	vapor			1.45E-17	1.11E-19
75-43-4	Dichlorofluoromethane	7.67E-03	No		20	vapor			3.39E-10	2.60E-12
75-45-6	Chlorodifluoromethane	7.67E-03	No		22	vapor			1.45E-17	1.11E-19
75-50-3	Trimethylamine	7.67E-03	No		14	vapor			2.52E-04	1.94E-06
75-52-5	Nitromethane	3.49E-02	No		13	vapor			3.96E-04	1.38E-05
75-55-8	2-Methylaziridine	3.49E-02	No		11	vapor			2.21E-04	7.71E-06
75-61-6	Difluorodibromomethane	7.67E-03	No		22	vapor			1.45E-17	1.11E-19
75-63-8	Trifluorobromomethane	7.67E-03	No		25	vapor			0.00E+00	0.00E+00
75-65-0	2-Methyl-2-propanol	7.67E-03	No		11	vapor			2.21E-04	1.70E-06
75-69-4	Trichlorofluoromethane	7.67E-03	No		23	vapor			0.00E+00	0.00E+00
75-71-8	Dichlorodifluoromethane	7.67E-03	No		25	vapor			0.00E+00	0.00E+00
75-99-0	2,2-Dichloropropionic acid	3.49E-02	No		6	vapor			1.07E-06	3.72E-08
76-03-9	Trichloroacetic acid	7.67E-03	No		5	vapor			4.86E-07	3.73E-09
76-11-9	1,1,1,2-Tetrachloro-2,2-difluoroethane	3.49E-02	No		24	vapor			0.00E+00	0.00E+00
76-12-0	1,1,2,2-Tetrachloro-1,2-difluoroethane	3.49E-02	No		23	vapor			0.00E+00	0.00E+00
76-13-1	1,2,2-Trichloro-1,1,2-trifluoroethane (Freon 113)	7.67E-03	No		25	vapor			0.00E+00	0.00E+00
76-14-2	1,2-Dichloro-1,1,2,2-tetrafluoroethane	7.67E-03	No		28	vapor			0.00E+00	0.00E+00
76-15-3	Chloropentafluoroethane	7.67E-03	Yes	29	29	vapor	8.48E-29	1.11E-26		8.48E-29
76-44-8	Heptachlor	7.56E-04	Yes	16	16	vapor	4.31E-08	5.71E-05		4.31E-08
78-83-1	2-Methylpropyl alcohol (Isobutyl alcohol)	3.49E-02	No		11	vapor			2.21E-04	7.71E-06
78-87-5	1,2-Dichloropropane	7.67E-03	No		19	vapor			2.77E-08	2.12E-10
78-92-2	1-Methylpropyl alcohol (2-Butanol)	7.67E-03	No		11	vapor			2.21E-04	1.70E-06
78-93-3	Methyl ethyl ketone (MEK, 2-Butanone)	7.67E-03	No		13	vapor			3.96E-04	3.04E-06
79-00-5	1,1,2-Trichloroethane	7.67E-03	No		17	vapor			7.72E-07	5.92E-09
79-01-6	Trichloroethylene	7.67E-03	Yes	20	20	vapor	2.88E-12	3.75E-10		2.88E-12
79-09-4	Propionic acid	3.49E-02	No		8	vapor			4.10E-05	1.43E-06
79-10-7	2-Propenoic acid	3.49E-02	No		8	vapor			4.10E-05	1.43E-06
79-20-9	Methyl acetate	3.49E-02	No		14	vapor			2.52E-04	8.80E-06

Adjusted Performance Factors

Group	PF
1	4.46E-10
2	3.27E-09
3	6.63E-09
4	6.06E-08
5	4.86E-07
6	1.07E-06
7	6.58E-06
8	4.10E-05
9	6.10E-05
10	3.57E-04
11	2.21E-04
12	2.61E-04
13	3.96E-04
14	2.52E-04
15	1.07E-04
16	2.94E-05
17	7.72E-07
18	4.31E-07
19	2.77E-08
20	3.39E-10
21	2.47E-11
22	1.45E-17
23	0.00E+00
24	0.00E+00
25	0.00E+00
26	0.00E+00
27	0.00E+00
28	0.00E+00
29	1.11E-26
30	7.26E-05
31	2.29E-04
32	4.00E-04
33	9.53E-04
34	2.07E-03
35	1.61E-03

		PVP01 g/sec
Coplanar PCBs		
31508-00-6	2,3',4,4',5-Pentachlorobiphenyl (PBC 118)	1.39E-08
32598-13-3	3,3',4,4'-Tetrachlorobiphenyl (TCB)	1.39E-08
32598-14-4	2,3,3',4,4'-Pentachlorobiphenyl (PCB 105)	1.39E-08
32774-16-6	3,3',4,4',5,5'-Hexachlorobiphenyl	1.39E-08
35065-29-3	2,2',3,4,4',5,5'-Heptachlorobiphenyl	1.39E-08
35065-30-6	2,2',3,3',4,4',5-Heptachlorobiphenyl	1.39E-08
38380-08-4	2,3,3',4,4',5-Hexachlorobiphenyl (PCB 157)	1.39E-08
39635-31-9	2,3,3',4,4',5,5'-Heptachlorobiphenyl	1.39E-08
52663-72-6	2,3',4,4',5,5'-Hexachlorobiphenyl	1.39E-08
57465-28-8	3,3',4,4',5-Pentachlorobiphenyl	1.39E-08
65510-44-3	2',3,4,4',5-Pentachlorobiphenyl	1.39E-08
69782-90-7	2,3,3',4,4',5'-Hexachlorobiphenyl	1.39E-08
70362-50-4	3,4,4',5-Tetrachlorobiphenyl	1.39E-08
74472-37-0	2,3,4,4',5-Pentachlorobiphenyl	1.39E-08
1336-36-3	Polychlorinated biphenyls (PCBs)	1.93E-05
1336-36-3	UnCorrected (for coplanar PCBs)	1.95E-05

Correction for Coplanar PCBs	
0.99	as parent
0.01	as coplanar sum

CALCULATION SHEET

BY: E. Berrios
DATE: 05/21/03

PROJECT: WTP
JOB NO.: 24590
CALC NO.: 24590-WTP-M4C-FRP-00005
SHEET REV: A
SHEET NO.: 96

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W
1	**Table B-10 HOP10 - HLW Vessel Ventilation**																						
2			Feed Rate					HOP10 rate	Performan	Adjusted	Calc'd rate												
3	CAS #	COPC	g/sec	In ACM	Group	Grouping	Phase	g/sec	Factor	PF	g/sec		Adjusted Performance Factors										
202	79-34-5	1,1,2,2-Tetrachloroethane	7.67E-03	No		16	vapor			2.94E-05	2.26E-07												
203	8001-35-2	Toxaphene	2.67E-04	Yes	10	10	particle	1.64E-07	6.13E-04		1.64E-07												
204	82-68-8	Pentachloronitrobenzene (PCBN or quintobenzene)	3.49E-02	No		13	vapor			3.96E-04	1.38E-05												
205	83-32-9	Acenaphthene	3.49E-02	No		15	vapor			1.07E-04	3.73E-06												
206	84-66-2	Diethyl phthalate	3.49E-02	Yes	8	8	vapor	8.55E-07	2.45E-05		8.55E-07												
207	84-74-2	Dibutyl phthalate	3.49E-02	Yes	31	31	particle	8.00E-06	2.29E-04		8.00E-06												
208	85-01-8	Phenanthrene	3.49E-02	No		13	vapor			3.96E-04	1.38E-05												
209	85-68-7	Butylbenzyl phthalate	3.49E-02	No		31	particle			2.29E-04	8.00E-06												
210	86-73-7	Fluorene	3.49E-02	No		14	particle			2.52E-04	8.80E-06												
211	87-68-3	Hexachlorobutadiene	7.67E-03	Yes	20	20	vapor	2.31E-12	3.02E-10		2.31E-12												
212	87-86-5	Pentachlorophenol	3.49E-02	Yes	6	6	vapor	3.72E-08	1.07E-06		3.72E-08												
213	88-06-2	2,4,6-Trichlorophenol	3.49E-02	No		10	vapor			3.57E-04	1.24E-05												
214	88-72-2	2-Nitrotoluene	7.67E-03	No		12	vapor			2.61E-04	2.00E-06												
215	88-75-5	2-Nitrophenol	3.49E-02	No		12	vapor			2.61E-04	9.11E-06												
216	88-85-7	2-sec-Butyl-4,6-dinitrophenol (Dinoseb)	3.49E-02	Yes	8	8	particle	2.94E-06	8.42E-05		2.94E-06												
217	88-89-1	Picric acid	3.49E-02	Yes	2	2	particle	1.14E-10	3.27E-09		1.14E-10												
218	91-20-3	Naphthalene	1.16E-03	Yes	16	16	vapor	2.70E-08	2.33E-05		2.70E-08												
219	91-22-5	Quinoline	3.49E-02	No		9	vapor			6.10E-05	2.13E-06												
220	91-58-7	2-Chloronapthalene	3.49E-02	No		16	vapor			2.94E-05	1.03E-06												
221	92-52-4	1,1'-Biphenyl	3.49E-02	No		16	vapor			2.94E-05	1.03E-06												
222	92-93-3	4-Nitrobiphenyl	3.49E-02	No		10	particle			3.57E-04	1.24E-05												
223	93-72-1	Silvex (2,4,5-TP)	3.49E-02	No		5	particle			4.86E-07	1.70E-08												
224	93-76-5	2,4,5-T	3.49E-02	No		5	particle			4.86E-07	1.70E-08												
225	94-75-7	2,4-D and esters (160C typed)	3.49E-02	No		6	vapor			1.07E-06	3.72E-08												
226	95-13-6	Indene	3.49E-02	No		18	vapor			4.31E-07	1.50E-08												
227	95-47-6	o-Xylene	7.67E-03	No		19	vapor			2.77E-08	2.12E-10												
228	95-48-7	o-Cresol (2-Methylphenol)	7.67E-03	No		9	vapor			6.10E-05	4.68E-07												
229	95-49-8	2-Chlorotoluene	3.49E-02	No		19	vapor			2.77E-08	9.65E-10												
230	95-50-1	o-Dichlorobenzene (1,2-Dichlorobenzene)	7.67E-03	No		18	vapor			4.31E-07	3.30E-09												
231	95-57-8	2-Chlorophenol	3.49E-02	No		11	vapor			2.21E-04	7.71E-06												
232	95-95-4	2,4,5-Trichlorophenol	3.49E-02	No		9	vapor			6.10E-05	2.13E-06												
233	96-22-0	3-Pentanone	7.67E-03	No		14	vapor			2.52E-04	1.94E-06												
234	96-69-5	Bis(3-tert-butyl-4-hydroxy-6-methyl-phenyl)sulfide	3.49E-02	No		19	particle			2.77E-08	9.65E-10												
235	98-51-1	p-tert-Butyltoluene	3.49E-02	No		21	vapor			2.47E-11	8.61E-13												
236	98-82-8	Cumene	3.49E-02	No		20	vapor			3.39E-10	1.18E-11												
237	98-83-9	alpha-Methylstyrene	7.67E-03	No		19	vapor			2.77E-08	2.12E-10												
238	98-86-2	Acetophenone	3.49E-02	Yes	11	11	vapor	8.10E-06	2.32E-04		8.10E-06												
239	98-95-3	Nitrobenzene	3.49E-02	No		12	vapor			2.61E-04	9.11E-06												
240											7.81E-04												

CALCULATION SHEET

BY: E. Berrios
DATE: 05/21/03

PROJECT: WTP
JOB NO.: 24590
CALC NO.: 24590-WTP-M4C-FRP-00005
SHEET REV: A
SHEET NO.: 97

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P
1	Table B-11 HOP33 - Abated HLW Melter Offgas System															
2				HMP06	SBS	WESP	HOP07	HOP10	HOP11	HEME	HEPA 1	HEPA 2	VOC Ox	HOP33		
3	CAS #	COPC	Grouping	g/sec	DF	DF	g/sec	g/sec	g/sec	DF	DF	DF	DF	g/sec		
4	100-00-5	p-Nitrochlorobenzene	10	5.03E-03	1	1	5.03E-03	1.24E-05	5.04E-03	1	1	1	20	2.52E-04	2.25E-04	
5	100-21-0	p-Phthalic acid	1	6.81E-03	1	1	6.81E-03	1.56E-11	6.81E-03	1	1	1	20	3.41E-04	3.36E-04	
6	100-25-4	1,4-Dinitrobenzene	6	6.86E-03	40	11	1.56E-05	3.72E-08	1.56E-05	90	2000	100	20	4.34E-14	3.39E-04	
7	100-41-4	Ethyl benzene	20	1.17E-12	1	1	1.17E-12	2.60E-12	3.77E-12	1	1	1	20	1.89E-13	1.75E-13	
8	100-42-5	Styrene	19	3.39E-10	1	1	3.39E-10	2.12E-10	5.51E-10	1	1	1	20	2.75E-11	2.56E-11	
9	10061-01-5	cis-1,3-Dichloropropene	19	9.78E-10	1	1	9.78E-10	5.88E-10	1.57E-09	1	1	1	20	7.83E-11	7.27E-11	
10	10061-02-6	trans-1,3-Dichloropropene	17	1.88E-08	1	1	1.88E-08	5.92E-09	2.47E-08	1	1	1	20	1.24E-09	1.15E-09	
11	101-55-3	4-Bromophenylphenyl ether	14	3.50E-04	1	1	3.50E-04	8.80E-06	3.59E-04	1	1	1	20	1.80E-05	1.73E-05	
12	101-84-8	Diphenyl ether	16	2.99E-06	1	1	2.99E-06	2.26E-07	3.21E-06	1	1	1	20	1.61E-07	1.52E-07	
13	106-35-4	3-Heptanone	14	7.71E-05	1	1	7.71E-05	1.94E-06	7.90E-05	1	1	1	20	3.95E-06	3.80E-06	
14	106-42-3	p-Xylene (Dimethyl benzene)	19	3.39E-10	1	1	3.39E-10	2.12E-10	5.51E-10	1	1	1	20	2.75E-11	2.56E-11	
15	106-46-7	1,4-Dichlorobenzene	18	8.79E-09	1	1	8.79E-09	3.30E-09	1.21E-08	1	1	1	20	6.05E-10	5.63E-10	
16	106-88-7	1,2-Epoxybutane	15	1.74E-05	1	1	1.74E-05	8.20E-07	1.82E-05	1	1	1	20	9.10E-07	8.67E-07	
17	106-93-4	Ethylene dibromide (Dibromethane)	16	1.87E-06	1	1	1.87E-06	2.76E-07	2.14E-06	1	1	1	20	1.07E-07	1.01E-07	
18	106-97-8	Butane	26	0.00E+00	1	1	0.00E+00	0.00E+00	0.00E+00	1	1	1	20	0.00E+00	0.00E+00	
19	106-99-0	1,3-Butadiene	23	0.00E+00	1	1	0.00E+00	0.00E+00	0.00E+00	1	1	1	20	0.00E+00	0.00E+00	
20	107-02-8	Acrolein	14	7.71E-05	1	1	7.71E-05	1.94E-06	7.90E-05	1	1	1	20	3.95E-06	3.80E-06	
21	107-05-1	3-Chloropropene (Allyl chloride)	20	1.17E-12	1	1	1.17E-12	2.60E-12	3.77E-12	1	1	1	20	1.89E-13	1.75E-13	
22	107-06-2	1,2-Dichloroethane (Ethylene chloride)	17	1.88E-08	1	1	1.88E-08	5.92E-09	2.47E-08	1	1	1	20	1.24E-09	1.15E-09	
23	107-12-0	Propionitrile	13	3.23E-04	1	1	3.23E-04	3.04E-06	3.27E-04	1	1	1	20	1.63E-05	1.59E-05	
24	107-13-1	Acrylonitrile	14	7.71E-05	1	1	7.71E-05	1.94E-06	7.90E-05	1	1	1	20	3.95E-06	3.80E-06	
25	107-18-6	2-Propene-1-ol	10	5.03E-03	1	1	5.03E-03	1.24E-05	5.04E-03	1	1	1	20	2.52E-04	2.25E-04	
26	107-31-3	Formic acid, methyl ester	15	7.90E-05	1	1	7.90E-05	3.73E-06	8.27E-05	1	1	1	20	4.14E-06	3.94E-06	
27	107-66-4	Dibutylphosphate	5	6.86E-03	40	11	1.56E-05	1.70E-08	1.56E-05	90	2000	100	20	4.34E-14	3.39E-04	
28	107-87-9	2-Pentanone	14	7.71E-05	1	1	7.71E-05	1.94E-06	7.90E-05	1	1	1	20	3.95E-06	3.80E-06	
29	108-03-2	1-Nitropropane	14	3.50E-04	1	1	3.50E-04	8.80E-06	3.59E-04	1	1	1	20	1.80E-05	1.73E-05	
30	108-05-4	Vinyl acetate	16	1.36E-05	1	1	1.36E-05	1.03E-06	1.46E-05	1	1	1	20	7.31E-07	6.92E-07	
31	108-10-1	Hexone (4-Methyl-2-pentanone or MIBK)	14	7.71E-05	1	1	7.71E-05	1.94E-06	7.90E-05	1	1	1	20	3.95E-06	3.80E-06	
32	108-20-3	Bis(isopropyl)ether	18	8.79E-09	1	1	8.79E-09	3.30E-09	1.21E-08	1	1	1	20	6.05E-10	5.63E-10	
33	108-38-3	m-Xylene (Dimethyl benzene)	19	3.39E-10	1	1	3.39E-10	2.12E-10	5.51E-10	1	1	1	20	2.75E-11	2.56E-11	
34	108-39-4	m-Cresol	9	1.16E-03	1	1	1.16E-03	4.68E-07	1.16E-03	1	1	1	20	5.82E-05	5.75E-05	
35	108-87-2	Methylcyclohexane	25	0.00E+00	1	1	0.00E+00	0.00E+00	0.00E+00	1	1	1	20	0.00E+00	0.00E+00	
36	108-88-3	Toluene	19	1.06E-11	1	1	1.06E-11	1.56E-11	2.63E-11	1	1	1	20	1.31E-12	1.22E-12	
37	108-90-7	Chlorobenzene	19	3.39E-10	1	1	3.39E-10	2.12E-10	5.51E-10	1	1	1	20	2.75E-11	2.56E-11	
38	108-93-0	Cyclohexanol	10	1.11E-03	1	1	1.11E-03	2.74E-06	1.11E-03	1	1	1	20	5.54E-05	4.96E-05	
39	108-94-1	Cyclohexanone	11	7.96E-04	1	1	7.96E-04	1.70E-06	7.98E-04	1	1	1	20	3.99E-05	3.93E-05	
40	108-95-2	Phenol	8	6.71E-03	1	1	6.71E-03	4.95E-07	6.71E-03	1	1	1	20	3.36E-04	3.32E-04	
41	109-66-0	n-Pentane	26	0.00E+00	1	1	0.00E+00	0.00E+00	0.00E+00	1	1	1	20	0.00E+00	0.00E+00	
42	109-99-9	Tetrahydrofuran	13	6.86E-04	1	1	6.86E-04	6.45E-06	6.93E-04	1	1	1	20	3.46E-05	3.38E-05	
43	110-12-3	5-Methyl-2-hexanone	15	1.74E-05	1	1	1.74E-05	8.20E-07	1.82E-05	1	1	1	20	9.10E-07	8.67E-07	
44	110-43-0	2-Heptanone	15	1.74E-05	1	1	1.74E-05	8.20E-07	1.82E-05	1	1	1	20	9.10E-07	8.67E-07	
45	110-54-3	n-Hexane	27	0.00E+00	1	1	0.00E+00	0.00E+00	0.00E+00	1	1	1	20	0.00E+00	0.00E+00	
46	110-62-3	n-Valeraldehyde	15	7.90E-05	1	1	7.90E-05	3.73E-06	8.27E-05	1	1	1	20	4.14E-06	3.94E-06	
47	110-82-7	Cyclohexane	24	0.00E+00	1	1	0.00E+00	0.00E+00	0.00E+00	1	1	1	20	0.00E+00	0.00E+00	
48	110-83-8	Cyclohexene	22	1.83E-20	1	1	1.83E-20	1.11E-19	1.29E-19	1	1	1	20	6.47E-21	2.13E-15	
49	110-86-1	Pyridine	11	3.62E-03	1	1	3.62E-03	7.71E-06	3.63E-03	1	1	1	20	1.81E-04	1.79E-04	
50	111-65-9	n-Octane	28	0.00E+00	1	1	0.00E+00	0.00E+00	0.00E+00	1	1	1	20	0.00E+00	0.00E+00	
51	111-76-2	Ethylene glycol monobutyl ether	9	5.29E-03	1	1	5.29E-03	2.13E-06	5.29E-03	1	1	1	20	2.65E-04	2.61E-04	
52	111-84-2	n-Nonane	28	0.00E+00	1	1	0.00E+00	0.00E+00	0.00E+00	1	1	1	20	0.00E+00	0.00E+00	
53	117-81-7	Bis(2-ethylhexyl)phthalate (DEHP)	30	8.50E-03	40	11	1.93E-05	2.53E-06	2.18E-05	90	2000	100	20	6.07E-14	7.17E-14	
54	117-84-0	n-Dioctyl phthalate	32	4.97E-03	40	11	1.13E-05	1.40E-05	2.53E-05	90	2000	100	20	7.01E-14	8.54E-14	
55	118-74-1	Hexachlorobenzene	18	8.26E-10	1	1	8.26E-10	3.10E-10	1.14E-09	1	1	1	20	5.68E-11	5.29E-11	
56	120-12-7	Anthracene	13	1.11E-03	1	1	1.11E-03	1.37E-05	1.12E-03	1	1	1	20	5.62E-05	5.47E-05	
57	120-82-1	1,2,4-Trichlorobenzene	17	1.88E-08	1	1	1.88E-08	5.92E-09	2.47E-08	1	1	1	20	1.24E-09	1.15E-09	
58	120-83-2	2,4-Dichlorophenol	10	5.03E-03	1	1	5.03E-03	1.24E-05	5.04E-03	1	1	1	20	2.52E-04	2.25E-04	
59	121-44-8	Triethylamine	15	1.74E-05	1	1	1.74E-05	8.20E-07	1.82E-05	1	1	1	20	9.10E-07	8.67E-07	
60	121-69-7	Dimethylaniline	13	3.23E-04	1	1	3.23E-04	3.04E-06	3.27E-04	1	1	1	20	1.63E-05	1.59E-05	
61	122-39-4	N,N-Diphenylamine	10	1.03E-03	1	1	1.03E-03	7.75E-07	1.03E-03	1	1	1	20	5.17E-05	5.11E-05	
62	123-19-3	4-Heptanone	13	3.23E-04	1	1	3.23E-04	3.04E-06	3.27E-04	1	1	1	20	1.63E-05	1.59E-05	
63	123-38-6	n-Propionaldehyde	14	7.71E-05	1	1	7.71E-05	1.94E-06	7.90E-05	1	1	1	20	3.95E-06	3.80E-06	
64	123-51-3	3-Methyl-1-butanol	12	7.28E-04	1	1	7.28E-04	2.00E-06	7.30E-04	1	1	1	20	3.65E-05	3.59E-05	
65	123-86-4	Acetic acid n-butyl ester	16	1.36E-05	1	1	1.36E-05	1.03E-06	1.46E-05	1	1	1	20	7.31E-07	6.92E-07	
66	123-91-1	1,4-Dioxane	10	3.02E-03	1	1	3.02E-03	7.47E-06	3.02E-03	1	1	1	20	1.51E-04	1.35E-04	
67	126-73-8	Tributyl phosphate	7	6.90E-03	1	1	6.90E-03	2.29E-07	6.90E-03	1	1	1	20	3.45E-04	7.62E-14	
68	126-98-7	2-Methyl-2-propenenitrile (Methacrylonitrile)	16	2.99E-06	1	1	2.99E-06	2.26E-07	3.21E-06	1	1	1	20	1.61E-07	1.52E-07	
69	127-18-4	Perchloroethylene (tetrachloroethylene)	21	4.81E-14	1	1	4.81E-14	1.89E-13	2.38E-13	1	1	1	20	1.19E-14	1.09E-14	
70	127-19-5	N,N-Dimethylacetamide	5	1.51E-03	1	1	1.51E-03	3.73E-09	1.51E-03	1	1	1	20	7.55E-05	7.45E-05	
71	128-37-0	2,6-Bis(tert-butyl)-4-methylphenol	32	4.97E-03	1	1	4.97E-03	1.40E-05	4.98E-03	1	1	1	20	2.49E-04	8.54E-14	
72	129-00-0	Pyrene	33	4.37E-03	40	11	9.94E-06	3.48E-05	4.47E-05	90	2000	100	20	1.24E-13	1.23E-13	
73	1321-64-8	Pentachloronaphthalene	14	3.50E-04	40	11	7.96E-07	8.80E-06	9.60E-06	90	2000	100	20	2.67E-14	6.49E-13	6.23E-13
74	1321-65-9	Trichloronaphthalene	15	7.90E-05	1	1	7.90E-05	3.73E-06	8.27E-05	1	1	1	20	4.14E-06	1.48E-13	-4.14E-06
75	132-64-9	Dibenzofuran	15	7.90E-05	1	1	7.90E-05	3.73E-06	8.27E-05	1	1	1	20	4.14E-06	3.94E-06	
76	1335-87-1	Hexachloronaphthalene	14	3.50E-04	40	11	7.96E-07	8.80E-06	9.60E-06	90	2000	100	20	2.67E-14	6.49E-13	6.23E-13
77	1335-88-2	Tetrachloronaphthalene	15	7.90E-05	40	11	1.80E-07	3.73E-06	3.91E-06	90	2000	100	20	1.09E-14	1.48E-13	1.37E-13
78	1336-36-3	Polychlorinated biphenyls (PCBs)	35	6.62E-05	40	11	1.51E-07	1.93E-05	1.95E-05	90	2000	100	20	5.41E-14	5.25E-14	
79	141-78-6	Acetic acid ethyl ester (Ethyl acetate)	14	3.50E-04	1	1	3.50E-04	8.80E-06	3.59E-04	1	1	1	20	1.80E-05	1.73E-05	
80	141-79-7	4-Methyl-3-penten-2-one	13	1.47E-03	1	1	1.47E-03	1.38E-05	1.48E-03	1	1	1	20	7.42E-05	7.25E-05	
81	142-82-5	n-Heptane	27	0.00E+00	1	1	0.00E+00	0.00E+00	0.00E+00	1	1	1	20	0.00E+00	0.00E+00	
82	144-62-7	Oxalic acid	3	6.83E-04	1	1	6.83E-04	2.31E-11	6.83E-04	1	1	1	20	3.41E-05	3.37E-05	
83	156-60-5	trans-1,2-Dichloroethylene	20	1.17E-12	1	1	1.17E-12	2.60E-12	3.77E-12	1	1	1	20	1.89E-13	1.75E-13	
84	1582-09-8	Trifluralin	14	3.50E-04	40	11	7.96E-07	8.80E-06	9.60E-06	90	2000	100	20	2.67E-14	6.49E-13	6.23E-13
85	1634-04-4	Methyl tert-butyl ether	16	2.99E-06	1	1	2.99E-06	2.26E-07	3.21E-06	1	1	1	20	1.61E-07	1.52E-07	
86	1836-75-5	Nitrofen	30	8.50E-03	40	11	1.93E-05	2.53E-06	2.18E-05	90	2000	100	20	6.07E-14	7.17E-14	
87	189-55-9	Dibenzo[a,i]pyrene	5	6.86E-03	40	11	1.56E-05	1.70E-08	1.56E-05	90	2000	100	20	4.34E-14	1.27E-11	1.27E-11
88	189-64-0	Dibenzo[a,h]pyrene	5	6.86E-03	40	11	1.56E-05	1.70E-08	1.56E-05	90	2000	100	20	4.34E-14	1.27E-11	1.27E-11
89	191-24-2	Benzo(g,h,i)perylene	30	8.50E-03	40	11	1.93E-05	2.53E-06	2.18E-05	90	2000	100	20	6.07E-14	7.17E-14	
90	191-30-0	Benzo[a,l]pyrene	5	6.86E-03	40	11	1.56E-05	1.70E-08	1.56E-05	90	2000	100	20	4.34E-14	1.27E-11	1.27E-11
91	192-65-4	Dibenzo[a,e]pyrene	5	6.86E-03	40	11	1.56E-05	1.70E-08	1.56E-05	90	2000	100	20	4.34E-14	1.27E-11	1.27E-11
92	193-39-5	Indeno(1,2,3-cd)pyrene	30	8.50E-03	40	11	1.93E-05	2.53E-06	2.18E-05	90	2000	100	20	6.07E-14	7.17E-14	
93	205-82-3	Benzo(j)fluoranthene	7	6.90E-03	40	11	1.57E-05	2.29E-07	1.59E-05	90	2000	100	20	4.42E-14	7.62E-14	
94	205-99-2	Benzo(b)fluoranthene	30	8.50E-03	40	11	1.93E-05	2.53E-06	2.18E-05	90	2000	100	20	6.07E-14	7.17E-14	
95	206-44-0	Fluoranthene	33	4.58E-03	40	11	1.04E-05	3.32E-05	4.36E-05	90	2000	100	20	1.21E-13	1.22E-13	
96	207-08-9	Benzo(k)fluoranthene	30	8.50E-03	40	11	1.93E-05	2.53E-06	2.18E-05	90	2000	100	20	6.07E-14	7.17E-14	
97	208-96-8	Acenaphthylene	14	3.50E-04	1	1	3.50E-04	8.80E-06	3.59E-04	1	1	1	20	1.80E-05	1.73E-05	
98	218-01-9	Chrysene	32	5.26E-03	40	11	1.20E-05	1.83E-05	3.02E-05	90	2000	100	20	8.40E-14	8.33E-14	
99	2234-13-1	Octachloronaphthalene	14	3.50E-04	40	11	7.96E-07	8.80E-06	9.60E-06	90	2000	100	20	2.67E-14	6.49E-13	6.23E-13
100	224-42-0	Dibenz[a,j]acridine	4	6.80E-03	40	11	1.55E-05	2.11E-09	1.55E-05	90	2000	100	20	4.30E-14	1.26E-11	1.26E-11
101	226-36-8	Dibenz[a,h]acridine	4	6.80E-03	40	11	1.55E-05	2.11E-09	1.55E-05	90	2000	100	20	4.30E-14	1.26E-11	1.26E-11
102	2385-85-5	Mirex	17	8.55E-08	1	1	8.55E-08	2.69E-08	1.12E-07	1	1	1	20	5.62E-09	1.97E-16	-5.62E-09
103	25551-13-7	Trimethyl benzene	19	3.39E-10	1	1	3.39E-10	2.12E-10	5.51E-10	1	1	1	20	2.75E-11	2.56E-11	
104	26140-60-3	Terphenyls	34	2.45E-03	40	11	5.56E-06	7.20E-05	7.76E-05	90	2000	100	20	2.15E-13	2.14E-13	
105	27154-33-2	Trichlorofluoroethane	23	0.00E+00	1	1	0.00E+00	0.00E+00	0.00E+00	1	1	1	20	0.00E+00	0.00E+00	
106	287-92-3	Cyclopentane	24	0.00E+00	1	1	0.00E+00	0.00E+00	0.00E+00	1	1	1	20	0.00E+00	0.00E+00	
107	309-00-2	Aldrin	34	3.02E-05	40	11	6.86E-08	8.88E-07	9.57E-07	90	2000	100	20	2.66E-15	2.64E-15	
108	319-84-6	Hexachlorocyclohexane (Lindane) Alpha BHC	33	1.53E-05	1	1	1.53E-05	1.11E-07	1.54E-05	1	1	1	20	7.68E-07	4.05E-16	
109	319-85-7	Hexachlorocyclohexane (Lindane) Beta BHC	30	2.86E-05	40	11	6.50E-08	8.37E-09	7.34E-08	90	2000	100	20	2.04E-16	2.44E-16	
110	319-86-8	Delta-BHC	30	2.83E-05	40	11	6.44E-08	8.44E-09	7.28E-08	90	2000	100	20	2.02E-16	2.39E-16	
111	3697-24-3	5-Methylchrysene	32	4.97E-03	40	11	1.13E-05	1.40E-05	2.53E-05	90	2000	100	20	7.01E-14	8.54E-14	
112	3825-26-1	Ammonium perfluorooctanoate	14	3.50E-04	40	11	7.96E-07	8.80E-06	9.60E-06	90	2000	100	20	2.67E-14	6.49E-13	6.23E-13
113	4170-30-3	2-Butenaldehyde (2-Butenal or Crotonaldehyde)	11	7.96E-04	1	1	7.96E-04	1.71E-06	7.98E-04	1	1	1	20	3.99E-05	3.93E-05	
114	465-73-6	Isodrin	35	1.29E-06	1	1	1.29E-06	3.75E-07	1.66E-06	1	1	1	20	8.30E-08	1.02E-15	
115	50-00-0	Formaldehyde	8	1.67E-03	1	1	1.67E-03	3.14E-07	1.67E-03	1	1	1	20	8.34E-05	7.09E-05	
116	50-29-3	4,4-DDT	33	3.05E-05	40	11	6.93E-08	2.22E-07	2.91E-07	90	2000	100	20	8.08E-16	8.10E-16	
117	50-32-8	Benzo(a)pyrene	30	1.07E-04	40	11	2.42E-07	3.24E-08	2.74E-07	90	2000	100	20	7.62E-16	8.90E-16	
118	53-70-3	Dibenzo(a,h)anthracene	7	1.15E-05	40	11	2.62E-08	3.82E-10	2.65E-08	90	2000	100	20	7.37E-17	1.27E-16	
119	540-59-0	1,2-Dichloroethylene	19	3.39E-10	1	1	3.39E-10	2.12E-10	5.51E-10	1	1	1	20	2.75E-11	2.56E-11	
120	540-84-1	2,2,4-Trimethylpentane	28	0.00E+00	1	1	0.00E+00	0.00E+00	0.00E+00	1	1	1	20	0.00E+00	0.00E+00	
121	541-73-1	1,3-Dichlorobenzene	19	3.39E-10	1	1	3.39E-10	2.12E-10	5.51E-10	1	1	1	20	2.75E-11	2.56E-11	
122	56-23-5	Carbon tetrachloride	22	1.83E-20	1	1	1.83E-20	1.11E-19	1.29E-19	1	1	1	20	6.47E-21	2.13E-15	
123	563-80-4	3-Methyl-2-butanone	14	7.71E-05	1	1	7.71E-05	1.94E-06	7.90E-05	1	1	1	20	3.95E-06	3.80E-06	
124	56-49-5	3-Methylcholanthrene	28	0.00E+00	40	11	0.00E+00	0.00E+00	0.00E+00	90	2000	100	20	0.00E+00	0.00E+00	
125	56-55-3	Benzo(a)anthracene	33	4.58E-03	40	11	1.04E-05	3.32E-05	4.36E-05	90	2000	100	20	1.21E-13	1.22E-13	
126	57-14-7	1,1-Dimethylhydrazine	12	3.31E-03	1	1	3.31E-03	9.11E-06	3.32E-03	1	1	1	20	1.66E-04	1.63E-04	
127	58-89-9	gamma-BHC (Lindane)	32	1.81E-05	40	11	4.11E-08	6.18E-08	1.03E-07	90	2000	100	20	2.86E-16	2.93E-16	
128	58-90-2	2,3,4,6-Tetrachlorophenol	11	3.71E-03	1	1	3.71E-03	7.26E-06	3.72E-03	1	1	1	20	1.86E-04	1.83E-04	
129	591-78-6	2-Hexanone	14	7.71E-05	1	1	7.71E-05	1.94E-06	7.90E-05	1	1	1	20	3.95E-06	3.80E-06	
130	59-50-7	4-Chloro-3-methylphenol	32	4.97E-03	40	11	1.13E-05	1.40E-05	2.53E-05	90	2000	100	20	7.01E-14	8.54E-14	
131	59-89-2	N-Nitrosomorpholine	6	6.86E-03	1	1	6.86E-03	3.72E-08	6.86E-03	1	1	1	20	3.43E-04	3.39E-04	
132	602-87-9	5-Nitroacenaphthene	9	5.29E-03	40	11	1.20E-05	2.13E-06	1.41E-05	90	2000	100	20	3.93E-14	2.61E-04	
133	60-29-7	Ethyl ether	17	8.55E-08	1	1	8.55E-08	2.69E-08	1.12E-07	1	1	1	20	5.62E-09	5.24E-09	
134	603-34-9	Triphenylamine	32	4.22E-03	1	1	4.22E-03	5.05E-06	4.22E-03	1	1	1	20	2.11E-04	8.47E-14	

CALCULATION SHEET

BY: E. Berrios
DATE: 05/21/03

PROJECT: WTP
JOB NO.: 24590
CALC NO.: 24590-WTP-M4C-FRP-00005
SHEET REV: A
SHEET NO.: 98

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P
1	Table B-11 HOP33 - Abated HLW Melter Offgas System															
2				HMP06	SBS	WESP	HOP07	HOP10	HOP11	HEME	HEPA 1	HEPA 2	VOC Ox	HOP33		
3	CAS #	COPC	Grouping	g/sec	DF	DF	g/sec	g/sec	g/sec	DF	DF	DF	DF	g/sec		
135	60-34-4	Methylhydrazine	10	1.11E-03	1	1	1.11E-03	2.74E-06	1.11E-03	1	1	1	20	5.54E-05	4.96E-05	
136	60-35-5	Acetamide	5	1.51E-03	1	1	1.51E-03	3.73E-09	1.51E-03	1	1	1	20	7.55E-05	7.45E-05	
137	60-57-1	Dieldrin	33	3.19E-05	40	11	7.24E-08	2.11E-07	2.84E-07	90	2000	100	20	7.88E-16	7.98E-16	
138	621-64-7	Di-n-Propylnitrosamine (N-Nitroso-di-n-propylamine)	10	5.03E-03	1	1	5.03E-03	1.24E-05	5.04E-03	1	1	1	20	2.52E-04	2.25E-04	
139	624-83-9	Methyl isocyanate	17	1.88E-08	1	1	1.88E-08	5.92E-09	2.47E-08	1	1	1	20	1.24E-09	1.15E-09	
140	627-13-4	Nitric acid, propyl ester	17	8.55E-08	1	1	8.55E-08	2.69E-08	1.12E-07	1	1	1	20	5.62E-09	5.24E-09	
141	62-75-9	N-Nitroso-N,N-dimethylamine (Dimethylnitrosamine)	9	9.87E-03	1	1	9.87E-03	3.97E-06	9.88E-03	1	1	1	20	4.94E-04	4.88E-04	
142	630-20-6	1,1,1,2-Tetrachloroethane	18	8.79E-09	1	1	8.79E-09	3.30E-09	1.21E-08	1	1	1	20	6.05E-10	5.63E-10	
143	64-17-5	Ethyl alcohol	10	1.11E-03	1	1	1.11E-03	2.74E-06	1.11E-03	1	1	1	20	5.54E-05	4.96E-05	
144	64-18-6	Formic acid	7	6.90E-03	1	1	6.90E-03	2.29E-07	6.90E-03	1	1	1	20	3.45E-04	2.03E-06	-3.43E-04
145	64-19-7	Acetic acid	6	6.86E-03	1	1	6.86E-03	3.72E-08	6.86E-03	1	1	1	20	3.43E-04	3.39E-04	
146	67-56-1	Methyl alcohol (Methanol)	10	1.11E-03	1	1	1.11E-03	2.74E-06	1.11E-03	1	1	1	20	5.54E-05	4.96E-05	
147	67-63-0	2-Propyl alcohol (Isopropanol; Propan-2-01)	11	7.96E-04	1	1	7.96E-04	1.70E-06	7.98E-04	1	1	1	20	3.99E-05	3.93E-05	
148	67-64-1	2-Propanone (Acetone)	13	1.76E-03	1	1	1.76E-03	1.66E-05	1.78E-03	1	1	1	20	8.91E-05	8.70E-05	
149	67-66-3	Chloroform	19	3.39E-10	1	1	3.39E-10	2.12E-10	5.51E-10	1	1	1	20	2.75E-11	2.56E-11	
150	67-72-1	Hexachloroethane	19	1.54E-09	1	1	1.54E-09	9.65E-10	2.50E-09	1	1	1	20	1.25E-10	1.16E-10	
151	684-16-2	Hexafluoroacetone	19	3.39E-10	1	1	3.39E-10	2.12E-10	5.51E-10	1	1	1	20	2.75E-11	2.56E-11	
152	71-23-8	n-Propyl alcohol	11	7.96E-04	1	1	7.96E-04	1.70E-06	7.98E-04	1	1	1	20	3.99E-05	3.93E-05	
153	71-36-3	n-Butyl alcohol	11	7.96E-04	1	1	7.96E-04	1.70E-06	7.98E-04	1	1	1	20	3.99E-05	3.93E-05	
154	71-43-2	Benzene	19	2.73E-11	1	1	2.73E-11	3.36E-11	6.09E-11	1	1	1	20	3.04E-12	2.82E-12	
155	71-55-6	Methyl chloroform (1,1,1-Trichloroethane)	21	4.81E-14	1	1	4.81E-14	1.89E-13	2.38E-13	1	1	1	20	1.19E-14	1.09E-14	
156	72-20-8	Endrin	32	3.31E-05	40	11	7.52E-08	9.31E-08	1.68E-07	90	2000	100	20	4.68E-16	5.69E-16	
157	72-43-5	Methoxychlor	7	2.30E-04	40	11	5.23E-07	7.65E-09	5.31E-07	90	2000	100	20	1.47E-15	2.54E-15	
158	72-54-8	4,4-DDD	32	3.31E-05	40	11	7.52E-08	9.31E-08	1.68E-07	90	2000	100	20	4.68E-16	5.69E-16	
159	72-55-9	4,4-DDE	34	1.63E-05	40	11	3.71E-08	4.80E-07	5.17E-07	90	2000	100	20	1.44E-15	1.43E-15	
160	74-83-9	Bromomethane (Methyl bromide)	19	3.39E-10	1	1	3.39E-10	2.12E-10	5.51E-10	1	1	1	20	2.75E-11	2.56E-11	
161	74-87-3	Chloromethane (Methyl chloride)	20	1.17E-12	1	1	1.17E-12	2.60E-12	3.77E-12	1	1	1	20	1.89E-13	1.75E-13	
162	74-97-5	Bromochloromethane	17	1.88E-08	1	1	1.88E-08	5.92E-09	2.47E-08	1	1	1	20	1.24E-09	1.15E-09	
163	74-99-7	Methylacetylene	20	5.34E-12	1	1	5.34E-12	1.18E-11	1.71E-11	1	1	1	20	8.57E-13	7.96E-13	
164	75-00-3	Chloroethane	20	1.17E-12	1	1	1.17E-12	2.60E-12	3.77E-12	1	1	1	20	1.89E-13	1.75E-13	
165	75-01-4	Vinyl chloride (1-Chloroethene)	22	8.32E-20	1	1	8.32E-20	5.05E-19	5.88E-19	1	1	1	20	2.94E-20	9.66E-15	
166	75-05-8	Acetonitrile	13	5.74E-04	1	1	5.74E-04	4.38E-06	5.78E-04	1	1	1	20	2.89E-05	2.83E-05	
167	75-07-0	Acetaldehyde	13	1.47E-03	1	1	1.47E-03	1.38E-05	1.48E-03	1	1	1	20	7.42E-05	7.25E-05	
168	75-09-2	Dichloromethane (Methylene chloride)	19	3.39E-10	1	1	3.39E-10	2.12E-10	5.51E-10	1	1	1	20	2.75E-11	2.56E-11	
169	75-12-7	Formamide	4	6.80E-03	1	1	6.80E-03	2.11E-09	6.80E-03	1	1	1	20	3.40E-04	3.36E-04	
170	75-15-0	Carbon disulfide	20	1.17E-12	1	1	1.17E-12	2.60E-12	3.77E-12	1	1	1	20	1.89E-13	1.75E-13	
171	75-21-8	Ethylene oxide (Oxirane)	15	1.74E-05	1	1	1.74E-05	8.20E-07	1.82E-05	1	1	1	20	9.10E-07	8.67E-07	
172	75-27-4	Bromodichloromethane	18	8.79E-09	1	1	8.79E-09	3.30E-09	1.21E-08	1	1	1	20	6.05E-10	5.63E-10	
173	75-34-3	1,1-Dichloroethane	19	3.39E-10	1	1	3.39E-10	2.12E-10	5.51E-10	1	1	1	20	2.75E-11	2.56E-11	
174	75-35-4	1,1-Dichloroethene (Vinylidene chloride)	22	1.83E-20	1	1	1.83E-20	1.11E-19	1.29E-19	1	1	1	20	6.47E-21	2.13E-15	
175	75-43-4	Dichlorofluoromethane	20	1.17E-12	1	1	1.17E-12	2.60E-12	3.77E-12	1	1	1	20	1.89E-13	1.75E-13	
176	75-45-6	Chlorodifluoromethane	22	1.83E-20	1	1	1.83E-20	1.11E-19	1.29E-19	1	1	1	20	6.47E-21	2.13E-15	
177	75-50-3	Trimethylamine	14	7.71E-05	1	1	7.71E-05	1.94E-06	7.90E-05	1	1	1	20	3.95E-06	3.80E-06	
178	75-52-5	Nitromethane	13	1.47E-03	1	1	1.47E-03	1.38E-05	1.48E-03	1	1	1	20	7.42E-05	7.25E-05	
179	75-55-8	2-Methylaziridine	11	3.62E-03	1	1	3.62E-03	7.71E-06	3.63E-03	1	1	1	20	1.81E-04	1.79E-04	
180	75-61-6	Difluorodibromomethane	22	1.83E-20	1	1	1.83E-20	1.11E-19	1.29E-19	1	1	1	20	6.47E-21	2.13E-15	
181	75-63-8	Trifluorobromomethane	25	0.00E+00	1	1	0.00E+00	0.00E+00	0.00E+00	1	1	1	20	0.00E+00	0.00E+00	
182	75-65-0	2-Methyl-2-propanol	11	7.96E-04	1	1	7.96E-04	1.70E-06	7.98E-04	1	1	1	20	3.99E-05	3.93E-05	
183	75-69-4	Trichlorofluoromethane	23	0.00E+00	1	1	0.00E+00	0.00E+00	0.00E+00	1	1	1	20	0.00E+00	0.00E+00	
184	75-71-8	Dichlorodifluoromethane	25	0.00E+00	1	1	0.00E+00	0.00E+00	0.00E+00	1	1	1	20	0.00E+00	0.00E+00	
185	75-99-0	2,2-Dichloropropionic acid	6	6.86E-03	1	1	6.86E-03	3.72E-08	6.86E-03	1	1	1	20	3.43E-04	3.39E-04	
186	76-03-9	Trichloroacetic acid	5	1.51E-03	1	1	1.51E-03	3.73E-09	1.51E-03	1	1	1	20	7.55E-05	7.45E-05	
187	76-11-9	1,1,1,2-Tetrachloro-2,2-difluoroethane	24	0.00E+00	1	1	0.00E+00	0.00E+00	0.00E+00	1	1	1	20	0.00E+00	0.00E+00	
188	76-12-0	1,1,2,2-Tetrachloro-1,2-difluoroethane	23	0.00E+00	1	1	0.00E+00	0.00E+00	0.00E+00	1	1	1	20	0.00E+00	0.00E+00	
189	76-13-1	1,2,2-Trichloro-1,1,2-trifluoroethane (Freon 113)	25	0.00E+00	1	1	0.00E+00	0.00E+00	0.00E+00	1	1	1	20	0.00E+00	0.00E+00	
190	76-14-2	1,2-Dichloro-1,1,2,2-tetrafluoroethane	28	0.00E+00	1	1	0.00E+00	0.00E+00	0.00E+00	1	1	1	20	0.00E+00	0.00E+00	
191	76-15-3	Chloropentafluoroethane	29	0.00E+00	1	1	0.00E+00	8.48E-29	8.48E-29	1	1	1	20	4.24E-30	4.24E-30	
192	76-44-8	Heptachlor	16	6.62E-07	1	1	6.62E-07	4.31E-08	7.05E-07	1	1	1	20	3.53E-08	3.34E-08	
193	78-83-1	2-Methylpropyl alcohol (Isobutyl alcohol)	11	3.62E-03	1	1	3.62E-03	7.71E-06	3.63E-03	1	1	1	20	1.81E-04	1.79E-04	
194	78-87-5	1,2-Dichloropropane	19	3.39E-10	1	1	3.39E-10	2.12E-10	5.51E-10	1	1	1	20	2.75E-11	2.56E-11	
195	78-92-2	1-Methylpropyl alcohol (2-Butanol)	11	7.96E-04	1	1	7.96E-04	1.70E-06	7.98E-04	1	1	1	20	3.99E-05	3.93E-05	
196	78-93-3	Methyl ethyl ketone (MEK, 2-Butanone)	13	3.23E-04	1	1	3.23E-04	3.04E-06	3.27E-04	1	1	1	20	1.63E-05	1.59E-05	
197	79-00-5	1,1,2-Trichloroethane	17	1.88E-08	1	1	1.88E-08	5.92E-09	2.47E-08	1	1	1	20	1.24E-09	1.15E-09	
198	79-01-6	Trichloroethylene	20	1.33E-12	1	1	1.33E-12	2.88E-12	4.21E-12	1	1	1	20	2.11E-13	1.96E-13	
199	79-09-4	Propionic acid	8	7.58E-03	1	1	7.58E-03	1.43E-06	7.58E-03	1	1	1	20	3.79E-04	3.22E-04	
200	79-10-7	2-Propenoic acid	8	7.58E-03	1	1	7.58E-03	1.43E-06	7.58E-03	1	1	1	20	3.79E-04	3.22E-04	
201	79-20-9	Methyl acetate	14	3.50E-04	1	1	3.50E-04	8.80E-06	3.59E-04	1	1	1	20	1.80E-05	1.73E-05	
202	79-34-5	1,1,2,2-Tetrachloroethane	16	2.99E-06	1	1	2.99E-06	2.26E-07	3.21E-06	1	1	1	20	1.61E-07	1.52E-07	
203	8001-35-2	Toxaphene	10	4.11E-05	40	11	9.33E-08	1.64E-07	2.57E-07	90	2000	100	20	7.14E-16	1.68E-06	
204	82-68-8	Pentachloronitrobenzene (PCBN or quintobenzene)	13	1.47E-03	1	1	1.47E-03	1.38E-05	1.48E-03	1	1	1	20	7.42E-05	7.25E-05	
205	83-32-9	Acenaphthene	15	7.90E-05	1	1	7.90E-05	3.73E-06	8.27E-05	1	1	1	20	4.14E-06	3.94E-06	
206	84-66-2	Diethyl phthalate	8	6.33E-03	1	1	6.33E-03	8.55E-07	6.33E-03	1	1	1	20	3.17E-04	3.13E-04	
207	84-74-2	Dibutyl phthalate	31	6.66E-03	40	11	1.51E-05	8.00E-06	2.31E-05	90	2000	100	20	6.43E-14	6.36E-14	
208	85-01-8	Phenanthrene	13	1.47E-03	1	1	1.47E-03	1.38E-05	1.48E-03	1	1	1	20	7.42E-05	7.25E-05	
209	85-68-7	Butylbenzyl phthalate	31	6.66E-03	40	11	1.51E-05	8.00E-06	2.31E-05	90	2000	100	20	6.43E-14	6.36E-14	
210	86-73-7	Fluorene	14	3.50E-04	40	11	7.96E-07	8.80E-06	9.60E-06	90	2000	100	20	2.67E-14	6.49E-13	6.23E-13
211	87-68-3	Hexachlorobutadiene	20	1.02E-12	1	1	1.02E-12	2.31E-12	3.33E-12	1	1	1	20	1.67E-13	1.54E-13	
212	87-86-5	Pentachlorophenol	6	6.86E-03	1	1	6.86E-03	3.72E-08	6.86E-03	1	1	1	20	3.43E-04	3.39E-04	
213	88-06-2	2,4,6-Trichlorophenol	10	5.03E-03	1	1	5.03E-03	1.24E-05	5.04E-03	1	1	1	20	2.52E-04	2.25E-04	
214	88-72-2	2-Nitrotoluene	12	7.28E-04	1	1	7.28E-04	2.00E-06	7.30E-04	1	1	1	20	3.65E-05	3.59E-05	
215	88-75-5	2-Nitrophenol	12	3.31E-03	1	1	3.31E-03	9.11E-06	3.32E-03	1	1	1	20	1.66E-04	1.63E-04	
216	88-85-7	2-sec-Butyl-4,6-dinitrophenol (Dinoseb)	8	9.69E-03	40	11	2.20E-05	2.94E-06	2.50E-05	90	2000	100	20	6.94E-14	3.23E-04	
217	88-89-1	Picric acid	2	8.46E-03	40	11	1.92E-05	1.14E-10	1.92E-05	90	2000	100	20	5.34E-14	3.36E-04	
218	91-20-3	Naphthalene	16	2.77E-07	1	1	2.77E-07	2.70E-08	3.04E-07	1	1	1	20	1.52E-08	1.44E-08	
219	91-22-5	Quinoline	9	5.29E-03	1	1	5.29E-03	2.13E-06	5.29E-03	1	1	1	20	2.65E-04	2.61E-04	
220	91-58-7	2-Chloronapthalene	16	1.36E-05	1	1	1.36E-05	1.03E-06	1.46E-05	1	1	1	20	7.31E-07	6.92E-07	
221	92-52-4	1,1`-Biphenyl	16	1.36E-05	1	1	1.36E-05	1.03E-06	1.46E-05	1	1	1	20	7.31E-07	6.92E-07	
222	92-93-3	4-Nitrobiphenyl	10	5.03E-03	40	11	1.14E-05	1.24E-05	2.39E-05	90	2000	100	20	6.63E-14	2.25E-04	
223	93-72-1	Silvex (2,4,5-TP)	5	6.86E-03	40	11	1.56E-05	1.70E-08	1.56E-05	90	2000	100	20	4.34E-14	1.27E-11	1.27E-11
224	93-76-5	2,4,5-T	5	6.86E-03	40	11	1.56E-05	1.70E-08	1.56E-05	90	2000	100	20	4.34E-14	1.27E-11	1.27E-11
225	94-75-7	2,4-D and esters (160C typed)	6	6.86E-03	1	1	6.86E-03	3.72E-08	6.86E-03	1	1	1	20	3.43E-04	1.27E-11	-3.43E-04
226	95-13-6	Indene	18	4.00E-08	1	1	4.00E-08	1.50E-08	5.50E-08	1	1	1	20	2.75E-09	2.56E-09	
227	95-47-6	o-Xylene	19	3.39E-10	1	1	3.39E-10	2.12E-10	5.51E-10	1	1	1	20	2.75E-11	2.56E-11	
228	95-48-7	o-Cresol (2-Methylphenol)	9	1.16E-03	1	1	1.16E-03	4.68E-07	1.16E-03	1	1	1	20	5.82E-05	5.75E-05	
229	95-49-8	2-Chlorotoluene	19	1.54E-09	1	1	1.54E-09	9.65E-10	2.50E-09	1	1	1	20	1.25E-10	1.16E-10	
230	95-50-1	o-Dichlorobenzene (1,2-Dichlorobenzene)	18	8.79E-09	1	1	8.79E-09	3.30E-09	1.21E-08	1	1	1	20	6.05E-10	5.63E-10	
231	95-57-8	2-Chlorophenol	11	3.62E-03	1	1	3.62E-03	7.71E-06	3.63E-03	1	1	1	20	1.81E-04	1.79E-04	
232	95-95-4	2,4,5-Trichlorophenol	9	5.29E-03	1	1	5.29E-03	2.13E-06	5.29E-03	1	1	1	20	2.65E-04	2.61E-04	
233	96-22-0	3-Pentanone	14	7.71E-05	1	1	7.71E-05	1.94E-06	7.90E-05	1	1	1	20	3.95E-06	3.80E-06	
234	96-69-5	Bis(3-tert-butyl-4-hydroxy-6-methyl-phenyl)sulfide	19	1.54E-09	40	11	3.50E-12	9.65E-10	9.69E-10	90	2000	100	20	2.69E-18	4.37E-18	1.68E-18
235	98-51-1	p-tert-Butyltoluene	21	2.19E-13	1	1	2.19E-13	8.61E-13	1.08E-12	1	1	1	20	5.40E-14	4.96E-14	
236	98-82-8	Cumene	20	5.34E-12	1	1	5.34E-12	1.18E-11	1.71E-11	1	1	1	20	8.57E-13	7.96E-13	
237	98-83-9	alpha-Methylstyrene	19	3.39E-10	1	1	3.39E-10	2.12E-10	5.51E-10	1	1	1	20	2.75E-11	2.56E-11	
238	98-86-2	Acetophenone	11	3.53E-03	1	1	3.53E-03	8.10E-06	3.54E-03	1	1	1	20	1.77E-04	1.74E-04	
239	98-95-3	Nitrobenzene	12	3.31E-03	1	1	3.31E-03	9.11E-06	3.32E-03	1	1	1	20	1.66E-04	1.63E-04	
240							2.23E-01									
241																
242	Coplanar PCBs			HOP07				HOP10	HOP11	HEME	HEPA 1	HEPA 2	VOC Ox	HOP33		
243				g/sec				g/sec	g/sec	DF	DF	DF	DF	g/sec		
244	31508-00-6	2,3',4,4',5-Pentachlorobiphenyl (PBC 118)		1.09E-10				1.39E-08	1.41E-08	90	2000	100	20	3.90E-17		
245	32598-13-3	3,3',4,4'-Tetrachlorobiphenyl (TCB)		1.09E-10		Correction for Coplanar I		1.39E-08	1.41E-08	90	2000	100	20	3.90E-17		
246	32598-14-4	2,3,3',4,4'-Pentachlorobiphenyl (PCB 105)		1.09E-10		0.99	as parent	1.39E-08	1.41E-08	90	2000	100	20	3.90E-17		
247	32774-16-6	3,3',4,4',5,5'-Hexachlorobiphenyl		1.09E-10		0.01	as coplanar	1.39E-08	1.41E-08	90	2000	100	20	3.90E-17		
248	35065-29-3	2,2',3,4,4',5,5'-Heptachlorobiphenyl		1.09E-10				1.39E-08	1.41E-08	90	2000	100	20	3.90E-17		
249	35065-30-6	2,2',3,3',4,4',5-Heptachlorobiphenyl		1.09E-10				1.39E-08	1.41E-08	90	2000	100	20	3.90E-17		
250	38380-08-4	2,3,3',4,4',5-Hexachlorobiphenyl (PCB 157)		1.09E-10				1.39E-08	1.41E-08	90	2000	100	20	3.90E-17		
251	39635-31-9	2,3,3',4,4',5,5'-Heptachlorobiphenyl		1.09E-10				1.39E-08	1.41E-08	90	2000	100	20	3.90E-17		
252	52663-72-6	2,3',4,4',5,5'-Hexachlorobiphenyl		1.09E-10				1.39E-08	1.41E-08	90	2000	100	20	3.90E-17		
253	57465-28-8	3,3',4,4',5-Pentachlorobiphenyl		1.09E-10				1.39E-08	1.41E-08	90	2000	100	20	3.90E-17		
254	65510-44-3	2',3,4,4',5-Pentachlorobiphenyl		1.09E-10				1.39E-08	1.41E-08	90	2000	100	20	3.90E-17		
255	69782-90-7	2,3,3',4,4',5'-Hexachlorobiphenyl		1.09E-10				1.39E-08	1.41E-08	90	2000	100	20	3.90E-17		
256	70362-50-4	3,4,4',5-Tetrachlorobiphenyl		1.09E-10				1.39E-08	1.41E-08	90	2000	100	20	3.90E-17		
257	74472-37-0	2,3,4,4',5-Pentachlorobiphenyl		1.09E-10				1.39E-08	1.41E-08	90	2000	100	20	3.90E-17		
258																
259	1336-36-3	Polychlorinated biphenyls (PCBs)		1.51E-07												
260	1336-36-3	UnCorrected (for coplanar PCBs)		1.52E-07												

CALCULATION SHEET

BY: E. Berrios
DATE: 05/21/03

PROJECT: WTP
JOB NO.: 24590
CALC NO.: 24590-WTP-M4C-FRP-00005
SHEET REV: A
SHEET NO.: 99

	A	B	C	D	E	F	G	H	I	J	K
1	Table B-12	PJV32 - Unabated HLW PJM/RFD									Calc'd rate
2			Feed Rate					PJV32 rate	Performan	Adjusted	PJV32
3	CAS #	COPC	g/sec	In ACM	Group	Grouping	Phase	g/sec	Factor	PF	g/sec
4	100-00-5	p-Nitrochlorobenzene	3.49E-02	No		10	vapor			1.10E-10	3.82E-12
5	100-21-0	p-Phthalic acid	3.49E-02	Yes	1	1	vapor	7.49E-13	2.15E-11		7.49E-13
6	100-25-4	1,4-Dinitrobenzene	3.49E-02	No		6	particle			2.16E-11	7.54E-13
7	100-41-4	Ethyl benzene	7.67E-03	No		20	vapor			5.08E-20	3.90E-22
8	100-42-5	Styrene	7.67E-03	No		19	vapor			7.62E-18	5.85E-20
9	10061-01-5	cis-1,3-Dichloropropene	7.67E-03	Yes	19	19	vapor	1.66E-19	2.17E-17		1.66E-19
10	10061-02-6	trans-1,3-Dichloropropene	7.67E-03	No		17	vapor			3.47E-16	2.66E-18
11	101-55-3	4-Bromophenylphenyl ether	3.49E-02	No		14	vapor			1.13E-12	3.94E-14
12	101-84-8	Diphenyl ether	7.67E-03	No		16	vapor			4.58E-14	3.51E-16
13	106-35-4	3-Heptanone	7.67E-03	No		14	vapor			1.13E-12	8.67E-15
14	106-42-3	p-Xylene (Dimethyl benzene)	7.67E-03	No		19	vapor			7.62E-18	5.85E-20
15	106-46-7	1,4-Dichlorobenzene	7.67E-03	No		18	vapor			1.69E-16	1.30E-18
16	106-88-7	1,2-Epoxybutane	7.67E-03	No		15	vapor			2.60E-13	1.99E-15
17	106-93-4	Ethylene dibromide (Dibromethane)	3.49E-02	Yes	16	16	vapor	2.33E-16	6.68E-15		2.33E-16
18	106-97-8	Butane	7.67E-03	Yes	26	26	vapor	0.00E+00	0.00E+00		0.00E+00
19	106-99-0	1,3-Butadiene	7.67E-03	Yes	23	23	vapor	2.11E-26	2.75E-24		2.11E-26
20	107-02-8	Acrolein	7.67E-03	No		14	vapor			1.13E-12	8.67E-15
21	107-05-1	3-Chloropropene (Allyl chloride)	7.67E-03	No		20	vapor			5.08E-20	3.90E-22
22	107-06-2	1,2-Dichloroethane (Ethylene chloride)	7.67E-03	No		17	vapor			3.47E-16	2.66E-18
23	107-12-0	Propionitrile	7.67E-03	No		13	vapor			4.68E-12	3.59E-14
24	107-13-1	Acrylonitrile	7.67E-03	No		14	vapor			1.13E-12	8.67E-15
25	107-18-6	2-Propene-1-ol	3.49E-02	No		10	vapor			1.10E-10	3.82E-12
26	107-31-3	Formic acid, methyl ester	3.49E-02	No		15	vapor			2.60E-13	9.06E-15
27	107-66-4	Dibutylphosphate	3.49E-02	No		5	particle			2.16E-11	7.55E-13
28	107-87-9	2-Pentanone	7.67E-03	No		14	vapor			1.13E-12	8.67E-15
29	108-03-2	1-Nitropropane	3.49E-02	No		14	vapor			1.13E-12	3.94E-14
30	108-05-4	Vinyl acetate	3.49E-02	No		16	vapor			4.58E-14	1.60E-15
31	108-10-1	Hexone (4-Methyl-2-pentanone or MIBK)	7.67E-03	No		14	vapor			1.13E-12	8.67E-15
32	108-20-3	Bis(isopropyl)ether	7.67E-03	No		18	vapor			1.69E-16	1.30E-18
33	108-38-3	m-Xylene (Dimethyl benzene)	7.67E-03	No		19	vapor			7.62E-18	5.85E-20
34	108-39-4	m-Cresol	7.67E-03	No		9	vapor			1.67E-11	1.28E-13
35	108-87-2	Methylcyclohexane	7.67E-03	Yes	25	25	vapor	0.00E+00	0.00E+00		0.00E+00
36	108-88-3	Toluene	7.67E-03	Yes	19	19	vapor	2.73E-21	3.56E-19		2.73E-21
37	108-90-7	Chlorobenzene	7.67E-03	No		19	vapor			7.62E-18	5.85E-20
38	108-93-0	Cyclohexanol	7.67E-03	No		10	vapor			1.10E-10	8.41E-13
39	108-94-1	Cyclohexanone	7.67E-03	No		11	vapor			1.14E-11	8.78E-14
40	108-95-2	Phenol	3.49E-02	Yes	8	8	vapor	7.39E-13	2.12E-11		7.39E-13
41	109-66-0	n-Pentane	7.67E-03	No		26	vapor			0.00E+00	0.00E+00
42	109-99-9	Tetrahydrofuran	1.63E-02	No		13	vapor			4.68E-12	7.61E-14
43	110-12-3	5-Methyl-2-hexanone	7.67E-03	No		15	vapor			2.60E-13	1.99E-15
44	110-43-0	2-Heptanone	7.67E-03	No		15	vapor			2.60E-13	1.99E-15
45	110-54-3	n-Hexane	7.67E-03	Yes	27	27	vapor	0.00E+00	0.00E+00		0.00E+00
46	110-62-3	n-Valeraldehyde	3.49E-02	No		15	vapor			2.60E-13	9.06E-15
47	110-82-7	Cyclohexane	7.67E-03	Yes	24	24	vapor	1.24E-34	1.62E-32		1.24E-34
48	110-83-8	Cyclohexene	7.67E-03	No		22	vapor			3.58E-22	2.75E-24
49	110-86-1	Pyridine	3.49E-02	No		11	vapor			1.14E-11	3.99E-13
50	111-65-9	n-Octane	7.67E-03	No		28	vapor			0.00E+00	0.00E+00
51	111-76-2	Ethylene glycol monobutyl ether	3.49E-02	No		9	vapor			1.67E-11	5.82E-13
52	111-84-2	n-Nonane	7.67E-03	Yes	28	28	vapor	0.00E+00	0.00E+00		0.00E+00
53	117-81-7	Bis(2-ethylhexyl)phthalate (DEHP)	3.49E-02	No		30	particle			3.23E-10	1.13E-11
54	117-84-0	n-Dioctyl phthalate	3.49E-02	No		32	particle			1.40E-10	4.89E-12
55	118-74-1	Hexachlorobenzene	7.21E-04	Yes	18	18	vapor	1.22E-19	1.69E-16		1.22E-19
56	120-12-7	Anthracene	3.49E-02	Yes	13	13	vapor	1.23E-13	3.54E-12		1.23E-13
57	120-82-1	1,2,4-Trichlorobenzene	7.67E-03	Yes	17	17	vapor	2.66E-18	3.47E-16		2.66E-18
58	120-83-2	2,4-Dichlorophenol	3.49E-02	No		10	vapor			1.10E-10	3.82E-12
59	121-44-8	Triethylamine	7.67E-03	No		15	vapor			2.60E-13	1.99E-15
60	121-69-7	Dimethylaniline	7.67E-03	No		13	vapor			4.68E-12	3.59E-14
61	122-39-4	N,N-Diphenylamine	7.67E-03	Yes	10	10	vapor	1.14E-13	1.48E-11		1.14E-13
62	123-19-3	4-Heptanone	7.67E-03	No		13	vapor			4.68E-12	3.59E-14
63	123-38-6	n-Propionaldehyde	7.67E-03	No		14	vapor			1.13E-12	8.67E-15
64	123-51-3	3-Methyl-1-butanol	7.67E-03	No		12	vapor			1.05E-11	8.02E-14
65	123-86-4	Acetic acid n-butyl ester	3.49E-02	No		16	vapor			4.58E-14	1.60E-15
66	123-91-1	1,4-Dioxane	2.09E-02	No		10	vapor			1.10E-10	2.29E-12
67	126-73-8	Tributyl phosphate	3.49E-02	Yes	7	7	vapor	7.59E-13	2.18E-11		7.59E-13
68	126-98-7	2-Methyl-2-propenenitrile (Methacrylonitrile)	7.67E-03	No		16	vapor			4.58E-14	3.51E-16
69	127-18-4	Perchloroethylene (tetrachloroethylene)	7.67E-03	Yes	21	21	vapor	2.48E-23	3.23E-21		2.48E-23
70	127-19-5	N,N-Dimethylacetamide	7.67E-03	No		5	vapor			2.16E-11	1.66E-13
71	128-37-0	2,6-Bis(tert-butyl)-4-methylphenol	3.49E-02	No		32	vapor			1.40E-10	4.89E-12
72	129-00-0	Pyrene	3.49E-02	Yes	33	33	particle	5.85E-12	1.68E-10		5.85E-12
73	1321-64-8	Pentachloronaphthalene	3.49E-02	No		14	particle			1.13E-12	3.94E-14
74	1321-65-9	Trichloronaphthalene	3.49E-02	No		15	vapor			2.60E-13	9.06E-15
75	132-64-9	Dibenzofuran	3.49E-02	Yes	15	15	vapor	9.06E-15	2.60E-13		9.06E-15
76	1335-87-1	Hexachloronaphthalene	3.49E-02	No		14	particle			1.13E-12	3.94E-14
77	1335-88-2	Tetrachloronaphthalene	3.49E-02	No		15	particle			2.60E-13	9.06E-15
78	1336-36-3	Polychlorinated biphenyls (PCBs)	1.21E-02	Yes	35	35	particle	1.15E-13	9.48E-12		1.14E-13
79	141-78-6	Acetic acid ethyl ester (Ethyl acetate)	3.49E-02	No		14	vapor			1.13E-12	3.94E-14
80	141-79-7	4-Methyl-3-penten-2-one	3.49E-02	No		13	vapor			4.68E-12	1.63E-13
81	142-82-5	n-Heptane	7.67E-03	No		27	vapor			0.00E+00	0.00E+00
82	144-62-7	Oxalic acid	3.49E-03	Yes	3	3	vapor	7.51E-14	2.15E-11		7.51E-14
83	156-60-5	trans-1,2-Dichloroethylene	7.67E-03	No		20	vapor			5.08E-20	3.90E-22
84	1582-09-8	Trifluralin	3.49E-02	No		14	particle			1.13E-12	3.94E-14
85	1634-04-4	Methyl tert-butyl ether	7.67E-03	No		16	vapor			4.58E-14	3.51E-16
86	1836-75-5	Nitrofen	3.49E-02	No		30	particle			3.23E-10	1.13E-11
87	189-55-9	Dibenzo[a,i]pyrene	3.49E-02	No		5	particle			2.16E-11	7.55E-13
88	189-64-0	Dibenzo[a,h]pyrene	3.49E-02	No		5	particle			2.16E-11	7.55E-13
89	191-24-2	Benzo(g,h,i)perylene	3.49E-02	No		30	particle			3.23E-10	1.13E-11
90	191-30-0	Benzo[a,i]pyrene	3.49E-02	No		5	particle			2.16E-11	7.55E-13
91	192-65-4	Dibenzo[a,e]pyrene	3.49E-02	No		5	particle			2.16E-11	7.55E-13
92	193-39-5	Indeno(1,2,3-cd)pyrene	3.49E-02	No		30	particle			3.23E-10	1.13E-11
93	205-82-3	Benzo(j)fluoranthene	3.49E-02	No		7	particle			2.18E-11	7.59E-13
94	205-99-2	Benzo(b)fluoranthene	3.49E-02	No		30	particle			3.23E-10	1.13E-11
95	206-44-0	Fluoranthene	3.49E-02	No		33	particle			1.75E-10	6.11E-12
96	207-08-9	Benzo(k)fluoranthene	3.49E-02	No		30	particle			3.23E-10	1.13E-11
97	208-96-8	Acenaphthylene	3.49E-02	Yes	14	14	vapor	3.94E-14	1.13E-12		3.94E-14
98	218-01-9	Chrysene	3.49E-02	Yes	32	32	particle	7.00E-12	2.01E-10		7.00E-12
99	2234-13-1	Octachloronaphthalene	3.49E-02	No		14	particle			1.13E-12	3.94E-14
100	224-42-0	Dibenz[a,j]acridine	3.49E-02	No		4	particle			2.15E-11	7.48E-13
101	226-36-8	Dibenz[a,h]acridine	3.49E-02	No		4	particle			2.15E-11	7.48E-13
102	2385-85-5	Mirex	3.49E-02	No		17	vapor			3.47E-16	1.21E-17
103	25551-13-7	Trimethyl benzene	7.67E-03	No		19	vapor			7.62E-18	5.85E-20
104	26140-60-3	Terphenyls	3.49E-02	No		34	particle			9.58E-11	3.34E-12
105	27154-33-2	Trichlorofluoroethane	7.67E-03	No		23	vapor			2.75E-24	2.11E-26
106	287-92-3	Cyclopentane	7.67E-03	No		24	vapor			1.62E-32	1.24E-34
107	309-00-2	Aldrin	4.30E-04	Yes	34	34	particle	4.12E-14	9.58E-11		4.12E-14
108	319-84-6	Hexachlorocyclohexane (Lindane) Alpha BHC	1.16E-04	No		33	vapor			1.75E-10	2.04E-14
109	319-85-7	Hexachlorocyclohexane (Lindane) Beta BHC	1.16E-04	Yes	30	30	particle	3.80E-14	3.27E-10		3.80E-14
110	319-86-8	Delta-BHC	1.16E-04	No		30	particle			3.23E-10	3.76E-14
111	3697-24-3	5-Methylchrysene	3.49E-02	No		32	particle			1.40E-10	4.89E-12
112	3825-26-1	Ammonium perfluorooctanoate	3.49E-02	No		14	particle			1.13E-12	3.94E-14
113	4170-30-3	2-Butenaldehyde (2-Butenal or Crotonaldehyde)	7.67E-03	Yes	11	11	vapor	8.77E-14	1.14E-11		8.77E-14
114	465-73-6	Isodrin	2.32E-04	No		35	vapor			9.48E-12	2.20E-15
115	50-00-0	Formaldehyde	7.67E-03	No		8	vapor			1.37E-10	1.05E-12
116	50-29-3	4,4-DDT	2.32E-04	No		33	particle			1.75E-10	4.08E-14
117	50-32-8	Benzo(a)pyrene	4.42E-04	Yes	30	30	particle	1.41E-13	3.20E-10		1.41E-13
118	53-70-3	Dibenzo(a,h)anthracene	5.81E-05	No		7	particle			2.18E-11	1.27E-15
119	540-59-0	1,2-Dichloroethylene	7.67E-03	No		19	vapor			7.62E-18	5.85E-20
120	540-84-1	2,2,4-Trimethylpentane	7.67E-03	No		28	vapor			0.00E+00	0.00E+00
121	541-73-1	1,3-Dichlorobenzene	7.67E-03	No		19	vapor			7.62E-18	5.85E-20
122	56-23-5	Carbon tetrachloride	7.67E-03	Yes	22	22	vapor	2.75E-24	3.58E-22		2.75E-24
123	563-80-4	3-Methyl-2-butanone	7.67E-03	No		14	vapor			1.13E-12	8.67E-15
124	56-49-5	3-Methylcholanthrene	3.49E-02	No		28	particle			0.00E+00	0.00E+00
125	56-55-3	Benzo(a)anthracene	3.49E-02	No		33	particle			1.75E-10	6.11E-12
126	57-14-7	1,1-Dimethylhydrazine	3.49E-02	Yes	12	12	vapor	3.65E-13	1.05E-11		3.65E-13
127	58-89-9	gamma-BHC (Lindane)	1.16E-04	Yes	32	32	particle	2.41E-14	2.07E-10		2.41E-14
128	58-90-2	2,3,4,6-Tetrachlorophenol	3.49E-02	Yes	11	11	vapor	4.09E-13	1.17E-11		4.09E-13
129	591-78-6	2-Hexanone	7.67E-03	No		14	vapor			1.13E-12	8.67E-15
130	59-50-7	4-Chloro-3-methylphenol	3.49E-02	No		32	particle			1.40E-10	4.89E-12
131	59-89-2	N-Nitrosomorpholine	3.49E-02	No		6	vapor			2.16E-11	7.54E-13
132	602-87-9	5-Nitroacenaphthene	3.49E-02	No		9	particle			1.67E-11	5.82E-13
133	60-29-7	Ethyl ether	3.49E-02	No		17	vapor			3.47E-16	1.21E-17
134	603-34-9	Triphenylamine	3.49E-02	Yes	32	32	vapor	4.65E-13	1.33E-11		4.65E-13
135	60-34-4	Methylhydrazine	7.67E-03	No		10	vapor			1.10E-10	8.41E-13
136	60-35-5	Acetamide	7.67E-03	Yes	5	5	vapor	1.66E-13	2.16E-11		1.66E-13
137	60-57-1	Dieldrin	2.32E-04	Yes	33	33	particle	4.26E-14	1.83E-10		4.26E-14
138	621-64-7	Di-n-Propylnitrosamine (N-Nitroso-di-n-propylamine)	3.49E-02	No		10	vapor			1.10E-10	3.82E-12
139	624-83-9	Methyl isocyanate	7.67E-03	No		17	vapor			3.47E-16	2.66E-18
140	627-13-4	Nitric acid, propyl ester	3.49E-02	No		17	vapor			3.47E-16	1.21E-17
141	62-75-9	N-Nitroso-N,N-dimethylamine (Dimethylnitrosamine)	6.51E-02	Yes	9	9	vapor	1.09E-12	1.67E-11		1.09E-12
142	630-20-6	1,1,1,2-Tetrachloroethane	7.67E-03	No		18	vapor			1.69E-16	1.30E-18
143	64-17-5	Ethyl alcohol	7.67E-03	No		10	vapor			1.10E-10	8.41E-13
144	64-18-6	Formic acid	3.49E-02	No		7	vapor			2.18E-11	7.59E-13
145	64-19-7	Acetic acid	3.49E-02	No		6	vapor			2.16E-11	7.54E-13
146	67-56-1	Methyl alcohol (Methanol)	7.67E-03	No		10	vapor			1.10E-10	8.41E-13
147	67-63-0	2-Propyl alcohol (Isopropanol; Propan-2-01)	7.67E-03	No		11	vapor			1.14E-11	8.78E-14
148	67-64-1	2-Propanone (Acetone)	4.18E-02	No		13	vapor			4.68E-12	1.96E-13
149	67-66-3	Chloroform	7.67E-03	No		19	vapor			7.62E-18	5.85E-20
150	67-72-1	Hexachloroethane	3.49E-02	No		19	vapor			7.62E-18	2.66E-19
151	684-16-2	Hexafluoroacetone	7.67E-03	No		19	vapor			7.62E-18	5.85E-20
152	71-23-8	n-Propyl alcohol	7.67E-03	No		11	vapor			1.14E-11	8.78E-14
153	71-36-3	n-Butyl alcohol	7.67E-03	No		11	vapor			1.14E-11	8.78E-14
154	71-43-2	Benzene	7.67E-03	Yes	19	19	vapor	6.36E-21	8.29E-19		6.36E-21
155	71-55-6	Methyl chloroform (1,1,1-Trichloroethane)	7.67E-03	No		21	vapor			3.23E-21	2.48E-23
156	72-20-8	Endrin	2.32E-04	No		32	particle			1.40E-10	3.26E-14
157	72-43-5	Methoxychlor	1.16E-03	No		7	particle			2.18E-11	2.53E-14
158	72-54-8	4,4-DDD	2.32E-04	No		32	particle			1.40E-10	3.26E-14
159	72-55-9	4,4-DDE	2.32E-04	No		34	particle			9.58E-11	2.23E-14
160	74-83-9	Bromomethane (Methyl bromide)	7.67E-03	No		19	vapor			7.62E-18	5.85E-20
161	74-87-3	Chloromethane (Methyl chloride)	7.67E-03	No		20	vapor			5.08E-20	3.90E-22
162	74-97-5	Bromochloromethane	7.67E-03	No		17	vapor			3.47E-16	2.66E-18
163	74-99-7	Methylacetylene	3.49E-02	No		20	vapor			5.08E-20	1.77E-21
164	75-00-3	Chloroethane	7.67E-03	No		20	vapor			5.08E-20	3.90E-22
165	75-01-4	Vinyl chloride (1-Chloroethene)	3.49E-02	No		22	vapor			3.58E-22	1.25E-23
166	75-05-8	Acetonitrile	1.09E-02	Yes	13	13	vapor	6.35E-14	5.81E-12		6.35E-14
167	75-07-0	Acetaldehyde	3.49E-02	No		13	vapor			4.68E-12	1.63E-13
168	75-09-2	Dichloromethane (Methylene chloride)	7.67E-03	No		19	vapor			7.62E-18	5.85E-20
169	75-12-7	Formamide	3.49E-02	Yes	4	4	vapor	7.48E-13	2.15E-11		7.48E-13
170	75-15-0	Carbon disulfide	7.67E-03	No		20	vapor			5.08E-20	3.90E-22
171	75-21-8	Ethylene oxide (Oxirane)	7.67E-03	No		15	vapor			2.60E-13	1.99E-15
172	75-27-4	Bromodichloromethane	7.67E-03	No		18	vapor			1.69E-16	1.30E-18
173	75-34-3	1,1-Dichloroethane	7.67E-03	No		19	vapor			7.62E-18	5.85E-20
174	75-35-4	1,1-Dichloroethene (Vinylidene chloride)	7.67E-03	No		22	vapor			3.58E-22	2.75E-24
175	75-43-4	Dichlorofluoromethane	7.67E-03	No		20	vapor			5.08E-20	3.90E-22
176	75-45-6	Chlorodifluoromethane	7.67E-03	No		22	vapor			3.58E-22	2.75E-24
177	75-50-3	Trimethylamine	7.67E-03	No		14	vapor			1.13E-12	8.67E-15
178	75-52-5	Nitromethane	3.49E-02	No		13	vapor			4.68E-12	1.63E-13
179	75-55-8	2-Methylaziridine	3.49E-02	No		11	vapor			1.14E-11	3.99E-13
180	75-61-6	Difluorodibromomethane	7.67E-03	No		22	vapor			3.58E-22	2.75E-24
181	75-63-8	Trifluorobromomethane	7.67E-03	No		25	vapor			0.00E+00	0.00E+00
182	75-65-0	2-Methyl-2-propanol	7.67E-03	No		11	vapor			1.14E-11	8.78E-14
183	75-69-4	Trichlorofluoromethane	7.67E-03	No		23	vapor			2.75E-24	2.11E-26
184	75-71-8	Dichlorodifluoromethane	7.67E-03	No		25	vapor			0.00E+00	0.00E+00
185	75-99-0	2,2-Dichloropropionic acid	3.49E-02	No		6	vapor			2.16E-11	7.54E-13
186	76-03-9	Trichloroacetic acid	7.67E-03	No		5	vapor			2.16E-11	1.66E-13
187	76-11-9	1,1,1,2-Tetrachloro-2,2-difluoroethane	3.49E-02	No		24	vapor			1.62E-32	5.66E-34
188	76-12-0	1,1,2,2-Tetrachloro-1,2-difluoroethane	3.49E-02	No		23	vapor			2.75E-24	9.60E-26
189	76-13-1	1,2,2-Trichloro-1,1,2-trifluoroethane (Freon 113)	7.67E-03	No		25	vapor			0.00E+00	0.00E+00
190	76-14-2	1,2-Dichloro-1,1,2,2-tetrafluoroethane	7.67E-03	No		28	vapor			0.00E+00	0.00E+00
191	76-15-3	Chloropentafluoroethane	7.67E-03	Yes	29	29	vapor	0.00E+00	0.00E+00		0.00E+00
192	76-44-8	Heptachlor	7.56E-04	Yes	16	16	vapor	7.72E-17	1.02E-13		7.72E-17
193	78-83-1	2-Methylpropyl alcohol (Isobutyl alcohol)	3.49E-02	No		11	vapor			1.14E-11	3.99E-13
194	78-87-5	1,2-Dichloropropane	7.67E-03	No		19	vapor			7.62E-18	5.85E-20
195	78-92-2	1-Methylpropyl alcohol (2-Butanol)	7.67E-03	No		11	vapor			1.14E-11	8.78E-14
196	78-93-3	Methyl ethyl ketone (MEK, 2-Butanone)	7.67E-03	No		13	vapor			4.68E-12	3.59E-14
197	79-00-5	1,1,2-Trichloroethane	7.67E-03	No		17	vapor			3.47E-16	2.66E-18
198	79-01-6	Trichloroethylene	7.67E-03	Yes	20	20	vapor	4.37E-22	5.69E-20		4.37E-22
199	79-09-4	Propionic acid	3.49E-02	No		8	vapor			1.37E-10	4.77E-12
200	79-10-7	2-Propenoic acid	3.49E-02	No		8	vapor			1.37E-10	4.77E-12
201	79-20-9	Methyl acetate	3.49E-02	No		14	vapor			1.13E-12	3.94E-14

	M	N
3	Adjusted Performance Factors	
4	Group	PF
5	1	2.15E-11
6	2	3.22E-10
7	3	2.15E-11
8	4	2.15E-11
9	5	2.16E-11
10	6	2.16E-11
11	7	2.18E-11
12	8	1.37E-10
13	9	1.67E-11
14	10	1.10E-10
15	11	1.14E-11
16	12	1.05E-11
17	13	4.68E-12
18	14	1.13E-12
19	15	2.60E-13
20	16	4.58E-14
21	17	3.47E-16
22	18	1.69E-16
23	19	7.62E-18
24	20	5.08E-20
25	21	3.23E-21
26	22	3.58E-22
27	23	2.75E-24
28	24	1.62E-32
29	25	0.00E+00
30	26	0.00E+00
31	27	0.00E+00
32	28	0.00E+00
33	29	0.00E+00
34	30	3.23E-10
35	31	2.54E-10
36	32	1.40E-10
37	33	1.75E-10
38	34	9.58E-11
39	35	9.48E-12

	Q	R	S
5	Coplanar PCBs		PJV32
6			g/sec
7	31508-00-6	2,3',4,4',5-Pentachlorobiphenyl (PBC 118)	8.20E-17
8	32598-13-3	3,3',4,4'-Tetrachlorobiphenyl (TCB)	8.20E-17
9	32598-14-4	2,3,3',4,4'-Pentachlorobiphenyl (PCB 105)	8.20E-17
10	32774-16-6	3,3',4,4',5,5'-Hexachlorobiphenyl	8.20E-17
11	35065-29-3	2,2',3,4,4',5,5'-Heptachlorobiphenyl	8.20E-17
12	35065-30-6	2,2',3,3',4,4',5-Heptachlorobiphenyl	8.20E-17
13	38380-08-4	2,3,3',4,4',5-Hexachlorobiphenyl (PCB 157)	8.20E-17
14	39635-31-9	2,3,3',4,4',5,5'-Heptachlorobiphenyl	8.20E-17
15	52663-72-6	2,3',4,4',5,5'-Hexachlorobiphenyl	8.20E-17
16	57465-28-8	3,3',4,4',5-Pentachlorobiphenyl	8.20E-17
17	65510-44-3	2',3,4,4',5-Pentachlorobiphenyl	8.20E-17
18	69782-90-7	2,3,3',4,4',5'-Hexachlorobiphenyl	8.20E-17
19	70362-50-4	3,4,4',5-Tetrachlorobiphenyl	8.20E-17
20	74472-37-0	2,3,4,4',5-Pentachlorobiphenyl	8.20E-17
22	1336-36-3	Polychlorinated biphenyls (PCBs)	1.14E-13
23	1336-36-3	UnCorrected (for coplanar PCBs)	1.15E-13

	U	V
8	Correction for Coplanar PCBs	
9	0.99	as parent
10	0.01	as coplanar sum

CALCULATION SHEET

BY: E. Berrios
DATE: 05/21/03

PROJECT: WTP
JOB NO.: 24590
CALC NO.: 24590-WTP-M4C-FRP-00005
SHEET REV: A
SHEET NO.: 100

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W
1	**Table B-12**	**PJV32 - Unabated HLW PJM/RFD**									Calc'd rate												
2			Feed Rate					PJV32 rate	Performan	Adjusted	PJV32												
3	CAS #	COPC	g/sec	In ACM	Group	Grouping	Phase	g/sec	Factor	PF	g/sec		Adjusted Performance Factors										
202	79-34-5	1,1,2,2-Tetrachloroethane	7.67E-03	No		16	vapor			4.58E-14	3.51E-16												
203	8001-35-2	Toxaphene	2.67E-04	Yes	10	10	particle	5.47E-14	2.05E-10		5.47E-14												
204	82-68-8	Pentachloronitrobenzene (PCBN or quintobenzene)	3.49E-02	No		13	vapor			4.68E-12	1.63E-13												
205	83-32-9	Acenaphthene	3.49E-02	No		15	vapor			2.60E-13	9.06E-15												
206	84-66-2	Diethyl phthalate	3.49E-02	Yes	8	8	vapor	6.97E-13	2.00E-11		6.97E-13												
207	84-74-2	Dibutyl phthalate	3.49E-02	Yes	31	31	particle	8.85E-12	2.54E-10		8.85E-12												
208	85-01-8	Phenanthrene	3.49E-02	No		13	vapor			4.68E-12	1.63E-13												
209	85-68-7	Butylbenzyl phthalate	3.49E-02	No		31	particle			2.54E-10	8.85E-12												
210	86-73-7	Fluorene	3.49E-02	No		14	particle			1.13E-12	3.94E-14												
211	87-68-3	Hexachlorobutadiene	7.67E-03	Yes	20	20	vapor	3.44E-22	4.48E-20		3.44E-22												
212	87-86-5	Pentachlorophenol	3.49E-02	Yes	6	6	vapor	7.54E-13	2.16E-11		7.54E-13												
213	88-06-2	2,4,6-Trichlorophenol	3.49E-02	No		10	vapor			1.10E-10	3.82E-12												
214	88-72-2	2-Nitrotoluene	7.67E-03	No		12	vapor			1.05E-11	8.02E-14												
215	88-75-5	2-Nitrophenol	3.49E-02	No		12	vapor			1.05E-11	3.65E-13												
216	88-85-7	2-sec-Butyl-4,6-dinitrophenol (Dinoseb)	3.49E-02	Yes	8	8	particle	1.29E-11	3.69E-10		1.29E-11												
217	88-89-1	Picric acid	3.49E-02	Yes	2	2	particle	1.12E-11	3.22E-10		1.12E-11												
218	91-20-3	Naphthalene	1.16E-03	Yes	16	16	vapor	3.32E-17	2.86E-14		3.32E-17												
219	91-22-5	Quinoline	3.49E-02	No		9	vapor			1.67E-11	5.82E-13												
220	91-58-7	2-Chloronapthalene	3.49E-02	No		16	vapor			4.58E-14	1.60E-15												
221	92-52-4	1,1`-Biphenyl	3.49E-02	No		16	vapor			4.58E-14	1.60E-15												
222	92-93-3	4-Nitrobiphenyl	3.49E-02	No		10	particle			1.10E-10	3.82E-12												
223	93-72-1	Silvex (2,4,5-TP)	3.49E-02	No		5	particle			2.16E-11	7.55E-13												
224	93-76-5	2,4,5-T	3.49E-02	No		5	particle			2.16E-11	7.55E-13												
225	94-75-7	2,4-D and esters (160C typed)	3.49E-02	No		6	vapor			2.16E-11	7.54E-13												
226	95-13-6	Indene	3.49E-02	No		18	vapor			1.69E-16	5.90E-18												
227	95-47-6	o-Xylene	7.67E-03	No		19	vapor			7.62E-18	5.85E-20												
228	95-48-7	o-Cresol (2-Methylphenol)	7.67E-03	No		9	vapor			1.67E-11	1.28E-13												
229	95-49-8	2-Chlorotoluene	3.49E-02	No		19	vapor			7.62E-18	2.66E-19												
230	95-50-1	o-Dichlorobenzene (1,2-Dichlorobenzene)	7.67E-03	No		18	vapor			1.69E-16	1.30E-18												
231	95-57-8	2-Chlorophenol	3.49E-02	No		11	vapor			1.14E-11	3.99E-13												
232	95-95-4	2,4,5-Trichlorophenol	3.49E-02	No		9	vapor			1.67E-11	5.82E-13												
233	96-22-0	3-Pentanone	7.67E-03	No		14	vapor			1.13E-12	8.67E-15												
234	96-69-5	Bis(3-tert-butyl-4-hydroxy-6-methyl-phenyl)sulfide	3.49E-02	No		19	particle			7.62E-18	2.66E-19												
235	98-51-1	p-tert-Butyltoluene	3.49E-02	No		21	vapor			3.23E-21	1.13E-22												
236	98-82-8	Cumene	3.49E-02	No		20	vapor			5.08E-20	1.77E-21												
237	98-83-9	alpha-Methylstyrene	7.67E-03	No		19	vapor			7.62E-18	5.85E-20												
238	98-86-2	Acetophenone	3.49E-02	Yes	11	11	vapor	3.89E-13	1.12E-11		3.89E-13												
239	98-95-3	Nitrobenzene	3.49E-02	No		12	vapor			1.05E-11	3.65E-13												
240											2.25E-10												

CALCULATION SHEET

BY: E. Berrios
DATE: 05/21/03

PROJECT: WTP
JOB NO.: 24590
CALC NO.: 24590-WTP-M4C-FRP-00005
SHEET REV: A
SHEET NO.: 101

	A	B	C	D	E	F	G	H	I	J	K	L	M	N
1	**Table B-13 PJV34 - Abated HLW PJM/RFD**													
2			PJV32	HEPA 1	HEPA 2	PJV34								
3	CAS #	COPC	g/sec	DF	DF	g/sec								
4	100-00-5	p-Nitrochlorobenzene	3.82E-12	1	1	3.82E-12		Coplanar PCBs		PJV34				
5	100-21-0	p-Phthalic acid	7.49E-13	1	1	7.49E-13				g/sec				
6	100-25-4	1,4-Dinitrobenzene	7.54E-13	2000	100	3.77E-18		31508-00-6	2,3',4,4',5-Pentachlorobiphenyl (PBC 118)	4.10E-22				
7	100-41-4	Ethyl benzene	3.90E-22	1	1	3.90E-22		32598-13-3	3,3',4,4'-Tetrachlorobiphenyl (TCB)	4.10E-22		Correction for Coplanar PCBs		
8	100-42-5	Styrene	5.85E-20	1	1	5.85E-20		32598-14-4	2,3,3',4,4'-Pentachlorobiphenyl (PCB 105)	4.10E-22		0.99	as parent	
9	10061-01-5	cis-1,3-Dichloropropene	1.66E-19	1	1	1.66E-19		32774-16-6	3,3',4,4',5,5'-Hexachlorobiphenyl	4.10E-22		0.01	as coplanar sum	
10	10061-02-6	trans-1,3-Dichloropropene	2.66E-18	1	1	2.66E-18		35065-29-3	2,2',3,4,4',5,5'-Heptachlorobiphenyl	4.10E-22				
11	101-55-3	4-Bromophenylphenyl ether	3.94E-14	1	1	3.94E-14		35065-30-6	2,2',3,3',4,4',5-Heptachlorobiphenyl	4.10E-22				
12	101-84-8	Diphenyl ether	3.51E-16	1	1	3.51E-16		38380-08-4	2,3,3',4,4',5-Hexachlorobiphenyl (PCB 157)	4.10E-22				
13	106-35-4	3-Heptanone	8.67E-15	1	1	8.67E-15		39635-31-9	2,3,3',4,4',5,5'-Heptachlorobiphenyl	4.10E-22				
14	106-42-3	p-Xylene (Dimethyl benzene)	5.85E-20	1	1	5.85E-20		52663-72-6	2,3',4,4',5,5'-Hexachlorobiphenyl	4.10E-22				
15	106-46-7	1,4-Dichlorobenzene	1.30E-18	1	1	1.30E-18		57465-28-8	3,3',4,4',5-Pentachlorobiphenyl	4.10E-22				
16	106-88-7	1,2-Epoxybutane	1.99E-15	1	1	1.99E-15		65510-44-3	2',3,4,4',5-Pentachlorobiphenyl	4.10E-22				
17	106-93-4	Ethylene dibromide (Dibromethane)	2.33E-16	1	1	2.33E-16		69782-90-7	2,3,3',4,4',5'-Hexachlorobiphenyl	4.10E-22				
18	106-97-8	Butane	0.00E+00	1	1	0.00E+00		70362-50-4	3,4,4',5-Tetrachlorobiphenyl	4.10E-22				
19	106-99-0	1,3-Butadiene	2.11E-26	1	1	2.11E-26		74472-37-0	2,3,4,4',5-Pentachlorobiphenyl	4.10E-22				
20	107-02-8	Acrolein	8.67E-15	1	1	8.67E-15								
21	107-05-1	3-Chloropropene (Allyl chloride)	3.90E-22	1	1	3.90E-22		1336-36-3	Polychlorinated biphenyls (PCBs)	5.68E-19				
22	107-06-2	1,2-Dichloroethane (Ethylene chloride)	2.66E-18	1	1	2.66E-18		1336-36-3	UnCorrected (for coplanar PCBs)	5.74E-19				
23	107-12-0	Propionitrile	3.59E-14	1	1	3.59E-14								
24	107-13-1	Acrylonitrile	8.67E-15	1	1	8.67E-15								
25	107-18-6	2-Propene-1-ol	3.82E-12	1	1	3.82E-12								
26	107-31-3	Formic acid, methyl ester	9.06E-15	1	1	9.06E-15								
27	107-66-4	Dibutylphosphate	7.55E-13	2000	100	3.77E-18								
28	107-87-9	2-Pentanone	8.67E-15	1	1	8.67E-15								
29	108-03-2	1-Nitropropane	3.94E-14	1	1	3.94E-14								
30	108-05-4	Vinyl acetate	1.60E-15	1	1	1.60E-15								
31	108-10-1	Hexone (4-Methyl-2-pentanone or MIBK)	8.67E-15	1	1	8.67E-15								
32	108-20-3	Bis(isopropyl)ether	1.30E-18	1	1	1.30E-18								
33	108-38-3	m-Xylene (Dimethyl benzene)	5.85E-20	1	1	5.85E-20								
34	108-39-4	m-Cresol	1.28E-13	1	1	1.28E-13								
35	108-87-2	Methylcyclohexane	0.00E+00	1	1	0.00E+00								
36	108-88-3	Toluene	2.73E-21	1	1	2.73E-21								
37	108-90-7	Chlorobenzene	5.85E-20	1	1	5.85E-20								
38	108-93-0	Cyclohexanol	8.41E-13	1	1	8.41E-13								
39	108-94-1	Cyclohexanone	8.78E-14	1	1	8.78E-14								
40	108-95-2	Phenol	7.39E-13	1	1	7.39E-13								
41	109-66-0	n-Pentane	0.00E+00	1	1	0.00E+00								
42	109-99-9	Tetrahydrofuran	7.61E-14	1	1	7.61E-14								
43	110-12-3	5-Methyl-2-hexanone	1.99E-15	1	1	1.99E-15								
44	110-43-0	2-Heptanone	1.99E-15	1	1	1.99E-15								
45	110-54-3	n-Hexane	0.00E+00	1	1	0.00E+00								
46	110-62-3	n-Valeraldehyde	9.06E-15	1	1	9.06E-15								
47	110-82-7	Cyclohexane	1.24E-34	1	1	1.24E-34								
48	110-83-8	Cyclohexene	2.75E-24	1	1	2.75E-24								
49	110-86-1	Pyridine	3.99E-13	1	1	3.99E-13								
50	111-65-9	n-Octane	0.00E+00	1	1	0.00E+00								
51	111-76-2	Ethylene glycol monobutyl ether	5.82E-13	1	1	5.82E-13								
52	111-84-2	n-Nonane	0.00E+00	1	1	0.00E+00								
53	117-81-7	Bis(2-ethylhexyl)phthalate (DEHP)	1.13E-11	2000	100	5.64E-17								
54	117-84-0	n-Dioctyl phthalate	4.89E-12	2000	100	2.45E-17								
55	118-74-1	Hexachlorobenzene	1.22E-19	1	1	1.22E-19								
56	120-12-7	Anthracene	1.23E-13	1	1	1.23E-13								
57	120-82-1	1,2,4-Trichlorobenzene	2.66E-18	1	1	2.66E-18								
58	120-83-2	2,4-Dichlorophenol	3.82E-12	1	1	3.82E-12								
59	121-44-8	Triethylamine	1.99E-15	1	1	1.99E-15								
60	121-69-7	Dimethylaniline	3.59E-14	1	1	3.59E-14								
61	122-39-4	N,N-Diphenylamine	1.14E-13	1	1	1.14E-13								
62	123-19-3	4-Heptanone	3.59E-14	1	1	3.59E-14								
63	123-38-6	n-Propionaldehyde	8.67E-15	1	1	8.67E-15								
64	123-51-3	3-Methyl-1-butanol	8.02E-14	1	1	8.02E-14								
65	123-86-4	Acetic acid n-butyl ester	1.60E-15	1	1	1.60E-15								
66	123-91-1	1,4-Dioxane	2.29E-12	1	1	2.29E-12								
67	126-73-8	Tributyl phosphate	7.59E-13	1	1	7.59E-13								
68	126-98-7	2-Methyl-2-propenenitrile (Methacrylonitrile)	3.51E-16	1	1	3.51E-16								
69	127-18-4	Perchloroethylene (tetrachloroethylene)	2.48E-23	1	1	2.48E-23								
70	127-19-5	N,N-Dimethylacetamide	1.66E-13	1	1	1.66E-13								
71	128-37-0	2,6-Bis(tert-butyl)-4-methylphenol	4.89E-12	1	1	4.89E-12								
72	129-00-0	Pyrene	5.85E-12	2000	100	2.92E-17								
73	1321-64-8	Pentachloronaphthalene	3.94E-14	2000	100	1.97E-19								
74	1321-65-9	Trichloronaphthalene	9.06E-15	1	1	9.06E-15								
75	132-64-9	Dibenzofuran	9.06E-15	1	1	9.06E-15								
76	1335-87-1	Hexachloronaphthalene	3.94E-14	2000	100	1.97E-19								
77	1335-88-2	Tetrachloronaphthalene	9.06E-15	2000	100	4.53E-20								
78	1336-36-3	Polychlorinated biphenyls (PCBs)	1.14E-13	2000	100	5.68E-19								
79	141-78-6	Acetic acid ethyl ester (Ethyl acetate)	3.94E-14	1	1	3.94E-14								
80	141-79-7	4-Methyl-3-penten-2-one	1.63E-13	1	1	1.63E-13								
81	142-82-5	n-Heptane	0.00E+00	1	1	0.00E+00								
82	144-62-7	Oxalic acid	7.51E-14	1	1	7.51E-14								
83	156-60-5	trans-1,2-Dichloroethylene	3.90E-22	1	1	3.90E-22								
84	1582-09-8	Trifluralin	3.94E-14	2000	100	1.97E-19								
85	1634-04-4	Methyl tert-butyl ether	3.51E-16	1	1	3.51E-16								
86	1836-75-5	Nitrofen	1.13E-11	2000	100	5.64E-17								
87	189-55-9	Dibenzo[a,i]pyrene	7.55E-13	2000	100	3.77E-18								
88	189-64-0	Dibenzo[a,h]pyrene	7.55E-13	2000	100	3.77E-18								
89	191-24-2	Benzo(g,h,i)perylene	1.13E-11	2000	100	5.64E-17								
90	191-30-0	Benzo[a,i]pyrene	7.55E-13	2000	100	3.77E-18								
91	192-65-4	Dibenzo[a,e]pyrene	7.55E-13	2000	100	3.77E-18								
92	193-39-5	Indeno(1,2,3-cd)pyrene	1.13E-11	2000	100	5.64E-17								
93	205-82-3	Benzo(j)fluoranthene	7.59E-13	2000	100	3.80E-18								
94	205-99-2	Benzo(b)fluoranthene	1.13E-11	2000	100	5.64E-17								
95	206-44-0	Fluoranthene	6.11E-12	2000	100	3.06E-17								
96	207-08-9	Benzo(k)fluoranthene	1.13E-11	2000	100	5.64E-17								
97	208-96-8	Acenaphthylene	3.94E-14	1	1	3.94E-14								
98	218-01-9	Chrysene	7.00E-12	2000	100	3.50E-17								
99	2234-13-1	Octachloronaphthalene	3.94E-14	2000	100	1.97E-19								
100	224-42-0	Dibenz[a,j]acridine	7.48E-13	2000	100	3.74E-18								
101	226-36-8	Dibenz[a,h]acridine	7.48E-13	2000	100	3.74E-18								
102	2385-85-5	Mirex	1.21E-17	1	1	1.21E-17								
103	25551-13-7	Trimethyl benzene	5.85E-20	1	1	5.85E-20								
104	26140-60-3	Terphenyls	3.34E-12	2000	100	1.67E-17								
105	27154-33-2	Trichlorofluoroethane	2.11E-26	1	1	2.11E-26								
106	287-92-3	Cyclopentane	1.24E-34	1	1	1.24E-34								
107	309-00-2	Aldrin	4.12E-14	2000	100	2.06E-19								
108	319-84-6	Hexachlorocyclohexane (Lindane) Alpha BHC	2.04E-14	1	1	2.04E-14								
109	319-85-7	Hexachlorocyclohexane (Lindane) Beta BHC	3.80E-14	2000	100	1.90E-19								
110	319-86-8	Delta-BHC	3.76E-14	2000	100	1.88E-19								
111	3697-24-3	5-Methylchrysene	4.89E-12	2000	100	2.45E-17								
112	3825-26-1	Ammonium perfluorooctanoate	3.94E-14	2000	100	1.97E-19								
113	4170-30-3	2-Butenaldehyde (2-Butenal or Crotonaldehyde)	8.77E-14	1	1	8.77E-14								
114	465-73-6	Isodrin	2.20E-15	1	1	2.20E-15								
115	50-00-0	Formaldehyde	1.05E-12	1	1	1.05E-12								
116	50-29-3	4,4-DDT	4.08E-14	2000	100	2.04E-19								
117	50-32-8	Benzo(a)pyrene	1.41E-13	2000	100	7.07E-19								
118	53-70-3	Dibenzo(a,h)anthracene	1.27E-15	2000	100	6.33E-21								
119	540-59-0	1,2-Dichloroethylene	5.85E-20	1	1	5.85E-20								
120	540-84-1	2,2,4-Trimethylpentane	0.00E+00	1	1	0.00E+00								
121	541-73-1	1,3-Dichlorobenzene	5.85E-20	1	1	5.85E-20								
122	56-23-5	Carbon tetrachloride	2.75E-24	1	1	2.75E-24								
123	563-80-4	3-Methyl-2-butanone	8.67E-15	1	1	8.67E-15								
124	56-49-5	3-Methylcholanthrene	0.00E+00	2000	100	0.00E+00								
125	56-55-3	Benzo(a)anthracene	6.11E-12	2000	100	3.06E-17								
126	57-14-7	1,1-Dimethylhydrazine	3.65E-13	1	1	3.65E-13								
127	58-89-9	gamma-BHC (Lindane)	2.41E-14	2000	100	1.20E-19								
128	58-90-2	2,3,4,6-Tetrachlorophenol	4.09E-13	1	1	4.09E-13								
129	591-78-6	2-Hexanone	8.67E-15	1	1	8.67E-15								
130	59-50-7	4-Chloro-3-methylphenol	4.89E-12	2000	100	2.45E-17								
131	59-89-2	N-Nitrosomorpholine	7.54E-13	1	1	7.54E-13								
132	602-87-9	5-Nitroacenaphthene	5.82E-13	2000	100	2.91E-18								
133	60-29-7	Ethyl ether	1.21E-17	1	1	1.21E-17								
134	603-34-9	Triphenylamine	4.65E-13	1	1	4.65E-13								
135	60-34-4	Methylhydrazine	8.41E-13	1	1	8.41E-13								
136	60-35-5	Acetamide	1.66E-13	1	1	1.66E-13								
137	60-57-1	Dieldrin	4.26E-14	2000	100	2.13E-19								
138	621-64-7	Di-n-Propylnitrosamine (N-Nitroso-di-n-propylamine)	3.82E-12	1	1	3.82E-12								
139	624-83-9	Methyl isocyanate	2.66E-18	1	1	2.66E-18								
140	627-13-4	Nitric acid, propyl ester	1.21E-17	1	1	1.21E-17								
141	62-75-9	N-Nitroso-N,N-dimethylamine (Dimethylnitrosamine)	1.09E-12	1	1	1.09E-12								

CALCULATION SHEET

BY: E. Berrios
DATE: 05/21/03

PROJECT: WTP
JOB NO.: 24590
CALC NO.: 24590-WTP-M4C-FRP-00005
SHEET REV: A
SHEET NO.: 102

	A	B	C	D	E	F	G	H	I	J	K	L	M	N
1	Table B-13 PJV34 - Abated HLW PJM/RFD													
2			PJV32	HEPA 1	HEPA 2	PJV34								
3	CAS #	COPC	g/sec	DF	DF	g/sec								
142	630-20-6	1,1,1,2-Tetrachloroethane	1.30E-18	1	1	1.30E-18								
143	64-17-5	Ethyl alcohol	8.41E-13	1	1	8.41E-13								
144	64-18-6	Formic acid	7.59E-13	1	1	7.59E-13								
145	64-19-7	Acetic acid	7.54E-13	1	1	7.54E-13								
146	67-56-1	Methyl alcohol (Methanol)	8.41E-13	1	1	8.41E-13								
147	67-63-0	2-Propyl alcohol (Isopropanol; Propan-2-01)	8.78E-14	1	1	8.78E-14								
148	67-64-1	2-Propanone (Acetone)	1.96E-13	1	1	1.96E-13								
149	67-66-3	Chloroform	5.85E-20	1	1	5.85E-20								
150	67-72-1	Hexachloroethane	2.66E-19	1	1	2.66E-19								
151	684-16-2	Hexafluoroacetone	5.85E-20	1	1	5.85E-20								
152	71-23-8	n-Propyl alcohol	8.78E-14	1	1	8.78E-14								
153	71-36-3	n-Butyl alcohol	8.78E-14	1	1	8.78E-14								
154	71-43-2	Benzene	6.36E-21	1	1	6.36E-21								
155	71-55-6	Methyl chloroform (1,1,1-Trichloroethane)	2.48E-23	1	1	2.48E-23								
156	72-20-8	Endrin	3.26E-14	2000	100	1.63E-19								
157	72-43-5	Methoxychlor	2.53E-14	2000	100	1.27E-19								
158	72-54-8	4,4-DDD	3.26E-14	2000	100	1.63E-19								
159	72-55-9	4,4-DDE	2.23E-14	2000	100	1.11E-19								
160	74-83-9	Bromomethane (Methyl bromide)	5.85E-20	1	1	5.85E-20								
161	74-87-3	Chloromethane (Methyl chloride)	3.90E-22	1	1	3.90E-22								
162	74-97-5	Bromochloromethane	2.66E-18	1	1	2.66E-18								
163	74-99-7	Methylacetylene	1.77E-21	1	1	1.77E-21								
164	75-00-3	Chloroethane	3.90E-22	1	1	3.90E-22								
165	75-01-4	Vinyl chloride (1-Chloroethene)	1.25E-23	1	1	1.25E-23								
166	75-05-8	Acetonitrile	6.35E-14	1	1	6.35E-14								
167	75-07-0	Acetaldehyde	1.63E-13	1	1	1.63E-13								
168	75-09-2	Dichloromethane (Methylene chloride)	5.85E-20	1	1	5.85E-20								
169	75-12-7	Formamide	7.48E-13	1	1	7.48E-13								
170	75-15-0	Carbon disulfide	3.90E-22	1	1	3.90E-22								
171	75-21-8	Ethylene oxide (Oxirane)	1.99E-15	1	1	1.99E-15								
172	75-27-4	Bromodichloromethane	1.30E-18	1	1	1.30E-18								
173	75-34-3	1,1-Dichloroethane	5.85E-20	1	1	5.85E-20								
174	75-35-4	1,1-Dichloroethene (Vinylidene chloride)	2.75E-24	1	1	2.75E-24								
175	75-43-4	Dichlorofluoromethane	3.90E-22	1	1	3.90E-22								
176	75-45-6	Chlorodifluoromethane	2.75E-24	1	1	2.75E-24								
177	75-50-3	Trimethylamine	8.67E-15	1	1	8.67E-15								
178	75-52-5	Nitromethane	1.63E-13	1	1	1.63E-13								
179	75-55-8	2-Methylaziridine	3.99E-13	1	1	3.99E-13								
180	75-61-6	Difluorodibromomethane	2.75E-24	1	1	2.75E-24								
181	75-63-8	Trifluorobromomethane	0.00E+00	1	1	0.00E+00								
182	75-65-0	2-Methyl-2-propanol	8.78E-14	1	1	8.78E-14								
183	75-69-4	Trichlorofluoromethane	2.11E-26	1	1	2.11E-26								
184	75-71-8	Dichlorodifluoromethane	0.00E+00	1	1	0.00E+00								
185	75-99-0	2,2-Dichloropropionic acid	7.54E-13	1	1	7.54E-13								
186	76-03-9	Trichloroacetic acid	1.66E-13	1	1	1.66E-13								
187	76-11-9	1,1,1,2-Tetrachloro-2,2-difluoroethane	5.66E-34	1	1	5.66E-34								
188	76-12-0	1,1,2,2-Tetrachloro-1,2-difluoroethane	9.60E-26	1	1	9.60E-26								
189	76-13-1	1,2,2-Trichloro-1,1,2-trifluoroethane (Freon 113)	0.00E+00	1	1	0.00E+00								
190	76-14-2	1,2-Dichloro-1,1,2,2-tetrafluoroethane	0.00E+00	1	1	0.00E+00								
191	76-15-3	Chloropentafluoroethane	0.00E+00	1	1	0.00E+00								
192	76-44-8	Heptachlor	7.72E-17	1	1	7.72E-17								
193	78-83-1	2-Methylpropyl alcohol (Isobutyl alcohol)	3.99E-13	1	1	3.99E-13								
194	78-87-5	1,2-Dichloropropane	5.85E-20	1	1	5.85E-20								
195	78-92-2	1-Methylpropyl alcohol (2-Butanol)	8.78E-14	1	1	8.78E-14								
196	78-93-3	Methyl ethyl ketone (MEK, 2-Butanone)	3.59E-14	1	1	3.59E-14								
197	79-00-5	1,1,2-Trichloroethane	2.66E-18	1	1	2.66E-18								
198	79-01-6	Trichloroethylene	4.37E-22	1	1	4.37E-22								
199	79-09-4	Propionic acid	4.77E-12	1	1	4.77E-12								
200	79-10-7	2-Propenoic acid	4.77E-12	1	1	4.77E-12								
201	79-20-9	Methyl acetate	3.94E-14	1	1	3.94E-14								
202	79-34-5	1,1,2,2-Tetrachloroethane	3.51E-16	1	1	3.51E-16								
203	8001-35-2	Toxaphene	5.47E-14	2000	100	2.73E-19								
204	82-68-8	Pentachloronitrobenzene (PCBN or quintobenzene)	1.63E-13	1	1	1.63E-13								
205	83-32-9	Acenaphthene	9.06E-15	1	1	9.06E-15								
206	84-66-2	Diethyl phthalate	6.97E-13	1	1	6.97E-13								
207	84-74-2	Dibutyl phthalate	8.85E-12	2000	100	4.42E-17								
208	85-01-8	Phenanthrene	1.63E-13	1	1	1.63E-13								
209	85-68-7	Butylbenzyl phthalate	8.85E-12	2000	100	4.42E-17								
210	86-73-7	Fluorene	3.94E-14	2000	100	1.97E-19								
211	87-68-3	Hexachlorobutadiene	3.44E-22	1	1	3.44E-22								
212	87-86-5	Pentachlorophenol	7.54E-13	1	1	7.54E-13								
213	88-06-2	2,4,6-Trichlorophenol	3.82E-12	1	1	3.82E-12								
214	88-72-2	2-Nitrotoluene	8.02E-14	1	1	8.02E-14								
215	88-75-5	2-Nitrophenol	3.65E-13	1	1	3.65E-13								
216	88-85-7	2-sec-Butyl-4,6-dinitrophenol (Dinoseb)	1.29E-11	2000	100	6.43E-17								
217	88-89-1	Picric acid	1.12E-11	2000	100	5.61E-17								
218	91-20-3	Naphthalene	3.32E-17	1	1	3.32E-17								
219	91-22-5	Quinoline	5.82E-13	1	1	5.82E-13								
220	91-58-7	2-Chloronapthalene	1.60E-15	1	1	1.60E-15								
221	92-52-4	1,1`-Biphenyl	1.60E-15	1	1	1.60E-15								
222	92-93-3	4-Nitrobiphenyl	3.82E-12	2000	100	1.91E-17								
223	93-72-1	Silvex (2,4,5-TP)	7.55E-13	2000	100	3.77E-18								
224	93-76-5	2,4,5-T	7.55E-13	2000	100	3.77E-18								
225	94-75-7	2,4-D and esters (160C typed)	7.54E-13	1	1	7.54E-13								
226	95-13-6	Indene	5.90E-18	1	1	5.90E-18								
227	95-47-6	o-Xylene	5.85E-20	1	1	5.85E-20								
228	95-48-7	o-Cresol (2-Methylphenol)	1.28E-13	1	1	1.28E-13								
229	95-49-8	2-Chlorotoluene	2.66E-19	1	1	2.66E-19								
230	95-50-1	o-Dichlorobenzene (1,2-Dichlorobenzene)	1.30E-18	1	1	1.30E-18								
231	95-57-8	2-Chlorophenol	3.99E-13	1	1	3.99E-13								
232	95-95-4	2,4,5-Trichlorophenol	5.82E-13	1	1	5.82E-13								
233	96-22-0	3-Pentanone	8.67E-15	1	1	8.67E-15								
234	96-69-5	Bis(3-tert-butyl-4-hydroxy-6-methyl-phenyl)sulfide	2.66E-19	2000	100	1.33E-24								
235	98-51-1	p-tert-Butyltoluene	1.13E-22	1	1	1.13E-22								
236	98-82-8	Cumene	1.77E-21	1	1	1.77E-21								
237	98-83-9	alpha-Methylstyrene	5.85E-20	1	1	5.85E-20								
238	98-86-2	Acetophenone	3.89E-13	1	1	3.89E-13								
239	98-95-3	Nitrobenzene	3.65E-13	1	1	3.65E-13								
240						5.88E-11								

C

Appendix C
Calculation: Integrated Emissions Baseline Report Non-SSFM Represented Constituents Emissions Rate Estimation

24590-WTP-M4C-FRP-00003, Rev A

R10027491

Calculation Cover Sheet

RIVER PROTECTION PROJECT-WASTE TREATMENT PLANT		JOB NO.:	24590
CALC NO.	24590-WTP-M4C-FRP-00003	GROUP	Process Operations
SUBJECT	Integrated Emissions Baseline Report Non-SSFM Represented Constituents Emissions Rate Estimation		

CALCULATION STATUS DESIGNATION	☒ PRELIMINARY	☐ COMMITTED	☐ CONFIRMED
	☐ SUPERSEDED		☐ VOIDED

SOFTWARE APPLICATION	N/A	QAS	PROGRAM NAME	VERSION/RELEASE NO.
	☒	☐ YES ☐ NO		

Notes/Comments

Calculations were performed on a Compaq Personal Computer using the software Microsoft Excel® 97 SR-2

John Cook and Cuong Nguyen checked the whole calculation for the accuracy and procedural compliance.

NO.	REASON FOR REVISION	TOTAL NO. OF SHEETS	LAST SHEET NO.	BY	CHECKED	APPROVED/ ACCEPTED	DATE
A	Initial Issue	69	69	E. Berrios	J. Cook/C. Nguyen	O. Block	03/13/03

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Contents

1 Objective 3
2 Inputs 3
3 Background 5
4 Applicable Codes and Standards 5
5 Methodology 5
6 Assumptions 6
7 Calculations 6
8 Results and Conclusions 8
9 References 10
10 Attachments 10
Attachment 1 – Summary Radioactive Properties for Selected Radionuclides 11
Attachment 2 – Periodic Table of the Elements 14
Appendix A Steady State Flowsheet Model Stream Reports 15
Appendix B Calculations 54

List of Tables

Table A-1 FRP14 Stream Report 16
Table A-2 PJV04 Stream Report 18
Table A-3 FEP06 Stream Report 20
Table A-4 PVP01 Stream Report 22
Table A-5 TLP01 Stream Report 24
Table A-6 LMP06 Stream Report 26
Table A-7 LVP01 Stream Report 28
Table A-8 HMP06 Stream Report 30
Table A-9 HOP10 Stream Report 32
Table A-10 PJV32 Stream Report 34
Table A-11 PVP12 Stream Report 36
Table A-12 PJV11 Stream Report 38

Table A-13 LVP26 Stream Report 40
Table A-14 HOP33 Stream Report 42
Table A-15 PJV34 Stream Report 44
Table A-16 LFP06 Stream Report 46
Table A-17 RLD34 Stream Report 48
Table A-18 RLD33 Stream Report 50
Table A-19 RLD32 Stream Report 52
Table B-1 Feed Rate Calculation 55
Table B-2 PJV04 Calculation 56
Table B-3 FEP06 Calculation 57
Table B-4 PVP01 Calculation 58
Table B-5 TLP01 Calculation 59
Table B-6 LMP06 Calculation 60
Table B-7 LVP01 Calculation 61
Table B-8 HMP06 Calculation 62
Table B-9 HOP10 Calculation 63
Table B-10 PJV32 Calculation 64
Table B-11 PVP12 Calculation 65
Table B-12 PJV11 Calculation 66
Table B-13 LVP26 Calculation 67
Table B-14 HOP33 Calculation 68
Table B-15 PJV34 Calculation 69

1 Objective

The objective of this calculation is to estimate the Waste Treatment Plant (WTP) emissions of non-represented constituents in the Steady State Flowsheet Model (SSFM) based on the results from the representative compounds. The results from this calculation will be reported in the next revision of the *Integrated Emissions Baseline Report for the River Protection Project Waste Treatment Plant* (RPT-W375-ES00001) scheduled to be released in May 2003 and will be used in support of air permitting and risk assessment.

2 Inputs

- Emission estimates for the non-represented compounds are based on the results from their representative compounds as determined in RPT-W375-ES00001 Section 7.4. A summary of the non-represented compounds and their representative constituents is presented below. This information is based on Table 7 of RPT-W375-ES00001.

Representative Compounds for Inorganics and Radionuclides

Compound	Representative Compound	Compound	Representative Compound
Be	Zr+4	134Cs	137Cs
CN	PO4-3	137mBa	137Cs
Co	60Co	226Ra	Zr+4
Mo	Bi+3	227Ac	Zr+4
Rh	Zr+4	228Ra	Zr+4
Sb	125Sb	229Th	232Th
Se	F-	231Pa	Zr+4
Sn	126Sn	232U	233U
Ta	Zr+4	242Pu	241Pu
Tl	F-	243Am	241Am
U	234U	59Ni	63Ni
V	Bi+3	79Se	F-
W	Zr+4	90Y	90Sr
Y	90Sr	93Zr	Zr+4
106Ru	F-	93mNb	Zr+4
113mCd	Cd+2	242Cm	243Cm

- Feed concentration for nonradioactive Tin (Sn) is the same as the feed concentration for its radioactive counterpart, ^{126}Sn. Conversion factor for Ci to kg for radioactive Sn is: 29 Ci Sn/kg Sn (see Attachment 1 from http://www.ead.anl.gov/pub/doc/Tbl2RadProp.pdf). Feed concentration is 4.03E-06 Ci/mol Na for LAW and 1.82E-04 Ci/mol Na for HLW (24590-WTP-M4C-FRP-00001, Section 8).
- Non-represented constituents feed concentrations are specified in the *Updated Emissions Run Feed Vector* (24590-WTP-M4C-FRP-00001, Section 8). A summary of these feed concentrations is presented below.

CALCULATION SHEET

PROJECT: RPP-WTP
JOB NO.: 24590
CALC NO.: 24590-WTP-M4C-FRP-00003
SHEET REV: A
SHEET NO.: 4

BY: E. Berrios
DATE: 03/13/03

SUBJECT: Integrated Baseline Emissions Report Non-SSFM Represented Constituents Emissions Rate Estimation

Non-represented Compounds Feed Concentrations

Analyte	Supernate mol/mol Na Bq/mol Na	Solids mol/mol Na Bq/mol Na
Be	1.21E-04	8.74E-03
CN	2.89E-04	7.45E-02
Co	1.67E-04	9.25E-03
Mo	2.67E-04	8.20E-03
Rh	5.54E-05	1.53E-03
Sb	1.07E-04	8.35E-03
Se	2.04E-04	7.97E-03
Ta	2.95E-05	2.01E-04
Tl	2.13E-04	2.67E-03
U	6.18E-04	7.12E-02
V	2.14E-04	7.61E-04
W	2.01E-04	1.58E-03
Y	2.02E-05	2.18E-03
106Ru	7.78E-01	4.37E+06
113mCd	8.26E+05	1.36E+07
134Cs	3.70E+07	3.15E+06
137mBa	1.36E+10	3.28E+09
226Ra	1.19E+00	1.52E+02
227Ac	1.32E+01	7.68E+05
228Ra	2.31E+03	1.59E+05
229Th	5.43E+01	6.63E+03
231Pa	3.85E+01	1.69E+06
232U	1.30E+03	1.36E+05
242Pu	2.79E-01	1.44E+03
243Am	7.29E+00	3.95E+04
59Ni	1.29E+04	2.27E+06
79Se	1.13E+04	1.26E+05
90Y	7.70E+08	3.71E+10
93Zr	1.92E+05	5.46E+06
93mNb	1.52E+05	4.92E+06
242Cm	4.49E+02	1.62E+05

- Streams analyzed in this calculation are FRP14, PJV04, FEP06, PVP01, TLP01, LMP06, LVP01, HMP06, HOP10, PJV32, PJV34, PVP12, PJV11, LVP26, and HOP33. Appendix A shows the stream reports for these streams. For stream LVP01, which is the LAW Vessel Vents, the total mass flow through this stream is the summation of streams LFP06, RLD34, RLD33, RLD32.
- Feed stream to Pretreatment is based on a sodium molarity of 4 (i.e., 4 mol Na /l) as with this conditions, the feed is treated through the feed evaporator.
- Molecular weights (see Attachment 2)

Analyte	MW g/mol	Analyte	MW g/mol
Be	9.0	134Cs	134
CN	26.0	137mBa	137

Analyte	MW g/mol	Analyte	MW g/mol
Co	58.9	226Ra	226
Mo	95.9	227Ac	227
Rh	102.9	228Ra	228
Sb	121.7	229Th	229
Se	78.9	231Pa	231
Sn	118.7	232U	232
Ta	180.9	242Pu	242
Tl	204.3	243Am	243
U	238.0	59Ni	59
V	50.9	79Se	79
W	183.8	90Y	90
Y	88.9	93Zr	93
106Ru	106	93mNb	93
113mCd	113	242Cm	242

- As HLW has the highest feed concentrations, all feed rates were based on HLW concentrations to obtain a bounding estimate.

3 Background

The *Integrated Emissions Baseline Report for the River Protection Project Waste Treatment Plant* (RPT-W375-ES00001) estimated emissions from the Waste Treatment Plant (WTP) by using the SSFM. Not all reported emissions constituents were calculated by using the SSFM as inclusion of all the constituents would increase the complexity of the model. Instead, constituents were separated into groups and representative from each group were selected and actually modeled in the SSFM. This calculation generates the estimated emissions for the constituents not represented in the SSFM.

4 Applicable Codes and Standards

NA

5 Methodology

The following methodology was used to estimate the emissions for the constituents not represented in the SSFM.

- HLW and LAW feed concentrations in mol/mol Na (for inorganics) and Bq/mol Na (for radionuclides) for the non-represented compounds in the supernate and solids were obtained from the *Updated Emissions Run Feed Vector* (24590-WTP-M4C-FRP-00001). These are presented in Section 2, 3rd bullet.
- HLW and LAW feed streams conditions to Pretreatment (Stream # FRP14) were obtained from the model run request titled *Emissions Maximum Case Runs with Updated Parameters* (24590-WTP-MRQ-PT-03-002). These are presented in Appendix A.
- Non-represented constituents feed rates were calculated based on stream volumetric flowrate (in liters/hr), their feed concentration (in mol/mol Na or Bq/mol Na), and feed sodium molarity. Feed rates in the supernate and solids phase were added together to obtain the total feed rate to the plant (stream # FRP14).
- Feed rates were converted to lb/day for inorganics and Ci/day for radionuclides (stream # FRP14).
- The performance factor (PF) for the representative compounds was calculated per stream relative to the feed stream, FRP14. This was done by obtaining the representative compounds mass feed rate (or radioactivity rate)

from stream report # FRP14 and its mass flowrate (or radioactivity rate) at the stream being evaluated. The PF was calculated by dividing the constituent's mass feed rate (or radioactivity rate) by the specified stream's constituent mass flowrate (or radioactivity rate).

$$PF = \frac{\text{mass rate at point of interest [representative compound]}}{\text{mass rate at waste feed [representative compund]}}$$

- Once the PF was calculated, it was applied to the feed rate for the non-represented compound in order to obtain the mass flowrate of the constituent at that stream.

6 Assumptions

NA

7 Calculations

Calculations were performed using the Microsoft Excel® 97 spreadsheet on a Compaq PC workstation. For illustration purposes, the calculation for one inorganic (Be) and one radionuclide (^{106}Ru) is shown below. Calculations are only shown for the feed stream (FRP14), PJV04, and FEP06. No others are shown, as the calculation process is the same. Appendix B shows the calculation for the rest of the constituents.

Feed Rates

1. Calculate total feed rate in liters/hr for stream FRP14

Feed Streams conditions (refer to Table B-1):
WTP Feed (FRP14)
- Na molarity: 4 (cell M4)
- Volumetric Flowrate: 52 ft^3/hr (cell M6)

Vol. flowrate in l/hr:
52 ft^3/hr * 28.317 l/ft^3 = 1473 l/hr (cell O6)

2. Example calculation: total feed rate of non-represented inorganic constituent, Be.

Feed rate is based on HLW concentration as this gives a bounding release estimate.
Be WTP feed rate (FRP14 - refer to Table B-1):
Feed Concentration: 8.74E-03 mol/mol Na (cell I4)
8.74E-03 mol/mol Na (cell I4)* 4 mol Na/l (cell M4)* 1473 l/hr (cell O6) = 51.5 mol/hr (cell K4)

Be total feed concentration (FRP14 - refer to Table B-2):
MW Be: 9 g/mole (cell B4)
51.5 mol/hr (cell C4) * 9 g/mole (cell B4) * 1kg/1000g * 2.2 lb/kg * 24 hr/d = 24.5 lb/d (cell D4)

3. Example calculation: total feed rate of non-represented radionuclide constituent, ^{106}Ru

^{106}Ru feed rate (FRP14 - refer to Table B-1):
Feed Concentration: 4.37E+06 Bq/mol Na (cell I19)
4.37E+06 Bq/mol Na (cell I19)* 4 mol Na/l (cell M4)* 1473 l/hr (cell O6)= 2.57E+10 Bq/hr (cell K19)

Total ^{106}Ru feed concentration (FRP14 - refer to Table B-2):
2.57E+10 Bq/hr (cell C19) * 1 Ci/3.7E+10 Bq * 24 hr/d = 16.7 Ci/d (cell D19)

4. Calculate the concentration of tin (Sn) in the LAW and HLW feeds

Non-radioactive tin (Sn) feed concentration is equivalent to the radioactive tin feed concentration.
126Sn feed (refer to Table B-1 for all cell references shown below):
1.49E+05 Bq/mol Na LAW Feed (cell B39) * 1 Ci / 3.7E+10 Bq = 4.03E-06 Ci/mol Na (cell E39)
6.72E+06 Bq/mol Na HLW Feed (cell B40) * 1 Ci / 3.7E+10 Bq = 1.82E-04 Ci/mol Na (cell E40)
Conversion factor for tin: 29 Ci Sn/kg Sn (cell B42)
LAW: 4.03E-06 Ci/mol Na (cell E39) * 1 kg Sn / 29 Ci Sn (cell B42) = 1.39E-07 kg/mol Na (cell B42)
HLW: 1.82E-04 Ci/mol Na (cell E40) * 1 kg Sn / 29 Ci Sn (cell B42) = 6.26E-06 kg/mol Na (cell B43)
Sn MW = 118.71 g/mol (cell B44)
LAW feed: 1.39E-07 kg/mol Na (cell B42) * 1000g/kg * 1 mol/118.71 g (cell B44) = 1.17E-06 mol/mol Na (cell B45)
HLW feed: 6.26E-06 kg/mol Na (cell B43) * 1000g/kg * 1 mol/118.71 g (cell B44) = 5.28E-05 mol/mol Na (cell B46)

Stream # PJV04 Calculation

Be (refer to Table B-2)
Feed rate (FRP14): 51.5 mol/hr (cell C4 from Table B-2)
51.5 mol/hr (cell C4) * 9 g/mol (cell B4) * 24 hr/d * 2.2 lb / 1000 g = 24.5 lb/d (cell D4 from Table B-2)
Representative compound: Zr+4
Zr+4 feed rate from FRP14 (from Table A-1): 3.65E+02 lb/d (cell G4 from Table B-2)
Zr+4 mass flowrate in PJV04 (from Table A-2): 2.25E-02 lb/d (cell I4 from Table B-2)
PF = 3.65E+02 lb/d (cell G4) / 2.25E-02 lb/d (cell I4) = 1.62E+04 (cell J4 from Table B-2)
Be mass flowrate in PJV04 = 24.5 lb/d (cell D4) / 1.62E+04 (cell J4) = 1.51E-03 lb/d
Converting to g/sec: 1.51E-03 lb/d * 1d / 24hr * 1hr / 3600 sec * 1000g / 2.2 lb = 7.93E-06 g/sec (cell K4 from Table B-2)

106Ru (refer to Table B-2)
Feed rate (FRP14): 16.7 Ci/d (cell D19 from Table B-2)
Representative compound: F-
F- feed rate from FRP14 (from Table A-1): 6.93E+02 lb/d (cell G19 from Table B-2)
F- mass flowrate in PJV04 (from Table A-2): 6.82E-02 lb/d (cell I19 from Table B-2)
PF = 6.93E+02 (cell G19) /6.82E-02 (cell I19)= 1.02E+04 (cell J19 from Table B-2)
106Ru mass flowrate in PJV04 = 16.7 Ci/d (cell D19) / 1.02E+04 (cell J19)= 1.64E-03 Ci/d (cell K19 from Table B-2)

Stream # FEP06 Calculation

Be (refer to Table B-3)
Feed rate (FRP14): 51.5 mol/hr (cell C4)
51.5 mol/hr (cell C4) * 9 g/mol (cell B4) * 24 hr/d * 2.2 lb / 1000 g = 24.5 lb/d (cell D4 from Table B-3)
Representative compound: Zr+4
Zr+4 feed rate from FRP14 (from Table A-1): 3.65E+02 lb/d (cell G4 from Table B-3)
Zr+4 mass flowrate in FEP06 (from Table A-3): 3.69E-01 lb/d (cell I4 from Table B-3)
PF = 3.65E+02 lb/d (cell J4) /3.69E-01 lb/d (cell I4) = 9.90E+02 (cell J4 from Table B-3)

Be mass flowrate in FEP06 = 24.5 lb/d / 9.90E+02 = 2.47E-02 lb/d
Converting to g/sec: 2.47E-02 lb/d * 1d / 24hr * 1hr / 3600 sec * 1000g / 2.2 lb = 1.30E-04 g/sec (cell K4 from Table B-3)

106Ru (refer to Table B-3)
Feed rate (FRP14): 16.7Ci/d (cell D19 from Table B-3)
Representative compound: F-
F- feed rate from FRP14 (from Table A-1): 6.93E+02 lb/d (cell G19 from Table B-3)
F- mass flowrate in FEP06 (from Table A-3): 4.54E-02 lb/d (cell I19 from Table B-3)
PF = 6.93E+02 lb/d (cell G19) / 4.54E-02 lb/d (cell I19) = 1.53E+04 (cell J19 from Table B-3)
106Ru mass flowrate in FEP06 = 16.7 Ci/d (cell D19)/ 1.53E+04 (cell J19) = 1.09E-03 Ci/d (cell K19 from Table B-3)

The rest of the calculations are shown in Appendix B.

8 Results and Conclusions

A summary of the results per constituent is presented below. Emissions rates from the non-represented compounds in the SSFM have been estimated in this calculation. These rates will be reported in the next revision of the *Integrated Emissions Baseline Report for the River Protection Project Waste Treatment Plant* (RPT-W375-ES00001). This calculation will be updated each time a new official emissions profile is generated.

BY: E. Berrios
DATE: 03/13/03

CALCULATION SHEET

PROJECT: WTP
JOB NO.: 24590
CALC NO.: 24590-WTP-M4C-FRP-00003
SHEET REV:A
SHEET NO.:9

SUBJECT: Integrated Baseline Emissions Report Non-SSFM Represented Constituents Emissions Rate Estimation

Summary of Calculation Results

	FRP14	FRP14	PJV04	FEP06	PVP01	TLP01	LMP06	LVP01	HMP06	HOP10	PJV32	PVP12	PJV11	LVP26	HOP33	PJV34
Inorganics	mol/hr	g/sec	g/sec	g/sec	g/sec	g/sec	g/sec	g/sec	g/sec	g/sec	g/sec	g/sec	g/sec	g/sec	g/sec	g/sec
Be	5.15E+01	1.29E-01	7.93E-06	1.30E-04	7.50E-07	6.10E-06	2.89E-03	1.66E-06	4.19E-04	5.70E-09	1.31E-11	5.63E-15	7.93E-12	4.82E-11	7.80E-14	6.55E-17
CN	4.39E+02	3.17E+00	2.83E-04	4.81E-03	3.94E-05	2.56E-03	6.46E-02	9.83E-06	1.43E-02	6.87E-09	5.73E-11	2.96E-13	2.83E-10	2.58E-13	3.82E-16	2.86E-16
Co	5.45E+01	8.92E-01	5.42E-05	8.94E-04	4.60E-06	2.03E-05	5.32E-05	4.06E-08	4.42E-03	5.49E-08	9.41E-11	3.46E-14	5.42E-11	4.16E-12	3.46E-12	4.70E-16
Mo	4.83E+01	1.29E+00	8.50E-05	3.56E-04	5.82E-06	4.80E-05	1.96E-03	7.49E-07	1.10E-02	1.24E-07	1.24E-10	4.37E-14	8.50E-11	1.26E-10	7.08E-12	6.21E-16
Rh	9.02E+00	2.58E-01	1.59E-05	2.60E-04	1.50E-06	1.22E-05	5.78E-03	3.33E-06	8.39E-04	1.14E-08	2.62E-11	1.13E-14	1.59E-11	9.64E-11	1.56E-13	1.31E-16
Sb	4.92E+01	1.66E+00	1.11E-04	4.64E-04	7.67E-06	1.33E-04	2.76E-03	1.06E-06	1.40E-02	1.57E-07	1.58E-10	5.76E-14	1.11E-10	3.40E-10	1.72E-11	7.89E-16
Se	4.70E+01	1.03E+00	1.01E-04	6.74E-05	9.92E-06	4.52E-05	1.83E-01	4.70E-06	3.87E-02	5.68E-07	9.37E-11	7.45E-14	1.01E-10	3.05E-09	7.21E-15	4.69E-16
Sn	3.11E-01	1.03E-02	7.06E-07	2.97E-06	5.21E-08	1.18E-06	1.22E-05	9.33E-09	3.92E-05	4.86E-10	8.33E-13	3.91E-16	7.06E-13	1.53E-13	5.47E-15	4.16E-18
Ta	1.18E+00	5.95E-02	3.66E-06	6.01E-05	3.47E-07	2.82E-06	1.33E-03	7.69E-07	1.94E-04	2.64E-09	6.05E-12	2.60E-15	3.66E-12	2.23E-11	3.60E-14	3.03E-17
Tl	1.57E+01	8.93E-01	8.79E-05	5.85E-05	8.61E-06	3.92E-05	1.59E-01	4.08E-06	3.36E-02	4.92E-07	8.13E-11	6.46E-14	8.79E-11	2.65E-09	6.25E-15	4.07E-16
U	4.20E+02	2.77E+01	2.03E-03	3.40E-02	2.44E-04	1.91E-02	4.98E-02	3.80E-05	8.93E-02	1.11E-06	1.90E-09	1.83E-12	2.03E-09	6.24E-10	1.25E-11	9.48E-15
V	4.48E+00	6.34E-02	4.19E-06	1.75E-05	2.87E-07	2.37E-06	9.64E-05	3.69E-08	5.43E-04	6.09E-09	6.12E-12	2.15E-15	4.19E-12	6.18E-12	3.49E-13	3.06E-17
W	9.31E+00	4.75E-01	2.93E-05	4.80E-04	2.77E-06	2.25E-05	1.07E-02	6.14E-06	1.55E-03	2.11E-08	4.83E-11	2.08E-14	2.93E-11	1.78E-10	2.88E-13	2.42E-16
Y	1.28E+01	3.17E-01	1.95E-05	1.40E-06	1.17E-06	3.49E-08	8.09E-05	3.09E-08	3.12E-03	3.50E-08	3.51E-11	8.78E-15	1.95E-11	1.01E-12	4.36E-13	1.75E-16
Radionuclides	Bq/hr	Ci/d	Ci/d	Ci/d	Ci/d	Ci/d	Ci/d	Ci/d	Ci/d	Ci/d	Ci/d	Ci/d	Ci/d	Ci/d	Ci/d	Ci/d
106Ru	2.57E+10	1.67E+01	1.64E-03	1.09E-03	1.61E-04	7.33E-04	2.97E+00	4.02E-07	6.29E-01	9.21E-06	1.52E-09	1.21E-12	1.64E-09	4.96E-08	1.17E-13	7.61E-15
113mCd	8.01E+10	5.20E+01	4.34E-03	3.27E-03	3.79E-04	1.35E-03	2.98E+00	6.43E-07	2.79E+00	2.82E-05	6.37E-09	2.85E-12	4.34E-09	1.16E-07	9.91E-10	3.19E-14
134Cs	1.86E+10	1.20E+01	9.86E-04	1.96E-07	7.80E-05	1.93E-11	6.03E-05	3.70E-11	4.15E-01	4.30E-06	1.77E-09	5.86E-13	9.86E-10	4.19E-12	2.88E-10	8.86E-15
137mBa	1.93E+13	1.25E+04	1.03E+00	2.04E-04	8.13E-02	2.01E-08	6.28E-02	3.85E-08	4.32E+02	4.48E-03	1.84E-06	6.10E-10	1.03E-06	4.36E-09	3.00E-07	9.22E-12
226Ra	8.96E+05	5.81E-04	3.58E-08	5.87E-07	3.38E-09	2.75E-08	1.30E-05	3.95E-11	1.89E-06	2.57E-11	5.91E-14	2.54E-17	3.58E-14	2.17E-13	3.52E-16	2.95E-19
227Ac	4.53E+09	2.94E+00	1.81E-04	2.96E-03	1.71E-05	1.39E-04	6.58E-02	2.00E-07	9.56E-03	1.30E-07	2.99E-10	1.28E-13	1.81E-10	1.10E-09	1.78E-12	1.49E-15
228Ra	9.37E+08	6.08E-01	3.74E-05	6.14E-04	3.54E-06	2.88E-05	1.36E-02	4.13E-08	1.98E-03	2.69E-08	6.18E-11	2.66E-14	3.74E-11	2.27E-10	3.68E-13	3.09E-16
229Th	3.91E+07	2.53E-02	1.69E-06	2.82E-05	1.69E-07	4.51E-06	2.32E-05	1.77E-08	1.04E-04	1.29E-09	2.21E-12	1.27E-15	1.69E-12	2.90E-13	1.45E-14	1.10E-17
231Pa	9.96E+09	6.46E+00	3.98E-04	6.52E-03	3.76E-05	3.06E-04	1.45E-01	4.39E-07	2.10E-02	2.86E-07	6.57E-10	2.82E-13	3.98E-10	2.42E-09	3.91E-12	3.28E-15
232U	8.01E+08	5.20E-01	4.49E-05	7.60E-04	6.59E-06	7.27E-04	1.90E-03	7.61E-09	7.04E-04	8.74E-09	1.50E-11	4.95E-14	4.49E-11	2.38E-11	9.83E-14	7.48E-17
242Pu	8.48E+06	5.50E-03	3.32E-07	1.48E-09	1.94E-08	4.40E-12	4.38E-08	1.76E-13	2.76E-05	3.42E-10	5.86E-13	1.45E-16	3.32E-13	5.49E-16	3.85E-15	2.93E-18
243Am	2.33E+08	1.51E-01	9.12E-06	1.08E-07	5.31E-07	1.44E-10	1.02E-06	4.08E-12	7.58E-04	9.39E-09	1.61E-11	3.98E-15	9.12E-12	1.27E-14	1.06E-13	8.04E-17
59Ni	1.34E+10	8.68E+00	5.70E-04	3.23E-04	3.90E-05	7.89E-05	1.35E-02	2.43E-08	8.50E-02	9.41E-07	8.62E-10	2.93E-13	5.70E-10	5.74E-10	4.01E-11	4.31E-15
79Se	7.42E+08	4.82E-01	4.74E-05	3.16E-05	4.64E-06	2.11E-05	8.57E-02	1.16E-08	1.81E-02	2.66E-07	4.39E-11	3.49E-14	4.74E-11	1.43E-09	3.37E-15	2.19E-16
90Y	2.19E+14	1.42E+05	8.74E+00	6.27E-01	5.23E-01	1.56E-02	3.62E+01	7.27E-05	1.40E+03	1.56E-02	1.57E-05	3.93E-09	8.74E-06	4.52E-07	1.95E-07	7.84E-11
93Zr	3.22E+10	2.09E+01	1.28E-03	2.11E-02	1.22E-04	9.88E-04	4.68E-01	1.42E-06	6.80E-02	9.24E-07	2.12E-09	9.12E-13	1.28E-09	7.81E-09	1.26E-11	1.06E-14
93mNb	2.90E+10	1.88E+01	1.16E-03	1.90E-02	1.09E-04	8.90E-04	4.22E-01	1.28E-06	6.12E-02	8.33E-07	1.91E-09	8.22E-13	1.16E-09	7.03E-09	1.14E-11	9.56E-15
242Cm	9.55E+08	6.19E-01	3.74E-05	6.16E-04	3.12E-06	7.77E-08	3.35E-07	1.34E-12	3.11E-03	3.86E-08	6.60E-11	2.34E-14	3.74E-11	4.20E-15	4.34E-13	3.30E-16

9 References

Project Documents

24590-WTP-M4C-FRP-00001, Rev 0A, *Updated Emissions Run Feed Vector*, Section 8

24590-WTP-MRQ-PT-03-002, Rev 0, *Emissions Maximum Case Runs with Updated Parameters*, Results section

RPT-W375-ES00001, Rev 1, *Integrated Emissions Baseline Report for the River Protection Project Waste Treatment Plant*, Section 7.4 and Table 7

Other Documents

Human Health Fact Sheet, ANL, July 2002, http://www.ead.anl.gov/pub/doc/Tbl2RadProp.pdf (Attachment 1)

Gillespie, R and others, 1986, *Chemistry*, Allyn and Bacon, Inc, Boston, inside cover page (Attachment 2)

10 Attachments

Attachment 1 – Summary Radioactive Properties for Selected Radionuclides

Attachment 2 – Periodic Table of the Elements

ATTACHMENT #1

CALC NO. 24590-WTP-M4C-FRP-00003
REV: A
SHEET NO.: 11

TABLE 2. Summary Radioactive Properties for Selected Radionuclides

Isotope	Half-Life	Specific Activity *(Ci/g)*	Decay Mode	Radiation Energy *(MeV)*		
				Alpha *(α)*	Beta *(β)*	Gamma *(γ)*
Americium-241	430 yr	3.5	α	5.5	0.052	0.033
Americium-242m	150 yr	9.8	IT	0.025	0.044	0.051
Americium-242	*16 hr*	*820,000*	*β, EC*	-	*0.18*	*0.018*
Americium-243	7,400 yr	0.20	α	5.3	0.022	0.055
Neptunium-239	*2.4 days*	*230,000*	*β*	-	*0.26*	*0.17*
Berkelium-247	1,400 yr	1.1	α	5.6	0.061	0.11
Californium-249	350 yr	4.1	α	5.8	0.043	0.33
Californium-251	900 yr	1.6	α	5.8	0.020	0.13
Cadmium-109	1.3 yr	2,600	EC	-	0.083	0.026
Cadmium-113[n]	9.3×10^{15} yr	3.4×10^{-13}	β	-	0.093	-
Cadmium-113m	14 yr	240	β	-	0.019	-
Carbon-14[n]	5.700 yr	4.5	β	-	0.049	-
Cesium-134	2.1 yr	1,300	β	-	0.16	1.6
Cesium-135	2.3 million yr	0.0012	β	-	0.067	-
Cesium-137	30 yr	88	β	-	0.19	-
Barium-137m (95%)	*2.6 min*	*540 million*	*IT*	-	*0.065*	*0.60*
Chlorine-36	300,000 yr	0.033	β, EC	-	0.027	<0.001
Cobalt-57	270 days	8,600	EC	-	0.019	0.13
Cobalt-60	5.3 yr	1,100	β	-	0.097	2.5
Curium-242	160 days	3,400	α	6.1	0.010	0.0018
Curium-243	29 yr	52	α	5.8	0.14	0.13
Curium-244	18 yr	82	α	5.8	0.086	00017
Curium-245	8,500 yr	0.17	α	5.4	0.065	0.096
Curium-246	4,700 yr	0.31	α	5.4	0.0080	0.0015
Curium-247	16 million yr	0.000094	α	4.9	0.021	0.32
Curium-248	340,000 yr	0.0043	α	4.7	0.0060	0.0012
Curium-250	6,900 yr	0.21	α, β	1.3	0.0016	-
Plutonium-246 (25%)	*11 days*	*49,000*	*β*	-	*0.13*	*0.14*
Berkelium-250 (14%)	*3.2 hr*	*3.9 million*	*β*	-	*0.29*	*0.89*
Americium-246 (25%)	*39 min*	*20 million*	*β*	-	*0.66*	*0.70*
Europium-150	34 yr	70	EC	-	0.044	1.5
Europium-152	13 yr	180	β, EC	-	0.14	1.2
Europium-154	8.8 yr	270	β	-	0.29	1.2
Europium-155	5.0 yr	470	β	-	0.063	0.061
Iodine-129	16 million yr	0.00018	β	-	0.064	0.025
Iodine-131	8.0 days	130,000	β	-	0.19	0.38
Krypton-81	210,000 yr	0.021	EC	-	0.0051	0.012
Krypton-85	11 yr	400	β	-	0.25	0.0022
Neptunium-235	1.1 yr	1,400	EC	<0.001	0.010	0.0071
Neptunium-236	120,000 yr	0.013	β	-	0.21	0.14
Plutonium-236 (9%)	*2.9 yr*	*540*	*α*	*5.8*	*0.013*	*0.0021*

ATTACHMENT # 1

CALC NO.: 24590-WTP-M4C-FRP-00003
REV: A
SHEET NO.: 12

Isotope	Half-Life	Specific Activity (Ci/g)	Decay Mode	Radiation Energy (MeV)		
				Alpha (α)	Beta (β)	Gamma (γ)
Neptunium-237	2.1 million yr	0.00071	α	4.8	0.070	0.035
Protactinium-233	*27 days*	*21,000*	*β*	-	*0.20*	*0.20*
Nickel-59	75,000 yr	0.082	EC	-	0.0046	0.0024
Nickel-63	96 yr	60	β	-	0.17	-
Plutonium-238	88 yr	17	α	5.5	0.011	0.0018
Plutonium-239	24,000 yr	0.063	α	5.1	0.0067	<0.001
Plutonium-240	6,500 yr	0.23	α	5.2	0.011	0.0017
Plutonium-241	14 yr	100	β	<0.001	0.0052	<0.001
Plutonium-242	380,000 yr	0.0040	α	4.9	0.0087	0.0014
Potassium-40[n]	1.3 billion yr	0.0000071	β, EC	-	0.52	0.16
Protactinium-231[n]	33,000 yr	0.048	α	5.0	0.065	0.048
Actinium-227[n]	*22 yr*	*73*	*α, β*	*0.068*	*0.016*	*<0.001*
Thorium-227[n] (99%)	*19 days*	*31,000*	*α*	*5.9*	*0.053*	*0.11*
Francium-223[n] (1%)	*22 min*	*39 million*	*β*	-	*0.40*	*0.059*
Radium-223[n]	*11 days*	*52,000*	*α*	*5.7*	*0.076*	*0.13*
Radon-219[n]	*4.0 sec*	*13 billion*	*α*	*6.8*	*0.0063*	*0.056*
Polonium-215[n]	*0.0018 sec*	*30 trillion*	*α*	*7.4*	*<0.001*	*<0.001*
Lead-211[n]	*36 min*	*25 million*	*β*	-	*0.46*	*0.051*
Bismuth-211[n]	*2.1 min*	*420 million*	*α, β*	*6.6*	*0.010*	*0.047*
Thallium-207[n]	*4.8 min*	*190 million*	*β*	-	*0.49*	*0.0022*
Radium-226[n]	1600 yr	1.0	α	4.8	0.0036	0.0067
Radon-222[n]	*3.8 days*	*160,000*	*α*	*5.5*	*<0.001*	*<0.001*
Polonium-218[n]	*3.1 min*	*290 million*	*α*	*6.0*	*<0.001*	*<0.001*
Lead-214[n]	*27 min*	*33 million*	*β*	-	*0.29*	*0.25*
Bismuth-214[n]	*20 min*	*45 million*	*β*	-	*0.66*	*1.5*
Polonium-214[n]	*0.00016 sec*	*330 trillion*	*α*	*7.7*	*<0.001*	*<0.001*
Lead-210[n]	*22 yr*	*77*	*β*	-	*0.038*	*0.0048*
Bismuth-210[n]	*5.0 days*	*130,000*	*β*	-	*0.39*	-
Polonium-210[n]	*140 days*	*4,500*	*α*	*5.3*	*<0.001*	*<0.001*
Radium-228[n]	5.8 yr	280	β	-	0.017	<0.001
Actinium-228[n]	*6.1 hr*	*2.3 million*	*β*	-	*0.48*	*0.97*
Thorium-228[n]	*1.9 yr*	*830*	*α*	*5.4*	*0.021*	*0.0033*
Radium-224[n]	*3.7 days*	*160,000*	*α*	*5.7*	*0.0022*	*0.010*
Radon-220[n]	*56 sec*	*930 million*	*α*	*6.3*	*<0.001*	*<0.001*
Polonium-216[n]	*0.15 sec*	*350 billion*	*α*	*6.8*	*<0.001*	*<0.001*
Lead-212[n]	*11 hr*	*1.4 million*	*β*	-	*0.18*	*0.15*
Bismuth-212[n]	*61 min*	*15 million*	*α, β*	*2.2*	*0.47*	*0.19*
Polonium-212[n] (64%)	*0.00000031 sec*	*180,000 trillion*	*α*	*8.8*	-	-
Thallium-208[n] (36%)	*3.1 min*	*300 million*	*β*	-	*0.60*	*3.4*
Samarium-146	100,000,000 yr	0.000024	α	2.5	-	-
Samarium-151	90 yr	27	β	-	0.020	<0.001
Selenium-79	650,000 yr	0.070	β	-	0.056	-
Strontium-90	29 yr	140	β	-	0.20	-
Yttrium-90	*64 hr*	*550,000*	*β*	-	*0.94*	*<0.001*

ATTACHMENT # 1

CALC NO.: [illegible]-NTP-NHC-FCP-00003
REV: A
SHEET NO.: [illegible]

Isotope	Half-Life	Specific Activity *(Ci/g)*	Decay Mode	Radiation Energy *(MeV)*		
				Alpha *(α)*	Beta *(β)*	Gamma *(γ)*
Technetium-97	2.6 million	0.0014	EC	-	0.0056	0.011
Technetium-98	4.2 million	0.00088	β	-	0.16	1.4
Technetium-99	210,000	0.017	β	-	0.10	-
Thorium-229	14 billion yr	0.00000011	α	4.0	0.012	0.0013
Radium-225	*15 days*	*40,000*	*β*	-	*0.11*	*0.014*
Actinium-225	*10 days*	*59,000*	*α*	*5.8*	*0.022*	*0.018*
Francium-221	*4.8 min*	*180 million*	*α*	*6.3*	*0.010*	*0.031*
Astatine-217	*0.032 sec*	*1.6 trillion*	*α*	*7.1*	*<0.001*	*<0.001*
Bismuth-213	*46 min*	*20 million*	*α, β*	*0.13*	*0.44*	*0.13*
Polonium-213 (98%)	*0.0000042 sec*	*13,000 trillion*	*α*	*8.4*	-	-
Thallium-209 (2%)	*2.2 min*	*410 million*	*β*	-	*0.69*	*2.0*
Lead-209	*3.3 hr*	*4.7 million*	*β*	-	*0.20*	-
Thorium-230[n]	77,000 yr	0.020	α	4.7	0.015	0.0016
Thorium-232[n]	7,300 yr	0.22	α	4.9	0.12	0.096
Tin-121m	55 yr	54	β, IT	-	0.035	0.0049
Tin-121 (78%)	*27 hr*	*970,000*	*β*	-	*0.11*	-
Tin-126	250,000 yr	0.029	β	-	0.17	0.057
Antimony-126	*12 days*	*85,000*	*β*	-	*0.28*	*2.8*
Tritium (H-3)[n]	12 yr	9,800	β	-	0.0057	-
Uranium-232	72 hr	22	α	5.3	0.017	0.0022
Uranium-233	160,000 yr	0.0098	α	4.8	0.0061	0.0013
Uranium-234[n]	240,000 yr	0.0063	α	4.8	0.013	0.0017
Uranium-235[n]	700 million yr	0.0000022	α	4.4	0.049	0.16
Thorium-231[n]	*26 hr*	*540,000*	*β*	-	*0.17*	*0.026*
Uranium-236	23 million yr	0.000065	α	4.5	0.011	0.0016
Uranium-238[n]	4.5 billion yr	0.00000034	α	4.2	0.010	0.0014
Thorium-234[n]	*24 days*	*23,000*	*β*	-	*0.060*	*0.0093*
Protactinium-234m[n]	*1.2 min*	*690 million*	*β*	-	*0.82*	*0.012*
Zirconium-93	1.5 million yr	0.0025	β	-	0.020	-
Niobium-93m	*14 yr*	*290*	*IT*	-	*0.028*	*0.0019*

This table summarizes key radioactive properties of selected radionuclides and their associated decay products (for which information is presented in italics). Values are given to two significant figures. See the radionuclide-specific fact sheets for further information. EC = electron capture, IT = isomeric transition, Ci = curie, g = gram, and MeV = million electron volts. A dash indicates that the entry is not applicable, and an "n" indicates that the isotope exists naturally in the environment. (See the companion fact sheet on *Radioactive Properties, Internal Distribution, and Risk Coefficients* for an explanation of terms and interpretation of radiation energies.)

1 ← Atomic number H 1.008 ← Atomic mass

Period	Group* I/1	II/2	3	4	5	6	7	8	9	10	11	12	III/13	IV/14	V/15	VI/16	VII/17	VIII/18
			Transition Elements															
1	1 H 1.008																	2 He 4.003
2	3 Li 6.941	4 Be 9.012											5 B 10.81	6 C 12.01	7 N 14.01	8 O 16.00	9 F 19.00	10 Ne 20.18
3	11 Na 22.99	12 Mg 24.31											13 Al 26.98	14 Si 28.09	15 P 30.97	16 S 32.06	17 Cl 35.45	18 Ar 39.95
4	19 K 39.10	20 Ca 40.08	21 Sc 44.96	22 Ti 47.90	23 V 50.94	24 Cr 52.00	25 Mn 54.94	26 Fe 55.85	27 Co 58.93	28 Ni 58.70	29 Cu 63.55	30 Zn 65.38	31 Ga 69.72	32 Ge 72.59	33 As 74.92	34 Se 78.96	35 Br 79.90	36 Kr 83.80
5	37 Rb 85.47	38 Sr 87.62	39 Y 88.91	40 Zr 91.22	41 Nb 92.91	42 Mo 95.94	43 Tc (98)	44 Ru 101.1	45 Rh 102.9	46 Pd 106.4	47 Ag 107.9	48 Cd 112.4	49 In 114.8	50 Sn 118.7	51 Sb 121.8	52 Te 127.6	53 I 126.9	54 Xe 131.3
6	55 Cs 132.9	56 Ba 137.3	57 La 138.9	72 Hf 178.5	73 Ta 180.9	74 W 183.9	75 Re 186.2	76 Os 190.2	77 Ir 192.2	78 Pt 195.1	79 Au 197.0	80 Hg 200.6	81 Tl 204.4	82 Pb 207.2	83 Bi 209.0	84 Po (209)	85 At (210)	86 Rn (222)
7	87 Fr (223)	88 Ra (226.0)	89 Ac (227)	104	105	106	107											

Lanthanides 6	58 Ce 140.1	59 Pr 140.9	60 Nd 144.2	61 Pm (145)	62 Sm 150.4	63 Eu 152.0	64 Gd 157.3	65 Tb 158.9	66 Dy 162.5	67 Ho 164.9	68 Er 167.3	69 Tm 168.9	70 Yb 173.0	71 Lu 175.0
Actinides 7	90 Th 232.0	91 Pa (231)	92 U 238.0	93 Np (244)	94 Pu (242)	95 Am (243)	96 Cm (247)	97 Bk (247)	98 Cf (251)	99 Es (252)	100 Fm (257)	101 Md (258)	102 No (259)	103 Lr (260)

*The main groups are numbered I to VIII following accepted practice, but the distinction between A and B groups has not been made because of the confusion that has been created by the differences between European and American practice in this respect. Recently, the American Chemical Society and the International Union of Pure and Applied Chemistry recommended a revised system in which the groups are numbered consecutively from 1 to 18 as shown here. Because it may be some time before this revised numbering system becomes widely accepted we have not adopted it in the main body of the text.

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ATTACHMENT #2

CALC. NO.: 24590-WTP-M4C-F02-D00
REV: A
SHEET NO. 14

Appendix A Steady State Flowsheet Model Stream Reports

Table A-1 FRP14 Stream Report

Stream Number: FRP14
Stream Name: Waste feed from DOE to HLW Feed Receipt
Configuration: 0
0
Run Data File: H:\Working Folder 2 (john)\MRQ_03_002_run2a_Streams.csv
Run Date / Time: 1/16/2003 - 1:27:28 PM

Read this note for program instructions.

Stream Properties Variable	Value	Units
Density	1.40E+00	g/cm^3
Enthalpy	-2.56E+07	BTU/hr
Mass Flow	4.95E+03	Lb/hr
	1.19E+05	Lb/day
Volumetric Flow	6.49E+00	GPM
Molar Flow	2.03E+02	Lbmol/hr
Volumetric Flow	8.67E-01	ft^3/min
Molecular Weight	2.25E+01	Lb/Lbmol
Pressure	1.00E+03	mbar
Temperature	4.90E+01	C
Viscosity	1.28E+00	cP
Na Molarity	4.00E+00	mol/L
pH	1.48E+01	pH
Total TRU	3.67E-02	Ci/L
Total Activity	5.88E+00	Ci/L

Component	Aqueous Components mol/L	Lb/gal	Lb/day	Solid Components Lb/day	Total Component Lb/day	mt/day	g/sec
Total	6.23E+01	1.17E+01	1.09E+05	8.42E+03	1.18E+05	53.4772	618.9493325
Ag^+	4.83E-04	4.35E-04	4.07E+00	1.30E+01	1.71E+01	0.00776	0.089832154
Al^{+3}	1.00E+00	2.25E-01	2.10E+03	3.31E+02	2.43E+03	1.1068	12.81013175
As^{+3}	2.44E-03	1.53E-03	1.43E+01	3.78E+00	1.80E+01	0.0082	0.09495905
B^{+3}	2.58E-02	2.33E-03	2.18E+01	3.08E+01	5.25E+01	0.02388	0.276335636
Ba^{+2}	4.00E-04	4.58E-04	4.28E+00	1.06E+02	1.11E+02	0.05034	0.582596781
Bi^{+3}	8.09E-04	1.41E-03	1.32E+01	6.62E+01	7.94E+01	0.03609	0.417717103
$C_2O_4^{-2}$	1.03E+00	7.57E-01	7.07E+03	2.60E+02	7.33E+03	3.33339	38.58086188
Ca^{+2}	1.60E-01	5.35E-02	5.00E+02	1.68E+02	6.68E+02	0.30359	3.513731935
Cd^{+2}	1.60E-02	1.50E-02	1.40E+02	1.06E+02	2.47E+02	0.11214	1.297876868
Ce^{+3}	1.21E-03	1.41E-03	1.32E+01	1.92E+01	3.23E+01	0.0147	0.170152908
Cl^-	1.83E-01	5.43E-02	5.07E+02	7.79E+00	5.15E+02	0.23405	2.708954834
CO_3^{-2}	6.18E-01	3.10E-01	2.89E+03	7.10E+02	3.60E+03	1.63749	18.95241274
Cr^{+3}	8.00E-02	3.47E-02	3.24E+02	1.61E+01	3.40E+02	0.15475	1.791132325
Cu^{+2}	8.84E-04	4.69E-04	4.38E+00	1.14E+01	1.57E+01	0.00716	0.082829026
F^-	4.12E-01	6.54E-02	6.11E+02	8.28E+01	6.93E+02	0.3152	3.648184785
Fe^{+3}	4.00E-02	1.86E-02	1.74E+02	6.86E+02	8.61E+02	0.39122	4.528040803
H^+	0.00E+00	0.00E+00	0.00E+00		0.00E+00	0	0
H_2O	4.48E+01	6.74E+00	6.30E+04		6.30E+04	28.6198	331.2472451
Hg^{+2}	5.60E-05	9.37E-05	8.76E-01	2.37E+00	3.24E+00	0.00147	0.017051125
K^+	7.20E-01	2.35E-01	2.20E+03	3.07E+01	2.23E+03	1.0118	11.71069254
La^{+3}	3.32E-04	3.85E-04	3.60E+00	6.15E+01	6.51E+01	0.02959	0.342459619
Li^+	1.58E-02	9.16E-04	8.56E+00	3.33E+00	1.19E+01	0.0054	0.062555477
Mg^{+2}	7.13E-03	1.45E-03	1.35E+01	4.97E+01	6.32E+01	0.02873	0.332476705
Mn^{+3}	1.95E-02	8.93E-03	8.35E+01	1.54E+02	2.37E+02	0.10788	1.24855819
MnO_4^-	0.00E+00	0.00E+00	0.00E+00		0.00E+00	0	0
Na^+	4.00E+00	7.67E-01	7.17E+03	4.49E+02	7.62E+03	3.46375	40.08966069
NH_4^+	4.09E-02	6.15E-03	5.75E+01	0.00E+00	5.75E+01	0.02612	0.302335551
Ni^{+2}	1.20E-02	5.88E-03	5.49E+01	5.68E+01	1.12E+02	0.05076	0.587556647
NO_2^-	7.83E-01	3.01E-01	2.81E+03	1.36E+02	2.95E+03	1.33904	15.49818956
NO_3^-	1.65E+00	8.53E-01	7.97E+03	8.52E+02	8.82E+03	4.0109	46.42244231
O^{-2}				0.00E+00	0.00E+00	0	0
OH^-	6.19E+00	8.79E-01	8.21E+03	2.87E+03	1.11E+04	5.03879	58.31931105
$OH(b)^-$	0.00E+00	0.00E+00	0.00E+00		0.00E+00	0	0
P^{+5}				0.00E+00	0.00E+00	0	0
Pb^{+2}	2.72E-03	4.70E-03	4.39E+01	2.60E+01	7.00E+01	0.0318	0.368071122
Pd^{+2}	3.19E-05	2.83E-05	2.64E-01	3.08E+00	3.34E+00	0.00152	0.017570903
PO_4^{-3}	2.68E-01	2.12E-01	1.98E+03	2.19E+02	2.20E+03	1.00136	11.58986191
S^{+6}				0.00E+00	0.00E+00	0	0
Si^{+4}				4.49E+02	4.49E+02	0.20416	2.363018209
SiO_4^{-4}	2.06E-02	1.58E-02	1.48E+02		1.48E+02	0.06708	0.776389595
SO_4^{-2}	1.44E-01	1.16E-01	1.08E+03	3.14E+01	1.11E+03	0.50551	5.850772573
Sr^{+2}	1.93E-04	1.41E-04	1.32E+00	1.23E+01	1.36E+01	0.00619	0.071656049

Ti^{+4}	3.86E-04	1.54E-04	1.44E+00	3.07E+01	3.22E+01	0.01462	0.16923953
Zn^{+2}	1.62E-03	8.84E-04	8.26E+00	9.93E+00	1.82E+01	0.00827	0.095696111
Zr^{+4}	1.44E-03	1.09E-03	1.02E+01	3.55E+02	3.65E+02	0.16595	1.920771371

Rad.	Aqueous Rad. Components			Solids Rad. Components (1)			Total Rad. Components (1)		
Component	Ci/L	Ci/day	Lb/day	Ci/L	Ci/day	Lb/day	Ci/L	Ci/day	Lb/day
Total	2.280385293	8.07E+04	1.61E+02	3.60E+00	1.27E+05	3.29E+02	5.88E+00	2.08E+05	4.90E+02
^{241}Am	3.73834E-05	1.32E+00	8.51E-04	2.73E-02	9.66E+02	6.21E-01	2.73E-02	9.67E+02	6.22E-01
^{14}C	2.86E-05	1.01E+00	4.99E-04	1.97E-06	6.97E-02	3.44E-05	3.05E-05	1.08E+00	5.33E-04
^{60}Co	4.00E-05	1.41E+00	2.76E-06	3.03E-03	1.07E+02	2.09E-04	3.07E-03	1.09E+02	2.12E-04
^{243}Cm	7.84E-09	2.77E-04	1.21E-08	9.10E-04	3.22E+01	1.40E-03	9.10E-04	3.22E+01	1.40E-03
^{244}Cm	4.08E-08	1.44E-03	3.94E-08	6.82E-04	2.41E+01	6.57E-04	6.82E-04	2.41E+01	6.57E-04
^{137}Cs	2.16E+00	7.65E+04	1.94E+00	4.55E-01	1.61E+04	4.09E-01	2.62E+00	9.26E+04	2.35E+00
^{152}Eu	1.41E-04	4.98E+00	6.31E-05	1.46E-04	5.15E+00	6.53E-05	2.86E-04	1.01E+01	1.28E-04
^{154}Eu	4.65E-04	1.64E+01	1.34E-04	1.58E-02	5.58E+02	4.55E-03	1.62E-02	5.74E+02	4.68E-03
^{155}Eu	8.02E-04	2.84E+01	1.29E-04	8.80E-03	3.11E+02	1.41E-03	9.60E-03	3.40E+02	1.54E-03
^{3}H	3.82E-04	1.35E+01	3.10E-06	1.97E-05	6.97E-01	1.60E-07	4.02E-04	1.42E+01	3.26E-06
^{129}I	3.11E-07	1.10E-02	1.37E-01	8.80E-08	3.11E-03	3.88E-02	3.99E-07	1.41E-02	1.76E-01
^{63}Ni	2.56E-04	9.06E+00	3.52E-04	1.44E-03	5.08E+01	1.97E-03	1.69E-03	5.99E+01	2.32E-03
^{237}Np	8.42E-08	2.98E-03	9.31E-03	2.24E-05	7.94E-01	2.48E+00	2.25E-05	7.97E-01	2.49E+00
^{238}Pu	2.22E-07	7.87E-03	1.01E-06	1.06E-04	3.75E+00	4.83E-04	1.06E-04	3.76E+00	4.84E-04
^{239}Pu	2.63E-06	9.32E-02	3.31E-03	9.40E-04	3.33E+01	1.18E+00	9.43E-04	3.34E+01	1.18E+00
^{240}Pu	4.66E-07	1.65E-02	1.60E-04	5.15E-05	1.82E+00	1.77E-02	5.20E-05	1.84E+00	1.79E-02
^{241}Pu	1.09E-05	3.87E-01	8.29E-06	6.67E-03	2.36E+02	5.05E-03	6.68E-03	2.36E+02	5.06E-03
^{125}Sb	2.15E-03	7.61E+01	1.62E-04	9.71E-03	3.43E+02	7.29E-04	1.19E-02	4.19E+02	8.91E-04
^{151}Sm	2.67E-02	9.44E+02	7.91E-02	3.03E-02	1.07E+03	8.99E-02	5.70E-02	2.02E+03	1.69E-01
^{126}Sn	1.62E-05	5.71E-01	1.11E-01	4.55E-05	1.61E+00	3.12E-01	6.16E-05	2.18E+00	4.23E-01
^{90}Sr	8.65E-02	3.06E+03	4.88E-02	3.03E+00	1.07E+05	1.71E+00	3.12E+00	1.10E+05	1.76E+00
^{99}Tc	7.68E-04	2.72E+01	3.53E+00	4.55E-03	1.61E+02	2.09E+01	5.32E-03	1.88E+02	2.45E+01
^{232}Th	5.99E-08	2.12E-03	4.25E+01	2.38E-07	8.42E-03	1.69E+02	2.98E-07	1.05E-02	2.11E+02
^{233}U	1.11E-06	3.94E-02	9.00E-03	2.73E-07	9.66E-03	2.21E-03	1.39E-06	4.90E-02	1.12E-02
^{234}U	6.47E-07	2.29E-02	8.13E-03	9.92E-07	3.51E-02	1.25E-02	1.64E-06	5.80E-02	2.06E-02
^{235}U	2.50E-08	8.84E-04	9.02E-01	7.58E-08	2.68E-03	2.74E+00	1.01E-07	3.57E-03	3.64E+00
^{236}U	7.49E-08	2.65E-03	9.03E-02	3.09E-08	1.09E-03	3.73E-02	1.06E-07	3.74E-03	1.28E-01
^{238}U	4.81E-07	1.70E-02	1.12E+02	5.58E-07	1.97E-02	1.30E+02	1.04E-06	3.68E-02	2.41E+02

Table A-2 PJV04 Stream Report

Read this note for program instructions.

Stream Number: PJV04
Stream Name: Vapor feed to demister
Configuration: 0
0
Run Data File: H:\Working Folder 2 (john)\MRQ_03_002_run2a_Streams.csv
Run Date / Time: 1/16/2003 - 1:27:28 PM

Stream Properties Variable	Value	Units
Density	1.16E-03	g/cm^3
Enthalpy	-7.83E+06	BTU/hr
Mass Flow	1.52E+05	Lb/hr
	3.65E+06	Lb/day
Volumetric Flow	2.62E+05	GPM
Molar Flow	5.30E+03	Lbmol/hr
Volumetric Flow	3.50E+04	ft^3/min
Molecular Weight	2.87E+01	Lb/Lbmol
Pressure	1.00E+03	mbar
Temperature	2.50E+01	C
Viscosity	1.83E-02	cP
Na Molarity	0.00E+00	mol/L
pH	#NUM!	pH
Total TRU	5.49E-11	Ci/L
Total Activity	1.03E-08	Ci/L

Gaseous Components (1) Component	mol/L	Lb/day	Mt/day
CO	3.33E-28	2.94E-20	1.33621E-23
CO_2	4.96E-13	6.88E-05	3.12706E-08
H_2O	5.72E-04	3.25E+04	14.75495033
NO	2.82E-33	2.66E-25	1.2094E-28
NO_2	6.27E-39	9.08E-31	4.12854E-34
N_2	3.14E-02	2.77E+06	1260.313991
O_2	8.36E-03	8.42E+05	382.6816082
SO_2	1.28E-34	2.59E-26	1.17531E-29
NH_3	4.71E-11	2.52E-03	1.14763E-06
HNO_3	2.14E-11	4.25E-03	1.93051E-06
HCl	6.42E-32	7.37E-24	3.35218E-27
HF	0.00E+00	0.00E+00	0

(1) All radionuclides in gaseous streams are assumed to exist as solid particulate.

Component	Aqueous Components mol/L	Lb/gal	Lb/day	Solid Components Lb/day	Total Component Lb/day	mt/day	g/sec
Total	0.00E+00	0.00E+00	0.00E+00	5.93E+00	5.93E+00	0.002693339	0.031172908
Ag^+	0.00E+00	0.00E+00	0.00E+00	1.19E-03	1.19E-03	5.41706E-07	6.26975E-06
Al^{+3}	0.00E+00	0.00E+00	0.00E+00	2.16E-01	2.16E-01	9.81535E-05	0.001136035
As^{+3}	0.00E+00	0.00E+00	0.00E+00	4.58E-01	4.58E-01	0.000208163	0.002409293
B^{+3}	0.00E+00	0.00E+00	0.00E+00	7.10E-03	7.10E-03	3.22915E-06	3.73744E-05
Ba^{+2}	0.00E+00	0.00E+00	0.00E+00	6.86E-03	6.86E-03	3.11714E-06	3.6078E-05
Bi^{+3}	0.00E+00	0.00E+00	0.00E+00	5.24E-03	5.24E-03	2.38405E-06	2.75931E-05
$C_2O_4^{-2}$	0.00E+00	0.00E+00	0.00E+00	6.28E-01	6.28E-01	0.000285668	0.003306338
Ca^{+2}	0.00E+00	0.00E+00	0.00E+00	5.79E-02	5.79E-02	2.63037E-05	0.000304441
Cd^{+2}	0.00E+00	0.00E+00	0.00E+00	2.06E-02	2.06E-02	9.36407E-06	0.00010838
Ce^{+3}	0.00E+00	0.00E+00	0.00E+00	4.78E-03	4.78E-03	2.17395E-06	2.51615E-05
Cl^-	0.00E+00	0.00E+00	0.00E+00	5.13E-02	5.13E-02	2.33256E-05	0.000269973
CO_3^{-2}	0.00E+00	0.00E+00	0.00E+00	3.11E-01	3.11E-01	0.000141261	0.001634962
Cr^{+3}	0.00E+00	0.00E+00	0.00E+00	3.12E-02	3.12E-02	1.41838E-05	0.000164165
Cu^{+2}	0.00E+00	0.00E+00	0.00E+00	1.09E-03	1.09E-03	4.96373E-07	5.74505E-06
F^-	0.00E+00	0.00E+00	0.00E+00	6.82E-02	6.82E-02	3.10211E-05	0.00035904
Fe^{+3}	0.00E+00	0.00E+00	0.00E+00	5.82E-02	5.82E-02	2.64561E-05	0.000306205
H^+	0.00E+00	0.00E+00	0.00E+00		0.00E+00	0	0
H_2O	0.00E+00	0.00E+00	0.00E+00		0.00E+00	0	0
Hg^{+2}	0.00E+00	0.00E+00	0.00E+00	3.66E-03	3.66E-03	1.66521E-06	1.92733E-05
K^+	0.00E+00	0.00E+00	0.00E+00	2.09E-01	2.09E-01	9.48457E-05	0.001097751
La^{+3}	0.00E+00	0.00E+00	0.00E+00	4.11E-03	4.11E-03	1.86866E-06	2.1628E-05
Li^+	0.00E+00	0.00E+00	0.00E+00	1.48E-03	1.48E-03	6.72836E-07	7.78746E-06
Mg^{+2}	0.00E+00	0.00E+00	0.00E+00	4.40E-03	4.40E-03	2.00191E-06	2.31703E-05
Mn^{+3}	0.00E+00	0.00E+00	0.00E+00	1.71E-02	1.71E-02	7.78859E-06	9.01457E-05
MnO_4^-	0.00E+00	0.00E+00	0.00E+00		0.00E+00	0	0
Na^+	0.00E+00	0.00E+00	0.00E+00	7.42E-01	7.42E-01	0.000337109	0.003901728
NH_4^+	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0	0
Ni^{+2}	0.00E+00	0.00E+00	0.00E+00	8.59E-03	8.59E-03	3.90617E-06	4.52103E-05
NO_2^-	0.00E+00	0.00E+00	0.00E+00	2.69E-01	2.69E-01	0.000122125	0.001413484
NO_3^-	0.00E+00	0.00E+00	0.00E+00	1.41E+00	1.41E+00	0.000641309	0.007422562
O^{-2}				1.63E-01	1.63E-01	7.39167E-05	0.000855517
OH^-	0.00E+00	0.00E+00	0.00E+00	7.98E-01	7.98E-01	0.000362651	0.004197349
$OH(b)^-$	0.00E+00	0.00E+00	0.00E+00		0.00E+00	0	0
P^{+5}				5.39E-10	5.39E-10	2.44948E-13	2.83505E-12
Pb^{+2}	0.00E+00	0.00E+00	0.00E+00	5.65E-03	5.65E-03	2.56841E-06	2.97269E-05
Pd^{+2}	0.00E+00	0.00E+00	0.00E+00	2.10E-04	2.10E-04	9.55297E-08	1.10567E-06
PO_4^{-3}	0.00E+00	0.00E+00	0.00E+00	1.97E-01	1.97E-01	8.95391E-05	0.001036332
S^{+6}				1.63E-09	1.63E-09	7.41195E-13	8.57864E-12
Si^{+4}				3.33E-02	3.33E-02	1.51193E-05	0.000174991
SiO_4^{-4}	0.00E+00	0.00E+00	0.00E+00		0.00E+00	0	0
SO_4^{-2}	0.00E+00	0.00E+00	0.00E+00	1.02E-01	1.02E-01	4.63887E-05	0.000536906
Sr^{+2}	0.00E+00	0.00E+00	0.00E+00	8.69E-04	8.69E-04	3.95191E-07	4.57397E-06
Ti^{+4}	0.00E+00	0.00E+00	0.00E+00	5.27E-03	5.27E-03	2.39325E-06	2.76996E-05
Zn^{+2}	0.00E+00	0.00E+00	0.00E+00	2.03E-03	2.03E-03	9.21311E-07	1.06633E-05

BY: E. Berrios
DATE: 03/13/03

CALCULATION SHEET

PROJECT: WTP
JOB NO.: 24590
CALC NO.: 24590-WTP-M4C-FRP-00003
SHEET REV: A
SHEET NO.: 19

SUBJECT: Integrated Baseline Emissions Report Non-SSFM Represented Constituents Emissions Rate Estimation

Zr^{+4}	0.00E+00	0.00E+00	0.00E+00	2.25E-02	2.25E-02	1.02167E-05	0.000118249

Rad.	Aqueous Rad. Components			Solids Rad. Components (1)			Total Rad. Components (1)		
Component	Ci/L	Ci/day	Lb/day	Ci/L	Ci/day	Lb/day	Ci/L	Ci/day	Lb/day
Total	0.00E+00	0.00E+00	0.00E+00	1.03E-08	1.47E+01	3.56E-02	1.03E-08	1.47E+01	3.56E-02
^{241}Am	0	0.00E+00	0.00E+00	4.09E-11	5.84E-02	3.76E-05	4.09E-11	5.84E-02	3.76E-05
^{14}C	0.00E+00	0.00E+00	0.00E+00	6.85E-14	9.78E-05	4.83E-08	6.85E-14	9.78E-05	4.83E-08
^{60}Co	0.00E+00	0.00E+00	0.00E+00	4.62E-12	6.60E-03	1.29E-08	4.62E-12	6.60E-03	1.29E-08
^{243}Cm	0.00E+00	0.00E+00	0.00E+00	1.36E-12	1.94E-03	8.47E-08	1.36E-12	1.94E-03	8.47E-08
^{244}Cm	0.00E+00	0.00E+00	0.00E+00	1.02E-12	1.46E-03	3.97E-08	1.02E-12	1.46E-03	3.97E-08
^{137}Cs	0.00E+00	0.00E+00	0.00E+00	5.31E-09	7.58E+00	1.93E-04	5.31E-09	7.58E+00	1.93E-04
^{152}Eu	0.00E+00	0.00E+00	0.00E+00	5.41E-13	7.73E-04	9.80E-09	5.41E-13	7.73E-04	9.80E-09
^{154}Eu	0.00E+00	0.00E+00	0.00E+00	2.46E-11	3.52E-02	2.87E-07	2.46E-11	3.52E-02	2.87E-07
^{155}Eu	0.00E+00	0.00E+00	0.00E+00	1.50E-11	2.14E-02	9.72E-08	1.50E-11	2.14E-02	9.72E-08
^{3}H	0.00E+00	0.00E+00	0.00E+00	5.76E-13	8.23E-04	1.89E-10	5.76E-13	8.23E-04	1.89E-10
^{129}I	0.00E+00	0.00E+00	0.00E+00	9.05E-16	1.29E-06	1.61E-05	9.05E-16	1.29E-06	1.61E-05
^{63}Ni	0.00E+00	0.00E+00	0.00E+00	2.75E-12	3.93E-03	1.53E-07	2.75E-12	3.93E-03	1.53E-07
^{237}Np	0.00E+00	0.00E+00	0.00E+00	3.37E-14	4.82E-05	1.51E-04	3.37E-14	4.82E-05	1.51E-04
^{238}Pu	0.00E+00	0.00E+00	0.00E+00	1.59E-13	2.27E-04	2.93E-08	1.59E-13	2.27E-04	2.93E-08
^{239}Pu	0.00E+00	0.00E+00	0.00E+00	1.41E-12	2.02E-03	7.16E-05	1.41E-12	2.02E-03	7.16E-05
^{240}Pu	0.00E+00	0.00E+00	0.00E+00	7.81E-14	1.12E-04	1.08E-06	7.81E-14	1.12E-04	1.08E-06
^{241}Pu	0.00E+00	0.00E+00	0.00E+00	1.00E-11	1.43E-02	3.06E-07	1.00E-11	1.43E-02	3.06E-07
^{125}Sb	0.00E+00	0.00E+00	0.00E+00	1.95E-11	2.79E-02	5.93E-08	1.95E-11	2.79E-02	5.93E-08
^{151}Sm	0.00E+00	0.00E+00	0.00E+00	1.07E-10	1.52E-01	1.28E-05	1.07E-10	1.52E-01	1.28E-05
^{126}Sn	0.00E+00	0.00E+00	0.00E+00	1.05E-13	1.50E-04	2.92E-05	1.05E-13	1.50E-04	2.92E-05
^{90}Sr	0.00E+00	0.00E+00	0.00E+00	4.76E-09	6.80E+00	1.08E-04	4.76E-09	6.80E+00	1.08E-04
^{99}Tc	0.00E+00	0.00E+00	0.00E+00	1.29E-11	1.85E-02	2.40E-03	1.29E-11	1.85E-02	2.40E-03
^{232}Th	0.00E+00	0.00E+00	0.00E+00	4.93E-16	7.05E-07	1.41E-02	4.93E-16	7.05E-07	1.41E-02
^{233}U	0.00E+00	0.00E+00	0.00E+00	2.96E-15	4.23E-06	9.69E-07	2.96E-15	4.23E-06	9.69E-07
^{234}U	0.00E+00	0.00E+00	0.00E+00	2.97E-15	4.24E-06	1.51E-06	2.97E-15	4.24E-06	1.51E-06
^{235}U	0.00E+00	0.00E+00	0.00E+00	1.71E-16	2.44E-07	2.49E-04	1.71E-16	2.44E-07	2.49E-04
^{236}U	0.00E+00	0.00E+00	0.00E+00	2.18E-16	3.12E-07	1.06E-05	2.18E-16	3.12E-07	1.06E-05
^{238}U	0.00E+00	0.00E+00	0.00E+00	1.94E-15	2.77E-06	1.82E-02	1.94E-15	2.77E-06	1.82E-02

Table A-3 FEP06 Stream Report

Stream Number: FEP06
Stream Name: Evaporator overheads with Air
Configuration: 0
0
Run Data File: H:\Working Folder 2 (john)\MRQ_03_002_run2a_Streams.csv
Run Date / Time: 1/16/2003 - 1:27:28 PM

Read this note for program instructions.

Stream Properties Variable	Value	Units
Density	5.96E-05	g/cm^3
Enthalpy	-8.92E+07	BTU/hr
Mass Flow	1.57E+04	Lb/hr
	3.76E+05	Lb/day
Volumetric Flow	5.23E+05	GPM
Molar Flow	8.64E+02	Lbmol/hr
Volumetric Flow	6.99E+04	ft^3/min
Molecular Weight	1.81E+01	Lb/Lbmol
Pressure	8.97E+01	mbar
Temperature	5.41E+01	C
Viscosity	1.09E-02	cP
Na Molarity	0.00E+00	mol/L
pH	#NUM!	pH
Total TRU	2.02E-11	Ci/L
Total Activity	7.75E-09	Ci/L

Gaseous Components (1) Component	mol/L	Lb/day	Mt/day
CO	8.41E-24	1.48E-15	6.73291E-19
CO_2	5.53E-09	1.53E+00	0.000695604
H_2O	3.28E-03	3.72E+05	169.0691572
NO	9.42E-27	1.78E-18	8.08288E-22
NO_2	7.11E-36	2.06E-27	9.35398E-31
N_2	1.18E-05	2.08E+03	0.947181242
O_2	3.24E-06	6.52E+02	0.296196622
SO_2	5.54E-29	2.23E-20	1.01427E-23
NH_3	9.04E-07	9.68E+01	0.043993144
HNO_3	1.81E-18	7.19E-10	3.26717E-13
HCl	2.56E-28	5.88E-20	2.67295E-23
HF	8.49E-29	1.07E-20	4.85366E-24

(1) All radionuclides in gaseous streams are assumed to exist as solid particulate.

Component	Aqueous Components mol/L	Lb/gal	Lb/day	Solid Components Lb/day	Total Component Lb/day	mt/day	g/sec
Total	0.00E+00	0.00E+00	0.00E+00	8.34E+02	8.34E+02	0.37899515	4.386517936
Ag^+	0.00E+00	0.00E+00	0.00E+00	1.97E-02	1.97E-02	8.97617E-06	0.000103891
Al^{+3}	0.00E+00	0.00E+00	0.00E+00	2.43E+00	2.43E+00	0.001102285	0.012757929
As^{+3}	0.00E+00	0.00E+00	0.00E+00	6.01E+00	6.01E+00	0.002730423	0.031602116
B^{+3}	0.00E+00	0.00E+00	0.00E+00	7.69E-02	7.69E-02	3.4977E-05	0.000404827
Ba^{+2}	0.00E+00	0.00E+00	0.00E+00	1.13E-01	1.13E-01	5.14709E-05	0.000595728
Bi^{+3}	0.00E+00	0.00E+00	0.00E+00	2.20E-02	2.20E-02	9.98732E-06	0.000115594
$C_2O_4^{-2}$	0.00E+00	0.00E+00	0.00E+00	7.49E+02	7.49E+02	0.340674345	3.942990105
Ca^{+2}	0.00E+00	0.00E+00	0.00E+00	9.67E-01	9.67E-01	0.000439474	0.005086509
Cd^{+2}	0.00E+00	0.00E+00	0.00E+00	1.55E-02	1.55E-02	7.05508E-06	8.1656E-05
Ce^{+3}	0.00E+00	0.00E+00	0.00E+00	7.67E-02	7.67E-02	3.48734E-05	0.000403628
Cl^-	0.00E+00	0.00E+00	0.00E+00	1.58E+00	1.58E+00	0.000720269	0.008336447
CO_3^{-2}	0.00E+00	0.00E+00	0.00E+00	5.26E+00	5.26E+00	0.002392936	0.027696014
Cr^{+3}	0.00E+00	0.00E+00	0.00E+00	1.51E-02	1.51E-02	6.85774E-06	7.9372E-05
Cu^{+2}	0.00E+00	0.00E+00	0.00E+00	1.82E-02	1.82E-02	8.28032E-06	9.5837E-05
F^-	0.00E+00	0.00E+00	0.00E+00	4.54E-02	4.54E-02	2.0652E-05	0.000239028
Fe^{+3}	0.00E+00	0.00E+00	0.00E+00	9.61E-01	9.61E-01	0.000437023	0.005058139
H^+	0.00E+00	0.00E+00	0.00E+00		0.00E+00	0	0
H_2O	0.00E+00	0.00E+00	0.00E+00		0.00E+00	0	0
Hg^{+2}	0.00E+00	0.00E+00	0.00E+00	5.13E-02	5.13E-02	2.33109E-05	0.000269802
K^+	0.00E+00	0.00E+00	0.00E+00	1.00E+00	1.00E+00	0.000455222	0.005268776
La^{+3}	0.00E+00	0.00E+00	0.00E+00	6.78E-02	6.78E-02	3.08247E-05	0.000356768
Li^+	0.00E+00	0.00E+00	0.00E+00	5.96E-04	5.96E-04	2.70715E-07	3.13327E-06
Mg^{+2}	0.00E+00	0.00E+00	0.00E+00	7.08E-02	7.08E-02	3.21618E-05	0.000372243
Mn^{+3}	0.00E+00	0.00E+00	0.00E+00	2.86E-01	2.86E-01	0.000130035	0.001505032
MnO_4^-	0.00E+00	0.00E+00	0.00E+00		0.00E+00	0	0
Na^+	0.00E+00	0.00E+00	0.00E+00	4.17E-01	4.17E-01	0.00018967	0.002195254
NH_4^+	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0	0
Ni^{+2}	0.00E+00	0.00E+00	0.00E+00	4.93E-03	4.93E-03	2.24105E-06	2.5938E-05
NO_2^-	0.00E+00	0.00E+00	0.00E+00	1.90E+00	1.90E+00	0.000862321	0.009980562
NO_3^-	0.00E+00	0.00E+00	0.00E+00	4.17E+01	4.17E+01	0.018950838	0.219338408
O^{-2}				2.15E+00	2.15E+00	0.000976222	0.011298869
OH^-	0.00E+00	0.00E+00	0.00E+00	1.35E+01	1.35E+01	0.006134176	0.070997409
$OH(b)^-$	0.00E+00	0.00E+00	0.00E+00		0.00E+00	0	0
P^{+5}				2.88E-09	2.88E-09	1.30952E-12	1.51565E-11
Pb^{+2}	0.00E+00	0.00E+00	0.00E+00	2.40E-02	2.40E-02	1.09257E-05	0.000126455
Pd^{+2}	0.00E+00	0.00E+00	0.00E+00	1.19E-04	1.19E-04	5.41159E-08	6.26341E-07
PO_4^{-3}	0.00E+00	0.00E+00	0.00E+00	3.34E+00	3.34E+00	0.001520042	0.017593075
S^{+6}				2.69E-08	2.69E-08	1.22381E-11	1.41645E-10
Si^{+4}				5.24E-01	5.24E-01	0.000238077	0.002755519
SiO_4^{-4}	0.00E+00	0.00E+00	0.00E+00		0.00E+00	0	0
SO_4^{-2}	0.00E+00	0.00E+00	0.00E+00	1.23E+00	1.23E+00	0.000560821	0.006490988
Sr^{+2}	0.00E+00	0.00E+00	0.00E+00	6.26E-05	6.26E-05	2.84615E-08	3.29415E-07
Ti^{+4}	0.00E+00	0.00E+00	0.00E+00	4.23E-02	4.23E-02	1.92094E-05	0.000222331
Zn^{+2}	0.00E+00	0.00E+00	0.00E+00	2.47E-02	2.47E-02	1.12219E-05	0.000129884

BY: E. Berrios
DATE: 03/13/03

CALCULATION SHEET

PROJECT: WTP
JOB NO.: 24590
CALC NO.: 24590-WTP-M4C-FRP-00003
SHEET REV: A
SHEET NO.: 21

SUBJECT: Integrated Baseline Emissions Report Non-SSFM Represented Constituents Emissions Rate Estimation

Zr^{+4}	0.00E+00	0.00E+00	0.00E+00	3.69E-01	3.69E-01	0.000167592	0.001939717

Rad. Component	Aqueous Rad. Components			Solids Rad. Components (1)			Total Rad. Components (1)		
	Ci/L	Ci/day	Lb/day	Ci/L	Ci/day	Lb/day	Ci/L	Ci/day	Lb/day
Total	0.00E+00	0.00E+00	0.00E+00	7.75E-09	2.21E+01	5.86E-01	7.75E-09	2.21E+01	5.86E-01
^{241}Am	0	0.00E+00	0.00E+00	2.42E-13	6.90E-04	4.44E-07	2.42E-13	6.90E-04	4.44E-07
^{14}C	0.00E+00	0.00E+00	0.00E+00	5.83E-13	1.66E-03	8.20E-07	5.83E-13	1.66E-03	8.20E-07
^{60}Co	0.00E+00	0.00E+00	0.00E+00	3.82E-11	1.09E-01	2.12E-07	3.82E-11	1.09E-01	2.12E-07
^{243}Cm	0.00E+00	0.00E+00	0.00E+00	1.12E-11	3.20E-02	1.40E-06	1.12E-11	3.20E-02	1.40E-06
^{244}Cm	0.00E+00	0.00E+00	0.00E+00	8.42E-12	2.40E-02	6.54E-07	8.42E-12	2.40E-02	6.54E-07
^{137}Cs	0.00E+00	0.00E+00	0.00E+00	5.28E-13	1.51E-03	3.82E-08	5.28E-13	1.51E-03	3.82E-08
^{152}Eu	0.00E+00	0.00E+00	0.00E+00	3.26E-15	9.29E-06	1.18E-10	3.26E-15	9.29E-06	1.18E-10
^{154}Eu	0.00E+00	0.00E+00	0.00E+00	1.46E-13	4.16E-04	3.40E-09	1.46E-13	4.16E-04	3.40E-09
^{155}Eu	0.00E+00	0.00E+00	0.00E+00	8.90E-14	2.54E-04	1.15E-09	8.90E-14	2.54E-04	1.15E-09
^{3}H	0.00E+00	0.00E+00	0.00E+00	7.37E-09	2.10E+01	4.83E-06	7.37E-09	2.10E+01	4.83E-06
^{129}I	0.00E+00	0.00E+00	0.00E+00	1.73E-14	4.94E-05	6.16E-04	1.73E-14	4.94E-05	6.16E-04
^{63}Ni	0.00E+00	0.00E+00	0.00E+00	7.82E-13	2.23E-03	8.66E-08	7.82E-13	2.23E-03	8.66E-08
^{237}Np	0.00E+00	0.00E+00	0.00E+00	2.79E-13	7.95E-04	2.49E-03	2.79E-13	7.95E-04	2.49E-03
^{238}Pu	0.00E+00	0.00E+00	0.00E+00	3.55E-16	1.01E-06	1.30E-10	3.55E-16	1.01E-06	1.30E-10
^{239}Pu	0.00E+00	0.00E+00	0.00E+00	3.15E-15	8.98E-06	3.19E-07	3.15E-15	8.98E-06	3.19E-07
^{240}Pu	0.00E+00	0.00E+00	0.00E+00	1.74E-16	4.97E-07	4.82E-09	1.74E-16	4.97E-07	4.82E-09
^{241}Pu	0.00E+00	0.00E+00	0.00E+00	2.23E-14	6.36E-05	1.36E-09	2.23E-14	6.36E-05	1.36E-09
^{125}Sb	0.00E+00	0.00E+00	0.00E+00	4.10E-11	1.17E-01	2.49E-07	4.10E-11	1.17E-01	2.49E-07
^{151}Sm	0.00E+00	0.00E+00	0.00E+00	2.42E-13	6.91E-04	5.78E-08	2.42E-13	6.91E-04	5.78E-08
^{126}Sn	0.00E+00	0.00E+00	0.00E+00	2.22E-13	6.32E-04	1.23E-04	2.22E-13	6.32E-04	1.23E-04
^{90}Sr	0.00E+00	0.00E+00	0.00E+00	1.71E-10	4.88E-01	7.79E-06	1.71E-10	4.88E-01	7.79E-06
^{99}Tc	0.00E+00	0.00E+00	0.00E+00	1.03E-10	2.95E-01	3.83E-02	1.03E-10	2.95E-01	3.83E-02
^{232}Th	0.00E+00	0.00E+00	0.00E+00	4.11E-15	1.17E-05	2.35E-01	4.11E-15	1.17E-05	2.35E-01
^{233}U	0.00E+00	0.00E+00	0.00E+00	2.51E-14	7.17E-05	1.64E-05	2.51E-14	7.17E-05	1.64E-05
^{234}U	0.00E+00	0.00E+00	0.00E+00	2.49E-14	7.10E-05	2.52E-05	2.49E-14	7.10E-05	2.52E-05
^{235}U	0.00E+00	0.00E+00	0.00E+00	1.42E-15	4.06E-06	4.15E-03	1.42E-15	4.06E-06	4.15E-03
^{236}U	0.00E+00	0.00E+00	0.00E+00	1.85E-15	5.26E-06	1.79E-04	1.85E-15	5.26E-06	1.79E-04
^{238}U	0.00E+00	0.00E+00	0.00E+00	1.63E-14	4.65E-05	3.05E-01	1.63E-14	4.65E-05	3.05E-01

Table A-4 PVP01 Stream Report

Stream Number: PVP01
Stream Name: Pretreatment vessel vents feed to caustic scrubber
Configuration: 0
0
Run Data File: H:\Working Folder 2 (john)\MRQ_03_002_run2a_Streams.csv
Run Date / Time: 1/16/2003 - 1:27:28 PM

Read this note for program instructions.

Stream Properties Variable	Value	Units
Density	1.13E-03	g/cm^3
Enthalpy	-1.63E+06	BTU/hr
Mass Flow	1.13E+04	Lb/hr
	2.70E+05	Lb/day
Volumetric Flow	1.98E+04	GPM
Molar Flow	3.96E+02	Lbmol/hr
Volumetric Flow	2.65E+03	ft^3/min
Molecular Weight	2.84E+01	Lb/Lbmol
Pressure	1.00E+03	mbar
Temperature	2.87E+01	C
Viscosity	1.84E-02	cP
Na Molarity	0.00E+00	mol/L
pH	#NUM!	pH
Total TRU	4.31E-11	Ci/L
Total Activity	1.26E-08	Ci/L

Gaseous Components (1) Component	mol/L	Lb/day	Mt/day
CO	2.30E-27	1.53E-20	6.97408E-24
CO_2	2.39E-07	2.50E+00	0.001137715
H_2O	1.59E-03	6.82E+03	3.098869253
NO	8.44E-31	6.03E-24	2.74254E-27
NO_2	5.20E-40	5.69E-33	2.58847E-36
N_2	3.02E-02	2.02E+05	91.74652304
O_2	8.04E-03	6.13E+04	27.84468279
SO_2	1.17E-27	1.79E-20	8.11802E-24
NH_3	8.08E-06	3.28E+01	0.014894544
HNO_3	1.67E-09	2.51E-02	1.13959E-05
HCl	6.77E-33	5.88E-26	2.67298E-29
HF	1.03E-32	4.93E-26	2.24117E-29

(1) All radionuclides in gaseous streams are assumed to exist as solid particulate.

Component	Aqueous Components mol/L	Lb/gal	Lb/day	Solid Components Lb/day	Total Component Lb/day	mt/day	g/sec
Total	0.00E+00	0.00E+00	0.00E+00	7.66E-01	7.66E-01	0.000348363	0.00403198
Ag^+	0.00E+00	0.00E+00	0.00E+00	1.30E-04	1.30E-04	5.89439E-08	6.82222E-07
Al^{+3}	0.00E+00	0.00E+00	0.00E+00	2.68E-02	2.68E-02	1.21808E-05	0.000140981
As^{+3}	0.00E+00	0.00E+00	0.00E+00	3.47E-02	3.47E-02	1.57936E-05	0.000182797
B^{+3}	0.00E+00	0.00E+00	0.00E+00	9.70E-04	9.70E-04	4.40965E-07	5.10376E-06
Ba^{+2}	0.00E+00	0.00E+00	0.00E+00	6.52E-04	6.52E-04	2.96158E-07	3.42775E-06
Bi^{+3}	0.00E+00	0.00E+00	0.00E+00	3.59E-04	3.59E-04	1.63135E-07	1.88814E-06
$C_2O_4^{-2}$	0.00E+00	0.00E+00	0.00E+00	6.57E-02	6.57E-02	2.98632E-05	0.000345638
Ca^{+2}	0.00E+00	0.00E+00	0.00E+00	9.17E-02	9.17E-02	4.16651E-05	0.000482235
Cd^{+2}	0.00E+00	0.00E+00	0.00E+00	1.80E-03	1.80E-03	8.1831E-07	9.47118E-06
Ce^{+3}	0.00E+00	0.00E+00	0.00E+00	5.76E-04	5.76E-04	2.62027E-07	3.03272E-06
Cl^-	0.00E+00	0.00E+00	0.00E+00	5.78E-03	5.78E-03	2.62906E-06	3.0429E-05
CO_3^{-2}	0.00E+00	0.00E+00	0.00E+00	5.51E-02	5.51E-02	2.50383E-05	0.000289795
Cr^{+3}	0.00E+00	0.00E+00	0.00E+00	3.14E-03	3.14E-03	1.42588E-06	1.65032E-05
Cu^{+2}	0.00E+00	0.00E+00	0.00E+00	1.23E-04	1.23E-04	5.58431E-08	6.46332E-07
F^-	0.00E+00	0.00E+00	0.00E+00	6.69E-03	6.69E-03	3.03911E-06	3.51749E-05
Fe^{+3}	0.00E+00	0.00E+00	0.00E+00	6.39E-03	6.39E-03	2.90402E-06	3.36114E-05
H^+	0.00E+00	0.00E+00	0.00E+00		0.00E+00	0	0
H_2O	0.00E+00	0.00E+00	0.00E+00		0.00E+00	0	0
Hg^{+2}	0.00E+00	0.00E+00	0.00E+00	2.66E-04	2.66E-04	1.20762E-07	1.3977E-06
K^+	0.00E+00	0.00E+00	0.00E+00	2.36E-02	2.36E-02	1.07485E-05	0.000124403
La^{+3}	0.00E+00	0.00E+00	0.00E+00	3.63E-04	3.63E-04	1.649E-07	1.90857E-06
Li^+	0.00E+00	0.00E+00	0.00E+00	1.39E-04	1.39E-04	6.33848E-08	7.3362E-07
Mg^{+2}	0.00E+00	0.00E+00	0.00E+00	3.48E-03	3.48E-03	1.58285E-06	1.83201E-05
Mn^{+3}	0.00E+00	0.00E+00	0.00E+00	1.93E-03	1.93E-03	8.76458E-07	1.01442E-05
MnO_4^-	0.00E+00	0.00E+00	0.00E+00		0.00E+00	0	0
Na^+	0.00E+00	0.00E+00	0.00E+00	9.23E-02	9.23E-02	4.1963E-05	0.000485683
NH_4^+	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0	0
Ni^{+2}	0.00E+00	0.00E+00	0.00E+00	7.33E-04	7.33E-04	3.33371E-07	3.85847E-06
NO_2^-	0.00E+00	0.00E+00	0.00E+00	2.73E-02	2.73E-02	1.24025E-05	0.000143547
NO_3^-	0.00E+00	0.00E+00	0.00E+00	1.45E-01	1.45E-01	6.59558E-05	0.000763377
O^{-2}				1.40E-02	1.40E-02	6.35493E-06	7.35525E-05
OH^-	0.00E+00	0.00E+00	0.00E+00	1.09E-01	1.09E-01	4.96737E-05	0.000574927
$OH(b)^-$	0.00E+00	0.00E+00	0.00E+00		0.00E+00	0	0
P^{+5}				1.22E-08	1.22E-08	5.53418E-12	6.4053E-11
Pb^{+2}	0.00E+00	0.00E+00	0.00E+00	5.08E-04	5.08E-04	2.30846E-07	2.67183E-06
Pd^{+2}	0.00E+00	0.00E+00	0.00E+00	1.35E-05	1.35E-05	6.13278E-09	7.09812E-08
PO_4^{-3}	0.00E+00	0.00E+00	0.00E+00	2.74E-02	2.74E-02	1.24418E-05	0.000144003
S^{+6}				2.72E-05	2.72E-05	1.23772E-08	1.43255E-07
Si^{+4}				4.97E-03	4.97E-03	2.25979E-06	2.61549E-05
SiO_4^{-4}	0.00E+00	0.00E+00	0.00E+00		0.00E+00	0	0
SO_4^{-2}	0.00E+00	0.00E+00	0.00E+00	1.12E-02	1.12E-02	5.07967E-06	5.87925E-05
Sr^{+2}	0.00E+00	0.00E+00	0.00E+00	5.58E-05	5.58E-05	2.53739E-08	2.9368E-07
Ti^{+4}	0.00E+00	0.00E+00	0.00E+00	7.59E-04	7.59E-04	3.44809E-07	3.99085E-06

BY: E. Berrios
DATE: 03/13/03

CALCULATION SHEET

PROJECT: WTP
JOB NO.: 24590
CALC NO.: 24590-WTP-M4C-FRP-00003
SHEET REV: A
SHEET NO.: 23

SUBJECT: Integrated Baseline Emissions Report Non-SSFM Represented Constituents Emissions Rate Estimation

Zn^{+2}	0.00E+00	0.00E+00	0.00E+00	2.67E-04	2.67E-04	1.21481E-07	1.40603E-06
Zr^{+4}	0.00E+00	0.00E+00	0.00E+00	2.13E-03	2.13E-03	9.66247E-07	1.11834E-05

Rad. Component	Aqueous Rad. Components			Solids Rad. Components (1)			Total Rad. Components (1)		
	Ci/L	Ci/day	Lb/day	Ci/L	Ci/day	Lb/day	Ci/L	Ci/day	Lb/day
Total	0.00E+00	0.00E+00	0.00E+00	1.26E-08	1.36E+00	3.82E-03	1.26E-08	1.36E+00	3.82E-03
^{241}Am	0	0.00E+00	0.00E+00	3.15E-11	3.40E-03	2.19E-06	3.15E-11	3.40E-03	2.19E-06
^{14}C	0.00E+00	0.00E+00	0.00E+00	1.39E-13	1.50E-05	7.42E-09	1.39E-13	1.50E-05	7.42E-09
^{60}Co	0.00E+00	0.00E+00	0.00E+00	5.19E-12	5.61E-04	1.09E-09	5.19E-12	5.61E-04	1.09E-09
^{243}Cm	0.00E+00	0.00E+00	0.00E+00	1.50E-12	1.62E-04	7.07E-09	1.50E-12	1.62E-04	7.07E-09
^{244}Cm	0.00E+00	0.00E+00	0.00E+00	1.13E-12	1.22E-04	3.31E-09	1.13E-12	1.22E-04	3.31E-09
^{137}Cs	0.00E+00	0.00E+00	0.00E+00	5.55E-09	6.00E-01	1.52E-05	5.55E-09	6.00E-01	1.52E-05
^{152}Eu	0.00E+00	0.00E+00	0.00E+00	6.03E-13	6.51E-05	8.26E-10	6.03E-13	6.51E-05	8.26E-10
^{154}Eu	0.00E+00	0.00E+00	0.00E+00	1.95E-11	2.11E-03	1.72E-08	1.95E-11	2.11E-03	1.72E-08
^{155}Eu	0.00E+00	0.00E+00	0.00E+00	1.26E-11	1.36E-03	6.17E-09	1.26E-11	1.36E-03	6.17E-09
^{3}H	0.00E+00	0.00E+00	0.00E+00	3.04E-09	3.28E-01	7.53E-08	3.04E-09	3.28E-01	7.53E-08
^{129}I	0.00E+00	0.00E+00	0.00E+00	2.01E-15	2.17E-07	2.71E-06	2.01E-15	2.17E-07	2.71E-06
^{63}Ni	0.00E+00	0.00E+00	0.00E+00	2.49E-12	2.69E-04	1.04E-08	2.49E-12	2.69E-04	1.04E-08
^{237}Np	0.00E+00	0.00E+00	0.00E+00	3.74E-14	4.04E-06	1.26E-05	3.74E-14	4.04E-06	1.26E-05
^{238}Pu	0.00E+00	0.00E+00	0.00E+00	1.23E-13	1.32E-05	1.70E-09	1.23E-13	1.32E-05	1.70E-09
^{239}Pu	0.00E+00	0.00E+00	0.00E+00	1.09E-12	1.18E-04	4.17E-06	1.09E-12	1.18E-04	4.17E-06
^{240}Pu	0.00E+00	0.00E+00	0.00E+00	6.06E-14	6.55E-06	6.36E-08	6.06E-14	6.55E-06	6.36E-08
^{241}Pu	0.00E+00	0.00E+00	0.00E+00	7.69E-12	8.31E-04	1.78E-08	7.69E-12	8.31E-04	1.78E-08
^{125}Sb	0.00E+00	0.00E+00	0.00E+00	1.79E-11	1.93E-03	4.11E-09	1.79E-11	1.93E-03	4.11E-09
^{151}Sm	0.00E+00	0.00E+00	0.00E+00	1.17E-10	1.27E-02	1.06E-06	1.17E-10	1.27E-02	1.06E-06
^{126}Sn	0.00E+00	0.00E+00	0.00E+00	1.03E-13	1.11E-05	2.15E-06	1.03E-13	1.11E-05	2.15E-06
^{90}Sr	0.00E+00	0.00E+00	0.00E+00	3.77E-09	4.07E-01	6.49E-06	3.77E-09	4.07E-01	6.49E-06
^{99}Tc	0.00E+00	0.00E+00	0.00E+00	1.42E-11	1.53E-03	1.99E-04	1.42E-11	1.53E-03	1.99E-04
^{232}Th	0.00E+00	0.00E+00	0.00E+00	6.52E-16	7.05E-08	1.41E-03	6.52E-16	7.05E-08	1.41E-03
^{233}U	0.00E+00	0.00E+00	0.00E+00	5.75E-15	6.22E-07	1.42E-07	5.75E-15	6.22E-07	1.42E-07
^{234}U	0.00E+00	0.00E+00	0.00E+00	4.72E-15	5.10E-07	1.81E-07	4.72E-15	5.10E-07	1.81E-07
^{235}U	0.00E+00	0.00E+00	0.00E+00	2.44E-16	2.64E-08	2.69E-05	2.44E-16	2.64E-08	2.69E-05
^{236}U	0.00E+00	0.00E+00	0.00E+00	4.08E-16	4.41E-08	1.50E-06	4.08E-16	4.41E-08	1.50E-06
^{238}U	0.00E+00	0.00E+00	0.00E+00	3.01E-15	3.25E-07	2.13E-03	3.01E-15	3.25E-07	2.13E-03

Table A-5 TLP01 Stream Report

Read this note for program instructions.

Stream Number: TLP01
Stream Name: Overheads from evaporator with air
Configuration: 0
0
Run Data File: H:\Working Folder 2 (john)\MRQ_03_002_run2a_Streams.csv
Run Date / Time: 1/16/2003 - 1:27:28 PM

Stream Properties Variable	Value	Units
Density	5.78E-05	g/cm^3
Enthalpy	-3.35E+07	BTU/hr
Mass Flow	5.89E+03	Lb/hr
	1.41E+05	Lb/day
Volumetric Flow	2.03E+05	GPM
Molar Flow	3.25E+02	Lbmol/hr
Volumetric Flow	2.71E+04	ft^3/min
Molecular Weight	1.81E+01	Lb/Lbmol
Pressure	9.00E+01	mbar
Temperature	6.56E+01	C
Viscosity	1.13E-02	cP
Na Molarity	0.00E+00	mol/L
pH	#NUM!	pH
Total TRU	1.42E-14	Ci/L
Total Activity	2.21E-09	Ci/L

Gaseous Components (1) Component	mol/L	Lb/day	Mt/day
CO	6.01E-24	4.10E-16	1.86509E-19
CO_2	2.35E-08	2.52E+00	0.001143638
H_2O	3.18E-03	1.40E+05	63.53843723
NO	0.00E+00	0.00E+00	0
NO_2	3.49E-38	3.92E-30	1.78108E-33
N_2	1.15E-05	7.86E+02	0.357401447
O_2	3.09E-06	2.41E+02	0.109517555
SO_2	0.00E+00	0.00E+00	0
NH_3	1.66E-07	6.88E+00	0.003128441
HNO_3	7.55E-18	1.16E-09	5.27358E-13
HCl	4.28E-34	3.80E-26	1.72905E-29
HF	1.02E-50	5.00E-43	2.27073E-46

(1) All radionuclides in gaseous streams are assumed to exist as solid particulate.

Component	Aqueous Components mol/L	Lb/gal	Lb/day	Solid Components Lb/day	Total Component Lb/day	mt/day	g/sec
Total	0.00E+00	0.00E+00	0.00E+00	4.31E+02	4.31E+02	0.195798721	2.266188905
Ag^+	0.00E+00	0.00E+00	0.00E+00	3.70E-03	3.70E-03	1.68365E-06	1.94867E-05
Al^{+3}	0.00E+00	0.00E+00	0.00E+00	1.28E+00	1.28E+00	0.000580711	0.006721194
As^{+3}	0.00E+00	0.00E+00	0.00E+00	1.69E+00	1.69E+00	0.000767843	0.008887071
B^{+3}	0.00E+00	0.00E+00	0.00E+00	1.37E-01	1.37E-01	6.24922E-05	0.000723289
Ba^{+2}	0.00E+00	0.00E+00	0.00E+00	3.82E-03	3.82E-03	1.73633E-06	2.00964E-05
Bi^{+3}	0.00E+00	0.00E+00	0.00E+00	2.96E-03	2.96E-03	1.34717E-06	1.55922E-05
$C_2O_4^{-2}$	0.00E+00	0.00E+00	0.00E+00	3.88E+02	3.88E+02	0.176477905	2.042568343
Ca^{+2}	0.00E+00	0.00E+00	0.00E+00	5.16E-01	5.16E-01	0.000234616	0.002715469
Cd^{+2}	0.00E+00	0.00E+00	0.00E+00	6.39E-03	6.39E-03	2.90625E-06	3.36372E-05
Ce^{+3}	0.00E+00	0.00E+00	0.00E+00	3.39E-02	3.39E-02	1.5397E-05	0.000178206
Cl^-	0.00E+00	0.00E+00	0.00E+00	1.14E+00	1.14E+00	0.000518521	0.006001404
CO_3^{-2}	0.00E+00	0.00E+00	0.00E+00	2.60E+00	2.60E+00	0.00118113	0.013670492
Cr^{+3}	0.00E+00	0.00E+00	0.00E+00	8.41E-03	8.41E-03	3.82435E-06	4.42634E-05
Cu^{+2}	0.00E+00	0.00E+00	0.00E+00	3.88E-03	3.88E-03	1.76309E-06	2.04061E-05
F^-	0.00E+00	0.00E+00	0.00E+00	3.04E-02	3.04E-02	1.38347E-05	0.000160124
Fe^{+3}	0.00E+00	0.00E+00	0.00E+00	1.79E-01	1.79E-01	8.11998E-05	0.000939812
H^+	0.00E+00	0.00E+00	0.00E+00		0.00E+00	0	0
H_2O	0.00E+00	0.00E+00	0.00E+00		0.00E+00	0	0
Hg^{+2}	0.00E+00	0.00E+00	0.00E+00	4.73E-03	4.73E-03	2.14996E-06	2.48838E-05
K^+	0.00E+00	0.00E+00	0.00E+00	5.94E-01	5.94E-01	0.000269887	0.003123687
La^{+3}	0.00E+00	0.00E+00	0.00E+00	3.58E-03	3.58E-03	1.62686E-06	1.88294E-05
Li^+	0.00E+00	0.00E+00	0.00E+00	9.34E-04	9.34E-04	4.24492E-07	4.91311E-06
Mg^{+2}	0.00E+00	0.00E+00	0.00E+00	1.98E-02	1.98E-02	8.98363E-06	0.000103977
Mn^{+3}	0.00E+00	0.00E+00	0.00E+00	7.59E-02	7.59E-02	3.4513E-05	0.000399456
MnO_4^-	0.00E+00	0.00E+00	0.00E+00		0.00E+00	0	0
Na^+	0.00E+00	0.00E+00	0.00E+00	2.31E-01	2.31E-01	0.000105064	0.001216024
NH_4^+	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0	0
Ni^{+2}	0.00E+00	0.00E+00	0.00E+00	1.72E-03	1.72E-03	7.81366E-07	9.04359E-06
NO_2^-	0.00E+00	0.00E+00	0.00E+00	1.05E+00	1.05E+00	0.000476664	0.00551694
NO_3^-	0.00E+00	0.00E+00	0.00E+00	2.29E+01	2.29E+01	0.010396418	0.120328914
O^{-2}				1.20E+00	1.20E+00	0.000543674	0.006292523
OH^-	0.00E+00	0.00E+00	0.00E+00	6.04E+00	6.04E+00	0.002747498	0.031799747
$OH(b)^-$	0.00E+00	0.00E+00	0.00E+00		0.00E+00	0	0
P^{+5}				8.12E-10	8.12E-10	3.6928E-13	4.27407E-12
Pb^{+2}	0.00E+00	0.00E+00	0.00E+00	9.83E-03	9.83E-03	4.46754E-06	5.17076E-05
Pd^{+2}	0.00E+00	0.00E+00	0.00E+00	1.58E-05	1.58E-05	7.17744E-09	8.30723E-08
PO_4^{-3}	0.00E+00	0.00E+00	0.00E+00	1.78E+00	1.78E+00	0.000809257	0.009366401
S^{+6}				4.67E-28	4.67E-28	2.12146E-31	2.4554E-30
Si^{+4}				1.19E-01	1.19E-01	5.40529E-05	0.000625612
SiO_4^{-4}	0.00E+00	0.00E+00	0.00E+00		0.00E+00	0	0
SO_4^{-2}	0.00E+00	0.00E+00	0.00E+00	6.90E-01	6.90E-01	0.000313628	0.003629954
Sr^{+2}	0.00E+00	0.00E+00	0.00E+00	6.32E-06	6.32E-06	2.87132E-09	3.32329E-08
Ti^{+4}	0.00E+00	0.00E+00	0.00E+00	1.31E-01	1.31E-01	5.94138E-05	0.00068766
Zn^{+2}	0.00E+00	0.00E+00	0.00E+00	3.40E-02	3.40E-02	1.5438E-05	0.00017868

BY: E. Berrios
DATE: 03/13/03

CALCULATION SHEET

PROJECT: WTP
JOB NO.: 24590
CALC NO.: 24590-WTP-M4C-FRP-00003
SHEET REV: A
SHEET NO.: 25

SUBJECT: Integrated Baseline Emissions Report Non-SSFM Represented Constituents Emissions Rate Estimation

Zr^{+4}	0.00E+00	0.00E+00	0.00E+00	1.73E-02	1.73E-02	7.85806E-06	9.09498E-05	

Rad. Component	Aqueous Rad. Components			Solids Rad. Components (1)			Total Rad. Components (1)		
	Ci/L	Ci/day	Lb/day	Ci/L	Ci/day	Lb/day	Ci/L	Ci/day	Lb/day
Total	0.00E+00	0.00E+00	0.00E+00	2.21E-09	2.44E+00	1.39E-01	2.21E-09	2.44E+00	1.39E-01
^{241}Am	0	0.00E+00	0.00E+00	8.36E-16	9.24E-07	5.94E-10	8.36E-16	9.24E-07	5.94E-10
^{14}C	0.00E+00	0.00E+00	0.00E+00	1.58E-12	1.75E-03	8.64E-07	1.58E-12	1.75E-03	8.64E-07
^{60}Co	0.00E+00	0.00E+00	0.00E+00	2.24E-12	2.47E-03	4.82E-09	2.24E-12	2.47E-03	4.82E-09
^{243}Cm	0.00E+00	0.00E+00	0.00E+00	3.65E-15	4.04E-06	1.76E-10	3.65E-15	4.04E-06	1.76E-10
^{244}Cm	0.00E+00	0.00E+00	0.00E+00	4.69E-15	5.18E-06	1.41E-10	4.69E-15	5.18E-06	1.41E-10
^{137}Cs	0.00E+00	0.00E+00	0.00E+00	1.34E-16	1.49E-07	3.77E-12	1.34E-16	1.49E-07	3.77E-12
^{152}Eu	0.00E+00	0.00E+00	0.00E+00	5.62E-15	6.21E-06	7.88E-11	5.62E-15	6.21E-06	7.88E-11
^{154}Eu	0.00E+00	0.00E+00	0.00E+00	1.86E-14	2.06E-05	1.68E-10	1.86E-14	2.06E-05	1.68E-10
^{155}Eu	0.00E+00	0.00E+00	0.00E+00	3.21E-14	3.54E-05	1.61E-10	3.21E-14	3.54E-05	1.61E-10
^{3}H	0.00E+00	0.00E+00	0.00E+00	2.16E-09	2.39E+00	5.47E-07	2.16E-09	2.39E+00	5.47E-07
^{129}I	0.00E+00	0.00E+00	0.00E+00	2.41E-14	2.67E-05	3.33E-04	2.41E-14	2.67E-05	3.33E-04
^{63}Ni	0.00E+00	0.00E+00	0.00E+00	4.92E-13	5.44E-04	2.11E-08	4.92E-13	5.44E-04	2.11E-08
^{237}Np	0.00E+00	0.00E+00	0.00E+00	4.79E-15	5.30E-06	1.66E-05	4.79E-15	5.30E-06	1.66E-05
^{238}Pu	0.00E+00	0.00E+00	0.00E+00	3.45E-18	3.82E-09	4.91E-13	3.45E-18	3.82E-09	4.91E-13
^{239}Pu	0.00E+00	0.00E+00	0.00E+00	4.05E-17	4.48E-08	1.59E-09	4.05E-17	4.48E-08	1.59E-09
^{240}Pu	0.00E+00	0.00E+00	0.00E+00	7.07E-18	7.81E-09	7.59E-11	7.07E-18	7.81E-09	7.59E-11
^{241}Pu	0.00E+00	0.00E+00	0.00E+00	1.71E-16	1.89E-07	4.05E-12	1.71E-16	1.89E-07	4.05E-12
^{125}Sb	0.00E+00	0.00E+00	0.00E+00	3.04E-11	3.36E-02	7.14E-08	3.04E-11	3.36E-02	7.14E-08
^{151}Sm	0.00E+00	0.00E+00	0.00E+00	4.02E-13	4.44E-04	3.72E-08	4.02E-13	4.44E-04	3.72E-08
^{126}Sn	0.00E+00	0.00E+00	0.00E+00	2.27E-13	2.51E-04	4.88E-05	2.27E-13	2.51E-04	4.88E-05
^{90}Sr	0.00E+00	0.00E+00	0.00E+00	1.10E-11	1.21E-02	1.94E-07	1.10E-11	1.21E-02	1.94E-07
^{99}Tc	0.00E+00	0.00E+00	0.00E+00	1.01E-12	1.11E-03	1.45E-04	1.01E-12	1.11E-03	1.45E-04
^{232}Th	0.00E+00	0.00E+00	0.00E+00	1.70E-15	1.88E-06	3.76E-02	1.70E-15	1.88E-06	3.76E-02
^{233}U	0.00E+00	0.00E+00	0.00E+00	6.19E-14	6.85E-05	1.57E-05	6.19E-14	6.85E-05	1.57E-05
^{234}U	0.00E+00	0.00E+00	0.00E+00	3.60E-14	3.99E-05	1.41E-05	3.60E-14	3.99E-05	1.41E-05
^{235}U	0.00E+00	0.00E+00	0.00E+00	1.39E-15	1.54E-06	1.57E-03	1.39E-15	1.54E-06	1.57E-03
^{236}U	0.00E+00	0.00E+00	0.00E+00	4.17E-15	4.61E-06	1.57E-04	4.17E-15	4.61E-06	1.57E-04
^{238}U	0.00E+00	0.00E+00	0.00E+00	1.36E-14	1.51E-05	9.89E-02	1.36E-14	1.51E-05	9.89E-02

Table A-6 LMP06 Stream Report

Read this note for program instructions.

Stream Number: LMP06
Stream Name: Melter offgas (primary)
Configuration: 0
0
Run Data File: H:\Working Folder 2 (john)\MRQ_03_002_run2a_Streams.csv
Run Date / Time: 1/16/2003 - 1:27:28 PM

Stream Properties Variable	Value	Units
Density	4.52E-04	g/cm^3
Enthalpy	-1.19E+07	BTU/hr
Mass Flow	6.52E+03	Lb/hr
	1.56E+05	Lb/day
Volumetric Flow	2.80E+04	GPM
Molar Flow	2.46E+02	Lbmol/hr
Volumetric Flow	3.74E+03	ft^3/min
Molecular Weight	2.58E+01	Lb/Lbmol
Pressure	9.83E+02	mbar
Temperature	4.00E+02	C
Viscosity	3.19E-02	cP
Na Molarity	0.00E+00	mol/L
pH	#NUM!	pH
Total TRU	5.92E-11	Ci/L
Total Activity	2.34E-07	Ci/L

Gaseous Components (1) Component	mol/L	Lb/day	Mt/day
CO	1.28E-05	1.21E+02	0.054805914
CO_2	1.28E-03	1.89E+04	8.611111232
H_2O	7.10E-03	4.30E+04	19.53627617
NO	4.20E-04	4.23E+03	1.92435179
NO_2	3.83E-05	5.91E+02	0.268831367
N_2	6.48E-03	6.10E+04	27.74285808
O_2	2.19E-03	2.35E+04	10.69929104
SO_2	1.12E-05	2.42E+02	0.109904136
NH_3	1.32E-07	7.57E-01	0.000344125
HNO_3	0.00E+00	0.00E+00	0
HCl	1.98E-05	2.42E+02	0.110069541
HF	9.62E-06	6.47E+01	0.029406105

(1) All radionuclides in gaseous streams are assumed to exist as solid particulate.

Component	Aqueous Components mol/L	Lb/gal	Lb/day	Solid Components Lb/day	Total Component Lb/day	mt/day	g/sec
Total	0.00E+00	0.00E+00	0.00E+00	4.32E+03	4.32E+03	1.965553824	22.74946556
Ag^+	0.00E+00	0.00E+00	0.00E+00	1.27E-01	1.27E-01	5.76909E-05	0.000667719
Al^{+3}	0.00E+00	0.00E+00	0.00E+00	3.46E+01	3.46E+01	0.015745914	0.182244379
As^{+3}	0.00E+00	0.00E+00	0.00E+00	1.70E+03	1.70E+03	0.774744954	8.966955482
B^{+3}	0.00E+00	0.00E+00	0.00E+00	1.20E+02	1.20E+02	0.054319918	0.628702754
Ba^{+2}	0.00E+00	0.00E+00	0.00E+00	3.93E-02	3.93E-02	1.785E-05	0.000206597
Bi^{+3}	0.00E+00	0.00E+00	0.00E+00	1.21E-01	1.21E-01	5.48918E-05	0.000635322
$C_2O_4^{-2}$	0.00E+00	0.00E+00	0.00E+00	5.44E+02	5.44E+02	0.247066344	2.859564168
Ca^{+2}	0.00E+00	0.00E+00	0.00E+00	6.34E+01	6.34E+01	0.028817849	0.333539919
Cd^{+2}	0.00E+00	0.00E+00	0.00E+00	1.41E+01	1.41E+01	0.006421213	0.074319592
Ce^{+3}	0.00E+00	0.00E+00	0.00E+00	1.66E-01	1.66E-01	7.56046E-05	0.000875054
Cl^-	0.00E+00	0.00E+00	0.00E+00	7.97E+01	7.97E+01	0.036247344	0.419529441
CO_3^{-2}	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0	0
Cr^{+3}	0.00E+00	0.00E+00	0.00E+00	2.98E+00	2.98E+00	0.001353402	0.015664379
Cu^{+2}	0.00E+00	0.00E+00	0.00E+00	1.99E-02	1.99E-02	9.0631E-06	0.000104897
F^-	0.00E+00	0.00E+00	0.00E+00	1.23E+02	1.23E+02	0.056116938	0.649501599
Fe^{+3}	0.00E+00	0.00E+00	0.00E+00	2.05E+01	2.05E+01	0.009314301	0.107804409
H^+	0.00E+00	0.00E+00	0.00E+00		0.00E+00	0	0
H_2O	0.00E+00	0.00E+00	0.00E+00		0.00E+00	0	0
Hg^{+2}	0.00E+00	0.00E+00	0.00E+00	4.77E+00	4.77E+00	0.002168208	0.025094998
K^+	0.00E+00	0.00E+00	0.00E+00	1.05E+02	1.05E+02	0.047755898	0.552730301
La^{+3}	0.00E+00	0.00E+00	0.00E+00	6.66E-02	6.66E-02	3.02514E-05	0.000350132
Li^+	0.00E+00	0.00E+00	0.00E+00	2.08E+01	2.08E+01	0.009444343	0.109309522
Mg^{+2}	0.00E+00	0.00E+00	0.00E+00	7.75E+00	7.75E+00	0.003521587	0.040759106
Mn^{+3}	0.00E+00	0.00E+00	0.00E+00	1.02E+00	1.02E+00	0.000464187	0.005372537
MnO_4^-	0.00E+00	0.00E+00	0.00E+00		0.00E+00	0	0
Na^+	0.00E+00	0.00E+00	0.00E+00	7.00E+01	7.00E+01	0.031833139	0.368439104
NH_4^+	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0	0
Ni^{+2}	0.00E+00	0.00E+00	0.00E+00	5.70E-01	5.70E-01	0.000258909	0.002996627
NO_2^-	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0	0
NO_3^-	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0	0
O^{-2}				1.14E+03	1.14E+03	0.520386139	6.02298772
OH^-	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0	0
$OH(b)^-$	0.00E+00	0.00E+00	0.00E+00		0.00E+00	0	0
P^{+5}				1.46E+01	1.46E+01	0.006656396	0.077041625
Pb^{+2}	0.00E+00	0.00E+00	0.00E+00	2.00E-01	2.00E-01	9.10193E-05	0.001053464
Pd^{+2}	0.00E+00	0.00E+00	0.00E+00	1.21E-03	1.21E-03	5.48794E-07	6.35178E-06
PO_4^{-3}	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0	0
S^{+6}				0.00E+00	0.00E+00	0	0
Si^{+4}				7.95E+01	7.95E+01	0.036150569	0.418409362
SiO_4^{-4}	0.00E+00	0.00E+00	0.00E+00		0.00E+00	0	0
SO_4^{-2}	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0	0
Sr^{+2}	0.00E+00	0.00E+00	0.00E+00	1.21E-02	1.21E-02	5.49744E-06	6.36278E-05
Ti^{+4}	0.00E+00	0.00E+00	0.00E+00	1.33E+02	1.33E+02	0.060458999	0.699756934
Zn^{+2}	0.00E+00	0.00E+00	0.00E+00	2.69E+01	2.69E+01	0.012244002	0.14171299

BY: E. Berrios
DATE: 03/13/03

CALCULATION SHEET

PROJECT: WTP
JOB NO.: 24590
CALC NO.: 24590-WTP-M4C-FRP-00003
SHEET REV: A
SHEET NO.: 27

SUBJECT: Integrated Baseline Emissions Report Non-SSFM Represented Constituents Emissions Rate Estimation

Zr^{+4}	0.00E+00	0.00E+00	0.00E+00	8.19E+00	8.19E+00	0.003720854	0.043065443

Rad. Component	Aqueous Rad. Components			Solids Rad. Components (1)			Total Rad. Components (1)		
	Ci/L	Ci/day	Lb/day	Ci/L	Ci/day	Lb/day	Ci/L	Ci/day	Lb/day
Total	0.00E+00	0.00E+00	0.00E+00	2.34E-07	3.57E+01	8.89E-01	2.34E-07	3.57E+01	8.89E-01
^{241}Am	0	0.00E+00	0.00E+00	4.27E-11	6.51E-03	4.19E-06	4.27E-11	6.51E-03	4.19E-06
^{14}C	0.00E+00	0.00E+00	0.00E+00	6.00E-09	9.14E-01	4.51E-04	6.00E-09	9.14E-01	4.51E-04
^{60}Co	0.00E+00	0.00E+00	0.00E+00	4.26E-11	6.49E-03	1.26E-08	4.26E-11	6.49E-03	1.26E-08
^{243}Cm	0.00E+00	0.00E+00	0.00E+00	1.14E-13	1.74E-05	7.60E-10	1.14E-13	1.74E-05	7.60E-10
^{244}Cm	0.00E+00	0.00E+00	0.00E+00	1.23E-13	1.87E-05	5.09E-10	1.23E-13	1.87E-05	5.09E-10
^{137}Cs	0.00E+00	0.00E+00	0.00E+00	3.04E-09	4.63E-01	1.18E-05	3.04E-09	4.63E-01	1.18E-05
^{152}Eu	0.00E+00	0.00E+00	0.00E+00	1.49E-10	2.27E-02	2.88E-07	1.49E-10	2.27E-02	2.88E-07
^{154}Eu	0.00E+00	0.00E+00	0.00E+00	4.94E-10	7.52E-02	6.14E-07	4.94E-10	7.52E-02	6.14E-07
^{155}Eu	0.00E+00	0.00E+00	0.00E+00	8.50E-10	1.30E-01	5.88E-07	8.50E-10	1.30E-01	5.88E-07
^{3}H	0.00E+00	0.00E+00	0.00E+00	2.95E-09	4.49E-01	1.03E-07	2.95E-09	4.49E-01	1.03E-07
^{129}I	0.00E+00	0.00E+00	0.00E+00	6.99E-11	1.06E-02	1.33E-01	6.99E-11	1.06E-02	1.33E-01
^{63}Ni	0.00E+00	0.00E+00	0.00E+00	6.13E-10	9.35E-02	3.63E-06	6.13E-10	9.35E-02	3.63E-06
^{237}Np	0.00E+00	0.00E+00	0.00E+00	1.84E-13	2.80E-05	8.76E-05	1.84E-13	2.80E-05	8.76E-05
^{238}Pu	0.00E+00	0.00E+00	0.00E+00	2.48E-13	3.78E-05	4.86E-09	2.48E-13	3.78E-05	4.86E-09
^{239}Pu	0.00E+00	0.00E+00	0.00E+00	2.90E-12	4.41E-04	1.57E-05	2.90E-12	4.41E-04	1.57E-05
^{240}Pu	0.00E+00	0.00E+00	0.00E+00	4.99E-13	7.61E-05	7.39E-07	4.99E-13	7.61E-05	7.39E-07
^{241}Pu	0.00E+00	0.00E+00	0.00E+00	1.24E-11	1.88E-03	4.03E-08	1.24E-11	1.88E-03	4.03E-08
^{125}Sb	0.00E+00	0.00E+00	0.00E+00	4.57E-09	6.97E-01	1.48E-06	4.57E-09	6.97E-01	1.48E-06
^{151}Sm	0.00E+00	0.00E+00	0.00E+00	2.82E-08	4.30E+00	3.61E-04	2.82E-08	4.30E+00	3.61E-04
^{126}Sn	0.00E+00	0.00E+00	0.00E+00	1.71E-11	2.60E-03	5.06E-04	1.71E-11	2.60E-03	5.06E-04
^{90}Sr	0.00E+00	0.00E+00	0.00E+00	1.85E-07	2.81E+01	4.49E-04	1.85E-07	2.81E+01	4.49E-04
^{99}Tc	0.00E+00	0.00E+00	0.00E+00	2.46E-09	3.74E-01	4.87E-02	2.46E-09	3.74E-01	4.87E-02
^{232}Th	0.00E+00	0.00E+00	0.00E+00	6.33E-14	9.64E-06	1.93E-01	6.33E-14	9.64E-06	1.93E-01
^{233}U	0.00E+00	0.00E+00	0.00E+00	1.17E-12	1.79E-04	4.10E-05	1.17E-12	1.79E-04	4.10E-05
^{234}U	0.00E+00	0.00E+00	0.00E+00	6.83E-13	1.04E-04	3.70E-05	6.83E-13	1.04E-04	3.70E-05
^{235}U	0.00E+00	0.00E+00	0.00E+00	2.64E-14	4.02E-06	4.10E-03	2.64E-14	4.02E-06	4.10E-03
^{236}U	0.00E+00	0.00E+00	0.00E+00	7.91E-14	1.20E-05	4.11E-04	7.91E-14	1.20E-05	4.11E-04
^{238}U	0.00E+00	0.00E+00	0.00E+00	5.08E-13	7.75E-05	5.08E-01	5.08E-13	7.75E-05	5.08E-01

Table A-7 LVP01 Stream Report

Stream Number: LVP01
Stream Name: LAW vessel ventilation header offgas
Configuration: 0
0
Run Data File: H:\Working Folder 2 (john)\MRQ_03_002_run2a_Streams.csv
Run Date / Time: 1/16/2003 - 1:27:28 PM

Read this note for program instructions.

Stream Properties Variable	Value	Units
Density	9.99E-04	g/cm^3
Enthalpy	-2.97E+05	BTU/hr
Mass Flow	1.93E+03	Lb/hr
	4.63E+04	Lb/day
Volumetric Flow	3.86E+03	GPM
Molar Flow	6.80E+01	Lbmol/hr
Volumetric Flow	5.16E+02	ft^3/min
Molecular Weight	2.84E+01	Lb/Lbmol
Pressure	8.92E+02	mbar
Temperature	3.20E+01	C
Viscosity	1.85E-02	cP
Na Molarity	0.00E+00	mol/L
pH	#NUM!	pH
Total TRU	0.00E+00	Ci/L
Total Activity	0.00E+00	Ci/L

Gaseous Components (1) Component	mol/L	Lb/day	Mt/day
CO	0.00E+00	0.00E+00	0
CO_2	0.00E+00	0.00E+00	0
H_2O	1.51E-03	1.26E+03	0.572380228
NO	0.00E+00	0.00E+00	0
NO_2	0.00E+00	0.00E+00	0
N_2	2.66E-02	3.45E+04	15.70352739
O_2	7.07E-03	1.05E+04	4.768217408
SO_2	0.00E+00	0.00E+00	0
NH_3	0.00E+00	0.00E+00	0
HNO_3	0.00E+00	0.00E+00	0
HCl	0.00E+00	0.00E+00	0
HF	0.00E+00	0.00E+00	0

(1) All radionuclides in gaseous streams are assumed to exist as solid particulate.

Component	Aqueous Components mol/L	Lb/gal	Lb/day	Solid Components Lb/day	Total Component Lb/day	mt/day	g/sec
Total	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0	0
Ag^+	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0	0
Al^{+3}	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0	0
As^{+3}	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0	0
B^{+3}	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0	0
Ba^{+2}	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0	0
Bi^{+3}	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0	0
$C_2O_4^{-2}$	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0	0
Ca^{+2}	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0	0
Cd^{+2}	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0	0
Ce^{+3}	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0	0
Cl^-	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0	0
CO_3^{-2}	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0	0
Cr^{+3}	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0	0
Cu^{+2}	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0	0
F^-	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0	0
Fe^{+3}	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0	0
H^+	0.00E+00	0.00E+00	0.00E+00		0.00E+00	0	0
H_2O	0.00E+00	0.00E+00	0.00E+00		0.00E+00	0	0
Hg^{+2}	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0	0
K^+	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0	0
La^{+3}	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0	0
Li^+	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0	0
Mg^{+2}	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0	0
Mn^{+3}	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0	0
MnO_4^-	0.00E+00	0.00E+00	0.00E+00		0.00E+00	0	0
Na^+	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0	0
NH_4^+	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0	0
Ni^{+2}	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0	0
NO_2^-	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0	0
NO_3^-	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0	0
O^{-2}				0.00E+00	0.00E+00	0	0
OH^-	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0	0
$OH(b)^-$	0.00E+00	0.00E+00	0.00E+00		0.00E+00	0	0
P^{+5}				0.00E+00	0.00E+00	0	0
Pb^{+2}	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0	0
Pd^{+2}	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0	0
PO_4^{-3}	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0	0
S^{+6}				0.00E+00	0.00E+00	0	0
Si^{+4}				0.00E+00	0.00E+00	0	0
SiO_4^{-4}	0.00E+00	0.00E+00	0.00E+00		0.00E+00	0	0
SO_4^{-2}	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0	0
Sr^{+2}	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0	0
Ti^{+4}	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0	0
Zn^{+2}	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0	0

SUBJECT: Integrated Baseline Emissions Report Non-SSFM Represented Constituents Emissions Rate Estimation

Zr^{+4}	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0	0

Rad. Component	Aqueous Rad. Components			Solids Rad. Components (1)			Total Rad. Components (1)		
	Ci/L	Ci/day	Lb/day	Ci/L	Ci/day	Lb/day	Ci/L	Ci/day	Lb/day
Total	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
^{241}Am	0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
^{14}C	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
^{60}Co	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
^{243}Cm	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
^{244}Cm	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
^{137}Cs	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
^{152}Eu	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
^{154}Eu	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
^{155}Eu	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
^{3}H	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
^{129}I	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
^{63}Ni	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
^{237}Np	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
^{238}Pu	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
^{239}Pu	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
^{240}Pu	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
^{241}Pu	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
^{125}Sb	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
^{151}Sm	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
^{126}Sn	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
^{90}Sr	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
^{99}Tc	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
^{232}Th	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
^{233}U	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
^{234}U	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
^{235}U	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
^{236}U	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
^{238}U	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

Table A-8 HMP06 Stream Report

Read this note for program instructions.

Stream Number: HMP06
Stream Name: Melter offgas (primary)
Configuration: 0
0
Run Data File: H:\Working Folder 2 (john)\MRQ_03_002_run2a_Streams.csv
Run Date / Time: 1/16/2003 - 1:27:28 PM

Stream Properties Variable	Value	Units
Density	3.64E-04	g/cm^3
Enthalpy	-1.67E+07	BTU/hr
Mass Flow	4.83E+03	Lb/hr
	1.16E+05	Lb/day
Volumetric Flow	2.46E+04	GPM
Molar Flow	2.16E+02	Lbmol/hr
Volumetric Flow	3.28E+03	ft^3/min
Molecular Weight	2.07E+01	Lb/Lbmol
Pressure	9.83E+02	mbar
Temperature	4.00E+02	C
Viscosity	2.82E-02	cP
Na Molarity	0.00E+00	mol/L
pH	#NUM!	pH
Total TRU	4.87E-08	Ci/L
Total Activity	3.28E-05	Ci/L

Gaseous Components (1) Component	mol/L	Lb/day	Mt/day
CO	2.41E-06	2.00E+01	0.009078662
CO_2	2.41E-04	3.14E+03	1.426440377
H_2O	1.36E-02	7.24E+04	32.89522449
NO	9.22E-05	8.17E+02	0.371542272
NO_2	8.41E-06	1.14E+02	0.051904344
N_2	2.78E-03	2.30E+04	10.46805194
O_2	8.39E-04	7.93E+03	3.602332108
SO_2	1.68E-06	3.18E+01	0.014456898
NH_3	1.74E-06	8.73E+00	0.003968199
HNO_3	0.00E+00	0.00E+00	0
HCl	2.26E-06	2.43E+01	0.011052281
HF	2.43E-06	1.44E+01	0.006538081

(1) All radionuclides in gaseous streams are assumed to exist as solid particulate.

Component	Aqueous Components mol/L	Lb/gal	Lb/day	Solid Components Lb/day	Total Component Lb/day	mt/day	g/sec
Total	0.00E+00	0.00E+00	0.00E+00	8.35E+03	8.35E+03	3.796428027	43.9401392
Ag^+	0.00E+00	0.00E+00	0.00E+00	4.61E-01	4.61E-01	0.000209502	0.002424787
Al^{+3}	0.00E+00	0.00E+00	0.00E+00	5.26E+00	5.26E+00	0.002389067	0.027651238
As^{+3}	0.00E+00	0.00E+00	0.00E+00	6.04E+03	6.04E+03	2.74578062	31.77986829
B^{+3}	0.00E+00	0.00E+00	0.00E+00	1.23E+01	1.23E+01	0.005586081	0.064653712
Ba^{+2}	0.00E+00	0.00E+00	0.00E+00	1.08E+00	1.08E+00	0.000490195	0.005673555
Bi^{+3}	0.00E+00	0.00E+00	0.00E+00	6.81E-01	6.81E-01	0.000309381	0.003580794
$C_2O_4^{-2}$	0.00E+00	0.00E+00	0.00E+00	1.24E+02	1.24E+02	0.056293305	0.651542878
Ca^{+2}	0.00E+00	0.00E+00	0.00E+00	2.88E+00	2.88E+00	0.001308268	0.015141986
Cd^{+2}	0.00E+00	0.00E+00	0.00E+00	1.32E+01	1.32E+01	0.006009708	0.069556811
Ce^{+3}	0.00E+00	0.00E+00	0.00E+00	1.13E-01	1.13E-01	5.12838E-05	0.000593563
Cl^-	0.00E+00	0.00E+00	0.00E+00	8.07E+00	8.07E+00	0.003666318	0.042434235
CO_3^{-2}	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0	0
Cr^{+3}	0.00E+00	0.00E+00	0.00E+00	4.57E-01	4.57E-01	0.000207528	0.00240195
Cu^{+2}	0.00E+00	0.00E+00	0.00E+00	5.90E-02	5.90E-02	2.68366E-05	0.000310609
F^-	0.00E+00	0.00E+00	0.00E+00	2.61E+01	2.61E+01	0.011864666	0.13732252
Fe^{+3}	0.00E+00	0.00E+00	0.00E+00	3.53E+00	3.53E+00	0.00160334	0.018557177
H^+	0.00E+00	0.00E+00	0.00E+00		0.00E+00	0	0
H_2O	0.00E+00	0.00E+00	0.00E+00		0.00E+00	0	0
Hg^{+2}	0.00E+00	0.00E+00	0.00E+00	5.04E+01	5.04E+01	0.022926597	0.265354128
K^+	0.00E+00	0.00E+00	0.00E+00	1.16E+01	1.16E+01	0.005284798	0.06116664
La^{+3}	0.00E+00	0.00E+00	0.00E+00	1.26E+00	1.26E+00	0.000573075	0.006632812
Li^+	0.00E+00	0.00E+00	0.00E+00	1.08E+00	1.08E+00	0.000492691	0.005702442
Mg^{+2}	0.00E+00	0.00E+00	0.00E+00	2.56E-01	2.56E-01	0.000116193	0.001344829
Mn^{+3}	0.00E+00	0.00E+00	0.00E+00	2.18E+00	2.18E+00	0.000990648	0.011465835
MnO_4^-	0.00E+00	0.00E+00	0.00E+00		0.00E+00	0	0
Na^+	0.00E+00	0.00E+00	0.00E+00	1.21E+01	1.21E+01	0.005485947	0.063494761
NH_4^+	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0	0
Ni^{+2}	0.00E+00	0.00E+00	0.00E+00	7.01E-01	7.01E-01	0.000318697	0.00368862
NO_2^-	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0	0
NO_3^-	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0	0
O^{-2}				2.01E+03	2.01E+03	0.913376477	10.57148701
OH^-	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0	0
$OH(b)^-$	0.00E+00	0.00E+00	0.00E+00		0.00E+00	0	0
P^{+5}				3.24E+00	3.24E+00	0.001474586	0.017066964
Pb^{+2}	0.00E+00	0.00E+00	0.00E+00	1.51E-01	1.51E-01	6.84193E-05	0.00079189
Pd^{+2}	0.00E+00	0.00E+00	0.00E+00	1.56E-02	1.56E-02	7.0775E-06	8.19155E-05
PO_4^{-3}	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0	0
S^{+6}				0.00E+00	0.00E+00	0	0
Si^{+4}				8.12E+00	8.12E+00	0.00369192	0.042730556
SiO_4^{-4}	0.00E+00	0.00E+00	0.00E+00		0.00E+00	0	0
SO_4^{-2}	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0	0
Sr^{+2}	0.00E+00	0.00E+00	0.00E+00	1.25E-01	1.25E-01	5.70161E-05	0.000659909
Ti^{+4}	0.00E+00	0.00E+00	0.00E+00	9.65E+00	9.65E+00	0.004384561	0.050747239
Zn^{+2}	0.00E+00	0.00E+00	0.00E+00	1.85E+00	1.85E+00	0.000842722	0.009753727

BY: E. Berrios
DATE: 03/13/03

CALCULATION SHEET

PROJECT: WTP
JOB NO.: 24590
CALC NO.: 24590-WTP-M4C-FRP-00003
SHEET REV: A
SHEET NO.: 31

SUBJECT: Integrated Baseline Emissions Report Non-SSFM Represented Constituents Emissions Rate Estimation

Zr^{+4}	0.00E+00	0.00E+00	0.00E+00	1.19E+00	1.19E+00	0.000540503	0.006255824

Rad. Component	Aqueous Rad. Components			Solids Rad. Components (1)			Total Rad. Components (1)		
	Ci/L	Ci/day	Lb/day	Ci/L	Ci/day	Lb/day	Ci/L	Ci/day	Lb/day
Total	0.00E+00	0.00E+00	0.00E+00	3.28E-05	4.40E+03	1.39E+01	3.28E-05	4.40E+03	1.39E+01
^{241}Am	0	0.00E+00	0.00E+00	3.62E-08	4.85E+00	3.12E-03	3.62E-08	4.85E+00	3.12E-03
^{14}C	0.00E+00	0.00E+00	0.00E+00	1.20E-09	1.61E-01	7.96E-05	1.20E-09	1.61E-01	7.96E-05
^{60}Co	0.00E+00	0.00E+00	0.00E+00	4.03E-09	5.39E-01	1.05E-06	4.03E-09	5.39E-01	1.05E-06
^{243}Cm	0.00E+00	0.00E+00	0.00E+00	1.21E-09	1.62E-01	7.05E-06	1.21E-09	1.62E-01	7.05E-06
^{244}Cm	0.00E+00	0.00E+00	0.00E+00	9.05E-10	1.21E-01	3.30E-06	9.05E-10	1.21E-01	3.30E-06
^{137}Cs	0.00E+00	0.00E+00	0.00E+00	2.38E-05	3.19E+03	8.10E-02	2.38E-05	3.19E+03	8.10E-02
^{152}Eu	0.00E+00	0.00E+00	0.00E+00	2.10E-10	2.81E-02	3.57E-07	2.10E-10	2.81E-02	3.57E-07
^{154}Eu	0.00E+00	0.00E+00	0.00E+00	2.10E-08	2.81E+00	2.29E-05	2.10E-08	2.81E+00	2.29E-05
^{155}Eu	0.00E+00	0.00E+00	0.00E+00	1.18E-08	1.58E+00	7.15E-06	1.18E-08	1.58E+00	7.15E-06
^{3}H	0.00E+00	0.00E+00	0.00E+00	3.71E-08	4.96E+00	1.14E-06	3.71E-08	4.96E+00	1.14E-06
^{129}I	0.00E+00	0.00E+00	0.00E+00	3.29E-11	4.41E-03	5.50E-02	3.29E-11	4.41E-03	5.50E-02
^{63}Ni	0.00E+00	0.00E+00	0.00E+00	4.38E-09	5.86E-01	2.28E-05	4.38E-09	5.86E-01	2.28E-05
^{237}Np	0.00E+00	0.00E+00	0.00E+00	2.98E-11	3.99E-03	1.25E-02	2.98E-11	3.99E-03	1.25E-02
^{238}Pu	0.00E+00	0.00E+00	0.00E+00	1.41E-10	1.89E-02	2.43E-06	1.41E-10	1.89E-02	2.43E-06
^{239}Pu	0.00E+00	0.00E+00	0.00E+00	1.25E-09	1.67E-01	5.94E-03	1.25E-09	1.67E-01	5.94E-03
^{240}Pu	0.00E+00	0.00E+00	0.00E+00	6.84E-11	9.16E-03	8.90E-05	6.84E-11	9.16E-03	8.90E-05
^{241}Pu	0.00E+00	0.00E+00	0.00E+00	8.85E-09	1.19E+00	2.54E-05	8.85E-09	1.19E+00	2.54E-05
^{125}Sb	0.00E+00	0.00E+00	0.00E+00	2.64E-08	3.54E+00	7.51E-06	2.64E-08	3.54E+00	7.51E-06
^{151}Sm	0.00E+00	0.00E+00	0.00E+00	4.34E-08	5.82E+00	4.87E-04	4.34E-08	5.82E+00	4.87E-04
^{126}Sn	0.00E+00	0.00E+00	0.00E+00	6.23E-11	8.34E-03	1.62E-03	6.23E-11	8.34E-03	1.62E-03
^{90}Sr	0.00E+00	0.00E+00	0.00E+00	8.11E-06	1.09E+03	1.73E-02	8.11E-06	1.09E+03	1.73E-02
^{99}Tc	0.00E+00	0.00E+00	0.00E+00	6.98E-07	9.35E+01	1.22E+01	6.98E-07	9.35E+01	1.22E+01
^{232}Th	0.00E+00	0.00E+00	0.00E+00	3.23E-13	4.32E-05	8.66E-01	3.23E-13	4.32E-05	8.66E-01
^{233}U	0.00E+00	0.00E+00	0.00E+00	4.96E-13	6.64E-05	1.52E-05	4.96E-13	6.64E-05	1.52E-05
^{234}U	0.00E+00	0.00E+00	0.00E+00	1.39E-12	1.87E-04	6.63E-05	1.39E-12	1.87E-04	6.63E-05
^{235}U	0.00E+00	0.00E+00	0.00E+00	1.04E-13	1.39E-05	1.42E-02	1.04E-13	1.39E-05	1.42E-02
^{236}U	0.00E+00	0.00E+00	0.00E+00	5.00E-14	6.70E-06	2.28E-04	5.00E-14	6.70E-06	2.28E-04
^{238}U	0.00E+00	0.00E+00	0.00E+00	7.98E-13	1.07E-04	7.01E-01	7.98E-13	1.07E-04	7.01E-01

Table A-9 HOP10 Stream Report

Read this note for program instructions.

Stream Number: HOP10
Stream Name: HLW vessel ventilation header offgas
Configuration: 0
0
Run Data File: H:\Working Folder 2 (john)\MRQ_03_002_run2a_Streams.csv
Run Date / Time: 1/16/2003 - 1:27:28 PM

Stream Properties Variable	Value	Units
Density	1.14E-03	g/cm^3
Enthalpy	-2.56E+04	BTU/hr
Mass Flow	1.88E+02	Lb/hr
	4.51E+03	Lb/day
Volumetric Flow	3.30E+02	GPM
Molar Flow	6.60E+00	Lbmol/hr
Volumetric Flow	4.41E+01	ft^3/min
Molecular Weight	2.84E+01	Lb/Lbmol
Pressure	1.00E+03	mbar
Temperature	2.76E+01	C
Viscosity	1.83E-02	cP
Na Molarity	0.00E+00	mol/L
pH	#NUM!	pH
Total TRU	4.50E-11	Ci/L
Total Activity	2.59E-08	Ci/L

Gaseous Components (1) Component	mol/L	Lb/day	Mt/day
CO	8.68E-26	9.63E-21	4.37933E-24
CO_2	6.66E-11	1.16E-05	5.27887E-09
H_2O	1.50E-03	1.07E+02	0.048787814
NO	5.76E-32	6.84E-27	3.10968E-30
NO_2	1.60E-41	2.92E-36	1.32595E-39
N_2	3.04E-02	3.38E+03	1.534617849
O_2	8.09E-03	1.03E+03	0.465971203
SO_2	5.50E-34	1.40E-28	6.34356E-32
NH_3	1.00E-09	6.76E-05	3.0711E-08
HNO_3	1.77E-11	4.43E-06	2.01159E-09
HCl	4.69E-44	6.78E-39	3.08215E-42
HF	1.12E-32	8.86E-28	4.02931E-31

(1) All radionuclides in gaseous streams are assumed to exist as solid particulate.

Component	Aqueous Components mol/L	Lb/gal	Lb/day	Solid Components Lb/day	Total Component Lb/day	mt/day	g/sec
Total	0.00E+00	0.00E+00	0.00E+00	8.26E-02	8.26E-02	3.75621E-05	0.000434746
Ag^+	0.00E+00	0.00E+00	0.00E+00	4.77E-06	4.77E-06	2.17023E-09	2.51183E-08
Al^{+3}	0.00E+00	0.00E+00	0.00E+00	5.89E-05	5.89E-05	2.67572E-08	3.09689E-07
As^{+3}	0.00E+00	0.00E+00	0.00E+00	6.05E-02	6.05E-02	2.74882E-05	0.00031815
B^{+3}	0.00E+00	0.00E+00	0.00E+00	1.24E-04	1.24E-04	5.63991E-08	6.52767E-07
Ba^{+2}	0.00E+00	0.00E+00	0.00E+00	1.21E-05	1.21E-05	5.49018E-09	6.35438E-08
Bi^{+3}	0.00E+00	0.00E+00	0.00E+00	7.62E-06	7.62E-06	3.4647E-09	4.01007E-08
$C_2O_4^{-2}$	0.00E+00	0.00E+00	0.00E+00	1.49E-05	1.49E-05	6.7552E-09	7.81851E-08
Ca^{+2}	0.00E+00	0.00E+00	0.00E+00	3.14E-05	3.14E-05	1.42595E-08	1.65041E-07
Cd^{+2}	0.00E+00	0.00E+00	0.00E+00	1.34E-04	1.34E-04	6.08146E-08	7.03873E-07
Ce^{+3}	0.00E+00	0.00E+00	0.00E+00	1.63E-06	1.63E-06	7.42215E-10	8.59045E-09
Cl^-	0.00E+00	0.00E+00	0.00E+00	1.36E-04	1.36E-04	6.17912E-08	7.15176E-07
CO_3^{-2}	0.00E+00	0.00E+00	0.00E+00	1.25E-05	1.25E-05	5.70011E-09	6.59735E-08
Cr^{+3}	0.00E+00	0.00E+00	0.00E+00	5.12E-06	5.12E-06	2.32656E-09	2.69278E-08
Cu^{+2}	0.00E+00	0.00E+00	0.00E+00	7.32E-07	7.32E-07	3.32746E-10	3.85123E-09
F^-	0.00E+00	0.00E+00	0.00E+00	3.82E-04	3.82E-04	1.73838E-07	2.01201E-06
Fe^{+3}	0.00E+00	0.00E+00	0.00E+00	4.38E-05	4.38E-05	1.98916E-08	2.30227E-07
H^+	0.00E+00	0.00E+00	0.00E+00		0.00E+00	0	0
H_2O	0.00E+00	0.00E+00	0.00E+00		0.00E+00	0	0
Hg^{+2}	0.00E+00	0.00E+00	0.00E+00	4.81E-04	4.81E-04	2.18625E-07	2.53038E-06
K^+	0.00E+00	0.00E+00	0.00E+00	1.19E-04	1.19E-04	5.41117E-08	6.26293E-07
La^{+3}	0.00E+00	0.00E+00	0.00E+00	1.34E-05	1.34E-05	6.07457E-09	7.03075E-08
Li^+	0.00E+00	0.00E+00	0.00E+00	1.11E-05	1.11E-05	5.04846E-09	5.84313E-08
Mg^{+2}	0.00E+00	0.00E+00	0.00E+00	3.17E-06	3.17E-06	1.44075E-09	1.66753E-08
Mn^{+3}	0.00E+00	0.00E+00	0.00E+00	2.38E-05	2.38E-05	1.07978E-08	1.24975E-07
MnO_4^-	0.00E+00	0.00E+00	0.00E+00		0.00E+00	0	0
Na^+	0.00E+00	0.00E+00	0.00E+00	1.35E-04	1.35E-04	6.14327E-08	7.11026E-07
NH_4^+	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0	0
Ni^{+2}	0.00E+00	0.00E+00	0.00E+00	7.76E-06	7.76E-06	3.52855E-09	4.08397E-08
NO_2^-	0.00E+00	0.00E+00	0.00E+00	4.67E-06	4.67E-06	2.12052E-09	2.45431E-08
NO_3^-	0.00E+00	0.00E+00	0.00E+00	3.25E-05	3.25E-05	1.47779E-08	1.7104E-07
O^{-2}				2.01E-02	2.01E-02	9.13098E-06	0.000105683
OH^-	0.00E+00	0.00E+00	0.00E+00	4.07E-05	4.07E-05	1.8503E-08	2.14155E-07
$OH(b)^-$	0.00E+00	0.00E+00	0.00E+00		0.00E+00	0	0
P^{+5}				2.41E-13	2.41E-13	1.0933E-16	1.2654E-15
Pb^{+2}	0.00E+00	0.00E+00	0.00E+00	1.87E-06	1.87E-06	8.48308E-10	9.81838E-09
Pd^{+2}	0.00E+00	0.00E+00	0.00E+00	1.93E-07	1.93E-07	8.77599E-11	1.01574E-09
PO_4^{-3}	0.00E+00	0.00E+00	0.00E+00	4.77E-06	4.77E-06	2.17027E-09	2.51189E-08
S^{+6}				3.26E-13	3.26E-13	1.4822E-16	1.71551E-15
Si^{+4}				9.07E-05	9.07E-05	4.1229E-08	4.77188E-07
SiO_4^{-4}	0.00E+00	0.00E+00	0.00E+00		0.00E+00	0	0
SO_4^{-2}	0.00E+00	0.00E+00	0.00E+00	1.55E-06	1.55E-06	7.02365E-10	8.12923E-09
Sr^{+2}	0.00E+00	0.00E+00	0.00E+00	1.40E-06	1.40E-06	6.38571E-10	7.39087E-09
Ti^{+4}	0.00E+00	0.00E+00	0.00E+00	9.69E-05	9.69E-05	4.40585E-08	5.09937E-07
Zn^{+2}	0.00E+00	0.00E+00	0.00E+00	1.90E-05	1.90E-05	8.65239E-09	1.00143E-07

BY: E. Berrios
DATE: 03/13/03

CALCULATION SHEET

PROJECT: WTP
JOB NO.: 24590
CALC NO.: 24590-WTP-M4C-FRP-00003
SHEET REV: A
SHEET NO.: 33

SUBJECT: Integrated Baseline Emissions Report Non-SSFM Represented Constituents Emissions Rate Estimation

Zr^{+4}	0.00E+00	0.00E+00	0.00E+00	1.62E-05	1.62E-05	7.35072E-09	8.50777E-08

Rad. Component	Aqueous Rad. Components			Solids Rad. Components (1)			Total Rad. Components (1)		
	Ci/L	Ci/day	Lb/day	Ci/L	Ci/day	Lb/day	Ci/L	Ci/day	Lb/day
Total	0.00E+00	0.00E+00	0.00E+00	2.59E-08	4.65E-02	1.43E-04	2.59E-08	4.65E-02	1.43E-04
^{241}Am	0	0.00E+00	0.00E+00	3.35E-11	6.02E-05	3.87E-08	3.35E-11	6.02E-05	3.87E-08
^{14}C	0.00E+00	0.00E+00	0.00E+00	1.08E-15	1.94E-09	9.55E-13	1.08E-15	1.94E-09	9.55E-13
^{60}Co	0.00E+00	0.00E+00	0.00E+00	3.72E-12	6.69E-06	1.30E-11	3.72E-12	6.69E-06	1.30E-11
^{243}Cm	0.00E+00	0.00E+00	0.00E+00	1.12E-12	2.00E-06	8.74E-11	1.12E-12	2.00E-06	8.74E-11
^{244}Cm	0.00E+00	0.00E+00	0.00E+00	8.36E-13	1.50E-06	4.09E-11	8.36E-13	1.50E-06	4.09E-11
^{137}Cs	0.00E+00	0.00E+00	0.00E+00	1.84E-08	3.31E-02	8.39E-07	1.84E-08	3.31E-02	8.39E-07
^{152}Eu	0.00E+00	0.00E+00	0.00E+00	1.94E-13	3.49E-07	4.42E-12	1.94E-13	3.49E-07	4.42E-12
^{154}Eu	0.00E+00	0.00E+00	0.00E+00	1.94E-11	3.48E-05	2.84E-10	1.94E-11	3.48E-05	2.84E-10
^{155}Eu	0.00E+00	0.00E+00	0.00E+00	1.09E-11	1.95E-05	8.87E-11	1.09E-11	1.95E-05	8.87E-11
^{3}H	0.00E+00	0.00E+00	0.00E+00	2.49E-11	4.48E-05	1.03E-11	2.49E-11	4.48E-05	1.03E-11
^{129}I	0.00E+00	0.00E+00	0.00E+00	4.12E-15	7.40E-09	9.24E-08	4.12E-15	7.40E-09	9.24E-08
^{63}Ni	0.00E+00	0.00E+00	0.00E+00	3.61E-12	6.49E-06	2.52E-10	3.61E-12	6.49E-06	2.52E-10
^{237}Np	0.00E+00	0.00E+00	0.00E+00	2.75E-14	4.94E-08	1.55E-07	2.75E-14	4.94E-08	1.55E-07
^{238}Pu	0.00E+00	0.00E+00	0.00E+00	1.30E-13	2.34E-07	3.01E-11	1.30E-13	2.34E-07	3.01E-11
^{239}Pu	0.00E+00	0.00E+00	0.00E+00	1.15E-12	2.07E-06	7.36E-08	1.15E-12	2.07E-06	7.36E-08
^{240}Pu	0.00E+00	0.00E+00	0.00E+00	6.32E-14	1.14E-07	1.10E-09	6.32E-14	1.14E-07	1.10E-09
^{241}Pu	0.00E+00	0.00E+00	0.00E+00	8.18E-12	1.47E-05	3.15E-10	8.18E-12	1.47E-05	3.15E-10
^{125}Sb	0.00E+00	0.00E+00	0.00E+00	2.20E-11	3.96E-05	8.41E-11	2.20E-11	3.96E-05	8.41E-11
^{151}Sm	0.00E+00	0.00E+00	0.00E+00	4.01E-11	7.21E-05	6.04E-09	4.01E-11	7.21E-05	6.04E-09
^{126}Sn	0.00E+00	0.00E+00	0.00E+00	5.76E-14	1.03E-07	2.01E-08	5.76E-14	1.03E-07	2.01E-08
^{90}Sr	0.00E+00	0.00E+00	0.00E+00	6.77E-09	1.22E-02	1.94E-07	6.77E-09	1.22E-02	1.94E-07
^{99}Tc	0.00E+00	0.00E+00	0.00E+00	5.22E-10	9.39E-04	1.22E-04	5.22E-10	9.39E-04	1.22E-04
^{232}Th	0.00E+00	0.00E+00	0.00E+00	2.98E-16	5.36E-10	1.07E-05	2.98E-16	5.36E-10	1.07E-05
^{233}U	0.00E+00	0.00E+00	0.00E+00	4.58E-16	8.24E-10	1.88E-10	4.58E-16	8.24E-10	1.88E-10
^{234}U	0.00E+00	0.00E+00	0.00E+00	1.29E-15	2.31E-09	8.22E-10	1.29E-15	2.31E-09	8.22E-10
^{235}U	0.00E+00	0.00E+00	0.00E+00	9.57E-17	1.72E-10	1.76E-07	9.57E-17	1.72E-10	1.76E-07
^{236}U	0.00E+00	0.00E+00	0.00E+00	4.62E-17	8.31E-11	2.83E-09	4.62E-17	8.31E-11	2.83E-09
^{238}U	0.00E+00	0.00E+00	0.00E+00	7.37E-16	1.33E-09	8.70E-06	7.37E-16	1.33E-09	8.70E-06

Table A-10 PJV32 Stream Report

Read this note for program instructions.

Stream Number: PJV32
Stream Name: HLW pulse ventilation header offgas
Configuration: 0
0
Run Data File: H:\Working Folder 2 (john)\MRQ_03_002_run2a_Streams.csv
Run Date / Time: 1/16/2003 - 1:27:28 PM

Stream Properties Variable	Value	Units
Density	1.16E-03	g/cm^3
Enthalpy	-8.56E+05	BTU/hr
Mass Flow	2.32E+04	Lb/hr
	5.57E+05	Lb/day
Volumetric Flow	4.00E+04	GPM
Molar Flow	8.08E+02	Lbmol/hr
Volumetric Flow	5.34E+03	ft^3/min
Molecular Weight	2.87E+01	Lb/Lbmol
Pressure	1.00E+03	mbar
Temperature	2.50E+01	C
Viscosity	1.83E-02	cP
Na Molarity	0.00E+00	mol/L
pH	#NUM!	pH
Total TRU	6.35E-16	Ci/L
Total Activity	1.21E-13	Ci/L

Gaseous Components (1) Component	mol/L	Lb/day	Mt/day
CO	1.00E-31	1.35E-24	6.13003E-28
CO_2	6.87E-17	1.45E-09	6.59816E-13
H_2O	4.10E-04	3.54E+03	1.610811694
NO	3.96E-36	5.70E-29	2.5914E-32
NO_2	1.10E-45	2.43E-38	1.10496E-41
N_2	3.16E-02	4.25E+05	193.0529451
O_2	8.39E-03	1.29E+05	58.61857599
SO_2	4.59E-39	1.41E-31	6.42065E-35
NH_3	1.12E-15	9.16E-09	4.165E-12
HNO_3	6.35E-24	1.92E-16	8.7353E-20
HCl	0.00E+00	0.00E+00	0
HF	7.69E-37	7.39E-30	3.35776E-33

(1) All radionuclides in gaseous streams are assumed to exist as solid particulate.

Component	Aqueous Components mol/L	Lb/gal	Lb/day	Solid Components Lb/day	Total Component Lb/day	mt/day	g/sec
Total	0.00E+00	0.00E+00	0.00E+00	1.24E-05	1.24E-05	5.65638E-09	6.54673E-08
Ag^+	0.00E+00	0.00E+00	0.00E+00	1.97E-09	1.97E-09	8.96953E-13	1.03814E-11
Al^{+3}	0.00E+00	0.00E+00	0.00E+00	5.90E-08	5.90E-08	2.68255E-11	3.1048E-10
As^{+3}	0.00E+00	0.00E+00	0.00E+00	8.13E-06	8.13E-06	3.69761E-09	4.27964E-08
B^{+3}	0.00E+00	0.00E+00	0.00E+00	1.96E-08	1.96E-08	8.91274E-12	1.03157E-10
Ba^{+2}	0.00E+00	0.00E+00	0.00E+00	1.21E-08	1.21E-08	5.50345E-12	6.36973E-11
Bi^{+3}	0.00E+00	0.00E+00	0.00E+00	7.67E-09	7.67E-09	3.48494E-12	4.0335E-11
$C_2O_4^{-2}$	0.00E+00	0.00E+00	0.00E+00	1.24E-07	1.24E-07	5.62933E-11	6.51543E-10
Ca^{+2}	0.00E+00	0.00E+00	0.00E+00	2.51E-08	2.51E-08	1.14223E-11	1.32203E-10
Cd^{+2}	0.00E+00	0.00E+00	0.00E+00	3.03E-08	3.03E-08	1.37524E-11	1.59171E-10
Ce^{+3}	0.00E+00	0.00E+00	0.00E+00	2.40E-09	2.40E-09	1.08868E-12	1.26004E-11
Cl^-	0.00E+00	0.00E+00	0.00E+00	2.32E-08	2.32E-08	1.05337E-11	1.21917E-10
CO_3^{-2}	0.00E+00	0.00E+00	0.00E+00	9.71E-08	9.71E-08	4.41204E-11	5.10653E-10
Cr^{+3}	0.00E+00	0.00E+00	0.00E+00	5.14E-09	5.14E-09	2.33574E-12	2.7034E-11
Cu^{+2}	0.00E+00	0.00E+00	0.00E+00	1.26E-09	1.26E-09	5.70554E-13	6.60363E-12
F^-	0.00E+00	0.00E+00	0.00E+00	6.32E-08	6.32E-08	2.87068E-11	3.32255E-10
Fe^{+3}	0.00E+00	0.00E+00	0.00E+00	7.49E-08	7.49E-08	3.40364E-11	3.9394E-10
H^+	0.00E+00	0.00E+00	0.00E+00		0.00E+00	0	0
H_2O	0.00E+00	0.00E+00	0.00E+00		0.00E+00	0	0
Hg^{+2}	0.00E+00	0.00E+00	0.00E+00	6.45E-08	6.45E-08	2.93341E-11	3.39515E-10
K^+	0.00E+00	0.00E+00	0.00E+00	3.82E-08	3.82E-08	1.73587E-11	2.00911E-10
La^{+3}	0.00E+00	0.00E+00	0.00E+00	7.85E-09	7.85E-09	3.56875E-12	4.1305E-11
Li^+	0.00E+00	0.00E+00	0.00E+00	1.90E-09	1.90E-09	8.62916E-13	9.98745E-12
Mg^{+2}	0.00E+00	0.00E+00	0.00E+00	5.43E-09	5.43E-09	2.46689E-12	2.85519E-11
Mn^{+3}	0.00E+00	0.00E+00	0.00E+00	1.90E-08	1.90E-08	8.64761E-12	1.00088E-10
MnO_4^-	0.00E+00	0.00E+00	0.00E+00		0.00E+00	0	0
Na^+	0.00E+00	0.00E+00	0.00E+00	1.36E-07	1.36E-07	6.17946E-11	7.15216E-10
NH_4^+	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0	0
Ni^{+2}	0.00E+00	0.00E+00	0.00E+00	7.11E-09	7.11E-09	3.23247E-12	3.74129E-11
NO_2^-	0.00E+00	0.00E+00	0.00E+00	3.89E-08	3.89E-08	1.76708E-11	2.04524E-10
NO_3^-	0.00E+00	0.00E+00	0.00E+00	2.68E-07	2.68E-07	1.21924E-10	1.41115E-09
O^{-2}				2.67E-06	2.67E-06	1.21176E-09	1.4025E-08
OH^-	0.00E+00	0.00E+00	0.00E+00	3.39E-07	3.39E-07	1.5419E-10	1.78461E-09
$OH(b)^-$	0.00E+00	0.00E+00	0.00E+00		0.00E+00	0	0
P^{+5}				2.00E-15	2.00E-15	9.11086E-19	1.0545E-17
Pb^{+2}	0.00E+00	0.00E+00	0.00E+00	3.20E-09	3.20E-09	1.45523E-12	1.68429E-11
Pd^{+2}	0.00E+00	0.00E+00	0.00E+00	3.31E-10	3.31E-10	1.50244E-13	1.73894E-12
PO_4^{-3}	0.00E+00	0.00E+00	0.00E+00	3.98E-08	3.98E-08	1.80854E-11	2.09322E-10
S^{+6}				2.72E-15	2.72E-15	1.23497E-18	1.42936E-17
Si^{+4}				5.61E-08	5.61E-08	2.54947E-11	2.95078E-10
SiO_4^{-4}	0.00E+00	0.00E+00	0.00E+00		0.00E+00	0	0
SO_4^{-2}	0.00E+00	0.00E+00	0.00E+00	1.29E-08	1.29E-08	5.85299E-12	6.77429E-11
Sr^{+2}	0.00E+00	0.00E+00	0.00E+00	1.41E-09	1.41E-09	6.40201E-13	7.40973E-12
Ti^{+4}	0.00E+00	0.00E+00	0.00E+00	1.61E-08	1.61E-08	7.29999E-12	8.44906E-11
Zn^{+2}	0.00E+00	0.00E+00	0.00E+00	3.54E-09	3.54E-09	1.60696E-12	1.85991E-11

Zr^{+4}	0.00E+00	0.00E+00	0.00E+00	3.71E-08	3.71E-08	1.68795E-11	1.95365E-10	

Rad. Component	Aqueous Rad. Components			Solids Rad. Components (1)			Total Rad. Components (1)		
	Ci/L	Ci/day	Lb/day	Ci/L	Ci/day	Lb/day	Ci/L	Ci/day	Lb/day
Total	0.00E+00	0.00E+00	0.00E+00	1.21E-13	2.64E-05	5.35E-08	1.21E-13	2.64E-05	5.35E-08
^{241}Am	0	0.00E+00	0.00E+00	4.73E-16	1.03E-07	6.63E-11	4.73E-16	1.03E-07	6.63E-11
^{14}C	0.00E+00	0.00E+00	0.00E+00	7.40E-20	1.61E-11	7.96E-15	7.40E-20	1.61E-11	7.96E-15
^{60}Co	0.00E+00	0.00E+00	0.00E+00	5.26E-17	1.15E-08	2.23E-14	5.26E-17	1.15E-08	2.23E-14
^{243}Cm	0.00E+00	0.00E+00	0.00E+00	1.57E-17	3.43E-09	1.50E-13	1.57E-17	3.43E-09	1.50E-13
^{244}Cm	0.00E+00	0.00E+00	0.00E+00	1.18E-17	2.57E-09	7.01E-14	1.18E-17	2.57E-09	7.01E-14
^{137}Cs	0.00E+00	0.00E+00	0.00E+00	6.25E-14	1.36E-05	3.46E-10	6.25E-14	1.36E-05	3.46E-10
^{152}Eu	0.00E+00	0.00E+00	0.00E+00	2.74E-18	5.97E-10	7.57E-15	2.74E-18	5.97E-10	7.57E-15
^{154}Eu	0.00E+00	0.00E+00	0.00E+00	2.74E-16	5.97E-08	4.87E-13	2.74E-16	5.97E-08	4.87E-13
^{155}Eu	0.00E+00	0.00E+00	0.00E+00	1.54E-16	3.35E-08	1.52E-13	1.54E-16	3.35E-08	1.52E-13
^{3}H	0.00E+00	0.00E+00	0.00E+00	2.75E-17	5.98E-09	1.37E-15	2.75E-17	5.98E-09	1.37E-15
^{129}I	0.00E+00	0.00E+00	0.00E+00	6.36E-21	1.39E-12	1.73E-11	6.36E-21	1.39E-12	1.73E-11
^{63}Ni	0.00E+00	0.00E+00	0.00E+00	2.73E-17	5.95E-09	2.31E-13	2.73E-17	5.95E-09	2.31E-13
^{237}Np	0.00E+00	0.00E+00	0.00E+00	3.89E-19	8.47E-11	2.65E-10	3.89E-19	8.47E-11	2.65E-10
^{238}Pu	0.00E+00	0.00E+00	0.00E+00	1.84E-18	4.01E-10	5.16E-14	1.84E-18	4.01E-10	5.16E-14
^{239}Pu	0.00E+00	0.00E+00	0.00E+00	1.63E-17	3.55E-09	1.26E-10	1.63E-17	3.55E-09	1.26E-10
^{240}Pu	0.00E+00	0.00E+00	0.00E+00	8.93E-19	1.95E-10	1.89E-12	8.93E-19	1.95E-10	1.89E-12
^{241}Pu	0.00E+00	0.00E+00	0.00E+00	1.16E-16	2.52E-08	5.39E-13	1.16E-16	2.52E-08	5.39E-13
^{125}Sb	0.00E+00	0.00E+00	0.00E+00	1.83E-16	3.98E-08	8.45E-14	1.83E-16	3.98E-08	8.45E-14
^{151}Sm	0.00E+00	0.00E+00	0.00E+00	5.67E-16	1.23E-07	1.03E-11	5.67E-16	1.23E-07	1.03E-11
^{126}Sn	0.00E+00	0.00E+00	0.00E+00	8.13E-19	1.77E-10	3.44E-11	8.13E-19	1.77E-10	3.44E-11
^{90}Sr	0.00E+00	0.00E+00	0.00E+00	5.60E-14	1.22E-05	1.95E-10	5.60E-14	1.22E-05	1.95E-10
^{99}Tc	0.00E+00	0.00E+00	0.00E+00	6.66E-16	1.45E-07	1.89E-08	6.66E-16	1.45E-07	1.89E-08
^{232}Th	0.00E+00	0.00E+00	0.00E+00	4.21E-21	9.18E-13	1.84E-08	4.21E-21	9.18E-13	1.84E-08
^{233}U	0.00E+00	0.00E+00	0.00E+00	6.47E-21	1.41E-12	3.23E-13	6.47E-21	1.41E-12	3.23E-13
^{234}U	0.00E+00	0.00E+00	0.00E+00	1.82E-20	3.96E-12	1.41E-12	1.82E-20	3.96E-12	1.41E-12
^{235}U	0.00E+00	0.00E+00	0.00E+00	1.35E-21	2.94E-13	3.00E-10	1.35E-21	2.94E-13	3.00E-10
^{236}U	0.00E+00	0.00E+00	0.00E+00	6.53E-22	1.42E-13	4.85E-12	6.53E-22	1.42E-13	4.85E-12
^{238}U	0.00E+00	0.00E+00	0.00E+00	1.04E-20	2.27E-12	1.49E-08	1.04E-20	2.27E-12	1.49E-08

Table A-11 PVP12 Stream Report

Read this note for program instructions.

Stream Number: PVP12
Stream Name: Carbon bed adsorber discharge
Configuration: 0
0
Run Data File: H:\Working Folder 2 (john)\MRQ_03_002_run2a_Streams.csv
Run Date / Time: 1/16/2003 - 1:27:28 PM

Stream Properties Variable	Value	Units
Density	1.10E-03	g/cm^3
Enthalpy	-1.25E+06	BTU/hr
Mass Flow	1.12E+04	Lb/hr
	2.69E+05	Lb/day
Volumetric Flow	2.02E+04	GPM
Molar Flow	3.93E+02	Lbmol/hr
Volumetric Flow	2.70E+03	ft^3/min
Molecular Weight	2.85E+01	Lb/Lbmol
Pressure	1.00E+03	mbar
Temperature	3.73E+01	C
Viscosity	1.88E-02	cP
Na Molarity	0.00E+00	mol/L
pH	#NUM!	pH
Total TRU	3.17E-19	Ci/L
Total Activity	2.37E-09	Ci/L

Gaseous Components (1) Component	mol/L	Lb/day	Mt/day
CO	2.25E-27	1.53E-20	6.97408E-24
CO_2	1.39E-07	1.48E+00	0.000673417
H_2O	1.24E-03	5.43E+03	2.469559107
NO	5.52E-31	4.02E-24	1.82836E-27
NO_2	3.40E-40	3.80E-33	1.72565E-36
N_2	2.96E-02	2.02E+05	91.74652304
O_2	7.88E-03	6.13E+04	27.84468279
SO_2	3.82E-28	5.95E-21	2.70601E-24
NH_3	2.64E-06	1.09E+01	0.004964848
HNO_3	5.46E-10	8.36E-03	3.79863E-06
HCl	2.21E-33	1.96E-26	8.90994E-30
HF	3.38E-33	1.64E-26	7.47058E-30

(1) All radionuclides in gaseous streams are assumed to exist as solid particulate.

Component	Aqueous Components mol/L	Lb/gal	Lb/day	Solid Components Lb/day	Total Component Lb/day	mt/day	g/sec
Total	0.00E+00	0.00E+00	0.00E+00	2.66E-04	2.66E-04	1.20764E-07	1.39773E-06
Ag^+	0.00E+00	0.00E+00	0.00E+00	9.74E-13	9.74E-13	4.42522E-16	5.12178E-15
Al^{+3}	0.00E+00	0.00E+00	0.00E+00	2.01E-10	2.01E-10	9.14472E-14	1.05842E-12
As^{+3}	0.00E+00	0.00E+00	0.00E+00	2.61E-10	2.61E-10	1.18571E-13	1.37235E-12
B^{+3}	0.00E+00	0.00E+00	0.00E+00	7.28E-12	7.28E-12	3.31054E-15	3.83165E-14
Ba^{+2}	0.00E+00	0.00E+00	0.00E+00	4.89E-12	4.89E-12	2.22341E-15	2.57339E-14
Bi^{+3}	0.00E+00	0.00E+00	0.00E+00	2.69E-12	2.69E-12	1.22474E-15	1.41752E-14
$C_2O_4^{-2}$	0.00E+00	0.00E+00	0.00E+00	2.74E-12	2.74E-12	1.2443E-15	1.44016E-14
Ca^{+2}	0.00E+00	0.00E+00	0.00E+00	6.88E-10	6.88E-10	3.12801E-13	3.62038E-12
Cd^{+2}	0.00E+00	0.00E+00	0.00E+00	1.35E-11	1.35E-11	6.14347E-15	7.1105E-14
Ce^{+3}	0.00E+00	0.00E+00	0.00E+00	4.33E-12	4.33E-12	1.96717E-15	2.27682E-14
Cl^-	0.00E+00	0.00E+00	0.00E+00	4.34E-11	4.34E-11	1.97377E-14	2.28446E-13
CO_3^{-2}	0.00E+00	0.00E+00	0.00E+00	4.59E-10	4.59E-10	2.08653E-13	2.41496E-12
Cr^{+3}	0.00E+00	0.00E+00	0.00E+00	2.36E-11	2.36E-11	1.07048E-14	1.23898E-13
Cu^{+2}	0.00E+00	0.00E+00	0.00E+00	9.22E-13	9.22E-13	4.19243E-16	4.85234E-15
F^-	0.00E+00	0.00E+00	0.00E+00	5.02E-11	5.02E-11	2.28161E-14	2.64076E-13
Fe^{+3}	0.00E+00	0.00E+00	0.00E+00	4.80E-11	4.80E-11	2.1802E-14	2.52338E-13
H^+	0.00E+00	0.00E+00	0.00E+00		0.00E+00	0	0
H_2O	0.00E+00	0.00E+00	0.00E+00		0.00E+00	0	0
Hg^{+2}	0.00E+00	0.00E+00	0.00E+00	2.66E-04	2.66E-04	1.20762E-07	1.3977E-06
K^+	0.00E+00	0.00E+00	0.00E+00	1.78E-10	1.78E-10	8.06942E-14	9.3396E-13
La^{+3}	0.00E+00	0.00E+00	0.00E+00	2.72E-12	2.72E-12	1.23799E-15	1.43286E-14
Li^+	0.00E+00	0.00E+00	0.00E+00	1.05E-12	1.05E-12	4.75862E-16	5.50766E-15
Mg^{+2}	0.00E+00	0.00E+00	0.00E+00	2.61E-11	2.61E-11	1.18833E-14	1.37538E-13
Mn^{+3}	0.00E+00	0.00E+00	0.00E+00	1.45E-11	1.45E-11	6.58001E-15	7.61575E-14
MnO_4^-	0.00E+00	0.00E+00	0.00E+00		0.00E+00	0	0
Na^+	0.00E+00	0.00E+00	0.00E+00	6.93E-10	6.93E-10	3.15038E-13	3.64627E-12
NH_4^+	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0	0
Ni^{+2}	0.00E+00	0.00E+00	0.00E+00	5.51E-12	5.51E-12	2.50279E-15	2.89675E-14
NO_2^-	0.00E+00	0.00E+00	0.00E+00	2.05E-10	2.05E-10	9.31115E-14	1.07768E-12
NO_3^-	0.00E+00	0.00E+00	0.00E+00	1.09E-09	1.09E-09	4.95164E-13	5.73106E-12
O^{-2}				1.05E-10	1.05E-10	4.77097E-14	5.52196E-13
OH^-	0.00E+00	0.00E+00	0.00E+00	8.20E-10	8.20E-10	3.72926E-13	4.31627E-12
$OH(b)^-$	0.00E+00	0.00E+00	0.00E+00		0.00E+00	0	0
P^{+5}				9.14E-17	9.14E-17	4.15479E-20	4.80878E-19
Pb^{+2}	0.00E+00	0.00E+00	0.00E+00	3.81E-12	3.81E-12	1.73308E-15	2.00588E-14
Pd^{+2}	0.00E+00	0.00E+00	0.00E+00	1.01E-13	1.01E-13	4.60419E-17	5.32892E-16
PO_4^{-3}	0.00E+00	0.00E+00	0.00E+00	2.05E-10	2.05E-10	9.34071E-14	1.0811E-12
S^{+6}				2.04E-13	2.04E-13	9.29222E-17	1.07549E-15
Si^{+4}				3.73E-11	3.73E-11	1.69654E-14	1.96358E-13
SiO_4^{-4}	0.00E+00	0.00E+00	0.00E+00		0.00E+00	0	0
SO_4^{-2}	0.00E+00	0.00E+00	0.00E+00	8.39E-11	8.39E-11	3.81357E-14	4.41385E-13
Sr^{+2}	0.00E+00	0.00E+00	0.00E+00	4.19E-13	4.19E-13	1.90495E-16	2.2048E-15
Ti^{+4}	0.00E+00	0.00E+00	0.00E+00	5.70E-12	5.70E-12	2.58866E-15	2.99613E-14
Zn^{+2}	0.00E+00	0.00E+00	0.00E+00	2.01E-12	2.01E-12	9.12022E-16	1.05558E-14

Zr^{+4}	0.00E+00	0.00E+00	0.00E+00	1.60E-11	1.60E-11	7.25411E-15	8.39596E-14

Rad. Component	Aqueous Rad. Components			Solids Rad. Components (1)			Total Rad. Components (1)		
	Ci/L	Ci/day	Lb/day	Ci/L	Ci/day	Lb/day	Ci/L	Ci/day	Lb/day
Total	0.00E+00	0.00E+00	0.00E+00	2.37E-09	2.61E-01	8.82E-07	2.37E-09	2.61E-01	8.82E-07
^{241}Am	0	0.00E+00	0.00E+00	2.31E-19	2.55E-11	1.64E-14	2.31E-19	2.55E-11	1.64E-14
^{14}C	0.00E+00	0.00E+00	0.00E+00	1.36E-13	1.50E-05	7.42E-09	1.36E-13	1.50E-05	7.42E-09
^{60}Co	0.00E+00	0.00E+00	0.00E+00	3.82E-20	4.21E-12	8.21E-18	3.82E-20	4.21E-12	8.21E-18
^{243}Cm	0.00E+00	0.00E+00	0.00E+00	1.10E-20	1.22E-12	5.31E-17	1.10E-20	1.22E-12	5.31E-17
^{244}Cm	0.00E+00	0.00E+00	0.00E+00	8.28E-21	9.13E-13	2.49E-17	8.28E-21	9.13E-13	2.49E-17
^{137}Cs	0.00E+00	0.00E+00	0.00E+00	4.09E-17	4.51E-09	1.14E-13	4.09E-17	4.51E-09	1.14E-13
^{152}Eu	0.00E+00	0.00E+00	0.00E+00	4.43E-21	4.89E-13	6.20E-18	4.43E-21	4.89E-13	6.20E-18
^{154}Eu	0.00E+00	0.00E+00	0.00E+00	1.44E-19	1.59E-11	1.29E-16	1.44E-19	1.59E-11	1.29E-16
^{155}Eu	0.00E+00	0.00E+00	0.00E+00	9.26E-20	1.02E-11	4.63E-17	9.26E-20	1.02E-11	4.63E-17
^{3}H	0.00E+00	0.00E+00	0.00E+00	2.37E-09	2.61E-01	6.00E-08	2.37E-09	2.61E-01	6.00E-08
^{129}I	0.00E+00	0.00E+00	0.00E+00	5.92E-16	6.53E-08	8.15E-07	5.92E-16	6.53E-08	8.15E-07
^{63}Ni	0.00E+00	0.00E+00	0.00E+00	1.83E-20	2.02E-12	7.84E-17	1.83E-20	2.02E-12	7.84E-17
^{237}Np	0.00E+00	0.00E+00	0.00E+00	2.75E-22	3.04E-14	9.50E-14	2.75E-22	3.04E-14	9.50E-14
^{238}Pu	0.00E+00	0.00E+00	0.00E+00	9.02E-22	9.94E-14	1.28E-17	9.02E-22	9.94E-14	1.28E-17
^{239}Pu	0.00E+00	0.00E+00	0.00E+00	8.00E-21	8.82E-13	3.13E-14	8.00E-21	8.82E-13	3.13E-14
^{240}Pu	0.00E+00	0.00E+00	0.00E+00	4.46E-22	4.92E-14	4.77E-16	4.46E-22	4.92E-14	4.77E-16
^{241}Pu	0.00E+00	0.00E+00	0.00E+00	5.66E-20	6.24E-12	1.34E-16	5.66E-20	6.24E-12	1.34E-16
^{125}Sb	0.00E+00	0.00E+00	0.00E+00	1.32E-19	1.45E-11	3.09E-17	1.32E-19	1.45E-11	3.09E-17
^{151}Sm	0.00E+00	0.00E+00	0.00E+00	8.64E-19	9.53E-11	7.98E-15	8.64E-19	9.53E-11	7.98E-15
^{126}Sn	0.00E+00	0.00E+00	0.00E+00	7.54E-22	8.32E-14	1.61E-14	7.54E-22	8.32E-14	1.61E-14
^{90}Sr	0.00E+00	0.00E+00	0.00E+00	2.77E-17	3.06E-09	4.88E-14	2.77E-17	3.06E-09	4.88E-14
^{99}Tc	0.00E+00	0.00E+00	0.00E+00	1.04E-19	1.15E-11	1.50E-12	1.04E-19	1.15E-11	1.50E-12
^{232}Th	0.00E+00	0.00E+00	0.00E+00	4.80E-24	5.29E-16	1.06E-11	4.80E-24	5.29E-16	1.06E-11
^{233}U	0.00E+00	0.00E+00	0.00E+00	4.23E-23	4.67E-15	1.07E-15	4.23E-23	4.67E-15	1.07E-15
^{234}U	0.00E+00	0.00E+00	0.00E+00	3.47E-23	3.83E-15	1.36E-15	3.47E-23	3.83E-15	1.36E-15
^{235}U	0.00E+00	0.00E+00	0.00E+00	1.80E-24	1.98E-16	2.02E-13	1.80E-24	1.98E-16	2.02E-13
^{236}U	0.00E+00	0.00E+00	0.00E+00	3.00E-24	3.31E-16	1.13E-14	3.00E-24	3.31E-16	1.13E-14
^{238}U	0.00E+00	0.00E+00	0.00E+00	2.21E-23	2.44E-15	1.60E-11	2.21E-23	2.44E-15	1.60E-11

Table A-12 PJV11 Stream Report

Stream Number: PJV11
Stream Name: HEPA discharge
Configuration: 0
0
Run Data File: H:\Working Folder 2 (john)\MRQ_03_002_run2a_Streams.csv
Run Date / Time: 1/16/2003 - 1:27:28 PM

Read this note for program instructions.

Stream Properties Variable	Value	Units
Density	1.15E-03	g/cm^3
Enthalpy	-8.44E+06	BTU/hr
Mass Flow	1.66E+05	Lb/hr
	3.99E+06	Lb/day
Volumetric Flow	2.88E+05	GPM
Molar Flow	5.79E+03	Lbmol/hr
Volumetric Flow	3.85E+04	ft^3/min
Molecular Weight	2.87E+01	Lb/Lbmol
Pressure	1.00E+03	mbar
Temperature	2.67E+01	C
Viscosity	1.84E-02	cP
Na Molarity	0.00E+00	mol/L
pH	#NUM!	pH
Total TRU	5.00E-17	Ci/L
Total Activity	5.97E-13	Ci/L

Gaseous Components (1) Component	mol/L	Lb/day	Mt/day
CO	2.90E-28	2.81E-20	1.27941E-23
CO_2	4.54E-13	6.93E-05	3.14835E-08
H_2O	5.69E-04	3.55E+04	16.13505795
NO	2.31E-33	2.40E-25	1.08909E-28
NO_2	6.24E-39	9.94E-31	4.51828E-34
N_2	3.13E-02	3.03E+06	1378.323746
O_2	8.31E-03	9.21E+05	418.5140778
SO_2	1.05E-34	2.33E-26	1.05781E-29
NH_3	4.28E-11	2.52E-03	1.14673E-06
HNO_3	1.96E-11	4.28E-03	1.94555E-06
HCl	5.71E-32	7.21E-24	3.27559E-27
HF	3.03E-34	2.10E-26	9.54539E-30

(1) All radionuclides in gaseous streams are assumed to exist as solid particulate.

Component	Aqueous Components mol/L	Lb/gal	Lb/day	Solid Components Lb/day	Total Component Lb/day	mt/day	g/sec
Total	0.00E+00	0.00E+00	0.00E+00	3.67E-03	3.67E-03	1.6679E-06	1.93044E-05
Ag^+	0.00E+00	0.00E+00	0.00E+00	1.19E-09	1.19E-09	5.41706E-13	6.26975E-12
Al^{+3}	0.00E+00	0.00E+00	0.00E+00	2.16E-07	2.16E-07	9.81535E-11	1.13604E-09
As^{+3}	0.00E+00	0.00E+00	0.00E+00	4.58E-07	4.58E-07	2.08163E-10	2.40929E-09
B^{+3}	0.00E+00	0.00E+00	0.00E+00	7.10E-09	7.10E-09	3.22915E-12	3.73744E-11
Ba^{+2}	0.00E+00	0.00E+00	0.00E+00	6.86E-09	6.86E-09	3.11714E-12	3.6078E-11
Bi^{+3}	0.00E+00	0.00E+00	0.00E+00	5.24E-09	5.24E-09	2.38405E-12	2.75931E-11
$C_2O_4^{-2}$	0.00E+00	0.00E+00	0.00E+00	6.28E-07	6.28E-07	2.85668E-10	3.30634E-09
Ca^{+2}	0.00E+00	0.00E+00	0.00E+00	5.79E-08	5.79E-08	2.63037E-11	3.04441E-10
Cd^{+2}	0.00E+00	0.00E+00	0.00E+00	2.06E-08	2.06E-08	9.36407E-12	1.0838E-10
Ce^{+3}	0.00E+00	0.00E+00	0.00E+00	4.78E-09	4.78E-09	2.17395E-12	2.51615E-11
Cl^-	0.00E+00	0.00E+00	0.00E+00	5.13E-08	5.13E-08	2.33256E-11	2.69973E-10
CO_3^{-2}	0.00E+00	0.00E+00	0.00E+00	3.11E-07	3.11E-07	1.41261E-10	1.63496E-09
Cr^{+3}	0.00E+00	0.00E+00	0.00E+00	3.12E-08	3.12E-08	1.41838E-11	1.64165E-10
Cu^{+2}	0.00E+00	0.00E+00	0.00E+00	1.09E-09	1.09E-09	4.96373E-13	5.74505E-12
F^-	0.00E+00	0.00E+00	0.00E+00	6.82E-08	6.82E-08	3.10211E-11	3.5904E-10
Fe^{+3}	0.00E+00	0.00E+00	0.00E+00	5.82E-08	5.82E-08	2.64561E-11	3.06205E-10
H^+	0.00E+00	0.00E+00	0.00E+00		0.00E+00	0	0
H_2O	0.00E+00	0.00E+00	0.00E+00		0.00E+00	0	0
Hg^{+2}	0.00E+00	0.00E+00	0.00E+00	3.66E-03	3.66E-03	1.66521E-06	1.92733E-05
K^+	0.00E+00	0.00E+00	0.00E+00	2.09E-07	2.09E-07	9.48457E-11	1.09775E-09
La^{+3}	0.00E+00	0.00E+00	0.00E+00	4.11E-09	4.11E-09	1.86866E-12	2.1628E-11
Li^+	0.00E+00	0.00E+00	0.00E+00	1.48E-09	1.48E-09	6.72836E-13	7.78746E-12
Mg^{+2}	0.00E+00	0.00E+00	0.00E+00	4.40E-09	4.40E-09	2.00191E-12	2.31703E-11
Mn^{+3}	0.00E+00	0.00E+00	0.00E+00	1.71E-08	1.71E-08	7.78859E-12	9.01457E-11
MnO_4^-	0.00E+00	0.00E+00	0.00E+00		0.00E+00	0	0
Na^+	0.00E+00	0.00E+00	0.00E+00	7.42E-07	7.42E-07	3.37109E-10	3.90173E-09
NH_4^+	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0	0
Ni^{+2}	0.00E+00	0.00E+00	0.00E+00	8.59E-09	8.59E-09	3.90617E-12	4.52103E-11
NO_2^-	0.00E+00	0.00E+00	0.00E+00	2.69E-07	2.69E-07	1.22125E-10	1.41348E-09
NO_3^-	0.00E+00	0.00E+00	0.00E+00	1.41E-06	1.41E-06	6.41309E-10	7.42256E-09
O^{-2}				1.63E-07	1.63E-07	7.39167E-11	8.55517E-10
OH^-	0.00E+00	0.00E+00	0.00E+00	7.98E-07	7.98E-07	3.62651E-10	4.19735E-09
$OH(b)^-$	0.00E+00	0.00E+00	0.00E+00		0.00E+00	0	0
P^{+5}				5.39E-16	5.39E-16	2.44948E-19	2.83505E-18
Pb^{+2}	0.00E+00	0.00E+00	0.00E+00	5.65E-09	5.65E-09	2.56841E-12	2.97269E-11
Pd^{+2}	0.00E+00	0.00E+00	0.00E+00	2.10E-10	2.10E-10	9.55297E-14	1.10567E-12
PO_4^{-3}	0.00E+00	0.00E+00	0.00E+00	1.97E-07	1.97E-07	8.95391E-11	1.03633E-09
S^{+6}				1.63E-15	1.63E-15	7.41195E-19	8.57864E-18
Si^{+4}				3.33E-08	3.33E-08	1.51193E-11	1.74991E-10
SiO_4^{-4}	0.00E+00	0.00E+00	0.00E+00		0.00E+00	0	0
SO_4^{-2}	0.00E+00	0.00E+00	0.00E+00	1.02E-07	1.02E-07	4.63887E-11	5.36906E-10
Sr^{+2}	0.00E+00	0.00E+00	0.00E+00	8.69E-10	8.69E-10	3.95191E-13	4.57397E-12
Ti^{+4}	0.00E+00	0.00E+00	0.00E+00	5.27E-09	5.27E-09	2.39325E-12	2.76996E-11
Zn^{+2}	0.00E+00	0.00E+00	0.00E+00	2.03E-09	2.03E-09	9.21311E-13	1.06633E-11

BY: E. Berrios
DATE: 03/13/03

CALCULATION SHEET

PROJECT: WTP
JOB NO.: 24590
CALC NO.: 24590-WTP-M4C-FRP-00003
SHEET REV: A
SHEET NO.: 39

SUBJECT: Integrated Baseline Emissions Report Non-SSFM Represented Constituents Emissions Rate Estimation

Zr^{+4}	0.00E+00	0.00E+00	0.00E+00	2.25E-08	2.25E-08	1.02167E-11	1.18249E-10

Rad. Component	Aqueous Rad. Components			Solids Rad. Components (1)			Total Rad. Components (1)		
	Ci/L	Ci/day	Lb/day	Ci/L	Ci/day	Lb/day	Ci/L	Ci/day	Lb/day
Total	0.00E+00	0.00E+00	0.00E+00	5.97E-13	9.37E-04	1.62E-05	5.97E-13	9.37E-04	1.62E-05
^{241}Am	0	0.00E+00	0.00E+00	3.72E-17	5.84E-08	3.76E-11	3.72E-17	5.84E-08	3.76E-11
^{14}C	0.00E+00	0.00E+00	0.00E+00	6.23E-14	9.78E-05	4.83E-08	6.23E-14	9.78E-05	4.83E-08
^{60}Co	0.00E+00	0.00E+00	0.00E+00	4.20E-18	6.60E-09	1.29E-14	4.20E-18	6.60E-09	1.29E-14
^{243}Cm	0.00E+00	0.00E+00	0.00E+00	1.24E-18	1.94E-09	8.47E-14	1.24E-18	1.94E-09	8.47E-14
^{244}Cm	0.00E+00	0.00E+00	0.00E+00	9.27E-19	1.46E-09	3.97E-14	9.27E-19	1.46E-09	3.97E-14
^{137}Cs	0.00E+00	0.00E+00	0.00E+00	4.83E-15	7.58E-06	1.93E-10	4.83E-15	7.58E-06	1.93E-10
^{152}Eu	0.00E+00	0.00E+00	0.00E+00	4.92E-19	7.73E-10	9.80E-15	4.92E-19	7.73E-10	9.80E-15
^{154}Eu	0.00E+00	0.00E+00	0.00E+00	2.24E-17	3.52E-08	2.87E-13	2.24E-17	3.52E-08	2.87E-13
^{155}Eu	0.00E+00	0.00E+00	0.00E+00	1.36E-17	2.14E-08	9.72E-14	1.36E-17	2.14E-08	9.72E-14
^{3}H	0.00E+00	0.00E+00	0.00E+00	5.24E-13	8.23E-04	1.89E-10	5.24E-13	8.23E-04	1.89E-10
^{129}I	0.00E+00	0.00E+00	0.00E+00	8.23E-16	1.29E-06	1.61E-05	8.23E-16	1.29E-06	1.61E-05
^{63}Ni	0.00E+00	0.00E+00	0.00E+00	2.50E-18	3.93E-09	1.53E-13	2.50E-18	3.93E-09	1.53E-13
^{237}Np	0.00E+00	0.00E+00	0.00E+00	3.07E-20	4.82E-11	1.51E-10	3.07E-20	4.82E-11	1.51E-10
^{238}Pu	0.00E+00	0.00E+00	0.00E+00	1.45E-19	2.27E-10	2.93E-14	1.45E-19	2.27E-10	2.93E-14
^{239}Pu	0.00E+00	0.00E+00	0.00E+00	1.28E-18	2.02E-09	7.16E-11	1.28E-18	2.02E-09	7.16E-11
^{240}Pu	0.00E+00	0.00E+00	0.00E+00	7.10E-20	1.12E-10	1.08E-12	7.10E-20	1.12E-10	1.08E-12
^{241}Pu	0.00E+00	0.00E+00	0.00E+00	9.09E-18	1.43E-08	3.06E-13	9.09E-18	1.43E-08	3.06E-13
^{125}Sb	0.00E+00	0.00E+00	0.00E+00	1.78E-17	2.79E-08	5.93E-14	1.78E-17	2.79E-08	5.93E-14
^{151}Sm	0.00E+00	0.00E+00	0.00E+00	9.70E-17	1.52E-07	1.28E-11	9.70E-17	1.52E-07	1.28E-11
^{126}Sn	0.00E+00	0.00E+00	0.00E+00	9.56E-20	1.50E-10	2.92E-11	9.56E-20	1.50E-10	2.92E-11
^{90}Sr	0.00E+00	0.00E+00	0.00E+00	4.33E-15	6.80E-06	1.08E-10	4.33E-15	6.80E-06	1.08E-10
^{99}Tc	0.00E+00	0.00E+00	0.00E+00	1.18E-17	1.85E-08	2.40E-09	1.18E-17	1.85E-08	2.40E-09
^{232}Th	0.00E+00	0.00E+00	0.00E+00	4.49E-22	7.05E-13	1.41E-08	4.49E-22	7.05E-13	1.41E-08
^{233}U	0.00E+00	0.00E+00	0.00E+00	2.70E-21	4.23E-12	9.69E-13	2.70E-21	4.23E-12	9.69E-13
^{234}U	0.00E+00	0.00E+00	0.00E+00	2.70E-21	4.24E-12	1.51E-12	2.70E-21	4.24E-12	1.51E-12
^{235}U	0.00E+00	0.00E+00	0.00E+00	1.55E-22	2.44E-13	2.49E-10	1.55E-22	2.44E-13	2.49E-10
^{236}U	0.00E+00	0.00E+00	0.00E+00	1.98E-22	3.12E-13	1.06E-11	1.98E-22	3.12E-13	1.06E-11
^{238}U	0.00E+00	0.00E+00	0.00E+00	1.76E-21	2.77E-12	1.82E-08	1.76E-21	2.77E-12	1.82E-08

Table A-13 LVP26 Stream Report

Stream Number: LVP26
Stream Name: Activated Carbon Column discharge to stack
Configuration: 0
0
Run Data File: H:\Working Folder 2 (john)\MRQ_03_002_run2a_Streams.csv
Run Date / Time: 1/16/2003 - 1:27:28 PM

Read this note for program instructions.

Stream Properties Variable	Value	Units
Density	9.16E-04	g/cm^3
Enthalpy	-6.56E+06	BTU/hr
Mass Flow	1.56E+04	Lb/hr
	3.75E+05	Lb/day
Volumetric Flow	3.40E+04	GPM
Molar Flow	5.50E+02	Lbmol/hr
Volumetric Flow	4.55E+03	ft^3/min
Molecular Weight	2.84E+01	Lb/Lbmol
Pressure	1.00E+03	mbar
Temperature	1.00E+02	C
Viscosity	2.14E-02	cP
Na Molarity	0.00E+00	mol/L
pH	#NUM!	pH
Total TRU	6.08E-19	Ci/L
Total Activity	5.27E-09	Ci/L

Gaseous Components (1) Component	mol/L	Lb/day	Mt/day
CO	1.05E-06	1.21E+01	0.005480591
CO_2	8.62E-04	1.55E+04	7.051801872
H_2O	2.59E-03	1.91E+04	8.688901249
NO	1.44E-05	1.76E+02	0.080181325
NO_2	1.31E-06	2.46E+01	0.011201307
N_2	2.25E-02	2.58E+05	117.2498311
O_2	6.27E-03	8.21E+04	37.31166516
SO_2	7.69E-07	2.01E+01	0.009158678
NH_3	8.92E-07	6.22E+00	0.002825601
HNO_3	3.21E-27	8.29E-20	3.76628E-23
HCl	4.99E-07	7.45E+00	0.003386755
HF	1.32E-07	1.08E+00	0.000490102

(1) All radionuclides in gaseous streams are assumed to exist as solid particulate.

Component	Aqueous Components mol/L	Lb/gal	Lb/day	Solid Components Lb/day	Total Component Lb/day	mt/day	g/sec
Total	0.00E+00	0.00E+00	0.00E+00	4.21E+01	4.21E+01	0.019121167	0.221309799
Ag^+	0.00E+00	0.00E+00	0.00E+00	7.05E-09	7.05E-09	3.20523E-12	3.70976E-11
Al^{+3}	0.00E+00	0.00E+00	0.00E+00	4.33E-07	4.33E-07	1.96948E-10	2.27949E-09
As^{+3}	0.00E+00	0.00E+00	0.00E+00	8.88E-05	8.88E-05	4.03514E-08	4.6703E-07
B^{+3}	0.00E+00	0.00E+00	0.00E+00	1.99E-06	1.99E-06	9.05419E-10	1.04794E-08
Ba^{+2}	0.00E+00	0.00E+00	0.00E+00	1.99E-10	1.99E-10	9.0331E-14	1.0455E-12
Bi^{+3}	0.00E+00	0.00E+00	0.00E+00	7.74E-09	7.74E-09	3.51926E-12	4.07322E-11
$C_2O_4^{-2}$	0.00E+00	0.00E+00	0.00E+00	2.72E+01	2.72E+01	0.01235332	0.142978237
Ca^{+2}	0.00E+00	0.00E+00	0.00E+00	1.59E-06	1.59E-06	7.20568E-10	8.3399E-09
Cd^{+2}	0.00E+00	0.00E+00	0.00E+00	5.52E-07	5.52E-07	2.50836E-10	2.90319E-09
Ce^{+3}	0.00E+00	0.00E+00	0.00E+00	2.08E-09	2.08E-09	9.46574E-13	1.09557E-11
Cl^-	0.00E+00	0.00E+00	0.00E+00	1.33E-06	1.33E-06	6.04154E-10	6.99252E-09
CO_3^{-2}	0.00E+00	0.00E+00	0.00E+00	7.05E-10	7.05E-10	3.20546E-13	3.71002E-12
Cr^{+3}	0.00E+00	0.00E+00	0.00E+00	3.65E-07	3.65E-07	1.65872E-10	1.91981E-09
Cu^{+2}	0.00E+00	0.00E+00	0.00E+00	1.15E-09	1.15E-09	5.2105E-13	6.03067E-12
F^-	0.00E+00	0.00E+00	0.00E+00	2.06E-06	2.06E-06	9.3532E-10	1.08255E-08
Fe^{+3}	0.00E+00	0.00E+00	0.00E+00	2.56E-07	2.56E-07	1.16526E-10	1.34869E-09
H^+	0.00E+00	0.00E+00	0.00E+00		0.00E+00	0	0
H_2O	0.00E+00	0.00E+00	0.00E+00		0.00E+00	0	0
Hg^{+2}	0.00E+00	0.00E+00	0.00E+00	1.33E-02	1.33E-02	6.0228E-06	6.97083E-05
K^+	0.00E+00	0.00E+00	0.00E+00	5.15E-06	5.15E-06	2.34107E-09	2.70958E-08
La^{+3}	0.00E+00	0.00E+00	0.00E+00	4.32E-10	4.32E-10	1.96591E-13	2.27536E-12
Li^+	0.00E+00	0.00E+00	0.00E+00	1.24E-06	1.24E-06	5.62212E-10	6.50708E-09
Mg^{+2}	0.00E+00	0.00E+00	0.00E+00	1.94E-07	1.94E-07	8.80755E-11	1.01939E-09
Mn^{+3}	0.00E+00	0.00E+00	0.00E+00	1.70E-08	1.70E-08	7.73996E-12	8.95829E-11
MnO_4^-	0.00E+00	0.00E+00	0.00E+00		0.00E+00	0	0
Na^+	0.00E+00	0.00E+00	0.00E+00	6.73E-06	6.73E-06	3.0612E-09	3.54305E-08
NH_4^+	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0	0
Ni^{+2}	0.00E+00	0.00E+00	0.00E+00	2.41E-08	2.41E-08	1.0973E-11	1.27003E-10
NO_2^-	0.00E+00	0.00E+00	0.00E+00	2.55E-10	2.55E-10	1.1576E-13	1.33982E-12
NO_3^-	0.00E+00	0.00E+00	0.00E+00	1.32E-09	1.32E-09	5.98822E-13	6.93081E-12
O^{-2}				1.29E+01	1.29E+01	0.005844906	0.067649373
OH^-	0.00E+00	0.00E+00	0.00E+00	6.10E-10	6.10E-10	2.77228E-13	3.20865E-12
$OH(b)^-$	0.00E+00	0.00E+00	0.00E+00		0.00E+00	0	0
P^{+5}				7.32E-05	7.32E-05	3.3282E-08	3.85208E-07
Pb^{+2}	0.00E+00	0.00E+00	0.00E+00	1.45E-08	1.45E-08	6.59743E-12	7.63591E-11
Pd^{+2}	0.00E+00	0.00E+00	0.00E+00	1.51E-11	1.51E-11	6.87093E-15	7.95246E-14
PO_4^{-3}	0.00E+00	0.00E+00	0.00E+00	1.80E-10	1.80E-10	8.1639E-14	9.44896E-13
S^{+6}				2.02E+00	2.02E+00	0.000916828	0.010611441
Si^{+4}				1.33E-06	1.33E-06	6.03056E-10	6.97982E-09
SiO_4^{-4}	0.00E+00	0.00E+00	0.00E+00		0.00E+00	0	0
SO_4^{-2}	0.00E+00	0.00E+00	0.00E+00	9.79E-11	9.79E-11	4.44956E-14	5.14996E-13
Sr^{+2}	0.00E+00	0.00E+00	0.00E+00	1.51E-10	1.51E-10	6.87732E-14	7.95986E-13
Ti^{+4}	0.00E+00	0.00E+00	0.00E+00	1.16E-05	1.16E-05	5.2849E-09	6.11678E-08
Zn^{+2}	0.00E+00	0.00E+00	0.00E+00	6.12E-07	6.12E-07	2.78335E-10	3.22147E-09

Zr^{+4}	0.00E+00	0.00E+00	0.00E+00	1.37E-07	1.37E-07	6.20706E-11	7.1841E-10

Rad. Component	Aqueous Rad. Components			Solids Rad. Components (1)			Total Rad. Components (1)		
	Ci/L	Ci/day	Lb/day	Ci/L	Ci/day	Lb/day	Ci/L	Ci/day	Lb/day
Total	0.00E+00	0.00E+00	0.00E+00	5.27E-09	9.78E-01	1.56E-03	5.27E-09	9.78E-01	1.56E-03
^{241}Am	0	0.00E+00	0.00E+00	4.39E-19	8.16E-11	5.25E-14	4.39E-19	8.16E-11	5.25E-14
^{14}C	0.00E+00	0.00E+00	0.00E+00	4.93E-09	9.14E-01	4.51E-04	4.93E-09	9.14E-01	4.51E-04
^{60}Co	0.00E+00	0.00E+00	0.00E+00	2.73E-18	5.07E-10	9.88E-16	2.73E-18	5.07E-10	9.88E-16
^{243}Cm	0.00E+00	0.00E+00	0.00E+00	1.18E-21	2.18E-13	9.52E-18	1.18E-21	2.18E-13	9.52E-18
^{244}Cm	0.00E+00	0.00E+00	0.00E+00	1.26E-21	2.34E-13	6.38E-18	1.26E-21	2.34E-13	6.38E-18
^{137}Cs	0.00E+00	0.00E+00	0.00E+00	1.73E-16	3.22E-08	8.17E-13	1.73E-16	3.22E-08	8.17E-13
^{152}Eu	0.00E+00	0.00E+00	0.00E+00	1.53E-18	2.84E-10	3.60E-15	1.53E-18	2.84E-10	3.60E-15
^{154}Eu	0.00E+00	0.00E+00	0.00E+00	5.08E-18	9.42E-10	7.68E-15	5.08E-18	9.42E-10	7.68E-15
^{155}Eu	0.00E+00	0.00E+00	0.00E+00	8.74E-18	1.62E-09	7.36E-15	8.74E-18	1.62E-09	7.36E-15
^{3}H	0.00E+00	0.00E+00	0.00E+00	3.44E-10	6.39E-02	1.47E-08	3.44E-10	6.39E-02	1.47E-08
^{129}I	0.00E+00	0.00E+00	0.00E+00	4.78E-13	8.87E-05	1.11E-03	4.78E-13	8.87E-05	1.11E-03
^{63}Ni	0.00E+00	0.00E+00	0.00E+00	2.13E-17	3.96E-09	1.54E-13	2.13E-17	3.96E-09	1.54E-13
^{237}Np	0.00E+00	0.00E+00	0.00E+00	1.89E-21	3.50E-13	1.10E-12	1.89E-21	3.50E-13	1.10E-12
^{238}Pu	0.00E+00	0.00E+00	0.00E+00	2.55E-21	4.73E-13	6.09E-17	2.55E-21	4.73E-13	6.09E-17
^{239}Pu	0.00E+00	0.00E+00	0.00E+00	2.98E-20	5.53E-12	1.96E-13	2.98E-20	5.53E-12	1.96E-13
^{240}Pu	0.00E+00	0.00E+00	0.00E+00	5.13E-21	9.53E-13	9.25E-15	5.13E-21	9.53E-13	9.25E-15
^{241}Pu	0.00E+00	0.00E+00	0.00E+00	1.27E-19	2.36E-11	5.05E-16	1.27E-19	2.36E-11	5.05E-16
^{125}Sb	0.00E+00	0.00E+00	0.00E+00	4.61E-16	8.56E-08	1.82E-13	4.61E-16	8.56E-08	1.82E-13
^{151}Sm	0.00E+00	0.00E+00	0.00E+00	2.90E-16	5.39E-08	4.51E-12	2.90E-16	5.39E-08	4.51E-12
^{126}Sn	0.00E+00	0.00E+00	0.00E+00	1.76E-19	3.26E-11	6.33E-12	1.76E-19	3.26E-11	6.33E-12
^{90}Sr	0.00E+00	0.00E+00	0.00E+00	1.90E-15	3.52E-07	5.62E-12	1.90E-15	3.52E-07	5.62E-12
^{99}Tc	0.00E+00	0.00E+00	0.00E+00	1.29E-16	2.40E-08	3.12E-09	1.29E-16	2.40E-08	3.12E-09
^{232}Th	0.00E+00	0.00E+00	0.00E+00	6.50E-22	1.21E-13	2.42E-09	6.50E-22	1.21E-13	2.42E-09
^{233}U	0.00E+00	0.00E+00	0.00E+00	1.21E-20	2.24E-12	5.13E-13	1.21E-20	2.24E-12	5.13E-13
^{234}U	0.00E+00	0.00E+00	0.00E+00	7.03E-21	1.30E-12	4.63E-13	7.03E-21	1.30E-12	4.63E-13
^{235}U	0.00E+00	0.00E+00	0.00E+00	2.71E-22	5.03E-14	5.14E-11	2.71E-22	5.03E-14	5.14E-11
^{236}U	0.00E+00	0.00E+00	0.00E+00	8.13E-22	1.51E-13	5.14E-12	8.13E-22	1.51E-13	5.14E-12
^{238}U	0.00E+00	0.00E+00	0.00E+00	5.22E-21	9.70E-13	6.36E-09	5.22E-21	9.70E-13	6.36E-09

Table A-14 HOP33 Stream Report

Stream Number: HOP33
Stream Name: Activated Carbon Adsorber Discharge
Configuration: 0
0
Run Data File: H:\Working Folder 2 (john)\MRQ_03_002_run2a_Streams.csv
Run Date / Time: 1/16/2003 - 1:27:28 PM

Read this note for program instructions.

Stream Properties Variable	Value	Units
Density	9.12E-04	g/cm³
Enthalpy	-4.93E+06	BTU/hr
Mass Flow	5.38E+03	Lb/hr
	1.29E+05	Lb/day
Volumetric Flow	1.18E+04	GPM
Molar Flow	2.01E+02	Lbmol/hr
Volumetric Flow	1.57E+03	ft³/min
Molecular Weight	2.67E+01	Lb/Lbmol
Pressure	1.00E+03	mbar
Temperature	8.00E+01	C
Viscosity	1.99E-02	cP
Na Molarity	0.00E+00	mol/L
pH	#NUM!	pH
Total TRU	1.42E-17	Ci/L
Total Activity	1.03E-08	Ci/L

Gaseous Components (1) Component	mol/L	Lb/day	Mt/day
CO	5.04E-07	2.00E+00	0.000907866
CO_2	5.29E-04	3.29E+03	1.496264184
H_2O	7.41E-03	1.89E+04	8.578196871
NO	9.63E-06	4.09E+01	0.018577114
NO_2	8.78E-07	5.71E+00	0.002595217
N_2	2.05E-02	8.13E+04	36.97462272
O_2	5.61E-03	2.54E+04	11.54699556
SO_2	2.93E-06	2.65E+01	0.012047415
NH_3	1.49E-06	3.59E+00	0.001631487
HNO_3	4.97E-13	4.43E-06	2.01159E-09
HCl	3.63E-09	1.87E-02	8.50175E-06
HF	6.36E-10	1.80E-03	8.1726E-07

(1) All radionuclides in gaseous streams are assumed to exist as solid particulate.

Component	Aqueous Components mol/L	Lb/gal	Lb/day	Solid Components Lb/day	Total Component Lb/day	mt/day	g/sec
Total	0.00E+00	0.00E+00	0.00E+00	3.51E+01	3.51E+01	0.015963128	0.184758429
Ag^+	0.00E+00	0.00E+00	0.00E+00	2.56E-10	2.56E-10	1.16498E-13	1.34836E-12
Al^{+3}	0.00E+00	0.00E+00	0.00E+00	7.33E-10	7.33E-10	3.33301E-13	3.85765E-12
As^{+3}	0.00E+00	0.00E+00	0.00E+00	3.15E-06	3.15E-06	1.43147E-09	1.65679E-08
B^{+3}	0.00E+00	0.00E+00	0.00E+00	2.28E-09	2.28E-09	1.03759E-12	1.20092E-11
Ba^{+2}	0.00E+00	0.00E+00	0.00E+00	6.12E-11	6.12E-11	2.78132E-14	3.21912E-13
Bi^{+3}	0.00E+00	0.00E+00	0.00E+00	4.37E-10	4.37E-10	1.98494E-13	2.29739E-12
$C_2O_4^{-2}$	0.00E+00	0.00E+00	0.00E+00	6.19E+00	6.19E+00	0.002814666	0.032577148
Ca^{+2}	0.00E+00	0.00E+00	0.00E+00	8.01E-10	8.01E-10	3.642E-13	4.21528E-12
Cd^{+2}	0.00E+00	0.00E+00	0.00E+00	4.70E-09	4.70E-09	2.13689E-12	2.47326E-11
Ce^{+3}	0.00E+00	0.00E+00	0.00E+00	1.58E-11	1.58E-11	7.16399E-15	8.29165E-14
Cl^-	0.00E+00	0.00E+00	0.00E+00	1.50E-12	1.50E-12	6.82381E-16	7.89792E-15
CO_3^{-2}	0.00E+00	0.00E+00	0.00E+00	6.97E-13	6.97E-13	3.16673E-16	3.66519E-15
Cr^{+3}	0.00E+00	0.00E+00	0.00E+00	6.22E-10	6.22E-10	2.82712E-13	3.27213E-12
Cu^{+2}	0.00E+00	0.00E+00	0.00E+00	3.40E-11	3.40E-11	1.544E-14	1.78703E-13
F^-	0.00E+00	0.00E+00	0.00E+00	4.85E-12	4.85E-12	2.20682E-15	2.55419E-14
Fe^{+3}	0.00E+00	0.00E+00	0.00E+00	4.92E-10	4.92E-10	2.23791E-13	2.59018E-12
H^+	0.00E+00	0.00E+00	0.00E+00		0.00E+00	0	0
H_2O	0.00E+00	0.00E+00	0.00E+00		0.00E+00	0	0
Hg^{+2}	0.00E+00	0.00E+00	0.00E+00	2.40E-03	2.40E-03	1.09181E-06	1.26366E-05
K^+	0.00E+00	0.00E+00	0.00E+00	5.71E-09	5.71E-09	2.59329E-12	3.0015E-11
La^{+3}	0.00E+00	0.00E+00	0.00E+00	9.17E-11	9.17E-11	4.16849E-14	4.82464E-13
Li^+	0.00E+00	0.00E+00	0.00E+00	6.46E-10	6.46E-10	2.93521E-13	3.39723E-12
Mg^{+2}	0.00E+00	0.00E+00	0.00E+00	7.12E-11	7.12E-11	3.23559E-14	3.7449E-13
Mn^{+3}	0.00E+00	0.00E+00	0.00E+00	4.05E-10	4.05E-10	1.84053E-13	2.13025E-12
MnO_4^-	0.00E+00	0.00E+00	0.00E+00		0.00E+00	0	0
Na^+	0.00E+00	0.00E+00	0.00E+00	1.16E-08	1.16E-08	5.27802E-12	6.10882E-11
NH_4^+	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0	0
Ni^{+2}	0.00E+00	0.00E+00	0.00E+00	3.31E-10	3.31E-10	1.50242E-13	1.73891E-12
NO_2^-	0.00E+00	0.00E+00	0.00E+00	2.59E-13	2.59E-13	1.17807E-16	1.3635E-15
NO_3^-	0.00E+00	0.00E+00	0.00E+00	1.81E-12	1.81E-12	8.20992E-16	9.50222E-15
O^{-2}				2.63E+01	2.63E+01	0.011941357	0.138210149
OH^-	0.00E+00	0.00E+00	0.00E+00	2.26E-12	2.26E-12	1.02795E-15	1.18975E-14
$OH(b)^-$	0.00E+00	0.00E+00	0.00E+00		0.00E+00	0	0
P^{+5}				1.62E-05	1.62E-05	7.37293E-09	8.53348E-08
Pb^{+2}	0.00E+00	0.00E+00	0.00E+00	1.09E-10	1.09E-10	4.96216E-14	5.74324E-13
Pd^{+2}	0.00E+00	0.00E+00	0.00E+00	2.17E-12	2.17E-12	9.87862E-16	1.14336E-14
PO_4^{-3}	0.00E+00	0.00E+00	0.00E+00	2.65E-13	2.65E-13	1.20571E-16	1.39549E-15
S^{+6}				2.65E+00	2.65E+00	0.001206005	0.013958393
Si^{+4}				1.51E-09	1.51E-09	6.85979E-13	7.93958E-12
SiO_4^{-4}	0.00E+00	0.00E+00	0.00E+00		0.00E+00	0	0
SO_4^{-2}	0.00E+00	0.00E+00	0.00E+00	8.58E-14	8.58E-14	3.90203E-17	4.51624E-16
Sr^{+2}	0.00E+00	0.00E+00	0.00E+00	1.75E-11	1.75E-11	7.95438E-15	9.20646E-14
Ti^{+4}	0.00E+00	0.00E+00	0.00E+00	9.37E-09	9.37E-09	4.26096E-12	4.93166E-11
Zn^{+2}	0.00E+00	0.00E+00	0.00E+00	4.69E-10	4.69E-10	2.13289E-13	2.46863E-12

Zr^{+4}	0.00E+00	0.00E+00	0.00E+00	2.21E-10	2.21E-10	1.00502E-13	1.16321E-12		
Rad.	Aqueous Rad. Components			Solids Rad. Components (1)			Total Rad. Components (1)		
Component	Ci/L	Ci/day	Lb/day	Ci/L	Ci/day	Lb/day	Ci/L	Ci/day	Lb/day
Total	0.00E+00	0.00E+00	0.00E+00	1.03E-08	6.61E-01	1.26E-04	1.03E-08	6.61E-01	1.26E-04
^{241}Am	0	0.00E+00	0.00E+00	1.06E-17	6.77E-10	4.36E-13	1.06E-17	6.77E-10	4.36E-13
^{14}C	0.00E+00	0.00E+00	0.00E+00	2.51E-09	1.61E-01	7.96E-05	2.51E-09	1.61E-01	7.96E-05
^{60}Co	0.00E+00	0.00E+00	0.00E+00	6.57E-18	4.22E-10	8.22E-16	6.57E-18	4.22E-10	8.22E-16
^{243}Cm	0.00E+00	0.00E+00	0.00E+00	3.52E-19	2.26E-11	9.84E-16	3.52E-19	2.26E-11	9.84E-16
^{244}Cm	0.00E+00	0.00E+00	0.00E+00	2.64E-19	1.69E-11	4.61E-16	2.64E-19	1.69E-11	4.61E-16
^{137}Cs	0.00E+00	0.00E+00	0.00E+00	3.46E-14	2.22E-06	5.63E-11	3.46E-14	2.22E-06	5.63E-11
^{152}Eu	0.00E+00	0.00E+00	0.00E+00	6.12E-20	3.92E-12	4.98E-17	6.12E-20	3.92E-12	4.98E-17
^{154}Eu	0.00E+00	0.00E+00	0.00E+00	6.12E-18	3.92E-10	3.20E-15	6.12E-18	3.92E-10	3.20E-15
^{155}Eu	0.00E+00	0.00E+00	0.00E+00	3.43E-18	2.20E-10	9.98E-16	3.43E-18	2.20E-10	9.98E-16
^{3}H	0.00E+00	0.00E+00	0.00E+00	7.78E-09	4.99E-01	1.15E-07	7.78E-09	4.99E-01	1.15E-07
^{129}I	0.00E+00	0.00E+00	0.00E+00	5.73E-14	3.67E-06	4.58E-05	5.73E-14	3.67E-06	4.58E-05
^{63}Ni	0.00E+00	0.00E+00	0.00E+00	4.31E-18	2.76E-10	1.07E-14	4.31E-18	2.76E-10	1.07E-14
^{237}Np	0.00E+00	0.00E+00	0.00E+00	8.68E-21	5.57E-13	1.74E-12	8.68E-21	5.57E-13	1.74E-12
^{238}Pu	0.00E+00	0.00E+00	0.00E+00	4.11E-20	2.63E-12	3.39E-16	4.11E-20	2.63E-12	3.39E-16
^{239}Pu	0.00E+00	0.00E+00	0.00E+00	3.64E-19	2.33E-11	8.29E-13	3.64E-19	2.33E-11	8.29E-13
^{240}Pu	0.00E+00	0.00E+00	0.00E+00	1.99E-20	1.28E-12	1.24E-14	1.99E-20	1.28E-12	1.24E-14
^{241}Pu	0.00E+00	0.00E+00	0.00E+00	2.58E-18	1.66E-10	3.54E-15	2.58E-18	1.66E-10	3.54E-15
^{125}Sb	0.00E+00	0.00E+00	0.00E+00	6.77E-17	4.35E-09	9.23E-15	6.77E-17	4.35E-09	9.23E-15
^{151}Sm	0.00E+00	0.00E+00	0.00E+00	1.27E-17	8.12E-10	6.80E-14	1.27E-17	8.12E-10	6.80E-14
^{126}Sn	0.00E+00	0.00E+00	0.00E+00	1.82E-20	1.16E-12	2.26E-13	1.82E-20	1.16E-12	2.26E-13
^{90}Sr	0.00E+00	0.00E+00	0.00E+00	2.36E-15	1.52E-07	2.42E-12	2.36E-15	1.52E-07	2.42E-12
^{99}Tc	0.00E+00	0.00E+00	0.00E+00	9.36E-16	6.00E-08	7.81E-09	9.36E-16	6.00E-08	7.81E-09
^{232}Th	0.00E+00	0.00E+00	0.00E+00	9.41E-23	6.04E-15	1.21E-10	9.41E-23	6.04E-15	1.21E-10
^{233}U	0.00E+00	0.00E+00	0.00E+00	1.45E-22	9.27E-15	2.12E-15	1.45E-22	9.27E-15	2.12E-15
^{234}U	0.00E+00	0.00E+00	0.00E+00	4.06E-22	2.61E-14	9.25E-15	4.06E-22	2.61E-14	9.25E-15
^{235}U	0.00E+00	0.00E+00	0.00E+00	3.02E-23	1.94E-15	1.98E-12	3.02E-23	1.94E-15	1.98E-12
^{236}U	0.00E+00	0.00E+00	0.00E+00	1.46E-23	9.35E-16	3.19E-14	1.46E-23	9.35E-16	3.19E-14
^{238}U	0.00E+00	0.00E+00	0.00E+00	2.33E-22	1.49E-14	9.79E-11	2.33E-22	1.49E-14	9.79E-11

Table A-15 PJV34 Stream Report

Stream Number: PJV34
Stream Name: Pulse vent HEPA discharge offgas
Configuration: 0
0
Run Data File: H:\Working Folder 2 (john)\MRQ_03_002_run2a_Streams.csv
Run Date / Time: 1/16/2003 - 1:27:28 PM

Read this note for program instructions.

Stream Properties Variable	Value	Units
Density	1.14E-03	g/cm^3
Enthalpy	-7.95E+05	BTU/hr
Mass Flow	2.32E+04	Lb/hr
	5.57E+05	Lb/day
Volumetric Flow	4.08E+04	GPM
Molar Flow	8.08E+02	Lbmol/hr
Volumetric Flow	5.45E+03	ft^3/min
Molecular Weight	2.87E+01	Lb/Lbmol
Pressure	1.00E+03	mbar
Temperature	3.10E+01	C
Viscosity	1.86E-02	cP
Na Molarity	0.00E+00	mol/L
pH	#NUM!	pH
Total TRU	3.11E-21	Ci/L
Total Activity	2.76E-17	Ci/L

Gaseous Components (1) Component	mol/L	Lb/day	Mt/day
CO	5.18E-27	7.11E-20	3.23246E-23
CO_2	1.11E-16	2.39E-09	1.08677E-12
H_2O	4.01E-04	3.54E+03	1.610811376
NO	9.04E-44	1.33E-36	6.04215E-40
NO_2	2.85E-49	6.43E-42	2.92175E-45
N_2	3.09E-02	4.25E+05	193.0529455
O_2	8.22E-03	1.29E+05	58.61857611
SO_2	0.00E+00	0.00E+00	0
NH_3	2.22E-15	1.85E-08	8.42737E-12
HNO_3	6.22E-24	1.92E-16	8.73343E-20
HCl	1.40E-70	2.51E-63	1.14042E-66
HF	0.00E+00	0.00E+00	0

(1) All radionuclides in gaseous streams are assumed to exist as solid particulate.

Component	Aqueous Components mol/L	Lb/gal	Lb/day	Solid Components Lb/day	Total Component Lb/day	mt/day	g/sec
Total	0.00E+00	0.00E+00	0.00E+00	6.46E-08	6.46E-08	2.93623E-11	3.39841E-10
Ag^+	0.00E+00	0.00E+00	0.00E+00	9.87E-15	9.87E-15	4.48476E-18	5.1907E-17
Al^{+3}	0.00E+00	0.00E+00	0.00E+00	2.95E-13	2.95E-13	1.34127E-16	1.5524E-15
As^{+3}	0.00E+00	0.00E+00	0.00E+00	4.07E-11	4.07E-11	1.84881E-14	2.13982E-13
B^{+3}	0.00E+00	0.00E+00	0.00E+00	9.80E-14	9.80E-14	4.45637E-17	5.15784E-16
Ba^{+2}	0.00E+00	0.00E+00	0.00E+00	6.05E-14	6.05E-14	2.75172E-17	3.18487E-16
Bi^{+3}	0.00E+00	0.00E+00	0.00E+00	3.83E-14	3.83E-14	1.74247E-17	2.01675E-16
$C_2O_4^{-2}$	0.00E+00	0.00E+00	0.00E+00	6.19E-13	6.19E-13	2.81467E-16	3.25771E-15
Ca^{+2}	0.00E+00	0.00E+00	0.00E+00	1.26E-13	1.26E-13	5.71117E-17	6.61015E-16
Cd^{+2}	0.00E+00	0.00E+00	0.00E+00	1.51E-13	1.51E-13	6.8762E-17	7.95856E-16
Ce^{+3}	0.00E+00	0.00E+00	0.00E+00	1.20E-14	1.20E-14	5.44338E-18	6.3002E-17
Cl^-	0.00E+00	0.00E+00	0.00E+00	1.16E-13	1.16E-13	5.26684E-17	6.09587E-16
CO_3^{-2}	0.00E+00	0.00E+00	0.00E+00	4.85E-13	4.85E-13	2.20602E-16	2.55327E-15
Cr^{+3}	0.00E+00	0.00E+00	0.00E+00	2.57E-14	2.57E-14	1.16787E-17	1.3517E-16
Cu^{+2}	0.00E+00	0.00E+00	0.00E+00	6.28E-15	6.28E-15	2.85277E-18	3.30182E-17
F^-	0.00E+00	0.00E+00	0.00E+00	3.16E-13	3.16E-13	1.43534E-16	1.66128E-15
Fe^{+3}	0.00E+00	0.00E+00	0.00E+00	3.74E-13	3.74E-13	1.70182E-16	1.9697E-15
H^+	0.00E+00	0.00E+00	0.00E+00		0.00E+00	0	0
H_2O	0.00E+00	0.00E+00	0.00E+00		0.00E+00	0	0
Hg^{+2}	0.00E+00	0.00E+00	0.00E+00	6.45E-08	6.45E-08	2.93341E-11	3.39515E-10
K^+	0.00E+00	0.00E+00	0.00E+00	1.91E-13	1.91E-13	8.67936E-17	1.00456E-15
La^{+3}	0.00E+00	0.00E+00	0.00E+00	3.93E-14	3.93E-14	1.78437E-17	2.06525E-16
Li^+	0.00E+00	0.00E+00	0.00E+00	9.49E-15	9.49E-15	4.31458E-18	4.99373E-17
Mg^{+2}	0.00E+00	0.00E+00	0.00E+00	2.71E-14	2.71E-14	1.23344E-17	1.4276E-16
Mn^{+3}	0.00E+00	0.00E+00	0.00E+00	9.51E-14	9.51E-14	4.3238E-17	5.0044E-16
MnO_4^-	0.00E+00	0.00E+00	0.00E+00		0.00E+00	0	0
Na^+	0.00E+00	0.00E+00	0.00E+00	6.80E-13	6.80E-13	3.08973E-16	3.57608E-15
NH_4^+	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0	0
Ni^{+2}	0.00E+00	0.00E+00	0.00E+00	3.56E-14	3.56E-14	1.61624E-17	1.87064E-16
NO_2^-	0.00E+00	0.00E+00	0.00E+00	1.94E-13	1.94E-13	8.83542E-17	1.02262E-15
NO_3^-	0.00E+00	0.00E+00	0.00E+00	1.34E-12	1.34E-12	6.09619E-16	7.05577E-15
O^{-2}				1.33E-11	1.33E-11	6.05882E-15	7.01252E-14
OH^-	0.00E+00	0.00E+00	0.00E+00	1.70E-12	1.70E-12	7.70952E-16	8.92306E-15
$OH(b)^-$	0.00E+00	0.00E+00	0.00E+00		0.00E+00	0	0
P^{+5}				1.00E-20	1.00E-20	4.55543E-24	5.27249E-23
Pb^{+2}	0.00E+00	0.00E+00	0.00E+00	1.60E-14	1.60E-14	7.27613E-18	8.42145E-17
Pd^{+2}	0.00E+00	0.00E+00	0.00E+00	1.65E-15	1.65E-15	7.51221E-19	8.69469E-18
PO_4^{-3}	0.00E+00	0.00E+00	0.00E+00	1.99E-13	1.99E-13	9.04271E-17	1.04661E-15
S^{+6}				1.36E-20	1.36E-20	6.17485E-24	7.14682E-23
Si^{+4}				2.80E-13	2.80E-13	1.27474E-16	1.47539E-15
SiO_4^{-4}	0.00E+00	0.00E+00	0.00E+00		0.00E+00	0	0
SO_4^{-2}	0.00E+00	0.00E+00	0.00E+00	6.44E-14	6.44E-14	2.92649E-17	3.38715E-16
Sr^{+2}	0.00E+00	0.00E+00	0.00E+00	7.04E-15	7.04E-15	3.201E-18	3.70487E-17
Ti^{+4}	0.00E+00	0.00E+00	0.00E+00	8.03E-14	8.03E-14	3.65E-17	4.22453E-16
Zn^{+2}	0.00E+00	0.00E+00	0.00E+00	1.77E-14	1.77E-14	8.0348E-18	9.29954E-17

Zr^{+4}	0.00E+00	0.00E+00	0.00E+00	1.86E-13	1.86E-13	8.43975E-17	9.76823E-16

Rad.	Aqueous Rad. Components			Solids Rad. Components (1)			Total Rad. Components (1)		
Component	Ci/L	Ci/day	Lb/day	Ci/L	Ci/day	Lb/day	Ci/L	Ci/day	Lb/day
Total	0.00E+00	0.00E+00	0.00E+00	2.76E-17	6.13E-09	1.76E-11	2.76E-17	6.13E-09	1.76E-11
^{241}Am	0	0.00E+00	0.00E+00	2.32E-21	5.15E-13	3.31E-16	2.32E-21	5.15E-13	3.31E-16
^{14}C	0.00E+00	0.00E+00	0.00E+00	7.26E-20	1.61E-11	7.96E-15	7.26E-20	1.61E-11	7.96E-15
^{60}Co	0.00E+00	0.00E+00	0.00E+00	2.58E-22	5.73E-14	1.12E-19	2.58E-22	5.73E-14	1.12E-19
^{243}Cm	0.00E+00	0.00E+00	0.00E+00	7.72E-23	1.72E-14	7.48E-19	7.72E-23	1.72E-14	7.48E-19
^{244}Cm	0.00E+00	0.00E+00	0.00E+00	5.79E-23	1.29E-14	3.50E-19	5.79E-23	1.29E-14	3.50E-19
^{137}Cs	0.00E+00	0.00E+00	0.00E+00	3.06E-19	6.81E-11	1.73E-15	3.06E-19	6.81E-11	1.73E-15
^{152}Eu	0.00E+00	0.00E+00	0.00E+00	1.34E-23	2.98E-15	3.79E-20	1.34E-23	2.98E-15	3.79E-20
^{154}Eu	0.00E+00	0.00E+00	0.00E+00	1.34E-21	2.98E-13	2.43E-18	1.34E-21	2.98E-13	2.43E-18
^{155}Eu	0.00E+00	0.00E+00	0.00E+00	7.53E-22	1.67E-13	7.59E-19	7.53E-22	1.67E-13	7.59E-19
^{3}H	0.00E+00	0.00E+00	0.00E+00	2.69E-17	5.98E-09	1.37E-15	2.69E-17	5.98E-09	1.37E-15
^{129}I	0.00E+00	0.00E+00	0.00E+00	6.23E-21	1.39E-12	1.73E-11	6.23E-21	1.39E-12	1.73E-11
^{63}Ni	0.00E+00	0.00E+00	0.00E+00	1.34E-22	2.97E-14	1.15E-18	1.34E-22	2.97E-14	1.15E-18
^{237}Np	0.00E+00	0.00E+00	0.00E+00	1.90E-24	4.23E-16	1.32E-15	1.90E-24	4.23E-16	1.32E-15
^{238}Pu	0.00E+00	0.00E+00	0.00E+00	9.01E-24	2.00E-15	2.58E-19	9.01E-24	2.00E-15	2.58E-19
^{239}Pu	0.00E+00	0.00E+00	0.00E+00	7.98E-23	1.77E-14	6.30E-16	7.98E-23	1.77E-14	6.30E-16
^{240}Pu	0.00E+00	0.00E+00	0.00E+00	4.38E-24	9.73E-16	9.45E-18	4.38E-24	9.73E-16	9.45E-18
^{241}Pu	0.00E+00	0.00E+00	0.00E+00	5.66E-22	1.26E-13	2.69E-18	5.66E-22	1.26E-13	2.69E-18
^{125}Sb	0.00E+00	0.00E+00	0.00E+00	8.95E-22	1.99E-13	4.23E-19	8.95E-22	1.99E-13	4.23E-19
^{151}Sm	0.00E+00	0.00E+00	0.00E+00	2.78E-21	6.17E-13	5.17E-17	2.78E-21	6.17E-13	5.17E-17
^{126}Sn	0.00E+00	0.00E+00	0.00E+00	3.98E-24	8.85E-16	1.72E-16	3.98E-24	8.85E-16	1.72E-16
^{90}Sr	0.00E+00	0.00E+00	0.00E+00	2.74E-19	6.10E-11	9.73E-16	2.74E-19	6.10E-11	9.73E-16
^{99}Tc	0.00E+00	0.00E+00	0.00E+00	3.26E-21	7.26E-13	9.44E-14	3.26E-21	7.26E-13	9.44E-14
^{232}Th	0.00E+00	0.00E+00	0.00E+00	2.06E-26	4.59E-18	9.20E-14	2.06E-26	4.59E-18	9.20E-14
^{233}U	0.00E+00	0.00E+00	0.00E+00	3.17E-26	7.05E-18	1.61E-18	3.17E-26	7.05E-18	1.61E-18
^{234}U	0.00E+00	0.00E+00	0.00E+00	8.91E-26	1.98E-17	7.04E-18	8.91E-26	1.98E-17	7.04E-18
^{235}U	0.00E+00	0.00E+00	0.00E+00	6.62E-27	1.47E-18	1.50E-15	6.62E-27	1.47E-18	1.50E-15
^{236}U	0.00E+00	0.00E+00	0.00E+00	3.20E-27	7.11E-19	2.42E-17	3.20E-27	7.11E-19	2.42E-17
^{238}U	0.00E+00	0.00E+00	0.00E+00	5.10E-26	1.13E-17	7.44E-14	5.10E-26	1.13E-17	7.44E-14

Table A-16 LFP06 Stream Report

Stream Number: LFP06
Stream Name: LAW LFP Vents
Configuration: 0
0
Run Data File: H:\Working Folder 2 (john)\MRQ_03_002_run2a_Streams.csv
Run Date / Time: 1/16/2003 - 1:27:28 PM

Read this note for program instructions.

Stream Properties Variable	Value	Units
Density	1.13E-03	g/cm^3
Enthalpy	-9.49E+04	BTU/hr
Mass Flow	6.15E+02	Lb/hr
	1.48E+04	Lb/day
Volumetric Flow	1.09E+03	GPM
Molar Flow	2.17E+01	Lbmol/hr
Volumetric Flow	1.46E+02	ft^3/min
Molecular Weight	2.84E+01	Lb/Lbmol
Pressure	1.00E+03	mbar
Temperature	3.00E+01	C
Viscosity	1.84E-02	cP
Na Molarity	0.00E+00	mol/L
pH	#NUM!	pH
Total TRU	6.06E-15	Ci/L
Total Activity	1.29E-11	Ci/L

Gaseous Components (1) Component	mol/L	Lb/day	Mt/day
CO	3.58E-42	1.32E-36	5.97736E-40
CO_2	8.60E-50	4.96E-44	2.2548E-47
H_2O	1.69E-03	4.00E+02	0.181634522
NO	6.70E-34	2.64E-28	1.19801E-31
NO_2	8.34E-55	5.02E-49	2.28355E-52
N_2	3.00E-02	1.10E+04	5.008999025
O_2	7.98E-03	3.35E+03	1.520931938
SO_2	4.57E-37	3.83E-31	1.74273E-34
NH_3	6.79E-14	1.51E-08	6.88249E-12
HNO_3	9.21E-26	7.61E-20	3.45743E-23
HCl	0.00E+00	0.00E+00	0
HF	0.00E+00	0.00E+00	0

(1) All radionuclides in gaseous streams are assumed to exist as solid particulate.

Component	Aqueous Components mol/L	Lb/gal	Lb/day	Solid Components Lb/day	Total Component Lb/day	mt/day	g/sec
Total	0.00E+00	0.00E+00	0.00E+00	1.96E-03	1.96E-03	8.93098E-07	1.03368E-05
Ag^+	0.00E+00	0.00E+00	0.00E+00	7.62E-08	7.62E-08	3.46146E-11	4.00632E-10
Al^{+3}	0.00E+00	0.00E+00	0.00E+00	5.40E-05	5.40E-05	2.45664E-08	2.84334E-07
As^{+3}	0.00E+00	0.00E+00	0.00E+00	3.41E-05	3.41E-05	1.54949E-08	1.79339E-07
B^{+3}	0.00E+00	0.00E+00	0.00E+00	3.72E-05	3.72E-05	1.69265E-08	1.95909E-07
Ba^{+2}	0.00E+00	0.00E+00	0.00E+00	7.85E-08	7.85E-08	3.57E-11	4.13195E-10
Bi^{+3}	0.00E+00	0.00E+00	0.00E+00	2.42E-07	2.42E-07	1.09784E-10	1.27064E-09
$C_2O_4^{-2}$	0.00E+00	0.00E+00	0.00E+00	1.09E-04	1.09E-04	4.94133E-08	5.71913E-07
Ca^{+2}	0.00E+00	0.00E+00	0.00E+00	5.27E-05	5.27E-05	2.39572E-08	2.77282E-07
Cd^{+2}	0.00E+00	0.00E+00	0.00E+00	2.83E-06	2.83E-06	1.28424E-09	1.48639E-08
Ce^{+3}	0.00E+00	0.00E+00	0.00E+00	6.65E-07	6.65E-07	3.02419E-10	3.50022E-09
Cl^-	0.00E+00	0.00E+00	0.00E+00	1.20E-05	1.20E-05	5.44441E-09	6.30141E-08
CO_3^{-2}	0.00E+00	0.00E+00	0.00E+00	1.41E-04	1.41E-04	6.40975E-08	7.41869E-07
Cr^{+3}	0.00E+00	0.00E+00	0.00E+00	5.95E-06	5.95E-06	2.7068E-09	3.13288E-08
Cu^{+2}	0.00E+00	0.00E+00	0.00E+00	7.98E-08	7.98E-08	3.62524E-11	4.19588E-10
F^-	0.00E+00	0.00E+00	0.00E+00	1.48E-05	1.48E-05	6.72332E-09	7.78162E-08
Fe^{+3}	0.00E+00	0.00E+00	0.00E+00	4.28E-05	4.28E-05	1.94479E-08	2.25091E-07
H^+	0.00E+00	0.00E+00	0.00E+00		0.00E+00	0	0
H_2O	0.00E+00	0.00E+00	0.00E+00		0.00E+00	0	0
Hg^{+2}	0.00E+00	0.00E+00	0.00E+00	9.54E-08	9.54E-08	4.33642E-11	5.019E-10
K^+	0.00E+00	0.00E+00	0.00E+00	4.20E-05	4.20E-05	1.91024E-08	2.21092E-07
La^{+3}	0.00E+00	0.00E+00	0.00E+00	6.66E-08	6.66E-08	3.02514E-11	3.50133E-10
Li^+	0.00E+00	0.00E+00	0.00E+00	2.11E-05	2.11E-05	9.57296E-09	1.10798E-07
Mg^{+2}	0.00E+00	0.00E+00	0.00E+00	1.57E-05	1.57E-05	7.13382E-09	8.25673E-08
Mn^{+3}	0.00E+00	0.00E+00	0.00E+00	1.53E-06	1.53E-06	6.96281E-10	8.05881E-09
MnO_4^-	0.00E+00	0.00E+00	0.00E+00		0.00E+00	0	0
Na^+	0.00E+00	0.00E+00	0.00E+00	1.40E-04	1.40E-04	6.36663E-08	7.36878E-07
NH_4^+	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0	0
Ni^{+2}	0.00E+00	0.00E+00	0.00E+00	1.01E-06	1.01E-06	4.60857E-10	5.334E-09
NO_2^-	0.00E+00	0.00E+00	0.00E+00	5.09E-05	5.09E-05	2.3152E-08	2.67963E-07
NO_3^-	0.00E+00	0.00E+00	0.00E+00	2.63E-04	2.63E-04	1.19764E-07	1.38616E-06
O^{-2}				4.45E-04	4.45E-04	2.02069E-07	2.33876E-06
OH^-	0.00E+00	0.00E+00	0.00E+00	1.22E-04	1.22E-04	5.54439E-08	6.41712E-07
$OH(b)^-$	0.00E+00	0.00E+00	0.00E+00		0.00E+00	0	0
P^{+5}				1.64E-14	1.64E-14	7.45198E-18	8.62498E-17
Pb^{+2}	0.00E+00	0.00E+00	0.00E+00	8.01E-07	8.01E-07	3.64077E-10	4.21386E-09
Pd^{+2}	0.00E+00	0.00E+00	0.00E+00	4.83E-09	4.83E-09	2.19518E-12	2.54071E-11
PO_4^{-3}	0.00E+00	0.00E+00	0.00E+00	3.59E-05	3.59E-05	1.63278E-08	1.88979E-07
S^{+6}				5.41E-17	5.41E-17	2.46118E-20	2.84859E-19
Si^{+4}				2.40E-04	2.40E-04	1.08997E-07	1.26154E-06
SiO_4^{-4}	0.00E+00	0.00E+00	0.00E+00		0.00E+00	0	0
SO_4^{-2}	0.00E+00	0.00E+00	0.00E+00	1.96E-05	1.96E-05	8.89912E-09	1.02999E-07
Sr^{+2}	0.00E+00	0.00E+00	0.00E+00	2.42E-08	2.42E-08	1.09949E-11	1.27256E-10
Ti^{+4}	0.00E+00	0.00E+00	0.00E+00	6.91E-06	6.91E-06	3.13875E-09	3.63281E-08
Zn^{+2}	0.00E+00	0.00E+00	0.00E+00	2.73E-05	2.73E-05	1.23998E-08	1.43516E-07

Zr^{+4}	0.00E+00	0.00E+00	0.00E+00	2.47E-05	2.47E-05	1.12418E-08	1.30114E-07

Rad.	Aqueous Rad. Components			Solids Rad. Components (1)			Total Rad. Components (1)		
Component	Ci/L	Ci/day	Lb/day	Ci/L	Ci/day	Lb/day	Ci/L	Ci/day	Lb/day
Total	0.00E+00	0.00E+00	0.00E+00	1.29E-11	7.64E-05	2.83E-06	1.29E-11	7.64E-05	2.83E-06
^{241}Am	0	0.00E+00	0.00E+00	4.38E-15	2.61E-08	1.68E-11	4.38E-15	2.61E-08	1.68E-11
^{14}C	0.00E+00	0.00E+00	0.00E+00	3.08E-15	1.83E-08	9.03E-12	3.08E-15	1.83E-08	9.03E-12
^{60}Co	0.00E+00	0.00E+00	0.00E+00	4.37E-15	2.60E-08	5.06E-14	4.37E-15	2.60E-08	5.06E-14
^{243}Cm	0.00E+00	0.00E+00	0.00E+00	1.17E-17	6.97E-11	3.04E-15	1.17E-17	6.97E-11	3.04E-15
^{244}Cm	0.00E+00	0.00E+00	0.00E+00	1.26E-17	7.48E-11	2.04E-15	1.26E-17	7.48E-11	2.04E-15
^{137}Cs	0.00E+00	0.00E+00	0.00E+00	4.68E-14	2.78E-07	7.06E-12	4.68E-14	2.78E-07	7.06E-12
^{152}Eu	0.00E+00	0.00E+00	0.00E+00	1.53E-14	9.08E-08	1.15E-12	1.53E-14	9.08E-08	1.15E-12
^{154}Eu	0.00E+00	0.00E+00	0.00E+00	5.07E-14	3.01E-07	2.46E-12	5.07E-14	3.01E-07	2.46E-12
^{155}Eu	0.00E+00	0.00E+00	0.00E+00	8.72E-14	5.18E-07	2.35E-12	8.72E-14	5.18E-07	2.35E-12
^{3}H	0.00E+00	0.00E+00	0.00E+00	1.51E-15	8.99E-09	2.06E-15	1.51E-15	8.99E-09	2.06E-15
^{129}I	0.00E+00	0.00E+00	0.00E+00	3.94E-17	2.34E-10	2.92E-09	3.94E-17	2.34E-10	2.92E-09
^{63}Ni	0.00E+00	0.00E+00	0.00E+00	2.80E-14	1.66E-07	6.46E-12	2.80E-14	1.66E-07	6.46E-12
^{237}Np	0.00E+00	0.00E+00	0.00E+00	9.43E-18	5.60E-11	1.75E-10	9.43E-18	5.60E-11	1.75E-10
^{238}Pu	0.00E+00	0.00E+00	0.00E+00	2.54E-17	1.51E-10	1.94E-14	2.54E-17	1.51E-10	1.94E-14
^{239}Pu	0.00E+00	0.00E+00	0.00E+00	2.97E-16	1.77E-09	6.27E-11	2.97E-16	1.77E-09	6.27E-11
^{240}Pu	0.00E+00	0.00E+00	0.00E+00	5.12E-17	3.04E-10	2.96E-12	5.12E-17	3.04E-10	2.96E-12
^{241}Pu	0.00E+00	0.00E+00	0.00E+00	1.27E-15	7.53E-09	1.61E-13	1.27E-15	7.53E-09	1.61E-13
^{125}Sb	0.00E+00	0.00E+00	0.00E+00	2.35E-13	1.39E-06	2.96E-12	2.35E-13	1.39E-06	2.96E-12
^{151}Sm	0.00E+00	0.00E+00	0.00E+00	2.90E-12	1.72E-05	1.44E-09	2.90E-12	1.72E-05	1.44E-09
^{126}Sn	0.00E+00	0.00E+00	0.00E+00	1.75E-15	1.04E-08	2.02E-09	1.75E-15	1.04E-08	2.02E-09
^{90}Sr	0.00E+00	0.00E+00	0.00E+00	9.47E-12	5.63E-05	8.98E-10	9.47E-12	5.63E-05	8.98E-10
^{99}Tc	0.00E+00	0.00E+00	0.00E+00	3.78E-15	2.25E-08	2.92E-09	3.78E-15	2.25E-08	2.92E-09
^{232}Th	0.00E+00	0.00E+00	0.00E+00	6.49E-18	3.86E-11	7.73E-07	6.49E-18	3.86E-11	7.73E-07
^{233}U	0.00E+00	0.00E+00	0.00E+00	1.20E-16	7.16E-10	1.64E-10	1.20E-16	7.16E-10	1.64E-10
^{234}U	0.00E+00	0.00E+00	0.00E+00	7.01E-17	4.17E-10	1.48E-10	7.01E-17	4.17E-10	1.48E-10
^{235}U	0.00E+00	0.00E+00	0.00E+00	2.71E-18	1.61E-11	1.64E-08	2.71E-18	1.61E-11	1.64E-08
^{236}U	0.00E+00	0.00E+00	0.00E+00	8.11E-18	4.82E-11	1.64E-09	8.11E-18	4.82E-11	1.64E-09
^{238}U	0.00E+00	0.00E+00	0.00E+00	5.21E-17	3.10E-10	2.03E-06	5.21E-17	3.10E-10	2.03E-06

Table A-17 RLD34 Stream Report

Stream Number: RLD34
Stream Name: LAW C3/C5 drain/sump collection vessel vent
Configuration: 0
0
Run Data File: H:\Working Folder 2 (john)\MRQ_03_002_run2a_Streams.csv
Run Date / Time: 1/16/2003 - 1:27:28 PM

Read this note for program instructions.

Stream Properties Variable	Value	Units
Density	1.13E-03	g/cm^3
Enthalpy	-3.83E+02	BTU/hr
Mass Flow	2.48E+00	Lb/hr
	5.96E+01	Lb/day
Volumetric Flow	4.40E+00	GPM
Molar Flow	8.75E-02	Lbmol/hr
Volumetric Flow	5.89E-01	ft^3/min
Molecular Weight	2.84E+01	Lb/Lbmol
Pressure	1.00E+03	mbar
Temperature	3.00E+01	C
Viscosity	1.84E-02	cP
Na Molarity	0.00E+00	mol/L
pH	#NUM!	pH
Total TRU	8.45E-17	Ci/L
Total Activity	5.01E-13	Ci/L

Gaseous Components (1) Component	mol/L	Lb/day	Mt/day
CO	2.31E-27	3.42E-24	1.5567E-27
CO_2	3.48E-12	8.11E-09	3.68832E-12
H_2O	1.69E-03	1.61E+00	0.00073358
NO	0.00E+00	0.00E+00	0
NO_2	0.00E+00	0.00E+00	0
N_2	3.00E-02	4.45E+01	0.020230206
O_2	7.98E-03	1.35E+01	0.006142698
SO_2	0.00E+00	0.00E+00	0
NH_3	1.91E-13	1.72E-10	7.82101E-14
HNO_3	1.92E-25	6.42E-22	2.9161E-25
HCl	0.00E+00	0.00E+00	0
HF	0.00E+00	0.00E+00	0

(1) All radionuclides in gaseous streams are assumed to exist as solid particulate.

Component	Aqueous Components mol/L	Lb/gal	Lb/day	Solid Components Lb/day	Total Component Lb/day	mt/day	g/sec
Total	0.00E+00	0.00E+00	0.00E+00	5.71E-06	5.71E-06	2.59488E-09	3.00333E-08
Ag^+	0.00E+00	0.00E+00	0.00E+00	6.91E-10	6.91E-10	3.14095E-13	3.63536E-12
Al^{+3}	0.00E+00	0.00E+00	0.00E+00	7.79E-09	7.79E-09	3.54283E-12	4.1005E-11
As^{+3}	0.00E+00	0.00E+00	0.00E+00	3.37E-06	3.37E-06	1.53335E-09	1.77471E-08
B^{+3}	0.00E+00	0.00E+00	0.00E+00	3.59E-08	3.59E-08	1.6296E-11	1.88611E-10
Ba^{+2}	0.00E+00	0.00E+00	0.00E+00	3.97E-12	3.97E-12	1.80303E-15	2.08684E-14
Bi^{+3}	0.00E+00	0.00E+00	0.00E+00	4.49E-10	4.49E-10	2.04085E-13	2.36209E-12
$C_2O_4^{-2}$	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0	0
Ca^{+2}	0.00E+00	0.00E+00	0.00E+00	2.85E-08	2.85E-08	1.2968E-11	1.50093E-10
Cd^{+2}	0.00E+00	0.00E+00	0.00E+00	8.72E-08	8.72E-08	3.96309E-11	4.58691E-10
Ce^{+3}	0.00E+00	0.00E+00	0.00E+00	3.74E-11	3.74E-11	1.7011E-14	1.96887E-13
Cl^-	0.00E+00	0.00E+00	0.00E+00	5.67E-07	5.67E-07	2.57859E-10	2.98448E-09
CO_3^{-2}	0.00E+00	0.00E+00	0.00E+00	1.28E-08	1.28E-08	5.80978E-12	6.72428E-11
Cr^{+3}	0.00E+00	0.00E+00	0.00E+00	8.03E-09	8.03E-09	3.64888E-12	4.22324E-11
Cu^{+2}	0.00E+00	0.00E+00	0.00E+00	6.65E-11	6.65E-11	3.02103E-14	3.49657E-13
F^-	0.00E+00	0.00E+00	0.00E+00	1.91E-07	1.91E-07	8.66466E-11	1.00285E-09
Fe^{+3}	0.00E+00	0.00E+00	0.00E+00	4.61E-09	4.61E-09	2.09572E-12	2.4256E-11
H^+	0.00E+00	0.00E+00	0.00E+00		0.00E+00	0	0
H_2O	0.00E+00	0.00E+00	0.00E+00		0.00E+00	0	0
Hg^{+2}	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0	0
K^+	0.00E+00	0.00E+00	0.00E+00	6.08E-07	6.08E-07	2.76235E-10	3.19717E-09
La^{+3}	0.00E+00	0.00E+00	0.00E+00	8.64E-12	8.64E-12	3.92876E-15	4.54718E-14
Li^+	0.00E+00	0.00E+00	0.00E+00	9.65E-08	9.65E-08	4.38487E-11	5.07508E-10
Mg^{+2}	0.00E+00	0.00E+00	0.00E+00	3.49E-09	3.49E-09	1.58471E-12	1.83416E-11
Mn^{+3}	0.00E+00	0.00E+00	0.00E+00	3.06E-10	3.06E-10	1.39256E-13	1.61176E-12
MnO_4^-	0.00E+00	0.00E+00	0.00E+00		0.00E+00	0	0
Na^+	0.00E+00	0.00E+00	0.00E+00	2.56E-07	2.56E-07	1.16313E-10	1.34622E-09
NH_4^+	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0	0
Ni^{+2}	0.00E+00	0.00E+00	0.00E+00	9.17E-10	9.17E-10	4.16887E-13	4.82508E-12
NO_2^-	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0	0
NO_3^-	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0	0
O^{-2}				1.51E-07	1.51E-07	6.8666E-11	7.94745E-10
OH^-	0.00E+00	0.00E+00	0.00E+00	3.62E-09	3.62E-09	1.64657E-12	1.90575E-11
$OH(b)^-$	0.00E+00	0.00E+00	0.00E+00		0.00E+00	0	0
P^{+5}				0.00E+00	0.00E+00	0	0
Pb^{+2}	0.00E+00	0.00E+00	0.00E+00	8.42E-10	8.42E-10	3.82545E-13	4.4276E-12
Pd^{+2}	0.00E+00	0.00E+00	0.00E+00	2.72E-13	2.72E-13	1.23479E-16	1.42915E-15
PO_4^{-3}	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0	0
S^{+6}				0.00E+00	0.00E+00	0	0
Si^{+4}				2.39E-08	2.39E-08	1.08452E-11	1.25523E-10
SiO_4^{-4}	0.00E+00	0.00E+00	0.00E+00		0.00E+00	0	0
SO_4^{-2}	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0	0
Sr^{+2}	0.00E+00	0.00E+00	0.00E+00	2.72E-12	2.72E-12	1.23692E-15	1.43162E-14
Ti^{+4}	0.00E+00	0.00E+00	0.00E+00	2.33E-07	2.33E-07	1.05698E-10	1.22335E-09
Zn^{+2}	0.00E+00	0.00E+00	0.00E+00	1.22E-08	1.22E-08	5.56546E-12	6.4415E-11

Zr^{+4}	0.00E+00	0.00E+00	0.00E+00	2.46E-09	2.46E-09	1.11626E-12	1.29196E-11

Rad. Component	Aqueous Rad. Components			Solids Rad. Components (1)			Total Rad. Components (1)		
	Ci/L	Ci/day	Lb/day	Ci/L	Ci/day	Lb/day	Ci/L	Ci/day	Lb/day
Total	0.00E+00	0.00E+00	0.00E+00	5.01E-13	1.20E-08	2.78E-10	5.01E-13	1.20E-08	2.78E-10
^{241}Am	0	0.00E+00	0.00E+00	6.11E-17	1.47E-12	9.43E-16	6.11E-17	1.47E-12	9.43E-16
^{14}C	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
^{60}Co	0.00E+00	0.00E+00	0.00E+00	8.03E-16	1.93E-11	3.75E-17	8.03E-16	1.93E-11	3.75E-17
^{243}Cm	0.00E+00	0.00E+00	0.00E+00	1.63E-19	3.92E-15	1.71E-19	1.63E-19	3.92E-15	1.71E-19
^{244}Cm	0.00E+00	0.00E+00	0.00E+00	1.75E-19	4.21E-15	1.15E-19	1.75E-19	4.21E-15	1.15E-19
^{137}Cs	0.00E+00	0.00E+00	0.00E+00	7.78E-14	1.87E-09	4.74E-14	7.78E-14	1.87E-09	4.74E-14
^{152}Eu	0.00E+00	0.00E+00	0.00E+00	2.13E-16	5.10E-12	6.48E-17	2.13E-16	5.10E-12	6.48E-17
^{154}Eu	0.00E+00	0.00E+00	0.00E+00	7.05E-16	1.69E-11	1.38E-16	7.05E-16	1.69E-11	1.38E-16
^{155}Eu	0.00E+00	0.00E+00	0.00E+00	1.21E-15	2.91E-11	1.32E-16	1.21E-15	2.91E-11	1.32E-16
^{3}H	0.00E+00	0.00E+00	0.00E+00	7.52E-16	1.80E-11	4.14E-18	7.52E-16	1.80E-11	4.14E-18
^{129}I	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
^{63}Ni	0.00E+00	0.00E+00	0.00E+00	6.27E-15	1.51E-10	5.84E-15	6.27E-15	1.51E-10	5.84E-15
^{237}Np	0.00E+00	0.00E+00	0.00E+00	2.63E-19	6.30E-15	1.97E-14	2.63E-19	6.30E-15	1.97E-14
^{238}Pu	0.00E+00	0.00E+00	0.00E+00	3.54E-19	8.50E-15	1.09E-18	3.54E-19	8.50E-15	1.09E-18
^{239}Pu	0.00E+00	0.00E+00	0.00E+00	4.14E-18	9.93E-14	3.53E-15	4.14E-18	9.93E-14	3.53E-15
^{240}Pu	0.00E+00	0.00E+00	0.00E+00	7.13E-19	1.71E-14	1.66E-16	7.13E-19	1.71E-14	1.66E-16
^{241}Pu	0.00E+00	0.00E+00	0.00E+00	1.77E-17	4.24E-13	9.07E-18	1.77E-17	4.24E-13	9.07E-18
^{125}Sb	0.00E+00	0.00E+00	0.00E+00	7.13E-14	1.71E-09	3.64E-15	7.13E-14	1.71E-09	3.64E-15
^{151}Sm	0.00E+00	0.00E+00	0.00E+00	4.04E-14	9.69E-10	8.11E-14	4.04E-14	9.69E-10	8.11E-14
^{126}Sn	0.00E+00	0.00E+00	0.00E+00	2.44E-17	5.86E-13	1.14E-13	2.44E-17	5.86E-13	1.14E-13
^{90}Sr	0.00E+00	0.00E+00	0.00E+00	2.64E-13	6.33E-09	1.01E-13	2.64E-13	6.33E-09	1.01E-13
^{99}Tc	0.00E+00	0.00E+00	0.00E+00	3.80E-14	9.12E-10	1.19E-10	3.80E-14	9.12E-10	1.19E-10
^{232}Th	0.00E+00	0.00E+00	0.00E+00	9.04E-20	2.17E-15	4.35E-11	9.04E-20	2.17E-15	4.35E-11
^{233}U	0.00E+00	0.00E+00	0.00E+00	1.68E-18	4.03E-14	9.21E-15	1.68E-18	4.03E-14	9.21E-15
^{234}U	0.00E+00	0.00E+00	0.00E+00	9.76E-19	2.34E-14	8.32E-15	9.76E-19	2.34E-14	8.32E-15
^{235}U	0.00E+00	0.00E+00	0.00E+00	3.77E-20	9.05E-16	9.23E-13	3.77E-20	9.05E-16	9.23E-13
^{236}U	0.00E+00	0.00E+00	0.00E+00	1.13E-19	2.71E-15	9.24E-14	1.13E-19	2.71E-15	9.24E-14
^{238}U	0.00E+00	0.00E+00	0.00E+00	7.26E-19	1.74E-14	1.14E-10	7.26E-19	1.74E-14	1.14E-10

Table A-18 RLD33 Stream Report

Stream Number: RLD33
Stream Name: LAW Plant wash vessel vent
Configuration: 0
0
Run Data File: H:\Working Folder 2 (john)\MRQ_03_002_run2a_Streams.csv
Run Date / Time: 1/16/2003 - 1:27:28 PM

Read this note for program instructions.

Stream Properties Variable	Value	Units
Density	1.13E-03	g/cm^3
Enthalpy	-3.83E+02	BTU/hr
Mass Flow	2.48E+00	Lb/hr
	5.96E+01	Lb/day
Volumetric Flow	4.40E+00	GPM
Molar Flow	8.75E-02	Lbmol/hr
Volumetric Flow	5.89E-01	ft^3/min
Molecular Weight	2.84E+01	Lb/Lbmol
Pressure	1.00E+03	mbar
Temperature	3.00E+01	C
Viscosity	1.84E-02	cP
Na Molarity	0.00E+00	mol/L
pH	#NUM!	pH
Total TRU	0.00E+00	Ci/L
Total Activity	0.00E+00	Ci/L

Gaseous Components (1) Component	mol/L	Lb/day	Mt/day
CO	0.00E+00	0.00E+00	0
CO_2	0.00E+00	0.00E+00	0
H_2O	1.69E-03	1.61E+00	0.00073358
NO	0.00E+00	0.00E+00	0
NO_2	0.00E+00	0.00E+00	0
N_2	3.00E-02	4.45E+01	0.020230206
O_2	7.98E-03	1.35E+01	0.006142698
SO_2	0.00E+00	0.00E+00	0
NH_3	0.00E+00	0.00E+00	0
HNO_3	0.00E+00	0.00E+00	0
HCl	0.00E+00	0.00E+00	0
HF	0.00E+00	0.00E+00	0

(1) All radionuclides in gaseous streams are assumed to exist as solid particulate.

Component	Aqueous Components mol/L	Lb/gal	Lb/day	Solid Components Lb/day	Total Component Lb/day	mt/day	g/sec
Total	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0	0
Ag^+	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0	0
Al^{+3}	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0	0
As^{+3}	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0	0
B^{+3}	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0	0
Ba^{+2}	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0	0
Bi^{+3}	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0	0
$C_2O_4^{-2}$	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0	0
Ca^{+2}	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0	0
Cd^{+2}	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0	0
Ce^{+3}	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0	0
Cl^-	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0	0
CO_3^{-2}	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0	0
Cr^{+3}	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0	0
Cu^{+2}	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0	0
F^-	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0	0
Fe^{+3}	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0	0
H^+	0.00E+00	0.00E+00	0.00E+00		0.00E+00	0	0
H_2O	0.00E+00	0.00E+00	0.00E+00		0.00E+00	0	0
Hg^{+2}	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0	0
K^+	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0	0
La^{+3}	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0	0
Li^+	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0	0
Mg^{+2}	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0	0
Mn^{+3}	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0	0
MnO_4^-	0.00E+00	0.00E+00	0.00E+00		0.00E+00	0	0
Na^+	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0	0
NH_4^+	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0	0
Ni^{+2}	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0	0
NO_2^-	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0	0
NO_3^-	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0	0
O^{-2}				0.00E+00	0.00E+00	0	0
OH^-	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0	0
$OH(b)^-$	0.00E+00	0.00E+00	0.00E+00		0.00E+00	0	0
P^{+5}				0.00E+00	0.00E+00	0	0
Pb^{+2}	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0	0
Pd^{+2}	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0	0
PO_4^{-3}	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0	0
S^{+6}				0.00E+00	0.00E+00	0	0
Si^{+4}				0.00E+00	0.00E+00	0	0
SiO_4^{-4}	0.00E+00	0.00E+00	0.00E+00		0.00E+00	0	0
SO_4^{-2}	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0	0
Sr^{+2}	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0	0
Ti^{+4}	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0	0
Zn^{+2}	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0	0

SUBJECT: Integrated Baseline Emissions Report Non-SSFM Represented Constituents Emissions Rate Estimation

Zr^{+4}	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0	0

Rad. Component	Aqueous Rad. Components			Solids Rad. Components (1)			Total Rad. Components (1)		
	Ci/L	Ci/day	Lb/day	Ci/L	Ci/day	Lb/day	Ci/L	Ci/day	Lb/day
Total	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
^{241}Am	0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
^{14}C	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
^{60}Co	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
^{243}Cm	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
^{244}Cm	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
^{137}Cs	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
^{152}Eu	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
^{154}Eu	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
^{155}Eu	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
^{3}H	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
^{129}I	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
^{63}Ni	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
^{237}Np	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
^{238}Pu	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
^{239}Pu	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
^{240}Pu	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
^{241}Pu	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
^{125}Sb	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
^{151}Sm	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
^{126}Sn	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
^{90}Sr	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
^{99}Tc	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
^{232}Th	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
^{233}U	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
^{234}U	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
^{235}U	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
^{236}U	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
^{238}U	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

Table A-19 RLD32 Stream Report

Stream Number: RLD32
Stream Name: LAW SBS condensate vessel vent
Configuration: 0
0
Run Data File: H:\Working Folder 2 (john)\MRQ_03_002_run2a_Streams.csv
Run Date / Time: 1/16/2003 - 1:27:28 PM

Read this note for program instructions.

Stream Properties Variable	Value	Units
Density	1.13E-03	g/cm^3
Enthalpy	-1.44E+04	BTU/hr
Mass Flow	9.34E+01	Lb/hr
	2.24E+03	Lb/day
Volumetric Flow	1.66E+02	GPM
Molar Flow	3.29E+00	Lbmol/hr
Volumetric Flow	2.21E+01	ft^3/min
Molecular Weight	2.84E+01	Lb/Lbmol
Pressure	1.00E+03	mbar
Temperature	3.00E+01	C
Viscosity	1.84E-02	cP
Na Molarity	0.00E+00	mol/L
pH	#NUM!	pH
Total TRU	9.97E-17	Ci/L
Total Activity	3.83E-13	Ci/L

Gaseous Components (1) Component	mol/L	Lb/day	Mt/day
CO	6.15E-29	3.42E-24	1.5567E-27
CO_2	2.68E-13	2.34E-08	1.06509E-11
H_2O	1.69E-03	6.07E+01	0.027582625
NO	0.00E+00	0.00E+00	0
NO_2	0.00E+00	0.00E+00	0
N_2	3.00E-02	1.67E+03	0.760655748
O_2	7.98E-03	5.08E+02	0.230965432
SO_2	0.00E+00	0.00E+00	0
NH_3	1.73E-13	5.85E-09	2.65915E-12
HNO_3	4.91E-26	6.15E-21	2.79689E-24
HCl	0.00E+00	0.00E+00	0
HF	0.00E+00	0.00E+00	0

(1) All radionuclides in gaseous streams are assumed to exist as solid particulate.

Component	Aqueous Components mol/L	Lb/gal	Lb/day	Solid Components Lb/day	Total Component Lb/day	mt/day	g/sec
Total	0.00E+00	0.00E+00	0.00E+00	3.81E-05	3.81E-05	1.73188E-08	2.00449E-07
Ag^+	0.00E+00	0.00E+00	0.00E+00	1.26E-09	1.26E-09	5.70499E-13	6.603E-12
Al^{+3}	0.00E+00	0.00E+00	0.00E+00	3.46E-07	3.46E-07	1.57065E-10	1.81789E-09
As^{+3}	0.00E+00	0.00E+00	0.00E+00	1.69E-05	1.69E-05	7.66675E-09	8.87355E-08
B^{+3}	0.00E+00	0.00E+00	0.00E+00	1.19E-06	1.19E-06	5.41389E-10	6.26607E-09
Ba^{+2}	0.00E+00	0.00E+00	0.00E+00	3.92E-10	3.92E-10	1.7832E-13	2.06389E-12
Bi^{+3}	0.00E+00	0.00E+00	0.00E+00	1.19E-09	1.19E-09	5.41881E-13	6.27177E-12
$C_2O_4^{-2}$	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0	0
Ca^{+2}	0.00E+00	0.00E+00	0.00E+00	6.31E-07	6.31E-07	2.86738E-10	3.31872E-09
Cd^{+2}	0.00E+00	0.00E+00	0.00E+00	1.40E-07	1.40E-07	6.37105E-11	7.3739E-10
Ce^{+3}	0.00E+00	0.00E+00	0.00E+00	1.66E-09	1.66E-09	7.54156E-13	8.72866E-12
Cl^-	0.00E+00	0.00E+00	0.00E+00	1.34E-06	1.34E-06	6.0825E-10	7.03993E-09
CO_3^{-2}	0.00E+00	0.00E+00	0.00E+00	1.28E-08	1.28E-08	5.80978E-12	6.72428E-11
Cr^{+3}	0.00E+00	0.00E+00	0.00E+00	2.90E-08	2.90E-08	1.32023E-11	1.52804E-10
Cu^{+2}	0.00E+00	0.00E+00	0.00E+00	1.97E-10	1.97E-10	8.95893E-14	1.03691E-12
F^-	0.00E+00	0.00E+00	0.00E+00	1.69E-06	1.69E-06	7.68733E-10	8.89738E-09
Fe^{+3}	0.00E+00	0.00E+00	0.00E+00	2.04E-07	2.04E-07	9.29102E-11	1.07535E-09
H^+	0.00E+00	0.00E+00	0.00E+00		0.00E+00	0	0
H_2O	0.00E+00	0.00E+00	0.00E+00		0.00E+00	0	0
Hg^{+2}	0.00E+00	0.00E+00	0.00E+00	3.98E-08	3.98E-08	1.80684E-11	2.09125E-10
K^+	0.00E+00	0.00E+00	0.00E+00	1.04E-06	1.04E-06	4.72877E-10	5.47311E-09
La^{+3}	0.00E+00	0.00E+00	0.00E+00	6.65E-10	6.65E-10	3.02122E-13	3.49678E-12
Li^+	0.00E+00	0.00E+00	0.00E+00	2.05E-07	2.05E-07	9.33191E-11	1.08008E-09
Mg^{+2}	0.00E+00	0.00E+00	0.00E+00	7.71E-08	7.71E-08	3.50398E-11	4.05553E-10
Mn^{+3}	0.00E+00	0.00E+00	0.00E+00	1.02E-08	1.02E-08	4.6264E-12	5.35463E-11
MnO_4^-	0.00E+00	0.00E+00	0.00E+00		0.00E+00	0	0
Na^+	0.00E+00	0.00E+00	0.00E+00	6.87E-07	6.87E-07	3.1221E-10	3.61354E-09
NH_4^+	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0	0
Ni^{+2}	0.00E+00	0.00E+00	0.00E+00	5.65E-09	5.65E-09	2.56714E-12	2.97123E-11
NO_2^-	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0	0
NO_3^-	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0	0
O^{-2}				1.11E-05	1.11E-05	5.05883E-09	5.85513E-08
OH^-	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0	0
$OH(b)^-$	0.00E+00	0.00E+00	0.00E+00		0.00E+00	0	0
P^{+5}				0.00E+00	0.00E+00	0	0
Pb^{+2}	0.00E+00	0.00E+00	0.00E+00	1.97E-09	1.97E-09	8.97002E-13	1.0382E-11
Pd^{+2}	0.00E+00	0.00E+00	0.00E+00	1.20E-11	1.20E-11	5.47422E-15	6.3359E-14
PO_4^{-3}	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0	0
S^{+6}				0.00E+00	0.00E+00	0	0
Si^{+4}				7.93E-07	7.93E-07	3.60301E-10	4.17015E-09
SiO_4^{-4}	0.00E+00	0.00E+00	0.00E+00		0.00E+00	0	0
SO_4^{-2}	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0	0
Sr^{+2}	0.00E+00	0.00E+00	0.00E+00	1.21E-10	1.21E-10	5.48369E-14	6.34687E-13
Ti^{+4}	0.00E+00	0.00E+00	0.00E+00	1.31E-06	1.31E-06	5.9402E-10	6.87523E-09
Zn^{+2}	0.00E+00	0.00E+00	0.00E+00	2.68E-07	2.68E-07	1.21883E-10	1.41069E-09

SUBJECT: Integrated Baseline Emissions Report Non-SSFM Represented Constituents Emissions Rate Estimation

Zr^{+4}	0.00E+00	0.00E+00	0.00E+00	8.16E-08	8.16E-08	3.70845E-11	4.29219E-10

Rad. Component	Aqueous Rad. Components			Solids Rad. Components (1)			Total Rad. Components (1)		
	Ci/L	Ci/day	Lb/day	Ci/L	Ci/day	Lb/day	Ci/L	Ci/day	Lb/day
Total	0.00E+00	0.00E+00	0.00E+00	3.83E-13	3.45E-07	7.76E-09	3.83E-13	3.45E-07	7.76E-09
^{241}Am	0	0.00E+00	0.00E+00	7.20E-17	6.50E-11	4.18E-14	7.20E-17	6.50E-11	4.18E-14
^{14}C	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
^{60}Co	0.00E+00	0.00E+00	0.00E+00	7.08E-17	6.39E-11	1.24E-16	7.08E-17	6.39E-11	1.24E-16
^{243}Cm	0.00E+00	0.00E+00	0.00E+00	1.93E-19	1.74E-13	7.58E-18	1.93E-19	1.74E-13	7.58E-18
^{244}Cm	0.00E+00	0.00E+00	0.00E+00	2.07E-19	1.86E-13	5.08E-18	2.07E-19	1.86E-13	5.08E-18
^{137}Cs	0.00E+00	0.00E+00	0.00E+00	5.06E-15	4.57E-09	1.16E-13	5.06E-15	4.57E-09	1.16E-13
^{152}Eu	0.00E+00	0.00E+00	0.00E+00	2.51E-16	2.26E-10	2.87E-15	2.51E-16	2.26E-10	2.87E-15
^{154}Eu	0.00E+00	0.00E+00	0.00E+00	8.32E-16	7.51E-10	6.12E-15	8.32E-16	7.51E-10	6.12E-15
^{155}Eu	0.00E+00	0.00E+00	0.00E+00	1.43E-15	1.29E-09	5.86E-15	1.43E-15	1.29E-09	5.86E-15
^{3}H	0.00E+00	0.00E+00	0.00E+00	3.44E-15	3.10E-09	7.12E-16	3.44E-15	3.10E-09	7.12E-16
^{129}I	0.00E+00	0.00E+00	0.00E+00	1.97E-17	1.77E-11	2.21E-10	1.97E-17	1.77E-11	2.21E-10
^{63}Ni	0.00E+00	0.00E+00	0.00E+00	1.03E-15	9.27E-10	3.60E-14	1.03E-15	9.27E-10	3.60E-14
^{237}Np	0.00E+00	0.00E+00	0.00E+00	3.10E-19	2.79E-13	8.74E-13	3.10E-19	2.79E-13	8.74E-13
^{238}Pu	0.00E+00	0.00E+00	0.00E+00	4.17E-19	3.77E-13	4.85E-17	4.17E-19	3.77E-13	4.85E-17
^{239}Pu	0.00E+00	0.00E+00	0.00E+00	4.88E-18	4.40E-12	1.56E-13	4.88E-18	4.40E-12	1.56E-13
^{240}Pu	0.00E+00	0.00E+00	0.00E+00	8.41E-19	7.59E-13	7.37E-15	8.41E-19	7.59E-13	7.37E-15
^{241}Pu	0.00E+00	0.00E+00	0.00E+00	2.08E-17	1.88E-11	4.02E-16	2.08E-17	1.88E-11	4.02E-16
^{125}Sb	0.00E+00	0.00E+00	0.00E+00	7.53E-15	6.80E-09	1.44E-14	7.53E-15	6.80E-09	1.44E-14
^{151}Sm	0.00E+00	0.00E+00	0.00E+00	4.76E-14	4.29E-08	3.60E-12	4.76E-14	4.29E-08	3.60E-12
^{126}Sn	0.00E+00	0.00E+00	0.00E+00	2.88E-17	2.60E-11	5.04E-12	2.88E-17	2.60E-11	5.04E-12
^{90}Sr	0.00E+00	0.00E+00	0.00E+00	3.11E-13	2.81E-07	4.48E-12	3.11E-13	2.81E-07	4.48E-12
^{99}Tc	0.00E+00	0.00E+00	0.00E+00	4.10E-15	3.70E-09	4.81E-10	4.10E-15	3.70E-09	4.81E-10
^{232}Th	0.00E+00	0.00E+00	0.00E+00	1.07E-19	9.62E-14	1.93E-09	1.07E-19	9.62E-14	1.93E-09
^{233}U	0.00E+00	0.00E+00	0.00E+00	1.98E-18	1.79E-12	4.09E-13	1.98E-18	1.79E-12	4.09E-13
^{234}U	0.00E+00	0.00E+00	0.00E+00	1.15E-18	1.04E-12	3.69E-13	1.15E-18	1.04E-12	3.69E-13
^{235}U	0.00E+00	0.00E+00	0.00E+00	4.44E-20	4.01E-14	4.09E-11	4.44E-20	4.01E-14	4.09E-11
^{236}U	0.00E+00	0.00E+00	0.00E+00	1.33E-19	1.20E-13	4.10E-12	1.33E-19	1.20E-13	4.10E-12
^{238}U	0.00E+00	0.00E+00	0.00E+00	8.56E-19	7.73E-13	5.07E-09	8.56E-19	7.73E-13	5.07E-09

Appendix B Calculations

BY: E. Berrios
DATE: 03/13/03

CALCULATION SHEET

PROJECT: WTP
JOB NO.: 24590
CALC NO.: 24590-WTP-M4C-FRP-00003
SHEET REV:A
SHEET NO.:55

SUBJECT: Integrated Baseline Emissions Report Non-SSFM Represented Constituents Emissions Rate Estimation

Table B-1 Feed Rate Calculation

LAW & HLW Supernate			Represent		FRP14
Non-Rep Const	MW	mol/mol Na	Compound	mol/l	mol/hr
Be	9.0	1.21E-04	Zr	4.84E-04	0.00E+00
CN	26.0	2.89E-04	PO4	1.16E-03	0.00E+00
Co	58.9	1.67E-04	60Co	6.68E-04	0.00E+00
Mo	95.9	2.67E-04	Bi	1.07E-03	0.00E+00
Rh	102.9	5.54E-05	Zr	2.22E-04	0.00E+00
Sb	121.7	1.07E-04	Sb-125	4.28E-04	0.00E+00
Se	78.9	2.04E-04	F	8.16E-04	0.00E+00
Sn	118.7	1.17E-06	Sn-126	4.68E-06	0.00E+00
Ta	180.9	2.95E-05	Zr	1.18E-04	0.00E+00
Tl	204.3	2.13E-04	F	8.52E-04	0.00E+00
U	238.0	6.18E-04	234U	2.47E-03	0.00E+00
V	50.9	2.14E-04	Bi	8.56E-04	0.00E+00
W	183.8	2.01E-04	Zr	8.04E-04	0.00E+00
Y	88.9	2.02E-05	Sr-90	8.08E-05	0.00E+00
		Bq/mol Na		Bq/l	Bq/hr
106Ru	106	7.78E-01	F	3.11E+00	0.00E+00
113mCd	113	8.26E+05	Cd	3.30E+06	0.00E+00
134Cs	134	3.70E+07	137Cs	1.48E+08	0.00E+00
137mBa	137	1.36E+10	137Cs	5.44E+10	0.00E+00
226Ra	226	1.19E+00	Zr	4.76E+00	0.00E+00
227Ac	227	1.32E+01	Zr	5.28E+01	0.00E+00
228Ra	228	2.31E+03	Zr	9.24E+03	0.00E+00
229Th	229	5.43E+01	232Th	2.17E+02	0.00E+00
231Pa	231	3.85E+01	Zr	1.54E+02	0.00E+00
232U	232	1.30E+03	233U	5.20E+03	0.00E+00
242Pu	242	2.79E-01	241Pu	1.12E+00	0.00E+00
243Am	243	7.29E+00	241Am	2.92E+01	0.00E+00
59Ni	59	1.29E+04	63Ni	5.16E+04	0.00E+00
79Se	79	1.13E+04	F	4.52E+04	0.00E+00
90Y	90	7.70E+08	90Sr	3.08E+09	0.00E+00
93Zr	93	1.92E+05	Zr	7.68E+05	0.00E+00
93mNb	93	1.52E+05	Zr	6.08E+05	0.00E+00
242Cm	242	4.49E+02	243Cm	1.80E+03	0.00E+00

LAW & HLW Solids			FRP14	Feed rates			
	mol/mol Na	mol/l	mol/hr				
Be	8.74E-03	3.50E-02	5.15E+01	Na mol	4 mol/l		
CN	7.45E-02	2.98E-01	4.39E+02	Vol Flow	0 ft3/hr	0 L/hr	FRP14
Co	9.25E-03	3.70E-02	5.45E+01	Total Flow	52 ft3/hr	1473 L/hr	FRP14
Mo	8.20E-03	3.28E-02	4.83E+01				
Rh	1.53E-03	6.12E-03	9.02E+00				
Sb	8.35E-03	3.34E-02	4.92E+01				
Se	7.97E-03	3.19E-02	4.70E+01				
Sn	5.28E-05	2.11E-04	3.11E-01				
Ta	2.01E-04	8.04E-04	1.18E+00				
Tl	2.67E-03	1.07E-02	1.57E+01				
U	7.12E-02	2.85E-01	4.20E+02				
V	7.61E-04	3.04E-03	4.48E+00				
W	1.58E-03	6.32E-03	9.31E+00				
Y	2.18E-03	8.72E-03	1.28E+01				
	Bq/mol Na	Bq/l	Bq/hr				
106Ru	4.37E+06	1.75E+07	2.57E+10				
113mCd	1.36E+07	5.44E+07	8.01E+10				
134Cs	3.15E+06	1.26E+07	1.86E+10				
137mBa	3.28E+09	1.31E+10	1.93E+13				
226Ra	1.52E+02	6.08E+02	8.96E+05				
227Ac	7.68E+05	3.07E+06	4.53E+09				
228Ra	1.59E+05	6.36E+05	9.37E+08				
229Th	6.63E+03	2.65E+04	3.91E+07				
231Pa	1.69E+06	6.76E+06	9.96E+09				
232U	1.36E+05	5.44E+05	8.01E+08				
242Pu	1.44E+03	5.76E+03	8.48E+06				
243Am	3.95E+04	1.58E+05	2.33E+08				
59Ni	2.27E+06	9.08E+06	1.34E+10				
79Se	1.26E+05	5.04E+05	7.42E+08				
90Y	3.71E+10	1.48E+11	2.19E+14				
93Zr	5.46E+06	2.18E+07	3.22E+10				
93mNb	4.92E+06	1.97E+07	2.90E+10				
242Cm	1.62E+05	6.48E+05	9.55E+08				

Tin Calc

126Sn	1.49E+05	Bq/mol Na LAW Feed	4.03E-06	Ci/mol Na
	6.72E+06	Bq/mol Na HLW Feed	1.82E-04	Ci/mol Na
	2.90E+01	Ci Sn/kg Sn		
	1.39E-07	kg/mol Na LAW		
	6.26E-06	kg/mol Na HLW		
	118.71	g/mol		
	1.17E-06	mol/mol Na LAW		
	5.28E-05	mol/mol Na HLW		

CALCULATION SHEET

BY: E. Berrios
DATE: 03/13/03

PROJECT: WTP
JOB NO.: 24590
CALC NO.: 24590-WTP-M4C-FRP-00003
SHEET REV: A
SHEET NO.: 56

SUBJECT: Integrated Baseline Emissions Report Non-SSFM Represented Constituents Emissions Rate Estimation

	A	B	C	D	E	F	G	H	I	J	K	L	M
1	**Table B-2 PJV04 Calculation**												
2			Total feed			Representatives			PJV04	Unabated PT- RFD/PJM			
3	Non-Rep Const	MW	mol/hr	lb/d			Feed Rate		Rate	PF	Non-Rep Const (g/sec)		
4	Be	9.0	5.15E+01	2.45E+01		Zr+4	3.65E+02	lb/d	2.25E-02	1.62E+04	7.93E-06		
5	CN	26.0	4.39E+02	6.03E+02		PO4-3	2.20E+03	lb/d	1.97E-01	1.12E+04	2.83E-04		
6	Co	58.9	5.45E+01	1.70E+02		60Co	1.09E+02	Ci/d	6.60E-03	1.65E+04	5.42E-05		
7	Mo	95.9	4.83E+01	2.45E+02		Bi+3	7.94E+01	lb/d	5.24E-03	1.51E+04	8.50E-05		
8	Rh	102.9	9.02E+00	4.90E+01		Zr+4	3.65E+02	lb/d	2.25E-02	1.62E+04	1.59E-05		
9	Sb	121.7	4.92E+01	3.16E+02		125Sb	4.19E+02	Ci/d	2.79E-02	1.50E+04	1.11E-04		
10	Se	78.9	4.70E+01	1.96E+02		F-	6.93E+02	lb/d	6.82E-02	1.02E+04	1.01E-04		
11	Sn	118.7	3.11E-01	1.95E+00		126Sn	2.18E+00	Ci/d	1.50E-04	1.45E+04	7.06E-07		
12	Ta	180.9	1.18E+00	1.13E+01		Zr+4	3.65E+02	lb/d	2.25E-02	1.62E+04	3.66E-06		
13	Tl	204.3	1.57E+01	1.70E+02		F-	6.93E+02	lb/d	6.82E-02	1.02E+04	8.79E-05		
14	U	238.0	4.20E+02	5.27E+03		234U	5.80E-02	Ci/d	4.24E-06	1.37E+04	2.03E-03		
15	V	50.9	4.48E+00	1.21E+01		Bi+3	7.94E+01	lb/d	5.24E-03	1.51E+04	4.19E-06		
16	W	183.8	9.31E+00	9.03E+01		Zr+4	3.65E+02	lb/d	2.25E-02	1.62E+04	2.93E-05		
17	Y	88.9	1.28E+01	6.03E+01		90Sr	1.10E+05	Ci/d	6.80E+00	1.62E+04	1.95E-05		
18			Bq/hr	Ci/d									
19	106Ru	106	2.57E+10	1.67E+01		F-	6.93E+02	lb/d	6.82E-02	1.02E+04	1.64E-03		
20	113mCd	113	8.01E+10	5.20E+01		Cd+2	2.47E+02	lb/d	2.06E-02	1.20E+04	4.34E-03		
21	134Cs	134	1.86E+10	1.20E+01		137Cs	9.26E+04	Ci/d	7.58E+00	1.22E+04	9.86E-04		
22	137mBa	137	1.93E+13	1.25E+04		137Cs	9.26E+04	Ci/d	7.58E+00	1.22E+04	1.03E+00		
23	226Ra	226	8.96E+05	5.81E-04		Zr+4	3.65E+02	lb/d	2.25E-02	1.62E+04	3.58E-08		
24	227Ac	227	4.53E+09	2.94E+00		Zr+4	3.65E+02	lb/d	2.25E-02	1.62E+04	1.81E-04		
25	228Ra	228	9.37E+08	6.08E-01		Zr+4	3.65E+02	lb/d	2.25E-02	1.62E+04	3.74E-05		
26	229Th	229	3.91E+07	2.53E-02		232Th	1.05E-02	Ci/d	7.05E-07	1.50E+04	1.69E-06		
27	231Pa	231	9.96E+09	6.46E+00		Zr+4	3.65E+02	lb/d	2.25E-02	1.62E+04	3.98E-04		
28	232U	232	8.01E+08	5.20E-01		233U	4.90E-02	Ci/d	4.23E-06	1.16E+04	4.49E-05		
29	242Pu	242	8.48E+06	5.50E-03		241Pu	2.36E+02	Ci/d	1.43E-02	1.66E+04	3.32E-07		
30	243Am	243	2.33E+08	1.51E-01		241Am	9.67E+02	Ci/d	5.84E-02	1.66E+04	9.12E-06		
31	59Ni	59	1.34E+10	8.68E+00		63Ni	5.99E+01	Ci/d	3.93E-03	1.52E+04	5.70E-04		
32	79Se	79	7.42E+08	4.82E-01		F-	6.93E+02	lb/d	6.82E-02	1.02E+04	4.74E-05		
33	90Y	90	2.19E+14	1.42E+05		90Sr	1.10E+05	Ci/d	6.80E+00	1.62E+04	8.74E+00		
34	93Zr	93	3.22E+10	2.09E+01		Zr+4	3.65E+02	lb/d	2.25E-02	1.62E+04	1.28E-03		
35	93mNb	93	2.90E+10	1.88E+01		Zr+4	3.65E+02	lb/d	2.25E-02	1.62E+04	1.16E-03		
36	242Cm	242	9.55E+08	6.19E-01		243Cm	3.22E+01	Ci/d	1.94E-03	1.66E+04	3.74E-05		

SUBJECT: Integrated Baseline Emissions Report Non-SSFM Represented Constituents Emissions Rate Estimation

	A	B	C	D	E	F	G	H	I	J	K	L	M
1	**Table B-3 FEP06 Calculation**												
2			Total feed			Representatives			FEP06	Unabated PT- LAW Feed Evap			
3	Non-Rep Const	MW	mol/hr	lb/d			Feed Rate		Rate	PF	Non-Rep Const (g/sec)		
4	Be	9.0	5.15E+01	2.45E+01		Zr+4	3.65E+02	lb/d	3.69E-01	9.90E+02	1.30E-04		
5	CN	26.0	4.39E+02	6.03E+02		PO4-3	2.20E+03	lb/d	3.34E+00	6.59E+02	4.81E-03		
6	Co	58.9	5.45E+01	1.70E+02		60Co	1.09E+02	Ci/d	1.09E-01	9.97E+02	8.94E-04		
7	Mo	95.9	4.83E+01	2.45E+02		Bi+3	7.94E+01	lb/d	2.20E-02	3.61E+03	3.56E-04		
8	Rh	102.9	9.02E+00	4.90E+01		Zr+4	3.65E+02	lb/d	3.69E-01	9.90E+02	2.60E-04		
9	Sb	121.7	4.92E+01	3.16E+02		125Sb	4.19E+02	Ci/d	1.17E-01	3.58E+03	4.64E-04		
10	Se	78.9	4.70E+01	1.96E+02		F-	6.93E+02	lb/d	4.54E-02	1.53E+04	6.74E-05		
11	Sn	118.7	3.11E-01	1.95E+00		126Sn	2.18E+00	Ci/d	6.32E-04	3.45E+03	2.97E-06		
12	Ta	180.9	1.18E+00	1.13E+01		Zr+4	3.65E+02	lb/d	3.69E-01	9.90E+02	6.01E-05		
13	Tl	204.3	1.57E+01	1.70E+02		F-	6.93E+02	lb/d	4.54E-02	1.53E+04	5.85E-05		
14	U	238.0	4.20E+02	5.27E+03		234U	5.80E-02	Ci/d	7.10E-05	8.17E+02	3.40E-02		
15	V	50.9	4.48E+00	1.21E+01		Bi+3	7.94E+01	lb/d	2.20E-02	3.61E+03	1.75E-05		
16	W	183.8	9.31E+00	9.03E+01		Zr+4	3.65E+02	lb/d	3.69E-01	9.90E+02	4.80E-04		
17	Y	88.9	1.28E+01	6.03E+01		90Sr	1.10E+05	Ci/d	4.88E-01	2.26E+05	1.40E-06		
18			Bq/hr	Ci/d									
19	106Ru	106	2.57E+10	1.67E+01		F-	6.93E+02	lb/d	4.54E-02	1.53E+04	1.09E-03		
20	113mCd	113	8.01E+10	5.20E+01		Cd+2	2.47E+02	lb/d	1.55E-02	1.59E+04	3.27E-03		
21	134Cs	134	1.86E+10	1.20E+01		137Cs	9.26E+04	Ci/d	1.51E-03	6.15E+07	1.96E-07		
22	137mBa	137	1.93E+13	1.25E+04		137Cs	9.26E+04	Ci/d	1.51E-03	6.15E+07	2.04E-04		
23	226Ra	226	8.96E+05	5.81E-04		Zr+4	3.65E+02	lb/d	3.69E-01	9.90E+02	5.87E-07		
24	227Ac	227	4.53E+09	2.94E+00		Zr+4	3.65E+02	lb/d	3.69E-01	9.90E+02	2.96E-03		
25	228Ra	228	9.37E+08	6.08E-01		Zr+4	3.65E+02	lb/d	3.69E-01	9.90E+02	6.14E-04		
26	229Th	229	3.91E+07	2.53E-02		232Th	1.05E-02	Ci/d	1.17E-05	8.99E+02	2.82E-05		
27	231Pa	231	9.96E+09	6.46E+00		Zr+4	3.65E+02	lb/d	3.69E-01	9.90E+02	6.52E-03		
28	232U	232	8.01E+08	5.20E-01		233U	4.90E-02	Ci/d	7.17E-05	6.84E+02	7.60E-04		
29	242Pu	242	8.48E+06	5.50E-03		241Pu	2.36E+02	Ci/d	6.36E-05	3.72E+06	1.48E-09		
30	243Am	243	2.33E+08	1.51E-01		241Am	9.67E+02	Ci/d	6.90E-04	1.40E+06	1.08E-07		
31	59Ni	59	1.34E+10	8.68E+00		63Ni	5.99E+01	Ci/d	2.23E-03	2.68E+04	3.23E-04		
32	79Se	79	7.42E+08	4.82E-01		F-	6.93E+02	lb/d	4.54E-02	1.53E+04	3.16E-05		
33	90Y	90	2.19E+14	1.42E+05		90Sr	1.10E+05	Ci/d	4.88E-01	2.26E+05	6.27E-01		
34	93Zr	93	3.22E+10	2.09E+01		Zr+4	3.65E+02	lb/d	3.69E-01	9.90E+02	2.11E-02		
35	93mNb	93	2.90E+10	1.88E+01		Zr+4	3.65E+02	lb/d	3.69E-01	9.90E+02	1.90E-02		
36	242Cm	242	9.55E+08	6.19E-01		243Cm	3.22E+01	Ci/d	3.20E-02	1.00E+03	6.16E-04		

BY: E. Berrios
DATE: 03/13/03

CALCULATION SHEET

PROJECT: WTP
JOB NO.: 24590
CALC NO.: 24590-WTP-M4C-FRP-00003
SHEET REV: A
SHEET NO.: 58

SUBJECT: Integrated Baseline Emissions Report Non-SSFM Represented Constituents Emissions Rate Estimation

	A	B	C	D	E	F	G	H	I	J	K	L	M
1	**Table B-4 PVP01 Calculation**												
2			Total feed			Representatives			PVP01	Unabated PT- VV			
3	Non-Rep Const	MW	mol/hr	lb/d			Feed Rate		Rate	PF	Non-Rep Const (g/sec)		
4	Be	9.0	5.15E+01	2.45E+01		Zr+4	3.65E+02	lb/d	2.13E-03	1.72E+05	7.50E-07		
5	CN	26.0	4.39E+02	6.03E+02		PO4-3	2.20E+03	lb/d	2.74E-02	8.05E+04	3.94E-05		
6	Co	58.9	5.45E+01	1.70E+02		60Co	1.09E+02	Ci/d	5.61E-04	1.94E+05	4.60E-06		
7	Mo	95.9	4.83E+01	2.45E+02		Bi+3	7.94E+01	lb/d	3.59E-04	2.21E+05	5.82E-06		
8	Rh	102.9	9.02E+00	4.90E+01		Zr+4	3.65E+02	lb/d	2.13E-03	1.72E+05	1.50E-06		
9	Sb	121.7	4.92E+01	3.16E+02		125Sb	4.19E+02	Ci/d	1.93E-03	2.17E+05	7.67E-06		
10	Se	78.9	4.70E+01	1.96E+02		F-	6.93E+02	lb/d	6.69E-03	1.04E+05	9.92E-06		
11	Sn	118.7	3.11E-01	1.95E+00		126Sn	2.18E+00	Ci/d	1.11E-05	1.97E+05	5.21E-08		
12	Ta	180.9	1.18E+00	1.13E+01		Zr+4	3.65E+02	lb/d	2.13E-03	1.72E+05	3.47E-07		
13	Tl	204.3	1.57E+01	1.70E+02		F-	6.93E+02	lb/d	6.69E-03	1.04E+05	8.61E-06		
14	U	238.0	4.20E+02	5.27E+03		234U	5.80E-02	Ci/d	5.10E-07	1.14E+05	2.44E-04		
15	V	50.9	4.48E+00	1.21E+01		Bi+3	7.94E+01	lb/d	3.59E-04	2.21E+05	2.87E-07		
16	W	183.8	9.31E+00	9.03E+01		Zr+4	3.65E+02	lb/d	2.13E-03	1.72E+05	2.77E-06		
17	Y	88.9	1.28E+01	6.03E+01		90Sr	1.10E+05	Ci/d	4.07E-01	2.71E+05	1.17E-06		
18			Bq/hr	Ci/d									
19	106Ru	106	2.57E+10	1.67E+01		F-	6.93E+02	lb/d	6.69E-03	1.04E+05	1.61E-04		
20	113mCd	113	8.01E+10	5.20E+01		Cd+2	2.47E+02	lb/d	1.80E-03	1.37E+05	3.79E-04		
21	134Cs	134	1.86E+10	1.20E+01		137Cs	9.26E+04	Ci/d	6.00E-01	1.54E+05	7.80E-05		
22	137mBa	137	1.93E+13	1.25E+04		137Cs	9.26E+04	Ci/d	6.00E-01	1.54E+05	8.13E-02		
23	226Ra	226	8.96E+05	5.81E-04		Zr+4	3.65E+02	lb/d	2.13E-03	1.72E+05	3.38E-09		
24	227Ac	227	4.53E+09	2.94E+00		Zr+4	3.65E+02	lb/d	2.13E-03	1.72E+05	1.71E-05		
25	228Ra	228	9.37E+08	6.08E-01		Zr+4	3.65E+02	lb/d	2.13E-03	1.72E+05	3.54E-06		
26	229Th	229	3.91E+07	2.53E-02		232Th	1.05E-02	Ci/d	7.05E-08	1.50E+05	1.69E-07		
27	231Pa	231	9.96E+09	6.46E+00		Zr+4	3.65E+02	lb/d	2.13E-03	1.72E+05	3.76E-05		
28	232U	232	8.01E+08	5.20E-01		233U	4.90E-02	Ci/d	6.22E-07	7.88E+04	6.59E-06		
29	242Pu	242	8.48E+06	5.50E-03		241Pu	2.36E+02	Ci/d	8.31E-04	2.84E+05	1.94E-08		
30	243Am	243	2.33E+08	1.51E-01		241Am	9.67E+02	Ci/d	3.40E-03	2.85E+05	5.31E-07		
31	59Ni	59	1.34E+10	8.68E+00		63Ni	5.99E+01	Ci/d	2.69E-04	2.22E+05	3.90E-05		
32	79Se	79	7.42E+08	4.82E-01		F-	6.93E+02	lb/d	6.69E-03	1.04E+05	4.64E-06		
33	90Y	90	2.19E+14	1.42E+05		90Sr	1.10E+05	Ci/d	4.07E-01	2.71E+05	5.23E-01		
34	93Zr	93	3.22E+10	2.09E+01		Zr+4	3.65E+02	lb/d	2.13E-03	1.72E+05	1.22E-04		
35	93mNb	93	2.90E+10	1.88E+01		Zr+4	3.65E+02	lb/d	2.13E-03	1.72E+05	1.09E-04		
36	242Cm	242	9.55E+08	6.19E-01		243Cm	3.22E+01	Ci/d	1.62E-04	1.98E+05	3.12E-06		

CALCULATION SHEET

BY: E. Berrios
DATE: 03/13/03

PROJECT: WTP
JOB NO.: 24590
CALC NO.: 24590-WTP-M4C-FRP-00003
SHEET REV: A
SHEET NO.: 59

SUBJECT: Integrated Baseline Emissions Report Non-SSFM Represented Constituents Emissions Rate Estimation

	A	B	C	D	E	F	G	H	I	J	K	L	M
1	**Table B-5 TLP01 Calculation**												
2			Total feed			Representatives			TLP01	Unabated PT- LAW Melter Evap			
3	Non-Rep Const	MW	mol/hr	lb/d			Feed Rate		Rate	PF	Non-Rep Const (g/sec)		
4	Be	9.0	5.15E+01	2.45E+01		Zr+4	3.65E+02	lb/d	1.73E-02	2.11E+04	6.10E-06		
5	CN	26.0	4.39E+02	6.03E+02		PO4-3	2.20E+03	lb/d	1.78E+00	1.24E+03	2.56E-03		
6	Co	58.9	5.45E+01	1.70E+02		60Co	1.09E+02	Ci/d	2.47E-03	4.39E+04	2.03E-05		
7	Mo	95.9	4.83E+01	2.45E+02		Bi+3	7.94E+01	lb/d	2.96E-03	2.68E+04	4.80E-05		
8	Rh	102.9	9.02E+00	4.90E+01		Zr+4	3.65E+02	lb/d	1.73E-02	2.11E+04	1.22E-05		
9	Sb	121.7	4.92E+01	3.16E+02		125Sb	4.19E+02	Ci/d	3.36E-02	1.25E+04	1.33E-04		
10	Se	78.9	4.70E+01	1.96E+02		F-	6.93E+02	lb/d	3.04E-02	2.28E+04	4.52E-05		
11	Sn	118.7	3.11E-01	1.95E+00		126Sn	2.18E+00	Ci/d	2.51E-04	8.68E+03	1.18E-06		
12	Ta	180.9	1.18E+00	1.13E+01		Zr+4	3.65E+02	lb/d	1.73E-02	2.11E+04	2.82E-06		
13	Tl	204.3	1.57E+01	1.70E+02		F-	6.93E+02	lb/d	3.04E-02	2.28E+04	3.92E-05		
14	U	238.0	4.20E+02	5.27E+03		234U	5.80E-02	Ci/d	3.99E-05	1.46E+03	1.91E-02		
15	V	50.9	4.48E+00	1.21E+01		Bi+3	7.94E+01	lb/d	2.96E-03	2.68E+04	2.37E-06		
16	W	183.8	9.31E+00	9.03E+01		Zr+4	3.65E+02	lb/d	1.73E-02	2.11E+04	2.25E-05		
17	Y	88.9	1.28E+01	6.03E+01		90Sr	1.10E+05	Ci/d	1.21E-02	9.10E+06	3.49E-08		
18			Bq/hr	Ci/d									
19	106Ru	106	2.57E+10	1.67E+01		F-	6.93E+02	lb/d	3.04E-02	2.28E+04	7.33E-04		
20	113mCd	113	8.01E+10	5.20E+01		Cd+2	2.47E+02	lb/d	6.39E-03	3.86E+04	1.35E-03		
21	134Cs	134	1.86E+10	1.20E+01		137Cs	9.26E+04	Ci/d	1.49E-07	6.23E+11	1.93E-11		
22	137mBa	137	1.93E+13	1.25E+04		137Cs	9.26E+04	Ci/d	1.49E-07	6.23E+11	2.01E-08		
23	226Ra	226	8.96E+05	5.81E-04		Zr+4	3.65E+02	lb/d	1.73E-02	2.11E+04	2.75E-08		
24	227Ac	227	4.53E+09	2.94E+00		Zr+4	3.65E+02	lb/d	1.73E-02	2.11E+04	1.39E-04		
25	228Ra	228	9.37E+08	6.08E-01		Zr+4	3.65E+02	lb/d	1.73E-02	2.11E+04	2.88E-05		
26	229Th	229	3.91E+07	2.53E-02		232Th	1.05E-02	Ci/d	1.88E-06	5.62E+03	4.51E-06		
27	231Pa	231	9.96E+09	6.46E+00		Zr+4	3.65E+02	lb/d	1.73E-02	2.11E+04	3.06E-04		
28	232U	232	8.01E+08	5.20E-01		233U	4.90E-02	Ci/d	6.85E-05	7.15E+02	7.27E-04		
29	242Pu	242	8.48E+06	5.50E-03		241Pu	2.36E+02	Ci/d	1.89E-07	1.25E+09	4.40E-12		
30	243Am	243	2.33E+08	1.51E-01		241Am	9.67E+02	Ci/d	9.24E-07	1.05E+09	1.44E-10		
31	59Ni	59	1.34E+10	8.68E+00		63Ni	5.99E+01	Ci/d	5.44E-04	1.10E+05	7.89E-05		
32	79Se	79	7.42E+08	4.82E-01		F-	6.93E+02	lb/d	3.04E-02	2.28E+04	2.11E-05		
33	90Y	90	2.19E+14	1.42E+05		90Sr	1.10E+05	Ci/d	1.21E-02	9.10E+06	1.56E-02		
34	93Zr	93	3.22E+10	2.09E+01		Zr+4	3.65E+02	lb/d	1.73E-02	2.11E+04	9.88E-04		
35	93mNb	93	2.90E+10	1.88E+01		Zr+4	3.65E+02	lb/d	1.73E-02	2.11E+04	8.90E-04		
36	242Cm	242	9.55E+08	6.19E-01		243Cm	3.22E+01	Ci/d	4.04E-06	7.97E+06	7.77E-08		

CALCULATION SHEET

BY: E. Berrios
DATE: 03/13/03

PROJECT: WTP
JOB NO.: 24590
CALC NO.: 24590-WTP-M4C-FRP-00003
SHEET REV: A
SHEET NO.: 60

SUBJECT: Integrated Baseline Emissions Report Non-SSFM Represented Constituents Emissions Rate Estimation

	A	B	C	D	E	F	G	H	I	J	K	L	M
1	**Table B-6 LMP06 Calculation**												
2			Total feed			Representatives			LMP06	Unabated LAW OFFGAS			
3	Non-Rep Const	MW	mol/hr	lb/d			Feed Rate		Rate	PF	Non-Rep Const (g/sec)		
4	Be	9.0	5.15E+01	2.45E+01		Zr+4	3.65E+02	lb/d	8.19E+00	4.46E+01	2.89E-03		
5	CN	26.0	4.39E+02	6.03E+02		PO4-3	2.20E+03	lb/d	4.49E+01	4.91E+01	6.46E-02		
6	Co	58.9	5.45E+01	1.70E+02		60Co	1.09E+02	Ci/d	6.49E-03	1.68E+04	5.32E-05		
7	Mo	95.9	4.83E+01	2.45E+02		Bi+3	7.94E+01	lb/d	1.21E-01	6.57E+02	1.96E-03		
8	Rh	102.9	9.02E+00	4.90E+01		Zr+4	3.65E+02	lb/d	8.19E+00	4.46E+01	5.78E-03		
9	Sb	121.7	4.92E+01	3.16E+02		125Sb	4.19E+02	Ci/d	6.97E-01	6.02E+02	2.76E-03		
10	Se	78.9	4.70E+01	1.96E+02		F-	6.93E+02	lb/d	1.23E+02	5.62E+00	1.83E-01		
11	Sn	118.7	3.11E-01	1.95E+00		126Sn	2.18E+00	Ci/d	2.60E-03	8.37E+02	1.22E-05		
12	Ta	180.9	1.18E+00	1.13E+01		Zr+4	3.65E+02	lb/d	8.19E+00	4.46E+01	1.33E-03		
13	Tl	204.3	1.57E+01	1.70E+02		F-	6.93E+02	lb/d	1.23E+02	5.62E+00	1.59E-01		
14	U	238.0	4.20E+02	5.27E+03		234U	5.80E-02	Ci/d	1.04E-04	5.57E+02	4.98E-02		
15	V	50.9	4.48E+00	1.21E+01		Bi+3	7.94E+01	lb/d	1.21E-01	6.57E+02	9.64E-05		
16	W	183.8	9.31E+00	9.03E+01		Zr+4	3.65E+02	lb/d	8.19E+00	4.46E+01	1.07E-02		
17	Y	88.9	1.28E+01	6.03E+01		90Sr	1.10E+05	Ci/d	2.81E+01	3.92E+03	8.09E-05		
18			Bq/hr	Ci/d									
19	106Ru	106	2.57E+10	1.67E+01		F-	6.93E+02	lb/d	1.23E+02	5.62E+00	2.97E+00		
20	113mCd	113	8.01E+10	5.20E+01		Cd+2	2.47E+02	lb/d	1.41E+01	1.75E+01	2.98E+00		
21	134Cs	134	1.86E+10	1.20E+01		137Cs	9.26E+04	Ci/d	4.63E-01	2.00E+05	6.03E-05		
22	137mBa	137	1.93E+13	1.25E+04		137Cs	9.26E+04	Ci/d	4.63E-01	2.00E+05	6.28E-02		
23	226Ra	226	8.96E+05	5.81E-04		Zr+4	3.65E+02	lb/d	8.19E+00	4.46E+01	1.30E-05		
24	227Ac	227	4.53E+09	2.94E+00		Zr+4	3.65E+02	lb/d	8.19E+00	4.46E+01	6.58E-02		
25	228Ra	228	9.37E+08	6.08E-01		Zr+4	3.65E+02	lb/d	8.19E+00	4.46E+01	1.36E-02		
26	229Th	229	3.91E+07	2.53E-02		232Th	1.05E-02	Ci/d	9.64E-06	1.09E+03	2.32E-05		
27	231Pa	231	9.96E+09	6.46E+00		Zr+4	3.65E+02	lb/d	8.19E+00	4.46E+01	1.45E-01		
28	232U	232	8.01E+08	5.20E-01		233U	4.90E-02	Ci/d	1.79E-04	2.74E+02	1.90E-03		
29	242Pu	242	8.48E+06	5.50E-03		241Pu	2.36E+02	Ci/d	1.88E-03	1.26E+05	4.38E-08		
30	243Am	243	2.33E+08	1.51E-01		241Am	9.67E+02	Ci/d	6.51E-03	1.48E+05	1.02E-06		
31	59Ni	59	1.34E+10	8.68E+00		63Ni	5.99E+01	Ci/d	9.35E-02	6.40E+02	1.35E-02		
32	79Se	79	7.42E+08	4.82E-01		F-	6.93E+02	lb/d	1.23E+02	5.62E+00	8.57E-02		
33	90Y	90	2.19E+14	1.42E+05		90Sr	1.10E+05	Ci/d	2.81E+01	3.92E+03	3.62E+01		
34	93Zr	93	3.22E+10	2.09E+01		Zr+4	3.65E+02	lb/d	8.19E+00	4.46E+01	4.68E-01		
35	93mNb	93	2.90E+10	1.88E+01		Zr+4	3.65E+02	lb/d	8.19E+00	4.46E+01	4.22E-01		
36	242Cm	242	9.55E+08	6.19E-01		243Cm	3.22E+01	Ci/d	1.74E-05	1.85E+06	3.35E-07		

BY: E. Berrios
DATE: 03/13/03

CALCULATION SHEET

PROJECT: WTP
JOB NO.: 24590
CALC NO.: 24590-WTP-M4C-FRP-00003
SHEET REV: A
SHEET NO.: 61

SUBJECT: Integrated Baseline Emissions Report Non-SSFM Represented Constituents Emissions Rate Estimation

	A	B	C	D	E	F	G	H	I	J	K	L	M
1	**Table B-7 LVP01 Calculation**												
2			Total feed			Representatives			LVP01	Unabated LAW VV			
3	Non-Rep Const	MW	mol/hr	lb/d			Feed Rate		Rate	PF	Non-Rep Const (g/sec)		
4	Be	9.0	5.15E+01	2.45E+01		Zr+4	1.92E+00	g/sec	1.31E-07	1.47E+07	1.66E-06		
5	CN	26.0	4.39E+02	6.03E+02		PO4-3	1.16E+01	g/sec	1.89E-07	6.13E+07	9.83E-06		
6	Co	58.9	5.45E+01	1.70E+02		60Co	1.09E+02	Ci/d	2.60E-08	4.17E+09	4.06E-08		
7	Mo	95.9	4.83E+01	2.45E+02		Bi+3	4.18E-01	g/sec	1.28E-09	3.27E+08	7.49E-07		
8	Rh	102.9	9.02E+00	4.90E+01		Zr+4	1.92E+00	g/sec	1.31E-07	1.47E+07	3.33E-06		
9	Sb	121.7	4.92E+01	3.16E+02		125Sb	4.19E+02	Ci/d	1.40E-06	2.99E+08	1.06E-06		
10	Se	78.9	4.70E+01	1.96E+02		F-	3.65E+00	g/sec	8.77E-08	4.16E+07	4.70E-06		
11	Sn	118.7	3.11E-01	1.95E+00		126Sn	2.18E+00	Ci/d	1.04E-08	2.09E+08	9.33E-09		
12	Ta	180.9	1.18E+00	1.13E+01		Zr+4	1.92E+00	g/sec	1.31E-07	1.47E+07	7.69E-07		
13	Tl	204.3	1.57E+01	1.70E+02		F-	3.65E+00	g/sec	8.77E-08	4.16E+07	4.08E-06		
14	U	238.0	4.20E+02	5.27E+03		234U	5.80E-02	Ci/d	4.18E-10	1.39E+08	3.80E-05		
15	V	50.9	4.48E+00	1.21E+01		Bi+3	4.18E-01	g/sec	1.28E-09	3.27E+08	3.69E-08		
16	W	183.8	9.31E+00	9.03E+01		Zr+4	1.92E+00	g/sec	1.31E-07	1.47E+07	6.14E-06		
17	Y	88.9	1.28E+01	6.03E+01		90Sr	1.10E+05	Ci/d	5.66E-05	1.95E+09	3.09E-08		
18			Bq/hr	Ci/d									
19	106Ru	106	2.57E+10	1.67E+01		F-	3.65E+00	g/sec	8.77E-08	4.16E+07	4.02E-07		
20	113mCd	113	8.01E+10	5.20E+01		Cd+2	1.30E+00	g/sec	1.61E-08	8.08E+07	6.43E-07		
21	134Cs	134	1.86E+10	1.20E+01		137Cs	9.26E+04	Ci/d	2.84E-07	3.25E+11	3.70E-11		
22	137mBa	137	1.93E+13	1.25E+04		137Cs	9.26E+04	Ci/d	2.84E-07	3.25E+11	3.85E-08		
23	226Ra	226	8.96E+05	5.81E-04		Zr+4	1.92E+00	g/sec	1.31E-07	1.47E+07	3.95E-11		
24	227Ac	227	4.53E+09	2.94E+00		Zr+4	1.92E+00	g/sec	1.31E-07	1.47E+07	2.00E-07		
25	228Ra	228	9.37E+08	6.08E-01		Zr+4	1.92E+00	g/sec	1.31E-07	1.47E+07	4.13E-08		
26	229Th	229	3.91E+07	2.53E-02		232Th	5.54E-05	Ci/d	3.87E-11	1.43E+06	1.77E-08		
27	231Pa	231	9.96E+09	6.46E+00		Zr+4	1.92E+00	g/sec	1.31E-07	1.47E+07	4.39E-07		
28	232U	232	8.01E+08	5.20E-01		233U	4.90E-02	Ci/d	7.18E-10	6.83E+07	7.61E-09		
29	242Pu	242	8.48E+06	5.50E-03		241Pu	2.36E+02	Ci/d	7.55E-09	3.13E+10	1.76E-13		
30	243Am	243	2.33E+08	1.51E-01		241Am	9.67E+02	Ci/d	2.61E-08	3.70E+10	4.08E-12		
31	59Ni	59	1.34E+10	8.68E+00		63Ni	5.99E+01	Ci/d	1.67E-07	3.57E+08	2.43E-08		
32	79Se	79	7.42E+08	4.82E-01		F-	3.65E+00	g/sec	8.77E-08	4.16E+07	1.16E-08		
33	90Y	90	2.19E+14	1.42E+05		90Sr	1.10E+05	Ci/d	5.66E-05	1.95E+09	7.27E-05		
34	93Zr	93	3.22E+10	2.09E+01		Zr+4	1.92E+00	g/sec	1.31E-07	1.47E+07	1.42E-06		
35	93mNb	93	2.90E+10	1.88E+01		Zr+4	1.92E+00	g/sec	1.31E-07	1.47E+07	1.28E-06		
36	242Cm	242	9.55E+08	6.19E-01		243Cm	3.22E+01	Ci/d	6.99E-11	4.60E+11	1.34E-12		

CALCULATION SHEET

BY: E. Berrios
DATE: 03/13/03

PROJECT: WTP
JOB NO.: 24590
CALC NO.: 24590-WTP-M4C-FRP-00003
SHEET REV: A
SHEET NO.: 62

SUBJECT: Integrated Baseline Emissions Report Non-SSFM Represented Constituents Emissions Rate Estimation

	A	B	C	D	E	F	G	H	I	J	K	L	M
1	**Table B-8 HMP06 Calculation**												
2			Total feed			Representatives			HMP06	Unabated HLW OFFGAS			
3	Non-Rep Const	MW	mol/hr	lb/d			Feed Rate		Rate	PF	Non-Rep Const (g/sec)		
4	Be	9.0	5.15E+01	2.45E+01		Zr+4	3.65E+02	lb/d	1.19E+00	3.07E+02	4.19E-04		
5	CN	26.0	4.39E+02	6.03E+02		PO4-3	2.20E+03	lb/d	9.95E+00	2.21E+02	1.43E-02		
6	Co	58.9	5.45E+01	1.70E+02		60Co	1.09E+02	Ci/d	5.39E-01	2.02E+02	4.42E-03		
7	Mo	95.9	4.83E+01	2.45E+02		Bi+3	7.94E+01	lb/d	6.81E-01	1.17E+02	1.10E-02		
8	Rh	102.9	9.02E+00	4.90E+01		Zr+4	3.65E+02	lb/d	1.19E+00	3.07E+02	8.39E-04		
9	Sb	121.7	4.92E+01	3.16E+02		125Sb	4.19E+02	Ci/d	3.54E+00	1.19E+02	1.40E-02		
10	Se	78.9	4.70E+01	1.96E+02		F-	6.93E+02	lb/d	2.61E+01	2.66E+01	3.87E-02		
11	Sn	118.7	3.11E-01	1.95E+00		126Sn	2.18E+00	Ci/d	8.34E-03	2.61E+02	3.92E-05		
12	Ta	180.9	1.18E+00	1.13E+01		Zr+4	3.65E+02	lb/d	1.19E+00	3.07E+02	1.94E-04		
13	Tl	204.3	1.57E+01	1.70E+02		F-	6.93E+02	lb/d	2.61E+01	2.66E+01	3.36E-02		
14	U	238.0	4.20E+02	5.27E+03		234U	5.80E-02	Ci/d	1.87E-04	3.11E+02	8.93E-02		
15	V	50.9	4.48E+00	1.21E+01		Bi+3	7.94E+01	lb/d	6.81E-01	1.17E+02	5.43E-04		
16	W	183.8	9.31E+00	9.03E+01		Zr+4	3.65E+02	lb/d	1.19E+00	3.07E+02	1.55E-03		
17	Y	88.9	1.28E+01	6.03E+01		90Sr	1.10E+05	Ci/d	1.09E+03	1.02E+02	3.12E-03		
18			Bq/hr	Ci/d									
19	106Ru	106	2.57E+10	1.67E+01		F-	6.93E+02	lb/d	2.61E+01	2.66E+01	6.29E-01		
20	113mCd	113	8.01E+10	5.20E+01		Cd+2	2.47E+02	lb/d	1.32E+01	1.87E+01	2.79E+00		
21	134Cs	134	1.86E+10	1.20E+01		137Cs	9.26E+04	Ci/d	3.19E+03	2.90E+01	4.15E-01		
22	137mBa	137	1.93E+13	1.25E+04		137Cs	9.26E+04	Ci/d	3.19E+03	2.90E+01	4.32E+02		
23	226Ra	226	8.96E+05	5.81E-04		Zr+4	3.65E+02	lb/d	1.19E+00	3.07E+02	1.89E-06		
24	227Ac	227	4.53E+09	2.94E+00		Zr+4	3.65E+02	lb/d	1.19E+00	3.07E+02	9.56E-03		
25	228Ra	228	9.37E+08	6.08E-01		Zr+4	3.65E+02	lb/d	1.19E+00	3.07E+02	1.98E-03		
26	229Th	229	3.91E+07	2.53E-02		232Th	1.05E-02	Ci/d	4.32E-05	2.44E+02	1.04E-04		
27	231Pa	231	9.96E+09	6.46E+00		Zr+4	3.65E+02	lb/d	1.19E+00	3.07E+02	2.10E-02		
28	232U	232	8.01E+08	5.20E-01		233U	4.90E-02	Ci/d	6.64E-05	7.38E+02	7.04E-04		
29	242Pu	242	8.48E+06	5.50E-03		241Pu	2.36E+02	Ci/d	1.19E+00	1.99E+02	2.76E-05		
30	243Am	243	2.33E+08	1.51E-01		241Am	9.67E+02	Ci/d	4.85E+00	1.99E+02	7.58E-04		
31	59Ni	59	1.34E+10	8.68E+00		63Ni	5.99E+01	Ci/d	5.86E-01	1.02E+02	8.50E-02		
32	79Se	79	7.42E+08	4.82E-01		F-	6.93E+02	lb/d	2.61E+01	2.66E+01	1.81E-02		
33	90Y	90	2.19E+14	1.42E+05		90Sr	1.10E+05	Ci/d	1.09E+03	1.02E+02	1.40E+03		
34	93Zr	93	3.22E+10	2.09E+01		Zr+4	3.65E+02	lb/d	1.19E+00	3.07E+02	6.80E-02		
35	93mNb	93	2.90E+10	1.88E+01		Zr+4	3.65E+02	lb/d	1.19E+00	3.07E+02	6.12E-02		
36	242Cm	242	9.55E+08	6.19E-01		243Cm	3.22E+01	Ci/d	1.62E-01	1.99E+02	3.11E-03		

CALCULATION SHEET

BY: E. Berrios
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PROJECT: WTP
JOB NO.: 24590
CALC NO.: 24590-WTP-M4C-FRP-00003
SHEET REV: A
SHEET NO.: 63

SUBJECT: Integrated Baseline Emissions Report Non-SSFM Represented Constituents Emissions Rate Estimation

	A	B	C	D	E	F	G	H	I	J	K	L	M
1	**Table B-9 HOP10 Calculation**												
2			Total feed			Representatives			HOP10	Unabated HLW VV			
3	Non-Rep Const	MW	mol/hr	lb/d			Feed Rate		Rate	PF	Non-Rep Const (g/sec)		
4	Be	9.0	5.15E+01	2.45E+01		Zr+4	3.65E+02	lb/d	1.62E-05	2.26E+07	5.70E-09		
5	CN	26.0	4.39E+02	6.03E+02		PO4-3	2.20E+03	lb/d	4.77E-06	4.61E+08	6.87E-09		
6	Co	58.9	5.45E+01	1.70E+02		60Co	1.09E+02	Ci/d	6.69E-06	1.63E+07	5.49E-08		
7	Mo	95.9	4.83E+01	2.45E+02		Bi+3	7.94E+01	lb/d	7.62E-06	1.04E+07	1.24E-07		
8	Rh	102.9	9.02E+00	4.90E+01		Zr+4	3.65E+02	lb/d	1.62E-05	2.26E+07	1.14E-08		
9	Sb	121.7	4.92E+01	3.16E+02		125Sb	4.19E+02	Ci/d	3.96E-05	1.06E+07	1.57E-07		
10	Se	78.9	4.70E+01	1.96E+02		F-	6.93E+02	lb/d	3.82E-04	1.81E+06	5.68E-07		
11	Sn	118.7	3.11E-01	1.95E+00		126Sn	2.18E+00	Ci/d	1.03E-07	2.11E+07	4.86E-10		
12	Ta	180.9	1.18E+00	1.13E+01		Zr+4	3.65E+02	lb/d	1.62E-05	2.26E+07	2.64E-09		
13	Tl	204.3	1.57E+01	1.70E+02		F-	6.93E+02	lb/d	3.82E-04	1.81E+06	4.92E-07		
14	U	238.0	4.20E+02	5.27E+03		234U	5.80E-02	Ci/d	2.31E-09	2.51E+07	1.11E-06		
15	V	50.9	4.48E+00	1.21E+01		Bi+3	7.94E+01	lb/d	7.62E-06	1.04E+07	6.09E-09		
16	W	183.8	9.31E+00	9.03E+01		Zr+4	3.65E+02	lb/d	1.62E-05	2.26E+07	2.11E-08		
17	Y	88.9	1.28E+01	6.03E+01		90Sr	1.10E+05	Ci/d	1.22E-02	9.07E+06	3.50E-08		
18			Bq/hr	Ci/d									
19	106Ru	106	2.57E+10	1.67E+01		F-	6.93E+02	lb/d	3.82E-04	1.81E+06	9.21E-06		
20	113mCd	113	8.01E+10	5.20E+01		Cd+2	2.47E+02	lb/d	1.34E-04	1.84E+06	2.82E-05		
21	134Cs	134	1.86E+10	1.20E+01		137Cs	9.26E+04	Ci/d	3.31E-02	2.80E+06	4.30E-06		
22	137mBa	137	1.93E+13	1.25E+04		137Cs	9.26E+04	Ci/d	3.31E-02	2.80E+06	4.48E-03		
23	226Ra	226	8.96E+05	5.81E-04		Zr+4	3.65E+02	lb/d	1.62E-05	2.26E+07	2.57E-11		
24	227Ac	227	4.53E+09	2.94E+00		Zr+4	3.65E+02	lb/d	1.62E-05	2.26E+07	1.30E-07		
25	228Ra	228	9.37E+08	6.08E-01		Zr+4	3.65E+02	lb/d	1.62E-05	2.26E+07	2.69E-08		
26	229Th	229	3.91E+07	2.53E-02		232Th	1.05E-02	Ci/d	5.36E-10	1.97E+07	1.29E-09		
27	231Pa	231	9.96E+09	6.46E+00		Zr+4	3.65E+02	lb/d	1.62E-05	2.26E+07	2.86E-07		
28	232U	232	8.01E+08	5.20E-01		233U	4.90E-02	Ci/d	8.24E-10	5.95E+07	8.74E-09		
29	242Pu	242	8.48E+06	5.50E-03		241Pu	2.36E+02	Ci/d	1.47E-05	1.61E+07	3.42E-10		
30	243Am	243	2.33E+08	1.51E-01		241Am	9.67E+02	Ci/d	6.02E-05	1.61E+07	9.39E-09		
31	59Ni	59	1.34E+10	8.68E+00		63Ni	5.99E+01	Ci/d	6.49E-06	9.22E+06	9.41E-07		
32	79Se	79	7.42E+08	4.82E-01		F-	6.93E+02	lb/d	3.82E-04	1.81E+06	2.66E-07		
33	90Y	90	2.19E+14	1.42E+05		90Sr	1.10E+05	Ci/d	1.22E-02	9.07E+06	1.56E-02		
34	93Zr	93	3.22E+10	2.09E+01		Zr+4	3.65E+02	lb/d	1.62E-05	2.26E+07	9.24E-07		
35	93mNb	93	2.90E+10	1.88E+01		Zr+4	3.65E+02	lb/d	1.62E-05	2.26E+07	8.33E-07		
36	242Cm	242	9.55E+08	6.19E-01		243Cm	3.22E+01	Ci/d	2.00E-06	1.61E+07	3.86E-08		

CALCULATION SHEET

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PROJECT: WTP
JOB NO.: 24590
CALC NO.: 24590-WTP-M4C-FRP-00003
SHEET REV: A
SHEET NO.: 64

SUBJECT: Integrated Baseline Emissions Report Non-SSFM Represented Constituents Emissions Rate Estimation

	A	B	C	D	E	F	G	H	I	J	K	L	M
1	**Table B-10 PJV32 Calculation**												
2			Total feed			Representatives			PJV32	Unabated HLW RFD/PJM			
3	Non-Rep Const	MW	mol/hr	lb/d			Feed Rate		Rate	PF	Non-Rep Const (g/sec)		
4	Be	9.0	5.15E+01	2.45E+01		Zr+4	3.65E+02	lb/d	3.71E-08	9.83E+09	1.31E-11		
5	CN	26.0	4.39E+02	6.03E+02		PO4-3	2.20E+03	lb/d	3.98E-08	5.54E+10	5.73E-11		
6	Co	58.9	5.45E+01	1.70E+02		60Co	1.09E+02	Ci/d	1.15E-08	9.48E+09	9.41E-11		
7	Mo	95.9	4.83E+01	2.45E+02		Bi+3	7.94E+01	lb/d	7.67E-09	1.04E+10	1.24E-10		
8	Rh	102.9	9.02E+00	4.90E+01		Zr+4	3.65E+02	lb/d	3.71E-08	9.83E+09	2.62E-11		
9	Sb	121.7	4.92E+01	3.16E+02		125Sb	4.19E+02	Ci/d	3.98E-08	1.05E+10	1.58E-10		
10	Se	78.9	4.70E+01	1.96E+02		F-	6.93E+02	lb/d	6.32E-08	1.10E+10	9.37E-11		
11	Sn	118.7	3.11E-01	1.95E+00		126Sn	2.18E+00	Ci/d	1.77E-10	1.23E+10	8.33E-13		
12	Ta	180.9	1.18E+00	1.13E+01		Zr+4	3.65E+02	lb/d	3.71E-08	9.83E+09	6.05E-12		
13	Tl	204.3	1.57E+01	1.70E+02		F-	6.93E+02	lb/d	6.32E-08	1.10E+10	8.13E-11		
14	U	238.0	4.20E+02	5.27E+03		234U	5.80E-02	Ci/d	3.96E-12	1.46E+10	1.90E-09		
15	V	50.9	4.48E+00	1.21E+01		Bi+3	7.94E+01	lb/d	7.67E-09	1.04E+10	6.12E-12		
16	W	183.8	9.31E+00	9.03E+01		Zr+4	3.65E+02	lb/d	3.71E-08	9.83E+09	4.83E-11		
17	Y	88.9	1.28E+01	6.03E+01		90Sr	1.10E+05	Ci/d	1.22E-05	9.05E+09	3.51E-11		
18			Bq/hr	Ci/d									
19	106Ru	106	2.57E+10	1.67E+01		F-	6.93E+02	lb/d	6.32E-08	1.10E+10	1.52E-09		
20	113mCd	113	8.01E+10	5.20E+01		Cd+2	2.47E+02	lb/d	3.03E-08	8.15E+09	6.37E-09		
21	134Cs	134	1.86E+10	1.20E+01		137Cs	9.26E+04	Ci/d	1.36E-05	6.80E+09	1.77E-09		
22	137mBa	137	1.93E+13	1.25E+04		137Cs	9.26E+04	Ci/d	1.36E-05	6.80E+09	1.84E-06		
23	226Ra	226	8.96E+05	5.81E-04		Zr+4	3.65E+02	lb/d	3.71E-08	9.83E+09	5.91E-14		
24	227Ac	227	4.53E+09	2.94E+00		Zr+4	3.65E+02	lb/d	3.71E-08	9.83E+09	2.99E-10		
25	228Ra	228	9.37E+08	6.08E-01		Zr+4	3.65E+02	lb/d	3.71E-08	9.83E+09	6.18E-11		
26	229Th	229	3.91E+07	2.53E-02		232Th	1.05E-02	Ci/d	9.18E-13	1.15E+10	2.21E-12		
27	231Pa	231	9.96E+09	6.46E+00		Zr+4	3.65E+02	lb/d	3.71E-08	9.83E+09	6.57E-10		
28	232U	232	8.01E+08	5.20E-01		233U	4.90E-02	Ci/d	1.41E-12	3.48E+10	1.50E-11		
29	242Pu	242	8.48E+06	5.50E-03		241Pu	2.36E+02	Ci/d	2.52E-08	9.39E+09	5.86E-13		
30	243Am	243	2.33E+08	1.51E-01		241Am	9.67E+02	Ci/d	1.03E-07	9.39E+09	1.61E-11		
31	59Ni	59	1.34E+10	8.68E+00		63Ni	5.99E+01	Ci/d	5.95E-09	1.01E+10	8.62E-10		
32	79Se	79	7.42E+08	4.82E-01		F-	6.93E+02	lb/d	6.32E-08	1.10E+10	4.39E-11		
33	90Y	90	2.19E+14	1.42E+05		90Sr	1.10E+05	Ci/d	1.22E-05	9.05E+09	1.57E-05		
34	93Zr	93	3.22E+10	2.09E+01		Zr+4	3.65E+02	lb/d	3.71E-08	9.83E+09	2.12E-09		
35	93mNb	93	2.90E+10	1.88E+01		Zr+4	3.65E+02	lb/d	3.71E-08	9.83E+09	1.91E-09		
36	242Cm	242	9.55E+08	6.19E-01		243Cm	3.22E+01	Ci/d	3.43E-09	9.38E+09	6.60E-11		

CALCULATION SHEET

BY: E. Berrios
DATE: 03/13/03

PROJECT: WTP
JOB NO.: 24590
CALC NO.: 24590-WTP-M4C-FRP-00003
SHEET REV: A
SHEET NO.: 65

SUBJECT: Integrated Baseline Emissions Report Non-SSFM Represented Constituents Emissions Rate Estimation

	A	B	C	D	E	F	G	H	I	J	K	L	M
1	**Table B-11 PVP12 Calculation**												
2			Total feed			Representatives			PVP12	Abated PT- VV			
3	Non-Rep Const	MW	mol/hr	lb/d			Feed Rate		Rate	PF	Non-Rep Const (g/sec)		
4	Be	9.0	5.15E+01	2.45E+01		Zr+4	3.65E+02	lb/d	1.60E-11	2.29E+13	5.63E-15		
5	CN	26.0	4.39E+02	6.03E+02		PO4-3	2.20E+03	lb/d	2.05E-10	1.07E+13	2.96E-13		
6	Co	58.9	5.45E+01	1.70E+02		60Co	1.09E+02	Ci/d	4.21E-12	2.58E+13	3.46E-14		
7	Mo	95.9	4.83E+01	2.45E+02		Bi+3	7.94E+01	lb/d	2.69E-12	2.95E+13	4.37E-14		
8	Rh	102.9	9.02E+00	4.90E+01		Zr+4	3.65E+02	lb/d	1.60E-11	2.29E+13	1.13E-14		
9	Sb	121.7	4.92E+01	3.16E+02		125Sb	4.19E+02	Ci/d	1.45E-11	2.89E+13	5.76E-14		
10	Se	78.9	4.70E+01	1.96E+02		F-	6.93E+02	lb/d	5.02E-11	1.38E+13	7.45E-14		
11	Sn	118.7	3.11E-01	1.95E+00		126Sn	2.18E+00	Ci/d	8.32E-14	2.62E+13	3.91E-16		
12	Ta	180.9	1.18E+00	1.13E+01		Zr+4	3.65E+02	lb/d	1.60E-11	2.29E+13	2.60E-15		
13	Tl	204.3	1.57E+01	1.70E+02		F-	6.93E+02	lb/d	5.02E-11	1.38E+13	6.46E-14		
14	U	238.0	4.20E+02	5.27E+03		234U	5.80E-02	Ci/d	3.83E-15	1.51E+13	1.83E-12		
15	V	50.9	4.48E+00	1.21E+01		Bi+3	7.94E+01	lb/d	2.69E-12	2.95E+13	2.15E-15		
16	W	183.8	9.31E+00	9.03E+01		Zr+4	3.65E+02	lb/d	1.60E-11	2.29E+13	2.08E-14		
17	Y	88.9	1.28E+01	6.03E+01		90Sr	1.10E+05	Ci/d	3.06E-09	3.61E+13	8.78E-15		
18			Bq/hr	Ci/d									
19	106Ru	106	2.57E+10	1.67E+01		F-	6.93E+02	lb/d	5.02E-11	1.38E+13	1.21E-12		
20	113mCd	113	8.01E+10	5.20E+01		Cd+2	2.47E+02	lb/d	1.35E-11	1.83E+13	2.85E-12		
21	134Cs	134	1.86E+10	1.20E+01		137Cs	9.26E+04	Ci/d	4.51E-09	2.05E+13	5.86E-13		
22	137mBa	137	1.93E+13	1.25E+04		137Cs	9.26E+04	Ci/d	4.51E-09	2.05E+13	6.10E-10		
23	226Ra	226	8.96E+05	5.81E-04		Zr+4	3.65E+02	lb/d	1.60E-11	2.29E+13	2.54E-17		
24	227Ac	227	4.53E+09	2.94E+00		Zr+4	3.65E+02	lb/d	1.60E-11	2.29E+13	1.28E-13		
25	228Ra	228	9.37E+08	6.08E-01		Zr+4	3.65E+02	lb/d	1.60E-11	2.29E+13	2.66E-14		
26	229Th	229	3.91E+07	2.53E-02		232Th	1.05E-02	Ci/d	5.29E-16	1.99E+13	1.27E-15		
27	231Pa	231	9.96E+09	6.46E+00		Zr+4	3.65E+02	lb/d	1.60E-11	2.29E+13	2.82E-13		
28	232U	232	8.01E+08	5.20E-01		233U	4.90E-02	Ci/d	4.67E-15	1.05E+13	4.95E-14		
29	242Pu	242	8.48E+06	5.50E-03		241Pu	2.36E+02	Ci/d	6.24E-12	3.79E+13	1.45E-16		
30	243Am	243	2.33E+08	1.51E-01		241Am	9.67E+02	Ci/d	2.55E-11	3.79E+13	3.98E-15		
31	59Ni	59	1.34E+10	8.68E+00		63Ni	5.99E+01	Ci/d	2.02E-12	2.96E+13	2.93E-13		
32	79Se	79	7.42E+08	4.82E-01		F-	6.93E+02	lb/d	5.02E-11	1.38E+13	3.49E-14		
33	90Y	90	2.19E+14	1.42E+05		90Sr	1.10E+05	Ci/d	3.06E-09	3.61E+13	3.93E-09		
34	93Zr	93	3.22E+10	2.09E+01		Zr+4	3.65E+02	lb/d	1.60E-11	2.29E+13	9.12E-13		
35	93mNb	93	2.90E+10	1.88E+01		Zr+4	3.65E+02	lb/d	1.60E-11	2.29E+13	8.22E-13		
36	242Cm	242	9.55E+08	6.19E-01		243Cm	3.22E+01	Ci/d	1.22E-12	2.64E+13	2.34E-14		

CALCULATION SHEET

BY: E. Berrios
DATE: 03/13/03

PROJECT: WTP
JOB NO.: 24590
CALC NO.: 24590-WTP-M4C-FRP-00003
SHEET REV: A
SHEET NO.: 66

SUBJECT: Integrated Baseline Emissions Report Non-SSFM Represented Constituents Emissions Rate Estimation

	A	B	C	D	E	F	G	H	I	J	K	L	M
1	**Table B-12 PJV11 Calculation**												
2			Total feed			Representatives			PJV11	Abated PT- PJM/RFD			
3	Non-Rep Const	MW	mol/hr	lb/d			Feed Rate		Rate	PF	Non-Rep Const (g/sec)		
4	Be	9.0	5.15E+01	2.45E+01		Zr+4	3.65E+02	lb/d	2.25E-08	1.62E+10	7.93E-12		
5	CN	26.0	4.39E+02	6.03E+02		PO4-3	2.20E+03	lb/d	1.97E-07	1.12E+10	2.83E-10		
6	Co	58.9	5.45E+01	1.70E+02		60Co	1.09E+02	Ci/d	6.60E-09	1.65E+10	5.42E-11		
7	Mo	95.9	4.83E+01	2.45E+02		Bi+3	7.94E+01	lb/d	5.24E-09	1.51E+10	8.50E-11		
8	Rh	102.9	9.02E+00	4.90E+01		Zr+4	3.65E+02	lb/d	2.25E-08	1.62E+10	1.59E-11		
9	Sb	121.7	4.92E+01	3.16E+02		125Sb	4.19E+02	Ci/d	2.79E-08	1.50E+10	1.11E-10		
10	Se	78.9	4.70E+01	1.96E+02		F-	6.93E+02	lb/d	6.82E-08	1.02E+10	1.01E-10		
11	Sn	118.7	3.11E-01	1.95E+00		126Sn	2.18E+00	Ci/d	1.50E-10	1.45E+10	7.06E-13		
12	Ta	180.9	1.18E+00	1.13E+01		Zr+4	3.65E+02	lb/d	2.25E-08	1.62E+10	3.66E-12		
13	Tl	204.3	1.57E+01	1.70E+02		F-	6.93E+02	lb/d	6.82E-08	1.02E+10	8.79E-11		
14	U	238.0	4.20E+02	5.27E+03		234U	5.80E-02	Ci/d	4.24E-12	1.37E+10	2.03E-09		
15	V	50.9	4.48E+00	1.21E+01		Bi+3	7.94E+01	lb/d	5.24E-09	1.51E+10	4.19E-12		
16	W	183.8	9.31E+00	9.03E+01		Zr+4	3.65E+02	lb/d	2.25E-08	1.62E+10	2.93E-11		
17	Y	88.9	1.28E+01	6.03E+01		90Sr	1.10E+05	Ci/d	6.80E-06	1.62E+10	1.95E-11		
18			Bq/hr	Ci/d									
19	106Ru	106	2.57E+10	1.67E+01		F-	6.93E+02	lb/d	6.82E-08	1.02E+10	1.64E-09		
20	113mCd	113	8.01E+10	5.20E+01		Cd+2	2.47E+02	lb/d	2.06E-08	1.20E+10	4.34E-09		
21	134Cs	134	1.86E+10	1.20E+01		137Cs	9.26E+04	Ci/d	7.58E-06	1.22E+10	9.86E-10		
22	137mBa	137	1.93E+13	1.25E+04		137Cs	9.26E+04	Ci/d	7.58E-06	1.22E+10	1.03E-06		
23	226Ra	226	8.96E+05	5.81E-04		Zr+4	3.65E+02	lb/d	2.25E-08	1.62E+10	3.58E-14		
24	227Ac	227	4.53E+09	2.94E+00		Zr+4	3.65E+02	lb/d	2.25E-08	1.62E+10	1.81E-10		
25	228Ra	228	9.37E+08	6.08E-01		Zr+4	3.65E+02	lb/d	2.25E-08	1.62E+10	3.74E-11		
26	229Th	229	3.91E+07	2.53E-02		232Th	1.05E-02	Ci/d	7.05E-13	1.50E+10	1.69E-12		
27	231Pa	231	9.96E+09	6.46E+00		Zr+4	3.65E+02	lb/d	2.25E-08	1.62E+10	3.98E-10		
28	232U	232	8.01E+08	5.20E-01		233U	4.90E-02	Ci/d	4.23E-12	1.16E+10	4.49E-11		
29	242Pu	242	8.48E+06	5.50E-03		241Pu	2.36E+02	Ci/d	1.43E-08	1.66E+10	3.32E-13		
30	243Am	243	2.33E+08	1.51E-01		241Am	9.67E+02	Ci/d	5.84E-08	1.66E+10	9.12E-12		
31	59Ni	59	1.34E+10	8.68E+00		63Ni	5.99E+01	Ci/d	3.93E-09	1.52E+10	5.70E-10		
32	79Se	79	7.42E+08	4.82E-01		F-	6.93E+02	lb/d	6.82E-08	1.02E+10	4.74E-11		
33	90Y	90	2.19E+14	1.42E+05		90Sr	1.10E+05	Ci/d	6.80E-06	1.62E+10	8.74E-06		
34	93Zr	93	3.22E+10	2.09E+01		Zr+4	3.65E+02	lb/d	2.25E-08	1.62E+10	1.28E-09		
35	93mNb	93	2.90E+10	1.88E+01		Zr+4	3.65E+02	lb/d	2.25E-08	1.62E+10	1.16E-09		
36	242Cm	242	9.55E+08	6.19E-01		243Cm	3.22E+01	Ci/d	1.94E-09	1.66E+10	3.74E-11		

BY: E. Berrios
DATE: 03/13/03

CALCULATION SHEET

PROJECT: WTP
JOB NO.: 24590
CALC NO.: 24590-WTP-M4C-FRP-00003
SHEET REV: A
SHEET NO.: 67

SUBJECT: Integrated Baseline Emissions Report Non-SSFM Represented Constituents Emissions Rate Estimation

	A	B	C	D	E	F	G	H	I	J	K	L	M
1	**Table B-13 LVP26 Calculation**												
2			Total feed			Representatives			LVP26	Abated LAW OFFGAS			
3	Non-Rep Const	MW	mol/hr	lb/d			Feed Rate		Rate	PF	Non-Rep Const (g/sec)		
4	Be	9.0	5.15E+01	2.45E+01		Zr+4	3.65E+02	lb/d	1.37E-07	2.67E+09	4.82E-11		
5	CN	26.0	4.39E+02	6.03E+02		PO4-3	2.20E+03	lb/d	1.80E-10	1.23E+13	2.58E-13		
6	Co	58.9	5.45E+01	1.70E+02		60Co	1.09E+02	Ci/d	5.07E-10	2.14E+11	4.16E-12		
7	Mo	95.9	4.83E+01	2.45E+02		Bi+3	7.94E+01	lb/d	7.74E-09	1.03E+10	1.26E-10		
8	Rh	102.9	9.02E+00	4.90E+01		Zr+4	3.65E+02	lb/d	1.37E-07	2.67E+09	9.64E-11		
9	Sb	121.7	4.92E+01	3.16E+02		125Sb	4.19E+02	Ci/d	8.56E-08	4.90E+09	3.40E-10		
10	Se	78.9	4.70E+01	1.96E+02		F-	6.93E+02	lb/d	2.06E-06	3.37E+08	3.05E-09		
11	Sn	118.7	3.11E-01	1.95E+00		126Sn	2.18E+00	Ci/d	3.26E-11	6.69E+10	1.53E-13		
12	Ta	180.9	1.18E+00	1.13E+01		Zr+4	3.65E+02	lb/d	1.37E-07	2.67E+09	2.23E-11		
13	Tl	204.3	1.57E+01	1.70E+02		F-	6.93E+02	lb/d	2.06E-06	3.37E+08	2.65E-09		
14	U	238.0	4.20E+02	5.27E+03		234U	5.80E-02	Ci/d	1.30E-12	4.45E+10	6.24E-10		
15	V	50.9	4.48E+00	1.21E+01		Bi+3	7.94E+01	lb/d	7.74E-09	1.03E+10	6.18E-12		
16	W	183.8	9.31E+00	9.03E+01		Zr+4	3.65E+02	lb/d	1.37E-07	2.67E+09	1.78E-10		
17	Y	88.9	1.28E+01	6.03E+01		90Sr	1.10E+05	Ci/d	3.52E-07	3.13E+11	1.01E-12		
18			Bq/hr	Ci/d									
19	106Ru	106	2.57E+10	1.67E+01		F-	6.93E+02	lb/d	2.06E-06	3.37E+08	4.96E-08		
20	113mCd	113	8.01E+10	5.20E+01		Cd+2	2.47E+02	lb/d	5.52E-07	4.47E+08	1.16E-07		
21	134Cs	134	1.86E+10	1.20E+01		137Cs	9.26E+04	Ci/d	3.22E-08	2.88E+12	4.19E-12		
22	137mBa	137	1.93E+13	1.25E+04		137Cs	9.26E+04	Ci/d	3.22E-08	2.88E+12	4.36E-09		
23	226Ra	226	8.96E+05	5.81E-04		Zr+4	3.65E+02	lb/d	1.37E-07	2.67E+09	2.17E-13		
24	227Ac	227	4.53E+09	2.94E+00		Zr+4	3.65E+02	lb/d	1.37E-07	2.67E+09	1.10E-09		
25	228Ra	228	9.37E+08	6.08E-01		Zr+4	3.65E+02	lb/d	1.37E-07	2.67E+09	2.27E-10		
26	229Th	229	3.91E+07	2.53E-02		232Th	1.05E-02	Ci/d	1.21E-13	8.73E+10	2.90E-13		
27	231Pa	231	9.96E+09	6.46E+00		Zr+4	3.65E+02	lb/d	1.37E-07	2.67E+09	2.42E-09		
28	232U	232	8.01E+08	5.20E-01		233U	4.90E-02	Ci/d	2.24E-12	2.19E+10	2.38E-11		
29	242Pu	242	8.48E+06	5.50E-03		241Pu	2.36E+02	Ci/d	2.36E-11	1.00E+13	5.49E-16		
30	243Am	243	2.33E+08	1.51E-01		241Am	9.67E+02	Ci/d	8.16E-11	1.19E+13	1.27E-14		
31	59Ni	59	1.34E+10	8.68E+00		63Ni	5.99E+01	Ci/d	3.96E-09	1.51E+10	5.74E-10		
32	79Se	79	7.42E+08	4.82E-01		F-	6.93E+02	lb/d	2.06E-06	3.37E+08	1.43E-09		
33	90Y	90	2.19E+14	1.42E+05		90Sr	1.10E+05	Ci/d	3.52E-07	3.13E+11	4.52E-07		
34	93Zr	93	3.22E+10	2.09E+01		Zr+4	3.65E+02	lb/d	1.37E-07	2.67E+09	7.81E-09		
35	93mNb	93	2.90E+10	1.88E+01		Zr+4	3.65E+02	lb/d	1.37E-07	2.67E+09	7.03E-09		
36	242Cm	242	9.55E+08	6.19E-01		243Cm	3.22E+01	Ci/d	2.18E-13	1.47E+14	4.20E-15		

CALCULATION SHEET

BY: E. Berrios
DATE: 03/13/03

PROJECT: WTP
JOB NO.: 24590
CALC NO.: 24590-WTP-M4C-FRP-00003
SHEET REV: A
SHEET NO.: 68

SUBJECT: Integrated Baseline Emissions Report Non-SSFM Represented Constituents Emissions Rate Estimation

	A	B	C	D	E	F	G	H	I	J	K	L	M
1	**Table B-14 HOP33 Calculation**												
2			Total feed			Representatives			HOP33	Abated HLW OFFGAS			
3	Non-Rep Const	MW	mol/hr	lb/d			Feed Rate		Rate	PF	Non-Rep Const (g/sec)		
4	Be	9.0	5.15E+01	2.45E+01		Zr+4	3.65E+02	lb/d	2.21E-10	1.65E+12	7.80E-14		
5	CN	26.0	4.39E+02	6.03E+02		PO4-3	2.20E+03	lb/d	2.65E-13	8.31E+15	3.82E-16		
6	Co	58.9	5.45E+01	1.70E+02		60Co	1.09E+02	Ci/d	4.22E-10	2.58E+11	3.46E-12		
7	Mo	95.9	4.83E+01	2.45E+02		Bi+3	7.94E+01	lb/d	4.37E-10	1.82E+11	7.08E-12		
8	Rh	102.9	9.02E+00	4.90E+01		Zr+4	3.65E+02	lb/d	2.21E-10	1.65E+12	1.56E-13		
9	Sb	121.7	4.92E+01	3.16E+02		125Sb	4.19E+02	Ci/d	4.35E-09	9.65E+10	1.72E-11		
10	Se	78.9	4.70E+01	1.96E+02		F-	6.93E+02	lb/d	4.85E-12	1.43E+14	7.21E-15		
11	Sn	118.7	3.11E-01	1.95E+00		126Sn	2.18E+00	Ci/d	1.16E-12	1.87E+12	5.47E-15		
12	Ta	180.9	1.18E+00	1.13E+01		Zr+4	3.65E+02	lb/d	2.21E-10	1.65E+12	3.60E-14		
13	Tl	204.3	1.57E+01	1.70E+02		F-	6.93E+02	lb/d	4.85E-12	1.43E+14	6.25E-15		
14	U	238.0	4.20E+02	5.27E+03		234U	5.80E-02	Ci/d	2.61E-14	2.23E+12	1.25E-11		
15	V	50.9	4.48E+00	1.21E+01		Bi+3	7.94E+01	lb/d	4.37E-10	1.82E+11	3.49E-13		
16	W	183.8	9.31E+00	9.03E+01		Zr+4	3.65E+02	lb/d	2.21E-10	1.65E+12	2.88E-13		
17	Y	88.9	1.28E+01	6.03E+01		90Sr	1.10E+05	Ci/d	1.52E-07	7.28E+11	4.36E-13		
18			Bq/hr	Ci/d									
19	106Ru	106	2.57E+10	1.67E+01		F-	6.93E+02	lb/d	4.85E-12	1.43E+14	1.17E-13		
20	113mCd	113	8.01E+10	5.20E+01		Cd+2	2.47E+02	lb/d	4.70E-09	5.25E+10	9.91E-10		
21	134Cs	134	1.86E+10	1.20E+01		137Cs	9.26E+04	Ci/d	2.22E-06	4.17E+10	2.88E-10		
22	137mBa	137	1.93E+13	1.25E+04		137Cs	9.26E+04	Ci/d	2.22E-06	4.17E+10	3.00E-07		
23	226Ra	226	8.96E+05	5.81E-04		Zr+4	3.65E+02	lb/d	2.21E-10	1.65E+12	3.52E-16		
24	227Ac	227	4.53E+09	2.94E+00		Zr+4	3.65E+02	lb/d	2.21E-10	1.65E+12	1.78E-12		
25	228Ra	228	9.37E+08	6.08E-01		Zr+4	3.65E+02	lb/d	2.21E-10	1.65E+12	3.68E-13		
26	229Th	229	3.91E+07	2.53E-02		232Th	1.05E-02	Ci/d	6.04E-15	1.75E+12	1.45E-14		
27	231Pa	231	9.96E+09	6.46E+00		Zr+4	3.65E+02	lb/d	2.21E-10	1.65E+12	3.91E-12		
28	232U	232	8.01E+08	5.20E-01		233U	4.90E-02	Ci/d	9.27E-15	5.29E+12	9.83E-14		
29	242Pu	242	8.48E+06	5.50E-03		241Pu	2.36E+02	Ci/d	1.66E-10	1.43E+12	3.85E-15		
30	243Am	243	2.33E+08	1.51E-01		241Am	9.67E+02	Ci/d	6.77E-10	1.43E+12	1.06E-13		
31	59Ni	59	1.34E+10	8.68E+00		63Ni	5.99E+01	Ci/d	2.76E-10	2.17E+11	4.01E-11		
32	79Se	79	7.42E+08	4.82E-01		F-	6.93E+02	lb/d	4.85E-12	1.43E+14	3.37E-15		
33	90Y	90	2.19E+14	1.42E+05		90Sr	1.10E+05	Ci/d	1.52E-07	7.28E+11	1.95E-07		
34	93Zr	93	3.22E+10	2.09E+01		Zr+4	3.65E+02	lb/d	2.21E-10	1.65E+12	1.26E-11		
35	93mNb	93	2.90E+10	1.88E+01		Zr+4	3.65E+02	lb/d	2.21E-10	1.65E+12	1.14E-11		
36	242Cm	242	9.55E+08	6.19E-01		243Cm	3.22E+01	Ci/d	2.26E-11	1.43E+12	4.34E-13		

CALCULATION SHEET

BY: E. Berrios
DATE: 03/13/03

PROJECT: WTP
JOB NO.: 24590
CALC NO.: 24590-WTP-M4C-FRP-00003
SHEET REV: A
SHEET NO.: 69

SUBJECT: Integrated Baseline Emissions Report Non-SSFM Represented Constituents Emissions Rate Estimation

	A	B	C	D	E	F	G	H	I	J	K	L	M
1	**Table B-15 PJV34 Calculation**												
2			Total feed			Representatives			PJV34	Abated HLW PJM			
3	Non-Rep Const	MW	mol/hr	lb/d			Feed Rate		Rate	PF	Non-Rep Const (g/sec)		
4	Be	9.0	5.15E+01	2.45E+01		Zr+4	3.65E+02	lb/d	1.86E-13	1.97E+15	6.55E-17		
5	CN	26.0	4.39E+02	6.03E+02		PO4-3	2.20E+03	lb/d	1.99E-13	1.11E+16	2.86E-16		
6	Co	58.9	5.45E+01	1.70E+02		60Co	1.09E+02	Ci/d	5.73E-14	1.90E+15	4.70E-16		
7	Mo	95.9	4.83E+01	2.45E+02		Bi+3	7.94E+01	lb/d	3.83E-14	2.07E+15	6.21E-16		
8	Rh	102.9	9.02E+00	4.90E+01		Zr+4	3.65E+02	lb/d	1.86E-13	1.97E+15	1.31E-16		
9	Sb	121.7	4.92E+01	3.16E+02		125Sb	4.19E+02	Ci/d	1.99E-13	2.11E+15	7.89E-16		
10	Se	78.9	4.70E+01	1.96E+02		F-	6.93E+02	lb/d	3.16E-13	2.20E+15	4.69E-16		
11	Sn	118.7	3.11E-01	1.95E+00		126Sn	2.18E+00	Ci/d	8.85E-16	2.46E+15	4.16E-18		
12	Ta	180.9	1.18E+00	1.13E+01		Zr+4	3.65E+02	lb/d	1.86E-13	1.97E+15	3.03E-17		
13	Tl	204.3	1.57E+01	1.70E+02		F-	6.93E+02	lb/d	3.16E-13	2.20E+15	4.07E-16		
14	U	238.0	4.20E+02	5.27E+03		234U	5.80E-02	Ci/d	1.98E-17	2.93E+15	9.48E-15		
15	V	50.9	4.48E+00	1.21E+01		Bi+3	7.94E+01	lb/d	3.83E-14	2.07E+15	3.06E-17		
16	W	183.8	9.31E+00	9.03E+01		Zr+4	3.65E+02	lb/d	1.86E-13	1.97E+15	2.42E-16		
17	Y	88.9	1.28E+01	6.03E+01		90Sr	1.10E+05	Ci/d	6.10E-11	1.81E+15	1.75E-16		
18			Bq/hr	Ci/d									
19	106Ru	106	2.57E+10	1.67E+01		F-	6.93E+02	lb/d	3.16E-13	2.20E+15	7.61E-15		
20	113mCd	113	8.01E+10	5.20E+01		Cd+2	2.47E+02	lb/d	1.51E-13	1.63E+15	3.19E-14		
21	134Cs	134	1.86E+10	1.20E+01		137Cs	9.26E+04	Ci/d	6.81E-11	1.36E+15	8.86E-15		
22	137mBa	137	1.93E+13	1.25E+04		137Cs	9.26E+04	Ci/d	6.81E-11	1.36E+15	9.22E-12		
23	226Ra	226	8.96E+05	5.81E-04		Zr+4	3.65E+02	lb/d	1.86E-13	1.97E+15	2.95E-19		
24	227Ac	227	4.53E+09	2.94E+00		Zr+4	3.65E+02	lb/d	1.86E-13	1.97E+15	1.49E-15		
25	228Ra	228	9.37E+08	6.08E-01		Zr+4	3.65E+02	lb/d	1.86E-13	1.97E+15	3.09E-16		
26	229Th	229	3.91E+07	2.53E-02		232Th	1.05E-02	Ci/d	4.59E-18	2.30E+15	1.10E-17		
27	231Pa	231	9.96E+09	6.46E+00		Zr+4	3.65E+02	lb/d	1.86E-13	1.97E+15	3.28E-15		
28	232U	232	8.01E+08	5.20E-01		233U	4.90E-02	Ci/d	7.05E-18	6.95E+15	7.48E-17		
29	242Pu	242	8.48E+06	5.50E-03		241Pu	2.36E+02	Ci/d	1.26E-13	1.88E+15	2.93E-18		
30	243Am	243	2.33E+08	1.51E-01		241Am	9.67E+02	Ci/d	5.15E-13	1.88E+15	8.04E-17		
31	59Ni	59	1.34E+10	8.68E+00		63Ni	5.99E+01	Ci/d	2.97E-14	2.01E+15	4.31E-15		
32	79Se	79	7.42E+08	4.82E-01		F-	6.93E+02	lb/d	3.16E-13	2.20E+15	2.19E-16		
33	90Y	90	2.19E+14	1.42E+05		90Sr	1.10E+05	Ci/d	6.10E-11	1.81E+15	7.84E-11		
34	93Zr	93	3.22E+10	2.09E+01		Zr+4	3.65E+02	lb/d	1.86E-13	1.97E+15	1.06E-14		
35	93mNb	93	2.90E+10	1.88E+01		Zr+4	3.65E+02	lb/d	1.86E-13	1.97E+15	9.56E-15		
36	242Cm	242	9.55E+08	6.19E-01		243Cm	3.22E+01	Ci/d	1.72E-14	1.88E+15	3.30E-16		

D

Appendix D
Calculation: Updated Emissions Run Feed Vector

24590-WTP-M4C-FRP-00001, Rev 0A

Calculation Cover Sheet

ISSUED BY
BPP-WTP PDC
KLD 12-26-02
INIT DATE

RIVER PROTECTION PROJECT-WASTE TREATMENT PLANT				JOB NO.: 24590	
CALC NO. 24590-WTP-M4C-FRP-00001				GROUP Process Operations	
SUBJECT Updated Emissions Run Feed Vector					
CALCULATION STATUS DESIGNATION	☒ PRELIMINARY ☐ SUPERSEDED		☐ COMMITTED		☐ CONFIRMED ☐ VOIDED
COMPUTER PROGRAM/TYPE	N/A ☒	QAS ☐ YES ☐ NO	SCP ☐ YES ☐ NO	PROGRAM NAME	VERSION/RELEASE NO.

Notes/Comments

This calculation is a complete re-write of Revision 0 therefore no revision bars are used.

Calculations were performed on a Personal Computer using the software Excel 97 SR-2.

NO.	REASON FOR REVISION	TOTAL NO OF SHEETS	LAST SHEET NO.	BY	CHECKED	APPROVED/ ACCEPTED	DATE
0A	Update the feed vector	137	137	E. Berrios	T. Lix/J. Tadlock	O. Block	12-18-02
0	Initial Issue	43	43	E. Berrios	J. Reynolds	O. Block	04/01/02

RECORD OF REVISIONS

Contents

1 Objective 2
2 Inputs 2
2.1 Design Inputs 2
2.2 Criteria 7
3 Background 7
4 Applicable Codes and Standards 8
5 Methodology 8
5.1 LAW 8
5.2 HLW 8
6 Assumptions 9
7 Calculations 9
7.1 LAW 9
7.2 HLW 13
8 Results and Conclusions 16
9 References 19
10 Attachments 19
Appendix A LAW Calculations 20
Appendix B HLW Calculations 40
Appendix C LAW BBI Data 57
Appendix D HLW BBI Data 89

LIST OF TABLES

Table A-1 LAW Chemical Analytes Feed Quantities in Kg 21
Table A-2 LAW Chemical Analytes Feed Quantities in moles 23
Table A-3 LAW Radionuclide Feed Quantities in Curies 25
Table A-4 LAW Chemical Analytes Comparison with SOW Maximums 27
Table A-5 LAW Radionuclide Comparison with SOW Maximums 29
Table A-6 LAW Chemical Analytes Feed Charge Balance 30
Table A-7 LAW Radionuclide Feed Charge Balance 32
Table A-8 Adjustment of Chemical Analytes Positive Charges 34

Table A-9 Adjustment of Radionuclide Positive Charges 36
Table A-10 LAW Chemical Analytes Emissions Feed Quantities 38
Table A-11 LAW Radionuclide Emissions Feed Quantities 39
Table B-1 HLW Chemical Analytes Feed Quantities in kg 41
Table B-2 HLW Chemical Analytes Feed Quantities in moles 43
Table B-3 HLW Radionuclide Feed Quantities in Curies 45
Table B-4 HLW Waste Oxide Mass Calculation 47
Table B-5 Chemical Analytes Feed Quantity Comparison 49
Table B-6 Radionuclides Feed Quantity Comparison 51
Table B-7 HLW Chemical Analytes Charge Balance 52
Table B-8 HLW Radionuclides Charge Balance 54
Table B-9 HLW Chemical Analytes Emissions Feed 55
Table B-10 HLW Radionuclide Emissions Feed 56

1 Objective

The objective of this calculation is to update the Steady State Flowsheet Model (ACM) feed vector for the updated revision of the *Integrated Emissions Baseline Report for the River Protection Project Waste Treatment Plant* (Cook 2001).

2 Inputs

2.1 Design Inputs

Rev. 1 of the Emissions Report (Cook 2001) recommended that the highest concentration of the constituents be used in the feed vector in order to obtain a bounding emissions estimate for the Waste Treatment Plant (WTP). The feed vector used was based on several sources which included the Tank Farm Contractor Utilization Plan (TFCOUP), the Best Basis Inventory (BBI), and the Aspen model. It was decided by the Emissions Feed Vector Task team that only one source of information should be used to determine the feed vector. It was agreed that this source is the BBI data (CCN# 044663). It was also decided that tanks to be evaluated to derive the feed vector are those scheduled to be processed during Phase I as stated in the System Plan Run 1C document (Allen 2002). The tanks in scope are:

LAW
- AP-101 supernate
- AZ-101 supernate
- AZ-102 supernate
- AN-102 supernate
- AN-104 dissolved solids (salt cake) and supernate
- AN-107 supernate

- AN-105 dissolved solids (salt cake) and supernate
- SY-101 supernate
- AN-103 dissolved solids (salt cake) and supernate
- AW-101 dissolved solids (salt cake) and supernate
- AP-104 supernate

HLW

- AZ-101 solids
- AZ-102 solids
- AY-102 solids
- C-106 solids
- AY-101 solids
- C-104 solids
- SY-102 solids
- C-107 solids
- AW-104 solids (sludge portion only)

Inventory from each tank is located in the BBI website http://twins.pnl.gov:8001/data/datamenu.htm. The inventory is located under the subject area called Best Basis Inventory

Part of this calculation requires comparing BBI results to contract maximums. For the LAW feed, the following Statement of Work (SOW) maximums, based on the *WTP Statement of Work* (DE-AC27-01RV14136) Specification 7, Tables TS-7.1 and TS-7.2, were used:

LAW Contract Maximums

Chemical Analyte	**mol/mol Na**
Al	2.5E-01
Ba	1.0E-04
Ca	4.0E-02
Cd	4.0E-03
Cl	8.9E-02
Cr	2.0E-02
F	2.0E-01
Fe	1.0E-02
Hg	1.4E-05
K	1.8E-01
La	8.3E-05
Ni	3.0E-03
NO_2	3.8E-01
NO_3	8.0E-01
Pb	6.8E-04
PO_4	1.3E-01
SO_4	7.0E-02
TIC as CO_3	3.0E-01
TOC as oxalate	5.0E-01
U	1.2E-03
Radionuclide	**Bq/mol Na**

CALCULATION SHEET

PROJECT: RPP-WTP
JOB NO.: 24590
CALC NO.: 24590-WTP-M4C-FRP-00001
SHEET REV: 0A
SHEET NO.: 4

BY: E. Berrios
DATE: 12/04/02

SUBJECT: Updated Emissions Run Feed Vector

Chemical Analyte	mol/mol Na
TRU*	4.8E+05
^{137}Cs	2.0E+10
^{90}Sr	8.0E+08
^{99}Tc	7.1E+06
^{60}Co	3.7E+05
^{154}Eu	4.3E+06

* TRU is defined as alpha-emitting radionuclides with an atomic number greater than 92 with half-life greater than 10 years.

For the HLW feed, the SOW maximums are based on grams per 100 grams of non-volatile waste oxides. SOW maximums are available for various non-volatile elements, volatile components, and radionuclides. The HLW SOW maximums, per the *WTP Statement of Work* (DE-AC27-01RV14136) Specification 8, Tables TS-8.1, TS-8.2, TS-8.3, and TS-8.4 are:

HLW Non-Volatile Elements SOW Maximums

Non-Volatile Element	Maximum (grams / 100 grams waste oxides)	Non-Volatile Element	Maximum (grams / 100 grams waste oxides)
As	0.16	Zn	0.42
B	1.3	Ag	0.55
Be	0.065	Al	14
Ce	0.81	Ba	4.5
Co	0.45	Bi	2.8
Cs	0.58	Ca	7.1
Cu	0.48	Cd	4.5
Hg	0.1	Cr	0.68
La	2.6	F	3.5
Li	0.14	Fe	29
Mn	6.5	K	1.3
Mo	0.65	Mg	2.1
Nd	1.7	Na	19
Pr	0.35	Th	5.0
Pu	0.054	Ni	2.4
Rb	0.19	P	1.7
Sb	0.84	Pb	1.1
Se	0.52	Pd	0.13
Sr	0.52	Rh	0.13
Ta	0.03	Ru	0.35
Tc	0.26	S	0.65
Te	0.13	Si	19
Tl	0.45	Ti	1.3
V	0.032	U	14
W	0.24	Zr	15
Y	0.16		

CALCULATION SHEET

PROJECT: RPP-WTP
JOB NO.: 24590
CALC NO.: 24590-WTP-M4C-FRP-00001
SHEET REV: 0A
SHEET NO.: 5

BY: E. Berríos
DATE: 12/04/02

SUBJECT: Updated Emissions Run Feed Vector

HLW Volatile Components SOW Maximums

Volatile Components	Maximum (grams / 100 grams waste oxides)
Cl	0.33
CO_3^{-2}	30
NO_2	36 (total NO_2/NO_3) as NO_3
NO_3	
TOC	11
CN	1.6
NH_3	1.6

HLW Radionuclides SOW Maximums

Radionuclide	Maximum (Ci/100 grams waste oxide)	Radionuclide	Maximum (Ci/100 grams waste oxide)	Radionuclide	Maximum (Ci/100 grams waste oxide)
3H	6.5E-05	129I	2.9E-07	237Np	7.4E-05
14C	6.5E-06	137Cs	1.5E+00	238Pu	3.5E-04
60Co	1.0E-02	152Eu	4.8E-04	239Pu	3.1E-03
90Sr	1.0E+01	154Eu	5.2E-02	241Pu	2.2E-02
99Tc	1.5E-02	155Eu	2.9E-02	241Am	9.0E-02
125Sb	3.2E-02	233U	9.0E-07	243+244Cm	3.0E-03
126Sn	1.5E-04	235U	2.5E-07		

For the purposes of charge balancing the feed vector, the following element charges were used. Only the elements tracked on the Steady State Flowsheet Model were charged balanced. Charges are based on the CRC Handbook 71st Edition (CRC 1991).

Component Charges

Component	Charge	Component	Charge	Component	Charge
Ag	1	NO_2	-1	137Cs	1
Al	3	NO_3	-1	14C	4
As	5	OH	-1	151Sm	3
B	3	Oxalate	-2	152Eu	3
Ba	2	Pb	2	154Eu	3
Be	2	Pd	2	155Eu	3
Bi	3	PO_4	-3	232Th	4
Ca	2	Rb	1	233U	6
Cd	2	Rh	3	234U	6
Ce	3	Ru	4	235U	6
Cl	-1	Sb	3	236U	6
CN	-1	Se	4	237Np	4
CO_3	-2	Ta	5	238Pu	4
Co	3	Si	4	238U	6
Cr	3	SO_4	-2	239Pu	4
Cu	2	Sr	2	240Pu	4
F	-1	Te	4	241Pu	4
Fe	3	Th	4	241Am	3
Hg	2	Ti	4	243Cm	3

CALCULATION SHEET

PROJECT: RPP-WTP
JOB NO.: 24590
CALC NO.: 24590-WTP-M4C-FRP-00001
SHEET REV: 0A
SHEET NO.: 6

BY: E. Berrios
DATE: 12/04/02

SUBJECT: Updated Emissions Run Feed Vector

Component	Charge	Component	Charge	Component	Charge
K	1	Tl	5	244Cm	3
La	3	V	3	3H	1
Li	1	W	6	60Co	3
Mg	2	Y	3	63Ni	2
Mn	4	Zn	2	90Sr	2
Mo	6	Zr	4	99Tc	7
Na	1	125Sb	3		
Nd	3	126Sn	2		
Ni	2	129I	-1		

For the radionuclides, the activity per mole ratios used during charge balancing were based on the *Tank by Tank Feed Composition for Steady State Mass Balance* calculation (Capps 2002). Only the ratios for the radionuclides used during the charge balance process were used. The activity per mole ratios are:

Radionuclide	Ci/kmol	Radionuclide	Ci/kmol
125Sb	1.30E+08	237Np	1.67E+02
126Sn	1.43E+03	238Pu	4.08E+06
129I	2.28E+01	238U	8.00E-02
137Cs	1.19E+07	239Pu	1.48E+04
14C	6.26E+04	240Pu	5.45E+04
151Sm	3.97E+06	241Am	8.26E+05
152Eu	2.64E+07	241Pu	2.48E+07
154Eu	4.16E+07	243Cm	1.23E+07
155Eu	7.53E+07	244Cm	2.62E+07
232Th	2.55E-02	3H	2.90E+07
233U	2.25E+03	60Co	6.78E+07
234U	1.45E+03	63Ni	3.57E+06
235U	5.08E-01	90Sr	1.24E+07
236U	1.52E+01	99Tc	1.68E+03

Molecular weights of components were based on the CRC Handbook 71st Edition (CRC 1991). These are:

Analyte	MW g/mol	Analyte	MW g/mol
Ag	107.8	NO2	46.0
Al	26.9	NO3	62.0
As	74.9	OH	17.0
B	10.8	Oxalate	88.0
Ba	137.3	Pb	207.2
Be	9.0	Pd	105.4
Bi	208.9	PO4	94.9
Ca	40.0	Pr	140.9
Cd	112.4	Rb	85.5
Ce	140.1	Rh	102.9
Cl	35.4	Ru	101.1
CN	26.0	Sb	121.7

Analyte	MW g/mol	Analyte	MW g/mol
Co	58.9	Se	78.9
Cr	51.9	Si	28.1
Cu	63.5	SO4	96.1
F	18.9	Sr	87.6
Fe	55.8	Ta	180.9
Hg	200.6	Te	127.6
K	39.1	Th	232.0
La	138.9	Ti	47.9
Li	6.9	TIC as CO3	60.0
Mg	24.3	Tl	204.4
Mn	54.9	U(total)	238.0
Mo	95.9	V	50.9
Na	22.9	W	183.9
Nd	144.2	Y	88.9
NH3	17	Zn	65.4
Ni	58.7	Zr	91.2

2.2 Criteria

The following criteria were used in this calculation to develop the emissions feed vector:

- Constituents feed quantity selected is the highest value from all the tanks evaluated.
- SOW maximums shall be selected for all constituents that the SOW indicated has a maximum. Otherwise the BBI information is used.
- The LAW transuranics are defined as: ^{237}Np, ^{238}Pu, ^{239}Pu, ^{240}Pu, ^{241}Am, ^{241}Pu, ^{242}Cm, ^{242}Pu, ^{243}Am, ^{243}Cm, and ^{244}Cm, per the contract specifications.
- For the HLW feed contract maximum calculations, the non-volatile compounds are all those in the feed except Cl, CN, F, NH_3, NO_2, NO_3, OH, oxalate, PO_4, SO_4, and CO_3.

3 Background

The previous emissions profiles for the Waste Treatment Plant (WTP) have been based on a feed vector generated from various sources. For the profile generated in the *Integrated Emissions Baseline Report for the River Protection Project Waste Treatment Plant* (Cook 2001), the feed vector was based on data from the Best Basis Inventory, data from the ACM model, and the TFCOUP Rev. 2.

In March 2002, an update to the emissions profile was generated and can be found in the *Integrated Emissions Baseline Report Update* (Berrios 2002). The feed vector for this profile was based on a comparison between what was used in the *Integrated Emissions Baseline Report for the River Protection Project Waste Treatment Plant* (Cook 2001) and data from the TFCOUP Rev. 3a. The highest constituent concentration between the two sources was selected as the preferred feed quantity.

In May 2002, an Emissions Task Team was developed to resolve issues pertaining to the basis of the WTP emissions profiles. This team was comprised of personnel from Process Engineering, Process Technology, Environmental Safety and Health, and Research and Technology. One of the issues that required evaluation was the feed vector (CCN# 034316). The required action for the team was to arrive to a commonly agreed feed vector

for inorganic constituents that would be representative of the WTP feed yet be adequately conservative for emissions estimates. The Emissions Task Team decided to maintain a single data source for developing the emissions feed vector. This source is the BBI. Thus, the emissions feed vector requires to be updated. This calculation arrives at the new feed vector to be used for future emissions profiles.

It should be noted that the BBI data was only retrieved for the tanks being processed during the Phase I of the WTP. If at any point, the tanks to be processed through Phase I changes, this calculation will require to be updated.

4 Applicable Codes and Standards

No codes and standards were used in this calculation.

5 Methodology

The following methodology was used in this calculation.

5.1 LAW

- Data for the LAW tanks was obtained from the Best Basis Inventory on the web site http://twins.pnl.gov:8001/twins.htm. This data was downloaded on September 2002 and can be found in Appendix C sorted by tanks. Units of this data are:
  - Chemical Analytes: kg
  - Radionuclides: Ci
- For inventories that included supernatant and salt cake, both numbers were added together to get a total constituent inventory.
- Chemical analyte weight was converted to moles by multiplying by 1000 grams/kg and dividing by the molecular weight of the analyte in grams/mol. The maximum concentration in moles per constituents was then selected, except for Na. Reason being that the low sodium moles will give the highest concentration when based on mol/mol of Na.
- Radionuclides maximum activity in Ci was selected per constituent.
- Statement of Work maximums were used for constituents that had one specified. Otherwise, the maximum BBI data was used.
- Once the new feed quantities were selected, they were charge balanced. For this process, only the constituents tracked on the Steady State Flowsheet Model were charge balanced. If the final overall charge was positive, then the amount of negative charges was adjusted to counteract the positive balance. If the final overall charge was negative, then the positive charges were adjusted to counteract the negative balance.
- After the charges were balanced, the final feed vector was converted to the units used by the Steady State Flowsheet Model. Chemical analytes were converted to a ratio of mol/mol Na and the radionuclides were converted to a ratio of Bq/mol Na.

5.2 HLW

- Data for the HLW tanks was obtained from the Best Basis Inventory on the web site http://twins.pnl.gov:8001/twins.htm. This data was downloaded on September 2002 and can be found in Appendix D sorted by tanks. Units for this data are:
  - Chemical Analyte: kg
  - Radionuclides: Ci

- For analytes that have several data points, these were added together to obtain a total inventory for the analyte.
- Chemical analyte weight was converted to moles by multiplying by 1000 grams/kg and dividing by the molecular weight of the analyte in grams/mol. The maximum concentration in moles per constituents was then selected, except for Na. Reason being that the low sodium moles will give the highest concentration when based on mols/mol of Na.
- Radionuclides maximum activity in Ci was selected per constituent.
- Statement of Work maximums were used for constituents that had one specified. Otherwise, the maximum BBI data was used. In order to determine to the SOW maximum, the amount of total non-volatile oxides had to be calculated. Once this number was obtained, the feed quantity required, per the SOW maximum, was calculated.
- Once the new feed quantities were selected, they were charge balanced. For this process, only the constituents tracked on the Steady State Flowsheet Model were charged balanced. If the final overall charge was positive, then the amount of negative charges adjusted to counteract the positive balance. If the final overall charge was negative, then the positive charges were adjusted to counteract the negative balance.
- After the charges were balanced, the final feed vector was converted to the units used by the Steady State Flowsheet Model. Chemical analytes were converted to a ratio of mol/mol Na and the radionuclides were converted to a ratio of Bq/mol Na.

6 Assumptions

- For compounds with multiple valance states, the most common valance state (or state that is most appropriate for high level waste) has been assumed.
- Only WTP Phase I tanks will be processed with the new WTP 2+2 configuration. If at a later time, the feed sequence for WTP changes and new tanks are added to the scope of the project, then this calculation will be revised to include the inventories of the new added tanks.

7 Calculations

These calculations were performed with a Microsoft Excel® 97 spreadsheet on a Compaq PC workstation. A detail calculation of each step is presented in this section for at least one constituent. The rest of the calculations are presented in the spreadsheets found in Appendix A for LAW and Appendix B for HLW.

7.1 LAW

7.1.1 Data Collection

The spreadsheet for the LAW portion of the calculation can be located in Appendix A. Table A-1 shows the raw data from the BBI for the chemical analytes in kilograms. This data was then converted to moles by multiplying by 1000 g/kg and dividing by the constituent's molecular weight in g/mole. Silver is used as an example:

Ag: 20.9 kg * 1000 g / kg * 1 mole / 107.9 g = 194 mole Ag

Table A-2 shows the data in moles for all chemical analytes. The highest feed quantity for each constituent was then selected except for Na. The reason being is that the lowest Na concentration would give the highest constituent concentration based on moles per moles of Na (mol/mol Na). The last column on Table A-2 shows the selected feed in units of mol.

For the radionuclides, the raw data from BBI is presented in Table A-3. The maximum activity, in Ci, per constituent was selected and is shown in the last column of the table.

7.1.2 Comparison with SOW Maximum

The selected chemical analytes and radionuclide feed quantities were then compared to the SOW maximums. For constituents with SOW maximum, this amount was selected for their feed concentration. BBI calculated feed quantity was used for all other constituents without SOW maximum. For chemical analytes, SOW maximums are given in terms of mol/mol Na, therefore data was converted to these units to do the comparison. The chemical analytes amount in moles was divided by the moles of Na to obtain mol/mol Na. For example,

Ag
mol: 9.04E+02 moles
Na: 7.48E+06 moles
Concentration = 9.04E+02 / 7.48E+06 = 1.21E-04 mol/mol Na

The amount in mol/mol Na was then compared to the SOW maximum. Examples for aliminum and calcium are shown below.

Al
mol: 8.07E+06 mol
Concentration = 8.07E+06 mol Al / 7.48E+06 mol Na = 1.08 mol/mol Na
SOW maximum = 0.25 mol/mol Na
Concentration selected = SOW maximum = 0.25 mol/mol Na

Ca
mol: 5.09E+04 mol
Concentration = 5.09E+04 mol Ca / 7.48E+06 mol Na = 6.8E-03 mol/mol Na
SOW maximum = 4.0E-02 mol/mol Na
Concentration selected = SOW maximum = 4.0E-02 mol/mol Na

For constituents without SOW maximums, the BBI feed quantity was used. Table A-4 shows the calculation for all the constituents. The final selected amounts were then converted back to moles by multiplying by the total Na moles (7.48E+06 moles) to facilitate the feed charge balancing.

For the radionuclides, the SOW maximum is given in terms of Bq/mol Na, therefore data was converted to these units for comparison. The Ci amount was converted to Bq by multiplying by 3.7E+10 Bq/Ci and then dividing by the moles of Na (7.48E+06 moles) to get the units of Bq/mol Na. Constituents without SOW maximums were kept at the BBI feed quantity value. For example,

^{106}Ru: 3.05E-04 Ci * 3.7E+10 Bq/Ci * 1 / 7.48E+06 moles Na = 1.5 Bq/mol Na

The calculated amount in Bq/mol Na was then compared to the SOW maximum. If the SOW maximum was lower than the calculated number, then the SOW maximum was selected. For constituents without SOW maximum, the calculated value was selected. Examples are shown below.

^{137}Cs: 5.65E+06 Ci * 3.7E+10 Bq/Ci * 1 / 7.48E+06 moles Na = 2.8E+10 Bq/mol Na
SOW maximum = 2.0E+10 Bq/mol Na
Concentration selected = SOW maximum = 2.0E+10 Bq/mol Na

Table A-5 shows the calculation for all the radionuclides. The selected amounts were then converted to Ci to facilitate in the feed charge balancing. Conversion to Ci was done by multiplying the Bq/mol Na by 1 Ci / 3.7E+10 Bq and then by the moles of Na (7.48E+06 moles). For example,

^{106}Ru: 1.51 Bq/mol Na * 1 Ci / 3.7E+10 Bq * 7.48E+06 mol Na = 3.05E-04 Ci

For the transuranics, the SOW maximum is given as a whole amount of 4.80E+05 Bq/mol Na. The LAW transuranics are defined as ^{237}Np, ^{238}Pu, ^{239}Pu, ^{240}Pu, ^{241}Am, ^{241}Pu, ^{242}Cm, ^{242}Pu, ^{243}Am, ^{243}Cm, and ^{244}Cm. The sum of all these in Bq/mol Na were added together to determine the overall concentration (Table A-5 shows the amounts of the radionuclides in Bq/mol Na). The summation is:
^{237}Np = 2.75E+04 Bq/mol Na
^{238}Pu = 7.27E+04 Bq/mol Na
^{239}Pu = 8.61E+05 Bq/mol Na
^{240}Pu = 1.52E+05 Bq/mol Na
^{241}Am = 1.22E+07 Bq/mol Na
^{241}Pu = 3.58E+06 Bq/mol Na
^{242}Cm = 3.08E+04 Bq/mol Na
^{242}Pu = 1.91E+01 Bq/mol Na
^{243}Am = 5.00E+02 Bq/mol Na
^{243}Cm = 2.56E+03 Bq/mol Na
^{244}Cm = 1.78E+04 Bq/mol Na
Total = 1.70E+07 Bq/mol Na
The total amount is higher than the SOW maximum, therefore the SOW maximum will be used as the feed quantity. To calculate the feed quantity based on the SOW maximum, the total concentration was divided equally between all the transuranics. This was done by dividing the feed quantity by the total feed quantity and then multiplying by the SOW maximum.
^{237}Np = 2.75E+04 Bq/mol Na / 1.7E+07 Bq/mol Na * 4.80E+05 Bq/mol Na = 7.78E+02 Bq/mol Na
^{238}Pu = 7.27E+04 Bq/mol Na / 1.7E+07 Bq/mol Na * 4.80E+05 Bq/mol Na = 2.06E+03 Bq/mol Na
^{239}Pu = 8.61E+05 Bq/mol Na / 1.7E+07 Bq/mol Na * 4.80E+05 Bq/mol Na = 2.44E+04 Bq/mol Na
^{240}Pu = 1.52E+05 Bq/mol Na / 1.7E+07 Bq/mol Na * 4.80E+05 Bq/mol Na = 4.31E+03 Bq/mol Na
^{241}Am = 1.22E+07 Bq/mol Na / 1.7E+07 Bq/mol Na * 4.80E+05 Bq/mol Na = 3.46E+05 Bq/mol Na
^{241}Pu = 3.58E+06 Bq/mol Na / 1.7E+07 Bq/mol Na * 4.80E+05 Bq/mol Na = 1.01E+05 Bq/mol Na
^{242}Cm = 3.08E+04 Bq/mol Na / 1.7E+07 Bq/mol Na * 4.80E+05 Bq/mol Na = 8.72E+02 Bq/mol Na
^{242}Pu = 1.91E+01 Bq/mol Na / 1.7E+07 Bq/mol Na * 4.80E+05 Bq/mol Na = 5.42E-01 Bq/mol Na
^{243}Am = 5.00E+02 Bq/mol Na / 1.7E+07 Bq/mol Na * 4.80E+05 Bq/mol Na = 1.41E+01 Bq/mol Na
^{243}Cm = 2.56E+03 Bq/mol Na / 1.7E+07 Bq/mol Na * 4.80E+05 Bq/mol Na = 7.25E+01 Bq/mol Na
^{244}Cm = 1.78E+04 Bq/mol Na / 1.7E+07 Bq/mol Na * 4.80E+05 Bq/mol Na = 5.04E+02 Bq/mol Na
To verify the calculation, the new concentrations were added together to make sure they matched the SOW maximum. Total sum is 4.80E+05 Bq/mol Na which is the same as the SOW maximum.

7.1.3 Feed Charge Balance

Once the final feed quantities were determined, the feed was charge balanced. Only the constituents that are tracked on the Steady State Flowsheet Model were charge balanced.

For the chemical analytes, the feed quantity in moles was multiplied by the charge to get the total constituent's charge. For example,

Ag
9.04E+02 moles * 1 = 9.04E+02 moles

After all the charges were calculated they were added together. Table A-6 shows the charge balance calculation for the chemical analytes. Constituents that have a charge of zero (0) are not tracked in the Steady State Flowsheet Model. Total charge for chemical analytes is -27,791,598.

For the radionuclides, the Ci amount was converted to mol by multiplying by the activity per mole ratio. The activity per mole ratio used are the ones presented in Section 2.0. For example,

^{125}Sb
Feed quantity: 4.02E+03 Ci
Activity per mole = 1.30E+08 Ci/kmol
Amount in moles = 4.02E+03 Ci * 1 kmol / 1.30E+08 Ci * 1000 mol / kmol = 3.09E-02 mol

The amount of the radionuclide in moles was then multiplied by the charge to get the total charge for the constituent.

^{125}Sb
Total charge = 3.09E-02 mol * 3 = 9.28E-02

The same calculation was performed for all the radionuclides tracked in the Steady State Flowsheet Model. This calculation can be found in Table A-7. After all the charges were calculated, they were added together to get the total charge. The total charge for all radionuclides is 92,071.

The total charges for radionuclides and chemical analytes were then added together to obtain the overall charge of the feed:

-32,652,468 (chemical analytes charge) + 92,120 (radionuclides charge) = -32,560,348

Being highly negative, the amount of Na was then adjusted to counteract the positive charge. In order to add this much Na, all the positive charges were also readjusted to keep the concentrations selected. To do this, all the positive charges were added together (both chemical and radionuclide). This total positive charge is 16,824,502. The new mole amount needed per constituent was calculated by multiplying the original moles charge by the new amount of positive mole charges needed divided by the total positive mole charges. For example,

Ag
Original mole charges = 904
New mole charges = 904 * 32,652,468 / 16,824,502 = 1.75E+03 new positive mole charges of Ag

This value was then converted back to actual moles by dividing by the charge of the analyte.

Ag = 1.75E+03 / +1 = 1.75E+03 moles of Ag needed
Based on this new ratio, the new moles of Na are:
7.48E+06 moles Na * 32,652,468 / 16,824,502 = 1.45E+07 / +1 = 1.45E+07 new moles of Na

The new mol/mol Na concentration are then based on this new Na amount. Therefore for Ag:

Ag: 1.75E+03 / 1.45E+07 = 1.21E-04 mol/mol Na

This concentration is equivalent to the one previously calculated before the charge balance thereby confirming that the ratio was applied correctly. Table A-8 shows the new ratio adjustment process for the chemical analytes. Table A-9 shows the adjustment for the radionuclides.

The chemical analyte feed vector for LAW for emissions purposes is shown in Table A-10. Table A-11 shows the finalized radionuclide feed vector for LAW.

7.2 HLW

7.2.1 Data Collection

The spreadsheet for the HLW portion of the calculation can be located in Appendix B. Table B-1 shows the raw data from the BBI for the chemical analytes in kilograms. This data was then converted to moles by multiplying by 1000 g/kg and dividing by the molecular weight in g/mole. Silver is used as an example:

Ag: 117 kg * 1000 g / kg * 1 mole / 107.9 g = 1,080 mole Ag

Table B-2 shows the data in moles for all chemical analytes. The highest amount for each constituent was then selected except for Na. The reason being is that the lowest Na concentration would give the highest constituent concentration based on moles per moles of Na (mol/mol Na). The last column on Table B-2 shows the selected feed.

For the radionuclides, the raw data from BBI is presented in Table B-3. The maximum activity, in Ci, per each constituent was selected and is shown in the last column of the table.

7.2.2 Comparison with SOW Maximums

The selected chemical analytes and radionuclide feeds were then compared to the SOW maximums. For constituents with SOW maximum, this amount was selected for their feed concentration. For constituents without a SOW maximum, the selected feed was used. To determine the SOW maximum, first the amount of non-volatile oxides had to be calculated. Non-volatile compounds include all components except Cl, CN, F, NH_3, NO_2, NO_3, OH, oxalate, PO_4, SO_4, and CO_3. Table B-4 shows the calculation of the total oxides mass.

Silver is used as an example to demonstrate the calculation process. First, the amount of each constituent per mole was converted to grams by multiplying by the molecular weight.

Ag: 9.82E+03 moles * 107.87 g / mol = 1.06E+06 grams

The charge per each constituent was then obtained as shown in Section 2.0. In order to calculate the amount of oxygen needed to form the oxides, the constituent charge was divided by the charge of oxygen.

Ag (O needed)
charge = 1
Oxygen needed = 1/2 = 0.5

The mass of oxygen associated with each constituent in the oxide form is then the number of oxygens ratio times the moles of the constituent times the molecular weight of oxygen (16 g/mole).

Ag (Mass of oxygen)
9.82E+03 moles Ag * 0.5 moles O / moles Ag * 16 g O / mole O = 7.86E+04 g O

This process was then repeated for all the constituents. Once all the numbers were calculated, the total amount of oxides in grams was calculated by adding all the constituents' weights together with the oxygen weight.

Total mass of constituents: 4.36E+08 grams
Total mass of oxygen: 2.0E+08 grams
Total mass of oxides: 4.36E+08 grams + 2.0E+08 grams = 6.36E+08 grams

The SOW maximum feed was then calculated by multiplying the constituents SOW maximum ratio by the total mass of oxides and dividing by 100. SOW maximum ratios used are those presented in Section 2.0.

Ag:
Total mass oxides = 6.36E+08 grams
SOW maximum ratio = 0.55 / 100 g of oxides
SOW maximum feed quantity = 6.36E+08 * 0.55/100 = 3.50E+06 grams

The calculated SOW maximum feed quantity was then compared to the selected feed quantity. If the selected feed quantity was higher than the SOW maximum, then the SOW maximum was used. For constituents without a SOW maximum, the selected feed quantity was selected as the emissions feed.

Ag:
SOW maximum feed quantity = 3.50E+06 grams
Actual feed quantity = 1.06E+06 grams
Feed quantity selected = SOW maximuml = 3.50E+06 grams

An example where SOW maximum feed quantity was selected is Chromium.

Cr:
SOW maximum feed quantity = 4.32E+06 grams
Actual feed quantity = 1.34E+07 grams
Feed quantity selected = SOW maximum = 4.32E+06 grams

Table B-5 shows the rest of the comparisons and the selected feed in grams for HLW chemical analytes.

For the radionuclides a similar approach was used. The SOW maximum Ci feed was calculated by multiplying the total oxide mass by the SOW maximum ratio and dividing by 100. ^{125}Sb is usd as an example:

^{125}Sb
SOW maximum ratio: 3.20E-02 Ci / 100 grams of oxides
Total oxide mass: 6.36E+08 grams
SOW maximum feed quantity = 6.36E+08 * 3.20E-02 / 100 = 2.03E+05 Ci

This SOW maximum feed quantity was then compared to the selected feed quantity.

^{125}Sb
SOW maximum feed quantity = 2.03E+05 Ci
Actual feed quantity = 6.18E+03 Ci

Selected feed quantity = 2.03E+05 Ci

Table B-6 shows the rest of the calculation for the remaining radionuclides.

7.2.3 Feed Charge Balance

Once the final feed quantities were determined, the feed was charge balanced. Only the constituents that are tracked on the Steady State Flowsheet Model were charge balanced for the purposes of this calculation.

For the chemical analytes, the feed quantity in moles was multiplied by the charge to get the total constituent's charge. For example,

Ag
3.24E+04 moles * 1 = 3.24E+04 moles

After all the charges were calculated they were added together. Table B-7 shows the charge balance calculation for the chemical analytes. Constituents that have a charge of zero (0) are not tracked in the Steady State Flowsheet Model.

For the radionuclides, the Ci amount was converted to mol by multiplying by the activity per mole ratio. The activity per mole ratio used are the ones presented in Section 2.0. For example,

^{125}Sb
Feed quantity: 2.03E+05 Ci
Activity per mole = 1.30E+08 Ci/kmol
Amount in moles = 2.03E+05 Ci * 1 kmol / 1.30E+08 Ci * 1000 mol / kmol = 1.56 mol

The amount of the radionuclide in moles was then multiplied by the charge to get the total charge for the constituent.

^{125}Sb
Total charge = 1.56 mol * 3 = 4.69 mol

The same calculation was performed for all the radionuclides tracked in the Steady State Flowsheet Model. This calculation can be found in Table B-8. After all the charges were calculated, they were added together to get the total charge.

The total charges for radionuclides and chemical analytes were then added together to obtain the overall charge of the feed:

29,810,608 (chemical analytes charge) + 2,108,359 (radionuclides charge) = 31,918,968 mol charges

Being highly positive, the amount of OH is then adjusted to counteract the positive charge. The added amount of OH is 31,918,968 moles.

The final chemical analytes feed vector, in moles, is then converted to mol/mol Na by diving all the constituents by the total moles of sodium (5.25E+06 moles). The chemical analyte feed vector for HLW for emissions purposes is found in Table B-9.

The final radionuclide feed vector, in curies, is then converted to Bq per mol of Na by multiplying the Ci amount by 3.7E+10 and then dividing by the sodium moles (5.25E+06 moles). For example,

^{106}Ru
Feed quantity = 621 Ci
Mol Na = 5.25E+06 moles
Conversion to Bq/mol Na = 621 Ci * 3.7E+10 Bq/Ci * 1/ 5.25E+06 mol Na = 4.37E+06 Bq/mol Na

The final radionuclide feed vector is presented in Table B-10.

8 Results and Conclusions

The HLW and LAW feed vectors for the WTP emissions profiles have been developed in this calculation by using the BBI data as the main basis. Calculated feed quantities were compared to the SOW maximums. If the SOW maximum was higher than the calculated number, then the SOW maximum was used. If the actual calculated number was higher than SOW maximum, then the SOW maximum was used. Otherwise the calculated number was selected as the constituent's feed quantity. The tables below show the final feed vector for LAW and HLW respectively. This feed vector will be incorporated in the Steady State Flowsheet Model to support future emissions profiles.

LAW Chemical Analytes Emissions Feed Vector

Analyte	mol/mol Na	Analyte	mol/mol Na
Ag	1.21E-04	NO2	1.96E-01
Al	2.50E-01	NO3	4.12E-01
As	6.11E-04	OH	1.55E+00
B	6.46E-03	Oxalate	2.58E-01
Ba	1.00E-04	Pb	6.80E-04
Be	1.21E-04	Pd	8.04E-06
Bi	2.02E-04	PO4	6.70E-02
Ca	4.00E-02	Pr	3.49E-07
Cd	4.00E-03	Rb	1.35E-05
Ce	3.02E-04	Rh	5.54E-05
Cl	4.59E-02	Ru	6.13E-05
CN	2.89E-04	Sb	1.07E-04
Co	1.67E-04	Se	2.04E-04
Cr	2.00E-02	Si	1.68E-02
Cu	2.21E-04	SO4	3.61E-02
F	1.03E-01	Sr	4.82E-05
Fe	1.00E-02	Ta	2.95E-05
Hg	1.40E-05	Te	3.85E-07
K	1.80E-01	Th	2.15E-05
La	8.30E-05	Ti	9.66E-05
Li	3.95E-03	TIC as CO3	1.55E-01
Mg	1.78E-03	Tl	2.13E-04
Mn	4.87E-03	U(total)	6.18E-04
Mo	2.67E-04	V	2.14E-04
Na	1.00E+00	W	2.01E-04

CALCULATION SHEET

PROJECT: RPP-WTP
JOB NO.: 24590
CALC NO.: 24590-WTP-M4C-FRP-00001
SHEET REV: 0A
SHEET NO.: 17

BY: E. Berríos
DATE: 12/04/02

SUBJECT: Updated Emissions Run Feed Vector

Analyte	mol/mol Na	Analyte	mol/mol Na
Nd	1.69E-04	Y	2.02E-05
NH3	1.02E-02	Zn	4.05E-04
Ni	3.00E-03	Zr	3.59E-04

LAW Radionuclide Emissions Feed Vector

Analyte	Bq/mol Na	Analyte	Bq/mol Na
106Ru	7.78E-01	236U	6.93E+02
113mCd	8.26E+05	237Np	7.78E+02
125Sb	1.99E+07	238Pu	2.06E+03
126Sn	1.49E+05	238U	4.45E+03
129I	2.88E+03	239Pu	2.44E+04
134Cs	3.70E+07	240Pu	4.31E+03
137Cs	2.00E+10	241Am	3.46E+05
137mBa	1.36E+10	241Pu	1.01E+05
14C	2.64E+05	242Cm	4.49E+02
151Sm	2.47E+08	242Pu	2.79E-01
152Eu	1.30E+06	243Am	7.29E+00
154Eu	4.30E+06	243Cm	7.25E+01
155Eu	7.42E+06	244Cm	5.04E+02
226Ra	1.19E+00	3H	3.53E+06
227Ac	1.32E+01	59Ni	1.29E+04
228Ra	2.31E+03	60Co	3.70E+05
229Th	5.43E+01	63Ni	2.37E+06
231Pa	3.85E+01	79Se	1.13E+04
232Th	5.54E+02	90Sr	8.00E+08
232U	1.30E+03	90Y	7.70E+08
233U	1.03E+04	93mNb	1.52E+05
234U	5.99E+03	93Zr	1.92E+05
235U	2.31E+02	99Tc	7.10E+06

HLW Chemical Analytes Emissions Feed Vector

Analyte	mol	mol/mol Na	Analyte	mol	mol/mol Na
Ag	3.24E+04	6.17E-03	NO2	7.96E+05	1.51E-01
Al	3.30E+06	6.28E-01	NO3	3.69E+06	7.03E-01
As	1.36E+04	2.59E-03	OH	4.54E+07	8.64E+00
B	7.65E+05	1.46E-01	Oxalate	7.95E+05	1.51E-01
Ba	2.08E+05	3.97E-02	Pb	3.38E+04	6.43E-03
Be	4.59E+04	8.74E-03	Pd	7.77E+03	1.48E-03
Bi	8.52E+04	1.62E-02	PO4	6.19E+05	1.18E-01
Ca	1.13E+06	2.14E-01	Pr	1.58E+04	3.01E-03
Cd	2.55E+05	4.85E-02	Rb	1.41E+04	2.69E-03
Ce	3.68E+04	7.00E-03	Rh	8.03E+03	1.53E-03
Cl	5.91E+04	1.13E-02	Ru	2.20E+04	4.19E-03
CN	3.91E+05	7.45E-02	Sb	4.38E+04	8.35E-03
Co	4.86E+04	9.25E-03	Se	4.18E+04	7.97E-03
Cr	8.31E+04	1.58E-02	Si	4.30E+06	8.19E-01

CALCULATION SHEET

PROJECT: RPP-WTP
JOB NO.: 24590
CALC NO.: 24590-WTP-M4C-FRP-00001
SHEET REV: 0A
SHEET NO.: 18

BY: E. Berrios
DATE: 12/04/02

SUBJECT: Updated Emissions Run Feed Vector

Analyte	mol	mol/mol Na	Analyte	mol	mol/mol Na
Cu	4.81E+04	9.15E-03	SO4	8.77E+04	1.67E-02
F	1.17E+06	2.23E-01	Sr	3.77E+04	7.19E-03
Fe	3.30E+06	6.29E-01	Ta	1.05E+03	2.01E-04
Hg	3.17E+03	6.03E-04	Te	6.48E+03	1.23E-03
K	2.11E+05	4.02E-02	Th	1.37E+05	2.61E-02
La	1.19E+05	2.27E-02	Ti	1.73E+05	3.29E-02
Li	1.29E+05	2.46E-02	TIC as CO3	3.18E+06	6.05E-01
Mg	5.49E+05	1.05E-01	Tl	1.40E+04	2.67E-03
Mn	7.53E+05	1.43E-01	U(total)	3.74E+05	7.12E-02
Mo	4.31E+04	8.20E-03	V	4.00E+03	7.61E-04
Na	5.25E+06	1.00E+00	W	8.30E+03	1.58E-03
Nd	7.50E+04	1.43E-02	Y	1.14E+04	2.18E-03
NH3	5.98E+05	1.14E-01	Zn	4.08E+04	7.77E-03
Ni	2.60E+05	4.95E-02	Zr	1.05E+06	1.99E-01

HLW Radionuclide Emissions Feed Vector

Analyte	Ci	Bq/mol Na	Analyte	Ci	Bq/mol Na
106Ru	6.21E+02	4.37E+06	236U	6.48E-01	4.57E+03
113mCd	1.93E+03	1.36E+07	237Np	4.70E+02	3.31E+06
125Sb	2.03E+05	1.43E+09	238Pu	2.23E+03	1.57E+07
126Sn	9.54E+02	6.72E+06	238U	1.17E+01	8.24E+04
129I	1.84E+00	1.30E+04	239Pu	1.97E+04	1.39E+08
134Cs	4.47E+02	3.15E+06	240Pu	1.08E+03	7.61E+06
137Cs	9.54E+06	6.72E+10	241Am	5.72E+05	4.03E+09
137mBa	4.66E+05	3.28E+09	241Pu	1.40E+05	9.85E+08
14C	4.13E+01	2.91E+05	242Cm	2.30E+01	1.62E+05
151Sm	6.36E+05	4.48E+09	242Pu	2.05E-01	1.44E+03
152Eu	3.05E+03	2.15E+07	243Am	5.61E+00	3.95E+04
154Eu	3.31E+05	2.33E+09	243Cm	1.91E+04	1.34E+08
155Eu	1.84E+05	1.30E+09	244Cm	1.91E+04	1.34E+08
226Ra	2.16E-02	1.52E+02	3H	4.13E+02	2.91E+06
227Ac	1.09E+02	7.68E+05	59Ni	3.22E+02	2.27E+06
228Ra	2.25E+01	1.59E+05	60Co	6.36E+04	4.48E+08
229Th	9.41E-01	6.63E+03	63Ni	3.01E+04	2.12E+08
231Pa	2.40E+02	1.69E+06	79Se	1.79E+01	1.26E+05
232Th	4.99E+00	3.52E+04	90Sr	6.36E+07	4.48E+11
232U	1.93E+01	1.36E+05	90Y	5.27E+06	3.71E+10
233U	5.72E+00	4.03E+04	93mNb	6.98E+02	4.92E+06
234U	2.08E+01	1.47E+05	93Zr	7.75E+02	5.46E+06
235U	1.59E+00	1.12E+04	99Tc	9.54E+04	6.72E+08

9 References

Allen, G and others, *River Protection Project System Plan,* ORP-11242, Revision 0, August 2002

Berríos, E, 2002, *Integrated Emissions Baseline Report Update*, 24590-WTP-RPT-PT-02-002, Rev 0, March 2002, BNI, Richland, Washington

Capps, V 2002, *Tank by Tank Feed Composition for Steady State Mass Balance*, 24590-PTF-M4C-FRP-00003, Revision B, September 2002, BNI, Richland, Washington, Appendix AA, page AA-1

CHG, 2002, Tank Waste Information Network System-Best Basis Inventory, http:twins.pnl.8001/twins.htm, CH2Mhill H, 2002, Hanford Group Inc., Richland, Washington

Cook, J. et al, 2001 Integrated Emissions Baseline Report for the River Protection Project Waste Treatment Plant, RPT-W375-ES00001, Rev 1, Bechtel National, May 2001, Richland, Washington

CCN# 034316, Integrated Baseline Emissions Report Update, June 2002

CCN# 044663, Updated Basis for the WTP's Emissions Profile, October 2002

CRC 1991. *Handbook of Chemistry and Physics*, 71th Edition, CRC Press, Boca Raton, Florida, Page 1-10

DOE-ORP 2000, *DOE Statement of Work*, DE-AC27-*01RV14136*, US Department of Energy, Office of River Protection, Richland, Washington, Tables TS-7.1, TS-7.2, TS-8.1, TS-8.2, TS-8.3, and TS-8.4

10 Attachments

There are no attachments for this calculation

Appendix A LAW Calculations

CALCULATION SHEET

PROJECT: RPP-WTP
JOB NO.: 24590
CALC NO.: 24590-WTP-M4C-FRP-00001
SHEET REV: 0A
SHEET NO.: 21

BY: E. Berríos
DATE: 12/04/02

SUBJECT: Updated Emissions Run Feed Vector

Table A-1 LAW Chemical Analytes Feed Quantities in Kg

Analyte	Unit	Tank										
		AN-102	AN-103	AN-104	AN-105	AN-107	AP-101	AP-104	AW-101	AZ-101	AZ-102	SY-101
Ag	kg	2.09E+01	8.30E+01	7.86E+01	9.75E+01	6.13E+00	2.66E+00	1.05E+01	6.23E+01	2.43E+01	1.25E+01	7.85E+01
Al	kg	4.80E+04	2.18E+05	1.38E+05	1.60E+05	9.07E+02	2.93E+04	6.11E+04	1.25E+05	2.58E+04	1.26E+03	3.52E+04
As	kg	0.00E+00	3.16E+02	2.51E+02	2.27E+02	1.55E+02	5.31E+00	7.26E+00	3.42E+02	2.52E+01	1.29E+01	1.58E+02
B	kg	0.00E+00	5.22E+02	5.17E+02	4.40E+02	9.13E+01	6.75E+01	1.73E+02	4.90E+02	6.10E+01	1.36E+01	1.44E+02
Ba	kg	1.05E+02	1.58E+02	1.18E+02	1.14E+02	1.93E+01	1.39E+00	2.52E-01	1.38E+01	2.53E-01	1.57E-01	7.90E+01
Be	kg	1.06E+01	1.58E+01	1.45E+01	1.14E+01	3.06E+00	5.57E+00	5.10E-01	7.47E+00	9.57E-01	7.43E-02	7.90E+00
Bi	kg	1.69E+02	3.16E+02	2.34E+02	2.27E+02	2.76E+01	1.05E+01	1.05E+02	4.78E+01	0.00E+00	1.56E+00	5.78E+01
Ca	kg	1.60E+03	5.27E+02	7.17E+02	1.96E+03	2.04E+03	3.25E+01	2.36E+02	7.87E+02	1.21E+02	3.41E+01	2.68E+02
Cd	kg	2.08E+02	3.53E+01	3.35E+01	3.95E+01	2.29E+02	8.43E+00	5.24E+00	2.25E+01	6.75E+00	1.70E+00	7.90E+00
Ce	kg	0.00E+00	3.16E+02	2.34E+02	2.27E+02	1.87E+02	3.15E-01	2.46E-01	6.24E+01	1.92E-01	7.61E-02	1.58E+02
Cl	kg	1.17E+04	2.82E+04	2.86E+04	3.72E+04	7.85E+03	8.35E+03	2.44E+04	2.80E+04	4.56E+02	2.36E+02	1.87E+04
CN	kg	0.00E+00	2.84E+01	0.00E+00	0.00E+00	1.60E+01	2.40E+01	1.09E+02	0.00E+00	0.00E+00	2.44E+01	0.00E+00
Co	kg	0.00E+00	1.43E+02	4.69E+01	4.55E+01	1.38E+01	1.48E+00	2.89E+00	2.34E+01	1.92E-01	7.43E-02	3.15E+01
Cr	kg	8.64E+02	2.52E+03	4.99E+03	7.34E+03	5.90E+02	6.03E+02	1.98E+03	1.22E+03	2.18E+03	2.27E+03	3.57E+02
Cu	kg	8.31E+01	3.18E+01	3.37E+01	3.26E+01	1.05E+02	6.75E+00	1.06E+01	3.19E+01	1.21E+01	3.41E+00	2.56E+01
F	kg	2.18E+03	3.53E+03	2.39E+03	6.14E+03	2.48E+04	1.22E+04	5.13E+02	1.01E+04	5.28E+03	3.51E+03	1.62E+02
Fe	kg	1.43E+02	2.15E+02	3.80E+02	4.03E+02	5.81E+03	1.05E+01	5.24E+01	8.25E+02	6.76E+01	1.70E+01	7.90E+01
Hg	kg	0.00E+00	4.66E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.59E-02	2.03E-01	6.30E-03
K	kg	7.77E+03	4.81E+04	2.40E+04	2.52E+04	6.53E+03	1.32E+05	8.39E+03	1.68E+05	1.44E+04	9.86E+03	7.04E+03
La	kg	5.93E+00	8.72E+01	1.18E+02	6.22E+01	1.22E+02	5.48E+00	4.17E-01	1.62E+01	0.00E+00	1.17E-02	5.27E+00
Li	kg	2.09E+01	2.04E+02	6.95E+01	6.45E+01	9.19E+00	1.43E+00	8.39E-02	1.47E+01	1.68E+00	4.93E-01	1.58E+01
Mg	kg	1.14E+02	3.24E+02	2.34E+02	2.27E+02	2.76E+01	1.05E+01	1.05E+02	1.79E+02	1.21E+02	3.41E+01	1.58E+02
Mn	kg	7.06E+01	3.24E+01	5.98E+01	7.24E+01	2.00E+03	0.00E+00	1.05E+01	6.36E+02	0.00E+00	3.41E+00	1.58E+01
Mo	kg	1.73E+02	3.31E+02	3.07E+02	3.72E+02	1.27E+02	6.11E+01	2.36E+02	2.64E+02	2.91E+02	1.67E+02	2.12E+02
Na	kg	7.94E+05	1.06E+06	1.07E+06	1.10E+06	7.28E+05	5.45E+05	5.52E+05	1.09E+06	3.35E+05	1.72E+05	4.28E+05
Nd	kg	2.09E+02	3.16E+02	2.34E+02	2.27E+02	3.53E+02	1.05E+01	1.05E+02	4.78E+01	1.21E+02	3.41E+01	1.58E+02
NH3	kg	0.00E+00	0.00E+00	4.69E+02	0.00E+00	1.56E+02	7.21E+00	0.00E+00	2.77E+01	0.00E+00	0.00E+00	2.52E+03
Ni	kg	1.38E+03	6.32E+01	1.92E+02	1.42E+02	1.93E+03	3.33E+01	1.69E+02	1.09E+02	0.00E+00	6.82E+00	2.46E+02
NO2	kg	2.91E+05	4.93E+05	4.09E+05	4.58E+05	1.99E+05	1.77E+05	3.03E+05	4.62E+05	2.19E+05	1.09E+05	2.31E+05
NO3	kg	7.28E+05	7.23E+05	6.86E+05	6.91E+05	6.87E+05	5.57E+05	4.77E+05	8.17E+05	2.15E+05	5.70E+04	3.70E+05
OH	kg	3.74E+04	2.61E+05	2.50E+05	2.05E+05	3.87E+04	1.74E+05	8.64E+04	3.82E+05	3.47E+04	6.45E+02	6.91E+04

CALCULATION SHEET

PROJECT: RPP-WTP
JOB NO.: 24590
CALC NO.: 24590-WTP-M4C-FRP-00001
SHEET REV: 0A
SHEET NO.: 22

BY: E. Berríos
DATE: 12/04/02

SUBJECT: Updated Emissions Run Feed Vector

Analyte	Unit	Tank										
		AN-102	AN-103	AN-104	AN-105	AN-107	AP-101	AP-104	AW-101	AZ-101	AZ-102	SY-101
Oxalate	kg	0.00E+00	1.53E+04	2.50E+04	2.19E+04	1.24E+05	7.59E+03	0.00E+00	2.59E+04	3.92E+03	1.20E+04	4.37E+00
Pb	kg	5.45E+02	4.60E+02	2.40E+02	2.63E+02	1.34E+03	6.32E+01	1.05E+02	7.37E+02	0.00E+00	3.41E+01	1.58E+02
Pd	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.34E+00	0.00E+00	0.00E+00
PO4	kg	1.79E+04	8.91E+03	1.73E+04	2.53E+04	5.34E+03	4.06E+03	1.92E+04	1.11E+04	4.03E+03	1.53E+03	1.19E+04
Pr	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.29E-02	7.13E-01	0.00E+00	1.92E-01	7.43E-02	0.00E+00
Rb	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.67E+01	1.18E+01	0.00E+00	1.52E+01	1.13E+01	0.00E+00
Rh	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	8.27E+01	0.00E+00	2.28E+01	0.00E+00	6.82E+00	1.78E+01	0.00E+00
Ru	kg	0.00E+00	0.00E+00	9.00E+01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.52E+00	9.49E+00	0.00E+00
Sb	kg	0.00E+00	1.89E+02	1.41E+02	1.37E+02	1.02E+00	1.77E-01	1.12E-01	1.65E+02	1.92E-01	1.13E-01	9.48E+01
Se	kg	0.00E+00	2.18E+02	2.34E+02	2.27E+02	6.89E+01	9.70E+00	2.85E+01	1.20E+02	7.46E+01	2.22E+01	1.58E+02
Si	kg	7.24E+01	2.02E+03	3.54E+03	1.77E+03	0.00E+00	5.78E+02	1.94E+02	1.77E+03	1.77E+03	1.77E+03	2.16E+02
SO4	kg	5.46E+04	1.10E+04	4.10E+04	2.85E+04	3.09E+04	1.70E+04	1.40E+04	1.27E+04	4.54E+04	5.73E+04	1.17E+04
Sr	kg	7.25E+00	3.16E+01	2.34E+01	1.18E+01	9.19E+00	1.60E+00	1.05E+01	1.07E+01	1.21E+01	3.41E+00	1.58E+01
Ta	kg	0.00E+00	4.83E+01	0.00E+00	7.25E+01	7.75E+01	3.75E-01	1.44E-01	0.00E+00	1.92E-01	7.43E-02	0.00E+00
Te	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.13E-01	0.00E+00	1.92E-01	8.23E-02	0.00E+00
Th	kg	0.00E+00	4.83E+01	0.00E+00	7.25E+01	0.00E+00	4.64E-02	1.06E+00	0.00E+00	1.82E-01	6.20E-02	0.00E+00
Ti	kg	2.09E+01	3.16E+01	2.34E+01	2.27E+01	1.55E+01	2.66E+00	1.05E+01	3.46E+01	1.21E+01	3.41E+00	1.58E+01
TIC as CO3	kg	2.65E+05	9.15E+04	1.97E+05	2.31E+05	2.08E+05	1.36E+05	7.10E+04	1.19E+05	1.03E+05	1.08E+05	9.02E+04
Tl	kg	0.00E+00	6.32E+02	4.69E+02	4.55E+02	3.98E-01	7.59E-02	2.10E-01	2.42E+02	1.92E-01	7.43E-02	3.15E+02
U(total)	kg	7.36E+01	1.40E+02	5.01E+02	2.71E+02	3.43E+02	2.33E+02	4.36E+01	2.70E+03	3.71E+00	3.91E+01	8.14E+00
V	kg	1.05E+02	1.58E+02	1.18E+02	1.14E+02	0.00E+00	3.15E+00	5.24E+01	2.34E+01	9.60E+00	3.70E+00	7.90E+01
W	kg	0.00E+00	5.37E+02	0.00E+00	0.00E+00	5.19E+02	1.21E+02	3.75E+02	0.00E+00	0.00E+00	1.87E+01	0.00E+00
Y	kg	0.00E+00	9.65E+00	0.00E+00	1.45E+01	2.60E+01	0.00E+00	1.05E+01	0.00E+00	0.00E+00	7.43E-02	0.00E+00
Zn	kg	2.09E+01	1.10E+02	8.82E+01	1.98E+02	6.99E+01	2.36E+01	1.05E+01	1.33E+02	1.21E+01	3.41E+00	1.64E+01
Zr	kg	3.28E+01	3.49E+01	6.31E+01	4.43E+01	2.45E+02	5.90E+00	1.05E+01	2.08E+02	1.35E+01	3.41E+00	1.58E+01

CALCULATION SHEET

PROJECT: RPP-WTP
JOB NO.: 24590
CALC NO.: 24590-WTP-M4C-FRP-00001
SHEET REV: 0A
SHEET NO.: 23

BY: E. Berrios
DATE: 12/04/02

SUBJECT: Updated Emissions Run Feed Vector

Table A-2 LAW Chemical Analytes Feed Quantities in moles

Analyte	MW g/mol	Unit	Tank											
			AN-102	AN-103	AN-104	AN-105	AN-107	AP-101	AP-104	AW-101	AZ-101	AZ-102	SY-101	Max Feed*
Ag	107.8	mol	1.94E+02	7.70E+02	7.29E+02	9.04E+02	5.69E+01	2.47E+01	9.74E+01	5.78E+02	2.25E+02	1.16E+02	7.28E+02	9.04E+02
Al	26.9	mol	1.78E+06	8.10E+06	5.13E+06	5.95E+06	3.37E+04	1.09E+06	2.27E+06	4.65E+06	9.59E+05	4.68E+04	1.31E+06	8.10E+06
As	74.9	mol	0.00E+00	4.22E+03	3.35E+03	3.03E+03	2.07E+03	7.09E+01	9.69E+01	4.57E+03	3.36E+02	1.72E+02	2.11E+03	4.57E+03
B	10.8	mol	0.00E+00	4.83E+04	4.79E+04	4.07E+04	8.45E+03	6.25E+03	1.60E+04	4.54E+04	5.65E+03	1.26E+03	1.33E+04	4.83E+04
Ba	137.3	mol	7.65E+02	1.15E+03	8.59E+02	8.30E+02	1.41E+02	1.01E+01	1.84E+00	1.01E+02	1.84E+00	1.14E+00	5.75E+02	1.15E+03
Be	9.0	mol	1.18E+03	1.76E+03	1.61E+03	1.27E+03	3.40E+02	6.19E+02	5.67E+01	8.30E+02	1.06E+02	8.26E+00	8.78E+02	1.76E+03
Bi	208.9	mol	8.09E+02	1.51E+03	1.12E+03	1.09E+03	1.32E+02	5.02E+01	5.02E+02	2.29E+02	0.00E+00	7.46E+00	2.77E+02	1.51E+03
Ca	40.0	mol	4.00E+04	1.31E+04	1.79E+04	4.89E+04	5.09E+04	8.10E+02	5.89E+03	1.96E+04	3.02E+03	8.50E+02	6.68E+03	5.09E+04
Cd	112.4	mol	1.85E+03	3.14E+02	2.98E+02	3.51E+02	2.04E+03	7.50E+01	4.66E+01	2.00E+02	6.01E+01	1.51E+01	7.03E+01	2.04E+03
Ce	140.1	mol	0.00E+00	2.26E+03	1.67E+03	1.62E+03	1.33E+03	2.25E+00	1.76E+00	4.45E+02	1.37E+00	5.43E-01	1.13E+03	2.26E+03
Cl	35.4	mol	3.31E+05	7.94E+05	8.06E+05	1.05E+06	2.21E+05	2.35E+05	6.87E+05	7.89E+05	1.28E+04	6.65E+03	5.27E+05	1.05E+06
CN	26.0	mol	0.00E+00	1.09E+03	0.00E+00	0.00E+00	6.15E+02	9.23E+02	4.19E+03	0.00E+00	0.00E+00	9.38E+02	0.00E+00	4.19E+03
Co	58.9	mol	0.00E+00	2.43E+03	7.96E+02	7.72E+02	2.34E+02	2.51E+01	4.91E+01	3.97E+02	3.26E+00	1.26E+00	5.35E+02	2.43E+03
Cr	51.9	mol	1.66E+04	4.85E+04	9.60E+04	1.41E+05	1.13E+04	1.16E+04	3.81E+04	2.35E+04	4.19E+04	4.37E+04	6.87E+03	1.41E+05
Cu	63.5	mol	1.31E+03	5.01E+02	5.31E+02	5.13E+02	1.65E+03	1.06E+02	1.67E+02	5.02E+02	1.91E+02	5.37E+01	4.03E+02	1.65E+03
F	18.9	mol	1.15E+05	1.86E+05	1.26E+05	3.23E+05	1.31E+06	6.42E+05	2.70E+04	5.32E+05	2.78E+05	1.85E+05	8.53E+03	1.31E+06
Fe	55.8	mol	2.56E+03	3.85E+03	6.81E+03	7.22E+03	1.04E+05	1.88E+02	9.39E+02	1.48E+04	1.21E+03	3.05E+02	1.42E+03	1.04E+05
Hg	200.6	mol	0.00E+00	2.32E+01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.29E-01	1.01E+00	3.14E-02	2.32E+01
K	39.1	mol	1.99E+05	1.23E+06	6.14E+05	6.45E+05	1.67E+05	3.38E+06	2.15E+05	4.30E+06	3.68E+05	2.52E+05	1.80E+05	4.30E+06
La	138.9	mol	4.27E+01	6.28E+02	8.50E+02	4.48E+02	8.78E+02	3.95E+01	3.00E+00	1.17E+02	0.00E+00	8.42E-02	3.79E+01	8.78E+02
Li	6.9	mol	3.03E+03	2.96E+04	1.01E+04	9.35E+03	1.33E+03	2.07E+02	1.22E+01	2.13E+03	2.43E+02	7.14E+01	2.29E+03	2.96E+04
Mg	24.3	mol	4.69E+03	1.33E+04	9.63E+03	9.34E+03	1.14E+03	4.32E+02	4.32E+03	7.37E+03	4.98E+03	1.40E+03	6.50E+03	1.33E+04
Mn	54.9	mol	1.29E+03	5.90E+02	1.09E+03	1.32E+03	3.64E+04	0.00E+00	1.91E+02	1.16E+04	0.00E+00	6.21E+01	2.88E+02	3.64E+04
Mo	95.9	mol	1.80E+03	3.45E+03	3.20E+03	3.88E+03	1.32E+03	6.37E+02	2.46E+03	2.75E+03	3.03E+03	1.74E+03	2.21E+03	3.88E+03
Na	22.9	mol	3.47E+07	4.61E+07	4.65E+07	4.78E+07	3.17E+07	2.37E+07	2.40E+07	4.74E+07	1.46E+07	7.48E+06	1.86E+07	7.48E+06
Nd	144.2	mol	1.45E+03	2.19E+03	1.62E+03	1.57E+03	2.45E+03	7.28E+01	7.28E+02	3.31E+02	8.39E+02	2.36E+02	1.10E+03	2.45E+03
NH3	17	mol	0.00E+00	0.00E+00	2.76E+04	0.00E+00	9.18E+03	4.24E+02	0.00E+00	1.63E+03	0.00E+00	0.00E+00	1.48E+05	1.48E+05
Ni	58.7	mol	2.35E+04	1.08E+03	3.27E+03	2.42E+03	3.29E+04	5.67E+02	2.88E+03	1.86E+03	0.00E+00	1.16E+02	4.19E+03	3.29E+04
NO2	46.0	mol	6.33E+06	1.07E+07	8.89E+06	9.96E+06	4.33E+06	3.85E+06	6.59E+06	1.00E+07	4.76E+06	2.37E+06	5.02E+06	1.07E+07
NO3	62.0	mol	1.17E+07	1.17E+07	1.11E+07	1.11E+07	1.11E+07	8.98E+06	7.69E+06	1.32E+07	3.47E+06	9.19E+05	5.97E+06	1.32E+07
OH	17.0	mol	2.20E+06	1.54E+07	1.47E+07	1.21E+07	2.28E+06	1.02E+07	5.08E+06	2.25E+07	2.04E+06	3.79E+04	4.06E+06	2.25E+07
Oxalate	88.0	mol	0.00E+00	1.74E+05	2.84E+05	2.49E+05	1.41E+06	8.63E+04	0.00E+00	2.94E+05	4.45E+04	1.36E+05	4.97E+01	1.41E+06

CALCULATION SHEET

PROJECT: RPP-WTP
JOB NO.: 24590
CALC NO.: 24590-WTP-M4C-FRP-00001
SHEET REV: 0A
SHEET NO.: 24

BY: E. Berríos
DATE: 12/04/02

SUBJECT: Updated Emissions Run Feed Vector

Analyte	MW g/mol	Unit	Tank											
			AN-102	AN-103	AN-104	AN-105	AN-107	AP-101	AP-104	AW-101	AZ-101	AZ-102	SY-101	Max Feed*
Pb	207.2	mol	2.63E+03	2.22E+03	1.16E+03	1.27E+03	6.47E+03	3.05E+02	5.07E+02	3.56E+03	0.00E+00	1.65E+02	7.63E+02	6.47E+03
Pd	105.4	mol	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.02E+01	0.00E+00	0.00E+00	6.02E+01
PO4	94.9	mol	1.89E+05	9.38E+04	1.82E+05	2.66E+05	5.62E+04	4.27E+04	2.02E+05	1.17E+05	4.24E+04	1.61E+04	1.25E+05	2.66E+05
Pr	140.9	mol	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.17E-01	5.06E+00	0.00E+00	1.36E+00	5.27E-01	0.00E+00	5.06E+00
Rb	85.5	mol	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.95E+02	1.38E+02	0.00E+00	1.78E+02	1.32E+02	0.00E+00	1.95E+02
Rh	102.9	mol	0.00E+00	0.00E+00	0.00E+00	0.00E+00	8.04E+02	0.00E+00	2.22E+02	0.00E+00	6.63E+01	1.73E+02	0.00E+00	8.04E+02
Ru	101.1	mol	0.00E+00	0.00E+00	8.90E+02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.50E+01	9.39E+01	0.00E+00	8.90E+02
Sb	121.7	mol	0.00E+00	1.55E+03	1.16E+03	1.12E+03	8.37E+00	1.45E+00	9.20E-01	1.35E+03	1.58E+00	9.28E-01	7.78E+02	1.55E+03
Se	78.9	mol	0.00E+00	2.76E+03	2.96E+03	2.87E+03	8.72E+02	1.23E+02	3.61E+02	1.52E+03	9.44E+02	2.81E+02	2.00E+03	2.96E+03
Si	28.1	mol	2.58E+03	7.19E+04	1.26E+05	6.30E+04	0.00E+00	2.06E+04	6.90E+03	6.30E+04	6.30E+04	6.30E+04	7.69E+03	1.26E+05
SO4	96.1	mol	5.68E+05	1.14E+05	4.27E+05	2.97E+05	3.22E+05	1.77E+05	1.46E+05	1.32E+05	4.72E+05	5.96E+05	1.22E+05	5.96E+05
Sr	87.6	mol	8.28E+01	3.61E+02	2.67E+02	1.35E+02	1.05E+02	1.83E+01	1.20E+02	1.22E+02	1.38E+02	3.89E+01	1.80E+02	3.61E+02
Ta	180.9	mol	0.00E+00	2.67E+02	0.00E+00	4.01E+02	4.28E+02	2.07E+00	7.96E-01	0.00E+00	1.06E+00	4.11E-01	0.00E+00	4.28E+02
Te	127.6	mol	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.59E+00	0.00E+00	1.50E+00	6.45E-01	0.00E+00	5.59E+00
Th	232.0	mol	0.00E+00	2.08E+02	0.00E+00	3.13E+02	0.00E+00	2.00E-01	4.57E+00	0.00E+00	7.84E-01	2.67E-01	0.00E+00	3.13E+02
Ti	47.9	mol	4.36E+02	6.60E+02	4.89E+02	4.74E+02	3.24E+02	5.55E+01	2.19E+02	7.22E+02	2.53E+02	7.12E+01	3.30E+02	7.22E+02
TIC as CO3	60.0	mol	4.42E+06	1.53E+06	3.28E+06	3.85E+06	3.47E+06	2.27E+06	1.18E+06	1.98E+06	1.72E+06	1.80E+06	1.50E+06	4.42E+06
Tl	204.4	mol	0.00E+00	3.09E+03	2.29E+03	2.23E+03	1.95E+00	3.71E-01	1.03E+00	1.18E+03	9.39E-01	3.64E-01	1.54E+03	3.09E+03
U(total)	238.0	mol	3.09E+02	5.88E+02	2.11E+03	1.14E+03	1.44E+03	9.79E+02	1.83E+02	1.13E+04	1.56E+01	1.64E+02	3.42E+01	1.13E+04
V	50.9	mol	2.06E+03	3.10E+03	2.32E+03	2.24E+03	0.00E+00	6.19E+01	1.03E+03	4.60E+02	1.89E+02	7.27E+01	1.55E+03	3.10E+03
W	183.9	mol	0.00E+00	2.92E+03	0.00E+00	0.00E+00	2.82E+03	6.58E+02	2.04E+03	0.00E+00	0.00E+00	1.02E+02	0.00E+00	2.92E+03
Y	88.9	mol	0.00E+00	1.09E+02	0.00E+00	1.63E+02	2.92E+02	0.00E+00	1.18E+02	0.00E+00	0.00E+00	8.36E-01	0.00E+00	2.92E+02
Zn	65.4	mol	3.20E+02	1.68E+03	1.35E+03	3.03E+03	1.07E+03	3.61E+02	1.61E+02	2.03E+03	1.85E+02	5.21E+01	2.51E+02	3.03E+03
Zr	91.2	mol	3.60E+02	3.83E+02	6.92E+02	4.86E+02	2.69E+03	6.47E+01	1.15E+02	2.28E+03	1.48E+02	3.74E+01	1.73E+02	2.69E+03

* Except for Na which is the minimum.

CALCULATION SHEET

PROJECT: RPP-WTP
JOB NO.: 24590
CALC NO.: 24590-WTP-M4C-FRP-00001
SHEET REV: 0A
SHEET NO.: 25

BY: E. Berríos
DATE: 12/04/02

SUBJECT: Updated Emissions Run Feed Vector

Table A-3 LAW Radionuclide Feed Quantities in Curies

Analyte	Unit	Tank											
		AN-102	AN-103	AN-104	AN-105	AN-107	AP-101	AP-104	AW-101	AZ-101	AZ-102	SY-101	Max
106Ru	Ci	1.73E-04	2.21E-04	2.00E-04	2.23E-04	8.35E-05	1.16E-04	7.59E-05	2.17E-04	3.05E-04	6.25E-05	6.61E-05	3.05E-04
113mCd	Ci	1.57E+02	2.00E+02	1.82E+02	2.02E+02	7.59E+01	1.05E+02	9.08E+01	1.98E+02	3.24E+02	6.32E+01	7.85E+01	3.24E+02
125Sb	Ci	8.65E+01	1.10E+02	9.98E+01	1.11E+02	4.17E+01	2.12E+02	4.23E+01	1.08E+02	4.02E+03	3.17E+03	3.69E+01	4.02E+03
126Sn	Ci	4.87E+00	1.81E+01	1.30E+01	6.27E+00	3.02E+01	3.57E+00	3.04E+00	6.10E+00	7.89E+00	1.80E+00	2.61E+00	3.02E+01
129I	Ci	4.60E-01	9.24E-01	7.13E-01	9.05E-01	3.71E-01	3.39E-01	5.82E-01	1.13E+00	2.69E-01	1.16E-01	4.36E-01	1.13E+00
134Cs	Ci	2.17E+00	1.31E+00	1.24E+00	1.38E+00	1.05E+00	1.57E+02	9.25E-01	1.35E+02	1.45E+04	2.38E+03	1.13E+00	1.45E+04
137Cs	Ci	1.46E+06	1.90E+06	1.99E+06	1.51E+06	1.07E+06	5.97E+05	8.94E+05	1.72E+06	5.65E+06	3.35E+06	6.79E+05	5.65E+06
137mBa	Ci	1.38E+06	1.80E+06	1.88E+06	1.43E+06	1.01E+06	5.65E+05	8.46E+05	1.63E+06	5.35E+06	3.17E+06	6.42E+05	5.35E+06
14C	Ci	2.49E+00	5.34E+01	4.68E+01	5.25E+01	1.26E+00	1.11E+00	2.66E+00	3.94E+01	6.19E+00	3.17E+00	2.99E+00	5.34E+01
151Sm	Ci	2.68E+04	3.41E+04	3.09E+04	3.45E+04	1.29E+04	1.79E+04	0.00E+00	3.36E+04	4.99E+04	9.94E+03	1.45E+04	4.99E+04
152Eu	Ci	8.09E+00	1.03E+01	9.34E+00	1.04E+01	3.90E+00	8.13E+00	4.17E+00	1.02E+01	2.63E+02	5.02E+01	3.67E+00	2.63E+02
154Eu	Ci	7.97E+02	7.87E+02	3.11E+02	2.53E+02	2.46E+03	7.97E+00	1.80E+02	2.48E+02	1.98E+02	2.01E+02	7.97E+01	2.46E+03
155Eu	Ci	4.08E+02	1.27E+02	2.93E+02	1.55E+02	1.50E+03	4.91E+00	6.24E+01	7.77E+02	2.57E+02	3.83E+02	2.47E+02	1.50E+03
226Ra	Ci	3.23E-04	4.12E-04	3.73E-04	4.17E-04	1.56E-04	2.16E-04	2.39E-04	4.06E-04	4.65E-04	9.52E-05	1.92E-04	4.65E-04
227Ac	Ci	3.30E-03	2.42E-03	2.19E-03	4.25E-03	1.59E-03	1.27E-03	1.16E-03	4.13E-03	5.18E-03	1.04E-03	2.00E-03	5.18E-03
228Ra	Ci	3.45E-01	9.05E-01	8.20E-01	5.02E-01	1.88E-01	4.75E-01	8.57E-02	4.58E-01	9.72E-08	1.32E-03	7.44E-02	9.05E-01
229Th	Ci	1.65E-02	2.10E-02	1.90E-02	2.13E-02	7.96E-03	1.10E-02	3.85E-03	2.07E-02	3.89E-06	6.37E-05	3.33E-03	2.13E-02
231Pa	Ci	8.90E-03	1.13E-02	1.03E-02	1.15E-02	4.29E-03	5.94E-03	6.21E-03	1.11E-02	1.51E-02	2.99E-03	5.30E-03	1.51E-02
232Th	Ci	7.88E-04	7.10E-02	6.25E-02	1.12E-01	4.18E-02	5.79E-02	1.16E-04	5.14E-02	1.57E-07	6.78E-06	1.51E-02	1.12E-01
232U	Ci	3.29E-02	4.10E-02	1.72E-01	1.16E-01	2.53E-01	6.21E-02	1.27E-02	5.08E-01	6.30E-05	8.01E-05	2.59E-03	5.08E-01
233U	Ci	1.35E-01	1.69E-01	7.04E-01	4.76E-01	1.04E+00	2.55E-01	5.23E-02	2.08E+00	2.57E-04	3.10E-04	1.06E-02	2.08E+00
234U	Ci	2.78E-02	5.95E-02	2.37E-01	1.08E-01	1.33E-01	8.64E-02	1.63E-02	1.21E+00	1.79E-03	2.15E-02	2.99E-03	1.21E+00
235U	Ci	1.11E-03	2.31E-03	8.12E-03	4.24E-03	5.15E-03	3.56E-03	6.63E-04	4.67E-02	6.80E-05	7.04E-04	1.21E-04	4.67E-02
236U	Ci	9.90E-04	3.47E-03	1.12E-02	4.90E-03	4.69E-03	3.02E-03	5.33E-04	1.40E-01	1.45E-04	1.65E-03	9.42E-05	1.40E-01
237Np	Ci	5.56E+00	6.11E-01	5.67E-01	6.13E-01	1.84E-01	2.29E-02	7.47E-01	5.23E-01	1.29E-01	3.58E-01	9.45E-02	5.56E+00
238Pu	Ci	5.43E-01	2.75E-01	3.79E-01	2.16E-01	5.27E+00	6.16E-02	2.38E-02	1.47E+01	1.71E-01	2.63E+00	4.36E-03	1.47E+01
238U	Ci	2.46E-02	4.66E-02	1.68E-01	9.03E-02	1.14E-01	7.80E-02	1.47E-02	9.00E-01	1.24E-03	1.31E-02	2.72E-03	9.00E-01
239Pu	Ci	1.77E+01	5.43E+00	8.62E+00	5.80E+00	1.74E+02	4.55E-01	7.31E-01	9.92E+01	1.48E+00	2.38E+01	1.56E-01	1.74E+02
240Pu	Ci	3.12E+00	1.13E+00	1.70E+00	1.09E+00	3.08E+01	7.67E-02	1.24E-01	2.73E+01	4.47E-01	7.04E+00	2.66E-02	3.08E+01
241Am	Ci	5.68E+02	1.99E+01	5.29E+01	2.08E+01	2.47E+03	7.11E-01	1.18E+01	1.05E+02	2.13E+00	1.24E+00	8.92E-01	2.47E+03
241Pu	Ci	2.94E+01	1.75E+01	2.38E+01	1.26E+01	2.85E+02	7.90E-01	1.04E+00	7.23E+02	1.32E+01	2.01E+02	2.23E-01	7.23E+02
242Cm	Ci	1.52E+00	3.83E-02	1.20E-01	4.62E-02	6.23E+00	1.63E-06	3.70E-02	1.56E-01	1.90E-03	1.06E-01	2.34E-03	6.23E+00

CALCULATION SHEET

PROJECT: RPP-WTP
JOB NO.: 24590
CALC NO.: 24590-WTP-M4C-FRP-00001
SHEET REV: 0A
SHEET NO.: 26

BY: E. Berríos
DATE: 12/04/02

SUBJECT: Updated Emissions Run Feed Vector

Analyte	Unit	Tank											
		AN-102	AN-103	AN-104	AN-105	AN-107	AP-101	AP-104	AW-101	AZ-101	AZ-102	SY-101	Max
242Pu	Ci	2.20E-04	1.15E-04	1.55E-04	8.78E-05	2.14E-03	6.96E-06	8.05E-06	3.87E-03	6.90E-05	1.06E-03	1.72E-06	3.87E-03
243Am	Ci	2.23E-02	1.33E-03	2.91E-03	9.10E-04	1.01E-01	3.55E-05	4.20E-04	7.21E-03	4.48E-04	1.62E-04	3.17E-05	1.01E-01
243Cm	Ci	1.27E-01	3.40E-03	1.02E-02	4.00E-03	5.18E-01	1.47E-04	1.49E-02	7.68E-02	2.78E-04	1.55E-02	1.89E-04	5.18E-01
244Cm	Ci	9.94E-01	4.21E-02	9.40E-02	3.40E-02	3.60E+00	3.19E-03	3.27E-01	1.79E+00	6.24E-03	2.05E-03	1.66E-03	3.60E+00
3H	Ci	2.26E+00	9.01E+00	2.47E+01	4.98E+00	2.43E+00	1.96E+01	2.78E+00	2.74E+01	5.48E+01	1.16E+02	7.14E+02	7.14E+02
59Ni	Ci	1.74E+00	5.05E+00	4.49E+00	5.03E+00	8.41E-01	1.16E+00	1.86E+00	4.26E+00	0.00E+00	3.66E-02	5.33E-01	5.05E+00
60Co	Ci	2.73E+02	4.12E+01	6.33E+01	5.52E+01	4.04E+02	1.26E+01	2.77E+01	6.71E+01	5.92E+01	5.85E+01	3.23E+01	4.04E+02
63Ni	Ci	1.64E+02	4.79E+02	4.26E+02	4.77E+02	7.93E+01	1.10E+02	1.79E+02	4.03E+02	0.00E+00	3.44E+00	4.98E+01	4.79E+02
79Se	Ci	2.14E+00	2.06E+00	2.54E+00	1.04E+00	2.58E+00	2.45E-01	3.16E+00	2.42E+00	4.44E+00	1.43E+00	6.83E-01	4.44E+00
90Sr	Ci	2.97E+05	7.40E+03	8.55E+04	3.10E+04	3.02E+05	3.62E+02	7.76E+03	8.93E+04	3.03E+03	7.00E+03	9.66E+03	3.02E+05
90Y	Ci	2.97E+05	7.40E+03	8.55E+04	3.10E+04	3.02E+05	3.62E+02	7.76E+03	8.93E+04	3.03E+03	7.00E+03	9.66E+03	3.02E+05
93mNb	Ci	3.19E+01	3.63E+01	3.29E+01	4.11E+01	1.54E+01	1.91E+01	1.55E+01	4.00E+01	5.95E+01	1.18E+01	4.16E+00	5.95E+01
93Zr	Ci	3.98E+01	5.06E+01	4.58E+01	5.12E+01	1.92E+01	2.66E+01	1.88E+01	4.98E+01	7.53E+01	1.49E+01	5.02E+00	7.53E+01
99Tc	Ci	4.95E+02	6.93E+02	7.87E+02	1.12E+03	2.60E+02	1.99E+02	7.09E+02	8.37E+02	1.17E+03	6.99E+02	6.43E+02	1.17E+03

CALCULATION SHEET

PROJECT: RPP-WTP
JOB NO.: 24590
CALC NO.: 24590-WTP-M4C-FRP-00001
SHEET REV: 0A
SHEET NO.: 27

BY: E. Berrios
DATE: 12/04/02

SUBJECT: Updated Emissions Run Feed Vector

Table A-4 LAW Chemical Analytes Comparison with SOW Maximums

Analyte	Feed mol	Feed mol/mol Na	Cont Max mol/mol Na	Selected mol/mol Na	Basis	Feed mol
Ag	9.04E+02	1.21E-04	N/A*	1.21E-04	Actual	9.04E+02
Al	8.10E+06	1.08E+00	2.50E-01	2.50E-01	SOWM	1.87E+06
As	4.57E+03	6.11E-04	N/A	6.11E-04	Actual	4.57E+03
B	4.83E+04	6.46E-03	N/A	6.46E-03	Actual	4.83E+04
Ba	1.15E+03	1.54E-04	1.00E-04	1.00E-04	SOWM	7.48E+02
Be	1.76E+03	2.35E-04	N/A	2.35E-04	Actual	1.76E+03
Bi	1.51E+03	2.02E-04	N/A	2.02E-04	Actual	1.51E+03
Ca	5.09E+04	6.80E-03	4.00E-02	4.00E-02	SOWM	2.99E+05
Cd	2.04E+03	2.72E-04	4.00E-03	4.00E-03	SOWM	2.99E+04
Ce	2.26E+03	3.02E-04	N/A	3.02E-04	Actual	2.26E+03
Cl	1.05E+06	1.40E-01	8.90E-02	8.90E-02	SOWM	6.66E+05
CN	4.19E+03	5.61E-04	N/A	5.61E-04	Actual	4.19E+03
Co	2.43E+03	3.25E-04	N/A	3.25E-04	Actual	2.43E+03
Cr	1.41E+05	1.89E-02	2.00E-02	2.00E-02	SOWM	1.50E+05
Cu	1.65E+03	2.21E-04	N/A	2.21E-04	Actual	1.65E+03
F	1.31E+06	1.75E-01	2.00E-01	2.00E-01	SOWM	1.50E+06
Fe	1.04E+05	1.39E-02	1.00E-02	1.00E-02	SOWM	7.48E+04
Hg	2.32E+01	3.11E-06	1.40E-05	1.40E-05	SOWM	1.05E+02
K	4.30E+06	5.75E-01	1.80E-01	1.80E-01	SOWM	1.35E+06
La	8.78E+02	1.17E-04	8.30E-05	8.30E-05	SOWM	6.21E+02
Li	2.96E+04	3.95E-03	N/A	3.95E-03	Actual	2.96E+04
Mg	1.33E+04	1.78E-03	N/A	1.78E-03	Actual	1.33E+04
Mn	3.64E+04	4.87E-03	N/A	4.87E-03	Actual	3.64E+04
Mo	3.88E+03	5.19E-04	N/A	5.19E-04	Actual	3.88E+03
Na	7.48E+06	1.00E+00	N/A	1.00E+00	Actual	7.48E+06
Nd	2.45E+03	3.27E-04	N/A	3.27E-04	Actual	2.45E+03
NH3	1.48E+05	1.98E-02	N/A	1.98E-02	Actual	1.48E+05
Ni	3.29E+04	4.40E-03	3.00E-03	3.00E-03	SOWM	2.24E+04
NO2	1.07E+07	1.43E+00	3.80E-01	3.80E-01	SOWM	2.84E+06
NO3	1.32E+07	1.76E+00	8.00E-01	8.00E-01	SOWM	5.98E+06
OH	2.25E+07	3.00E+00	N/A	3.00E+00	Actual	2.25E+07
Oxalate	1.41E+06	1.88E-01	5.00E-01	5.00E-01	SOWM	3.74E+06
Pb	6.47E+03	8.65E-04	6.80E-04	6.80E-04	SOWM	5.09E+03
Pd	6.02E+01	8.04E-06	N/A	8.04E-06	Actual	6.02E+01
PO4	2.66E+05	3.56E-02	1.30E-01	1.30E-01	SOWM	9.72E+05
Pr	5.06E+00	6.77E-07	N/A	6.77E-07	Actual	5.06E+00
Rb	1.95E+02	2.61E-05	N/A	2.61E-05	Actual	1.95E+02
Rh	8.04E+02	1.07E-04	N/A	1.07E-04	Actual	8.04E+02
Ru	8.90E+02	1.19E-04	N/A	1.19E-04	Actual	8.90E+02
Sb	1.55E+03	2.07E-04	N/A	2.07E-04	Actual	1.55E+03
Se	2.96E+03	3.96E-04	N/A	3.96E-04	Actual	2.96E+03
Si	1.26E+05	1.68E-02	N/A	1.68E-02	Actual	1.26E+05
SO4	5.96E+05	7.97E-02	7.00E-02	7.00E-02	SOWM	5.23E+05
Sr	3.61E+02	4.82E-05	N/A	4.82E-05	Actual	3.61E+02
Ta	4.28E+02	5.73E-05	N/A	5.73E-05	Actual	4.28E+02
Te	5.59E+00	7.47E-07	N/A	7.47E-07	Actual	5.59E+00
Th	3.13E+02	4.18E-05	N/A	4.18E-05	Actual	3.13E+02

CALCULATION SHEET

PROJECT: RPP-WTP
JOB NO.: 24590
CALC NO.: 24590-WTP-M4C-FRP-00001
SHEET REV: 0A
SHEET NO.: 28

BY: E. Berríos
DATE: 12/04/02

SUBJECT: Updated Emissions Run Feed Vector

Analyte	Feed mol	Feed mol/mol Na	Cont Max mol/mol Na	Selected mol/mol Na	Basis	Feed mol
Ti	7.22E+02	9.66E-05	N/A	9.66E-05	Actual	7.22E+02
TIC as CO3	4.42E+06	5.91E-01	3.00E-01	3.00E-01	SOWM	2.24E+06
Tl	3.09E+03	4.13E-04	N/A	4.13E-04	Actual	3.09E+03
U(total)	1.13E+04	1.52E-03	1.20E-03	1.20E-03	SOWM	8.97E+03
V	3.10E+03	4.15E-04	N/A	4.15E-04	Actual	3.10E+03
W	2.92E+03	3.90E-04	N/A	3.90E-04	Actual	2.92E+03
Y	2.92E+02	3.91E-05	N/A	3.91E-05	Actual	2.92E+02
Zn	3.03E+03	4.05E-04	N/A	4.05E-04	Actual	3.03E+03
Zr	2.69E+03	3.59E-04	N/A	3.59E-04	Actual	2.69E+03

N/A = none available
SOWM = statement of work maximum

CALCULATION SHEET

PROJECT: RPP-WTP
JOB NO.: 24590
CALC NO.: 24590-WTP-M4C-FRP-00001
SHEET REV: 0A
SHEET NO.: 29

BY: E. Berríos
DATE: 12/04/02

SUBJECT: Updated Emissions Run Feed Vector

Table A-5 LAW Radionuclide Comparison with SOW Maximums

Analyte	Ci	Ci/mol Na	Bq/mol Na	CM	Selected Bq/mol Na	Basis	Selected Ci/mol Na	Selected Ci
106Ru	3.05E-04	4.08E-11	1.51E+00	N/A	1.51E+00	Actual	4.08E-11	3.05E-04
113mCd	3.24E+02	4.33E-05	1.60E+06	N/A	1.60E+06	Actual	4.33E-05	3.24E+02
125Sb	4.02E+03	5.38E-04	1.99E+07	N/A	1.99E+07	Actual	5.38E-04	4.02E+03
126Sn	3.02E+01	4.04E-06	1.49E+05	N/A	1.49E+05	Actual	4.04E-06	3.02E+01
129I	1.13E+00	1.51E-07	5.59E+03	N/A	5.59E+03	Actual	1.51E-07	1.13E+00
134Cs	1.45E+04	1.94E-03	7.17E+07	N/A	7.17E+07	Actual	1.94E-03	1.45E+04
137Cs	5.65E+06	7.56E-01	2.80E+10	2.00E+10	2.00E+10	SOWM	5.41E-01	4.04E+06
137mBa	5.35E+06	7.15E-01	2.65E+10	N/A	2.65E+10	Actual	7.15E-01	5.35E+06
14C	5.34E+01	7.14E-06	2.64E+05	N/A	2.64E+05	Actual	7.14E-06	5.34E+01
151Sm	4.99E+04	6.67E-03	2.47E+08	N/A	2.47E+08	Actual	6.67E-03	4.99E+04
152Eu	2.63E+02	3.52E-05	1.30E+06	N/A	1.30E+06	Actual	3.52E-05	2.63E+02
154Eu	2.46E+03	3.29E-04	1.22E+07	4.30E+06	4.30E+06	SOWM	1.16E-04	8.69E+02
155Eu	1.50E+03	2.01E-04	7.42E+06	N/A	7.42E+06	Actual	2.01E-04	1.50E+03
226Ra	4.65E-04	6.22E-11	2.30E+00	N/A	2.30E+00	Actual	6.22E-11	4.65E-04
227Ac	5.18E-03	6.93E-10	2.56E+01	N/A	2.56E+01	Actual	6.93E-10	5.18E-03
228Ra	9.05E-01	1.21E-07	4.48E+03	N/A	4.48E+03	Actual	1.21E-07	9.05E-01
229Th	2.13E-02	2.85E-09	1.05E+02	N/A	1.05E+02	Actual	2.85E-09	2.13E-02
231Pa	1.51E-02	2.02E-09	7.47E+01	N/A	7.47E+01	Actual	2.02E-09	1.51E-02
232Th	1.12E-01	1.50E-08	5.54E+02	N/A	5.54E+02	Actual	1.50E-08	1.12E-01
232U	5.08E-01	6.79E-08	2.51E+03	N/A	2.51E+03	Actual	6.79E-08	5.08E-01
233U	2.08E+00	2.78E-07	1.03E+04	N/A	1.03E+04	Actual	2.78E-07	2.08E+00
234U	1.21E+00	1.62E-07	5.99E+03	N/A	5.99E+03	Actual	1.62E-07	1.21E+00
235U	4.67E-02	6.24E-09	2.31E+02	N/A	2.31E+02	Actual	6.24E-09	4.67E-02
236U	1.40E-01	1.87E-08	6.93E+02	N/A	6.93E+02	Actual	1.87E-08	1.40E-01
237Np	5.56E+00	7.43E-07	2.75E+04	7.78E+02	7.78E+02	SOWM	2.10E-08	1.57E-01
238Pu	1.47E+01	1.97E-06	7.27E+04	2.06E+03	2.06E+03	SOWM	5.56E-08	4.16E-01
238U	9.00E-01	1.20E-07	4.45E+03	N/A	4.45E+03	Actual	1.20E-07	9.00E-01
239Pu	1.74E+02	2.33E-05	8.61E+05	2.44E+04	2.44E+04	SOWM	6.58E-07	4.92E+00
240Pu	3.08E+01	4.12E-06	1.52E+05	4.31E+03	4.31E+03	SOWM	1.17E-07	8.72E-01
241Am	2.47E+03	3.30E-04	1.22E+07	3.46E+05	3.46E+05	SOWM	9.35E-06	6.99E+01
241Pu	7.23E+02	9.67E-05	3.58E+06	1.01E+05	1.01E+05	SOWM	2.74E-06	2.05E+01
242Cm	6.23E+00	8.33E-07	3.08E+04	8.72E+02	8.72E+02	SOWM	2.36E-08	1.76E-01
242Pu	3.87E-03	5.18E-10	1.91E+01	5.42E-01	5.42E-01	SOWM	1.46E-11	1.10E-04
243Am	1.01E-01	1.35E-08	5.00E+02	1.41E+01	1.41E+01	SOWM	3.82E-10	2.86E-03
243Cm	5.18E-01	6.93E-08	2.56E+03	7.25E+01	7.25E+01	SOWM	1.96E-09	1.47E-02
244Cm	3.60E+00	4.81E-07	1.78E+04	5.04E+02	5.04E+02	SOWM	1.36E-08	1.02E-01
3H	7.14E+02	9.55E-05	3.53E+06	N/A	3.53E+06	Actual	9.55E-05	7.14E+02
59Ni	5.05E+00	6.75E-07	2.50E+04	N/A	2.50E+04	Actual	6.75E-07	5.05E+00
60Co	4.04E+02	5.40E-05	2.00E+06	3.70E+05	3.70E+05	SOWM	1.00E-05	7.48E+01
63Ni	4.79E+02	6.41E-05	2.37E+06	N/A	2.37E+06	Actual	6.41E-05	4.79E+02
79Se	4.44E+00	5.94E-07	2.20E+04	N/A	2.20E+04	Actual	5.94E-07	4.44E+00
90Sr	3.02E+05	4.04E-02	1.49E+09	8.00E+08	8.00E+08	SOWM	2.16E-02	1.62E+05
90Y	3.02E+05	4.04E-02	1.49E+09	N/A	1.49E+09	Actual	4.04E-02	3.02E+05
93mNb	5.95E+01	7.96E-06	2.94E+05	N/A	2.94E+05	Actual	7.96E-06	5.95E+01
93Zr	7.53E+01	1.01E-05	3.73E+05	N/A	3.73E+05	Actual	1.01E-05	7.53E+01
99Tc	1.17E+03	1.56E-04	5.79E+06	7.10E+06	7.10E+06	SOWM	1.92E-04	1.44E+03

NA = none available
SOWM = Statement of Work maximum

CALCULATION SHEET

PROJECT: RPP-WTP
JOB NO.: 24590
CALC NO.: 24590-WTP-M4C-FRP-00001
SHEET REV: 0A
SHEET NO.: 30

BY: E. Berrios
DATE: 12/04/02

SUBJECT: Updated Emissions Run Feed Vector

Table A-6 LAW Chemical Analytes Feed Charge Balance

Analyte	Charge	mol	Total Charge
Ag	1	9.04E+02	9.04E+02
Al	3	1.87E+06	5.61E+06
As	5	4.57E+03	2.28E+04
B	3	4.83E+04	1.45E+05
Ba	2	7.48E+02	1.50E+03
Be	0	1.76E+03	0.00E+00
Bi	3	1.51E+03	4.54E+03
Ca	2	2.99E+05	5.98E+05
Cd	2	2.99E+04	5.98E+04
Ce	3	2.26E+03	6.77E+03
Cl	-1	6.66E+05	-6.66E+05
CN	0	4.19E+03	0.00E+00
Co	0	2.43E+03	0.00E+00
Cr	3	1.50E+05	4.49E+05
Cu	2	1.65E+03	3.31E+03
F	-1	1.50E+06	-1.50E+06
Fe	3	7.48E+04	2.24E+05
Hg	2	1.05E+02	2.09E+02
K	1	1.35E+06	1.35E+06
La	3	6.21E+02	1.86E+03
Li	1	2.96E+04	2.96E+04
Mg	2	1.33E+04	2.67E+04
Mn	4	3.64E+04	1.46E+05
Mo	0	3.88E+03	0.00E+00
Na	1	7.48E+06	7.48E+06
Nd	0	2.45E+03	0.00E+00
NH3	0	1.48E+05	0.00E+00
Ni	2	2.24E+04	4.49E+04
NO2	-1	2.84E+06	-2.84E+06
NO3	-1	5.98E+06	-5.98E+06
OH	-1	2.25E+07	-2.25E+07
Oxalate	-2	3.74E+06	-7.48E+06
Pb	2	5.09E+03	1.02E+04
Pd	2	6.02E+01	1.20E+02
PO4	-3	9.72E+05	-2.92E+06
Pr	0	5.06E+00	0.00E+00
Rb	0	1.95E+02	0.00E+00
Rh	0	8.04E+02	0.00E+00
Ru	0	8.90E+02	0.00E+00
Sb	0	1.55E+03	0.00E+00
Se	0	2.96E+03	0.00E+00
Si	4	1.26E+05	5.04E+05
SO4	-2	5.23E+05	-1.05E+06
Sr	2	3.61E+02	7.21E+02
Ta	0	4.28E+02	0.00E+00

CALCULATION SHEET

PROJECT: RPP-WTP
JOB NO.: 24590
CALC NO.: 24590-WTP-M4C-FRP-00001
SHEET REV: 0A
SHEET NO.: 31

BY: E. Berríos
DATE: 12/04/02

SUBJECT: Updated Emissions Run Feed Vector

Analyte	Charge	mol	Total Charge
Te	0	5.59E+00	0.00E+00
Th	0	3.13E+02	0.00E+00
Ti	4	7.22E+02	2.89E+03
TIC as CO3	-2	2.24E+06	-4.49E+06
Tl	0	3.09E+03	0.00E+00
U(total)	0	8.97E+03	0.00E+00
V	0	3.10E+03	0.00E+00
W	0	2.92E+03	0.00E+00
Y	0	2.92E+02	0.00E+00
Zn	2	3.03E+03	6.06E+03
Zr	4	2.69E+03	1.07E+04
Total charge			-32652326

CALCULATION SHEET

PROJECT: RPP-WTP
JOB NO.: 24590
CALC NO.: 24590-WTP-M4C-FRP-00001
SHEET REV: 0A
SHEET NO.: 32

BY: E. Berríos
DATE: 12/04/02

SUBJECT: Updated Emissions Run Feed Vector

Table A-7 LAW Radionuclide Feed Charge Balance

Analyte	Charge	Ci/kmol	Ci	mol	Total Charge
106Ru	0		3.05E-04		0.00E+00
113mCd	0		3.24E+02		0.00E+00
125Sb	3	1.30E+08	4.02E+03	3.09E-02	9.28E-02
126Sn	2	1.43E+03	3.02E+01	2.11E+01	4.22E+01
129I	-1	2.28E+01	1.13E+00	4.96E+01	-4.96E+01
134Cs	0		1.45E+04		0.00E+00
137Cs	1	1.19E+07	4.04E+06	3.40E+02	3.40E+02
137mBa	0		5.35E+06		0.00E+00
14C	4	6.26E+04	5.34E+01	8.53E-01	3.41E+00
151Sm	3	3.97E+06	4.99E+04	1.26E+01	3.77E+01
152Eu	3	2.64E+07	2.63E+02	9.96E-03	2.99E-02
154Eu	3	4.16E+07	8.69E+02	2.09E-02	6.27E-02
155Eu	3	7.53E+07	1.50E+03	1.99E-02	5.98E-02
226Ra	0		4.65E-04		0.00E+00
227Ac	0		5.18E-03		0.00E+00
228Ra	0		9.05E-01		0.00E+00
229Th	0		2.13E-02		0.00E+00
231Pa	0		1.51E-02		0.00E+00
232Th	4	2.55E-02	1.12E-01	4.39E+03	1.76E+04
232U	0		5.08E-01		0.00E+00
233U	6	2.25E+03	2.08E+00	9.24E-01	5.55E+00
234U	6	1.45E+03	1.21E+00	8.34E-01	5.01E+00
235U	6	5.08E-01	4.67E-02	9.19E+01	5.52E+02
236U	6	1.52E+01	1.40E-01	9.21E+00	5.53E+01
237Np	4	1.67E+02	1.57E-01	9.42E-01	3.77E+00
238Pu	4	4.08E+06	4.16E-01	1.02E-04	4.08E-04
238U	6	8.00E-02	9.00E-01	1.13E+04	6.75E+04
239Pu	4	1.48E+04	4.92E+00	3.33E-01	1.33E+00
240Pu	4	5.45E+04	8.72E-01	1.60E-02	6.40E-02
241Am	3	8.26E+05	6.99E+01	8.46E-02	2.54E-01
241Pu	4	2.48E+07	2.05E+01	8.25E-04	3.30E-03
242Cm	0		1.76E-01		0.00E+00
242Pu	0		1.10E-04		0.00E+00
243Am	0		2.86E-03		0.00E+00
243Cm	3	1.23E+07	1.47E-02	1.19E-06	3.58E-06
244Cm	3	2.62E+07	1.02E-01	3.89E-06	1.17E-05
3H	1	2.90E+07	7.14E+02	2.46E-02	2.46E-02
59Ni	0		5.05E+00		0.00E+00
60Co	3	6.78E+07	7.48E+01	1.10E-03	3.31E-03
63Ni	2	3.57E+06	4.79E+02	1.34E-01	2.68E-01
79Se	0		4.44E+00		0.00E+00
90Sr	2	1.24E+07	1.62E+05	1.30E+01	2.61E+01
90Y	0		3.02E+05		0.00E+00
93mNb	0		5.95E+01		0.00E+00
93Zr	0		7.53E+01		0.00E+00

CALCULATION SHEET

PROJECT: RPP-WTP
JOB NO.: 24590
CALC NO.: 24590-WTP-M4C-FRP-00001
SHEET REV: 0A
SHEET NO.: 33

BY: E. Berrios
DATE: 12/04/02

SUBJECT: Updated Emissions Run Feed Vector

Analyte	Charge	Ci/kmol	Ci	mol	Total Charge
99Tc	7	1.68E+03	1.44E+03	8.54E+02	5.98E+03
Total charge					92071

CALCULATION SHEET

PROJECT: RPP-WTP
JOB NO.: 24590
CALC NO.: 24590-WTP-M4C-FRP-00001
SHEET REV: 0A
SHEET NO.: 34

BY: E. Berríos
DATE: 12/04/02

SUBJECT: Updated Emissions Run Feed Vector

Table A-8 Adjustment of Chemical Analytes Positive Charges

Analyte	mol	Charge	Adjusted Total Charge	Adjusted moles	Final mol/mol Na
Ag	9.04E+02	1	1.76E+03	1.76E+03	1.21E-04
Al	5.61E+06	3	1.09E+07	3.63E+06	2.50E-01
As	2.28E+04	5	4.43E+04	8.86E+03	6.11E-04
B	1.45E+05	3	2.81E+05	9.38E+04	6.46E-03
Ba	1.50E+03	2	2.90E+03	1.45E+03	1.00E-04
Be	0.00E+00	0			
Bi	4.54E+03	3	8.80E+03	2.93E+03	2.02E-04
Ca	5.98E+05	2	1.16E+06	5.81E+05	4.00E-02
Cd	5.98E+04	2	1.16E+05	5.81E+04	4.00E-03
Ce	6.77E+03	3	1.31E+04	4.38E+03	3.02E-04
Cl	-6.66E+05	-1			
CN	0.00E+00	0			
Co	0.00E+00	0			
Cr	4.49E+05	3	8.71E+05	2.90E+05	2.00E-02
Cu	3.31E+03	2	6.42E+03	3.21E+03	2.21E-04
F	-1.50E+06	-1			
Fe	2.24E+05	3	4.35E+05	1.45E+05	1.00E-02
Hg	2.09E+02	2	4.06E+02	2.03E+02	1.40E-05
K	1.35E+06	1	2.61E+06	2.61E+06	1.80E-01
La	1.86E+03	3	3.61E+03	1.20E+03	8.30E-05
Li	2.96E+04	1	5.74E+04	5.74E+04	3.95E-03
Mg	2.67E+04	2	5.18E+04	2.59E+04	1.78E-03
Mn	1.46E+05	4	2.83E+05	7.07E+04	4.87E-03
Mo	0.00E+00	0			
Na	7.48E+06	1	1.45E+07	1.45E+07	1.00E+00
Nd	0.00E+00	0			
NH3	0.00E+00	0			
Ni	4.49E+04	2	8.71E+04	4.35E+04	3.00E-03
NO2	-2.84E+06	-1			
NO3	-5.98E+06	-1			
OH	-2.25E+07	-1			
Oxalate	-7.48E+06	-2			
Pb	1.02E+04	2	1.97E+04	9.87E+03	6.80E-04
Pd	1.20E+02	2	2.33E+02	1.17E+02	8.04E-06
PO4	-2.92E+06	-3			
Pr	0.00E+00	0			
Rb	0.00E+00	0			
Rh	0.00E+00	0			
Ru	0.00E+00	0			
Sb	0.00E+00	0			
Se	0.00E+00	0			
Si	5.04E+05	4	9.78E+05	2.44E+05	1.68E-02
SO4	-1.05E+06	-2			
Sr	7.21E+02	2	1.40E+03	7.00E+02	4.82E-05

CALCULATION SHEET

PROJECT: RPP-WTP
JOB NO.: 24590
CALC NO.: 24590-WTP-M4C-FRP-00001
SHEET REV: 0A
SHEET NO.: 35

BY: E. Berríos
DATE: 12/04/02

SUBJECT: Updated Emissions Run Feed Vector

Analyte	mol	Charge	Adjusted Total Charge	Adjusted moles	Final mol/mol Na
Ta	0.00E+00	0			
Te	0.00E+00	0			
Th	0.00E+00	0			
Ti	2.89E+03	4	5.61E+03	1.40E+03	9.66E-05
TIC as CO3	-4.49E+06	-2			
Tl	0.00E+00	0			
U(total)	0.00E+00	0			
V	0.00E+00	0			
W	0.00E+00	0			
Y	0.00E+00	0			
Zn	6.06E+03	2	1.18E+04	5.88E+03	4.05E-04
Zr	1.07E+04	4	2.09E+04	5.21E+03	3.59E-04

CALCULATION SHEET

PROJECT: RPP-WTP
JOB NO.: 24590
CALC NO.: 24590-WTP-M4C-FRP-00001
SHEET REV: 0A
SHEET NO.: 36

BY: E. Berríos
DATE: 12/04/02

SUBJECT: Updated Emissions Run Feed Vector

Table A-9 Adjustment of Radionuclide Positive Charges

Analyte	mol	charge	Adjusted total charge	Adjusted Moles	Adjusted Ci	Bq/mol Na
106Ru	0.00E+00	0				
113mCd	0.00E+00	0				
125Sb	3.09E-02	3	1.80E-01	6.00E-02	7.80E+03	1.99E+07
126Sn	2.11E+01	2	8.20E+01	4.10E+01	5.86E+01	1.49E+05
129I	4.96E+01	-1				
134Cs	0.00E+00	0				
137Cs	3.40E+02	1	6.59E+02	6.59E+02	7.85E+06	2.00E+10
137mBa	0.00E+00	0				
14C	8.53E-01	4	6.62E+00	1.66E+00	1.04E+02	2.64E+05
151Sm	1.26E+01	3	7.32E+01	2.44E+01	9.68E+04	2.47E+08
152Eu	9.96E-03	3	5.80E-02	1.93E-02	5.10E+02	1.30E+06
154Eu	2.09E-02	3	1.22E-01	4.05E-02	1.69E+03	4.30E+06
155Eu	1.99E-02	3	1.16E-01	3.87E-02	2.91E+03	7.42E+06
226Ra	0.00E+00	0				
227Ac	0.00E+00	0				
228Ra	0.00E+00	0				
229Th	0.00E+00	0				
231Pa	0.00E+00	0				
232Th	4.39E+03	4	3.41E+04	8.52E+03	2.17E-01	5.54E+02
232U	0.00E+00	0				
233U	9.24E-01	6	1.08E+01	1.79E+00	4.04E+00	1.03E+04
234U	8.34E-01	6	9.72E+00	1.62E+00	2.35E+00	5.99E+03
235U	9.19E+01	6	1.07E+03	1.78E+02	9.06E-02	2.31E+02
236U	9.21E+00	6	1.07E+02	1.79E+01	2.72E-01	6.93E+02
237Np	9.42E-01	4	7.31E+00	1.83E+00	3.05E-01	7.78E+02
238Pu	1.02E-04	4	7.91E-04	1.98E-04	8.07E-01	2.06E+03
238U	1.13E+04	6	1.31E+05	2.18E+04	1.75E+00	4.45E+03
239Pu	3.33E-01	4	2.58E+00	6.46E-01	9.56E+00	2.44E+04
240Pu	1.60E-02	4	1.24E-01	3.10E-02	1.69E+00	4.31E+03
241Am	8.46E-02	3	4.93E-01	1.64E-01	1.36E+02	3.46E+05
241Pu	8.25E-04	4	6.40E-03	1.60E-03	3.97E+01	1.01E+05
242Cm	0.00E+00	0				
242Pu	0.00E+00	0				
243Am	0.00E+00	0				
243Cm	1.19E-06	3	6.94E-06	2.31E-06	2.84E-02	7.25E+01
244Cm	3.89E-06	3	2.26E-05	7.55E-06	1.98E-01	5.04E+02
3H	2.46E-02	1	4.78E-02	4.78E-02	1.39E+03	3.53E+06
59Ni	0.00E+00	0				
60Co	1.10E-03	3	6.42E-03	2.14E-03	1.45E+02	3.70E+05
63Ni	1.34E-01	2	5.21E-01	2.60E-01	9.30E+02	2.37E+06
79Se	0.00E+00	0				
90Sr	1.30E+01	2	5.06E+01	2.53E+01	3.14E+05	8.00E+08
90Y	0.00E+00	0				
93mNb	0.00E+00	0				

CALCULATION SHEET

PROJECT: RPP-WTP
JOB NO.: 24590
CALC NO.: 24590-WTP-M4C-FRP-00001
SHEET REV: 0A
SHEET NO.: 37

BY: E. Berrios
DATE: 12/04/02

SUBJECT: Updated Emissions Run Feed Vector

93Zr	0.00E+00	0				
99Tc	8.54E+02	7	1.16E+04	1.66E+03	2.79E+03	7.10E+06

CALCULATION SHEET

PROJECT: RPP-WTP
JOB NO.: 24590
CALC NO.: 24590-WTP-M4C-FRP-00001
SHEET REV: 0A
SHEET NO.: 38

BY: E. Berríos
DATE: 12/04/02

SUBJECT: Updated Emissions Run Feed Vector

Table A-10 LAW Chemical Analytes Emissions Feed Quantities

Analyte	mol/mol Na	Analyte	mol/mol Na
Ag	1.21E-04	NO2	1.96E-01
Al	2.50E-01	NO3	4.12E-01
As	6.11E-04	OH	1.55E+00
B	6.46E-03	Oxalate	2.58E-01
Ba	1.00E-04	Pb	6.80E-04
Be	1.21E-04	Pd	8.04E-06
Bi	2.02E-04	PO4	6.70E-02
Ca	4.00E-02	Pr	3.49E-07
Cd	4.00E-03	Rb	1.35E-05
Ce	3.02E-04	Rh	5.54E-05
Cl	4.59E-02	Ru	6.13E-05
CN	2.89E-04	Sb	1.07E-04
Co	1.67E-04	Se	2.04E-04
Cr	2.00E-02	Si	1.68E-02
Cu	2.21E-04	SO4	3.61E-02
F	1.03E-01	Sr	4.82E-05
Fe	1.00E-02	Ta	2.95E-05
Hg	1.40E-05	Te	3.85E-07
K	1.80E-01	Th	2.15E-05
La	8.30E-05	Ti	9.66E-05
Li	3.95E-03	TIC as CO3	1.55E-01
Mg	1.78E-03	Tl	2.13E-04
Mn	4.87E-03	U(total)	6.18E-04
Mo	2.67E-04	V	2.14E-04
Na	1.00E+00	W	2.01E-04
Nd	1.69E-04	Y	2.02E-05
NH3	1.02E-02	Zn	4.05E-04
Ni	3.00E-03	Zr	3.59E-04

CALCULATION SHEET

PROJECT: RPP-WTP
JOB NO.: 24590
CALC NO.: 24590-WTP-M4C-FRP-00001
SHEET REV: 0A
SHEET NO.: 39

BY: E. Berríos
DATE: 12/04/02

SUBJECT: Updated Emissions Run Feed Vector

Table A-11 LAW Radionuclide Emissions Feed Quantities

Analyte	Bq/mol Na	Analyte	Bq/mol Na
106Ru	7.78E-01	236U	6.93E+02
113mCd	8.26E+05	237Np	7.78E+02
125Sb	1.99E+07	238Pu	2.06E+03
126Sn	1.49E+05	238U	4.45E+03
129I	2.88E+03	239Pu	2.44E+04
134Cs	3.70E+07	240Pu	4.31E+03
137Cs	2.00E+10	241Am	3.46E+05
137mBa	1.36E+10	241Pu	1.01E+05
14C	2.64E+05	242Cm	4.49E+02
151Sm	2.47E+08	242Pu	2.79E-01
152Eu	1.30E+06	243Am	7.29E+00
154Eu	4.30E+06	243Cm	7.25E+01
155Eu	7.42E+06	244Cm	5.04E+02
226Ra	1.19E+00	3H	3.53E+06
227Ac	1.32E+01	59Ni	1.29E+04
228Ra	2.31E+03	60Co	3.70E+05
229Th	5.43E+01	63Ni	2.37E+06
231Pa	3.85E+01	79Se	1.13E+04
232Th	5.54E+02	90Sr	8.00E+08
232U	1.30E+03	90Y	7.70E+08
233U	1.03E+04	93mNb	1.52E+05
234U	5.99E+03	93Zr	1.92E+05
235U	2.31E+02	99Tc	7.10E+06

Appendix B HLW Calculations

CALCULATION SHEET

PROJECT: RPP-WTP
JOB NO.: 24590
CALC NO.: 24590-WTP-M4C-FRP-00001
SHEET REV: 0A
SHEET NO.: 41

BY: E. Berríos
DATE: 12/04/02

SUBJECT: Updated Emissions Run Feed Vector

Table B-1 HLW Chemical Analytes Feed Quantities in kg

Analyte	Unit	Tank								
		AY-101	AY-102	AZ-101	AZ-102	C-104	C-106	SY-102	AW-104	C-107
Ag	kg	1.17E+02	2.52E+01	4.88E+01	2.37E+02	1.06E+03	2.63E+01	2.98E+01	2.42E+01	2.94E+02
Al	kg	2.71E+04	3.87E+04	1.61E+04	1.99E+04	9.01E+04	1.83E+03	2.28E+04	3.59E+03	5.86E+04
As	kg	9.37E+00	2.09E+01	1.73E+01	8.60E+00	4.87E+01	8.79E-01	5.95E+00	1.50E+01	9.95E+00
B	kg	1.21E+02	3.52E+01	7.83E+01	1.52E+02	1.79E+03	8.98E+00	2.90E+01	8.06E+00	2.08E+02
Ba	kg	2.63E+02	6.84E+02	1.94E+02	0.00E+00	1.47E+02	1.52E+01	2.09E+01	8.27E+00	7.29E+02
Be	kg	2.17E+00	2.63E+00	2.75E+00	1.97E+00	3.81E+01	1.10E-01	2.04E+00	1.11E+00	1.56E+00
Bi	kg	2.13E+00	1.52E+02	1.97E+01	2.53E+01	4.80E+01	1.11E-01	2.80E+03	1.60E+00	1.04E+04
Ca	kg	1.19E+03	4.59E+03	0.00E+00	6.92E+02	2.98E+03	7.85E+01	1.07E+03	9.05E+02	1.24E+03
Cd	kg	6.18E+01	1.03E+02	1.88E+03	2.71E+03	1.03E+03	2.11E+00	1.20E+02	2.94E+01	9.52E+01
Ce	kg	2.96E+02	7.13E+02	2.30E+02	1.41E+02	7.09E+01	2.34E+01	3.91E+01	1.50E+01	7.79E+02
Cl	kg	1.65E+02	1.24E+02	2.92E+01	9.39E+01	7.99E+02	3.78E+00	1.60E+03	5.58E+02	8.70E+02
CN	kg	0.00E+00	0.00E+00	0.00E+00	5.64E+00	2.09E+01	3.53E-01	0.00E+00	0.00E+00	6.11E+00
Co	kg	1.56E+01	2.37E+01	1.23E+01	1.13E+01	9.74E+00	1.11E+00	7.91E+00	3.00E+00	2.65E+01
Cr	kg	1.20E+03	1.48E+03	1.64E+02	4.56E+02	1.46E+03	5.71E+01	1.34E+04	1.61E+02	9.30E+02
Cu	kg	9.75E+01	2.01E+02	6.37E+01	3.80E+01	1.34E+02	6.86E+00	1.85E+01	1.45E+01	2.28E+02
F	kg	9.48E+02	2.49E+02	1.41E+03	4.79E+02	3.46E+04	2.38E+00	5.92E+02	7.88E+02	6.39E+03
Fe	kg	3.57E+04	8.69E+04	2.21E+04	2.32E+04	2.76E+04	3.05E+03	7.61E+03	2.28E+03	1.03E+05
Hg	kg	1.20E+01	1.13E+02	5.58E-01	3.33E+00	8.29E+03	4.39E+00	5.82E+00	0.00E+00	6.70E+01
K	kg	2.93E+02	5.23E+02	9.56E+02	1.51E+03	1.33E+03	2.11E+01	7.63E+02	1.75E+03	4.47E+02
La	kg	1.23E+03	1.12E+03	9.85E+02	7.93E+02	4.87E+01	1.23E+01	4.82E+01	2.00E+01	2.70E+02
Li	kg	2.57E+00	4.34E+01	1.70E+02	1.65E+00	6.05E+00	1.33E+00	2.49E+01	3.11E+00	1.67E+02
Mg	kg	5.02E+02	1.74E+03	1.78E+02	1.78E+02	2.06E+02	2.02E+01	2.33E+02	2.00E+02	4.77E+02
Mn	kg	2.04E+03	1.15E+04	2.84E+02	5.08E+02	7.01E+03	7.59E+02	1.78E+03	7.87E+02	5.02E+03
Mo	kg	1.19E+01	9.17E+00	1.23E+01	2.02E+01	2.40E+01	3.85E-01	0.00E+00	1.29E+01	4.58E+01
Na	kg	4.78E+04	5.33E+04	2.63E+04	2.67E+04	1.78E+05	2.45E+03	7.46E+04	3.31E+04	9.52E+04
Nd	kg	7.41E+02	1.02E+03	5.99E+02	4.90E+02	1.07E+02	3.53E+01	6.83E+01	1.50E+01	6.33E+02
NH3	kg	3.62E+02	1.63E+03	0.00E+00	0.00E+00	2.25E+02	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Ni	kg	1.33E+03	2.11E+03	1.37E+03	1.46E+03	2.63E+03	1.06E+02	2.27E+02	6.29E+01	3.09E+03
NO2	kg	1.35E+04	5.16E+01	1.10E+04	1.67E+04	3.66E+04	8.08E+01	2.31E+04	1.01E+04	3.53E+04
NO3	kg	1.14E+03	2.91E+01	1.03E+04	6.87E+03	1.96E+04	1.18E+01	4.26E+04	1.75E+04	4.78E+04
OH	kg	0.00E+00	0.00E+00	1.39E+03	2.02E+03	0.00E+00	0.00E+00	4.11E+03	1.27E+03	2.29E+05
Oxalate	kg	1.92E+04	1.77E+03	1.47E+03	1.49E+03	5.61E+03	6.92E+01	3.36E+04	6.14E+02	7.36E+02

CALCULATION SHEET

PROJECT: RPP-WTP
JOB NO.: 24590
CALC NO.: 24590-WTP-M4C-FRP-00001
SHEET REV: 0A
SHEET NO.: 42

BY: E. Berríos
DATE: 12/04/02

SUBJECT: Updated Emissions Run Feed Vector

Analyte	Unit	Tank								
		AY-101	AY-102	AZ-101	AZ-102	C-104	C-106	SY-102	AW-104	C-107
Pb	kg	9.56E+02	3.52E+03	8.57E+01	2.71E+02	8.36E+02	1.57E+02	5.53E+02	8.16E+01	1.01E+04
Pd	kg	0.00E+00	0.00E+00	3.74E-04	1.62E+01	0.00E+00	3.88E-01	0.00E+00	0.00E+00	0.00E+00
PO4	kg	3.45E+03	9.04E+03	1.06E+02	6.31E+02	3.21E+03	3.75E+02	6.46E+03	1.77E+02	5.88E+04
Pr	kg	0.00E+00	3.01E+02	1.28E+02	9.27E+01	7.00E+01	1.26E+01	0.00E+00	0.00E+00	2.08E+02
Rb	kg	5.93E-01	0.00E+00	3.74E+00	1.39E+00	2.67E+02	9.07E-02	2.41E+01	0.00E+00	8.43E-01
Rh	kg	6.85E+00	0.00E+00	4.70E+01	9.77E+00	1.44E+02	8.92E-01	0.00E+00	0.00E+00	4.36E+01
Ru	kg	0.00E+00	4.36E+02	3.79E+02	4.37E+01	0.00E+00	1.83E+01	0.00E+00	0.00E+00	9.51E+02
Sb	kg	1.18E+01	2.38E+00	2.15E+00	9.88E+00	5.71E+00	9.97E-02	1.81E+00	9.03E+00	2.41E+00
Se	kg	1.96E+01	5.02E-01	7.16E+00	2.79E+00	3.92E+01	2.11E-02	5.90E+00	1.13E+01	5.01E+00
Si	kg	4.31E+02	1.13E+02	4.47E+02	2.49E+03	1.02E+04	4.15E+01	9.40E+02	4.78E+02	1.87E+03
SO4	kg	3.04E+03	1.51E+03	7.59E+03	7.05E+03	3.42E+03	6.06E+01	1.94E+03	7.36E+02	8.43E+03
Sr	kg	6.68E+01	2.28E+02	9.17E+01	4.79E+01	8.75E+01	6.49E+00	3.84E+01	5.31E+00	2.57E+02
Ta	kg	0.00E+00	0.00E+00	2.15E+00	6.53E-01	1.75E+00	8.79E-02	2.49E+00	0.00E+00	8.47E-01
Te	kg	0.00E+00	9.48E+01	2.36E+01	1.54E+01	0.00E+00	3.98E+00	1.48E+00	0.00E+00	1.80E+02
Th	kg	0.00E+00	4.53E+02	7.78E+01	8.93E+01	5.10E+04	1.89E+01	3.29E+02	1.50E+01	6.61E+02
Ti	kg	3.52E+01	1.10E+02	9.62E+00	1.06E+01	9.80E+01	4.09E+00	1.20E+01	1.60E+01	1.24E+02
TIC as CO3	kg	8.09E+04	5.45E+04	7.50E+03	1.90E+04	4.84E+04	3.25E+03	1.14E+04	1.31E+04	1.14E+04
Tl	kg	5.61E-01	2.96E+00	2.15E+00	6.53E-01	9.74E+01	1.24E-01	4.60E-01	3.00E+01	5.43E+00
U(total)	kg	4.67E+02	2.35E+03	1.63E+03	3.50E+03	3.53E+04	4.11E+01	6.77E+02	6.91E+03	9.29E+03
V	kg	9.80E+00	2.98E+01	5.35E+00	8.32E+00	2.72E+01	1.37E+00	9.06E+00	7.53E+00	2.51E+01
W	kg	0.00E+00	0.00E+00	0.00E+00	4.84E+00	9.60E+02	0.00E+00	0.00E+00	0.00E+00	6.75E+02
Y	kg	0.00E+00	9.81E+01	0.00E+00	3.41E+01	2.82E+01	4.46E+00	1.13E+01	1.50E+00	9.48E+01
Zn	kg	5.33E+01	1.52E+02	2.56E+01	2.45E+01	6.08E+02	4.36E+00	9.85E+00	2.80E+01	1.77E+02
Zr	kg	6.93E+02	2.86E+01	7.85E+03	3.81E+03	6.49E+04	2.65E+00	7.51E+01	2.10E+03	7.39E+01

CALCULATION SHEET

PROJECT: RPP-WTP
JOB NO.: 24590
CALC NO.: 24590-WTP-M4C-FRP-00001
SHEET REV: 0A
SHEET NO.: 43

BY: E. Berrios
DATE: 12/04/02

SUBJECT: Updated Emissions Run Feed Vector

Table B-2 HLW Chemical Analytes Feed Quantities in moles

Analyte	MW g/mol	Unit	Tank									
			AY-101	AY-102	AZ-101	AZ-102	C-104	C-106	SY-102	AW-104	C-107	Max Conc *
Ag	107.8	mol	1.08E+03	2.34E+02	4.52E+02	2.20E+03	9.82E+03	2.44E+02	2.76E+02	2.24E+02	2.72E+03	9.82E+03
Al	26.9	mol	1.00E+06	1.43E+06	5.96E+05	7.37E+05	3.34E+06	6.78E+04	8.44E+05	1.33E+05	2.17E+06	3.34E+06
As	74.9	mol	1.25E+02	2.79E+02	2.31E+02	1.15E+02	6.50E+02	1.17E+01	7.94E+01	2.00E+02	1.33E+02	6.50E+02
B	10.8	mol	1.12E+04	3.26E+03	7.25E+03	1.41E+04	1.66E+05	8.31E+02	2.69E+03	7.46E+02	1.93E+04	1.66E+05
Ba	137.3	mol	1.92E+03	4.98E+03	1.41E+03	0.00E+00	1.07E+03	1.11E+02	1.52E+02	6.02E+01	5.31E+03	5.31E+03
Be	9.0	mol	2.41E+02	2.92E+02	3.06E+02	2.19E+02	4.23E+03	1.22E+01	2.27E+02	1.23E+02	1.73E+02	4.23E+03
Bi	208.9	mol	1.02E+01	7.27E+02	9.43E+01	1.21E+02	2.30E+02	5.31E-01	1.34E+04	7.66E+00	4.98E+04	4.98E+04
Ca	40.0	mol	2.97E+04	1.14E+05	0.00E+00	1.73E+04	7.43E+04	1.96E+03	2.67E+04	2.26E+04	3.09E+04	1.14E+05
Cd	112.4	mol	5.50E+02	9.16E+02	1.67E+04	2.41E+04	9.16E+03	1.88E+01	1.07E+03	2.62E+02	8.47E+02	2.41E+04
Ce	140.1	mol	2.11E+03	5.09E+03	1.64E+03	1.01E+03	5.06E+02	1.67E+02	2.79E+02	1.07E+02	5.56E+03	5.56E+03
Cl	35.4	mol	4.65E+03	3.49E+03	8.23E+02	2.65E+03	2.25E+04	1.06E+02	4.51E+04	1.57E+04	2.45E+04	4.51E+04
CN	26.0	mol	0.00E+00	0.00E+00	0.00E+00	2.17E+02	8.04E+02	1.36E+01	0.00E+00	0.00E+00	2.35E+02	8.04E+02
Co	58.9	mol	2.65E+02	4.02E+02	2.09E+02	1.92E+02	1.65E+02	1.88E+01	1.34E+02	5.09E+01	4.50E+02	4.50E+02
Cr	51.9	mol	2.31E+04	2.85E+04	3.15E+03	8.77E+03	2.81E+04	1.10E+03	2.58E+05	3.09E+03	1.79E+04	2.58E+05
Cu	63.5	mol	1.54E+03	3.17E+03	1.00E+03	5.98E+02	2.11E+03	1.08E+02	2.91E+02	2.28E+02	3.59E+03	3.59E+03
F	18.9	mol	4.99E+04	1.31E+04	7.42E+04	2.52E+04	1.82E+06	1.25E+02	3.12E+04	4.15E+04	3.36E+05	1.82E+06
Fe	55.8	mol	6.40E+05	1.56E+06	3.96E+05	4.16E+05	4.95E+05	5.47E+04	1.36E+05	4.09E+04	1.85E+06	1.85E+06
Hg	200.6	mol	5.98E+01	5.63E+02	2.78E+00	1.66E+01	4.13E+04	2.19E+01	2.90E+01	0.00E+00	3.34E+02	4.13E+04
K	39.1	mol	7.49E+03	1.34E+04	2.45E+04	3.86E+04	3.40E+04	5.40E+02	1.95E+04	4.47E+04	1.14E+04	4.47E+04
La	138.9	mol	8.86E+03	8.06E+03	7.09E+03	5.71E+03	3.51E+02	8.86E+01	3.47E+02	1.44E+02	1.94E+03	8.86E+03
Li	6.9	mol	3.72E+02	6.29E+03	2.46E+04	2.39E+02	8.77E+02	1.93E+02	3.61E+03	4.51E+02	2.42E+04	2.46E+04
Mg	24.3	mol	2.07E+04	7.16E+04	7.33E+03	7.33E+03	8.48E+03	8.31E+02	9.59E+03	8.22E+03	1.96E+04	7.16E+04
Mn	54.9	mol	3.72E+04	2.09E+05	5.17E+03	9.25E+03	1.28E+05	1.38E+04	3.24E+04	1.43E+04	9.14E+04	2.09E+05
Mo	95.9	mol	1.24E+02	9.56E+01	1.28E+02	2.11E+02	2.50E+02	4.01E+00	0.00E+00	1.35E+02	4.78E+02	4.78E+02
Na	22.9	mol	2.08E+06	2.32E+06	1.14E+06	1.16E+06	7.74E+06	1.07E+05	3.24E+06	1.44E+06	4.14E+06	1.07E+05
Nd	144.2	mol	5.14E+03	7.07E+03	4.15E+03	3.40E+03	7.42E+02	2.45E+02	4.74E+02	1.04E+02	4.39E+03	7.07E+03
NH3	17	mol	2.13E+04	9.59E+04	0.00E+00	0.00E+00	1.32E+04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	9.59E+04
Ni	58.7	mol	2.27E+04	3.59E+04	2.33E+04	2.49E+04	4.48E+04	1.81E+03	3.87E+03	1.07E+03	5.26E+04	5.26E+04
NO2	46.0	mol	2.93E+05	1.12E+03	2.39E+05	3.63E+05	7.96E+05	1.76E+03	5.02E+05	2.20E+05	7.67E+05	7.96E+05
NO3	62.0	mol	1.84E+04	4.69E+02	1.66E+05	1.11E+05	3.16E+05	1.90E+02	6.87E+05	2.81E+05	7.71E+05	7.71E+05
OH	17.0	mol	0.00E+00	0.00E+00	8.18E+04	1.19E+05	0.00E+00	0.00E+00	2.42E+05	7.47E+04	1.35E+07	1.35E+07

CALCULATION SHEET

PROJECT: RPP-WTP
JOB NO.: 24590
CALC NO.: 24590-WTP-M4C-FRP-00001
SHEET REV: 0A
SHEET NO.: 44

BY: E. Berrios
DATE: 12/04/02

SUBJECT: Updated Emissions Run Feed Vector

Analyte	MW g/mol	Unit	Tank									
			AY-101	AY-102	AZ-101	AZ-102	C-104	C-106	SY-102	AW-104	C-107	Max Conc *
Oxalate	88.0	mol	2.18E+05	2.01E+04	1.67E+04	1.69E+04	6.38E+04	7.86E+02	3.82E+05	6.98E+03	8.36E+03	3.82E+05
Pb	207.2	mol	4.61E+03	1.70E+04	4.14E+02	1.31E+03	4.03E+03	7.58E+02	2.67E+03	3.94E+02	4.87E+04	4.87E+04
Pd	105.4	mol	0.00E+00	0.00E+00	3.52E-03	1.52E+02	0.00E+00	3.65E+00	0.00E+00	0.00E+00	0.00E+00	1.52E+02
PO4	94.9	mol	3.63E+04	9.52E+04	1.12E+03	6.64E+03	3.38E+04	3.95E+03	6.80E+04	1.86E+03	6.19E+05	6.19E+05
Pr	140.9	mol	0.00E+00	2.14E+03	9.08E+02	6.58E+02	4.97E+02	8.94E+01	0.00E+00	0.00E+00	1.48E+03	2.14E+03
Rb	85.5	mol	6.94E+00	0.00E+00	4.37E+01	1.63E+01	3.12E+03	1.06E+00	2.82E+02	0.00E+00	9.86E+00	3.12E+03
Rh	102.9	mol	6.66E+01	0.00E+00	4.57E+02	9.49E+01	1.40E+03	8.67E+00	0.00E+00	0.00E+00	4.24E+02	1.40E+03
Ru	101.1	mol	0.00E+00	4.31E+03	3.75E+03	4.32E+02	0.00E+00	1.81E+02	0.00E+00	0.00E+00	9.41E+03	9.41E+03
Sb	121.7	mol	9.69E+01	1.95E+01	1.77E+01	8.11E+01	4.69E+01	8.19E-01	1.49E+01	7.41E+01	1.98E+01	9.69E+01
Se	78.9	mol	2.48E+02	6.35E+00	9.06E+01	3.53E+01	4.96E+02	2.67E-01	7.47E+01	1.43E+02	6.34E+01	4.96E+02
Si	28.1	mol	1.53E+04	4.02E+03	1.59E+04	8.86E+04	3.63E+05	1.48E+03	3.35E+04	1.70E+04	6.65E+04	3.63E+05
SO4	96.1	mol	3.16E+04	1.57E+04	7.90E+04	7.34E+04	3.56E+04	6.31E+02	2.02E+04	7.66E+03	8.77E+04	8.77E+04
Sr	87.6	mol	7.63E+02	2.60E+03	1.05E+03	5.47E+02	9.99E+02	7.41E+01	4.38E+02	6.06E+01	2.93E+03	2.93E+03
Ta	180.9	mol	0.00E+00	0.00E+00	1.19E+01	3.61E+00	9.67E+00	4.86E-01	1.38E+01	0.00E+00	4.68E+00	1.38E+01
Te	127.6	mol	0.00E+00	7.43E+02	1.85E+02	1.21E+02	0.00E+00	3.12E+01	1.16E+01	0.00E+00	1.41E+03	1.41E+03
Th	232.0	mol	0.00E+00	1.95E+03	3.35E+02	3.85E+02	2.20E+05	8.15E+01	1.42E+03	6.48E+01	2.85E+03	2.20E+05
Ti	47.9	mol	7.35E+02	2.30E+03	2.01E+02	2.21E+02	2.05E+03	8.54E+01	2.51E+02	3.33E+02	2.59E+03	2.59E+03
TIC as CO3	60.0	mol	1.35E+06	9.08E+05	1.25E+05	3.17E+05	8.07E+05	5.42E+04	1.90E+05	2.19E+05	1.90E+05	1.35E+06
Tl	204.4	mol	2.74E+00	1.45E+01	1.05E+01	3.19E+00	4.77E+02	6.07E-01	2.25E+00	1.47E+02	2.66E+01	4.77E+02
U(total)	238.0	mol	1.96E+03	9.87E+03	6.85E+03	1.47E+04	1.48E+05	1.73E+02	2.84E+03	2.90E+04	3.90E+04	1.48E+05
V	50.9	mol	1.93E+02	5.85E+02	1.05E+02	1.63E+02	5.34E+02	2.69E+01	1.78E+02	1.48E+02	4.93E+02	5.85E+02
W	183.9	mol	0.00E+00	0.00E+00	0.00E+00	2.63E+01	5.22E+03	0.00E+00	0.00E+00	0.00E+00	3.67E+03	5.22E+03
Y	88.9	mol	0.00E+00	1.10E+03	0.00E+00	3.84E+02	3.17E+02	5.02E+01	1.27E+02	1.69E+01	1.07E+03	1.10E+03
Zn	65.4	mol	8.15E+02	2.32E+03	3.91E+02	3.75E+02	9.30E+03	6.67E+01	1.51E+02	4.28E+02	2.71E+03	9.30E+03
Zr	91.2	mol	7.60E+03	3.14E+02	8.61E+04	4.18E+04	7.12E+05	2.91E+01	8.23E+02	2.30E+04	8.10E+02	7.12E+05

* Except for Na which is the minimum concentration

CALCULATION SHEET

PROJECT: RPP-WTP
JOB NO.: 24590
CALC NO.: 24590-WTP-M4C-FRP-00001
SHEET REV: 0A
SHEET NO.: 45

BY: E. Berríos
DATE: 12/04/02

SUBJECT: Updated Emissions Run Feed Vector

Table B-3 HLW Radionuclide Feed Quantities in Curies

Analyte	Unit	Tank									
		AY-101	AY-102	AZ-101	AZ-102	C-104	C-106	SY-102	AW-104	C-107	MAX
106Ru	Ci	6.53E-02	7.54E-03	3.86E+02	6.21E+02	1.80E-04	5.77E-06	1.35E-05	1.65E-06	1.13E-02	6.21E+02
113mCd	Ci	1.75E+03	4.83E+00	1.93E+03	8.16E+02	1.93E+01	5.84E+00	1.60E+01	1.50E+00	1.19E+03	1.93E+03
125Sb	Ci	1.34E+01	1.55E+00	6.18E+03	4.93E+03	1.77E+02	4.01E-01	7.54E+00	8.23E-01	7.42E+00	6.18E+03
126Sn	Ci	2.80E+01	2.78E-01	2.31E+01	1.25E+01	1.72E+00	1.81E+00	5.31E-01	4.63E-02	6.37E+01	6.37E+01
129I	Ci	9.40E-02	8.43E-03	1.17E-01	1.40E+00	7.53E-01	8.28E-03	9.30E-02	2.89E-02	4.83E-02	1.40E+00
134Cs	Ci	8.07E-02	2.14E+02	2.81E+02	4.47E+02	4.49E-02	1.00E-02	1.03E-01	2.07E-02	4.90E-01	4.47E+02
137Cs	Ci	5.30E+04	1.61E+05	2.98E+05	4.92E+05	9.55E+04	1.14E+04	6.54E+04	1.33E+04	6.35E+04	4.92E+05
137mBa	Ci	5.02E+04	1.53E+05	2.82E+05	4.66E+05	9.03E+04	1.08E+04	6.19E+04	1.25E+04	6.01E+04	4.66E+05
14C	Ci	8.70E-01	1.74E-01	4.72E-01	4.80E-01	1.86E+00	8.28E-03	5.58E-01	1.27E+00	3.80E+00	3.80E+00
151Sm	Ci	4.29E+05	1.51E+03	1.60E+05	6.69E+04	9.39E+03	1.01E+04	2.94E+03	2.55E+02	6.36E+05	6.36E+05
152Eu	Ci	0.00E+00	6.13E+01	1.31E+02	5.23E+01	2.43E+00	2.85E+00	7.49E-01	7.70E-02	1.17E+02	1.31E+02
154Eu	Ci	4.69E+03	6.77E+03	1.35E+04	7.29E+03	1.10E+03	2.64E+02	1.91E+02	8.75E+00	1.60E+03	1.35E+04
155Eu	Ci	2.28E+03	5.53E+03	1.74E+04	1.30E+04	8.05E+02	1.82E+02	1.05E+02	2.41E+00	1.04E+03	1.74E+04
226Ra	Ci	1.02E-02	3.66E-03	2.32E-04	8.50E-05	6.27E-03	3.93E-04	3.92E-05	3.07E-06	2.16E-02	2.16E-02
227Ac	Ci	5.69E-02	1.29E-02	2.61E-03	7.40E-04	1.09E+02	2.21E-03	4.09E-04	3.14E-05	1.41E-01	1.09E+02
228Ra	Ci	4.11E-02	3.42E-02	3.11E-03	5.30E-03	2.25E+01	2.46E-05	3.02E-02	3.70E-03	4.85E-02	2.25E+01
229Th	Ci	6.53E-04	6.93E-06	1.94E-06	6.83E-07	9.41E-01	2.10E-05	6.77E-04	1.57E-04	2.43E-03	9.41E-01
231Pa	Ci	7.44E-02	3.90E-04	7.77E-03	1.77E-03	2.40E+02	2.82E-03	1.08E-03	8.46E-05	1.92E-01	2.40E+02
232Th	Ci	3.82E-02	6.02E-02	8.12E-03	9.83E-03	4.99E+00	2.53E-03	3.23E-02	8.24E-04	7.28E-02	4.99E+00
232U	Ci	9.37E-02	2.55E-04	2.77E-02	1.07E-02	1.93E+01	1.65E-04	1.04E-01	2.60E-03	5.45E-03	1.93E+01
233U	Ci	3.85E-01	3.72E-06	1.13E-01	4.17E-02	4.13E+02	6.81E-04	4.27E-01	7.83E-03	2.26E-02	4.13E+02
234U	Ci	1.71E-01	1.04E+00	7.86E-01	2.89E+00	2.08E+01	1.34E-02	2.38E-01	3.35E+00	5.63E-01	2.08E+01
235U	Ci	6.94E-03	4.01E-02	2.99E-02	6.88E-02	6.03E-01	5.73E-04	9.99E-03	1.27E-01	1.37E-01	6.03E-01
236U	Ci	5.87E-03	7.55E-02	6.37E-02	1.41E-01	6.48E-01	2.39E-04	5.78E-03	2.76E-01	8.92E-02	6.48E-01
237Np	Ci	1.59E-01	3.95E+00	1.34E+01	1.31E+01	4.40E+00	1.66E-01	7.44E-01	5.29E-02	8.07E-02	1.34E+01
238Pu	Ci	1.91E+02	5.26E+02	1.33E+02	1.79E+02	2.28E+02	3.48E+00	5.55E+02	5.14E+01	6.81E+01	5.55E+02
238U	Ci	1.56E-01	8.00E-01	5.44E-01	1.16E+00	1.17E+01	1.37E-02	2.26E-01	2.30E+00	3.10E+00	1.17E+01
239Pu	Ci	4.89E+02	1.64E+03	1.15E+03	1.54E+03	5.47E+03	7.52E+01	3.82E+03	4.40E+02	2.16E+03	5.47E+03
240Pu	Ci	1.48E+02	3.55E+02	3.46E+02	4.58E+02	1.08E+03	1.54E+01	8.61E+02	1.34E+02	3.93E+02	1.08E+03

CALCULATION SHEET

PROJECT: RPP-WTP
JOB NO.: 24590
CALC NO.: 24590-WTP-M4C-FRP-00001
SHEET REV: 0A
SHEET NO.: 46

BY: E. Berríos
DATE: 12/04/02

SUBJECT: Updated Emissions Run Feed Vector

Analyte	Unit	Tank									
		AY-101	AY-102	AZ-101	AZ-102	C-104	C-106	SY-102	AW-104	C-107	MAX
241Am	Ci	8.79E+03	7.62E+03	2.55E+04	1.88E+04	6.35E+03	2.25E+02	2.35E+04	5.28E+01	6.75E+03	2.55E+04
241Pu	Ci	2.69E+03	4.42E+03	1.02E+04	1.32E+04	1.48E+04	1.84E+02	3.27E+03	3.96E+03	3.73E+03	1.48E+04
242Cm	Ci	1.17E+01	1.40E+01	2.30E+01	6.52E+00	5.38E+00	3.42E-01	5.15E-02	9.84E-04	5.37E+00	2.30E+01
242Pu	Ci	2.67E-02	4.27E-02	5.35E-02	6.57E-02	9.48E-02	1.64E-03	2.05E-01	2.07E-02	2.74E-02	2.05E-01
243Am	Ci	8.83E-01	5.60E-01	5.40E+00	5.61E+00	3.12E-01	2.02E-03	3.96E-01	3.75E-05	3.47E-01	5.61E+00
243Cm	Ci	1.19E+00	1.27E+00	3.36E+00	8.39E-01	4.31E-01	2.74E-02	4.61E-01	1.35E-04	4.21E-01	3.36E+00
244Cm	Ci	4.08E+01	3.03E+01	7.53E+01	4.08E+01	1.50E+01	5.82E-01	1.10E+01	5.89E-04	1.56E+01	7.53E+01
3H	Ci	2.38E+00	7.31E+00	4.05E+00	1.22E+01	5.61E+01	1.45E-01	6.85E-01	7.81E+00	2.99E+01	5.61E+01
59Ni	Ci	1.58E+02	1.10E+02	2.68E+01	1.07E+01	4.58E+00	6.13E+00	2.58E-01	1.66E-02	3.22E+02	3.22E+02
60Co	Ci	4.36E+02	5.81E-01	1.09E+03	7.80E+02	2.72E+02	2.46E-01	8.13E+00	4.03E-01	2.47E+02	1.09E+03
63Ni	Ci	1.48E+04	1.04E+04	2.95E+03	1.19E+03	4.29E+02	5.71E+02	2.40E+01	1.56E+00	3.01E+04	3.01E+04
79Se	Ci	1.37E+01	4.39E-02	4.67E-01	3.51E-01	6.40E+00	2.77E-01	8.79E-02	7.66E-03	1.79E+01	1.79E+01
90Sr	Ci	1.38E+06	5.27E+06	4.94E+06	2.98E+06	4.84E+05	2.82E+05	6.73E+04	1.09E+03	2.24E+06	5.27E+06
90Y	Ci	1.38E+06	5.27E+06	4.94E+06	2.98E+06	4.84E+05	2.82E+05	6.73E+04	1.09E+03	2.24E+06	5.27E+06
93mNb	Ci	4.99E+02	1.70E+00	1.33E+02	5.25E+01	9.90E+00	1.08E+01	3.50E+00	3.04E-01	6.98E+02	6.98E+02
93Zr	Ci	6.09E+02	1.98E+00	2.35E+02	9.69E+01	1.16E+01	1.16E+01	4.31E+00	3.78E-01	7.75E+02	7.75E+02
99Tc	Ci	4.85E+01	1.39E+01	6.41E+01	8.99E+01	5.79E+01	1.03E+00	1.27E+02	1.49E+01	3.79E+01	1.27E+02

CALCULATION SHEET

PROJECT: RPP-WTP
JOB NO.: 24590
CALC NO.: 24590-WTP-M4C-FRP-00001
SHEET REV: 0A
SHEET NO.: 47

BY: E. Berríos
DATE: 12/04/02

SUBJECT: Updated Emissions Run Feed Vector

Table B-4 HLW Waste Oxide Mass Calculation

Analyte	Max Conc mol	MW g/mol	Mass g	Charge	# oxygens/mol oxide	Mass of O grams	Contract Max g/100 g w. ox	Feed Quantity g
Ag	9.82E+03	107.87	1.06E+06	1	0.5	7.86E+04	0.55	3.50E+06
Al	3.34E+06	27	9.01E+07	3	1.5	8.01E+07	14	8.90E+07
As	6.50E+02	74.92	4.87E+04	5	2.5	2.60E+04	0.16	1.02E+06
B	1.66E+05	10.81	1.79E+06	3	1.5	3.98E+06	1.3	8.26E+06
Ba	5.31E+03	137.3	7.29E+05	2	1	8.50E+04	4.5	2.86E+07
Be	4.23E+03	9	3.81E+04	2	1	6.77E+04	0.065	4.13E+05
Bi	4.98E+04	209	1.04E+07	3	1.5	1.19E+06	2.8	1.78E+07
Ca	1.14E+05	40.1	4.59E+06	2	1	1.83E+06	7.1	4.51E+07
Cd	2.41E+04	112.4	2.71E+06	2	1	3.86E+05	4.5	2.86E+07
Ce	5.56E+03	140.1	7.79E+05	3	1.5	1.33E+05	0.81	5.15E+06
Cl	4.51E+04	35.5	0.00E+00	-1	0	0.00E+00	0.33	2.10E+06
CN	8.04E+02	26	0.00E+00	-1	0	0.00E+00	1.6	1.02E+07
Co	4.50E+02	58.9	2.65E+04	3	1.5	1.08E+04	0.45	2.86E+06
Cr	2.58E+05	52	1.34E+07	3	1.5	6.18E+06	0.68	4.32E+06
Cu	3.59E+03	63.5	2.28E+05	2	1	5.74E+04	0.48	3.05E+06
F	1.82E+06	19	0.00E+00	-1	0	0.00E+00	3.5	2.23E+07
Fe	1.85E+06	55.8	1.03E+08	3	1.5	4.43E+07	29	1.84E+08
Hg	4.13E+04	200.6	8.29E+06	2	1	6.61E+05	0.1	6.36E+05
K	4.47E+04	39.1	1.75E+06	1	0.5	3.58E+05	1.3	8.26E+06
La	8.86E+03	138.9	1.23E+06	3	1.5	2.13E+05	2.6	1.65E+07
Li	2.46E+04	6.9	1.70E+05	1	0.5	1.97E+05	0.14	8.90E+05
Mg	7.16E+04	24.3	1.74E+06	2	1	1.15E+06	2.1	1.34E+07
Mn	2.09E+05	54.9	1.15E+07	4	2	6.70E+06	6.5	4.13E+07
Mo	4.78E+02	95.9	4.58E+04	6	3	2.29E+04	0.65	4.13E+06
Na	1.07E+05	23	2.45E+06	1	0.5	8.52E+05	19	1.21E+08
Nd	7.07E+03	144.2	1.02E+06	3	1.5	1.70E+05	1.7	1.08E+07
NH3	9.59E+04	17	0.00E+00	0	0	0.00E+00	1.6	1.02E+07
Ni	5.26E+04	58.7	3.09E+06	2	1	8.42E+05	2.4	1.53E+07
NO2	7.96E+05	46	0.00E+00	-1	0	0.00E+00	(no2/no3)	0.00E+00
NO3	7.71E+05	62	0.00E+00	-1	0	0.00E+00	36	2.29E+08
OH	1.35E+07	17	0.00E+00	-1	0	0.00E+00	N/A*	0.00E+00

CALCULATION SHEET

PROJECT: RPP-WTP
JOB NO.: 24590
CALC NO.: 24590-WTP-M4C-FRP-00001
SHEET REV: 0A
SHEET NO.: 48

BY: E. Berrios
DATE: 12/04/02

SUBJECT: Updated Emissions Run Feed Vector

Analyte	Max Conc mol	MW g/mol	Mass g	Charge	# oxygens/mol oxide	Mass of O grams	Contract Max g/100 g w. ox	Feed Quantity g
Oxalate	3.82E+05	88	0.00E+00	-2	0	0.00E+00	11	6.99E+07
Pb	4.87E+04	207.2	1.01E+07	2	1	7.80E+05	1.1	6.99E+06
Pd	1.52E+02	106.4	1.62E+04	2	1	2.44E+03	0.13	8.26E+05
PO4	6.19E+05	95	0.00E+00	-3	0	0.00E+00	N/A*	0.00E+00
Pr	2.14E+03	140.9	3.01E+05	4	2	6.84E+04	0.35	2.23E+06
Rb	3.12E+03	85.5	2.67E+05	1	0.5	2.50E+04	0.19	1.21E+06
Rh	1.40E+03	102.9	1.44E+05	3	1.5	3.36E+04	0.13	8.26E+05
Ru	9.41E+03	101.1	9.51E+05	4	2	3.01E+05	0.35	2.23E+06
Sb	9.69E+01	121.8	1.18E+04	3	1.5	2.33E+03	0.84	5.34E+06
Se	4.96E+02	79	3.92E+04	4	2	1.59E+04	0.52	3.31E+06
Si	3.63E+05	28.1	1.02E+07	4	2	1.16E+07	19	1.21E+08
SO4	8.77E+04	96.1	0.00E+00	-2	0	0.00E+00	N/A*	0.00E+00
Sr	2.93E+03	87.6	2.57E+05	2	1	4.69E+04	0.52	3.31E+06
Ta	1.38E+01	180.9	2.49E+03	5	2.5	5.51E+02	0.03	1.91E+05
Te	1.41E+03	127.6	1.80E+05	4	2	4.51E+04	0.13	8.26E+05
Th	2.20E+05	232	5.10E+07	4	2	7.03E+06	5	3.18E+07
Ti	2.59E+03	47.9	1.24E+05	4	2	8.28E+04	1.3	8.26E+06
TIC as CO3	1.35E+06	60	0.00E+00	-2	0	0.00E+00	30	1.91E+08
Tl	4.77E+02	204.4	9.74E+04	5	2.5	1.91E+04	0.45	2.86E+06
U(total)	1.48E+05	238	3.53E+07	6	3	7.12E+06	14	8.90E+07
V	5.85E+02	50.9	2.98E+04	3	1.5	1.41E+04	0.032	2.03E+05
W	5.22E+03	183.9	9.60E+05	6	3	2.51E+05	0.24	1.53E+06
Y	1.10E+03	88.9	9.81E+04	3	1.5	2.65E+04	0.16	1.02E+06
Zn	9.30E+03	65.4	6.08E+05	2	1	1.49E+05	0.42	2.67E+06
Zr	7.12E+05	91.2	6.49E+07	4	2	2.28E+07	15	9.54E+07

* N/A = not available

	4.36E+08 g mass		2.0E+08 g O
	4.36E+05 kg		2.0E+05 kg O
Total Mass	6.46E+05 kg	=	6.36E+08 g

CALCULATION SHEET

PROJECT: RPP-WTP
JOB NO.: 24590
CALC NO.: 24590-WTP-M4C-FRP-00001
SHEET REV: 0A
SHEET NO.: 49

BY: E. Berríos
DATE: 12/04/02

SUBJECT: Updated Emissions Run Feed Vector

Table B-5 Chemical Analytes Feed Quantity Comparison

Analyte	Actual (g)	SOW max (g)	Selected (g)	Source
Ag	1.06E+06	3.50E+06	3.50E+06	SOWM
Al	9.01E+07	8.90E+07	8.90E+07	SOWM
As	4.87E+04	1.02E+06	1.02E+06	SOWM
B	1.79E+06	8.26E+06	8.26E+06	SOWM
Ba	7.29E+05	2.86E+07	2.86E+07	SOWM
Be	3.81E+04	4.13E+05	4.13E+05	SOWM
Bi	1.04E+07	1.78E+07	1.78E+07	SOWM
Ca	4.59E+06	4.51E+07	4.51E+07	SOWM
Cd	2.71E+06	2.86E+07	2.86E+07	SOWM
Ce	7.79E+05	5.15E+06	5.15E+06	SOWM
Cl	1.60E+06	2.10E+06	2.10E+06	SOWM
CN	2.09E+04	1.02E+07	1.02E+07	SOWM
Co	2.65E+04	2.86E+06	2.86E+06	SOWM
Cr	1.34E+07	4.32E+06	4.32E+06	SOWM
Cu	2.28E+05	3.05E+06	3.05E+06	SOWM
F	3.46E+07	2.23E+07	2.23E+07	SOWM
Fe	1.03E+08	1.84E+08	1.84E+08	SOWM
Hg	8.29E+06	6.36E+05	6.36E+05	SOWM
K	1.75E+06	8.26E+06	8.26E+06	SOWM
La	1.23E+06	1.65E+07	1.65E+07	SOWM
Li	1.70E+05	8.90E+05	8.90E+05	SOWM
Mg	1.74E+06	1.34E+07	1.34E+07	SOWM
Mn	1.15E+07	4.13E+07	4.13E+07	SOWM
Mo	4.58E+04	4.13E+06	4.13E+06	SOWM
Na	2.45E+06	1.21E+08	1.21E+08	SOWM
Nd	1.02E+06	1.08E+07	1.08E+07	SOWM
NH3	1.63E+06	1.02E+07	1.02E+07	SOWM
Ni	3.09E+06	1.53E+07	1.53E+07	SOWM
NO2	3.66E+07		3.66E+07	Actual
NO3	4.78E+07	2.29E+08	2.29E+08	SOWM
OH	2.29E+08		2.29E+08	Actual
Oxalate	3.36E+07	6.99E+07	6.99E+07	SOWM
Pb	1.01E+07	6.99E+06	6.99E+06	SOWM
Pd	1.62E+04	8.26E+05	8.26E+05	SOWM
PO4	5.88E+07		5.88E+07	Actual
Pr	3.01E+05	2.23E+06	2.23E+06	SOWM
Rb	2.67E+05	1.21E+06	1.21E+06	SOWM
Rh	1.44E+05	8.26E+05	8.26E+05	SOWM
Ru	9.51E+05	2.23E+06	2.23E+06	SOWM
Sb	1.18E+04	5.34E+06	5.34E+06	SOWM
Se	3.92E+04	3.31E+06	3.31E+06	SOWM
Si	1.02E+07	1.21E+08	1.21E+08	SOWM
SO4	8.43E+06		8.43E+06	Actual
Sr	2.57E+05	3.31E+06	3.31E+06	SOWM
Ta	2.49E+03	1.91E+05	1.91E+05	SOWM
Te	1.80E+05	8.26E+05	8.26E+05	SOWM
Th	5.10E+07	3.18E+07	3.18E+07	SOWM

CALCULATION SHEET

PROJECT: RPP-WTP
JOB NO.: 24590
CALC NO.: 24590-WTP-M4C-FRP-00001
SHEET REV: 0A
SHEET NO.: 50

BY: E. Berríos
DATE: 12/04/02

SUBJECT: Updated Emissions Run Feed Vector

Analyte	Actual (g)	SOW max (g)	Selected (g)	Source
Ti	1.24E+05	8.26E+06	8.26E+06	SOWM
TIC as CO3	8.09E+07	1.91E+08	1.91E+08	SOWM
Tl	9.74E+04	2.86E+06	2.86E+06	SOWM
U(total)	3.53E+07	8.90E+07	8.90E+07	SOWM
V	2.98E+04	2.03E+05	2.03E+05	SOWM
W	9.60E+05	1.53E+06	1.53E+06	SOWM
Y	9.81E+04	1.02E+06	1.02E+06	SOWM
Zn	6.08E+05	2.67E+06	2.67E+06	SOWM
Zr	6.49E+07	9.54E+07	9.54E+07	SOWM

SOWM = statement of work maximum

CALCULATION SHEET

PROJECT: RPP-WTP
JOB NO.: 24590
CALC NO.: 24590-WTP-M4C-FRP-00001
SHEET REV: 0A
SHEET NO.: 51

BY: E. Berrios
DATE: 12/04/02

SUBJECT: Updated Emissions Run Feed Vector

Table B-6 Radionuclides Feed Quantity Comparison

Analyte	Ci	SOW Max Ci/100 g w. ox	Feed Quantity Ci	Actual Feed Ci	Selected Ci	Source
106Ru	6.21E+02			6.21E+02	6.21E+02	Actual
113mCd	1.93E+03			1.93E+03	1.93E+03	Actual
125Sb	6.18E+03	3.20E-02	2.03E+05	6.18E+03	2.03E+05	SOWM
126Sn	6.37E+01	1.50E-04	9.54E+02	6.37E+01	9.54E+02	SOWM
129I	1.40E+00	2.90E-07	1.84E+00	1.40E+00	1.84E+00	SOWM
134Cs	4.47E+02			4.47E+02	4.47E+02	Actual
137Cs	4.92E+05	1.5	9.54E+06	4.92E+05	9.54E+06	SOWM
137mBa	4.66E+05			4.66E+05	4.66E+05	Actual
14C	3.80E+00	6.50E-06	4.13E+01	3.80E+00	4.13E+01	SOWM
151Sm	6.36E+05			6.36E+05	6.36E+05	Actual
152Eu	1.31E+02	4.80E-04	3.05E+03	1.31E+02	3.05E+03	SOWM
154Eu	1.35E+04	5.20E-02	3.31E+05	1.35E+04	3.31E+05	SOWM
155Eu	1.74E+04	2.90E-02	1.84E+05	1.74E+04	1.84E+05	SOWM
226Ra	2.16E-02			2.16E-02	2.16E-02	Actual
227Ac	1.09E+02			1.09E+02	1.09E+02	Actual
228Ra	2.25E+01			2.25E+01	2.25E+01	Actual
229Th	9.41E-01			9.41E-01	9.41E-01	Actual
231Pa	2.40E+02			2.40E+02	2.40E+02	Actual
232Th	4.99E+00			4.99E+00	4.99E+00	Actual
232U	1.93E+01			1.93E+01	1.93E+01	Actual
233U	4.13E+02	9.00E-07	5.72E+00	4.13E+02	5.72E+00	SOWM
234U	2.08E+01			2.08E+01	2.08E+01	Actual
235U	6.03E-01	2.50E-07	1.59E+00	6.03E-01	1.59E+00	SOWM
236U	6.48E-01			6.48E-01	6.48E-01	Actual
237Np	1.34E+01	7.40E-05	4.70E+02	1.34E+01	4.70E+02	SOWM
238Pu	5.55E+02	3.50E-04	2.23E+03	5.55E+02	2.23E+03	SOWM
238U	1.17E+01			1.17E+01	1.17E+01	Actual
239Pu	5.47E+03	3.10E-03	1.97E+04	5.47E+03	1.97E+04	SOWM
240Pu	1.08E+03			1.08E+03	1.08E+03	Actual
241Am	2.55E+04	9.00E-02	5.72E+05	2.55E+04	5.72E+05	SOWM
241Pu	1.48E+04	2.20E-02	1.40E+05	1.48E+04	1.40E+05	SOWM
242Cm	2.30E+01			2.30E+01	2.30E+01	Actual
242Pu	2.05E-01			2.05E-01	2.05E-01	Actual
243Am	5.61E+00			5.61E+00	5.61E+00	Actual
243Cm*	3.36E+00	3.00E-03	1.91E+04	3.36E+00	1.91E+04	SOWM
244Cm*	7.53E+01	3.00E-03	1.91E+04	7.53E+01	1.91E+04	SOWM
3H	5.61E+01	6.50E-05	4.13E+02	5.61E+01	4.13E+02	SOWM
59Ni	3.22E+02			3.22E+02	3.22E+02	Actual
60Co	1.09E+03	1.00E-02	6.36E+04	1.09E+03	6.36E+04	SOWM
63Ni	3.01E+04			3.01E+04	3.01E+04	Actual
79Se	1.79E+01			1.79E+01	1.79E+01	Actual
90Sr	5.27E+06	1.00E+01	6.36E+07	5.27E+06	6.36E+07	SOWM
90Y	5.27E+06			5.27E+06	5.27E+06	Actual
93mNb	6.98E+02			6.98E+02	6.98E+02	Actual
93Zr	7.75E+02			7.75E+02	7.75E+02	Actual
99Tc	1.27E+02	1.50E-02	9.54E+04	1.27E+02	9.54E+04	SOWM

CALCULATION SHEET

PROJECT: RPP-WTP
JOB NO.: 24590
CALC NO.: 24590-WTP-M4C-FRP-00001
SHEET REV: 0A
SHEET NO.: 52

BY: E. Berríos
DATE: 12/04/02

SUBJECT: Updated Emissions Run Feed Vector

Table B-7 HLW Chemical Analytes Charge Balance

Analyte	mol	Charge	Total charge
Ag	3.24E+04	1	3.24E+04
Al	3.30E+06	3	9.89E+06
As	1.36E+04	5	6.79E+04
B	7.65E+05	3	2.29E+06
Ba	2.08E+05	2	4.17E+05
Be	4.59E+04	0	0.00E+00
Bi	8.52E+04	3	2.56E+05
Ca	1.13E+06	2	2.25E+06
Cd	2.55E+05	2	5.09E+05
Ce	3.68E+04	3	1.10E+05
Cl	5.91E+04	-1	-5.91E+04
CN	3.91E+05	0	0.00E+00
Co	4.86E+04	0	0.00E+00
Cr	8.31E+04	3	2.49E+05
Cu	4.81E+04	2	9.61E+04
F	1.17E+06	-1	-1.17E+06
Fe	3.30E+06	3	9.91E+06
Hg	3.17E+03	2	6.34E+03
K	2.11E+05	1	2.11E+05
La	1.19E+05	3	3.57E+05
Li	1.29E+05	1	1.29E+05
Mg	5.49E+05	2	1.10E+06
Mn	7.53E+05	4	3.01E+06
Mo	4.31E+04	0	0.00E+00
Na	5.25E+06	1	5.25E+06
Nd	7.50E+04	0	0.00E+00
NH3	5.98E+05	0	0.00E+00
Ni	2.60E+05	2	5.20E+05
NO2	7.96E+05	-1	-7.96E+05
NO3	3.69E+06	-1	-3.69E+06
OH	1.35E+07	-1	-1.35E+07
Oxalate	7.95E+05	-2	-1.59E+06
Pb	3.38E+04	2	6.75E+04
Pd	7.77E+03	2	1.55E+04
PO4	6.19E+05	-3	-1.86E+06
Pr	1.58E+04	0	0.00E+00
Rb	1.41E+04	0	0.00E+00
Rh	8.03E+03	0	0.00E+00
Ru	2.20E+04	0	0.00E+00
Sb	4.38E+04	0	0.00E+00
Se	4.18E+04	0	0.00E+00
Si	4.30E+06	4	1.72E+07
SO4	8.77E+04	-2	-1.75E+05
Sr	3.77E+04	2	7.55E+04
Ta	1.05E+03	0	0.00E+00
Te	6.48E+03	0	0.00E+00
Th	1.37E+05	0	0.00E+00
Ti	1.73E+05	4	6.90E+05

CALCULATION SHEET

PROJECT: RPP-WTP
JOB NO.: 24590
CALC NO.: 24590-WTP-M4C-FRP-00001
SHEET REV: 0A
SHEET NO.: 53

BY: E. Berrios
DATE: 12/04/02

SUBJECT: Updated Emissions Run Feed Vector

Analyte	mol	Charge	Total charge
TIC as CO3	3.18E+06	-2	-6.36E+06
Tl	1.40E+04	0	0.00E+00
U(total)	3.74E+05	0	0.00E+00
V	4.00E+03	0	0.00E+00
W	8.30E+03	0	0.00E+00
Y	1.14E+04	0	0.00E+00
Zn	4.08E+04	2	8.17E+04
Zr	1.05E+06	4	4.18E+06
Total charge			29810608

CALCULATION SHEET

PROJECT: RPP-WTP
JOB NO.: 24590
CALC NO.: 24590-WTP-M4C-FRP-00001
SHEET REV: 0A
SHEET NO.: 54

BY: E. Berrios
DATE: 12/04/02

SUBJECT: Updated Emissions Run Feed Vector

Table B-8 HLW Radionuclides Charge Balance

Analyte	Ci	Charge	Ci/kmol	mol	Total Charge
106Ru	6.21E+02				
113mCd	1.93E+03				
125Sb	2.03E+05	3	1.30E+08	1.56E+00	4.69E+00
126Sn	9.54E+02	2	1.43E+03	6.67E+02	1.33E+03
129I	1.84E+00	-1	2.28E+01	8.09E+01	-8.09E+01
134Cs	4.47E+02				
137Cs	9.54E+06	1	1.19E+07	8.01E+02	8.01E+02
137mBa	4.66E+05				
14C	4.13E+01	4	6.26E+04	6.60E-01	2.64E+00
151Sm	6.36E+05	3	3.97E+06	1.60E+02	4.81E+02
152Eu	3.05E+03	3	2.64E+07	1.16E-01	3.47E-01
154Eu	3.31E+05	3	4.16E+07	7.95E+00	2.38E+01
155Eu	1.84E+05	3	7.53E+07	2.45E+00	7.35E+00
226Ra	2.16E-02				
227Ac	1.09E+02				
228Ra	2.25E+01				
229Th	9.41E-01				
231Pa	2.40E+02				
232Th	4.99E+00	4	2.55E-02	1.96E+05	7.83E+05
232U	1.93E+01				
233U	5.72E+00	6	2.25E+03	2.54E+00	1.53E+01
234U	2.08E+01	6	1.45E+03	1.43E+01	8.61E+01
235U	1.59E+00	6	5.08E-01	3.13E+03	1.88E+04
236U	6.48E-01	6	1.52E+01	4.26E+01	2.56E+02
237Np	4.70E+02	4	1.67E+02	2.82E+03	1.13E+04
238Pu	2.23E+03	4	4.08E+06	5.45E-01	2.18E+00
238U	1.17E+01	6	8.00E-02	1.46E+05	8.78E+05
239Pu	1.97E+04	4	1.48E+04	1.33E+03	5.33E+03
240Pu	1.08E+03	4	5.45E+04	1.98E+01	7.93E+01
241Am	5.72E+05	3	8.26E+05	6.93E+02	2.08E+03
241Pu	1.40E+05	4	2.48E+07	5.64E+00	2.26E+01
242Cm	2.30E+01				
242Pu	2.05E-01				
243Am	5.61E+00				
243Cm	1.91E+04	3	1.23E+07	1.55E+00	4.65E+00
244Cm	1.91E+04	3	2.62E+07	7.28E-01	2.18E+00
3H	4.13E+02	1	2.90E+07	1.42E-02	1.42E-02
59Ni	3.22E+02				
60Co	6.36E+04	3	6.78E+07	9.38E-01	2.81E+00
63Ni	3.01E+04	2	3.57E+06	8.43E+00	1.69E+01
79Se	1.79E+01				
90Sr	6.36E+07	2	1.24E+07	5.13E+03	1.03E+04
90Y	5.27E+06				
93mNb	6.98E+02				
93Zr	7.75E+02				
99Tc	9.54E+04	7	1.68E+03	5.68E+04	3.97E+05
Total overall charge for radionuclides					2108359

CALCULATION SHEET

PROJECT: RPP-WTP
JOB NO.: 24590
CALC NO.: 24590-WTP-M4C-FRP-00001
SHEET REV: 0A
SHEET NO.: 55

BY: E. Berrios
DATE: 12/04/02

SUBJECT: Updated Emissions Run Feed Vector

Table B-9 HLW Chemical Analytes Emissions Feed

Analyte	mol	mol/mol Na	Analyte	mol	mol/mol Na
Ag	3.24E+04	6.17E-03	NO2	7.96E+05	1.51E-01
Al	3.30E+06	6.28E-01	NO3	3.69E+06	7.03E-01
As	1.36E+04	2.59E-03	OH	4.54E+07	8.64E+00
B	7.65E+05	1.46E-01	Oxalate	7.95E+05	1.51E-01
Ba	2.08E+05	3.97E-02	Pb	3.38E+04	6.43E-03
Be	4.59E+04	8.74E-03	Pd	7.77E+03	1.48E-03
Bi	8.52E+04	1.62E-02	PO4	6.19E+05	1.18E-01
Ca	1.13E+06	2.14E-01	Pr	1.58E+04	3.01E-03
Cd	2.55E+05	4.85E-02	Rb	1.41E+04	2.69E-03
Ce	3.68E+04	7.00E-03	Rh	8.03E+03	1.53E-03
Cl	5.91E+04	1.13E-02	Ru	2.20E+04	4.19E-03
CN	3.91E+05	7.45E-02	Sb	4.38E+04	8.35E-03
Co	4.86E+04	9.25E-03	Se	4.18E+04	7.97E-03
Cr	8.31E+04	1.58E-02	Si	4.30E+06	8.19E-01
Cu	4.81E+04	9.15E-03	SO4	8.77E+04	1.67E-02
F	1.17E+06	2.23E-01	Sr	3.77E+04	7.19E-03
Fe	3.30E+06	6.29E-01	Ta	1.05E+03	2.01E-04
Hg	3.17E+03	6.03E-04	Te	6.48E+03	1.23E-03
K	2.11E+05	4.02E-02	Th	1.37E+05	2.61E-02
La	1.19E+05	2.27E-02	Ti	1.73E+05	3.29E-02
Li	1.29E+05	2.46E-02	TIC as CO3	3.18E+06	6.05E-01
Mg	5.49E+05	1.05E-01	Tl	1.40E+04	2.67E-03
Mn	7.53E+05	1.43E-01	U(total)	3.74E+05	7.12E-02
Mo	4.31E+04	8.20E-03	V	4.00E+03	7.61E-04
Na	5.25E+06	1.00E+00	W	8.30E+03	1.58E-03
Nd	7.50E+04	1.43E-02	Y	1.14E+04	2.18E-03
NH3	5.98E+05	1.14E-01	Zn	4.08E+04	7.77E-03
Ni	2.60E+05	4.95E-02	Zr	1.05E+06	1.99E-01

CALCULATION SHEET

PROJECT: RPP-WTP
JOB NO.: 24590
CALC NO.: 24590-WTP-M4C-FRP-00001
SHEET REV: 0A
SHEET NO.: 56

BY: E. Berrios
DATE: 12/04/02

SUBJECT: Updated Emissions Run Feed Vector

Table B-10 HLW Radionuclide Emissions Feed

Analyte	Ci	Bq/mol Na	Analyte	Ci	Bq/mol Na
106Ru	6.21E+02	4.37E+06	236U	6.48E-01	4.57E+03
113mCd	1.93E+03	1.36E+07	237Np	4.70E+02	3.31E+06
125Sb	2.03E+05	1.43E+09	238Pu	2.23E+03	1.57E+07
126Sn	9.54E+02	6.72E+06	238U	1.17E+01	8.24E+04
129I	1.84E+00	1.30E+04	239Pu	1.97E+04	1.39E+08
134Cs	4.47E+02	3.15E+06	240Pu	1.08E+03	7.61E+06
137Cs	9.54E+06	6.72E+10	241Am	5.72E+05	4.03E+09
137mBa	4.66E+05	3.28E+09	241Pu	1.40E+05	9.85E+08
14C	4.13E+01	2.91E+05	242Cm	2.30E+01	1.62E+05
151Sm	6.36E+05	4.48E+09	242Pu	2.05E-01	1.44E+03
152Eu	3.05E+03	2.15E+07	243Am	5.61E+00	3.95E+04
154Eu	3.31E+05	2.33E+09	243Cm	1.91E+04	1.34E+08
155Eu	1.84E+05	1.30E+09	244Cm	1.91E+04	1.34E+08
226Ra	2.16E-02	1.52E+02	3H	4.13E+02	2.91E+06
227Ac	1.09E+02	7.68E+05	59Ni	3.22E+02	2.27E+06
228Ra	2.25E+01	1.59E+05	60Co	6.36E+04	4.48E+08
229Th	9.41E-01	6.63E+03	63Ni	3.01E+04	2.12E+08
231Pa	2.40E+02	1.69E+06	79Se	1.79E+01	1.26E+05
232Th	4.99E+00	3.52E+04	90Sr	6.36E+07	4.48E+11
232U	1.93E+01	1.36E+05	90Y	5.27E+06	3.71E+10
233U	5.72E+00	4.03E+04	93mNb	6.98E+02	4.92E+06
234U	2.08E+01	1.47E+05	93Zr	7.75E+02	5.46E+06
235U	1.59E+00	1.12E+04	99Tc	9.54E+04	6.72E+08

Appendix C LAW BBI Data

CALCULATION SHEET

PROJECT: RPP-WTP
JOB NO.: 24590
CALC NO.: 24590-WTP-M4C-FRP-00001
SHEET REV: 0A
SHEET NO.: 58

BY: E. Berrios
DATE: 12/04/02

SUBJECT: Updated Emissions Run Feed Vector

Tank Name	Analyte	Waste Phase	Inventory	Inventory Units	Basis	Density	Density Units	Volume	Volume Units	Concentration	Concentration Units	Decay Date
241-AN-102	106Ru	Supernatant	1.73E-04	Ci	TE	1.6	g/mL	3571	kL	3.21E-08	uCi/g	Jan 1 2001 12:00AM
241-AN-102	113mCd	Supernatant	1.57E+02	Ci	TE	1.6	g/mL	3571	kL	2.92E-02	uCi/g	Jan 1 2001 12:00AM
241-AN-102	125Sb	Supernatant	8.65E+01	Ci	TE	1.6	g/mL	3571	kL	1.60E-02	uCi/g	Jan 1 2001 12:00AM
241-AN-102	126Sn	Supernatant	4.87E+00	Ci	TE	1.6	g/mL	3571	kL	9.02E-04	uCi/g	Jan 1 2001 12:00AM
241-AN-102	129I	Supernatant	4.60E-01	Ci	S	1.43	g/mL	3571	kL	9.09E-05	uCi/g	Jan 1 2001 12:00AM
241-AN-102	134Cs	Supernatant	2.17E+00	Ci	TE	1.6	g/mL	3571	kL	4.03E-04	uCi/g	Jan 1 2001 12:00AM
241-AN-102	137Cs	Supernatant	1.46E+06	Ci	S	1.46	g/mL	3571	kL	2.83E+02	uCi/g	Jan 1 2001 12:00AM
241-AN-102	137mBa	Supernatant	1.38E+06	Ci	C		g/mL	3571	kL		uCi/g	Jan 1 2001 12:00AM
241-AN-102	14C	Supernatant	2.49E+00	Ci	S	1.43	g/mL	3571	kL	4.92E-04	uCi/g	Jan 1 2001 12:00AM
241-AN-102	151Sm	Supernatant	2.68E+04	Ci	TE	1.6	g/mL	3571	kL	4.97E+00	uCi/g	Jan 1 2001 12:00AM
241-AN-102	152Eu	Supernatant	8.09E+00	Ci	TE	1.6	g/mL	3571	kL	1.50E-03	uCi/g	Jan 1 2001 12:00AM
241-AN-102	154Eu	Supernatant	7.97E+02	Ci	S	1.43	g/mL	3571	kL	1.58E-01	uCi/g	Jan 1 2001 12:00AM
241-AN-102	155Eu	Supernatant	4.08E+02	Ci	S	1.43	g/mL	3571	kL	8.08E-02	uCi/g	Jan 1 2001 12:00AM
241-AN-102	226Ra	Supernatant	3.23E-04	Ci	TE	1.6	g/mL	3571	kL	5.99E-08	uCi/g	Jan 1 2001 12:00AM
241-AN-102	227Ac	Supernatant	3.30E-03	Ci	TE	1.6	g/mL	3571	kL	6.12E-07	uCi/g	Jan 1 2001 12:00AM
241-AN-102	228Ra	Supernatant	3.45E-01	Ci	TE	1.6	g/mL	3571	kL	6.40E-05	uCi/g	Jan 1 2001 12:00AM
241-AN-102	229Th	Supernatant	1.65E-02	Ci	TE	1.6	g/mL	3571	kL	3.06E-06	uCi/g	Jan 1 2001 12:00AM
241-AN-102	231Pa	Supernatant	8.90E-03	Ci	TE	1.6	g/mL	3571	kL	1.65E-06	uCi/g	Jan 1 2001 12:00AM
241-AN-102	232Th	Supernatant	7.88E-04	Ci	S	1.43	g/mL	3571	kL	1.56E-07	uCi/g	Jan 1 2001 12:00AM
241-AN-102	232U	Supernatant	3.29E-02	Ci	C	1.46	g/mL	3571	kL	6.39E-06	uCi/g	Jan 1 2001 12:00AM
241-AN-102	233U	Supernatant	1.35E-01	Ci	C	1.46	g/mL	3571	kL	2.62E-05	uCi/g	Jan 1 2001 12:00AM
241-AN-102	234U	Supernatant	2.78E-02	Ci	C	1.46	g/mL	3571	kL	5.40E-06	uCi/g	Jan 1 2001 12:00AM
241-AN-102	235U	Supernatant	1.11E-03	Ci	C	1.46	g/mL	3571	kL	2.15E-07	uCi/g	Jan 1 2001 12:00AM
241-AN-102	236U	Supernatant	9.90E-04	Ci	C	1.46	g/mL	3571	kL	1.92E-07	uCi/g	Jan 1 2001 12:00AM
241-AN-102	237Np	Supernatant	5.56E+00	Ci	TE	1.6	g/mL	3571	kL	1.03E-03	uCi/g	Jan 1 2001 12:00AM
241-AN-102	238Pu	Supernatant	5.43E-01	Ci	C	1.41	g/mL	3571	kL	1.08E-04	uCi/g	Jan 1 2001 12:00AM
241-AN-102	238U	Supernatant	2.46E-02	Ci	C	1.46	g/mL	3571	kL	4.77E-06	uCi/g	Jan 1 2001 12:00AM
241-AN-102	239Pu	Supernatant	1.77E+01	Ci	C	1.41	g/mL	3571	kL	3.51E-03	uCi/g	Jan 1 2001 12:00AM
241-AN-102	240Pu	Supernatant	3.12E+00	Ci	C	1.41	g/mL	3571	kL	6.18E-04	uCi/g	Jan 1 2001 12:00AM
241-AN-102	241Am	Supernatant	5.68E+02	Ci	S	1.43	g/mL	3571	kL	1.12E-01	uCi/g	Jan 1 2001 12:00AM
241-AN-102	241Pu	Supernatant	2.94E+01	Ci	C	1.41	g/mL	3571	kL	5.81E-03	uCi/g	Jan 1 2001 12:00AM
241-AN-102	242Cm	Supernatant	1.52E+00	Ci	C	1.43	g/mL	3571	kL	3.01E-04	uCi/g	Jan 1 2001 12:00AM
241-AN-102	242Pu	Supernatant	2.20E-04	Ci	C	1.41	g/mL	3571	kL	4.35E-08	uCi/g	Jan 1 2001 12:00AM
241-AN-102	243Am	Supernatant	2.23E-02	Ci	C	1.43	g/mL	3571	kL	4.40E-06	uCi/g	Jan 1 2001 12:00AM
241-AN-102	243Cm	Supernatant	1.27E-01	Ci	C	1.43	g/mL	3571	kL	2.50E-05	uCi/g	Jan 1 2001 12:00AM
241-AN-102	244Cm	Supernatant	9.94E-01	Ci	C	1.43	g/mL	3571	kL	1.97E-04	uCi/g	Jan 1 2001 12:00AM
241-AN-102	3H	Supernatant	2.26E+00	Ci	S	1.43	g/mL	3571	kL	4.47E-04	uCi/g	Jan 1 2001 12:00AM
241-AN-102	59Ni	Supernatant	1.74E+00	Ci	TE	1.6	g/mL	3571	kL	3.23E-04	uCi/g	Jan 1 2001 12:00AM
241-AN-102	60Co	Supernatant	2.73E+02	Ci	S	1.43	g/mL	3571	kL	5.39E-02	uCi/g	Jan 1 2001 12:00AM
241-AN-102	63Ni	Supernatant	1.64E+02	Ci	TE	1.6	g/mL	3571	kL	3.05E-02	uCi/g	Jan 1 2001 12:00AM
241-AN-102	79Se	Supernatant	2.14E+00	Ci	S	1.43	g/mL	3571	kL	4.22E-04	uCi/g	Jan 1 2001 12:00AM
241-AN-102	90Sr	Supernatant	2.97E+05	Ci	S	1.46	g/mL	3571	kL	5.75E+01	uCi/g	Jan 1 2001 12:00AM
241-AN-102	90Y	Supernatant	2.97E+05	Ci	C		g/mL	3571	kL		uCi/g	Jan 1 2001 12:00AM
241-AN-102	93mNb	Supernatant	3.19E+01	Ci	TE	1.6	g/mL	3571	kL	5.92E-03	uCi/g	Jan 1 2001 12:00AM
241-AN-102	93Zr	Supernatant	3.98E+01	Ci	TE	1.6	g/mL	3571	kL	7.37E-03	uCi/g	Jan 1 2001 12:00AM
241-AN-102	99Tc	Supernatant	4.95E+02	Ci	S	1.43	g/mL	3571	kL	9.79E-02	uCi/g	Jan 1 2001 12:00AM

CALCULATION SHEET

PROJECT: RPP-WTP
JOB NO.: 24590
CALC NO.: 24590-WTP-M4C-FRP-00001
SHEET REV: 0A
SHEET NO.: 59

BY: E. Berrios
DATE: 12/04/02

SUBJECT: Updated Emissions Run Feed Vector

Tank Name	Analyte	Waste Phase	Inventory	Inventory Units	Basis	Density	Density Units	Volume	Volume Units	Concentration	Concentration Units	Decay Date
241-AN-102	Ag	Supernatant	2.09E+01	kg	S	1.42	g/mL	3571	kL	4.23E+00	ug/g	Jan 1 2001 12:00AM
241-AN-102	Al	Supernatant	4.80E+04	kg	S	1.46	g/mL	3571	kL	9.20E+03	ug/g	Jan 1 2001 12:00AM
241-AN-102	Ba	Supernatant	1.05E+02	kg	S	1.42	g/mL	3571	kL	2.12E+01	ug/g	Jan 1 2001 12:00AM
241-AN-102	Be	Supernatant	1.06E+01	kg	S	1.46	g/mL	3571	kL	2.05E+00	ug/g	Jan 1 2001 12:00AM
241-AN-102	Bi	Supernatant	1.69E+02	kg	TE	1.6	g/mL	3571	kL	3.13E+01	ug/g	Jan 1 2001 12:00AM
241-AN-102	Ca	Supernatant	1.60E+03	kg	S	1.46	g/mL	3571	kL	3.08E+02	ug/g	Jan 1 2001 12:00AM
241-AN-102	Cd	Supernatant	2.08E+02	kg	S	1.46	g/mL	3571	kL	4.00E+01	ug/g	Jan 1 2001 12:00AM
241-AN-102	Cl	Supernatant	1.17E+04	kg	S	1.46	g/mL	3571	kL	2.24E+03	ug/g	Jan 1 2001 12:00AM
241-AN-102	Cr	Supernatant	8.64E+02	kg	S	1.46	g/mL	3571	kL	1.66E+02	ug/g	Jan 1 2001 12:00AM
241-AN-102	Cu	Supernatant	8.31E+01	kg	S	1.46	g/mL	3571	kL	1.59E+01	ug/g	Jan 1 2001 12:00AM
241-AN-102	F	Supernatant	2.18E+03	kg	S	1.46	g/mL	3571	kL	4.18E+02	ug/g	Jan 1 2001 12:00AM
241-AN-102	Fe	Supernatant	1.43E+02	kg	S	1.46	g/mL	3571	kL	2.74E+01	ug/g	Jan 1 2001 12:00AM
241-AN-102	Hg	Supernatant	0.00E+00	kg	TE	1.6	g/mL	3571	kL	0.00E+00	ug/g	Jan 1 2001 12:00AM
241-AN-102	K	Supernatant	7.77E+03	kg	S	1.46	g/mL	3571	kL	1.49E+03	ug/g	Jan 1 2001 12:00AM
241-AN-102	La	Supernatant	5.93E+00	kg	TE	1.6	g/mL	3571	kL	1.10E+00	ug/g	Jan 1 2001 12:00AM
241-AN-102	Li	Supernatant	2.09E+01	kg	S	1.42	g/mL	3571	kL	4.23E+00	ug/g	Jan 1 2001 12:00AM
241-AN-102	Mg	Supernatant	1.14E+02	kg	S	1.46	g/mL	3571	kL	2.18E+01	ug/g	Jan 1 2001 12:00AM
241-AN-102	Mn	Supernatant	7.06E+01	kg	S	1.46	g/mL	3571	kL	1.35E+01	ug/g	Jan 1 2001 12:00AM
241-AN-102	Mo	Supernatant	1.73E+02	kg	S	1.46	g/mL	3571	kL	3.32E+01	ug/g	Jan 1 2001 12:00AM
241-AN-102	Na	Supernatant	7.94E+05	kg	S	1.46	g/mL	3571	kL	1.52E+05	ug/g	Jan 1 2001 12:00AM
241-AN-102	Nd	Supernatant	2.09E+02	kg	S	1.42	g/mL	3571	kL	4.23E+01	ug/g	Jan 1 2001 12:00AM
241-AN-102	Ni	Supernatant	1.38E+03	kg	S	1.46	g/mL	3571	kL	2.64E+02	ug/g	Jan 1 2001 12:00AM
241-AN-102	NO2	Supernatant	2.91E+05	kg	S	1.46	g/mL	3571	kL	5.59E+04	ug/g	Jan 1 2001 12:00AM
241-AN-102	NO3	Supernatant	7.28E+05	kg	S	1.46	g/mL	3571	kL	1.40E+05	ug/g	Jan 1 2001 12:00AM
241-AN-102	OH	Supernatant	3.74E+04	kg	S	1.46	g/mL	3571	kL	7.17E+03	ug/g	Jan 1 2001 12:00AM
241-AN-102	Pb	Supernatant	5.45E+02	kg	S	1.46	g/mL	3571	kL	1.04E+02	ug/g	Jan 1 2001 12:00AM
241-AN-102	PO4	Supernatant	1.79E+04	kg	S	1.46	g/mL	3571	kL	3.43E+03	ug/g	Jan 1 2001 12:00AM
241-AN-102	Si	Supernatant	7.24E+01	kg	S	1.41	g/mL	3571	kL	1.43E+01	ug/g	Jan 1 2001 12:00AM
241-AN-102	SO4	Supernatant	5.46E+04	kg	S	1.46	g/mL	3571	kL	1.05E+04	ug/g	Jan 1 2001 12:00AM
241-AN-102	Sr	Supernatant	7.25E+00	kg	C		g/mL	3571	kL		ug/g	Jan 1 2001 12:00AM
241-AN-102	Ti	Supernatant	2.09E+01	kg	S	1.42	g/mL	3571	kL	4.23E+00	ug/g	Jan 1 2001 12:00AM
241-AN-102	TIC as CO3	Supernatant	2.65E+05	kg	S	1.46	g/mL	3571	kL	5.08E+04	ug/g	Jan 1 2001 12:00AM
241-AN-102	UTOTAL	Supernatant	7.36E+01	kg	S	1.46	g/mL	3571	kL	1.43E+01	ug/g	Jan 1 2001 12:00AM
241-AN-102	V	Supernatant	1.05E+02	kg	S	1.42	g/mL	3571	kL	2.12E+01	ug/g	Jan 1 2001 12:00AM
241-AN-102	Zn	Supernatant	2.09E+01	kg	S	1.42	g/mL	3571	kL	4.23E+00	ug/g	Jan 1 2001 12:00AM
241-AN-102	Zr	Supernatant	3.28E+01	kg	S	1.46	g/mL	3571	kL	6.37E+00	ug/g	Jan 1 2001 12:00AM
241-AN-103	106Ru	Salt Cake	1.40E-04	Ci	TS	1.58	g/mL	1533	kL	4.97E-08	uCi/g	Jan 1 2001 12:00AM
241-AN-103	106Ru	Supernatant	8.08E-05	Ci	TE	1.6	g/mL	1883	kL	3.21E-08	uCi/g	Jan 1 2001 12:00AM
241-AN-103	113mCd	Salt Cake	1.27E+02	Ci	TS	1.58	g/mL	1533	kL	4.52E-02	uCi/g	Jan 1 2001 12:00AM
241-AN-103	113mCd	Supernatant	7.34E+01	Ci	TE	1.6	g/mL	1883	kL	2.92E-02	uCi/g	Jan 1 2001 12:00AM
241-AN-103	125Sb	Salt Cake	6.97E+01	Ci	TS	1.58	g/mL	1533	kL	2.48E-02	uCi/g	Jan 1 2001 12:00AM
241-AN-103	125Sb	Supernatant	4.04E+01	Ci	TE	1.6	g/mL	1883	kL	1.60E-02	uCi/g	Jan 1 2001 12:00AM
241-AN-103	126Sn	Salt Cake	3.92E+00	Ci	TS	1.58	g/mL	1533	kL	1.40E-03	uCi/g	Jan 1 2001 12:00AM
241-AN-103	126Sn	Supernatant	1.42E+01	Ci	S	1.49	g/mL	1883	kL	5.93E-03	uCi/g	Jan 1 2001 12:00AM
241-AN-103	129I	Salt Cake	3.15E-01	Ci	TS	1.58	g/mL	1533	kL	1.12E-04	uCi/g	Jan 1 2001 12:00AM
241-AN-103	129I	Supernatant	6.09E-01	Ci	S	1.49	g/mL	1883	kL	2.54E-04	uCi/g	Jan 1 2001 12:00AM
241-AN-103	134Cs	Salt Cake	3.04E-01	Ci	TS	1.58	g/mL	1533	kL	1.08E-04	uCi/g	Jan 1 2001 12:00AM

CALCULATION SHEET

PROJECT: RPP-WTP
JOB NO.: 24590
CALC NO.: 24590-WTP-M4C-FRP-00001
SHEET REV: 0A
SHEET NO.: 60

BY: E. Berrios
DATE: 12/04/02

SUBJECT: Updated Emissions Run Feed Vector

Tank Name	Analyte	Waste Phase	Inventory	Inventory Units	Basis	Density	Density Units	Volume	Volume Units	Concentration	Concentration Units	Decay Date
241-AN-103	134Cs	Supernatant	1.01E+00	Ci	TE	1.6	g/mL	1883	kL	4.03E-04	uCi/g	Jan 1 2001 12:00AM
241-AN-103	137Cs	Salt Cake	6.79E+05	Ci	S	1.69	g/mL	1533	kL	2.24E+02	uCi/g	Jan 1 2001 12:00AM
241-AN-103	137Cs	Supernatant	1.22E+06	Ci	S	1.49	g/mL	1883	kL	5.12E+02	uCi/g	Jan 1 2001 12:00AM
241-AN-103	137mBa	Salt Cake	6.42E+05	Ci	C		g/mL	1533	kL		uCi/g	Jan 1 2001 12:00AM
241-AN-103	137mBa	Supernatant	1.16E+06	Ci	C		g/mL	1883	kL		uCi/g	Jan 1 2001 12:00AM
241-AN-103	14C	Salt Cake	5.28E+01	Ci	TS	1.58	g/mL	1533	kL	1.88E-02	uCi/g	Jan 1 2001 12:00AM
241-AN-103	14C	Supernatant	5.57E-01	Ci	S	1.49	g/mL	1883	kL	2.33E-04	uCi/g	Jan 1 2001 12:00AM
241-AN-103	151Sm	Salt Cake	2.16E+04	Ci	TS	1.58	g/mL	1533	kL	7.69E+00	uCi/g	Jan 1 2001 12:00AM
241-AN-103	151Sm	Supernatant	1.25E+04	Ci	TE	1.6	g/mL	1883	kL	4.97E+00	uCi/g	Jan 1 2001 12:00AM
241-AN-103	152Eu	Salt Cake	6.53E+00	Ci	TS	1.58	g/mL	1533	kL	2.32E-03	uCi/g	Jan 1 2001 12:00AM
241-AN-103	152Eu	Supernatant	3.77E+00	Ci	TE	1.6	g/mL	1883	kL	1.50E-03	uCi/g	Jan 1 2001 12:00AM
241-AN-103	154Eu	Salt Cake	1.61E+02	Ci	S	1.69	g/mL	1533	kL	5.30E-02	uCi/g	Jan 1 2001 12:00AM
241-AN-103	154Eu	Supernatant	6.26E+01	Ci	S	1.49	g/mL	1883	kL	2.62E-02	uCi/g	Jan 1 2001 12:00AM
241-AN-103	155Eu	Salt Cake	9.22E+01	Ci	E	1.69	g/mL	1533	kL	3.04E-02	uCi/g	Jan 1 2001 12:00AM
241-AN-103	155Eu	Supernatant	3.48E+01	Ci	E	1.49	g/mL	1883	kL	1.45E-02	uCi/g	Jan 1 2001 12:00AM
241-AN-103	226Ra	Salt Cake	2.61E-04	Ci	TS	1.58	g/mL	1533	kL	9.28E-08	uCi/g	Jan 1 2001 12:00AM
241-AN-103	226Ra	Supernatant	1.51E-04	Ci	TE	1.6	g/mL	1883	kL	5.99E-08	uCi/g	Jan 1 2001 12:00AM
241-AN-103	227Ac	Salt Cake	1.53E-03	Ci	TS	1.58	g/mL	1533	kL	5.46E-07	uCi/g	Jan 1 2001 12:00AM
241-AN-103	227Ac	Supernatant	8.87E-04	Ci	TE	1.6	g/mL	1883	kL	3.52E-07	uCi/g	Jan 1 2001 12:00AM
241-AN-103	228Ra	Supernatant	3.32E-01	Ci	TE	1.6	g/mL	1883	kL	1.32E-04	uCi/g	Jan 1 2001 12:00AM
241-AN-103	228Ra	Salt Cake	5.73E-01	Ci	TS	1.58	g/mL	1533	kL	2.04E-04	uCi/g	Jan 1 2001 12:00AM
241-AN-103	229Th	Salt Cake	1.33E-02	Ci	TS	1.58	g/mL	1533	kL	4.74E-06	uCi/g	Jan 1 2001 12:00AM
241-AN-103	229Th	Supernatant	7.70E-03	Ci	TE	1.6	g/mL	1883	kL	3.06E-06	uCi/g	Jan 1 2001 12:00AM
241-AN-103	231Pa	Salt Cake	7.16E-03	Ci	TS	1.58	g/mL	1533	kL	2.55E-06	uCi/g	Jan 1 2001 12:00AM
241-AN-103	231Pa	Supernatant	4.15E-03	Ci	TE	1.6	g/mL	1883	kL	1.65E-06	uCi/g	Jan 1 2001 12:00AM
241-AN-103	232Th	Salt Cake	7.00E-02	Ci	TS	1.58	g/mL	1533	kL	2.49E-05	uCi/g	Jan 1 2001 12:00AM
241-AN-103	232Th	Supernatant	9.69E-04	Ci	S	1.49	g/mL	1883	kL	4.05E-07	uCi/g	Jan 1 2001 12:00AM
241-AN-103	232U	Salt Cake	4.01E-02	Ci	C	1.69	g/mL	1533	kL	6.02E-04	uCi/g	Jan 1 2001 12:00AM
241-AN-103	232U	Supernatant	8.67E-04	Ci	E	1.49	g/mL	1883	kL	3.62E-07	uCi/g	Jan 1 2001 12:00AM
241-AN-103	233U	Salt Cake	1.65E-01	Ci	C	1.69	g/mL	1533	kL	2.38E-03	uCi/g	Jan 1 2001 12:00AM
241-AN-103	233U	Supernatant	3.55E-03	Ci	E	1.49	g/mL	1883	kL	1.48E-06	uCi/g	Jan 1 2001 12:00AM
241-AN-103	234U	Salt Cake	5.82E-02	Ci	C	1.69	g/mL	1533	kL	8.42E-04	uCi/g	Jan 1 2001 12:00AM
241-AN-103	234U	Supernatant	1.26E-03	Ci	E	1.49	g/mL	1883	kL	5.26E-07	uCi/g	Jan 1 2001 12:00AM
241-AN-103	235U	Salt Cake	2.26E-03	Ci	C	1.69	g/mL	1533	kL	3.27E-05	uCi/g	Jan 1 2001 12:00AM
241-AN-103	235U	Supernatant	4.88E-05	Ci	E	1.49	g/mL	1883	kL	2.04E-08	uCi/g	Jan 1 2001 12:00AM
241-AN-103	236U	Salt Cake	3.40E-03	Ci	C	1.69	g/mL	1533	kL	4.92E-05	uCi/g	Jan 1 2001 12:00AM
241-AN-103	236U	Supernatant	7.34E-05	Ci	E	1.49	g/mL	1883	kL	3.07E-08	uCi/g	Jan 1 2001 12:00AM
241-AN-103	237Np	Salt Cake	5.76E-01	Ci	TS	1.58	g/mL	1533	kL	2.05E-04	uCi/g	Jan 1 2001 12:00AM
241-AN-103	237Np	Supernatant	3.52E-02	Ci	S	1.49	g/mL	1883	kL	1.47E-05	uCi/g	Jan 1 2001 12:00AM
241-AN-103	238Pu	Salt Cake	2.25E-01	Ci	C	1.69	g/mL	1533	kL	2.11E-03	uCi/g	Jan 1 2001 12:00AM
241-AN-103	238Pu	Supernatant	5.03E-02	Ci	E	1.49	g/mL	1883	kL	2.10E-05	uCi/g	Jan 1 2001 12:00AM
241-AN-103	238U	Salt Cake	4.56E-02	Ci	C	1.69	g/mL	1533	kL	6.59E-04	uCi/g	Jan 1 2001 12:00AM
241-AN-103	238U	Supernatant	9.86E-04	Ci	E	1.49	g/mL	1883	kL	4.12E-07	uCi/g	Jan 1 2001 12:00AM
241-AN-103	239Pu	Salt Cake	4.44E+00	Ci	C	1.69	g/mL	1533	kL	4.05E-02	uCi/g	Jan 1 2001 12:00AM
241-AN-103	239Pu	Supernatant	9.93E-01	Ci	E	1.49	g/mL	1883	kL	4.15E-04	uCi/g	Jan 1 2001 12:00AM
241-AN-103	240Pu	Salt Cake	9.24E-01	Ci	C	1.69	g/mL	1533	kL	8.44E-03	uCi/g	Jan 1 2001 12:00AM
241-AN-103	240Pu	Supernatant	2.07E-01	Ci	E	1.49	g/mL	1883	kL	8.66E-05	uCi/g	Jan 1 2001 12:00AM

CALCULATION SHEET

PROJECT: RPP-WTP
JOB NO.: 24590
CALC NO.: 24590-WTP-M4C-FRP-00001
SHEET REV: 0A
SHEET NO.: 61

BY: E. Berrios
DATE: 12/04/02

SUBJECT: Updated Emissions Run Feed Vector

Tank Name	Analyte	Waste Phase	Inventory	Inventory Units	Basis	Density	Density Units	Volume	Volume Units	Concentration	Concentration Units	Decay Date
241-AN-103	241Am	Salt Cake	1.07E+01	Ci	E	1.69	g/mL	1533	kL	3.54E-03	uCi/g	Jan 1 2001 12:00AM
241-AN-103	241Am	Supernatant	9.16E+00	Ci	E	1.49	g/mL	1883	kL	3.83E-03	uCi/g	Jan 1 2001 12:00AM
241-AN-103	241Pu	Salt Cake	1.43E+01	Ci	E	1.69	g/mL	1533	kL	4.72E-03	uCi/g	Jan 1 2001 12:00AM
241-AN-103	241Pu	Supernatant	3.20E+00	Ci	E	1.49	g/mL	1883	kL	1.34E-03	uCi/g	Jan 1 2001 12:00AM
241-AN-103	242Cm	Salt Cake	2.06E-02	Ci	C	1.69	g/mL	1533	kL	1.06E-04	uCi/g	Jan 1 2001 12:00AM
241-AN-103	242Cm	Supernatant	1.77E-02	Ci	E	1.49	g/mL	1883	kL	7.38E-06	uCi/g	Jan 1 2001 12:00AM
241-AN-103	242Pu	Salt Cake	9.41E-05	Ci	C	1.69	g/mL	1533	kL	8.59E-07	uCi/g	Jan 1 2001 12:00AM
241-AN-103	242Pu	Supernatant	2.10E-05	Ci	E	1.49	g/mL	1883	kL	8.79E-09	uCi/g	Jan 1 2001 12:00AM
241-AN-103	243Am	Salt Cake	7.16E-04	Ci	C	1.69	g/mL	1533	kL	3.61E-06	uCi/g	Jan 1 2001 12:00AM
241-AN-103	243Am	Supernatant	6.15E-04	Ci	E	1.49	g/mL	1883	kL	2.57E-07	uCi/g	Jan 1 2001 12:00AM
241-AN-103	243Cm	Salt Cake	1.83E-03	Ci	C	1.69	g/mL	1533	kL	1.01E-05	uCi/g	Jan 1 2001 12:00AM
241-AN-103	243Cm	Supernatant	1.57E-03	Ci	E	1.49	g/mL	1883	kL	6.56E-07	uCi/g	Jan 1 2001 12:00AM
241-AN-103	244Cm	Salt Cake	2.26E-02	Ci	C	1.69	g/mL	1533	kL	1.32E-04	uCi/g	Jan 1 2001 12:00AM
241-AN-103	244Cm	Supernatant	1.94E-02	Ci	E	1.49	g/mL	1883	kL	8.12E-06	uCi/g	Jan 1 2001 12:00AM
241-AN-103	3H	Salt Cake	6.97E+00	Ci	S	1.69	g/mL	1533	kL	2.30E-03	uCi/g	Jan 1 2001 12:00AM
241-AN-103	3H	Supernatant	2.04E+00	Ci	S	1.49	g/mL	1883	kL	8.52E-04	uCi/g	Jan 1 2001 12:00AM
241-AN-103	59Ni	Salt Cake	4.24E+00	Ci	TS	1.58	g/mL	1533	kL	1.51E-03	uCi/g	Jan 1 2001 12:00AM
241-AN-103	59Ni	Supernatant	8.13E-01	Ci	TE	1.6	g/mL	1883	kL	3.23E-04	uCi/g	Jan 1 2001 12:00AM
241-AN-103	60Co	Salt Cake	2.30E+01	Ci	S	1.69	g/mL	1533	kL	7.59E-03	uCi/g	Jan 1 2001 12:00AM
241-AN-103	60Co	Supernatant	1.82E+01	Ci	S	1.49	g/mL	1883	kL	7.58E-03	uCi/g	Jan 1 2001 12:00AM
241-AN-103	63Ni	Salt Cake	4.02E+02	Ci	TS	1.58	g/mL	1533	kL	1.43E-01	uCi/g	Jan 1 2001 12:00AM
241-AN-103	63Ni	Supernatant	7.67E+01	Ci	TE	1.6	g/mL	1883	kL	3.05E-02	uCi/g	Jan 1 2001 12:00AM
241-AN-103	79Se	Salt Cake	6.49E-01	Ci	TS	1.58	g/mL	1533	kL	2.31E-04	uCi/g	Jan 1 2001 12:00AM
241-AN-103	79Se	Supernatant	1.41E+00	Ci	S	1.49	g/mL	1883	kL	5.88E-04	uCi/g	Jan 1 2001 12:00AM
241-AN-103	90Sr	Salt Cake	7.37E+03	Ci	S	1.69	g/mL	1533	kL	2.43E+00	uCi/g	Jan 1 2001 12:00AM
241-AN-103	90Sr	Supernatant	3.06E+01	Ci	S	1.49	g/mL	1883	kL	1.28E-02	uCi/g	Jan 1 2001 12:00AM
241-AN-103	90Y	Salt Cake	7.37E+03	Ci	C		g/mL	1533	kL		uCi/g	Jan 1 2001 12:00AM
241-AN-103	90Y	Supernatant	3.06E+01	Ci	C		g/mL	1883	kL		uCi/g	Jan 1 2001 12:00AM
241-AN-103	93mNb	Salt Cake	2.30E+01	Ci	TS	1.58	g/mL	1533	kL	8.19E-03	uCi/g	Jan 1 2001 12:00AM
241-AN-103	93mNb	Supernatant	1.33E+01	Ci	TE	1.6	g/mL	1883	kL	5.29E-03	uCi/g	Jan 1 2001 12:00AM
241-AN-103	93Zr	Salt Cake	3.20E+01	Ci	TS	1.58	g/mL	1533	kL	1.14E-02	uCi/g	Jan 1 2001 12:00AM
241-AN-103	93Zr	Supernatant	1.86E+01	Ci	TE	1.6	g/mL	1883	kL	7.37E-03	uCi/g	Jan 1 2001 12:00AM
241-AN-103	99Tc	Salt Cake	4.38E+02	Ci	S	1.69	g/mL	1533	kL	1.44E-01	uCi/g	Jan 1 2001 12:00AM
241-AN-103	99Tc	Supernatant	2.55E+02	Ci	S	1.49	g/mL	1883	kL	1.07E-01	uCi/g	Jan 1 2001 12:00AM
241-AN-103	Ag	Salt Cake	4.60E+01	kg	S	1.69	g/mL	1533	kL	1.52E+01	ug/g	Jan 1 2001 12:00AM
241-AN-103	Ag	Supernatant	3.70E+01	kg	S	1.48	g/mL	1883	kL	1.33E+01	ug/g	Jan 1 2001 12:00AM
241-AN-103	Al	Salt Cake	1.62E+05	kg	S	1.72	g/mL	1533	kL	6.13E+04	ug/g	Jan 1 2001 12:00AM
241-AN-103	Al	Supernatant	5.64E+04	kg	S	1.48	g/mL	1883	kL	2.03E+04	ug/g	Jan 1 2001 12:00AM
241-AN-103	As	Salt Cake	1.69E+02	kg	S	1.69	g/mL	1533	kL	5.57E+01	ug/g	Jan 1 2001 12:00AM
241-AN-103	As	Supernatant	1.47E+02	kg	S	1.48	g/mL	1883	kL	5.28E+01	ug/g	Jan 1 2001 12:00AM
241-AN-103	B	Salt Cake	3.72E+02	kg	S	1.72	g/mL	1533	kL	1.41E+02	ug/g	Jan 1 2001 12:00AM
241-AN-103	B	Supernatant	1.50E+02	kg	S	1.48	g/mL	1883	kL	5.38E+01	ug/g	Jan 1 2001 12:00AM
241-AN-103	Ba	Supernatant	7.36E+01	kg	S	1.48	g/mL	1883	kL	2.64E+01	ug/g	Jan 1 2001 12:00AM
241-AN-103	Ba	Salt Cake	8.44E+01	kg	S	1.69	g/mL	1533	kL	2.79E+01	ug/g	Jan 1 2001 12:00AM
241-AN-103	Be	Salt Cake	8.44E+00	kg	S	1.69	g/mL	1533	kL	2.79E+00	ug/g	Jan 1 2001 12:00AM
241-AN-103	Be	Supernatant	7.35E+00	kg	S	1.48	g/mL	1883	kL	2.64E+00	ug/g	Jan 1 2001 12:00AM
241-AN-103	Bi	Salt Cake	1.69E+02	kg	S	1.69	g/mL	1533	kL	5.57E+01	ug/g	Jan 1 2001 12:00AM

CALCULATION SHEET

PROJECT: RPP-WTP
JOB NO.: 24590
CALC NO.: 24590-WTP-M4C-FRP-00001
SHEET REV: 0A
SHEET NO.: 62

BY: E. Berrios
DATE: 12/04/02

SUBJECT: Updated Emissions Run Feed Vector

Tank Name	Analyte	Waste Phase	Inventory	Inventory Units	Basis	Density	Density Units	Volume	Volume Units	Concentration	Concentration Units	Decay Date
241-AN-103	Bi	Supernatant	1.47E+02	kg	S	1.48	g/mL	1883	kL	5.28E+01	ug/g	Jan 1 2001 12:00AM
241-AN-103	Ca	Salt Cake	3.80E+02	kg	S	1.69	g/mL	1533	kL	1.25E+02	ug/g	Jan 1 2001 12:00AM
241-AN-103	Ca	Supernatant	1.47E+02	kg	S	1.48	g/mL	1883	kL	5.28E+01	ug/g	Jan 1 2001 12:00AM
241-AN-103	Cd	Supernatant	9.89E+00	kg	S	1.48	g/mL	1883	kL	3.55E+00	ug/g	Jan 1 2001 12:00AM
241-AN-103	Cd	Salt Cake	2.54E+01	kg	S	1.72	g/mL	1533	kL	9.62E+00	ug/g	Jan 1 2001 12:00AM
241-AN-103	Ce	Supernatant	1.47E+02	kg	S	1.48	g/mL	1883	kL	5.28E+01	ug/g	Jan 1 2001 12:00AM
241-AN-103	Ce	Salt Cake	1.69E+02	kg	S	1.69	g/mL	1533	kL	5.57E+01	ug/g	Jan 1 2001 12:00AM
241-AN-103	Cl	Salt Cake	1.03E+04	kg	S	1.72	g/mL	1533	kL	3.92E+03	ug/g	Jan 1 2001 12:00AM
241-AN-103	Cl	Supernatant	1.79E+04	kg	S	1.48	g/mL	1883	kL	6.43E+03	ug/g	Jan 1 2001 12:00AM
241-AN-103	CN	Supernatant	2.84E+01	kg	S	1.49	g/mL	1883	kL	1.19E+01	ug/g	Jan 1 2001 12:00AM
241-AN-103	Co	Supernatant	1.93E+01	kg	S	1.49	g/mL	1883	kL	8.05E+00	ug/g	Jan 1 2001 12:00AM
241-AN-103	Co	Salt Cake	1.24E+02	kg	S	1.72	g/mL	1533	kL	4.71E+01	ug/g	Jan 1 2001 12:00AM
241-AN-103	Cr	Supernatant	1.06E+03	kg	S	1.48	g/mL	1883	kL	3.79E+02	ug/g	Jan 1 2001 12:00AM
241-AN-103	Cr	Salt Cake	1.46E+03	kg	S	1.72	g/mL	1533	kL	5.53E+02	ug/g	Jan 1 2001 12:00AM
241-AN-103	Cu	Salt Cake	1.69E+01	kg	S	1.69	g/mL	1533	kL	5.57E+00	ug/g	Jan 1 2001 12:00AM
241-AN-103	Cu	Supernatant	1.49E+01	kg	S	1.48	g/mL	1883	kL	5.36E+00	ug/g	Jan 1 2001 12:00AM
241-AN-103	F	Salt Cake	2.28E+03	kg	S	1.72	g/mL	1533	kL	8.65E+02	ug/g	Jan 1 2001 12:00AM
241-AN-103	F	Supernatant	1.25E+03	kg	S	1.48	g/mL	1883	kL	4.47E+02	ug/g	Jan 1 2001 12:00AM
241-AN-103	Fe	Salt Cake	1.40E+02	kg	S	1.69	g/mL	1533	kL	4.61E+01	ug/g	Jan 1 2001 12:00AM
241-AN-103	Fe	Supernatant	7.51E+01	kg	S	1.48	g/mL	1883	kL	2.69E+01	ug/g	Jan 1 2001 12:00AM
241-AN-103	Hg	Salt Cake	4.66E+00	kg	E	1	g/mL	1533	kL	3.04E+00	ug/g	Jan 1 2001 12:00AM
241-AN-103	Hg	Supernatant	0.00E+00	kg	TE	1.6	g/mL	1883	kL	0.00E+00	ug/g	Jan 1 2001 12:00AM
241-AN-103	K	Salt Cake	1.68E+04	kg	S	1.72	g/mL	1533	kL	6.38E+03	ug/g	Jan 1 2001 12:00AM
241-AN-103	K	Supernatant	3.13E+04	kg	S	1.48	g/mL	1883	kL	1.12E+04	ug/g	Jan 1 2001 12:00AM
241-AN-103	La	Salt Cake	8.44E+01	kg	S	1.69	g/mL	1533	kL	2.79E+01	ug/g	Jan 1 2001 12:00AM
241-AN-103	La	Supernatant	2.77E+00	kg	TE	1.6	g/mL	1883	kL	1.10E+00	ug/g	Jan 1 2001 12:00AM
241-AN-103	Li	Supernatant	4.68E+01	kg	S	1.48	g/mL	1883	kL	1.68E+01	ug/g	Jan 1 2001 12:00AM
241-AN-103	Li	Salt Cake	1.57E+02	kg	S	1.72	g/mL	1533	kL	5.96E+01	ug/g	Jan 1 2001 12:00AM
241-AN-103	Mg	Supernatant	1.47E+02	kg	S	1.48	g/mL	1883	kL	5.28E+01	ug/g	Jan 1 2001 12:00AM
241-AN-103	Mg	Salt Cake	1.77E+02	kg	S	1.69	g/mL	1533	kL	5.85E+01	ug/g	Jan 1 2001 12:00AM
241-AN-103	Mn	Salt Cake	1.77E+01	kg	S	1.69	g/mL	1533	kL	5.85E+00	ug/g	Jan 1 2001 12:00AM
241-AN-103	Mn	Supernatant	1.47E+01	kg	S	1.48	g/mL	1883	kL	5.28E+00	ug/g	Jan 1 2001 12:00AM
241-AN-103	Mo	Salt Cake	1.11E+02	kg	S	1.69	g/mL	1533	kL	3.66E+01	ug/g	Jan 1 2001 12:00AM
241-AN-103	Mo	Supernatant	2.20E+02	kg	S	1.48	g/mL	1883	kL	7.89E+01	ug/g	Jan 1 2001 12:00AM
241-AN-103	Na	Salt Cake	5.51E+05	kg	S	1.72	g/mL	1533	kL	2.09E+05	ug/g	Jan 1 2001 12:00AM
241-AN-103	Na	Supernatant	5.08E+05	kg	S	1.48	g/mL	1883	kL	1.82E+05	ug/g	Jan 1 2001 12:00AM
241-AN-103	Nd	Supernatant	1.47E+02	kg	S	1.48	g/mL	1883	kL	5.28E+01	ug/g	Jan 1 2001 12:00AM
241-AN-103	Nd	Salt Cake	1.69E+02	kg	S	1.69	g/mL	1533	kL	5.57E+01	ug/g	Jan 1 2001 12:00AM
241-AN-103	Ni	Salt Cake	3.38E+01	kg	S	1.69	g/mL	1533	kL	1.12E+01	ug/g	Jan 1 2001 12:00AM
241-AN-103	Ni	Supernatant	2.94E+01	kg	S	1.48	g/mL	1883	kL	1.06E+01	ug/g	Jan 1 2001 12:00AM
241-AN-103	NO2	Salt Cake	1.84E+05	kg	S	1.72	g/mL	1533	kL	7.00E+04	ug/g	Jan 1 2001 12:00AM
241-AN-103	NO2	Supernatant	3.09E+05	kg	S	1.48	g/mL	1883	kL	1.11E+05	ug/g	Jan 1 2001 12:00AM
241-AN-103	NO3	Salt Cake	4.08E+05	kg	S	1.72	g/mL	1533	kL	1.55E+05	ug/g	Jan 1 2001 12:00AM
241-AN-103	NO3	Supernatant	3.15E+05	kg	S	1.48	g/mL	1883	kL	1.13E+05	ug/g	Jan 1 2001 12:00AM
241-AN-103	OH	Salt Cake	1.03E+05	kg	S	1.69	g/mL	1533	kL	3.39E+04	ug/g	Jan 1 2001 12:00AM
241-AN-103	OH	Supernatant	1.58E+05	kg	S	1.49	g/mL	1883	kL	6.59E+04	ug/g	Jan 1 2001 12:00AM
241-AN-103	Oxalate	Supernatant	2.30E+00	kg	TE	1.6	g/mL	1883	kL	9.13E-01	ug/g	Jan 1 2001 12:00AM

CALCULATION SHEET

PROJECT: RPP-WTP
JOB NO.: 24590
CALC NO.: 24590-WTP-M4C-FRP-00001
SHEET REV: 0A
SHEET NO.: 63

BY: E. Berrios
DATE: 12/04/02

SUBJECT: Updated Emissions Run Feed Vector

Tank Name	Analyte	Waste Phase	Inventory	Inventory Units	Basis	Density	Density Units	Volume	Volume Units	Concentration	Concentration Units	Decay Date
241-AN-103	Oxalate	Salt Cake	1.53E+04	kg	S	1.72	g/mL	1533	kL	5.79E+03	ug/g	Jan 1 2001 12:00AM
241-AN-103	Pb	Salt Cake	1.69E+02	kg	S	1.69	g/mL	1533	kL	5.57E+01	ug/g	Jan 1 2001 12:00AM
241-AN-103	Pb	Supernatant	2.91E+02	kg	S	1.48	g/mL	1883	kL	1.05E+02	ug/g	Jan 1 2001 12:00AM
241-AN-103	PO4	Salt Cake	5.74E+03	kg	S	1.72	g/mL	1533	kL	2.18E+03	ug/g	Jan 1 2001 12:00AM
241-AN-103	PO4	Supernatant	3.17E+03	kg	S	1.48	g/mL	1883	kL	1.14E+03	ug/g	Jan 1 2001 12:00AM
241-AN-103	Sb	Salt Cake	1.01E+02	kg	S	1.69	g/mL	1533	kL	3.34E+01	ug/g	Jan 1 2001 12:00AM
241-AN-103	Sb	Supernatant	8.83E+01	kg	S	1.48	g/mL	1883	kL	3.17E+01	ug/g	Jan 1 2001 12:00AM
241-AN-103	Se	Salt Cake	1.69E+02	kg	S	1.69	g/mL	1533	kL	5.57E+01	ug/g	Jan 1 2001 12:00AM
241-AN-103	Se	Supernatant	1.49E+02	kg	S	1.48	g/mL	1883	kL	5.33E+01	ug/g	Jan 1 2001 12:00AM
241-AN-103	Si	Salt Cake	1.20E+03	kg	TS	1.58	g/mL	1533	kL	4.28E+02	ug/g	Jan 1 2001 12:00AM
241-AN-103	Si	Supernatant	8.17E+02	kg	S	1.48	g/mL	1883	kL	2.93E+02	ug/g	Jan 1 2001 12:00AM
241-AN-103	SO4	Salt Cake	8.56E+03	kg	S	1.72	g/mL	1533	kL	3.25E+03	ug/g	Jan 1 2001 12:00AM
241-AN-103	SO4	Supernatant	2.41E+03	kg	S	1.48	g/mL	1883	kL	8.66E+02	ug/g	Jan 1 2001 12:00AM
241-AN-103	Sr	Salt Cake	1.69E+01	kg	S	1.69	g/mL	1533	kL	5.57E+00	ug/g	Jan 1 2001 12:00AM
241-AN-103	Sr	Supernatant	1.47E+01	kg	S	1.48	g/mL	1883	kL	5.28E+00	ug/g	Jan 1 2001 12:00AM
241-AN-103	Ta	Supernatant	4.83E+01	kg	S	1.49	g/mL	1883	kL	2.02E+01	ug/g	Jan 1 2001 12:00AM
241-AN-103	Th	Supernatant	4.83E+01	kg	S	1.49	g/mL	1883	kL	2.02E+01	ug/g	Jan 1 2001 12:00AM
241-AN-103	Ti	Supernatant	1.47E+01	kg	S	1.48	g/mL	1883	kL	5.28E+00	ug/g	Jan 1 2001 12:00AM
241-AN-103	Ti	Salt Cake	1.69E+01	kg	S	1.69	g/mL	1533	kL	5.57E+00	ug/g	Jan 1 2001 12:00AM
241-AN-103	TIC as CO3	Salt Cake	8.22E+04	kg	S	1.69	g/mL	1533	kL	2.71E+04	ug/g	Jan 1 2001 12:00AM
241-AN-103	TIC as CO3	Supernatant	9.28E+03	kg	S	1.49	g/mL	1883	kL	3.88E+03	ug/g	Jan 1 2001 12:00AM
241-AN-103	Tl	Supernatant	2.94E+02	kg	S	1.48	g/mL	1883	kL	1.05E+02	ug/g	Jan 1 2001 12:00AM
241-AN-103	Tl	Salt Cake	3.38E+02	kg	S	1.69	g/mL	1533	kL	1.12E+02	ug/g	Jan 1 2001 12:00AM
241-AN-103	UTOTAL	Salt Cake	1.37E+02	kg	S	1.69	g/mL	1533	kL	4.51E+01	ug/g	Jan 1 2001 12:00AM
241-AN-103	UTOTAL	Supernatant	2.95E+00	kg	S	1.49	g/mL	1883	kL	1.23E+00	ug/g	Jan 1 2001 12:00AM
241-AN-103	V	Supernatant	7.36E+01	kg	S	1.48	g/mL	1883	kL	2.64E+01	ug/g	Jan 1 2001 12:00AM
241-AN-103	V	Salt Cake	8.44E+01	kg	S	1.69	g/mL	1533	kL	2.79E+01	ug/g	Jan 1 2001 12:00AM
241-AN-103	W	Supernatant	5.37E+02	kg	S	1.49	g/mL	1883	kL	2.24E+02	ug/g	Jan 1 2001 12:00AM
241-AN-103	Y	Supernatant	9.65E+00	kg	S	1.49	g/mL	1883	kL	4.03E+00	ug/g	Jan 1 2001 12:00AM
241-AN-103	Zn	Salt Cake	8.66E+01	kg	S	1.72	g/mL	1533	kL	3.29E+01	ug/g	Jan 1 2001 12:00AM
241-AN-103	Zn	Supernatant	2.32E+01	kg	S	1.48	g/mL	1883	kL	8.31E+00	ug/g	Jan 1 2001 12:00AM
241-AN-103	Zr	Salt Cake	1.69E+01	kg	S	1.69	g/mL	1533	kL	5.57E+00	ug/g	Jan 1 2001 12:00AM
241-AN-103	Zr	Supernatant	1.80E+01	kg	S	1.48	g/mL	1883	kL	6.46E+00	ug/g	Jan 1 2001 12:00AM
241-AN-104	106Ru	Salt Cake	1.22E-04	Ci	TS	1.58	g/mL	1736	kL	4.97E-08	uCi/g	Jan 1 2001 12:00AM
241-AN-104	106Ru	Supernatant	7.76E-05	Ci	TE	1.6	g/mL	2083	kL	3.21E-08	uCi/g	Jan 1 2001 12:00AM
241-AN-104	113mCd	Salt Cake	1.11E+02	Ci	TS	1.58	g/mL	1736	kL	4.52E-02	uCi/g	Jan 1 2001 12:00AM
241-AN-104	113mCd	Supernatant	7.05E+01	Ci	TE	1.6	g/mL	2083	kL	2.92E-02	uCi/g	Jan 1 2001 12:00AM
241-AN-104	125Sb	Salt Cake	6.10E+01	Ci	TS	1.58	g/mL	1736	kL	2.48E-02	uCi/g	Jan 1 2001 12:00AM
241-AN-104	125Sb	Supernatant	3.88E+01	Ci	TE	1.6	g/mL	2083	kL	1.60E-02	uCi/g	Jan 1 2001 12:00AM
241-AN-104	126Sn	Salt Cake	3.43E+00	Ci	TS	1.58	g/mL	1736	kL	1.40E-03	uCi/g	Jan 1 2001 12:00AM
241-AN-104	126Sn	Supernatant	9.59E+00	Ci	S	1.41	g/mL	2083	kL	3.23E-03	uCi/g	Jan 1 2001 12:00AM
241-AN-104	129I	Salt Cake	2.75E-01	Ci	TS	1.58	g/mL	1736	kL	1.12E-04	uCi/g	Jan 1 2001 12:00AM
241-AN-104	129I	Supernatant	4.38E-01	Ci	S	1.41	g/mL	2083	kL	1.48E-04	uCi/g	Jan 1 2001 12:00AM
241-AN-104	134Cs	Salt Cake	2.66E-01	Ci	TS	1.58	g/mL	1736	kL	1.08E-04	uCi/g	Jan 1 2001 12:00AM
241-AN-104	134Cs	Supernatant	9.73E-01	Ci	TE	1.6	g/mL	2083	kL	4.03E-04	uCi/g	Jan 1 2001 12:00AM
241-AN-104	137Cs	Salt Cake	8.88E+05	Ci	S	1.57	g/mL	1736	kL	3.26E+02	uCi/g	Jan 1 2001 12:00AM
241-AN-104	137Cs	Supernatant	1.10E+06	Ci	S	1.41	g/mL	2083	kL	3.70E+02	uCi/g	Jan 1 2001 12:00AM

CALCULATION SHEET

PROJECT: RPP-WTP
JOB NO.: 24590
CALC NO.: 24590-WTP-M4C-FRP-00001
SHEET REV: 0A
SHEET NO.: 64

BY: E. Berrios
DATE: 12/04/02

SUBJECT: Updated Emissions Run Feed Vector

Tank Name	Analyte	Waste Phase	Inventory	Inventory Units	Basis	Density	Density Units	Volume	Volume Units	Concentration	Concentration Units	Decay Date
241-AN-104	137mBa	Salt Cake	8.40E+05	Ci	C		g/mL	1736	kL		uCi/g	Jan 1 2001 12:00AM
241-AN-104	137mBa	Supernatant	1.04E+06	Ci	C		g/mL	2083	kL		uCi/g	Jan 1 2001 12:00AM
241-AN-104	14C	Salt Cake	4.62E+01	Ci	TS	1.58	g/mL	1736	kL	1.88E-02	uCi/g	Jan 1 2001 12:00AM
241-AN-104	14C	Supernatant	6.33E-01	Ci	S	1.41	g/mL	2083	kL	2.13E-04	uCi/g	Jan 1 2001 12:00AM
241-AN-104	151Sm	Salt Cake	1.89E+04	Ci	TS	1.58	g/mL	1736	kL	7.69E+00	uCi/g	Jan 1 2001 12:00AM
241-AN-104	151Sm	Supernatant	1.20E+04	Ci	TE	1.6	g/mL	2083	kL	4.97E+00	uCi/g	Jan 1 2001 12:00AM
241-AN-104	152Eu	Salt Cake	5.71E+00	Ci	TS	1.58	g/mL	1736	kL	2.32E-03	uCi/g	Jan 1 2001 12:00AM
241-AN-104	152Eu	Supernatant	3.63E+00	Ci	TE	1.6	g/mL	2083	kL	1.50E-03	uCi/g	Jan 1 2001 12:00AM
241-AN-104	154Eu	Salt Cake	1.89E+02	Ci	S	1.57	g/mL	1736	kL	6.94E-02	uCi/g	Jan 1 2001 12:00AM
241-AN-104	154Eu	Supernatant	1.22E+02	Ci	S	1.41	g/mL	2083	kL	4.10E-02	uCi/g	Jan 1 2001 12:00AM
241-AN-104	155Eu	Salt Cake	1.79E+02	Ci	TS	1.58	g/mL	1736	kL	7.29E-02	uCi/g	Jan 1 2001 12:00AM
241-AN-104	155Eu	Supernatant	1.14E+02	Ci	TE	1.6	g/mL	2083	kL	4.70E-02	uCi/g	Jan 1 2001 12:00AM
241-AN-104	226Ra	Salt Cake	2.28E-04	Ci	TS	1.58	g/mL	1736	kL	9.28E-08	uCi/g	Jan 1 2001 12:00AM
241-AN-104	226Ra	Supernatant	1.45E-04	Ci	TE	1.6	g/mL	2083	kL	5.99E-08	uCi/g	Jan 1 2001 12:00AM
241-AN-104	227Ac	Salt Cake	1.34E-03	Ci	TS	1.58	g/mL	1736	kL	5.46E-07	uCi/g	Jan 1 2001 12:00AM
241-AN-104	227Ac	Supernatant	8.52E-04	Ci	TE	1.6	g/mL	2083	kL	3.52E-07	uCi/g	Jan 1 2001 12:00AM
241-AN-104	228Ra	Salt Cake	5.01E-01	Ci	TS	1.58	g/mL	1736	kL	2.04E-04	uCi/g	Jan 1 2001 12:00AM
241-AN-104	228Ra	Supernatant	3.19E-01	Ci	TE	1.6	g/mL	2083	kL	1.32E-04	uCi/g	Jan 1 2001 12:00AM
241-AN-104	229Th	Salt Cake	1.16E-02	Ci	TS	1.58	g/mL	1736	kL	4.74E-06	uCi/g	Jan 1 2001 12:00AM
241-AN-104	229Th	Supernatant	7.39E-03	Ci	TE	1.6	g/mL	2083	kL	3.06E-06	uCi/g	Jan 1 2001 12:00AM
241-AN-104	231Pa	Salt Cake	6.27E-03	Ci	TS	1.58	g/mL	1736	kL	2.55E-06	uCi/g	Jan 1 2001 12:00AM
241-AN-104	231Pa	Supernatant	3.99E-03	Ci	TE	1.6	g/mL	2083	kL	1.65E-06	uCi/g	Jan 1 2001 12:00AM
241-AN-104	232Th	Salt Cake	6.12E-02	Ci	TS	1.58	g/mL	1736	kL	2.49E-05	uCi/g	Jan 1 2001 12:00AM
241-AN-104	232Th	Supernatant	1.32E-03	Ci	S	1.41	g/mL	2083	kL	4.44E-07	uCi/g	Jan 1 2001 12:00AM
241-AN-104	232U	Salt Cake	1.69E-01	Ci	C	1.57	g/mL	1736	kL	5.22E-04	uCi/g	Jan 1 2001 12:00AM
241-AN-104	232U	Supernatant	2.65E-03	Ci	C	1.41	g/mL	2083	kL	5.22E-04	uCi/g	Jan 1 2001 12:00AM
241-AN-104	233U	Supernatant	1.09E-02	Ci	C	1.41	g/mL	2083	kL	2.06E-03	uCi/g	Jan 1 2001 12:00AM
241-AN-104	233U	Salt Cake	6.93E-01	Ci	C	1.57	g/mL	1736	kL	2.06E-03	uCi/g	Jan 1 2001 12:00AM
241-AN-104	234U	Salt Cake	2.05E-01	Ci	C	1.57	g/mL	1736	kL	6.09E-04	uCi/g	Jan 1 2001 12:00AM
241-AN-104	234U	Supernatant	3.21E-03	Ci	C	1.41	g/mL	2083	kL	6.09E-04	uCi/g	Jan 1 2001 12:00AM
241-AN-104	235U	Salt Cake	7.99E-03	Ci	C	1.57	g/mL	1736	kL	2.38E-05	uCi/g	Jan 1 2001 12:00AM
241-AN-104	235U	Supernatant	1.25E-04	Ci	C	1.41	g/mL	2083	kL	2.38E-05	uCi/g	Jan 1 2001 12:00AM
241-AN-104	236U	Salt Cake	1.10E-02	Ci	C	1.57	g/mL	1736	kL	3.27E-05	uCi/g	Jan 1 2001 12:00AM
241-AN-104	236U	Supernatant	1.72E-04	Ci	C	1.41	g/mL	2083	kL	3.27E-05	uCi/g	Jan 1 2001 12:00AM
241-AN-104	237Np	Salt Cake	5.04E-01	Ci	TS	1.58	g/mL	1736	kL	2.05E-04	uCi/g	Jan 1 2001 12:00AM
241-AN-104	237Np	Supernatant	6.31E-02	Ci	S	1.41	g/mL	2083	kL	2.13E-05	uCi/g	Jan 1 2001 12:00AM
241-AN-104	238Pu	Salt Cake	3.65E-01	Ci	C	1.57	g/mL	1736	kL	1.32E-03	uCi/g	Jan 1 2001 12:00AM
241-AN-104	238Pu	Supernatant	1.35E-02	Ci	C	1.41	g/mL	2083	kL	1.32E-03	uCi/g	Jan 1 2001 12:00AM
241-AN-104	238U	Salt Cake	1.65E-01	Ci	C	1.57	g/mL	1736	kL	4.89E-04	uCi/g	Jan 1 2001 12:00AM
241-AN-104	238U	Supernatant	2.58E-03	Ci	C	1.41	g/mL	2083	kL	4.89E-04	uCi/g	Jan 1 2001 12:00AM
241-AN-104	239Pu	Salt Cake	8.31E+00	Ci	C	1.57	g/mL	1736	kL	2.91E-02	uCi/g	Jan 1 2001 12:00AM
241-AN-104	239Pu	Supernatant	3.08E-01	Ci	C	1.41	g/mL	2083	kL	2.91E-02	uCi/g	Jan 1 2001 12:00AM
241-AN-104	240Pu	Supernatant	6.05E-02	Ci	C	1.41	g/mL	2083	kL	5.73E-03	uCi/g	Jan 1 2001 12:00AM
241-AN-104	240Pu	Salt Cake	1.64E+00	Ci	C	1.57	g/mL	1736	kL	5.73E-03	uCi/g	Jan 1 2001 12:00AM
241-AN-104	241Am	Salt Cake	5.22E+01	Ci	E	1.57	g/mL	1736	kL	1.91E-02	uCi/g	Jan 1 2001 12:00AM
241-AN-104	241Am	Supernatant	7.31E-01	Ci	E	1.41	g/mL	2083	kL	2.47E-04	uCi/g	Jan 1 2001 12:00AM
241-AN-104	241Pu	Salt Cake	2.29E+01	Ci	E	1.57	g/mL	1736	kL	8.42E-03	uCi/g	Jan 1 2001 12:00AM

CALCULATION SHEET

PROJECT: RPP-WTP
JOB NO.: 24590
CALC NO.: 24590-WTP-M4C-FRP-00001
SHEET REV: 0A
SHEET NO.: 65

BY: E. Berrios
DATE: 12/04/02

SUBJECT: Updated Emissions Run Feed Vector

Tank Name	Analyte	Waste Phase	Inventory	Inventory Units	Basis	Density	Density Units	Volume	Volume Units	Concentration	Concentration Units	Decay Date
241-AN-104	241Pu	Supernatant	8.51E-01	Ci	E	1.41	g/mL	2083	kL	2.87E-04	uCi/g	Jan 1 2001 12:00AM
241-AN-104	242Cm	Salt Cake	1.18E-01	Ci	C	1.57	g/mL	1736	kL	8.75E-05	uCi/g	Jan 1 2001 12:00AM
241-AN-104	242Cm	Supernatant	1.64E-03	Ci	C	1.41	g/mL	2083	kL	8.75E-05	uCi/g	Jan 1 2001 12:00AM
241-AN-104	242Pu	Salt Cake	1.49E-04	Ci	C	1.57	g/mL	1736	kL	5.20E-07	uCi/g	Jan 1 2001 12:00AM
241-AN-104	242Pu	Supernatant	5.50E-06	Ci	C	1.41	g/mL	2083	kL	5.20E-07	uCi/g	Jan 1 2001 12:00AM
241-AN-104	243Am	Salt Cake	2.87E-03	Ci	C	1.57	g/mL	1736	kL	2.10E-06	uCi/g	Jan 1 2001 12:00AM
241-AN-104	243Am	Supernatant	4.01E-05	Ci	C	1.41	g/mL	2083	kL	2.10E-06	uCi/g	Jan 1 2001 12:00AM
241-AN-104	243Cm	Supernatant	1.41E-04	Ci	C	1.41	g/mL	2083	kL	8.08E-06	uCi/g	Jan 1 2001 12:00AM
241-AN-104	243Cm	Salt Cake	1.01E-02	Ci	C	1.57	g/mL	1736	kL	8.08E-06	uCi/g	Jan 1 2001 12:00AM
241-AN-104	244Cm	Salt Cake	9.27E-02	Ci	C	1.57	g/mL	1736	kL	7.85E-05	uCi/g	Jan 1 2001 12:00AM
241-AN-104	244Cm	Supernatant	1.29E-03	Ci	C	1.41	g/mL	2083	kL	7.85E-05	uCi/g	Jan 1 2001 12:00AM
241-AN-104	3H	Salt Cake	2.21E+01	Ci	S	1.57	g/mL	1736	kL	8.11E-03	uCi/g	Jan 1 2001 12:00AM
241-AN-104	3H	Supernatant	2.56E+00	Ci	S	1.41	g/mL	2083	kL	8.61E-04	uCi/g	Jan 1 2001 12:00AM
241-AN-104	59Ni	Salt Cake	3.71E+00	Ci	TS	1.58	g/mL	1736	kL	1.51E-03	uCi/g	Jan 1 2001 12:00AM
241-AN-104	59Ni	Supernatant	7.81E-01	Ci	TE	1.6	g/mL	2083	kL	3.23E-04	uCi/g	Jan 1 2001 12:00AM
241-AN-104	60Co	Salt Cake	4.27E+01	Ci	S	1.57	g/mL	1736	kL	1.57E-02	uCi/g	Jan 1 2001 12:00AM
241-AN-104	60Co	Supernatant	2.06E+01	Ci	S	1.41	g/mL	2083	kL	6.94E-03	uCi/g	Jan 1 2001 12:00AM
241-AN-104	63Ni	Salt Cake	3.52E+02	Ci	TS	1.58	g/mL	1736	kL	1.43E-01	uCi/g	Jan 1 2001 12:00AM
241-AN-104	63Ni	Supernatant	7.36E+01	Ci	TE	1.6	g/mL	2083	kL	3.05E-02	uCi/g	Jan 1 2001 12:00AM
241-AN-104	79Se	Supernatant	1.97E+00	Ci	S	1.41	g/mL	2083	kL	6.65E-04	uCi/g	Jan 1 2001 12:00AM
241-AN-104	79Se	Salt Cake	5.68E-01	Ci	TS	1.58	g/mL	1736	kL	2.31E-04	uCi/g	Jan 1 2001 12:00AM
241-AN-104	90Sr	Salt Cake	8.53E+04	Ci	S	1.57	g/mL	1736	kL	3.13E+01	uCi/g	Jan 1 2001 12:00AM
241-AN-104	90Sr	Supernatant	1.83E+02	Ci	S	1.41	g/mL	2083	kL	6.19E-02	uCi/g	Jan 1 2001 12:00AM
241-AN-104	90Y	Salt Cake	8.53E+04	Ci	C		g/mL	1736	kL		uCi/g	Jan 1 2001 12:00AM
241-AN-104	90Y	Supernatant	1.83E+02	Ci	C		g/mL	2083	kL		uCi/g	Jan 1 2001 12:00AM
241-AN-104	93mNb	Salt Cake	2.01E+01	Ci	TS	1.58	g/mL	1736	kL	8.19E-03	uCi/g	Jan 1 2001 12:00AM
241-AN-104	93mNb	Supernatant	1.28E+01	Ci	TE	1.6	g/mL	2083	kL	5.29E-03	uCi/g	Jan 1 2001 12:00AM
241-AN-104	93Zr	Salt Cake	2.80E+01	Ci	TS	1.58	g/mL	1736	kL	1.14E-02	uCi/g	Jan 1 2001 12:00AM
241-AN-104	93Zr	Supernatant	1.78E+01	Ci	TE	1.6	g/mL	2083	kL	7.37E-03	uCi/g	Jan 1 2001 12:00AM
241-AN-104	99Tc	Salt Cake	3.68E+02	Ci	S	1.57	g/mL	1736	kL	1.35E-01	uCi/g	Jan 1 2001 12:00AM
241-AN-104	99Tc	Supernatant	4.19E+02	Ci	S	1.41	g/mL	2083	kL	1.41E-01	uCi/g	Jan 1 2001 12:00AM
241-AN-104	Ag	Salt Cake	4.14E+01	kg	S	1.59	g/mL	1736	kL	1.50E+01	ug/g	Jan 1 2001 12:00AM
241-AN-104	Ag	Supernatant	3.72E+01	kg	S	1.4	g/mL	2083	kL	1.26E+01	ug/g	Jan 1 2001 12:00AM
241-AN-104	Al	Salt Cake	5.69E+04	kg	S	1.59	g/mL	1736	kL	2.06E+04	ug/g	Jan 1 2001 12:00AM
241-AN-104	Al	Supernatant	8.12E+04	kg	S	1.4	g/mL	2083	kL	2.76E+04	ug/g	Jan 1 2001 12:00AM
241-AN-104	As	Salt Cake	1.08E+02	kg	S	1.57	g/mL	1736	kL	3.98E+01	ug/g	Jan 1 2001 12:00AM
241-AN-104	As	Supernatant	1.43E+02	kg	S	1.4	g/mL	2083	kL	4.85E+01	ug/g	Jan 1 2001 12:00AM
241-AN-104	B	Supernatant	1.36E+02	kg	S	1.4	g/mL	2083	kL	4.63E+01	ug/g	Jan 1 2001 12:00AM
241-AN-104	B	Salt Cake	3.81E+02	kg	S	1.59	g/mL	1736	kL	1.38E+02	ug/g	Jan 1 2001 12:00AM
241-AN-104	Ba	Supernatant	6.33E+01	kg	S	1.41	g/mL	2083	kL	2.13E+01	ug/g	Jan 1 2001 12:00AM
241-AN-104	Ba	Salt Cake	5.42E+01	kg	S	1.57	g/mL	1736	kL	1.99E+01	ug/g	Jan 1 2001 12:00AM
241-AN-104	Be	Salt Cake	8.20E+00	kg	S	1.57	g/mL	1736	kL	3.01E+00	ug/g	Jan 1 2001 12:00AM
241-AN-104	Be	Supernatant	6.31E+00	kg	S	1.41	g/mL	2083	kL	2.13E+00	ug/g	Jan 1 2001 12:00AM
241-AN-104	Bi	Salt Cake	1.08E+02	kg	S	1.57	g/mL	1736	kL	3.98E+01	ug/g	Jan 1 2001 12:00AM
241-AN-104	Bi	Supernatant	1.26E+02	kg	S	1.41	g/mL	2083	kL	4.26E+01	ug/g	Jan 1 2001 12:00AM
241-AN-104	Ca	Salt Cake	5.91E+02	kg	S	1.59	g/mL	1736	kL	2.14E+02	ug/g	Jan 1 2001 12:00AM
241-AN-104	Ca	Supernatant	1.26E+02	kg	S	1.41	g/mL	2083	kL	4.26E+01	ug/g	Jan 1 2001 12:00AM

CALCULATION SHEET

PROJECT: RPP-WTP
JOB NO.: 24590
CALC NO.: 24590-WTP-M4C-FRP-00001
SHEET REV: 0A
SHEET NO.: 66

BY: E. Berrios
DATE: 12/04/02

SUBJECT: Updated Emissions Run Feed Vector

Tank Name	Analyte	Waste Phase	Inventory	Inventory Units	Basis	Density	Density Units	Volume	Volume Units	Concentration	Concentration Units	Decay Date
241-AN-104	Cd	Salt Cake	2.72E+01	kg	S	1.59	g/mL	1736	kL	9.86E+00	ug/g	Jan 1 2001 12:00AM
241-AN-104	Cd	Supernatant	6.31E+00	kg	S	1.41	g/mL	2083	kL	2.13E+00	ug/g	Jan 1 2001 12:00AM
241-AN-104	Ce	Supernatant	1.26E+02	kg	S	1.41	g/mL	2083	kL	4.26E+01	ug/g	Jan 1 2001 12:00AM
241-AN-104	Ce	Salt Cake	1.08E+02	kg	S	1.57	g/mL	1736	kL	3.98E+01	ug/g	Jan 1 2001 12:00AM
241-AN-104	Cl	Salt Cake	1.23E+04	kg	S	1.59	g/mL	1736	kL	4.46E+03	ug/g	Jan 1 2001 12:00AM
241-AN-104	Cl	Supernatant	1.63E+04	kg	S	1.4	g/mL	2083	kL	5.54E+03	ug/g	Jan 1 2001 12:00AM
241-AN-104	Co	Supernatant	2.52E+01	kg	S	1.4	g/mL	2083	kL	8.57E+00	ug/g	Jan 1 2001 12:00AM
241-AN-104	Co	Salt Cake	2.17E+01	kg	S	1.57	g/mL	1736	kL	7.96E+00	ug/g	Jan 1 2001 12:00AM
241-AN-104	Cr	Salt Cake	4.28E+03	kg	S	1.59	g/mL	1736	kL	1.55E+03	ug/g	Jan 1 2001 12:00AM
241-AN-104	Cr	Supernatant	7.07E+02	kg	S	1.4	g/mL	2083	kL	2.40E+02	ug/g	Jan 1 2001 12:00AM
241-AN-104	Cu	Supernatant	1.26E+01	kg	S	1.41	g/mL	2083	kL	4.26E+00	ug/g	Jan 1 2001 12:00AM
241-AN-104	Cu	Salt Cake	2.11E+01	kg	S	1.59	g/mL	1736	kL	7.64E+00	ug/g	Jan 1 2001 12:00AM
241-AN-104	F	Salt Cake	2.22E+03	kg	S	1.59	g/mL	1736	kL	8.03E+02	ug/g	Jan 1 2001 12:00AM
241-AN-104	F	Supernatant	1.72E+02	kg	S	1.41	g/mL	2083	kL	5.81E+01	ug/g	Jan 1 2001 12:00AM
241-AN-104	Fe	Salt Cake	3.17E+02	kg	S	1.59	g/mL	1736	kL	1.15E+02	ug/g	Jan 1 2001 12:00AM
241-AN-104	Fe	Supernatant	6.33E+01	kg	S	1.41	g/mL	2083	kL	2.13E+01	ug/g	Jan 1 2001 12:00AM
241-AN-104	Hg	Salt Cake	0.00E+00	kg	TS	1.58	g/mL	1736	kL	0.00E+00	ug/g	Jan 1 2001 12:00AM
241-AN-104	Hg	Supernatant	0.00E+00	kg	TE	1.6	g/mL	2083	kL	0.00E+00	ug/g	Jan 1 2001 12:00AM
241-AN-104	K	Salt Cake	9.88E+03	kg	S	1.59	g/mL	1736	kL	3.58E+03	ug/g	Jan 1 2001 12:00AM
241-AN-104	K	Supernatant	1.41E+04	kg	S	1.4	g/mL	2083	kL	4.78E+03	ug/g	Jan 1 2001 12:00AM
241-AN-104	La	Salt Cake	5.42E+01	kg	S	1.57	g/mL	1736	kL	1.99E+01	ug/g	Jan 1 2001 12:00AM
241-AN-104	La	Supernatant	6.33E+01	kg	S	1.41	g/mL	2083	kL	2.13E+01	ug/g	Jan 1 2001 12:00AM
241-AN-104	Li	Supernatant	2.48E+01	kg	S	1.4	g/mL	2083	kL	8.43E+00	ug/g	Jan 1 2001 12:00AM
241-AN-104	Li	Salt Cake	4.47E+01	kg	S	1.59	g/mL	1736	kL	1.62E+01	ug/g	Jan 1 2001 12:00AM
241-AN-104	Mg	Supernatant	1.26E+02	kg	S	1.41	g/mL	2083	kL	4.26E+01	ug/g	Jan 1 2001 12:00AM
241-AN-104	Mg	Salt Cake	1.08E+02	kg	S	1.57	g/mL	1736	kL	3.98E+01	ug/g	Jan 1 2001 12:00AM
241-AN-104	Mn	Salt Cake	4.72E+01	kg	S	1.59	g/mL	1736	kL	1.71E+01	ug/g	Jan 1 2001 12:00AM
241-AN-104	Mn	Supernatant	1.26E+01	kg	S	1.41	g/mL	2083	kL	4.26E+00	ug/g	Jan 1 2001 12:00AM
241-AN-104	Mo	Salt Cake	1.38E+02	kg	S	1.59	g/mL	1736	kL	5.00E+01	ug/g	Jan 1 2001 12:00AM
241-AN-104	Mo	Supernatant	1.69E+02	kg	S	1.4	g/mL	2083	kL	5.74E+01	ug/g	Jan 1 2001 12:00AM
241-AN-104	Na	Salt Cake	5.33E+05	kg	S	1.59	g/mL	1736	kL	1.93E+05	ug/g	Jan 1 2001 12:00AM
241-AN-104	Na	Supernatant	5.39E+05	kg	S	1.4	g/mL	2083	kL	1.83E+05	ug/g	Jan 1 2001 12:00AM
241-AN-104	Nd	Supernatant	1.26E+02	kg	S	1.41	g/mL	2083	kL	4.26E+01	ug/g	Jan 1 2001 12:00AM
241-AN-104	Nd	Salt Cake	1.08E+02	kg	S	1.57	g/mL	1736	kL	3.98E+01	ug/g	Jan 1 2001 12:00AM
241-AN-104	NH3	Supernatant	4.69E+02	kg	S	1.41	g/mL	2083	kL	1.58E+02	ug/g	Jan 1 2001 12:00AM
241-AN-104	Ni	Salt Cake	1.67E+02	kg	S	1.59	g/mL	1736	kL	6.04E+01	ug/g	Jan 1 2001 12:00AM
241-AN-104	Ni	Supernatant	2.52E+01	kg	S	1.41	g/mL	2083	kL	8.51E+00	ug/g	Jan 1 2001 12:00AM
241-AN-104	NO2	Salt Cake	1.75E+05	kg	S	1.59	g/mL	1736	kL	6.33E+04	ug/g	Jan 1 2001 12:00AM
241-AN-104	NO2	Supernatant	2.34E+05	kg	S	1.4	g/mL	2083	kL	7.93E+04	ug/g	Jan 1 2001 12:00AM
241-AN-104	NO3	Salt Cake	3.28E+05	kg	S	1.59	g/mL	1736	kL	1.19E+05	ug/g	Jan 1 2001 12:00AM
241-AN-104	NO3	Supernatant	3.58E+05	kg	S	1.4	g/mL	2083	kL	1.21E+05	ug/g	Jan 1 2001 12:00AM
241-AN-104	OH	Salt Cake	1.01E+05	kg	S	1.57	g/mL	1736	kL	3.72E+04	ug/g	Jan 1 2001 12:00AM
241-AN-104	OH	Supernatant	1.49E+05	kg	S	1.41	g/mL	2083	kL	5.03E+04	ug/g	Jan 1 2001 12:00AM
241-AN-104	Oxalate	Salt Cake	2.34E+04	kg	S	1.59	g/mL	1736	kL	8.47E+03	ug/g	Jan 1 2001 12:00AM
241-AN-104	Oxalate	Supernatant	1.56E+03	kg	S	1.41	g/mL	2083	kL	5.27E+02	ug/g	Jan 1 2001 12:00AM
241-AN-104	Pb	Salt Cake	1.14E+02	kg	S	1.57	g/mL	1736	kL	4.20E+01	ug/g	Jan 1 2001 12:00AM
241-AN-104	Pb	Supernatant	1.26E+02	kg	S	1.41	g/mL	2083	kL	4.26E+01	ug/g	Jan 1 2001 12:00AM

CALCULATION SHEET

PROJECT: RPP-WTP
JOB NO.: 24590
CALC NO.: 24590-WTP-M4C-FRP-00001
SHEET REV: 0A
SHEET NO.: 67

BY: E. Berrios
DATE: 12/04/02

SUBJECT: Updated Emissions Run Feed Vector

Tank Name	Analyte	Waste Phase	Inventory	Inventory Units	Basis	Density	Density Units	Volume	Volume Units	Concentration	Concentration Units	Decay Date
241-AN-104	PO4	Salt Cake	1.16E+04	kg	S	1.59	g/mL	1736	kL	4.20E+03	ug/g	Jan 1 2001 12:00AM
241-AN-104	PO4	Supernatant	5.69E+03	kg	S	1.4	g/mL	2083	kL	1.93E+03	ug/g	Jan 1 2001 12:00AM
241-AN-104	Sb	Salt Cake	6.51E+01	kg	S	1.57	g/mL	1736	kL	2.39E+01	ug/g	Jan 1 2001 12:00AM
241-AN-104	Sb	Supernatant	7.59E+01	kg	S	1.41	g/mL	2083	kL	2.56E+01	ug/g	Jan 1 2001 12:00AM
241-AN-104	Se	Salt Cake	1.08E+02	kg	S	1.57	g/mL	1736	kL	3.98E+01	ug/g	Jan 1 2001 12:00AM
241-AN-104	Se	Supernatant	1.26E+02	kg	S	1.41	g/mL	2083	kL	4.26E+01	ug/g	Jan 1 2001 12:00AM
241-AN-104	Si	Salt Cake	1.77E+03	kg	S	1.59	g/mL	1736	kL	6.41E+02	ug/g	Jan 1 2001 12:00AM
241-AN-104	Si	Supernatant	4.90E+02	kg	S	1.4	g/mL	2083	kL	1.66E+02	ug/g	Jan 1 2001 12:00AM
241-AN-104	SO4	Salt Cake	3.35E+04	kg	S	1.59	g/mL	1736	kL	1.21E+04	ug/g	Jan 1 2001 12:00AM
241-AN-104	SO4	Supernatant	7.45E+03	kg	S	1.4	g/mL	2083	kL	2.53E+03	ug/g	Jan 1 2001 12:00AM
241-AN-104	Sr	Salt Cake	1.08E+01	kg	S	1.57	g/mL	1736	kL	3.98E+00	ug/g	Jan 1 2001 12:00AM
241-AN-104	Sr	Supernatant	1.26E+01	kg	S	1.41	g/mL	2083	kL	4.26E+00	ug/g	Jan 1 2001 12:00AM
241-AN-104	Ti	Supernatant	1.26E+01	kg	S	1.41	g/mL	2083	kL	4.26E+00	ug/g	Jan 1 2001 12:00AM
241-AN-104	Ti	Salt Cake	1.08E+01	kg	S	1.57	g/mL	1736	kL	3.98E+00	ug/g	Jan 1 2001 12:00AM
241-AN-104	TIC as CO3	Salt Cake	1.74E+05	kg	S	1.57	g/mL	1736	kL	6.40E+04	ug/g	Jan 1 2001 12:00AM
241-AN-104	TIC as CO3	Supernatant	2.25E+04	kg	S	1.41	g/mL	2083	kL	7.59E+03	ug/g	Jan 1 2001 12:00AM
241-AN-104	Tl	Supernatant	2.52E+02	kg	S	1.41	g/mL	2083	kL	8.51E+01	ug/g	Jan 1 2001 12:00AM
241-AN-104	Tl	Salt Cake	2.17E+02	kg	S	1.57	g/mL	1736	kL	7.95E+01	ug/g	Jan 1 2001 12:00AM
241-AN-104	UTOTAL	Salt Cake	4.93E+02	kg	S	1.57	g/mL	1736	kL	1.81E+02	ug/g	Jan 1 2001 12:00AM
241-AN-104	UTOTAL	Supernatant	7.74E+00	kg	S	1.41	g/mL	2083	kL	2.61E+00	ug/g	Jan 1 2001 12:00AM
241-AN-104	V	Supernatant	6.33E+01	kg	S	1.41	g/mL	2083	kL	2.13E+01	ug/g	Jan 1 2001 12:00AM
241-AN-104	V	Salt Cake	5.42E+01	kg	S	1.57	g/mL	1736	kL	1.99E+01	ug/g	Jan 1 2001 12:00AM
241-AN-104	Zn	Supernatant	3.05E+01	kg	S	1.4	g/mL	2083	kL	1.04E+01	ug/g	Jan 1 2001 12:00AM
241-AN-104	Zn	Salt Cake	5.77E+01	kg	S	1.59	g/mL	1736	kL	2.09E+01	ug/g	Jan 1 2001 12:00AM
241-AN-104	Zr	Salt Cake	4.66E+01	kg	S	1.59	g/mL	1736	kL	1.69E+01	ug/g	Jan 1 2001 12:00AM
241-AN-104	Zr	Supernatant	1.65E+01	kg	S	1.4	g/mL	2083	kL	5.60E+00	ug/g	Jan 1 2001 12:00AM
241-AN-105	106Ru	Salt Cake	1.37E-04	Ci	TS	1.58	g/mL	1925	kL	4.97E-08	uCi/g	Jan 1 2001 12:00AM
241-AN-105	106Ru	Supernatant	8.61E-05	Ci	TE	1.6	g/mL	2227	kL	3.21E-08	uCi/g	Jan 1 2001 12:00AM
241-AN-105	113mCd	Salt Cake	1.24E+02	Ci	TS	1.58	g/mL	1925	kL	4.52E-02	uCi/g	Jan 1 2001 12:00AM
241-AN-105	113mCd	Supernatant	7.83E+01	Ci	TE	1.6	g/mL	2227	kL	2.92E-02	uCi/g	Jan 1 2001 12:00AM
241-AN-105	125Sb	Salt Cake	6.83E+01	Ci	TS	1.58	g/mL	1925	kL	2.48E-02	uCi/g	Jan 1 2001 12:00AM
241-AN-105	125Sb	Supernatant	4.30E+01	Ci	TE	1.6	g/mL	2227	kL	1.60E-02	uCi/g	Jan 1 2001 12:00AM
241-AN-105	126Sn	Salt Cake	3.85E+00	Ci	TS	1.58	g/mL	1925	kL	1.40E-03	uCi/g	Jan 1 2001 12:00AM
241-AN-105	126Sn	Supernatant	2.42E+00	Ci	TE	1.6	g/mL	2227	kL	9.02E-04	uCi/g	Jan 1 2001 12:00AM
241-AN-105	129I	Salt Cake	3.09E-01	Ci	TS	1.58	g/mL	1925	kL	1.12E-04	uCi/g	Jan 1 2001 12:00AM
241-AN-105	129I	Supernatant	5.96E-01	Ci	S	1.42	g/mL	2227	kL	1.88E-04	uCi/g	Jan 1 2001 12:00AM
241-AN-105	134Cs	Salt Cake	2.99E-01	Ci	TS	1.58	g/mL	1925	kL	1.08E-04	uCi/g	Jan 1 2001 12:00AM
241-AN-105	134Cs	Supernatant	1.08E+00	Ci	TE	1.6	g/mL	2227	kL	4.03E-04	uCi/g	Jan 1 2001 12:00AM
241-AN-105	137Cs	Salt Cake	8.10E+05	Ci	S	1.57	g/mL	1925	kL	2.68E+02	uCi/g	Jan 1 2001 12:00AM
241-AN-105	137Cs	Supernatant	6.98E+05	Ci	S	1.42	g/mL	2227	kL	2.21E+02	uCi/g	Jan 1 2001 12:00AM
241-AN-105	137mBa	Salt Cake	7.66E+05	Ci	C		g/mL	1925	kL		uCi/g	Jan 1 2001 12:00AM
241-AN-105	137mBa	Supernatant	6.61E+05	Ci	C		g/mL	2227	kL		uCi/g	Jan 1 2001 12:00AM
241-AN-105	14C	Salt Cake	5.18E+01	Ci	TS	1.58	g/mL	1925	kL	1.88E-02	uCi/g	Jan 1 2001 12:00AM
241-AN-105	14C	Supernatant	7.31E-01	Ci	S	1.42	g/mL	2227	kL	2.31E-04	uCi/g	Jan 1 2001 12:00AM
241-AN-105	151Sm	Salt Cake	2.12E+04	Ci	TS	1.58	g/mL	1925	kL	7.69E+00	uCi/g	Jan 1 2001 12:00AM
241-AN-105	151Sm	Supernatant	1.33E+04	Ci	TE	1.6	g/mL	2227	kL	4.97E+00	uCi/g	Jan 1 2001 12:00AM
241-AN-105	152Eu	Salt Cake	6.40E+00	Ci	TS	1.58	g/mL	1925	kL	2.32E-03	uCi/g	Jan 1 2001 12:00AM

CALCULATION SHEET

PROJECT: RPP-WTP
JOB NO.: 24590
CALC NO.: 24590-WTP-M4C-FRP-00001
SHEET REV: 0A
SHEET NO.: 68

BY: E. Berrios
DATE: 12/04/02

SUBJECT: Updated Emissions Run Feed Vector

Tank Name	Analyte	Waste Phase	Inventory	Inventory Units	Basis	Density	Density Units	Volume	Volume Units	Concentration	Concentration Units	Decay Date
241-AN-105	152Eu	Supernatant	4.03E+00	Ci	TE	1.6	g/mL	2227	kL	1.50E-03	uCi/g	Jan 1 2001 12:00AM
241-AN-105	154Eu	Salt Cake	1.94E+02	Ci	S	1.57	g/mL	1925	kL	6.43E-02	uCi/g	Jan 1 2001 12:00AM
241-AN-105	154Eu	Supernatant	5.85E+01	Ci	S	1.42	g/mL	2227	kL	1.85E-02	uCi/g	Jan 1 2001 12:00AM
241-AN-105	155Eu	Salt Cake	1.19E+02	Ci	E	1.57	g/mL	1925	kL	3.93E-02	uCi/g	Jan 1 2001 12:00AM
241-AN-105	155Eu	Supernatant	3.58E+01	Ci	E	1.42	g/mL	2227	kL	1.13E-02	uCi/g	Jan 1 2001 12:00AM
241-AN-105	226Ra	Salt Cake	2.56E-04	Ci	TS	1.58	g/mL	1925	kL	9.28E-08	uCi/g	Jan 1 2001 12:00AM
241-AN-105	226Ra	Supernatant	1.61E-04	Ci	TE	1.6	g/mL	2227	kL	5.99E-08	uCi/g	Jan 1 2001 12:00AM
241-AN-105	227Ac	Salt Cake	2.61E-03	Ci	TS	1.58	g/mL	1925	kL	9.46E-07	uCi/g	Jan 1 2001 12:00AM
241-AN-105	227Ac	Supernatant	1.64E-03	Ci	TE	1.6	g/mL	2227	kL	6.12E-07	uCi/g	Jan 1 2001 12:00AM
241-AN-105	228Ra	Salt Cake	3.08E-01	Ci	TS	1.58	g/mL	1925	kL	1.12E-04	uCi/g	Jan 1 2001 12:00AM
241-AN-105	228Ra	Supernatant	1.94E-01	Ci	TE	1.6	g/mL	2227	kL	7.22E-05	uCi/g	Jan 1 2001 12:00AM
241-AN-105	229Th	Salt Cake	1.31E-02	Ci	TS	1.58	g/mL	1925	kL	4.74E-06	uCi/g	Jan 1 2001 12:00AM
241-AN-105	229Th	Supernatant	8.21E-03	Ci	TE	1.6	g/mL	2227	kL	3.06E-06	uCi/g	Jan 1 2001 12:00AM
241-AN-105	231Pa	Salt Cake	7.03E-03	Ci	TS	1.58	g/mL	1925	kL	2.55E-06	uCi/g	Jan 1 2001 12:00AM
241-AN-105	231Pa	Supernatant	4.43E-03	Ci	TE	1.6	g/mL	2227	kL	1.65E-06	uCi/g	Jan 1 2001 12:00AM
241-AN-105	232Th	Salt Cake	6.86E-02	Ci	TS	1.58	g/mL	1925	kL	2.49E-05	uCi/g	Jan 1 2001 12:00AM
241-AN-105	232Th	Supernatant	4.31E-02	Ci	TE	1.6	g/mL	2227	kL	1.61E-05	uCi/g	Jan 1 2001 12:00AM
241-AN-105	232U	Salt Cake	1.13E-01	Ci	C	1.57	g/mL	1925	kL	3.73E-05	uCi/g	Jan 1 2001 12:00AM
241-AN-105	232U	Supernatant	3.40E-03	Ci	C	1.42	g/mL	2227	kL	1.07E-06	uCi/g	Jan 1 2001 12:00AM
241-AN-105	233U	Salt Cake	4.62E-01	Ci	C	1.57	g/mL	1925	kL	1.53E-04	uCi/g	Jan 1 2001 12:00AM
241-AN-105	233U	Supernatant	1.39E-02	Ci	C	1.42	g/mL	2227	kL	4.41E-06	uCi/g	Jan 1 2001 12:00AM
241-AN-105	234U	Salt Cake	1.05E-01	Ci	C	1.57	g/mL	1925	kL	3.47E-05	uCi/g	Jan 1 2001 12:00AM
241-AN-105	234U	Supernatant	3.16E-03	Ci	C	1.42	g/mL	2227	kL	1.00E-06	uCi/g	Jan 1 2001 12:00AM
241-AN-105	235U	Salt Cake	4.12E-03	Ci	C	1.57	g/mL	1925	kL	1.36E-06	uCi/g	Jan 1 2001 12:00AM
241-AN-105	235U	Supernatant	1.24E-04	Ci	C	1.42	g/mL	2227	kL	3.93E-08	uCi/g	Jan 1 2001 12:00AM
241-AN-105	236U	Salt Cake	4.76E-03	Ci	C	1.57	g/mL	1925	kL	1.57E-06	uCi/g	Jan 1 2001 12:00AM
241-AN-105	236U	Supernatant	1.43E-04	Ci	C	1.42	g/mL	2227	kL	4.54E-08	uCi/g	Jan 1 2001 12:00AM
241-AN-105	237Np	Salt Cake	5.65E-01	Ci	TS	1.58	g/mL	1925	kL	2.05E-04	uCi/g	Jan 1 2001 12:00AM
241-AN-105	237Np	Supernatant	4.75E-02	Ci	S	1.42	g/mL	2227	kL	1.50E-05	uCi/g	Jan 1 2001 12:00AM
241-AN-105	238Pu	Salt Cake	2.13E-01	Ci	C	1.57	g/mL	1925	kL	7.03E-05	uCi/g	Jan 1 2001 12:00AM
241-AN-105	238Pu	Supernatant	2.50E-03	Ci	C	1.42	g/mL	2227	kL	7.89E-07	uCi/g	Jan 1 2001 12:00AM
241-AN-105	238U	Salt Cake	8.77E-02	Ci	C	1.57	g/mL	1925	kL	2.90E-05	uCi/g	Jan 1 2001 12:00AM
241-AN-105	238U	Supernatant	2.64E-03	Ci	C	1.42	g/mL	2227	kL	8.36E-07	uCi/g	Jan 1 2001 12:00AM
241-AN-105	239Pu	Salt Cake	5.73E+00	Ci	C	1.57	g/mL	1925	kL	1.90E-03	uCi/g	Jan 1 2001 12:00AM
241-AN-105	239Pu	Supernatant	6.73E-02	Ci	C	1.42	g/mL	2227	kL	2.13E-05	uCi/g	Jan 1 2001 12:00AM
241-AN-105	240Pu	Salt Cake	1.08E+00	Ci	C	1.57	g/mL	1925	kL	3.58E-04	uCi/g	Jan 1 2001 12:00AM
241-AN-105	240Pu	Supernatant	1.27E-02	Ci	C	1.42	g/mL	2227	kL	4.02E-06	uCi/g	Jan 1 2001 12:00AM
241-AN-105	241Am	Salt Cake	2.07E+01	Ci	S	1.57	g/mL	1925	kL	6.86E-03	uCi/g	Jan 1 2001 12:00AM
241-AN-105	241Am	Supernatant	8.33E-02	Ci	S	1.42	g/mL	2227	kL	2.63E-05	uCi/g	Jan 1 2001 12:00AM
241-AN-105	241Pu	Salt Cake	1.25E+01	Ci	C	1.57	g/mL	1925	kL	4.13E-03	uCi/g	Jan 1 2001 12:00AM
241-AN-105	241Pu	Supernatant	1.47E-01	Ci	C	1.42	g/mL	2227	kL	4.64E-05	uCi/g	Jan 1 2001 12:00AM
241-AN-105	242Cm	Salt Cake	4.60E-02	Ci	C	1.57	g/mL	1925	kL	1.52E-05	uCi/g	Jan 1 2001 12:00AM
241-AN-105	242Cm	Supernatant	1.83E-04	Ci	C	1.42	g/mL	2227	kL	5.79E-08	uCi/g	Jan 1 2001 12:00AM
241-AN-105	242Pu	Salt Cake	8.68E-05	Ci	C	1.57	g/mL	1925	kL	2.87E-08	uCi/g	Jan 1 2001 12:00AM
241-AN-105	242Pu	Supernatant	1.02E-06	Ci	C	1.42	g/mL	2227	kL	3.22E-10	uCi/g	Jan 1 2001 12:00AM
241-AN-105	243Am	Salt Cake	9.06E-04	Ci	C	1.57	g/mL	1925	kL	3.00E-07	uCi/g	Jan 1 2001 12:00AM
241-AN-105	243Am	Supernatant	3.60E-06	Ci	C	1.42	g/mL	2227	kL	1.14E-09	uCi/g	Jan 1 2001 12:00AM

CALCULATION SHEET

PROJECT: RPP-WTP
JOB NO.: 24590
CALC NO.: 24590-WTP-M4C-FRP-00001
SHEET REV: 0A
SHEET NO.: 69

BY: E. Berrios
DATE: 12/04/02

SUBJECT: Updated Emissions Run Feed Vector

Tank Name	Analyte	Waste Phase	Inventory	Inventory Units	Basis	Density	Density Units	Volume	Volume Units	Concentration	Concentration Units	Decay Date
241-AN-105	243Cm	Salt Cake	3.98E-03 Ci		C	1.57	g/mL	1925	kL	1.32E-06	uCi/g	Jan 1 2001 12:00AM
241-AN-105	243Cm	Supernatant	1.58E-05 Ci		C	1.42	g/mL	2227	kL	5.00E-09	uCi/g	Jan 1 2001 12:00AM
241-AN-105	244Cm	Salt Cake	3.39E-02 Ci		C	1.57	g/mL	1925	kL	1.12E-05	uCi/g	Jan 1 2001 12:00AM
241-AN-105	244Cm	Supernatant	1.35E-04 Ci		C	1.42	g/mL	2227	kL	4.27E-08	uCi/g	Jan 1 2001 12:00AM
241-AN-105	3H	Salt Cake	4.91E+00 Ci		S	1.57	g/mL	1925	kL	1.62E-03	uCi/g	Jan 1 2001 12:00AM
241-AN-105	3H	Supernatant	6.87E-02 Ci		S	1.42	g/mL	2227	kL	2.17E-05	uCi/g	Jan 1 2001 12:00AM
241-AN-105	59Ni	Salt Cake	4.16E+00 Ci		TS	1.58	g/mL	1925	kL	1.51E-03	uCi/g	Jan 1 2001 12:00AM
241-AN-105	59Ni	Supernatant	8.67E-01 Ci		TE	1.6	g/mL	2227	kL	3.23E-04	uCi/g	Jan 1 2001 12:00AM
241-AN-105	60Co	Salt Cake	4.55E+01 Ci		TS	1.58	g/mL	1925	kL	1.65E-02	uCi/g	Jan 1 2001 12:00AM
241-AN-105	60Co	Supernatant	9.65E+00 Ci		S	1.42	g/mL	2227	kL	3.05E-03	uCi/g	Jan 1 2001 12:00AM
241-AN-105	63Ni	Salt Cake	3.95E+02 Ci		TS	1.58	g/mL	1925	kL	1.43E-01	uCi/g	Jan 1 2001 12:00AM
241-AN-105	63Ni	Supernatant	8.18E+01 Ci		TE	1.6	g/mL	2227	kL	3.05E-02	uCi/g	Jan 1 2001 12:00AM
241-AN-105	79Se	Salt Cake	6.37E-01 Ci		TS	1.58	g/mL	1925	kL	2.31E-04	uCi/g	Jan 1 2001 12:00AM
241-AN-105	79Se	Supernatant	4.01E-01 Ci		TE	1.6	g/mL	2227	kL	1.49E-04	uCi/g	Jan 1 2001 12:00AM
241-AN-105	90Sr	Salt Cake	3.09E+04 Ci		S	1.57	g/mL	1925	kL	1.02E+01	uCi/g	Jan 1 2001 12:00AM
241-AN-105	90Sr	Supernatant	8.32E+01 Ci		S	1.42	g/mL	2227	kL	2.63E-02	uCi/g	Jan 1 2001 12:00AM
241-AN-105	90Y	Salt Cake	3.09E+04 Ci		C		g/mL	1925	kL		uCi/g	Jan 1 2001 12:00AM
241-AN-105	90Y	Supernatant	8.32E+01 Ci		C		g/mL	2227	kL		uCi/g	Jan 1 2001 12:00AM
241-AN-105	93mNb	Salt Cake	2.52E+01 Ci		TS	1.58	g/mL	1925	kL	9.15E-03	uCi/g	Jan 1 2001 12:00AM
241-AN-105	93mNb	Supernatant	1.59E+01 Ci		TE	1.6	g/mL	2227	kL	5.92E-03	uCi/g	Jan 1 2001 12:00AM
241-AN-105	93Zr	Salt Cake	3.14E+01 Ci		TS	1.58	g/mL	1925	kL	1.14E-02	uCi/g	Jan 1 2001 12:00AM
241-AN-105	93Zr	Supernatant	1.98E+01 Ci		TE	1.6	g/mL	2227	kL	7.37E-03	uCi/g	Jan 1 2001 12:00AM
241-AN-105	99Tc	Salt Cake	5.34E+02 Ci		S	1.57	g/mL	1925	kL	1.77E-01	uCi/g	Jan 1 2001 12:00AM
241-AN-105	99Tc	Supernatant	5.88E+02 Ci		S	1.42	g/mL	2227	kL	1.86E-01	uCi/g	Jan 1 2001 12:00AM
241-AN-105	Ag	Supernatant	3.96E+01 kg		S	1.42	g/mL	2227	kL	1.25E+01	ug/g	Jan 1 2001 12:00AM
241-AN-105	Ag	Salt Cake	5.79E+01 kg		S	1.57	g/mL	1925	kL	1.92E+01	ug/g	Jan 1 2001 12:00AM
241-AN-105	Al	Supernatant	9.28E+04 kg		S	1.42	g/mL	2227	kL	2.93E+04	ug/g	Jan 1 2001 12:00AM
241-AN-105	Al	Salt Cake	6.76E+04 kg		S	1.57	g/mL	1925	kL	2.24E+04	ug/g	Jan 1 2001 12:00AM
241-AN-105	As	Salt Cake	1.18E+02 kg		S	1.57	g/mL	1925	kL	3.92E+01	ug/g	Jan 1 2001 12:00AM
241-AN-105	As	Supernatant	1.09E+02 kg		S	1.42	g/mL	2227	kL	3.45E+01	ug/g	Jan 1 2001 12:00AM
241-AN-105	B	Supernatant	1.66E+02 kg		S	1.42	g/mL	2227	kL	5.24E+01	ug/g	Jan 1 2001 12:00AM
241-AN-105	B	Salt Cake	2.74E+02 kg		S	1.57	g/mL	1925	kL	9.06E+01	ug/g	Jan 1 2001 12:00AM
241-AN-105	Ba	Supernatant	5.47E+01 kg		S	1.42	g/mL	2227	kL	1.73E+01	ug/g	Jan 1 2001 12:00AM
241-AN-105	Ba	Salt Cake	5.92E+01 kg		S	1.57	g/mL	1925	kL	1.96E+01	ug/g	Jan 1 2001 12:00AM
241-AN-105	Be	Supernatant	5.44E+00 kg		S	1.42	g/mL	2227	kL	1.72E+00	ug/g	Jan 1 2001 12:00AM
241-AN-105	Be	Salt Cake	5.92E+00 kg		S	1.57	g/mL	1925	kL	1.96E+00	ug/g	Jan 1 2001 12:00AM
241-AN-105	Bi	Salt Cake	1.18E+02 kg		S	1.57	g/mL	1925	kL	3.92E+01	ug/g	Jan 1 2001 12:00AM
241-AN-105	Bi	Supernatant	1.09E+02 kg		S	1.42	g/mL	2227	kL	3.45E+01	ug/g	Jan 1 2001 12:00AM
241-AN-105	Ca	Salt Cake	1.85E+03 kg		S	1.57	g/mL	1925	kL	6.13E+02	ug/g	Jan 1 2001 12:00AM
241-AN-105	Ca	Supernatant	1.09E+02 kg		S	1.42	g/mL	2227	kL	3.45E+01	ug/g	Jan 1 2001 12:00AM
241-AN-105	Cd	Supernatant	5.44E+00 kg		S	1.42	g/mL	2227	kL	1.72E+00	ug/g	Jan 1 2001 12:00AM
241-AN-105	Cd	Salt Cake	3.41E+01 kg		S	1.57	g/mL	1925	kL	1.13E+01	ug/g	Jan 1 2001 12:00AM
241-AN-105	Ce	Salt Cake	1.18E+02 kg		S	1.57	g/mL	1925	kL	3.92E+01	ug/g	Jan 1 2001 12:00AM
241-AN-105	Ce	Supernatant	1.09E+02 kg		S	1.42	g/mL	2227	kL	3.45E+01	ug/g	Jan 1 2001 12:00AM
241-AN-105	Cl	Salt Cake	1.57E+04 kg		S	1.57	g/mL	1925	kL	5.19E+03	ug/g	Jan 1 2001 12:00AM
241-AN-105	Cl	Supernatant	2.15E+04 kg		S	1.42	g/mL	2227	kL	6.79E+03	ug/g	Jan 1 2001 12:00AM
241-AN-105	Co	Supernatant	2.18E+01 kg		S	1.42	g/mL	2227	kL	6.89E+00	ug/g	Jan 1 2001 12:00AM

CALCULATION SHEET

PROJECT: RPP-WTP
JOB NO.: 24590
CALC NO.: 24590-WTP-M4C-FRP-00001
SHEET REV: 0A
SHEET NO.: 70

BY: E. Berrios
DATE: 12/04/02

SUBJECT: Updated Emissions Run Feed Vector

Tank Name	Analyte	Waste Phase	Inventory	Inventory Units	Basis	Density	Density Units	Volume	Volume Units	Concentration	Concentration Units	Decay Date
241-AN-105	Co	Salt Cake	2.37E+01	kg	S	1.57	g/mL	1925	kL	7.84E+00	ug/g	Jan 1 2001 12:00AM
241-AN-105	Cr	Salt Cake	6.84E+03	kg	S	1.57	g/mL	1925	kL	2.26E+03	ug/g	Jan 1 2001 12:00AM
241-AN-105	Cr	Supernatant	5.00E+02	kg	S	1.42	g/mL	2227	kL	1.58E+02	ug/g	Jan 1 2001 12:00AM
241-AN-105	Cu	Supernatant	1.17E+01	kg	S	1.42	g/mL	2227	kL	3.70E+00	ug/g	Jan 1 2001 12:00AM
241-AN-105	Cu	Salt Cake	2.09E+01	kg	S	1.57	g/mL	1925	kL	6.93E+00	ug/g	Jan 1 2001 12:00AM
241-AN-105	F	Salt Cake	5.45E+03	kg	S	1.57	g/mL	1925	kL	1.80E+03	ug/g	Jan 1 2001 12:00AM
241-AN-105	F	Supernatant	6.91E+02	kg	S	1.42	g/mL	2227	kL	2.18E+02	ug/g	Jan 1 2001 12:00AM
241-AN-105	Fe	Salt Cake	3.48E+02	kg	S	1.57	g/mL	1925	kL	1.15E+02	ug/g	Jan 1 2001 12:00AM
241-AN-105	Fe	Supernatant	5.47E+01	kg	S	1.42	g/mL	2227	kL	1.73E+01	ug/g	Jan 1 2001 12:00AM
241-AN-105	Hg	Salt Cake	0.00E+00	kg	TS	1.58	g/mL	1925	kL	0.00E+00	ug/g	Jan 1 2001 12:00AM
241-AN-105	Hg	Supernatant	0.00E+00	kg	TE	1.6	g/mL	2227	kL	0.00E+00	ug/g	Jan 1 2001 12:00AM
241-AN-105	K	Salt Cake	1.06E+04	kg	S	1.57	g/mL	1925	kL	3.49E+03	ug/g	Jan 1 2001 12:00AM
241-AN-105	K	Supernatant	1.46E+04	kg	S	1.42	g/mL	2227	kL	4.62E+03	ug/g	Jan 1 2001 12:00AM
241-AN-105	La	Salt Cake	5.92E+01	kg	S	1.57	g/mL	1925	kL	1.96E+01	ug/g	Jan 1 2001 12:00AM
241-AN-105	La	Supernatant	2.95E+00	kg	TE	1.6	g/mL	2227	kL	1.10E+00	ug/g	Jan 1 2001 12:00AM
241-AN-105	Li	Salt Cake	5.12E+01	kg	S	1.57	g/mL	1925	kL	1.70E+01	ug/g	Jan 1 2001 12:00AM
241-AN-105	Li	Supernatant	1.33E+01	kg	S	1.42	g/mL	2227	kL	4.20E+00	ug/g	Jan 1 2001 12:00AM
241-AN-105	Mg	Supernatant	1.09E+02	kg	S	1.42	g/mL	2227	kL	3.45E+01	ug/g	Jan 1 2001 12:00AM
241-AN-105	Mg	Salt Cake	1.18E+02	kg	S	1.57	g/mL	1925	kL	3.92E+01	ug/g	Jan 1 2001 12:00AM
241-AN-105	Mn	Salt Cake	6.15E+01	kg	S	1.57	g/mL	1925	kL	2.03E+01	ug/g	Jan 1 2001 12:00AM
241-AN-105	Mn	Supernatant	1.09E+01	kg	S	1.42	g/mL	2227	kL	3.45E+00	ug/g	Jan 1 2001 12:00AM
241-AN-105	Mo	Supernatant	2.15E+02	kg	S	1.42	g/mL	2227	kL	6.81E+01	ug/g	Jan 1 2001 12:00AM
241-AN-105	Mo	Salt Cake	1.57E+02	kg	S	1.57	g/mL	1925	kL	5.19E+01	ug/g	Jan 1 2001 12:00AM
241-AN-105	Na	Salt Cake	5.52E+05	kg	S	1.57	g/mL	1925	kL	1.83E+05	ug/g	Jan 1 2001 12:00AM
241-AN-105	Na	Supernatant	5.50E+05	kg	S	1.42	g/mL	2227	kL	1.74E+05	ug/g	Jan 1 2001 12:00AM
241-AN-105	Nd	Salt Cake	1.18E+02	kg	S	1.57	g/mL	1925	kL	3.92E+01	ug/g	Jan 1 2001 12:00AM
241-AN-105	Nd	Supernatant	1.09E+02	kg	S	1.42	g/mL	2227	kL	3.45E+01	ug/g	Jan 1 2001 12:00AM
241-AN-105	Ni	Salt Cake	1.20E+02	kg	S	1.57	g/mL	1925	kL	3.97E+01	ug/g	Jan 1 2001 12:00AM
241-AN-105	Ni	Supernatant	2.20E+01	kg	S	1.42	g/mL	2227	kL	6.96E+00	ug/g	Jan 1 2001 12:00AM
241-AN-105	NO2	Salt Cake	1.94E+05	kg	S	1.57	g/mL	1925	kL	6.44E+04	ug/g	Jan 1 2001 12:00AM
241-AN-105	NO2	Supernatant	2.64E+05	kg	S	1.42	g/mL	2227	kL	8.36E+04	ug/g	Jan 1 2001 12:00AM
241-AN-105	NO3	Salt Cake	3.43E+05	kg	S	1.57	g/mL	1925	kL	1.13E+05	ug/g	Jan 1 2001 12:00AM
241-AN-105	NO3	Supernatant	3.48E+05	kg	S	1.42	g/mL	2227	kL	1.10E+05	ug/g	Jan 1 2001 12:00AM
241-AN-105	OH	Salt Cake	7.22E+04	kg	S	1.57	g/mL	1925	kL	2.39E+04	ug/g	Jan 1 2001 12:00AM
241-AN-105	OH	Supernatant	1.33E+05	kg	S	1.47	g/mL	2227	kL	4.06E+04	ug/g	Jan 1 2001 12:00AM
241-AN-105	Oxalate	Supernatant	1.09E+03	kg	S	1.42	g/mL	2227	kL	3.44E+02	ug/g	Jan 1 2001 12:00AM
241-AN-105	Oxalate	Salt Cake	2.08E+04	kg	S	1.57	g/mL	1925	kL	6.88E+03	ug/g	Jan 1 2001 12:00AM
241-AN-105	Pb	Salt Cake	1.43E+02	kg	S	1.57	g/mL	1925	kL	4.72E+01	ug/g	Jan 1 2001 12:00AM
241-AN-105	Pb	Supernatant	1.20E+02	kg	S	1.42	g/mL	2227	kL	3.79E+01	ug/g	Jan 1 2001 12:00AM
241-AN-105	PO4	Salt Cake	2.26E+04	kg	S	1.57	g/mL	1925	kL	7.48E+03	ug/g	Jan 1 2001 12:00AM
241-AN-105	PO4	Supernatant	2.73E+03	kg	S	1.42	g/mL	2227	kL	8.63E+02	ug/g	Jan 1 2001 12:00AM
241-AN-105	Sb	Salt Cake	7.11E+01	kg	S	1.57	g/mL	1925	kL	2.35E+01	ug/g	Jan 1 2001 12:00AM
241-AN-105	Sb	Supernatant	6.55E+01	kg	S	1.42	g/mL	2227	kL	2.07E+01	ug/g	Jan 1 2001 12:00AM
241-AN-105	Se	Salt Cake	1.18E+02	kg	S	1.57	g/mL	1925	kL	3.92E+01	ug/g	Jan 1 2001 12:00AM
241-AN-105	Se	Supernatant	1.09E+02	kg	S	1.42	g/mL	2227	kL	3.45E+01	ug/g	Jan 1 2001 12:00AM
241-AN-105	Si	Salt Cake	4.19E+02	kg	S	1.57	g/mL	1925	kL	1.39E+02	ug/g	Jan 1 2001 12:00AM
241-AN-105	Si	Supernatant	4.86E+02	kg	S	1.42	g/mL	2227	kL	1.54E+02	ug/g	Jan 1 2001 12:00AM

CALCULATION SHEET

PROJECT: RPP-WTP
JOB NO.: 24590
CALC NO.: 24590-WTP-M4C-FRP-00001
SHEET REV: 0A
SHEET NO.: 71

BY: E. Berrios
DATE: 12/04/02

SUBJECT: Updated Emissions Run Feed Vector

Tank Name	Analyte	Waste Phase	Inventory	Inventory Units	Basis	Density	Density Units	Volume	Volume Units	Concentration	Concentration Units	Decay Date
241-AN-105	SO4	Salt Cake	2.22E+04	kg	S	1.57	g/mL	1925	kL	7.34E+03	ug/g	Jan 1 2001 12:00AM
241-AN-105	SO4	Supernatant	6.26E+03	kg	S	1.42	g/mL	2227	kL	1.98E+03	ug/g	Jan 1 2001 12:00AM
241-AN-105	Sr	Salt Cake	1.18E+01	kg	S	1.57	g/mL	1925	kL	3.92E+00	ug/g	Jan 1 2001 12:00AM
241-AN-105	Sr	Supernatant	2.03E-03	kg	C		g/mL	2227	kL		ug/g	Jan 1 2001 12:00AM
241-AN-105	Ta	Supernatant	7.25E+01	kg	S	1.42	g/mL	2227	kL	2.12E+01	ug/g	Jan 1 2001 12:00AM
241-AN-105	Th	Supernatant	7.25E+01	kg	S	1.42	g/mL	2227	kL	2.12E+01	ug/g	Jan 1 2001 12:00AM
241-AN-105	Ti	Supernatant	1.09E+01	kg	S	1.42	g/mL	2227	kL	3.45E+00	ug/g	Jan 1 2001 12:00AM
241-AN-105	Ti	Salt Cake	1.18E+01	kg	S	1.57	g/mL	1925	kL	3.92E+00	ug/g	Jan 1 2001 12:00AM
241-AN-105	TIC as CO3	Salt Cake	1.91E+05	kg	S	1.57	g/mL	1925	kL	6.33E+04	ug/g	Jan 1 2001 12:00AM
241-AN-105	TIC as CO3	Supernatant	3.97E+04	kg	S	1.42	g/mL	2227	kL	1.26E+04	ug/g	Jan 1 2001 12:00AM
241-AN-105	Tl	Salt Cake	2.37E+02	kg	S	1.57	g/mL	1925	kL	7.84E+01	ug/g	Jan 1 2001 12:00AM
241-AN-105	Tl	Supernatant	2.18E+02	kg	S	1.42	g/mL	2227	kL	6.89E+01	ug/g	Jan 1 2001 12:00AM
241-AN-105	UTOTAL	Salt Cake	2.63E+02	kg	S	1.57	g/mL	1925	kL	8.70E+01	ug/g	Jan 1 2001 12:00AM
241-AN-105	UTOTAL	Supernatant	7.93E+00	kg	S	1.42	g/mL	2227	kL	2.51E+00	ug/g	Jan 1 2001 12:00AM
241-AN-105	V	Salt Cake	5.92E+01	kg	S	1.57	g/mL	1925	kL	1.96E+01	ug/g	Jan 1 2001 12:00AM
241-AN-105	V	Supernatant	5.47E+01	kg	S	1.42	g/mL	2227	kL	1.73E+01	ug/g	Jan 1 2001 12:00AM
241-AN-105	Y	Supernatant	1.45E+01	kg	S	1.42	g/mL	2227	kL	4.23E+00	ug/g	Jan 1 2001 12:00AM
241-AN-105	Zn	Salt Cake	1.29E+02	kg	S	1.57	g/mL	1925	kL	4.27E+01	ug/g	Jan 1 2001 12:00AM
241-AN-105	Zn	Supernatant	6.91E+01	kg	S	1.42	g/mL	2227	kL	2.18E+01	ug/g	Jan 1 2001 12:00AM
241-AN-105	Zr	Supernatant	1.12E+01	kg	S	1.42	g/mL	2227	kL	3.55E+00	ug/g	Jan 1 2001 12:00AM
241-AN-105	Zr	Salt Cake	3.31E+01	kg	S	1.57	g/mL	1925	kL	1.10E+01	ug/g	Jan 1 2001 12:00AM
241-AN-107	106Ru	Supernatant	8.35E-05	Ci	TE	1.6	g/mL	3195	kL	3.21E-08	uCi/g	Jan 1 2001 12:00AM
241-AN-107	113mCd	Supernatant	7.59E+01	Ci	TE	1.6	g/mL	3195	kL	2.92E-02	uCi/g	Jan 1 2001 12:00AM
241-AN-107	125Sb	Supernatant	4.17E+01	Ci	TE	1.6	g/mL	3195	kL	1.60E-02	uCi/g	Jan 1 2001 12:00AM
241-AN-107	126Sn	Supernatant	3.02E+01	Ci	S	1.37	g/mL	3195	kL	7.20E-03	uCi/g	Jan 1 2001 12:00AM
241-AN-107	129I	Supernatant	3.71E-01	Ci	S	1.37	g/mL	3195	kL	8.83E-05	uCi/g	Jan 1 2001 12:00AM
241-AN-107	134Cs	Supernatant	1.05E+00	Ci	TE	1.6	g/mL	3195	kL	4.03E-04	uCi/g	Jan 1 2001 12:00AM
241-AN-107	137Cs	Supernatant	1.07E+06	Ci	S	1.37	g/mL	3195	kL	2.54E+02	uCi/g	Jan 1 2001 12:00AM
241-AN-107	137mBa	Supernatant	1.01E+06	Ci	C		g/mL	3195	kL		uCi/g	Jan 1 2001 12:00AM
241-AN-107	14C	Supernatant	1.26E+00	Ci	S	1.37	g/mL	3195	kL	3.01E-04	uCi/g	Jan 1 2001 12:00AM
241-AN-107	151Sm	Supernatant	1.29E+04	Ci	TE	1.6	g/mL	3195	kL	4.97E+00	uCi/g	Jan 1 2001 12:00AM
241-AN-107	152Eu	Supernatant	3.90E+00	Ci	TE	1.6	g/mL	3195	kL	1.50E-03	uCi/g	Jan 1 2001 12:00AM
241-AN-107	154Eu	Supernatant	2.46E+03	Ci	S	1.37	g/mL	3195	kL	5.87E-01	uCi/g	Jan 1 2001 12:00AM
241-AN-107	155Eu	Supernatant	1.50E+03	Ci	S	1.37	g/mL	3195	kL	3.57E-01	uCi/g	Jan 1 2001 12:00AM
241-AN-107	226Ra	Supernatant	1.56E-04	Ci	TE	1.6	g/mL	3195	kL	5.99E-08	uCi/g	Jan 1 2001 12:00AM
241-AN-107	227Ac	Supernatant	1.59E-03	Ci	TE	1.6	g/mL	3195	kL	6.12E-07	uCi/g	Jan 1 2001 12:00AM
241-AN-107	228Ra	Supernatant	1.88E-01	Ci	TE	1.6	g/mL	3195	kL	7.22E-05	uCi/g	Jan 1 2001 12:00AM
241-AN-107	229Th	Supernatant	7.96E-03	Ci	TE	1.6	g/mL	3195	kL	3.06E-06	uCi/g	Jan 1 2001 12:00AM
241-AN-107	231Pa	Supernatant	4.29E-03	Ci	TE	1.6	g/mL	3195	kL	1.65E-06	uCi/g	Jan 1 2001 12:00AM
241-AN-107	232Th	Supernatant	4.18E-02	Ci	TE	1.6	g/mL	3195	kL	1.61E-05	uCi/g	Jan 1 2001 12:00AM
241-AN-107	232U	Supernatant	2.53E-01	Ci	C	1.37	g/mL	3195	kL	6.03E-05	uCi/g	Jan 1 2001 12:00AM
241-AN-107	233U	Supernatant	1.04E+00	Ci	C	1.37	g/mL	3195	kL	2.47E-04	uCi/g	Jan 1 2001 12:00AM
241-AN-107	234U	Supernatant	1.33E-01	Ci	C	1.37	g/mL	3195	kL	3.16E-05	uCi/g	Jan 1 2001 12:00AM
241-AN-107	235U	Supernatant	5.15E-03	Ci	C	1.37	g/mL	3195	kL	1.23E-06	uCi/g	Jan 1 2001 12:00AM
241-AN-107	236U	Supernatant	4.69E-03	Ci	C	1.37	g/mL	3195	kL	1.12E-06	uCi/g	Jan 1 2001 12:00AM
241-AN-107	237Np	Supernatant	1.84E-01	Ci	S	1.42	g/mL	3195	kL	4.23E-05	uCi/g	Jan 1 2001 12:00AM
241-AN-107	238Pu	Supernatant	5.27E+00	Ci	C	1.37	g/mL	3195	kL	1.24E-03	uCi/g	Jan 1 2001 12:00AM

CALCULATION SHEET

PROJECT: RPP-WTP
JOB NO.: 24590
CALC NO.: 24590-WTP-M4C-FRP-00001
SHEET REV: 0A
SHEET NO.: 72

BY: E. Berrios
DATE: 12/04/02

SUBJECT: Updated Emissions Run Feed Vector

Tank Name	Analyte	Waste Phase	Inventory	Inventory Units	Basis	Density	Density Units	Volume	Volume Units	Concentration	Concentration Units	Decay Date
241-AN-107	238U	Supernatant	1.14E-01	Ci	C	1.37	g/mL	3195	kL	2.73E-05	uCi/g	Jan 1 2001 12:00AM
241-AN-107	239Pu	Supernatant	1.74E+02	Ci	C	1.37	g/mL	3195	kL	4.11E-02	uCi/g	Jan 1 2001 12:00AM
241-AN-107	240Pu	Supernatant	3.08E+01	Ci	C	1.37	g/mL	3195	kL	7.25E-03	uCi/g	Jan 1 2001 12:00AM
241-AN-107	241Am	Supernatant	2.47E+03	Ci	S	1.37	g/mL	3195	kL	5.89E-01	uCi/g	Jan 1 2001 12:00AM
241-AN-107	241Pu	Supernatant	2.85E+02	Ci	C	1.37	g/mL	3195	kL	6.72E-02	uCi/g	Jan 1 2001 12:00AM
241-AN-107	242Cm	Supernatant	6.23E+00	Ci	C	1.37	g/mL	3195	kL	1.48E-03	uCi/g	Jan 1 2001 12:00AM
241-AN-107	242Pu	Supernatant	2.14E-03	Ci	C	1.37	g/mL	3195	kL	5.03E-07	uCi/g	Jan 1 2001 12:00AM
241-AN-107	243Am	Supernatant	1.01E-01	Ci	C	1.37	g/mL	3195	kL	2.40E-05	uCi/g	Jan 1 2001 12:00AM
241-AN-107	243Cm	Supernatant	5.18E-01	Ci	C	1.37	g/mL	3195	kL	1.23E-04	uCi/g	Jan 1 2001 12:00AM
241-AN-107	244Cm	Supernatant	3.60E+00	Ci	C	1.37	g/mL	3195	kL	8.59E-04	uCi/g	Jan 1 2001 12:00AM
241-AN-107	3H	Supernatant	2.43E+00	Ci	S	1.37	g/mL	3195	kL	5.80E-04	uCi/g	Jan 1 2001 12:00AM
241-AN-107	59Ni	Supernatant	8.41E-01	Ci	TE	1.6	g/mL	3195	kL	3.23E-04	uCi/g	Jan 1 2001 12:00AM
241-AN-107	60Co	Supernatant	4.04E+02	Ci	S	1.37	g/mL	3195	kL	9.63E-02	uCi/g	Jan 1 2001 12:00AM
241-AN-107	63Ni	Supernatant	7.93E+01	Ci	TE	1.6	g/mL	3195	kL	3.05E-02	uCi/g	Jan 1 2001 12:00AM
241-AN-107	79Se	Supernatant	2.58E+00	Ci	S	1.37	g/mL	3195	kL	6.15E-04	uCi/g	Jan 1 2001 12:00AM
241-AN-107	90Sr	Supernatant	3.02E+05	Ci	S	1.37	g/mL	3195	kL	7.20E+01	uCi/g	Jan 1 2001 12:00AM
241-AN-107	90Y	Supernatant	3.02E+05	Ci	C		g/mL	3195	kL		uCi/g	Jan 1 2001 12:00AM
241-AN-107	93mNb	Supernatant	1.54E+01	Ci	TE	1.6	g/mL	3195	kL	5.92E-03	uCi/g	Jan 1 2001 12:00AM
241-AN-107	93Zr	Supernatant	1.92E+01	Ci	TE	1.6	g/mL	3195	kL	7.37E-03	uCi/g	Jan 1 2001 12:00AM
241-AN-107	99Tc	Supernatant	2.60E+02	Ci	S	1.37	g/mL	3195	kL	6.19E-02	uCi/g	Jan 1 2001 12:00AM
241-AN-107	Ag	Supernatant	6.13E+00	kg	S	1.42	g/mL	3195	kL	1.41E+00	ug/g	Jan 1 2001 12:00AM
241-AN-107	Al	Supernatant	9.07E+02	kg	S	1.37	g/mL	3195	kL	2.18E+02	ug/g	Jan 1 2001 12:00AM
241-AN-107	As	Supernatant	1.55E+02	kg	S	1.37	g/mL	3195	kL	3.69E+01	ug/g	Jan 1 2001 12:00AM
241-AN-107	B	Supernatant	9.13E+01	kg	S	1.37	g/mL	3195	kL	2.20E+01	ug/g	Jan 1 2001 12:00AM
241-AN-107	Ba	Supernatant	1.93E+01	kg	S	1.42	g/mL	3195	kL	4.44E+00	ug/g	Jan 1 2001 12:00AM
241-AN-107	Be	Supernatant	3.06E+00	kg	S	1.42	g/mL	3195	kL	7.04E-01	ug/g	Jan 1 2001 12:00AM
241-AN-107	Bi	Supernatant	2.76E+01	kg	S	1.42	g/mL	3195	kL	6.34E+00	ug/g	Jan 1 2001 12:00AM
241-AN-107	Ca	Supernatant	2.04E+03	kg	S	1.37	g/mL	3195	kL	4.91E+02	ug/g	Jan 1 2001 12:00AM
241-AN-107	Cd	Supernatant	2.29E+02	kg	S	1.37	g/mL	3195	kL	5.50E+01	ug/g	Jan 1 2001 12:00AM
241-AN-107	Ce	Supernatant	1.87E+02	kg	S	1.37	g/mL	3195	kL	4.50E+01	ug/g	Jan 1 2001 12:00AM
241-AN-107	Cl	Supernatant	7.85E+03	kg	S	1.37	g/mL	3195	kL	1.89E+03	ug/g	Jan 1 2001 12:00AM
241-AN-107	CN	Supernatant	1.60E+01	kg	S	1.37	g/mL	3195	kL	3.85E+00	ug/g	Jan 1 2001 12:00AM
241-AN-107	Co	Supernatant	1.38E+01	kg	S	1.42	g/mL	3195	kL	3.17E+00	ug/g	Jan 1 2001 12:00AM
241-AN-107	Cr	Supernatant	5.90E+02	kg	S	1.37	g/mL	3195	kL	1.42E+02	ug/g	Jan 1 2001 12:00AM
241-AN-107	Cu	Supernatant	1.05E+02	kg	S	1.37	g/mL	3195	kL	2.52E+01	ug/g	Jan 1 2001 12:00AM
241-AN-107	F	Supernatant	2.48E+04	kg	S	1.37	g/mL	3195	kL	5.96E+03	ug/g	Jan 1 2001 12:00AM
241-AN-107	Fe	Supernatant	5.81E+03	kg	S	1.37	g/mL	3195	kL	1.40E+03	ug/g	Jan 1 2001 12:00AM
241-AN-107	Hg	Supernatant	0.00E+00	kg	TE	1.6	g/mL	3195	kL	0.00E+00	ug/g	Jan 1 2001 12:00AM
241-AN-107	K	Supernatant	6.53E+03	kg	S	1.37	g/mL	3195	kL	1.57E+03	ug/g	Jan 1 2001 12:00AM
241-AN-107	La	Supernatant	1.22E+02	kg	S	1.37	g/mL	3195	kL	2.93E+01	ug/g	Jan 1 2001 12:00AM
241-AN-107	Li	Supernatant	9.19E+00	kg	S	1.42	g/mL	3195	kL	2.11E+00	ug/g	Jan 1 2001 12:00AM
241-AN-107	Mg	Supernatant	2.76E+01	kg	S	1.42	g/mL	3195	kL	6.34E+00	ug/g	Jan 1 2001 12:00AM
241-AN-107	Mn	Supernatant	2.00E+03	kg	S	1.37	g/mL	3195	kL	4.81E+02	ug/g	Jan 1 2001 12:00AM
241-AN-107	Mo	Supernatant	1.27E+02	kg	S	1.37	g/mL	3195	kL	3.05E+01	ug/g	Jan 1 2001 12:00AM
241-AN-107	Na	Supernatant	7.28E+05	kg	E	1.37	g/mL	3195	kL	1.66E+05	ug/g	Jan 1 2001 12:00AM
241-AN-107	Nd	Supernatant	3.53E+02	kg	S	1.37	g/mL	3195	kL	8.50E+01	ug/g	Jan 1 2001 12:00AM
241-AN-107	NH3	Supernatant	1.56E+02	kg	S	1.37	g/mL	3195	kL	3.71E+01	ug/g	Jan 1 2001 12:00AM

CALCULATION SHEET

PROJECT: RPP-WTP
JOB NO.: 24590
CALC NO.: 24590-WTP-M4C-FRP-00001
SHEET REV: 0A
SHEET NO.: 73

BY: E. Berrios
DATE: 12/04/02

SUBJECT: Updated Emissions Run Feed Vector

Tank Name	Analyte	Waste Phase	Inventory	Inventory Units	Basis	Density	Density Units	Volume	Volume Units	Concentration	Concentration Units	Decay Date
241-AN-107	Ni	Supernatant	1.93E+03	kg	S	1.37	g/mL	3195	kL	4.65E+02	ug/g	Jan 1 2001 12:00AM
241-AN-107	NO2	Supernatant	1.99E+05	kg	S	1.37	g/mL	3195	kL	4.79E+04	ug/g	Jan 1 2001 12:00AM
241-AN-107	NO3	Supernatant	6.87E+05	kg	S	1.37	g/mL	3195	kL	1.65E+05	ug/g	Jan 1 2001 12:00AM
241-AN-107	OH	Supernatant	3.87E+04	kg	E	1.37	g/mL	3195	kL	8.83E+03	ug/g	Jan 1 2001 12:00AM
241-AN-107	Pb	Supernatant	1.34E+03	kg	S	1.37	g/mL	3195	kL	3.23E+02	ug/g	Jan 1 2001 12:00AM
241-AN-107	PO4	Supernatant	5.34E+03	kg	S	1.37	g/mL	3195	kL	1.29E+03	ug/g	Jan 1 2001 12:00AM
241-AN-107	Rh	Supernatant	8.27E+01	kg	S	1.42	g/mL	3195	kL	1.90E+01	ug/g	Jan 1 2001 12:00AM
241-AN-107	Sb	Supernatant	1.02E+00	kg	S	1.37	g/mL	3195	kL	2.44E-01	ug/g	Jan 1 2001 12:00AM
241-AN-107	Se	Supernatant	6.89E+01	kg	S	1.42	g/mL	3195	kL	1.58E+01	ug/g	Jan 1 2001 12:00AM
241-AN-107	Si	Supernatant	9.13E+01	kg	S	1.37	g/mL	3195	kL	2.20E+01	ug/g	Jan 1 2001 12:00AM
241-AN-107	SO4	Supernatant	3.09E+04	kg	S	1.37	g/mL	3195	kL	7.45E+03	ug/g	Jan 1 2001 12:00AM
241-AN-107	Sr	Supernatant	9.19E+00	kg	S	1.42	g/mL	3195	kL	2.11E+00	ug/g	Jan 1 2001 12:00AM
241-AN-107	Ta	Supernatant	7.75E+01	kg	S	1.37	g/mL	3195	kL	1.85E+01	ug/g	Jan 1 2001 12:00AM
241-AN-107	Ti	Supernatant	1.55E+01	kg	S	1.37	g/mL	3195	kL	3.69E+00	ug/g	Jan 1 2001 12:00AM
241-AN-107	TIC as CO3	Supernatant	2.08E+05	kg	S	1.37	g/mL	3195	kL	5.02E+04	ug/g	Jan 1 2001 12:00AM
241-AN-107	Tl	Supernatant	3.98E-01	kg	S	1.37	g/mL	3195	kL	9.49E-02	ug/g	Jan 1 2001 12:00AM
241-AN-107	TOC	Supernatant	1.24E+05	kg	S	1.37	g/mL	3195	kL	2.99E+04	ug/g	Jan 1 2001 12:00AM
241-AN-107	UTOTAL	Supernatant	3.43E+02	kg	S	1.37	g/mL	3195	kL	8.18E+01	ug/g	Jan 1 2001 12:00AM
241-AN-107	V	Supernatant	1.38E+01	kg	S	1.42	g/mL	3195	kL	3.17E+00	ug/g	Jan 1 2001 12:00AM
241-AN-107	W	Supernatant	5.19E+02	kg	S	1.37	g/mL	3195	kL	1.25E+02	ug/g	Jan 1 2001 12:00AM
241-AN-107	Y	Supernatant	2.60E+01	kg	S	1.42	g/mL	3195	kL	5.99E+00	ug/g	Jan 1 2001 12:00AM
241-AN-107	Zn	Supernatant	6.99E+01	kg	S	1.37	g/mL	3195	kL	1.68E+01	ug/g	Jan 1 2001 12:00AM
241-AN-107	Zr	Supernatant	2.45E+02	kg	S	1.37	g/mL	3195	kL	5.91E+01	ug/g	Jan 1 2001 12:00AM
241-AP-101	106Ru	Supernatant	1.16E-04	Ci	TE	1.6	g/mL	4216	kL	3.21E-08	uCi/g	Jan 1 2001 12:00AM
241-AP-101	113mCd	Supernatant	1.05E+02	Ci	TE	1.6	g/mL	4216	kL	2.92E-02	uCi/g	Jan 1 2001 12:00AM
241-AP-101	125Sb	Supernatant	2.12E+02	Ci	S	1.31	g/mL	4216	kL	3.84E-02	uCi/g	Jan 1 2001 12:00AM
241-AP-101	126Sn	Supernatant	3.57E+00	Ci	S	1.31	g/mL	4216	kL	6.47E-04	uCi/g	Jan 1 2001 12:00AM
241-AP-101	129I	Supernatant	3.39E-01	Ci	S	1.31	g/mL	4216	kL	6.15E-05	uCi/g	Jan 1 2001 12:00AM
241-AP-101	134Cs	Supernatant	1.57E+02	Ci	S	1.31	g/mL	4216	kL	2.85E-02	uCi/g	Jan 1 2001 12:00AM
241-AP-101	137Cs	Supernatant	5.97E+05	Ci	S	1.31	g/mL	4216	kL	1.08E+02	uCi/g	Jan 1 2001 12:00AM
241-AP-101	137mBa	Supernatant	5.65E+05	Ci	C		g/mL	4216	kL		uCi/g	Jan 1 2001 12:00AM
241-AP-101	14C	Supernatant	1.11E+00	Ci	S	1.31	g/mL	4216	kL	2.01E-04	uCi/g	Jan 1 2001 12:00AM
241-AP-101	151Sm	Supernatant	1.79E+04	Ci	TE	1.6	g/mL	4216	kL	4.97E+00	uCi/g	Jan 1 2001 12:00AM
241-AP-101	152Eu	Supernatant	8.13E+00	Ci	S	1.31	g/mL	4216	kL	1.47E-03	uCi/g	Jan 1 2001 12:00AM
241-AP-101	154Eu	Supernatant	7.97E+00	Ci	S	1.31	g/mL	4216	kL	1.44E-03	uCi/g	Jan 1 2001 12:00AM
241-AP-101	155Eu	Supernatant	4.91E+00	Ci	E	1.31	g/mL	4216	kL	8.89E-04	uCi/g	Jan 1 2001 12:00AM
241-AP-101	226Ra	Supernatant	2.16E-04	Ci	TE	1.6	g/mL	4216	kL	5.99E-08	uCi/g	Jan 1 2001 12:00AM
241-AP-101	227Ac	Supernatant	1.27E-03	Ci	TE	1.6	g/mL	4216	kL	3.52E-07	uCi/g	Jan 1 2001 12:00AM
241-AP-101	228Ra	Supernatant	4.75E-01	Ci	TE	1.6	g/mL	4216	kL	1.32E-04	uCi/g	Jan 1 2001 12:00AM
241-AP-101	229Th	Supernatant	1.10E-02	Ci	TE	1.6	g/mL	4216	kL	3.06E-06	uCi/g	Jan 1 2001 12:00AM
241-AP-101	231Pa	Supernatant	5.94E-03	Ci	TE	1.6	g/mL	4216	kL	1.65E-06	uCi/g	Jan 1 2001 12:00AM
241-AP-101	232Th	Supernatant	5.79E-02	Ci	TE	1.6	g/mL	4216	kL	1.61E-05	uCi/g	Jan 1 2001 12:00AM
241-AP-101	232U	Supernatant	6.21E-02	Ci	E	1.31	g/mL	4216	kL	1.12E-05	uCi/g	Jan 1 2001 12:00AM
241-AP-101	233U	Supernatant	2.55E-01	Ci	E	1.31	g/mL	4216	kL	4.62E-05	uCi/g	Jan 1 2001 12:00AM
241-AP-101	234U	Supernatant	8.64E-02	Ci	E	1.31	g/mL	4216	kL	1.56E-05	uCi/g	Jan 1 2001 12:00AM
241-AP-101	235U	Supernatant	3.56E-03	Ci	E	1.31	g/mL	4216	kL	6.44E-07	uCi/g	Jan 1 2001 12:00AM
241-AP-101	236U	Supernatant	3.02E-03	Ci	E	1.31	g/mL	4216	kL	5.47E-07	uCi/g	Jan 1 2001 12:00AM

CALCULATION SHEET

PROJECT: RPP-WTP
JOB NO.: 24590
CALC NO.: 24590-WTP-M4C-FRP-00001
SHEET REV: 0A
SHEET NO.: 74

BY: E. Berrios
DATE: 12/04/02

SUBJECT: Updated Emissions Run Feed Vector

Tank Name	Analyte	Waste Phase	Inventory	Inventory Units	Basis	Density	Density Units	Volume	Volume Units	Concentration	Concentration Units	Decay Date
241-AP-101	237Np	Supernatant	2.29E-02	Ci	S	1.31	g/mL	4216	kL	4.15E-06	uCi/g	Jan 1 2001 12:00AM
241-AP-101	238Pu	Supernatant	6.16E-02	Ci	S	1.31	g/mL	4216	kL	1.12E-05	uCi/g	Jan 1 2001 12:00AM
241-AP-101	238U	Supernatant	7.80E-02	Ci	E	1.31	g/mL	4216	kL	1.41E-05	uCi/g	Jan 1 2001 12:00AM
241-AP-101	239Pu	Supernatant	4.55E-01	Ci	E	1.31	g/mL	4216	kL	8.24E-05	uCi/g	Jan 1 2001 12:00AM
241-AP-101	240Pu	Supernatant	7.67E-02	Ci	E	1.31	g/mL	4216	kL	1.39E-05	uCi/g	Jan 1 2001 12:00AM
241-AP-101	241Am	Supernatant	7.11E-01	Ci	E	1.31	g/mL	4216	kL	1.29E-04	uCi/g	Jan 1 2001 12:00AM
241-AP-101	241Pu	Supernatant	7.90E-01	Ci	E	1.31	g/mL	4216	kL	1.43E-04	uCi/g	Jan 1 2001 12:00AM
241-AP-101	242Cm	Supernatant	1.63E-06	Ci	E	1.31	g/mL	4216	kL	2.95E-10	uCi/g	Jan 1 2001 12:00AM
241-AP-101	242Pu	Supernatant	6.96E-06	Ci	E	1.31	g/mL	4216	kL	1.26E-09	uCi/g	Jan 1 2001 12:00AM
241-AP-101	243Am	Supernatant	3.55E-05	Ci	E	1.31	g/mL	4216	kL	6.42E-09	uCi/g	Jan 1 2001 12:00AM
241-AP-101	243Cm	Supernatant	1.47E-04	Ci	E	1.31	g/mL	4216	kL	2.65E-08	uCi/g	Jan 1 2001 12:00AM
241-AP-101	244Cm	Supernatant	3.19E-03	Ci	E	1.31	g/mL	4216	kL	5.77E-07	uCi/g	Jan 1 2001 12:00AM
241-AP-101	3H	Supernatant	1.96E+01	Ci	S	1.31	g/mL	4216	kL	3.54E-03	uCi/g	Jan 1 2001 12:00AM
241-AP-101	59Ni	Supernatant	1.16E+00	Ci	TE	1.6	g/mL	4216	kL	3.23E-04	uCi/g	Jan 1 2001 12:00AM
241-AP-101	60Co	Supernatant	1.26E+01	Ci	S	1.31	g/mL	4216	kL	2.29E-03	uCi/g	Jan 1 2001 12:00AM
241-AP-101	63Ni	Supernatant	1.10E+02	Ci	TE	1.6	g/mL	4216	kL	3.05E-02	uCi/g	Jan 1 2001 12:00AM
241-AP-101	79Se	Supernatant	2.45E-01	Ci	S	1.31	g/mL	4216	kL	4.44E-05	uCi/g	Jan 1 2001 12:00AM
241-AP-101	90Sr	Supernatant	3.62E+02	Ci	S	1.31	g/mL	4216	kL	6.56E-02	uCi/g	Jan 1 2001 12:00AM
241-AP-101	90Y	Supernatant	3.62E+02	Ci	C		g/mL	4216	kL		uCi/g	Jan 1 2001 12:00AM
241-AP-101	93mNb	Supernatant	1.91E+01	Ci	TE	1.6	g/mL	4216	kL	5.29E-03	uCi/g	Jan 1 2001 12:00AM
241-AP-101	93Zr	Supernatant	2.66E+01	Ci	TE	1.6	g/mL	4216	kL	7.37E-03	uCi/g	Jan 1 2001 12:00AM
241-AP-101	99Tc	Supernatant	1.99E+02	Ci	S	1.31	g/mL	4216	kL	3.60E-02	uCi/g	Jan 1 2001 12:00AM
241-AP-101	Ag	Supernatant	2.66E+00	kg	S	1.31	g/mL	4216	kL	4.81E-01	ug/g	Jan 1 2001 12:00AM
241-AP-101	Ag	Supernatant	2.66E+00	kg	S	1.31	g/mL	4216	kL	4.81E-01	ug/g	Jan 1 2001 12:00AM
241-AP-101	Al	Supernatant	2.93E+04	kg	S	1.31	g/mL	4216	kL	5.30E+03	ug/g	Jan 1 2001 12:00AM
241-AP-101	As	Supernatant	5.31E+00	kg	S	1.31	g/mL	4216	kL	9.62E-01	ug/g	Jan 1 2001 12:00AM
241-AP-101	As	Supernatant	5.31E+00	kg	S	1.31	g/mL	4216	kL	9.62E-01	ug/g	Jan 1 2001 12:00AM
241-AP-101	B	Supernatant	6.75E+01	kg	S	1.31	g/mL	4216	kL	1.22E+01	ug/g	Jan 1 2001 12:00AM
241-AP-101	B	Supernatant	6.75E+01	kg	S	1.31	g/mL	4216	kL	1.22E+01	ug/g	Jan 1 2001 12:00AM
241-AP-101	Ba	Supernatant	1.39E+00	kg	S	1.31	g/mL	4216	kL	2.52E-01	ug/g	Jan 1 2001 12:00AM
241-AP-101	Ba	Supernatant	1.39E+00	kg	S	1.31	g/mL	4216	kL	2.52E-01	ug/g	Jan 1 2001 12:00AM
241-AP-101	Be	Supernatant	5.57E+00	kg	S	1.31	g/mL	4216	kL	1.01E+00	ug/g	Jan 1 2001 12:00AM
241-AP-101	Be	Supernatant	5.57E+00	kg	S	1.31	g/mL	4216	kL	1.01E+00	ug/g	Jan 1 2001 12:00AM
241-AP-101	Bi	Supernatant	1.05E+01	kg	S	1.31	g/mL	4216	kL	1.91E+00	ug/g	Jan 1 2001 12:00AM
241-AP-101	Ca	Supernatant	3.25E+01	kg	S	1.31	g/mL	4216	kL	5.88E+00	ug/g	Jan 1 2001 12:00AM
241-AP-101	Cd	Supernatant	8.43E+00	kg	S	1.31	g/mL	4216	kL	1.53E+00	ug/g	Jan 1 2001 12:00AM
241-AP-101	Cd	Supernatant	8.43E+00	kg	S	1.31	g/mL	4216	kL	1.53E+00	ug/g	Jan 1 2001 12:00AM
241-AP-101	Ce	Supernatant	3.15E-01	kg	S	1.31	g/mL	4216	kL	5.70E-02	ug/g	Jan 1 2001 12:00AM
241-AP-101	Ce	Supernatant	3.15E-01	kg	S	1.31	g/mL	4216	kL	5.70E-02	ug/g	Jan 1 2001 12:00AM
241-AP-101	Cl	Supernatant	8.35E+03	kg	S	1.31	g/mL	4216	kL	1.51E+03	ug/g	Jan 1 2001 12:00AM
241-AP-101	CN	Supernatant	2.40E+01	kg	S	1.31	g/mL	4216	kL	4.35E+00	ug/g	Jan 1 2001 12:00AM
241-AP-101	CN	Supernatant	2.40E+01	kg	S	1.31	g/mL	4216	kL	4.35E+00	ug/g	Jan 1 2001 12:00AM
241-AP-101	Co	Supernatant	1.48E+00	kg	S	1.31	g/mL	4216	kL	2.69E-01	ug/g	Jan 1 2001 12:00AM
241-AP-101	Co	Supernatant	1.48E+00	kg	S	1.31	g/mL	4216	kL	2.69E-01	ug/g	Jan 1 2001 12:00AM
241-AP-101	Cr	Supernatant	6.03E+02	kg	S	1.31	g/mL	4216	kL	1.09E+02	ug/g	Jan 1 2001 12:00AM
241-AP-101	Cu	Supernatant	6.75E+00	kg	S	1.31	g/mL	4216	kL	1.22E+00	ug/g	Jan 1 2001 12:00AM
241-AP-101	Cu	Supernatant	6.75E+00	kg	S	1.31	g/mL	4216	kL	1.22E+00	ug/g	Jan 1 2001 12:00AM

CALCULATION SHEET

PROJECT: RPP-WTP
JOB NO.: 24590
CALC NO.: 24590-WTP-M4C-FRP-00001
SHEET REV: 0A
SHEET NO.: 75

BY: E. Berrios
DATE: 12/04/02

SUBJECT: Updated Emissions Run Feed Vector

Tank Name	Analyte	Waste Phase	Inventory	Inventory Units	Basis	Density	Density Units	Volume	Volume Units	Concentration	Concentration Units	Decay Date
241-AP-101	F	Supernatant	1.22E+04	kg	S	1.31	g/mL	4216	kL	2.21E+03	ug/g	Jan 1 2001 12:00AM
241-AP-101	Fe	Supernatant	1.05E+01	kg	S	1.31	g/mL	4216	kL	1.91E+00	ug/g	Jan 1 2001 12:00AM
241-AP-101	Hg	Supernatant	0.00E+00	kg	TE	1.6	g/mL	4216	kL	0.00E+00	ug/g	Jan 1 2001 12:00AM
241-AP-101	K	Supernatant	1.32E+05	kg	S	1.31	g/mL	4216	kL	2.38E+04	ug/g	Jan 1 2001 12:00AM
241-AP-101	La	Supernatant	5.48E+00	kg	S	1.31	g/mL	4216	kL	9.92E-01	ug/g	Jan 1 2001 12:00AM
241-AP-101	Li	Supernatant	1.43E+00	kg	S	1.31	g/mL	4216	kL	2.60E-01	ug/g	Jan 1 2001 12:00AM
241-AP-101	Li	Supernatant	1.43E+00	kg	S	1.31	g/mL	4216	kL	2.60E-01	ug/g	Jan 1 2001 12:00AM
241-AP-101	Mg	Supernatant	1.05E+01	kg	S	1.31	g/mL	4216	kL	1.91E+00	ug/g	Jan 1 2001 12:00AM
241-AP-101	Mg	Supernatant	1.05E+01	kg	S	1.31	g/mL	4216	kL	1.91E+00	ug/g	Jan 1 2001 12:00AM
241-AP-101	Mn	Supernatant	5.48E+00	kg	S	1.31	g/mL	4216	kL	9.92E-01	ug/g	Jan 1 2001 12:00AM
241-AP-101	Mo	Supernatant	6.11E+01	kg	S	1.31	g/mL	4216	kL	1.11E+01	ug/g	Jan 1 2001 12:00AM
241-AP-101	Mo	Supernatant	6.11E+01	kg	S	1.31	g/mL	4216	kL	1.11E+01	ug/g	Jan 1 2001 12:00AM
241-AP-101	Na	Supernatant	5.45E+05	kg	S	1.31	g/mL	4216	kL	9.87E+04	ug/g	Jan 1 2001 12:00AM
241-AP-101	Nd	Supernatant	1.05E+01	kg	S	1.31	g/mL	4216	kL	1.91E+00	ug/g	Jan 1 2001 12:00AM
241-AP-101	Nd	Supernatant	1.05E+01	kg	S	1.31	g/mL	4216	kL	1.91E+00	ug/g	Jan 1 2001 12:00AM
241-AP-101	NH3	Supernatant	7.21E+00	kg	S	1.31	g/mL	4216	kL	1.31E+00	ug/g	Jan 1 2001 12:00AM
241-AP-101	NH3	Supernatant	7.21E+00	kg	S	1.31	g/mL	4216	kL	1.31E+00	ug/g	Jan 1 2001 12:00AM
241-AP-101	Ni	Supernatant	3.33E+01	kg	S	1.31	g/mL	4216	kL	6.03E+00	ug/g	Jan 1 2001 12:00AM
241-AP-101	NO2	Supernatant	1.77E+05	kg	S	1.31	g/mL	4216	kL	3.20E+04	ug/g	Jan 1 2001 12:00AM
241-AP-101	NO3	Supernatant	5.57E+05	kg	S	1.31	g/mL	4216	kL	1.01E+05	ug/g	Jan 1 2001 12:00AM
241-AP-101	OH	Supernatant	1.74E+05	kg	S	1.31	g/mL	4216	kL	3.15E+04	ug/g	Jan 1 2001 12:00AM
241-AP-101	Oxalate	Supernatant	7.59E+03	kg	S	1.31	g/mL	4216	kL	1.37E+03	ug/g	Jan 1 2001 12:00AM
241-AP-101	Oxalate	Supernatant	7.59E+03	kg	S	1.31	g/mL	4216	kL	1.37E+03	ug/g	Jan 1 2001 12:00AM
241-AP-101	Pb	Supernatant	6.32E+01	kg	S	1.31	g/mL	4216	kL	1.15E+01	ug/g	Jan 1 2001 12:00AM
241-AP-101	PO4	Supernatant	4.06E+03	kg	S	1.31	g/mL	4216	kL	7.35E+02	ug/g	Jan 1 2001 12:00AM
241-AP-101	Pr	Supernatant	7.29E-02	kg	S	1.31	g/mL	4216	kL	1.32E-02	ug/g	Jan 1 2001 12:00AM
241-AP-101	Pr	Supernatant	7.29E-02	kg	S	1.31	g/mL	4216	kL	1.32E-02	ug/g	Jan 1 2001 12:00AM
241-AP-101	Rb	Supernatant	1.67E+01	kg	S	1.31	g/mL	4216	kL	3.03E+00	ug/g	Jan 1 2001 12:00AM
241-AP-101	Rb	Supernatant	1.67E+01	kg	S	1.31	g/mL	4216	kL	3.03E+00	ug/g	Jan 1 2001 12:00AM
241-AP-101	Sb	Supernatant	1.77E-01	kg	S	1.31	g/mL	4216	kL	3.21E-02	ug/g	Jan 1 2001 12:00AM
241-AP-101	Sb	Supernatant	1.77E-01	kg	S	1.31	g/mL	4216	kL	3.21E-02	ug/g	Jan 1 2001 12:00AM
241-AP-101	Se	Supernatant	9.70E+00	kg	S	1.31	g/mL	4216	kL	1.76E+00	ug/g	Jan 1 2001 12:00AM
241-AP-101	Se	Supernatant	9.70E+00	kg	S	1.31	g/mL	4216	kL	1.76E+00	ug/g	Jan 1 2001 12:00AM
241-AP-101	Si	Supernatant	5.78E+02	kg	S	1.31	g/mL	4216	kL	1.05E+02	ug/g	Jan 1 2001 12:00AM
241-AP-101	SO4	Supernatant	1.70E+04	kg	S	1.31	g/mL	4216	kL	3.08E+03	ug/g	Jan 1 2001 12:00AM
241-AP-101	Sr	Supernatant	1.60E+00	kg	S	1.31	g/mL	4216	kL	2.90E-01	ug/g	Jan 1 2001 12:00AM
241-AP-101	Ta	Supernatant	3.75E-01	kg	S	1.31	g/mL	4216	kL	6.79E-02	ug/g	Jan 1 2001 12:00AM
241-AP-101	Ta	Supernatant	3.75E-01	kg	S	1.31	g/mL	4216	kL	6.79E-02	ug/g	Jan 1 2001 12:00AM
241-AP-101	Th	Supernatant	4.64E-02	kg	S	1.31	g/mL	4216	kL	8.40E-03	ug/g	Jan 1 2001 12:00AM
241-AP-101	Th	Supernatant	4.64E-02	kg	S	1.31	g/mL	4216	kL	8.40E-03	ug/g	Jan 1 2001 12:00AM
241-AP-101	Ti	Supernatant	2.66E+00	kg	S	1.31	g/mL	4216	kL	4.81E-01	ug/g	Jan 1 2001 12:00AM
241-AP-101	Ti	Supernatant	2.66E+00	kg	S	1.31	g/mL	4216	kL	4.81E-01	ug/g	Jan 1 2001 12:00AM
241-AP-101	TIC as CO3	Supernatant	1.36E+05	kg	S	1.31	g/mL	4216	kL	2.47E+04	ug/g	Jan 1 2001 12:00AM
241-AP-101	Tl	Supernatant	7.59E-02	kg	S	1.31	g/mL	4216	kL	1.37E-02	ug/g	Jan 1 2001 12:00AM
241-AP-101	Tl	Supernatant	7.59E-02	kg	S	1.31	g/mL	4216	kL	1.37E-02	ug/g	Jan 1 2001 12:00AM
241-AP-101	UTOTAL	Supernatant	2.33E+02	kg	S	1.31	g/mL	4216	kL	4.22E+01	ug/g	Jan 1 2001 12:00AM
241-AP-101	V	Supernatant	3.15E+00	kg	S	1.31	g/mL	4216	kL	5.70E-01	ug/g	Jan 1 2001 12:00AM

CALCULATION SHEET

PROJECT: RPP-WTP
JOB NO.: 24590
CALC NO.: 24590-WTP-M4C-FRP-00001
SHEET REV: 0A
SHEET NO.: 76

BY: E. Berríos
DATE: 12/04/02

SUBJECT: Updated Emissions Run Feed Vector

Tank Name	Analyte	Waste Phase	Inventory	Inventory Units	Basis	Density	Density Units	Volume	Volume Units	Concentration	Concentration Units	Decay Date
241-AP-101	V	Supernatant	3.15E+00	kg	S	1.31	g/mL	4216	kL	5.70E-01	ug/g	Jan 1 2001 12:00AM
241-AP-101	W	Supernatant	1.21E+02	kg	S	1.31	g/mL	4216	kL	2.18E+01	ug/g	Jan 1 2001 12:00AM
241-AP-101	W	Supernatant	1.21E+02	kg	S	1.31	g/mL	4216	kL	2.18E+01	ug/g	Jan 1 2001 12:00AM
241-AP-101	Zn	Supernatant	2.36E+01	kg	S	1.31	g/mL	4216	kL	4.27E+00	ug/g	Jan 1 2001 12:00AM
241-AP-101	Zn	Supernatant	2.36E+01	kg	S	1.31	g/mL	4216	kL	4.27E+00	ug/g	Jan 1 2001 12:00AM
241-AP-101	Zr	Supernatant	5.90E+00	kg	S	1.31	g/mL	4216	kL	1.07E+00	ug/g	Jan 1 2001 12:00AM
241-AP-104	106Ru	Supernatant	7.59E-05	Ci	E	1.25	g/mL	4195	kL	1.45E-08	uCi/g	Jan 1 2001 12:00AM
241-AP-104	113mCd	Supernatant	9.08E+01	Ci	E	1.25	g/mL	4195	kL	1.73E-02	uCi/g	Jan 1 2001 12:00AM
241-AP-104	125Sb	Supernatant	4.23E+01	Ci	E	1.25	g/mL	4195	kL	8.06E-03	uCi/g	Jan 1 2001 12:00AM
241-AP-104	126Sn	Supernatant	3.04E+00	Ci	E	1.25	g/mL	4195	kL	5.79E-04	uCi/g	Jan 1 2001 12:00AM
241-AP-104	129I	Supernatant	5.82E-01	Ci	S	1.28	g/mL	4195	kL	1.08E-04	uCi/g	Jan 1 2001 12:00AM
241-AP-104	134Cs	Supernatant	9.25E-01	Ci	E	1.25	g/mL	4195	kL	1.76E-04	uCi/g	Jan 1 2001 12:00AM
241-AP-104	137Cs	Supernatant	8.94E+05	Ci	S	1.28	g/mL	4195	kL	1.66E+02	uCi/g	Jan 1 2001 12:00AM
241-AP-104	137mBa	Supernatant	8.46E+05	Ci	C		g/mL	4195	kL		uCi/g	Jan 1 2001 12:00AM
241-AP-104	14C	Supernatant	2.66E+00	Ci	S	1.28	g/mL	4195	kL	4.96E-04	uCi/g	Jan 1 2001 12:00AM
241-AP-104	151Sm	Supernatant	1.68E+04	Ci	E	1.25	g/mL	4195	kL	3.20E+00	uCi/g	Jan 1 2001 12:00AM
241-AP-104	152Eu	Supernatant	4.17E+00	Ci	E	1.25	g/mL	4195	kL	7.95E-04	uCi/g	Jan 1 2001 12:00AM
241-AP-104	154Eu	Supernatant	1.80E+02	Ci	E	1.25	g/mL	4195	kL	3.43E-02	uCi/g	Jan 1 2001 12:00AM
241-AP-104	155Eu	Supernatant	6.24E+01	Ci	E	1.25	g/mL	4195	kL	1.19E-02	uCi/g	Jan 1 2001 12:00AM
241-AP-104	226Ra	Supernatant	2.39E-04	Ci	E	1.25	g/mL	4195	kL	4.55E-08	uCi/g	Jan 1 2001 12:00AM
241-AP-104	227Ac	Supernatant	1.16E-03	Ci	E	1.25	g/mL	4195	kL	2.21E-07	uCi/g	Jan 1 2001 12:00AM
241-AP-104	228Ra	Supernatant	8.57E-02	Ci	E	1.25	g/mL	4195	kL	1.63E-05	uCi/g	Jan 1 2001 12:00AM
241-AP-104	229Th	Supernatant	3.85E-03	Ci	E	1.25	g/mL	4195	kL	7.35E-07	uCi/g	Jan 1 2001 12:00AM
241-AP-104	231Pa	Supernatant	6.21E-03	Ci	E	1.25	g/mL	4195	kL	1.18E-06	uCi/g	Jan 1 2001 12:00AM
241-AP-104	232Th	Supernatant	1.16E-04	Ci	S	1.28	g/mL	4195	kL	2.16E-08	uCi/g	Jan 1 2001 12:00AM
241-AP-104	232U	Supernatant	1.27E-02	Ci	E	1.28	g/mL	4195	kL	2.37E-06	uCi/g	Jan 1 2001 12:00AM
241-AP-104	233U	Supernatant	5.23E-02	Ci	E	1.28	g/mL	4195	kL	9.74E-06	uCi/g	Jan 1 2001 12:00AM
241-AP-104	234U	Supernatant	1.63E-02	Ci	E	1.28	g/mL	4195	kL	3.03E-06	uCi/g	Jan 1 2001 12:00AM
241-AP-104	235U	Supernatant	6.63E-04	Ci	E	1.28	g/mL	4195	kL	1.23E-07	uCi/g	Jan 1 2001 12:00AM
241-AP-104	236U	Supernatant	5.33E-04	Ci	E	1.28	g/mL	4195	kL	9.92E-08	uCi/g	Jan 1 2001 12:00AM
241-AP-104	237Np	Supernatant	7.47E-01	Ci	S	1.28	g/mL	4195	kL	1.39E-04	uCi/g	Jan 1 2001 12:00AM
241-AP-104	238Pu	Supernatant	2.38E-02	Ci	E	1.28	g/mL	4195	kL	4.43E-06	uCi/g	Jan 1 2001 12:00AM
241-AP-104	238U	Supernatant	1.47E-02	Ci	E	1.28	g/mL	4195	kL	2.74E-06	uCi/g	Jan 1 2001 12:00AM
241-AP-104	239Pu	Supernatant	7.31E-01	Ci	E	1.28	g/mL	4195	kL	1.36E-04	uCi/g	Jan 1 2001 12:00AM
241-AP-104	240Pu	Supernatant	1.24E-01	Ci	E	1.28	g/mL	4195	kL	2.31E-05	uCi/g	Jan 1 2001 12:00AM
241-AP-104	241Am	Supernatant	1.18E+01	Ci	E	1.28	g/mL	4195	kL	2.19E-03	uCi/g	Jan 1 2001 12:00AM
241-AP-104	241Pu	Supernatant	1.04E+00	Ci	E	1.28	g/mL	4195	kL	1.94E-04	uCi/g	Jan 1 2001 12:00AM
241-AP-104	242Cm	Supernatant	3.70E-02	Ci	E	1.28	g/mL	4195	kL	6.89E-06	uCi/g	Jan 1 2001 12:00AM
241-AP-104	242Pu	Supernatant	8.05E-06	Ci	E	1.28	g/mL	4195	kL	1.50E-09	uCi/g	Jan 1 2001 12:00AM
241-AP-104	243Am	Supernatant	4.20E-04	Ci	E	1.28	g/mL	4195	kL	7.81E-08	uCi/g	Jan 1 2001 12:00AM
241-AP-104	243Cm	Supernatant	1.49E-02	Ci	E	1.28	g/mL	4195	kL	2.78E-06	uCi/g	Jan 1 2001 12:00AM
241-AP-104	244Cm	Supernatant	3.27E-01	Ci	E	1.28	g/mL	4195	kL	6.09E-05	uCi/g	Jan 1 2001 12:00AM
241-AP-104	3H	Supernatant	2.78E+00	Ci	S	1.28	g/mL	4195	kL	5.18E-04	uCi/g	Jan 1 2001 12:00AM
241-AP-104	59Ni	Supernatant	1.86E+00	Ci	E	1.25	g/mL	4195	kL	3.55E-04	uCi/g	Jan 1 2001 12:00AM
241-AP-104	60Co	Supernatant	2.77E+01	Ci	E	1.25	g/mL	4195	kL	5.29E-03	uCi/g	Jan 1 2001 12:00AM
241-AP-104	63Ni	Supernatant	1.79E+02	Ci	E	1.25	g/mL	4195	kL	3.41E-02	uCi/g	Jan 1 2001 12:00AM
241-AP-104	79Se	Supernatant	3.16E+00	Ci	S	1.28	g/mL	4195	kL	5.88E-04	uCi/g	Jan 1 2001 12:00AM

CALCULATION SHEET

PROJECT: RPP-WTP
JOB NO.: 24590
CALC NO.: 24590-WTP-M4C-FRP-00001
SHEET REV: 0A
SHEET NO.: 77

BY: E. Berrios
DATE: 12/04/02

SUBJECT: Updated Emissions Run Feed Vector

Tank Name	Analyte	Waste Phase	Inventory	Inventory Units	Basis	Density	Density Units	Volume	Volume Units	Concentration	Concentration Units	Decay Date
241-AP-104	90Sr	Supernatant	7.76E+03	Ci	S	1.28	g/mL	4195	kL	1.44E+00	uCi/g	Jan 1 2001 12:00AM
241-AP-104	90Y	Supernatant	7.76E+03	Ci	C		g/mL	4195	kL		uCi/g	Jan 1 2001 12:00AM
241-AP-104	93mNb	Supernatant	1.55E+01	Ci	E	1.25	g/mL	4195	kL	2.95E-03	uCi/g	Jan 1 2001 12:00AM
241-AP-104	93Zr	Supernatant	1.88E+01	Ci	E	1.25	g/mL	4195	kL	3.58E-03	uCi/g	Jan 1 2001 12:00AM
241-AP-104	99Tc	Supernatant	7.09E+02	Ci	S	1.28	g/mL	4195	kL	1.32E-01	uCi/g	Jan 1 2001 12:00AM
241-AP-104	Ag	Supernatant	1.05E+01	kg	S	1.28	g/mL	4195	kL	1.95E+00	ug/g	Jan 1 2001 12:00AM
241-AP-104	Al	Supernatant	6.11E+04	kg	S	1.28	g/mL	4195	kL	1.14E+04	ug/g	Jan 1 2001 12:00AM
241-AP-104	As	Supernatant	7.26E+00	kg	S	1.28	g/mL	4195	kL	1.35E+00	ug/g	Jan 1 2001 12:00AM
241-AP-104	B	Supernatant	1.73E+02	kg	S	1.28	g/mL	4195	kL	3.22E+01	ug/g	Jan 1 2001 12:00AM
241-AP-104	Ba	Supernatant	2.52E-01	kg	S	1.28	g/mL	4195	kL	4.69E-02	ug/g	Jan 1 2001 12:00AM
241-AP-104	Be	Supernatant	5.10E-01	kg	S	1.28	g/mL	4195	kL	9.51E-02	ug/g	Jan 1 2001 12:00AM
241-AP-104	Bi	Supernatant	1.05E+02	kg	S	1.28	g/mL	4195	kL	1.95E+01	ug/g	Jan 1 2001 12:00AM
241-AP-104	Ca	Supernatant	2.36E+02	kg	S	1.28	g/mL	4195	kL	4.40E+01	ug/g	Jan 1 2001 12:00AM
241-AP-104	Cd	Supernatant	5.24E+00	kg	S	1.28	g/mL	4195	kL	9.77E-01	ug/g	Jan 1 2001 12:00AM
241-AP-104	Ce	Supernatant	2.46E-01	kg	S	1.28	g/mL	4195	kL	4.57E-02	ug/g	Jan 1 2001 12:00AM
241-AP-104	Cl	Supernatant	2.44E+04	kg	S	1.28	g/mL	4195	kL	4.54E+03	ug/g	Jan 1 2001 12:00AM
241-AP-104	CN	Supernatant	1.09E+02	kg	S	1.28	g/mL	4195	kL	2.04E+01	ug/g	Jan 1 2001 12:00AM
241-AP-104	Co	Supernatant	2.89E+00	kg	S	1.28	g/mL	4195	kL	5.38E-01	ug/g	Jan 1 2001 12:00AM
241-AP-104	Cr	Supernatant	1.98E+03	kg	S	1.28	g/mL	4195	kL	3.68E+02	ug/g	Jan 1 2001 12:00AM
241-AP-104	Cu	Supernatant	1.06E+01	kg	S	1.28	g/mL	4195	kL	1.97E+00	ug/g	Jan 1 2001 12:00AM
241-AP-104	F	Supernatant	5.13E+02	kg	S	1.28	g/mL	4195	kL	9.55E+01	ug/g	Jan 1 2001 12:00AM
241-AP-104	Fe	Supernatant	5.24E+01	kg	S	1.28	g/mL	4195	kL	9.77E+00	ug/g	Jan 1 2001 12:00AM
241-AP-104	Hg	Supernatant	0.00E+00	kg	E	1	g/mL	4195	kL	0.00E+00	ug/g	Jan 1 2001 12:00AM
241-AP-104	K	Supernatant	8.39E+03	kg	S	1.28	g/mL	4195	kL	1.56E+03	ug/g	Jan 1 2001 12:00AM
241-AP-104	La	Supernatant	4.17E-01	kg	S	1.28	g/mL	4195	kL	7.76E-02	ug/g	Jan 1 2001 12:00AM
241-AP-104	Li	Supernatant	8.39E-02	kg	S	1.28	g/mL	4195	kL	1.56E-02	ug/g	Jan 1 2001 12:00AM
241-AP-104	Mg	Supernatant	1.05E+02	kg	S	1.28	g/mL	4195	kL	1.95E+01	ug/g	Jan 1 2001 12:00AM
241-AP-104	Mn	Supernatant	1.05E+01	kg	S	1.28	g/mL	4195	kL	1.95E+00	ug/g	Jan 1 2001 12:00AM
241-AP-104	Mo	Supernatant	2.36E+02	kg	S	1.28	g/mL	4195	kL	4.40E+01	ug/g	Jan 1 2001 12:00AM
241-AP-104	Na	Supernatant	5.52E+05	kg	S	1.28	g/mL	4195	kL	1.03E+05	ug/g	Jan 1 2001 12:00AM
241-AP-104	Nd	Supernatant	1.05E+02	kg	S	1.28	g/mL	4195	kL	1.95E+01	ug/g	Jan 1 2001 12:00AM
241-AP-104	Ni	Supernatant	1.69E+02	kg	S	1.28	g/mL	4195	kL	3.14E+01	ug/g	Jan 1 2001 12:00AM
241-AP-104	NO2	Supernatant	3.03E+05	kg	S	1.28	g/mL	4195	kL	5.64E+04	ug/g	Jan 1 2001 12:00AM
241-AP-104	NO3	Supernatant	4.77E+05	kg	S	1.28	g/mL	4195	kL	8.89E+04	ug/g	Jan 1 2001 12:00AM
241-AP-104	OH	Supernatant	8.64E+04	kg	S	1.28	g/mL	4195	kL	1.61E+04	ug/g	Jan 1 2001 12:00AM
241-AP-104	Pb	Supernatant	1.05E+02	kg	S	1.28	g/mL	4195	kL	1.95E+01	ug/g	Jan 1 2001 12:00AM
241-AP-104	PO4	Supernatant	1.92E+04	kg	S	1.28	g/mL	4195	kL	3.58E+03	ug/g	Jan 1 2001 12:00AM
241-AP-104	Pr	Supernatant	7.13E-01	kg	S	1.28	g/mL	4195	kL	1.33E-01	ug/g	Jan 1 2001 12:00AM
241-AP-104	Rb	Supernatant	1.18E+01	kg	S	1.28	g/mL	4195	kL	2.20E+00	ug/g	Jan 1 2001 12:00AM
241-AP-104	Rh	Supernatant	2.28E+01	kg	S	1.28	g/mL	4195	kL	4.26E+00	ug/g	Jan 1 2001 12:00AM
241-AP-104	Ru	Supernatant	9.00E+01	kg	S	1.28	g/mL	4195	kL	1.68E+01	ug/g	Jan 1 2001 12:00AM
241-AP-104	Sb	Supernatant	1.12E-01	kg	S	1.28	g/mL	4195	kL	2.08E-02	ug/g	Jan 1 2001 12:00AM
241-AP-104	Se	Supernatant	2.85E+01	kg	S	1.28	g/mL	4195	kL	5.31E+00	ug/g	Jan 1 2001 12:00AM
241-AP-104	Si	Supernatant	1.94E+02	kg	S	1.28	g/mL	4195	kL	3.61E+01	ug/g	Jan 1 2001 12:00AM
241-AP-104	SO4	Supernatant	1.40E+04	kg	S	1.28	g/mL	4195	kL	2.60E+03	ug/g	Jan 1 2001 12:00AM
241-AP-104	Sr	Supernatant	1.05E+01	kg	S	1.28	g/mL	4195	kL	1.95E+00	ug/g	Jan 1 2001 12:00AM
241-AP-104	Ta	Supernatant	1.44E-01	kg	S	1.28	g/mL	4195	kL	2.68E-02	ug/g	Jan 1 2001 12:00AM

CALCULATION SHEET

PROJECT: RPP-WTP
JOB NO.: 24590
CALC NO.: 24590-WTP-M4C-FRP-00001
SHEET REV: 0A
SHEET NO.: 78

BY: E. Berrios
DATE: 12/04/02

SUBJECT: Updated Emissions Run Feed Vector

Tank Name	Analyte	Waste Phase	Inventory	Inventory Units	Basis	Density	Density Units	Volume	Volume Units	Concentration	Concentration Units	Decay Date
241-AP-104	Te	Supernatant	7.13E-01	kg	S	1.28	g/mL	4195	kL	1.33E-01	ug/g	Jan 1 2001 12:00AM
241-AP-104	Th	Supernatant	1.06E+00	kg	S	1.28	g/mL	4195	kL	1.98E-01	ug/g	Jan 1 2001 12:00AM
241-AP-104	Ti	Supernatant	1.05E+01	kg	S	1.28	g/mL	4195	kL	1.95E+00	ug/g	Jan 1 2001 12:00AM
241-AP-104	TIC as CO3	Supernatant	7.10E+04	kg	S	1.28	g/mL	4195	kL	1.32E+04	ug/g	Jan 1 2001 12:00AM
241-AP-104	Tl	Supernatant	2.10E-01	kg	S	1.28	g/mL	4195	kL	3.91E-02	ug/g	Jan 1 2001 12:00AM
241-AP-104	UTOTAL	Supernatant	4.36E+01	kg	S	1.28	g/mL	4195	kL	8.13E+00	ug/g	Jan 1 2001 12:00AM
241-AP-104	V	Supernatant	5.24E+01	kg	S	1.28	g/mL	4195	kL	9.77E+00	ug/g	Jan 1 2001 12:00AM
241-AP-104	W	Supernatant	3.75E+02	kg	S	1.28	g/mL	4195	kL	6.98E+01	ug/g	Jan 1 2001 12:00AM
241-AP-104	Y	Supernatant	1.05E+01	kg	S	1.28	g/mL	4195	kL	1.95E+00	ug/g	Jan 1 2001 12:00AM
241-AP-104	Zn	Supernatant	1.05E+01	kg	S	1.28	g/mL	4195	kL	1.95E+00	ug/g	Jan 1 2001 12:00AM
241-AP-104	Zr	Supernatant	1.05E+01	kg	S	1.28	g/mL	4195	kL	1.95E+00	ug/g	Jan 1 2001 12:00AM
241-AW-101	106Ru	Salt Cake	1.02E-04	Ci	TS	1.58	g/mL	1403	kL	4.97E-08	uCi/g	Jan 1 2001 12:00AM
241-AW-101	106Ru	Supernatant	1.15E-04	Ci	TE	1.6	g/mL	2768	kL	3.21E-08	uCi/g	Jan 1 2001 12:00AM
241-AW-101	113mCd	Salt Cake	9.27E+01	Ci	TS	1.58	g/mL	1403	kL	4.52E-02	uCi/g	Jan 1 2001 12:00AM
241-AW-101	113mCd	Supernatant	1.05E+02	Ci	TE	1.6	g/mL	2768	kL	2.92E-02	uCi/g	Jan 1 2001 12:00AM
241-AW-101	125Sb	Salt Cake	5.09E+01	Ci	TS	1.58	g/mL	1403	kL	2.48E-02	uCi/g	Jan 1 2001 12:00AM
241-AW-101	125Sb	Supernatant	5.75E+01	Ci	TE	1.6	g/mL	2768	kL	1.60E-02	uCi/g	Jan 1 2001 12:00AM
241-AW-101	126Sn	Salt Cake	2.87E+00	Ci	TS	1.58	g/mL	1403	kL	1.40E-03	uCi/g	Jan 1 2001 12:00AM
241-AW-101	126Sn	Supernatant	3.23E+00	Ci	TE	1.6	g/mL	2768	kL	9.02E-04	uCi/g	Jan 1 2001 12:00AM
241-AW-101	129I	Salt Cake	2.30E-01	Ci	TS	1.58	g/mL	1403	kL	1.12E-04	uCi/g	Jan 1 2001 12:00AM
241-AW-101	129I	Supernatant	9.02E-01	Ci	S	1.47	g/mL	2768	kL	2.22E-04	uCi/g	Jan 1 2001 12:00AM
241-AW-101	134Cs	Salt Cake	2.22E-01	Ci	TS	1.58	g/mL	1403	kL	1.08E-04	uCi/g	Jan 1 2001 12:00AM
241-AW-101	134Cs	Supernatant	1.35E+02	Ci	S	1.48	g/mL	2768	kL	3.31E-02	uCi/g	Jan 1 2001 12:00AM
241-AW-101	137Cs	Salt Cake	5.09E+05	Ci	S	1.59	g/mL	1403	kL	2.28E+02	uCi/g	Jan 1 2001 12:00AM
241-AW-101	137Cs	Supernatant	1.21E+06	Ci	S	1.47	g/mL	2768	kL	2.98E+02	uCi/g	Jan 1 2001 12:00AM
241-AW-101	137mBa	Salt Cake	4.81E+05	Ci	C		g/mL	1403	kL		uCi/g	Jan 1 2001 12:00AM
241-AW-101	137mBa	Supernatant	1.15E+06	Ci	C		g/mL	2768	kL		uCi/g	Jan 1 2001 12:00AM
241-AW-101	14C	Salt Cake	3.86E+01	Ci	TS	1.58	g/mL	1403	kL	1.88E-02	uCi/g	Jan 1 2001 12:00AM
241-AW-101	14C	Supernatant	8.36E-01	Ci	S	1.47	g/mL	2768	kL	2.05E-04	uCi/g	Jan 1 2001 12:00AM
241-AW-101	151Sm	Salt Cake	1.58E+04	Ci	TS	1.58	g/mL	1403	kL	7.69E+00	uCi/g	Jan 1 2001 12:00AM
241-AW-101	151Sm	Supernatant	1.78E+04	Ci	TE	1.6	g/mL	2768	kL	4.97E+00	uCi/g	Jan 1 2001 12:00AM
241-AW-101	152Eu	Salt Cake	4.77E+00	Ci	TS	1.58	g/mL	1403	kL	2.32E-03	uCi/g	Jan 1 2001 12:00AM
241-AW-101	152Eu	Supernatant	5.38E+00	Ci	TE	1.6	g/mL	2768	kL	1.50E-03	uCi/g	Jan 1 2001 12:00AM
241-AW-101	154Eu	Salt Cake	1.65E+02	Ci	S	1.59	g/mL	1403	kL	7.40E-02	uCi/g	Jan 1 2001 12:00AM
241-AW-101	154Eu	Supernatant	8.31E+01	Ci	S	1.47	g/mL	2768	kL	2.04E-02	uCi/g	Jan 1 2001 12:00AM
241-AW-101	155Eu	Salt Cake	6.09E+02	Ci	S	1.59	g/mL	1403	kL	2.73E-01	uCi/g	Jan 1 2001 12:00AM
241-AW-101	155Eu	Supernatant	1.68E+02	Ci	TE	1.6	g/mL	2768	kL	4.70E-02	uCi/g	Jan 1 2001 12:00AM
241-AW-101	226Ra	Salt Cake	1.91E-04	Ci	TS	1.58	g/mL	1403	kL	9.28E-08	uCi/g	Jan 1 2001 12:00AM
241-AW-101	226Ra	Supernatant	2.15E-04	Ci	TE	1.6	g/mL	2768	kL	5.99E-08	uCi/g	Jan 1 2001 12:00AM
241-AW-101	227Ac	Salt Cake	1.94E-03	Ci	TS	1.58	g/mL	1403	kL	9.46E-07	uCi/g	Jan 1 2001 12:00AM
241-AW-101	227Ac	Supernatant	2.19E-03	Ci	TE	1.6	g/mL	2768	kL	6.12E-07	uCi/g	Jan 1 2001 12:00AM
241-AW-101	228Ra	Salt Cake	2.29E-01	Ci	TS	1.58	g/mL	1403	kL	1.12E-04	uCi/g	Jan 1 2001 12:00AM
241-AW-101	228Ra	Supernatant	2.29E-01	Ci	TE	1.6	g/mL	2768	kL	6.39E-05	uCi/g	Jan 1 2001 12:00AM
241-AW-101	229Th	Salt Cake	9.72E-03	Ci	TS	1.58	g/mL	1403	kL	4.74E-06	uCi/g	Jan 1 2001 12:00AM
241-AW-101	229Th	Supernatant	1.10E-02	Ci	TE	1.6	g/mL	2768	kL	3.06E-06	uCi/g	Jan 1 2001 12:00AM
241-AW-101	231Pa	Salt Cake	5.23E-03	Ci	TS	1.58	g/mL	1403	kL	2.55E-06	uCi/g	Jan 1 2001 12:00AM
241-AW-101	231Pa	Supernatant	5.91E-03	Ci	TE	1.6	g/mL	2768	kL	1.65E-06	uCi/g	Jan 1 2001 12:00AM

CALCULATION SHEET

PROJECT: RPP-WTP
JOB NO.: 24590
CALC NO.: 24590-WTP-M4C-FRP-00001
SHEET REV: 0A
SHEET NO.: 79

BY: E. Berrios
DATE: 12/04/02

SUBJECT: Updated Emissions Run Feed Vector

Tank Name	Analyte	Waste Phase	Inventory	Inventory Units	Basis	Density	Density Units	Volume	Volume Units	Concentration	Concentration Units	Decay Date
241-AW-101	232Th	Supernatant	2.52E-04	Ci	S	1.47	g/mL	2768	kL	6.18E-08	uCi/g	Jan 1 2001 12:00AM
241-AW-101	232Th	Salt Cake	5.11E-02	Ci	TS	1.58	g/mL	1403	kL	2.49E-05	uCi/g	Jan 1 2001 12:00AM
241-AW-101	232U	Salt Cake	5.06E-01	Ci	C	1.59	g/mL	1403	kL	2.27E-04	uCi/g	Jan 1 2001 12:00AM
241-AW-101	232U	Supernatant	1.84E-03	Ci	C	1.48	g/mL	2768	kL	4.49E-07	uCi/g	Jan 1 2001 12:00AM
241-AW-101	233U	Salt Cake	2.07E+00	Ci	C	1.59	g/mL	1403	kL	9.29E-04	uCi/g	Jan 1 2001 12:00AM
241-AW-101	233U	Supernatant	7.54E-03	Ci	C	1.48	g/mL	2768	kL	1.84E-06	uCi/g	Jan 1 2001 12:00AM
241-AW-101	234U	Salt Cake	1.21E+00	Ci	C	1.59	g/mL	1403	kL	5.42E-04	uCi/g	Jan 1 2001 12:00AM
241-AW-101	234U	Supernatant	4.40E-03	Ci	C	1.48	g/mL	2768	kL	1.07E-06	uCi/g	Jan 1 2001 12:00AM
241-AW-101	235U	Salt Cake	4.65E-02	Ci	C	1.59	g/mL	1403	kL	2.08E-05	uCi/g	Jan 1 2001 12:00AM
241-AW-101	235U	Supernatant	1.69E-04	Ci	C	1.48	g/mL	2768	kL	4.13E-08	uCi/g	Jan 1 2001 12:00AM
241-AW-101	236U	Salt Cake	1.40E-01	Ci	S	1.59	g/mL	1403	kL	6.29E-05	uCi/g	Jan 1 2001 12:00AM
241-AW-101	236U	Supernatant	3.04E-04	Ci	C	1.48	g/mL	2768	kL	7.42E-08	uCi/g	Jan 1 2001 12:00AM
241-AW-101	237Np	Salt Cake	4.21E-01	Ci	TS	1.58	g/mL	1403	kL	2.05E-04	uCi/g	Jan 1 2001 12:00AM
241-AW-101	237Np	Supernatant	1.02E-01	Ci	S	1.47	g/mL	2768	kL	2.52E-05	uCi/g	Jan 1 2001 12:00AM
241-AW-101	238Pu	Salt Cake	1.46E+01	Ci	S	1.59	g/mL	1403	kL	6.55E-03	uCi/g	Jan 1 2001 12:00AM
241-AW-101	238Pu	Supernatant	1.35E-01	Ci	S	1.48	g/mL	2768	kL	3.30E-05	uCi/g	Jan 1 2001 12:00AM
241-AW-101	238U	Salt Cake	8.97E-01	Ci	S	1.59	g/mL	1403	kL	4.02E-04	uCi/g	Jan 1 2001 12:00AM
241-AW-101	238U	Supernatant	3.26E-03	Ci	C	1.48	g/mL	2768	kL	7.95E-07	uCi/g	Jan 1 2001 12:00AM
241-AW-101	239Pu	Salt Cake	9.81E+01	Ci	C	1.59	g/mL	1403	kL	4.40E-02	uCi/g	Jan 1 2001 12:00AM
241-AW-101	239Pu	Supernatant	1.12E+00	Ci	C	1.48	g/mL	2768	kL	2.72E-04	uCi/g	Jan 1 2001 12:00AM
241-AW-101	240Pu	Salt Cake	2.70E+01	Ci	C	1.59	g/mL	1403	kL	1.21E-02	uCi/g	Jan 1 2001 12:00AM
241-AW-101	240Pu	Supernatant	3.07E-01	Ci	C	1.48	g/mL	2768	kL	7.49E-05	uCi/g	Jan 1 2001 12:00AM
241-AW-101	241Am	Salt Cake	1.03E+02	Ci	S	1.59	g/mL	1403	kL	4.63E-02	uCi/g	Jan 1 2001 12:00AM
241-AW-101	241Am	Supernatant	1.85E+00	Ci	S	1.47	g/mL	2768	kL	4.56E-04	uCi/g	Jan 1 2001 12:00AM
241-AW-101	241Pu	Salt Cake	7.15E+02	Ci	C	1.59	g/mL	1403	kL	3.20E-01	uCi/g	Jan 1 2001 12:00AM
241-AW-101	241Pu	Supernatant	8.12E+00	Ci	C	1.48	g/mL	2768	kL	1.98E-03	uCi/g	Jan 1 2001 12:00AM
241-AW-101	242Cm	Salt Cake	1.53E-01	Ci	C	1.59	g/mL	1403	kL	6.87E-05	uCi/g	Jan 1 2001 12:00AM
241-AW-101	242Cm	Supernatant	2.78E-03	Ci	C	1.47	g/mL	2768	kL	6.83E-07	uCi/g	Jan 1 2001 12:00AM
241-AW-101	242Pu	Supernatant	4.35E-05	Ci	C	1.48	g/mL	2768	kL	1.06E-08	uCi/g	Jan 1 2001 12:00AM
241-AW-101	242Pu	Salt Cake	3.83E-03	Ci	C	1.59	g/mL	1403	kL	1.72E-06	uCi/g	Jan 1 2001 12:00AM
241-AW-101	243Am	Salt Cake	7.08E-03	Ci	C	1.59	g/mL	1403	kL	3.17E-06	uCi/g	Jan 1 2001 12:00AM
241-AW-101	243Am	Supernatant	1.28E-04	Ci	C	1.47	g/mL	2768	kL	3.15E-08	uCi/g	Jan 1 2001 12:00AM
241-AW-101	243Cm	Salt Cake	7.58E-02	Ci	C		g/mL	1403	kL		uCi/g	Jan 1 2001 12:00AM
241-AW-101	243Cm	Supernatant	1.01E-03	Ci	C		g/mL	2768	kL		uCi/g	Jan 1 2001 12:00AM
241-AW-101	244Cm	Salt Cake	1.77E+00	Ci	C		g/mL	1403	kL		uCi/g	Jan 1 2001 12:00AM
241-AW-101	244Cm	Supernatant	2.35E-02	Ci	C		g/mL	2768	kL		uCi/g	Jan 1 2001 12:00AM
241-AW-101	3H	Salt Cake	1.74E+01	Ci	S	1.59	g/mL	1403	kL	7.80E-03	uCi/g	Jan 1 2001 12:00AM
241-AW-101	3H	Supernatant	1.00E+01	Ci	S	1.47	g/mL	2768	kL	2.46E-03	uCi/g	Jan 1 2001 12:00AM
241-AW-101	59Ni	Salt Cake	3.10E+00	Ci	TS	1.58	g/mL	1403	kL	1.51E-03	uCi/g	Jan 1 2001 12:00AM
241-AW-101	59Ni	Supernatant	1.16E+00	Ci	TE	1.6	g/mL	2768	kL	3.23E-04	uCi/g	Jan 1 2001 12:00AM
241-AW-101	60Co	Salt Cake	4.54E+01	Ci	S	1.59	g/mL	1403	kL	2.03E-02	uCi/g	Jan 1 2001 12:00AM
241-AW-101	60Co	Supernatant	2.17E+01	Ci	S	1.48	g/mL	2768	kL	5.30E-03	uCi/g	Jan 1 2001 12:00AM
241-AW-101	63Ni	Salt Cake	2.94E+02	Ci	TS	1.58	g/mL	1403	kL	1.43E-01	uCi/g	Jan 1 2001 12:00AM
241-AW-101	63Ni	Supernatant	1.09E+02	Ci	TE	1.6	g/mL	2768	kL	3.05E-02	uCi/g	Jan 1 2001 12:00AM
241-AW-101	79Se	Salt Cake	4.74E-01	Ci	TS	1.58	g/mL	1403	kL	2.31E-04	uCi/g	Jan 1 2001 12:00AM
241-AW-101	79Se	Supernatant	1.95E+00	Ci	S	1.47	g/mL	2768	kL	4.79E-04	uCi/g	Jan 1 2001 12:00AM
241-AW-101	90Sr	Salt Cake	8.82E+04	Ci	S	1.59	g/mL	1403	kL	3.95E+01	uCi/g	Jan 1 2001 12:00AM

CALCULATION SHEET

PROJECT: RPP-WTP
JOB NO.: 24590
CALC NO.: 24590-WTP-M4C-FRP-00001
SHEET REV: 0A
SHEET NO.: 80

BY: E. Berrios
DATE: 12/04/02

SUBJECT: Updated Emissions Run Feed Vector

Tank Name	Analyte	Waste Phase	Inventory	Inventory Units	Basis	Density	Density Units	Volume	Volume Units	Concentration	Concentration Units	Decay Date
241-AW-101	90Sr	Supernatant	1.11E+03	Ci	S	1.47	g/mL	2768	kL	2.73E-01	uCi/g	Jan 1 2001 12:00AM
241-AW-101	90Y	Salt Cake	8.82E+04	Ci	C		g/mL	1403	kL		uCi/g	Jan 1 2001 12:00AM
241-AW-101	90Y	Supernatant	1.11E+03	Ci	C		g/mL	2768	kL		uCi/g	Jan 1 2001 12:00AM
241-AW-101	93mNb	Salt Cake	1.88E+01	Ci	TS	1.58	g/mL	1403	kL	9.15E-03	uCi/g	Jan 1 2001 12:00AM
241-AW-101	93mNb	Supernatant	2.12E+01	Ci	TE	1.6	g/mL	2768	kL	5.92E-03	uCi/g	Jan 1 2001 12:00AM
241-AW-101	93Zr	Salt Cake	2.34E+01	Ci	TS	1.58	g/mL	1403	kL	1.14E-02	uCi/g	Jan 1 2001 12:00AM
241-AW-101	93Zr	Supernatant	2.64E+01	Ci	TE	1.6	g/mL	2768	kL	7.37E-03	uCi/g	Jan 1 2001 12:00AM
241-AW-101	99Tc	Salt Cake	3.50E+02	Ci	S	1.58	g/mL	1403	kL	1.58E-01	uCi/g	Jan 1 2001 12:00AM
241-AW-101	99Tc	Supernatant	4.87E+02	Ci	S	1.47	g/mL	2768	kL	1.20E-01	uCi/g	Jan 1 2001 12:00AM
241-AW-101	Ag	Supernatant	5.54E+00	kg	S	1.48	g/mL	2768	kL	1.35E+00	ug/g	Jan 1 2001 12:00AM
241-AW-101	Ag	Salt Cake	5.68E+01	kg	S	1.59	g/mL	1403	kL	2.55E+01	ug/g	Jan 1 2001 12:00AM
241-AW-101	Al	Supernatant	9.11E+04	kg	S	1.47	g/mL	2768	kL	2.24E+04	ug/g	Jan 1 2001 12:00AM
241-AW-101	Al	Salt Cake	3.34E+04	kg	S	1.59	g/mL	1403	kL	1.50E+04	ug/g	Jan 1 2001 12:00AM
241-AW-101	As	Salt Cake	8.31E+01	kg	S	1.58	g/mL	1403	kL	3.75E+01	ug/g	Jan 1 2001 12:00AM
241-AW-101	As	Supernatant	2.59E+02	kg	S	1.47	g/mL	2768	kL	6.37E+01	ug/g	Jan 1 2001 12:00AM
241-AW-101	B	Salt Cake	2.44E+02	kg	S	1.59	g/mL	1403	kL	1.09E+02	ug/g	Jan 1 2001 12:00AM
241-AW-101	B	Supernatant	2.46E+02	kg	S	1.47	g/mL	2768	kL	6.05E+01	ug/g	Jan 1 2001 12:00AM
241-AW-101	Ba	Salt Cake	1.10E+01	kg	S	1.59	g/mL	1403	kL	4.95E+00	ug/g	Jan 1 2001 12:00AM
241-AW-101	Ba	Supernatant	2.77E+00	kg	S	1.48	g/mL	2768	kL	6.76E-01	ug/g	Jan 1 2001 12:00AM
241-AW-101	Be	Supernatant	7.47E+00	kg	S	1.48	g/mL	2768	kL	1.82E+00	ug/g	Jan 1 2001 12:00AM
241-AW-101	Be	Supernatant	7.47E+00	kg	S	1.48	g/mL	2768	kL	1.82E+00	ug/g	Jan 1 2001 12:00AM
241-AW-101	Bi	Salt Cake	2.57E+01	kg	S	1.59	g/mL	1403	kL	1.15E+01	ug/g	Jan 1 2001 12:00AM
241-AW-101	Bi	Supernatant	2.21E+01	kg	S	1.48	g/mL	2768	kL	5.41E+00	ug/g	Jan 1 2001 12:00AM
241-AW-101	Ca	Salt Cake	7.30E+02	kg	S	1.59	g/mL	1403	kL	3.27E+02	ug/g	Jan 1 2001 12:00AM
241-AW-101	Ca	Supernatant	5.67E+01	kg	S	1.48	g/mL	2768	kL	1.39E+01	ug/g	Jan 1 2001 12:00AM
241-AW-101	Cd	Salt Cake	1.67E+01	kg	S	1.59	g/mL	1403	kL	7.47E+00	ug/g	Jan 1 2001 12:00AM
241-AW-101	Cd	Supernatant	5.81E+00	kg	S	1.48	g/mL	2768	kL	1.42E+00	ug/g	Jan 1 2001 12:00AM
241-AW-101	Ce	Salt Cake	5.13E+01	kg	S	1.59	g/mL	1403	kL	2.30E+01	ug/g	Jan 1 2001 12:00AM
241-AW-101	Ce	Supernatant	1.11E+01	kg	S	1.48	g/mL	2768	kL	2.70E+00	ug/g	Jan 1 2001 12:00AM
241-AW-101	Cl	Salt Cake	7.81E+03	kg	S	1.59	g/mL	1403	kL	3.50E+03	ug/g	Jan 1 2001 12:00AM
241-AW-101	Cl	Supernatant	2.02E+04	kg	S	1.47	g/mL	2768	kL	4.97E+03	ug/g	Jan 1 2001 12:00AM
241-AW-101	Co	Supernatant	1.11E+01	kg	S	1.48	g/mL	2768	kL	2.70E+00	ug/g	Jan 1 2001 12:00AM
241-AW-101	Co	Salt Cake	1.23E+01	kg	S	1.59	g/mL	1403	kL	5.50E+00	ug/g	Jan 1 2001 12:00AM
241-AW-101	Cr	Salt Cake	8.76E+02	kg	S	1.59	g/mL	1403	kL	3.93E+02	ug/g	Jan 1 2001 12:00AM
241-AW-101	Cr	Supernatant	3.43E+02	kg	S	1.47	g/mL	2768	kL	8.44E+01	ug/g	Jan 1 2001 12:00AM
241-AW-101	Cu	Salt Cake	2.44E+01	kg	S	1.59	g/mL	1403	kL	1.09E+01	ug/g	Jan 1 2001 12:00AM
241-AW-101	Cu	Supernatant	7.47E+00	kg	S	1.48	g/mL	2768	kL	1.82E+00	ug/g	Jan 1 2001 12:00AM
241-AW-101	F	Supernatant	2.66E+03	kg	S	1.47	g/mL	2768	kL	6.54E+02	ug/g	Jan 1 2001 12:00AM
241-AW-101	F	Salt Cake	7.47E+03	kg	S	1.59	g/mL	1403	kL	3.35E+03	ug/g	Jan 1 2001 12:00AM
241-AW-101	Fe	Salt Cake	8.04E+02	kg	S	1.59	g/mL	1403	kL	3.61E+02	ug/g	Jan 1 2001 12:00AM
241-AW-101	Fe	Supernatant	2.08E+01	kg	S	1.48	g/mL	2768	kL	5.07E+00	ug/g	Jan 1 2001 12:00AM
241-AW-101	Hg	Salt Cake	0.00E+00	kg	TS	1.58	g/mL	1403	kL	0.00E+00	ug/g	Jan 1 2001 12:00AM
241-AW-101	Hg	Supernatant	0.00E+00	kg	TE	1.6	g/mL	2768	kL	0.00E+00	ug/g	Jan 1 2001 12:00AM
241-AW-101	K	Salt Cake	6.97E+04	kg	S	1.59	g/mL	1403	kL	3.12E+04	ug/g	Jan 1 2001 12:00AM
241-AW-101	K	Supernatant	9.83E+04	kg	S	1.47	g/mL	2768	kL	2.41E+04	ug/g	Jan 1 2001 12:00AM
241-AW-101	La	Salt Cake	1.23E+01	kg	S	1.59	g/mL	1403	kL	5.50E+00	ug/g	Jan 1 2001 12:00AM
241-AW-101	La	Supernatant	3.94E+00	kg	TE	1.6	g/mL	2768	kL	1.10E+00	ug/g	Jan 1 2001 12:00AM

CALCULATION SHEET

PROJECT: RPP-WTP
JOB NO.: 24590
CALC NO.: 24590-WTP-M4C-FRP-00001
SHEET REV: 0A
SHEET NO.: 81

BY: E. Berrios
DATE: 12/04/02

SUBJECT: Updated Emissions Run Feed Vector

Tank Name	Analyte	Waste Phase	Inventory	Inventory Units	Basis	Density	Density Units	Volume	Volume Units	Concentration	Concentration Units	Decay Date
241-AW-101	Li	Supernatant	6.92E+00	kg	S	1.48	g/mL	2768	kL	1.69E+00	ug/g	Jan 1 2001 12:00AM
241-AW-101	Li	Salt Cake	7.81E+00	kg	S	1.59	g/mL	1403	kL	3.50E+00	ug/g	Jan 1 2001 12:00AM
241-AW-101	Mg	Supernatant	2.21E+01	kg	S	1.48	g/mL	2768	kL	5.41E+00	ug/g	Jan 1 2001 12:00AM
241-AW-101	Mg	Salt Cake	1.57E+02	kg	S	1.59	g/mL	1403	kL	7.06E+01	ug/g	Jan 1 2001 12:00AM
241-AW-101	Mn	Salt Cake	6.25E+02	kg	S	1.59	g/mL	1403	kL	2.80E+02	ug/g	Jan 1 2001 12:00AM
241-AW-101	Mn	Supernatant	1.11E+01	kg	S	1.48	g/mL	2768	kL	2.70E+00	ug/g	Jan 1 2001 12:00AM
241-AW-101	Mo	Supernatant	1.88E+02	kg	S	1.47	g/mL	2768	kL	4.63E+01	ug/g	Jan 1 2001 12:00AM
241-AW-101	Mo	Salt Cake	7.63E+01	kg	S	1.59	g/mL	1403	kL	3.42E+01	ug/g	Jan 1 2001 12:00AM
241-AW-101	Na	Salt Cake	3.77E+05	kg	S	1.59	g/mL	1403	kL	1.69E+05	ug/g	Jan 1 2001 12:00AM
241-AW-101	Na	Supernatant	7.11E+05	kg	S	1.47	g/mL	2768	kL	1.75E+05	ug/g	Jan 1 2001 12:00AM
241-AW-101	Nd	Salt Cake	2.57E+01	kg	S	1.59	g/mL	1403	kL	1.15E+01	ug/g	Jan 1 2001 12:00AM
241-AW-101	Nd	Supernatant	2.21E+01	kg	S	1.48	g/mL	2768	kL	5.41E+00	ug/g	Jan 1 2001 12:00AM
241-AW-101	NH3	Supernatant	2.77E+01	kg	S	1.47	g/mL	2768	kL	6.80E+00	ug/g	Jan 1 2001 12:00AM
241-AW-101	Ni	Salt Cake	9.18E+01	kg	S	1.59	g/mL	1403	kL	4.11E+01	ug/g	Jan 1 2001 12:00AM
241-AW-101	Ni	Supernatant	1.69E+01	kg	S	1.48	g/mL	2768	kL	4.12E+00	ug/g	Jan 1 2001 12:00AM
241-AW-101	NO2	Salt Cake	1.30E+05	kg	S	1.59	g/mL	1403	kL	5.84E+04	ug/g	Jan 1 2001 12:00AM
241-AW-101	NO2	Supernatant	3.32E+05	kg	S	1.47	g/mL	2768	kL	8.16E+04	ug/g	Jan 1 2001 12:00AM
241-AW-101	NO3	Salt Cake	3.46E+05	kg	S	1.59	g/mL	1403	kL	1.55E+05	ug/g	Jan 1 2001 12:00AM
241-AW-101	NO3	Supernatant	4.71E+05	kg	S	1.47	g/mL	2768	kL	1.16E+05	ug/g	Jan 1 2001 12:00AM
241-AW-101	OH	Salt Cake	1.17E+05	kg	S	1.59	g/mL	1403	kL	5.26E+04	ug/g	Jan 1 2001 12:00AM
241-AW-101	OH	Supernatant	2.65E+05	kg	S	1.47	g/mL	2768	kL	6.52E+04	ug/g	Jan 1 2001 12:00AM
241-AW-101	Oxalate	Salt Cake	2.59E+04	kg	S	1.58	g/mL	1403	kL	1.17E+04	ug/g	Jan 1 2001 12:00AM
241-AW-101	Pb	Salt Cake	5.34E+02	kg	S	1.59	g/mL	1403	kL	2.39E+02	ug/g	Jan 1 2001 12:00AM
241-AW-101	Pb	Supernatant	2.03E+02	kg	S	1.48	g/mL	2768	kL	4.97E+01	ug/g	Jan 1 2001 12:00AM
241-AW-101	PO4	Salt Cake	9.26E+03	kg	S	1.59	g/mL	1403	kL	4.15E+03	ug/g	Jan 1 2001 12:00AM
241-AW-101	PO4	Supernatant	1.82E+03	kg	S	1.48	g/mL	2768	kL	4.45E+02	ug/g	Jan 1 2001 12:00AM
241-AW-101	Sb	Supernatant	1.15E+02	kg	S	1.48	g/mL	2768	kL	2.80E+01	ug/g	Jan 1 2001 12:00AM
241-AW-101	Sb	Salt Cake	4.99E+01	kg	S	1.58	g/mL	1403	kL	2.25E+01	ug/g	Jan 1 2001 12:00AM
241-AW-101	Se	Supernatant	5.67E+01	kg	S	1.48	g/mL	2768	kL	1.39E+01	ug/g	Jan 1 2001 12:00AM
241-AW-101	Se	Salt Cake	6.36E+01	kg	S	1.59	g/mL	1403	kL	2.85E+01	ug/g	Jan 1 2001 12:00AM
241-AW-101	Si	Salt Cake	8.95E+02	kg	S	1.59	g/mL	1403	kL	4.01E+02	ug/g	Jan 1 2001 12:00AM
241-AW-101	Si	Supernatant	4.98E+02	kg	S	1.47	g/mL	2768	kL	1.22E+02	ug/g	Jan 1 2001 12:00AM
241-AW-101	SO4	Salt Cake	9.17E+03	kg	S	1.59	g/mL	1403	kL	4.11E+03	ug/g	Jan 1 2001 12:00AM
241-AW-101	SO4	Supernatant	3.54E+03	kg	S	1.47	g/mL	2768	kL	8.69E+02	ug/g	Jan 1 2001 12:00AM
241-AW-101	Sr	Salt Cake	7.92E+00	kg	S	1.59	g/mL	1403	kL	3.55E+00	ug/g	Jan 1 2001 12:00AM
241-AW-101	Sr	Supernatant	2.77E+00	kg	S	1.48	g/mL	2768	kL	6.76E-01	ug/g	Jan 1 2001 12:00AM
241-AW-101	Ti	Salt Cake	8.67E+00	kg	S	1.58	g/mL	1403	kL	3.91E+00	ug/g	Jan 1 2001 12:00AM
241-AW-101	Ti	Supernatant	2.59E+01	kg	S	1.47	g/mL	2768	kL	6.37E+00	ug/g	Jan 1 2001 12:00AM
241-AW-101	TIC as CO3	Salt Cake	9.35E+04	kg	S	1.59	g/mL	1403	kL	4.19E+04	ug/g	Jan 1 2001 12:00AM
241-AW-101	TIC as CO3	Supernatant	2.55E+04	kg	S	1.47	g/mL	2768	kL	6.26E+03	ug/g	Jan 1 2001 12:00AM
241-AW-101	Tl	Supernatant	1.15E+02	kg	S	1.48	g/mL	2768	kL	2.80E+01	ug/g	Jan 1 2001 12:00AM
241-AW-101	Tl	Salt Cake	1.27E+02	kg	S	1.59	g/mL	1403	kL	5.70E+01	ug/g	Jan 1 2001 12:00AM
241-AW-101	UTOTAL	Salt Cake	2.69E+03	kg	S	1.59	g/mL	1403	kL	1.20E+03	ug/g	Jan 1 2001 12:00AM
241-AW-101	UTOTAL	Supernatant	9.77E+00	kg	S	1.48	g/mL	2768	kL	2.39E+00	ug/g	Jan 1 2001 12:00AM
241-AW-101	V	Salt Cake	1.23E+01	kg	S	1.59	g/mL	1403	kL	5.50E+00	ug/g	Jan 1 2001 12:00AM
241-AW-101	V	Supernatant	1.11E+01	kg	S	1.48	g/mL	2768	kL	2.70E+00	ug/g	Jan 1 2001 12:00AM
241-AW-101	Zn	Supernatant	6.03E+01	kg	S	1.47	g/mL	2768	kL	1.48E+01	ug/g	Jan 1 2001 12:00AM

CALCULATION SHEET

PROJECT: RPP-WTP
JOB NO.: 24590
CALC NO.: 24590-WTP-M4C-FRP-00001
SHEET REV: 0A
SHEET NO.: 82

BY: E. Berrios
DATE: 12/04/02

SUBJECT: Updated Emissions Run Feed Vector

Tank Name	Analyte	Waste Phase	Inventory	Inventory Units	Basis	Density	Density Units	Volume	Volume Units	Concentration	Concentration Units	Decay Date
241-AW-101	Zn	Salt Cake	7.24E+01	kg	S	1.59	g/mL	1403	kL	3.25E+01	ug/g	Jan 1 2001 12:00AM
241-AW-101	Zr	Salt Cake	1.68E+02	kg	S	1.59	g/mL	1403	kL	7.54E+01	ug/g	Jan 1 2001 12:00AM
241-AW-101	Zr	Supernatant	3.96E+01	kg	S	1.47	g/mL	2768	kL	9.73E+00	ug/g	Jan 1 2001 12:00AM
241-AZ-101	106Ru	Supernatant	3.05E-04	Ci	TE	1.11	g/mL	3539	kL	3.66E-08	uCi/g	Jan 1 2001 12:00AM
241-AZ-101	113mCd	Supernatant	3.24E+02	Ci	TE	1.11	g/mL	3539	kL	3.88E-02	uCi/g	Jan 1 2001 12:00AM
241-AZ-101	125Sb	Supernatant	4.02E+03	Ci	S	1.24	g/mL	3539	kL	1.07E+00	uCi/g	Jan 1 2001 12:00AM
241-AZ-101	126Sn	Supernatant	7.89E+00	Ci	S	1.24	g/mL	3539	kL	2.11E-03	uCi/g	Jan 1 2001 12:00AM
241-AZ-101	129I	Supernatant	2.69E-01	Ci	S	1.24	g/mL	3539	kL	7.18E-05	uCi/g	Jan 1 2001 12:00AM
241-AZ-101	134Cs	Supernatant	1.45E+04	Ci	TE	1.11	g/mL	3539	kL	1.73E+00	uCi/g	Jan 1 2001 12:00AM
241-AZ-101	137Cs	Supernatant	5.65E+06	Ci	S	1.24	g/mL	3539	kL	1.51E+03	uCi/g	Jan 1 2001 12:00AM
241-AZ-101	137mBa	Supernatant	5.35E+06	Ci	C		g/mL	3539	kL		uCi/g	Jan 1 2001 12:00AM
241-AZ-101	14C	Supernatant	6.19E+00	Ci	S	1.24	g/mL	3539	kL	1.65E-03	uCi/g	Jan 1 2001 12:00AM
241-AZ-101	151Sm	Supernatant	4.99E+04	Ci	TE	1.11	g/mL	3539	kL	5.98E+00	uCi/g	Jan 1 2001 12:00AM
241-AZ-101	152Eu	Supernatant	2.63E+02	Ci	TE	1.11	g/mL	3539	kL	3.15E-02	uCi/g	Jan 1 2001 12:00AM
241-AZ-101	154Eu	Supernatant	1.98E+02	Ci	S	1.24	g/mL	3539	kL	5.28E-02	uCi/g	Jan 1 2001 12:00AM
241-AZ-101	155Eu	Supernatant	2.57E+02	Ci	E	1.24	g/mL	3539	kL	6.87E-02	uCi/g	Jan 1 2001 12:00AM
241-AZ-101	226Ra	Supernatant	4.65E-04	Ci	TE	1.11	g/mL	3539	kL	5.57E-08	uCi/g	Jan 1 2001 12:00AM
241-AZ-101	227Ac	Supernatant	5.18E-03	Ci	TE	1.11	g/mL	3539	kL	6.19E-07	uCi/g	Jan 1 2001 12:00AM
241-AZ-101	228Ra	Supernatant	9.72E-08	Ci	TE	1.11	g/mL	3539	kL	1.16E-11	uCi/g	Jan 1 2001 12:00AM
241-AZ-101	229Th	Supernatant	3.89E-06	Ci	TE	1.11	g/mL	3539	kL	4.65E-10	uCi/g	Jan 1 2001 12:00AM
241-AZ-101	231Pa	Supernatant	1.51E-02	Ci	TE	1.11	g/mL	3539	kL	1.80E-06	uCi/g	Jan 1 2001 12:00AM
241-AZ-101	232Th	Supernatant	1.57E-07	Ci	TE	1.11	g/mL	3539	kL	1.87E-11	uCi/g	Jan 1 2001 12:00AM
241-AZ-101	232U	Supernatant	6.30E-05	Ci	C	1.24	g/mL	3539	kL	1.68E-08	uCi/g	Jan 1 2001 12:00AM
241-AZ-101	233U	Supernatant	2.57E-04	Ci	C	1.24	g/mL	3539	kL	6.86E-08	uCi/g	Jan 1 2001 12:00AM
241-AZ-101	234U	Supernatant	1.79E-03	Ci	C	1.24	g/mL	3539	kL	4.77E-07	uCi/g	Jan 1 2001 12:00AM
241-AZ-101	235U	Supernatant	6.80E-05	Ci	C	1.24	g/mL	3539	kL	1.82E-08	uCi/g	Jan 1 2001 12:00AM
241-AZ-101	236U	Supernatant	1.45E-04	Ci	C	1.24	g/mL	3539	kL	3.87E-08	uCi/g	Jan 1 2001 12:00AM
241-AZ-101	237Np	Supernatant	1.29E-01	Ci	S	1.24	g/mL	3539	kL	3.44E-05	uCi/g	Jan 1 2001 12:00AM
241-AZ-101	238Pu	Supernatant	1.71E-01	Ci	C	1.24	g/mL	3539	kL	4.58E-05	uCi/g	Jan 1 2001 12:00AM
241-AZ-101	238U	Supernatant	1.24E-03	Ci	C	1.24	g/mL	3539	kL	3.30E-07	uCi/g	Jan 1 2001 12:00AM
241-AZ-101	239Pu	Supernatant	1.48E+00	Ci	C	1.24	g/mL	3539	kL	3.96E-04	uCi/g	Jan 1 2001 12:00AM
241-AZ-101	240Pu	Supernatant	4.47E-01	Ci	C	1.24	g/mL	3539	kL	1.20E-04	uCi/g	Jan 1 2001 12:00AM
241-AZ-101	241Am	Supernatant	2.13E+00	Ci	S	1.24	g/mL	3539	kL	5.69E-04	uCi/g	Jan 1 2001 12:00AM
241-AZ-101	241Pu	Supernatant	1.32E+01	Ci	C	1.24	g/mL	3539	kL	3.52E-03	uCi/g	Jan 1 2001 12:00AM
241-AZ-101	242Cm	Supernatant	1.90E-03	Ci	C	1.24	g/mL	3539	kL	5.09E-07	uCi/g	Jan 1 2001 12:00AM
241-AZ-101	242Pu	Supernatant	6.90E-05	Ci	C	1.24	g/mL	3539	kL	1.84E-08	uCi/g	Jan 1 2001 12:00AM
241-AZ-101	243Am	Supernatant	4.48E-04	Ci	C	1.24	g/mL	3539	kL	1.20E-07	uCi/g	Jan 1 2001 12:00AM
241-AZ-101	243Cm	Supernatant	2.78E-04	Ci	C	1.24	g/mL	3539	kL	7.43E-08	uCi/g	Jan 1 2001 12:00AM
241-AZ-101	244Cm	Supernatant	6.24E-03	Ci	C	1.24	g/mL	3539	kL	1.67E-06	uCi/g	Jan 1 2001 12:00AM
241-AZ-101	3H	Supernatant	5.48E+01	Ci	S	1.24	g/mL	3539	kL	1.46E-02	uCi/g	Jan 1 2001 12:00AM
241-AZ-101	59Ni	Supernatant	0.00E+00	Ci	TE	1.11	g/mL	3539	kL	0.00E+00	uCi/g	Jan 1 2001 12:00AM
241-AZ-101	60Co	Supernatant	5.92E+01	Ci	S	1.24	g/mL	3539	kL	1.58E-02	uCi/g	Jan 1 2001 12:00AM
241-AZ-101	63Ni	Supernatant	0.00E+00	Ci	TE	1.11	g/mL	3539	kL	0.00E+00	uCi/g	Jan 1 2001 12:00AM
241-AZ-101	79Se	Supernatant	4.44E+00	Ci	S	1.24	g/mL	3539	kL	1.19E-03	uCi/g	Jan 1 2001 12:00AM
241-AZ-101	90Sr	Supernatant	3.03E+03	Ci	S	1.24	g/mL	3539	kL	8.10E-01	uCi/g	Jan 1 2001 12:00AM
241-AZ-101	90Y	Supernatant	3.03E+03	Ci	C		g/mL	3539	kL		uCi/g	Jan 1 2001 12:00AM
241-AZ-101	93mNb	Supernatant	5.95E+01	Ci	TE	1.11	g/mL	3539	kL	7.12E-03	uCi/g	Jan 1 2001 12:00AM

CALCULATION SHEET

PROJECT: RPP-WTP
JOB NO.: 24590
CALC NO.: 24590-WTP-M4C-FRP-00001
SHEET REV: 0A
SHEET NO.: 83

BY: E. Berrios
DATE: 12/04/02

SUBJECT: Updated Emissions Run Feed Vector

Tank Name	Analyte	Waste Phase	Inventory	Inventory Units	Basis	Density	Density Units	Volume	Volume Units	Concentration	Concentration Units	Decay Date
241-AZ-101	93Zr	Supernatant	7.53E+01	Ci	TE	1.11	g/mL	3539	kL	9.01E-03	uCi/g	Jan 1 2001 12:00AM
241-AZ-101	99Tc	Supernatant	1.17E+03	Ci	S	1.24	g/mL	3539	kL	3.14E-01	uCi/g	Jan 1 2001 12:00AM
241-AZ-101	Ag	Supernatant	2.43E+01	kg	S	1.24	g/mL	3539	kL	6.50E+00	ug/g	Jan 1 2001 12:00AM
241-AZ-101	Al	Supernatant	2.58E+04	kg	S	1.24	g/mL	3539	kL	6.90E+03	ug/g	Jan 1 2001 12:00AM
241-AZ-101	As	Supernatant	2.52E+01	kg	S	1.24	g/mL	3539	kL	6.73E+00	ug/g	Jan 1 2001 12:00AM
241-AZ-101	B	Supernatant	6.10E+01	kg	S	1.24	g/mL	3539	kL	1.63E+01	ug/g	Jan 1 2001 12:00AM
241-AZ-101	Ba	Supernatant	2.53E-01	kg	S	1.24	g/mL	3539	kL	6.77E-02	ug/g	Jan 1 2001 12:00AM
241-AZ-101	Be	Supernatant	9.57E-01	kg	S	1.24	g/mL	3539	kL	2.56E-01	ug/g	Jan 1 2001 12:00AM
241-AZ-101	Bi	Supernatant	0.00E+00	kg	TE	1.11	g/mL	3539	kL	0.00E+00	ug/g	Jan 1 2001 12:00AM
241-AZ-101	Ca	Supernatant	1.21E+02	kg	S	1.24	g/mL	3539	kL	3.23E+01	ug/g	Jan 1 2001 12:00AM
241-AZ-101	Cd	Supernatant	6.75E+00	kg	S	1.24	g/mL	3539	kL	1.80E+00	ug/g	Jan 1 2001 12:00AM
241-AZ-101	Ce	Supernatant	1.92E-01	kg	S	1.24	g/mL	3539	kL	5.13E-02	ug/g	Jan 1 2001 12:00AM
241-AZ-101	Cl	Supernatant	4.56E+02	kg	S	1.24	g/mL	3539	kL	1.22E+02	ug/g	Jan 1 2001 12:00AM
241-AZ-101	Co	Supernatant	1.92E-01	kg	S	1.24	g/mL	3539	kL	5.13E-02	ug/g	Jan 1 2001 12:00AM
241-AZ-101	Cr	Supernatant	2.18E+03	kg	S	1.24	g/mL	3539	kL	5.83E+02	ug/g	Jan 1 2001 12:00AM
241-AZ-101	Cu	Supernatant	1.21E+01	kg	S	1.24	g/mL	3539	kL	3.23E+00	ug/g	Jan 1 2001 12:00AM
241-AZ-101	F	Supernatant	5.28E+03	kg	S	1.24	g/mL	3539	kL	1.41E+03	ug/g	Jan 1 2001 12:00AM
241-AZ-101	Fe	Supernatant	6.76E+01	kg	S	1.24	g/mL	3539	kL	1.81E+01	ug/g	Jan 1 2001 12:00AM
241-AZ-101	Hg	Supernatant	4.59E-02	kg	S	1.24	g/mL	3539	kL	1.23E-02	ug/g	Jan 1 2001 12:00AM
241-AZ-101	K	Supernatant	1.44E+04	kg	S	1.24	g/mL	3539	kL	3.84E+03	ug/g	Jan 1 2001 12:00AM
241-AZ-101	La	Supernatant	0.00E+00	kg	TE	1.11	g/mL	3539	kL	0.00E+00	ug/g	Jan 1 2001 12:00AM
241-AZ-101	Li	Supernatant	1.68E+00	kg	S	1.24	g/mL	3539	kL	4.48E-01	ug/g	Jan 1 2001 12:00AM
241-AZ-101	Mg	Supernatant	1.21E+02	kg	S	1.24	g/mL	3539	kL	3.23E+01	ug/g	Jan 1 2001 12:00AM
241-AZ-101	Mn	Supernatant	0.00E+00	kg	TE	1.11	g/mL	3539	kL	0.00E+00	ug/g	Jan 1 2001 12:00AM
241-AZ-101	Mo	Supernatant	2.91E+02	kg	S	1.24	g/mL	3539	kL	7.78E+01	ug/g	Jan 1 2001 12:00AM
241-AZ-101	Na	Supernatant	3.35E+05	kg	S	1.24	g/mL	3539	kL	8.95E+04	ug/g	Jan 1 2001 12:00AM
241-AZ-101	Nd	Supernatant	1.21E+02	kg	S	1.24	g/mL	3539	kL	3.23E+01	ug/g	Jan 1 2001 12:00AM
241-AZ-101	Ni	Supernatant	0.00E+00	kg	TE	1.11	g/mL	3539	kL	0.00E+00	ug/g	Jan 1 2001 12:00AM
241-AZ-101	NO2	Supernatant	2.19E+05	kg	S	1.24	g/mL	3539	kL	5.85E+04	ug/g	Jan 1 2001 12:00AM
241-AZ-101	NO3	Supernatant	2.15E+05	kg	S	1.24	g/mL	3539	kL	5.74E+04	ug/g	Jan 1 2001 12:00AM
241-AZ-101	OH	Supernatant	3.47E+04	kg	S	1.24	g/mL	3539	kL	9.27E+03	ug/g	Jan 1 2001 12:00AM
241-AZ-101	Oxalate	Supernatant	3.92E+03	kg	S	1.24	g/mL	3539	kL	1.05E+03	ug/g	Jan 1 2001 12:00AM
241-AZ-101	Pb	Supernatant	0.00E+00	kg	TE	1.11	g/mL	3539	kL	0.00E+00	ug/g	Jan 1 2001 12:00AM
241-AZ-101	Pd	Supernatant	6.34E+00	kg	S	1.24	g/mL	3539	kL	1.69E+00	ug/g	Jan 1 2001 12:00AM
241-AZ-101	PO4	Supernatant	4.03E+03	kg	S	1.24	g/mL	3539	kL	1.08E+03	ug/g	Jan 1 2001 12:00AM
241-AZ-101	Pr	Supernatant	1.92E-01	kg	S	1.24	g/mL	3539	kL	5.13E-02	ug/g	Jan 1 2001 12:00AM
241-AZ-101	Rb	Supernatant	1.52E+01	kg	S	1.24	g/mL	3539	kL	4.05E+00	ug/g	Jan 1 2001 12:00AM
241-AZ-101	Rh	Supernatant	6.82E+00	kg	S	1.24	g/mL	3539	kL	1.82E+00	ug/g	Jan 1 2001 12:00AM
241-AZ-101	Ru	Supernatant	1.52E+00	kg	S	1.24	g/mL	3539	kL	4.07E-01	ug/g	Jan 1 2001 12:00AM
241-AZ-101	Sb	Supernatant	1.92E-01	kg	S	1.24	g/mL	3539	kL	5.13E-02	ug/g	Jan 1 2001 12:00AM
241-AZ-101	Se	Supernatant	7.46E+01	kg	S	1.24	g/mL	3539	kL	1.99E+01	ug/g	Jan 1 2001 12:00AM
241-AZ-101	Si	Supernatant	2.22E+02	kg	S	1.24	g/mL	3539	kL	5.94E+01	ug/g	Jan 1 2001 12:00AM
241-AZ-101	SO4	Supernatant	4.54E+04	kg	S	1.24	g/mL	3539	kL	1.21E+04	ug/g	Jan 1 2001 12:00AM
241-AZ-101	Sr	Supernatant	1.21E+01	kg	S	1.24	g/mL	3539	kL	3.23E+00	ug/g	Jan 1 2001 12:00AM
241-AZ-101	Ta	Supernatant	1.92E-01	kg	S	1.24	g/mL	3539	kL	5.13E-02	ug/g	Jan 1 2001 12:00AM
241-AZ-101	Te	Supernatant	1.92E-01	kg	S	1.24	g/mL	3539	kL	5.13E-02	ug/g	Jan 1 2001 12:00AM
241-AZ-101	Th	Supernatant	1.82E-01	kg	S	1.24	g/mL	3539	kL	4.86E-02	ug/g	Jan 1 2001 12:00AM

CALCULATION SHEET

PROJECT: RPP-WTP
JOB NO.: 24590
CALC NO.: 24590-WTP-M4C-FRP-00001
SHEET REV: 0A
SHEET NO.: 84

BY: E. Berrios
DATE: 12/04/02

SUBJECT: Updated Emissions Run Feed Vector

Tank Name	Analyte	Waste Phase	Inventory	Inventory Units	Basis	Density	Density Units	Volume	Volume Units	Concentration	Concentration Units	Decay Date
241-AZ-101	Ti	Supernatant	1.21E+01	kg	S	1.24	g/mL	3539	kL	3.23E+00	ug/g	Jan 1 2001 12:00AM
241-AZ-101	TIC as CO3	Supernatant	1.03E+05	kg	S	1.24	g/mL	3539	kL	2.76E+04	ug/g	Jan 1 2001 12:00AM
241-AZ-101	Tl	Supernatant	1.92E-01	kg	S	1.24	g/mL	3539	kL	5.13E-02	ug/g	Jan 1 2001 12:00AM
241-AZ-101	UTOTAL	Supernatant	3.71E+00	kg	S	1.24	g/mL	3539	kL	9.92E-01	ug/g	Jan 1 2001 12:00AM
241-AZ-101	V	Supernatant	9.60E+00	kg	S	1.24	g/mL	3539	kL	2.56E+00	ug/g	Jan 1 2001 12:00AM
241-AZ-101	Zn	Supernatant	1.21E+01	kg	S	1.24	g/mL	3539	kL	3.23E+00	ug/g	Jan 1 2001 12:00AM
241-AZ-101	Zr	Supernatant	1.35E+01	kg	S	1.24	g/mL	3539	kL	3.60E+00	ug/g	Jan 1 2001 12:00AM
241-AZ-102	106Ru	Supernatant	6.25E-05	Ci	M	1.05	g/mL	3369	kL	1.71E-08	uCi/g	Jan 1 2001 12:00AM
241-AZ-102	113mCd	Supernatant	6.32E+01	Ci	M	1.05	g/mL	3369	kL	1.73E-02	uCi/g	Jan 1 2001 12:00AM
241-AZ-102	125Sb	Supernatant	3.17E+03	Ci	S	1.14	g/mL	3369	kL	9.03E-01	uCi/g	Jan 1 2001 12:00AM
241-AZ-102	126Sn	Supernatant	1.80E+00	Ci	M	1.05	g/mL	3369	kL	4.91E-04	uCi/g	Jan 1 2001 12:00AM
241-AZ-102	129I	Supernatant	1.16E-01	Ci	S	1.14	g/mL	3369	kL	3.29E-05	uCi/g	Jan 1 2001 12:00AM
241-AZ-102	134Cs	Supernatant	2.38E+03	Ci	S	1.14	g/mL	3369	kL	6.78E-01	uCi/g	Jan 1 2001 12:00AM
241-AZ-102	137Cs	Supernatant	3.35E+06	Ci	S	1.14	g/mL	3369	kL	9.54E+02	uCi/g	Jan 1 2001 12:00AM
241-AZ-102	137mBa	Supernatant	3.17E+06	Ci	C		g/mL	3369	kL		uCi/g	Jan 1 2001 12:00AM
241-AZ-102	14C	Supernatant	3.17E+00	Ci	S	1.14	g/mL	3369	kL	9.03E-04	uCi/g	Jan 1 2001 12:00AM
241-AZ-102	151Sm	Supernatant	9.94E+03	Ci	M	1.05	g/mL	3369	kL	2.72E+00	uCi/g	Jan 1 2001 12:00AM
241-AZ-102	152Eu	Supernatant	5.02E+01	Ci	M	1.05	g/mL	3369	kL	1.37E-02	uCi/g	Jan 1 2001 12:00AM
241-AZ-102	154Eu	Supernatant	2.01E+02	Ci	S	1.14	g/mL	3369	kL	5.71E-02	uCi/g	Jan 1 2001 12:00AM
241-AZ-102	155Eu	Supernatant	3.83E+02	Ci	S	1.14	g/mL	3369	kL	1.09E-01	uCi/g	Jan 1 2001 12:00AM
241-AZ-102	226Ra	Supernatant	9.52E-05	Ci	M	1.05	g/mL	3369	kL	2.60E-08	uCi/g	Jan 1 2001 12:00AM
241-AZ-102	227Ac	Supernatant	1.04E-03	Ci	M	1.05	g/mL	3369	kL	2.85E-07	uCi/g	Jan 1 2001 12:00AM
241-AZ-102	228Ra	Supernatant	1.32E-03	Ci	M	1.05	g/mL	3369	kL	3.61E-07	uCi/g	Jan 1 2001 12:00AM
241-AZ-102	229Th	Supernatant	6.37E-05	Ci	M	1.05	g/mL	3369	kL	1.74E-08	uCi/g	Jan 1 2001 12:00AM
241-AZ-102	231Pa	Supernatant	2.99E-03	Ci	M	1.05	g/mL	3369	kL	8.17E-07	uCi/g	Jan 1 2001 12:00AM
241-AZ-102	232Th	Supernatant	6.78E-06	Ci	S	1.14	g/mL	3369	kL	1.93E-09	uCi/g	Jan 1 2001 12:00AM
241-AZ-102	232U	Supernatant	8.01E-05	Ci	M	1.05	g/mL	3369	kL	2.19E-08	uCi/g	Jan 1 2001 12:00AM
241-AZ-102	233U	Supernatant	3.10E-04	Ci	M	1.05	g/mL	3369	kL	8.47E-08	uCi/g	Jan 1 2001 12:00AM
241-AZ-102	234U	Supernatant	2.15E-02	Ci	M	1.05	g/mL	3369	kL	5.87E-06	uCi/g	Jan 1 2001 12:00AM
241-AZ-102	235U	Supernatant	7.04E-04	Ci	S	1.14	g/mL	3369	kL	2.00E-07	uCi/g	Jan 1 2001 12:00AM
241-AZ-102	236U	Supernatant	1.65E-03	Ci	S	1.14	g/mL	3369	kL	4.70E-07	uCi/g	Jan 1 2001 12:00AM
241-AZ-102	237Np	Supernatant	3.58E-01	Ci	S	1.14	g/mL	3369	kL	1.02E-04	uCi/g	Jan 1 2001 12:00AM
241-AZ-102	238Pu	Supernatant	2.63E+00	Ci	C	1.14	g/mL	3369	kL	7.49E-04	uCi/g	Jan 1 2001 12:00AM
241-AZ-102	238U	Supernatant	1.31E-02	Ci	S	1.14	g/mL	3369	kL	3.73E-06	uCi/g	Jan 1 2001 12:00AM
241-AZ-102	239Pu	Supernatant	2.38E+01	Ci	C	1.14	g/mL	3369	kL	6.77E-03	uCi/g	Jan 1 2001 12:00AM
241-AZ-102	240Pu	Supernatant	7.04E+00	Ci	C	1.14	g/mL	3369	kL	2.00E-03	uCi/g	Jan 1 2001 12:00AM
241-AZ-102	241Am	Supernatant	1.24E+00	Ci	S	1.14	g/mL	3369	kL	3.52E-04	uCi/g	Jan 1 2001 12:00AM
241-AZ-102	241Pu	Supernatant	2.01E+02	Ci	C	1.14	g/mL	3369	kL	5.71E-02	uCi/g	Jan 1 2001 12:00AM
241-AZ-102	242Cm	Supernatant	1.06E-01	Ci	C	1.14	g/mL	3369	kL	3.02E-05	uCi/g	Jan 1 2001 12:00AM
241-AZ-102	242Pu	Supernatant	1.06E-03	Ci	C	1.14	g/mL	3369	kL	3.02E-07	uCi/g	Jan 1 2001 12:00AM
241-AZ-102	243Am	Supernatant	1.62E-04	Ci	C	1.14	g/mL	3369	kL	4.61E-08	uCi/g	Jan 1 2001 12:00AM
241-AZ-102	243Cm	Supernatant	1.55E-02	Ci	C	1.14	g/mL	3369	kL	4.42E-06	uCi/g	Jan 1 2001 12:00AM
241-AZ-102	244Cm	Supernatant	2.05E-03	Ci	C	1.14	g/mL	3369	kL	5.83E-07	uCi/g	Jan 1 2001 12:00AM
241-AZ-102	3H	Supernatant	1.16E+02	Ci	S	1.14	g/mL	3369	kL	3.29E-02	uCi/g	Jan 1 2001 12:00AM
241-AZ-102	59Ni	Supernatant	3.66E-02	Ci	M	1.05	g/mL	3369	kL	1.00E-05	uCi/g	Jan 1 2001 12:00AM
241-AZ-102	60Co	Supernatant	5.85E+01	Ci	S	1.14	g/mL	3369	kL	1.67E-02	uCi/g	Jan 1 2001 12:00AM
241-AZ-102	63Ni	Supernatant	3.44E+00	Ci	M	1.05	g/mL	3369	kL	9.40E-04	uCi/g	Jan 1 2001 12:00AM

CALCULATION SHEET

PROJECT: RPP-WTP
JOB NO.: 24590
CALC NO.: 24590-WTP-M4C-FRP-00001
SHEET REV: 0A
SHEET NO.: 85

BY: E. Berrios
DATE: 12/04/02

SUBJECT: Updated Emissions Run Feed Vector

Tank Name	Analyte	Waste Phase	Inventory	Inventory Units	Basis	Density	Density Units	Volume	Volume Units	Concentration	Concentration Units	Decay Date
241-AZ-102	79Sc	Supernatant	1.43E+00	Ci	S	1.14	g/mL	3369	kL	4.07E-04	uCi/g	Jan 1 2001 12:00AM
241-AZ-102	90Sr	Supernatant	7.00E+03	Ci	S	1.14	g/mL	3369	kL	1.99E+00	uCi/g	Jan 1 2001 12:00AM
241-AZ-102	90Y	Supernatant	7.00E+03	Ci	C		g/mL	3369	kL		uCi/g	Jan 1 2001 12:00AM
241-AZ-102	93mNb	Supernatant	1.18E+01	Ci	M	1.05	g/mL	3369	kL	3.23E-03	uCi/g	Jan 1 2001 12:00AM
241-AZ-102	93Zr	Supernatant	1.49E+01	Ci	M	1.05	g/mL	3369	kL	4.08E-03	uCi/g	Jan 1 2001 12:00AM
241-AZ-102	99Tc	Supernatant	6.99E+02	Ci	S	1.14	g/mL	3369	kL	1.99E-01	uCi/g	Jan 1 2001 12:00AM
241-AZ-102	Ag	Supernatant	1.25E+01	kg	S	1.14	g/mL	3369	kL	3.57E+00	ug/g	Jan 1 2001 12:00AM
241-AZ-102	Al	Supernatant	1.26E+03	kg	S	1.14	g/mL	3369	kL	3.27E+02	ug/g	Jan 1 2001 12:00AM
241-AZ-102	As	Supernatant	1.29E+01	kg	S	1.14	g/mL	3369	kL	3.66E+00	ug/g	Jan 1 2001 12:00AM
241-AZ-102	B	Supernatant	1.36E+01	kg	S	1.14	g/mL	3369	kL	3.86E+00	ug/g	Jan 1 2001 12:00AM
241-AZ-102	Ba	Supernatant	1.57E-01	kg	S	1.14	g/mL	3369	kL	4.46E-02	ug/g	Jan 1 2001 12:00AM
241-AZ-102	Be	Supernatant	7.43E-02	kg	S	1.14	g/mL	3369	kL	2.11E-02	ug/g	Jan 1 2001 12:00AM
241-AZ-102	Bi	Supernatant	1.56E+00	kg	M	1.05	g/mL	3369	kL	4.28E-01	ug/g	Jan 1 2001 12:00AM
241-AZ-102	Ca	Supernatant	3.41E+01	kg	S	1.14	g/mL	3369	kL	8.86E+00	ug/g	Jan 1 2001 12:00AM
241-AZ-102	Cd	Supernatant	1.70E+00	kg	S	1.14	g/mL	3369	kL	4.43E-01	ug/g	Jan 1 2001 12:00AM
241-AZ-102	Ce	Supernatant	7.61E-02	kg	S	1.14	g/mL	3369	kL	2.17E-02	ug/g	Jan 1 2001 12:00AM
241-AZ-102	Cl	Supernatant	2.36E+02	kg	S	1.14	g/mL	3369	kL	6.72E+01	ug/g	Jan 1 2001 12:00AM
241-AZ-102	CN	Supernatant	2.44E+01	kg	S	1.14	g/mL	3369	kL	6.95E+00	ug/g	Jan 1 2001 12:00AM
241-AZ-102	Co	Supernatant	7.43E-02	kg	S	1.14	g/mL	3369	kL	2.11E-02	ug/g	Jan 1 2001 12:00AM
241-AZ-102	Cr	Supernatant	2.27E+03	kg	S	1.14	g/mL	3369	kL	6.46E+02	ug/g	Jan 1 2001 12:00AM
241-AZ-102	Cu	Supernatant	3.41E+00	kg	S	1.14	g/mL	3369	kL	8.86E-01	ug/g	Jan 1 2001 12:00AM
241-AZ-102	F	Supernatant	3.51E+03	kg	S	1.14	g/mL	3369	kL	1.00E+03	ug/g	Jan 1 2001 12:00AM
241-AZ-102	Fe	Supernatant	1.70E+01	kg	S	1.14	g/mL	3369	kL	4.43E+00	ug/g	Jan 1 2001 12:00AM
241-AZ-102	Hg	Supernatant	2.03E-01	kg	S	1.14	g/mL	3369	kL	5.79E-02	ug/g	Jan 1 2001 12:00AM
241-AZ-102	K	Supernatant	9.86E+03	kg	S	1.14	g/mL	3369	kL	2.81E+03	ug/g	Jan 1 2001 12:00AM
241-AZ-102	La	Supernatant	1.17E-02	kg	M	1.05	g/mL	3369	kL	3.20E-03	ug/g	Jan 1 2001 12:00AM
241-AZ-102	Li	Supernatant	4.93E-01	kg	S	1.14	g/mL	3369	kL	1.40E-01	ug/g	Jan 1 2001 12:00AM
241-AZ-102	Mg	Supernatant	3.41E+01	kg	S	1.14	g/mL	3369	kL	8.86E+00	ug/g	Jan 1 2001 12:00AM
241-AZ-102	Mn	Supernatant	3.41E+00	kg	S	1.14	g/mL	3369	kL	8.86E-01	ug/g	Jan 1 2001 12:00AM
241-AZ-102	Mo	Supernatant	1.67E+02	kg	S	1.14	g/mL	3369	kL	4.75E+01	ug/g	Jan 1 2001 12:00AM
241-AZ-102	Na	Supernatant	1.72E+05	kg	S	1.14	g/mL	3369	kL	4.90E+04	ug/g	Jan 1 2001 12:00AM
241-AZ-102	Nd	Supernatant	3.41E+01	kg	S	1.14	g/mL	3369	kL	8.86E+00	ug/g	Jan 1 2001 12:00AM
241-AZ-102	Ni	Supernatant	6.82E+00	kg	S	1.14	g/mL	3369	kL	1.77E+00	ug/g	Jan 1 2001 12:00AM
241-AZ-102	NO2	Supernatant	1.09E+05	kg	S	1.14	g/mL	3369	kL	3.11E+04	ug/g	Jan 1 2001 12:00AM
241-AZ-102	NO3	Supernatant	5.70E+04	kg	S	1.14	g/mL	3369	kL	1.62E+04	ug/g	Jan 1 2001 12:00AM
241-AZ-102	OH	Supernatant	6.45E+02	kg	S	1.14	g/mL	3369	kL	1.68E+02	ug/g	Jan 1 2001 12:00AM
241-AZ-102	Oxalate	Sludge	1.49E+03	kg	S	1.41	g/mL	396	kL	2.66E+03	ug/g	Jan 1 2001 12:00AM
241-AZ-102	Oxalate	Supernatant	1.20E+04	kg	S	1.14	g/mL	3369	kL	3.40E+03	ug/g	Jan 1 2001 12:00AM
241-AZ-102	Pb	Supernatant	3.41E+01	kg	S	1.14	g/mL	3369	kL	8.86E+00	ug/g	Jan 1 2001 12:00AM
241-AZ-102	Pd	Supernatant	1.00E+01	kg	S	1.14	g/mL	3369	kL	2.85E+00	ug/g	Jan 1 2001 12:00AM
241-AZ-102	PO4	Supernatant	1.53E+03	kg	S	1.14	g/mL	3369	kL	4.36E+02	ug/g	Jan 1 2001 12:00AM
241-AZ-102	Pr	Supernatant	7.43E-02	kg	S	1.14	g/mL	3369	kL	2.11E-02	ug/g	Jan 1 2001 12:00AM
241-AZ-102	Rb	Supernatant	1.13E+01	kg	S	1.14	g/mL	3369	kL	3.23E+00	ug/g	Jan 1 2001 12:00AM
241-AZ-102	Rh	Supernatant	1.78E+01	kg	S	1.14	g/mL	3369	kL	5.06E+00	ug/g	Jan 1 2001 12:00AM
241-AZ-102	Ru	Supernatant	9.49E+00	kg	S	1.14	g/mL	3369	kL	2.70E+00	ug/g	Jan 1 2001 12:00AM
241-AZ-102	Sb	Supernatant	1.13E-01	kg	S	1.14	g/mL	3369	kL	3.23E-02	ug/g	Jan 1 2001 12:00AM
241-AZ-102	Se	Supernatant	2.22E+01	kg	S	1.14	g/mL	3369	kL	6.31E+00	ug/g	Jan 1 2001 12:00AM

CALCULATION SHEET

PROJECT: RPP-WTP
JOB NO.: 24590
CALC NO.: 24590-WTP-M4C-FRP-00001
SHEET REV: 0A
SHEET NO.: 86

BY: E. Berrios
DATE: 12/04/02

SUBJECT: Updated Emissions Run Feed Vector

Tank Name	Analyte	Waste Phase	Inventory	Inventory Units	Basis	Density	Density Units	Volume	Volume Units	Concentration	Concentration Units	Decay Date
241-AZ-102	Si	Supernatant	8.14E+01	kg	S	1.14	g/mL	3369	kL	2.32E+01	ug/g	Jan 1 2001 12:00AM
241-AZ-102	SO4	Supernatant	5.73E+04	kg	S	1.14	g/mL	3369	kL	1.63E+04	ug/g	Jan 1 2001 12:00AM
241-AZ-102	Sr	Supernatant	3.41E+00	kg	S	1.14	g/mL	3369	kL	8.86E-01	ug/g	Jan 1 2001 12:00AM
241-AZ-102	Ta	Supernatant	7.43E-02	kg	S	1.14	g/mL	3369	kL	2.11E-02	ug/g	Jan 1 2001 12:00AM
241-AZ-102	Te	Supernatant	8.23E-02	kg	S	1.14	g/mL	3369	kL	2.34E-02	ug/g	Jan 1 2001 12:00AM
241-AZ-102	Th	Supernatant	6.20E-02	kg	S	1.14	g/mL	3369	kL	1.76E-02	ug/g	Jan 1 2001 12:00AM
241-AZ-102	Ti	Supernatant	3.41E+00	kg	S	1.14	g/mL	3369	kL	8.86E-01	ug/g	Jan 1 2001 12:00AM
241-AZ-102	TIC as CO3	Supernatant	1.08E+05	kg	S	1.14	g/mL	3369	kL	3.07E+04	ug/g	Jan 1 2001 12:00AM
241-AZ-102	Tl	Supernatant	7.43E-02	kg	S	1.14	g/mL	3369	kL	2.11E-02	ug/g	Jan 1 2001 12:00AM
241-AZ-102	UTOTAL	Supernatant	3.91E+01	kg	S	1.14	g/mL	3369	kL	1.11E+01	ug/g	Jan 1 2001 12:00AM
241-AZ-102	V	Supernatant	3.70E+00	kg	S	1.14	g/mL	3369	kL	1.05E+00	ug/g	Jan 1 2001 12:00AM
241-AZ-102	W	Supernatant	1.87E+01	kg	S	1.14	g/mL	3369	kL	5.32E+00	ug/g	Jan 1 2001 12:00AM
241-AZ-102	Y	Supernatant	7.43E-02	kg	S	1.14	g/mL	3369	kL	2.11E-02	ug/g	Jan 1 2001 12:00AM
241-AZ-102	Zn	Supernatant	3.41E+00	kg	S	1.14	g/mL	3369	kL	8.86E-01	ug/g	Jan 1 2001 12:00AM
241-AZ-102	Zr	Supernatant	3.41E+00	kg	S	1.14	g/mL	3369	kL	8.86E-01	ug/g	Jan 1 2001 12:00AM
241-SY-101	106Ru	Supernatant	6.61E-05	Ci	TE	1.83	g/mL	2626	kL	3.13E-08	uCi/g	Jan 1 2001 12:00AM
241-SY-101	113mCd	Supernatant	7.85E+01	Ci	TE	1.83	g/mL	2626	kL	3.71E-02	uCi/g	Jan 1 2001 12:00AM
241-SY-101	125Sb	Supernatant	3.69E+01	Ci	TE	1.83	g/mL	2626	kL	1.74E-02	uCi/g	Jan 1 2001 12:00AM
241-SY-101	126Sn	Supernatant	2.61E+00	Ci	TE	1.83	g/mL	2626	kL	1.23E-03	uCi/g	Jan 1 2001 12:00AM
241-SY-101	129I	Supernatant	4.36E-01	Ci	E	1.53	g/mL	2626	kL	1.08E-04	uCi/g	Jan 1 2001 12:00AM
241-SY-101	134Cs	Supernatant	1.13E+00	Ci	TE	1.83	g/mL	2626	kL	5.35E-04	uCi/g	Jan 1 2001 12:00AM
241-SY-101	137Cs	Supernatant	6.79E+05	Ci	S	1.36	g/mL	2626	kL	1.90E+02	uCi/g	Jan 1 2001 12:00AM
241-SY-101	137mBa	Supernatant	6.42E+05	Ci	C		g/mL	2626	kL		uCi/g	Jan 1 2001 12:00AM
241-SY-101	14C	Supernatant	2.99E+00	Ci	E	1.53	g/mL	2626	kL	7.44E-04	uCi/g	Jan 1 2001 12:00AM
241-SY-101	151Sm	Supernatant	1.45E+04	Ci	TE	1.83	g/mL	2626	kL	6.83E+00	uCi/g	Jan 1 2001 12:00AM
241-SY-101	152Eu	Supernatant	3.67E+00	Ci	TE	1.83	g/mL	2626	kL	1.74E-03	uCi/g	Jan 1 2001 12:00AM
241-SY-101	154Eu	Supernatant	7.97E+01	Ci	S	1.36	g/mL	2626	kL	2.23E-02	uCi/g	Jan 1 2001 12:00AM
241-SY-101	155Eu	Supernatant	2.47E+02	Ci	S	1.36	g/mL	2626	kL	6.91E-02	uCi/g	Jan 1 2001 12:00AM
241-SY-101	226Ra	Supernatant	1.92E-04	Ci	TE	1.83	g/mL	2626	kL	9.10E-08	uCi/g	Jan 1 2001 12:00AM
241-SY-101	227Ac	Supernatant	2.00E-03	Ci	TE	1.83	g/mL	2626	kL	9.47E-07	uCi/g	Jan 1 2001 12:00AM
241-SY-101	228Ra	Supernatant	7.44E-02	Ci	TE	1.83	g/mL	2626	kL	3.52E-05	uCi/g	Jan 1 2001 12:00AM
241-SY-101	229Th	Supernatant	3.33E-03	Ci	TE	1.83	g/mL	2626	kL	1.57E-06	uCi/g	Jan 1 2001 12:00AM
241-SY-101	231Pa	Supernatant	5.30E-03	Ci	TE	1.83	g/mL	2626	kL	2.51E-06	uCi/g	Jan 1 2001 12:00AM
241-SY-101	232Th	Supernatant	1.51E-02	Ci	TE	1.83	g/mL	2626	kL	7.16E-06	uCi/g	Jan 1 2001 12:00AM
241-SY-101	232U	Supernatant	2.59E-03	Ci	C	1.36	g/mL	2626	kL	7.26E-07	uCi/g	Jan 1 2001 12:00AM
241-SY-101	233U	Supernatant	1.06E-02	Ci	C	1.36	g/mL	2626	kL	2.98E-06	uCi/g	Jan 1 2001 12:00AM
241-SY-101	234U	Supernatant	2.99E-03	Ci	C	1.36	g/mL	2626	kL	8.38E-07	uCi/g	Jan 1 2001 12:00AM
241-SY-101	235U	Supernatant	1.21E-04	Ci	C	1.36	g/mL	2626	kL	3.39E-08	uCi/g	Jan 1 2001 12:00AM
241-SY-101	236U	Supernatant	9.42E-05	Ci	C	1.36	g/mL	2626	kL	2.64E-08	uCi/g	Jan 1 2001 12:00AM
241-SY-101	237Np	Supernatant	9.45E-02	Ci	E	1.53	g/mL	2626	kL	2.35E-05	uCi/g	Jan 1 2001 12:00AM
241-SY-101	238Pu	Supernatant	4.36E-03	Ci	C	1.36	g/mL	2626	kL	1.22E-06	uCi/g	Jan 1 2001 12:00AM
241-SY-101	238U	Supernatant	2.72E-03	Ci	C	1.36	g/mL	2626	kL	7.61E-07	uCi/g	Jan 1 2001 12:00AM
241-SY-101	239Pu	Supernatant	1.56E-01	Ci	C	1.36	g/mL	2626	kL	4.38E-05	uCi/g	Jan 1 2001 12:00AM
241-SY-101	240Pu	Supernatant	2.66E-02	Ci	C	1.36	g/mL	2626	kL	7.45E-06	uCi/g	Jan 1 2001 12:00AM
241-SY-101	241Am	Supernatant	8.92E-01	Ci	S	1.36	g/mL	2626	kL	2.50E-04	uCi/g	Jan 1 2001 12:00AM
241-SY-101	241Pu	Supernatant	2.23E-01	Ci	C	1.36	g/mL	2626	kL	6.25E-05	uCi/g	Jan 1 2001 12:00AM
241-SY-101	242Cm	Supernatant	2.34E-03	Ci	C	1.36	g/mL	2626	kL	6.54E-07	uCi/g	Jan 1 2001 12:00AM

CALCULATION SHEET

PROJECT: RPP-WTP
JOB NO.: 24590
CALC NO.: 24590-WTP-M4C-FRP-00001
SHEET REV: 0A
SHEET NO.: 87

BY: E. Berrios
DATE: 12/04/02

SUBJECT: Updated Emissions Run Feed Vector

Tank Name	Analyte	Waste Phase	Inventory	Inventory Units	Basis	Density	Density Units	Volume	Volume Units	Concentration	Concentration Units	Decay Date
241-SY-101	242Pu	Supernatant	1.72E-06	Ci	C	1.36	g/mL	2626	kL	4.82E-10	uCi/g	Jan 1 2001 12:00AM
241-SY-101	243Am	Supernatant	3.17E-05	Ci	C	1.36	g/mL	2626	kL	8.89E-09	uCi/g	Jan 1 2001 12:00AM
241-SY-101	243Cm	Supernatant	1.89E-04	Ci	C	1.36	g/mL	2626	kL	5.29E-08	uCi/g	Jan 1 2001 12:00AM
241-SY-101	244Cm	Supernatant	1.66E-03	Ci	C	1.36	g/mL	2626	kL	4.64E-07	uCi/g	Jan 1 2001 12:00AM
241-SY-101	3H	Supernatant	7.14E+02	Ci	TE	1.83	g/mL	2626	kL	3.38E-01	uCi/g	Jan 1 2001 12:00AM
241-SY-101	59Ni	Supernatant	5.33E-01	Ci	TE	1.83	g/mL	2626	kL	2.52E-04	uCi/g	Jan 1 2001 12:00AM
241-SY-101	60Co	Supernatant	3.23E+01	Ci	S	1.36	g/mL	2626	kL	9.05E-03	uCi/g	Jan 1 2001 12:00AM
241-SY-101	63Ni	Supernatant	4.98E+01	Ci	TE	1.83	g/mL	2626	kL	2.35E-02	uCi/g	Jan 1 2001 12:00AM
241-SY-101	79Se	Supernatant	6.83E-01	Ci	E	1.53	g/mL	2626	kL	1.70E-04	uCi/g	Jan 1 2001 12:00AM
241-SY-101	90Sr	Supernatant	9.66E+03	Ci	S	1.36	g/mL	2626	kL	2.70E+00	uCi/g	Jan 1 2001 12:00AM
241-SY-101	90Y	Supernatant	9.66E+03	Ci	C		g/mL	2626	kL		uCi/g	Jan 1 2001 12:00AM
241-SY-101	93mNb	Supernatant	4.16E+00	Ci	E	1.53	g/mL	2626	kL	1.04E-03	uCi/g	Jan 1 2001 12:00AM
241-SY-101	93Zr	Supernatant	5.02E+00	Ci	E	1.53	g/mL	2626	kL	1.25E-03	uCi/g	Jan 1 2001 12:00AM
241-SY-101	99Tc	Supernatant	6.43E+02	Ci	S	1.36	g/mL	2626	kL	1.80E-01	uCi/g	Jan 1 2001 12:00AM
241-SY-101	Ag	Supernatant	7.85E+01	kg	S	1.36	g/mL	2626	kL	2.20E+01	ug/g	Jan 1 2001 12:00AM
241-SY-101	Al	Supernatant	3.52E+04	kg	S	1.36	g/mL	2626	kL	9.85E+03	ug/g	Jan 1 2001 12:00AM
241-SY-101	As	Supernatant	1.58E+02	kg	S	1.36	g/mL	2626	kL	4.42E+01	ug/g	Jan 1 2001 12:00AM
241-SY-101	B	Supernatant	1.44E+02	kg	S	1.36	g/mL	2626	kL	4.04E+01	ug/g	Jan 1 2001 12:00AM
241-SY-101	Ba	Supernatant	7.90E+01	kg	S	1.36	g/mL	2626	kL	2.21E+01	ug/g	Jan 1 2001 12:00AM
241-SY-101	Be	Supernatant	7.90E+00	kg	S	1.36	g/mL	2626	kL	2.21E+00	ug/g	Jan 1 2001 12:00AM
241-SY-101	Bi	Supernatant	5.78E+01	kg	TE	1.83	g/mL	2626	kL	2.73E+01	ug/g	Jan 1 2001 12:00AM
241-SY-101	Ca	Supernatant	2.68E+02	kg	S	1.36	g/mL	2626	kL	7.50E+01	ug/g	Jan 1 2001 12:00AM
241-SY-101	Cd	Supernatant	7.90E+00	kg	S	1.36	g/mL	2626	kL	2.21E+00	ug/g	Jan 1 2001 12:00AM
241-SY-101	Ce	Supernatant	1.58E+02	kg	S	1.36	g/mL	2626	kL	4.42E+01	ug/g	Jan 1 2001 12:00AM
241-SY-101	Cl	Supernatant	1.87E+04	kg	S	1.36	g/mL	2626	kL	5.24E+03	ug/g	Jan 1 2001 12:00AM
241-SY-101	Co	Supernatant	3.15E+01	kg	S	1.36	g/mL	2626	kL	8.82E+00	ug/g	Jan 1 2001 12:00AM
241-SY-101	Cr	Supernatant	3.57E+02	kg	S	1.36	g/mL	2626	kL	1.00E+02	ug/g	Jan 1 2001 12:00AM
241-SY-101	Cu	Supernatant	2.56E+01	kg	S	1.36	g/mL	2626	kL	7.16E+00	ug/g	Jan 1 2001 12:00AM
241-SY-101	F	Supernatant	1.62E+02	kg	S	1.36	g/mL	2626	kL	4.54E+01	ug/g	Jan 1 2001 12:00AM
241-SY-101	Fe	Supernatant	7.90E+01	kg	S	1.36	g/mL	2626	kL	2.21E+01	ug/g	Jan 1 2001 12:00AM
241-SY-101	Hg	Supernatant	6.30E-03	kg	S	1.36	g/mL	2626	kL	1.76E-03	ug/g	Jan 1 2001 12:00AM
241-SY-101	K	Supernatant	7.04E+03	kg	S	1.36	g/mL	2626	kL	1.97E+03	ug/g	Jan 1 2001 12:00AM
241-SY-101	La	Supernatant	5.27E+00	kg	TE	1.83	g/mL	2626	kL	2.49E+00	ug/g	Jan 1 2001 12:00AM
241-SY-101	Li	Supernatant	1.58E+01	kg	S	1.36	g/mL	2626	kL	4.42E+00	ug/g	Jan 1 2001 12:00AM
241-SY-101	Mg	Supernatant	1.58E+02	kg	S	1.36	g/mL	2626	kL	4.42E+01	ug/g	Jan 1 2001 12:00AM
241-SY-101	Mn	Supernatant	1.58E+01	kg	S	1.36	g/mL	2626	kL	4.42E+00	ug/g	Jan 1 2001 12:00AM
241-SY-101	Mo	Supernatant	2.12E+02	kg	S	1.36	g/mL	2626	kL	5.94E+01	ug/g	Jan 1 2001 12:00AM
241-SY-101	Na	Supernatant	4.28E+05	kg	S	1.36	g/mL	2626	kL	1.20E+05	ug/g	Jan 1 2001 12:00AM
241-SY-101	Nd	Supernatant	1.58E+02	kg	S	1.36	g/mL	2626	kL	4.42E+01	ug/g	Jan 1 2001 12:00AM
241-SY-101	NH3	Supernatant	2.52E+03	kg	S	1.36	g/mL	2626	kL	7.07E+02	ug/g	Jan 1 2001 12:00AM
241-SY-101	Ni	Supernatant	2.46E+02	kg	S	1.36	g/mL	2626	kL	6.88E+01	ug/g	Jan 1 2001 12:00AM
241-SY-101	NO2	Supernatant	2.31E+05	kg	S	1.36	g/mL	2626	kL	6.46E+04	ug/g	Jan 1 2001 12:00AM
241-SY-101	NO3	Supernatant	3.70E+05	kg	S	1.36	g/mL	2626	kL	1.04E+05	ug/g	Jan 1 2001 12:00AM
241-SY-101	OH	Supernatant	6.91E+04	kg	S	1.36	g/mL	2626	kL	1.93E+04	ug/g	Jan 1 2001 12:00AM
241-SY-101	Oxalate	Supernatant	4.37E+00	kg	TE	1.83	g/mL	2626	kL	2.07E+00	ug/g	Jan 1 2001 12:00AM
241-SY-101	Pb	Supernatant	1.58E+02	kg	S	1.36	g/mL	2626	kL	4.42E+01	ug/g	Jan 1 2001 12:00AM
241-SY-101	PO4	Supernatant	1.19E+04	kg	S	1.36	g/mL	2626	kL	3.33E+03	ug/g	Jan 1 2001 12:00AM

CALCULATION SHEET

PROJECT: RPP-WTP
JOB NO.: 24590
CALC NO.: 24590-WTP-M4C-FRP-00001
SHEET REV: 0A
SHEET NO.: 88

BY: E. Berrios
DATE: 12/04/02

SUBJECT: Updated Emissions Run Feed Vector

Tank Name	Analyte	Waste Phase	Inventory	Inventory Units	Basis	Density	Density Units	Volume	Volume Units	Concentration	Concentration Units	Decay Date
241-SY-101	Sb	Supernatant	9.48E+01	kg	S	1.36	g/mL	2626	kL	2.65E+01	ug/g	Jan 1 2001 12:00AM
241-SY-101	Se	Supernatant	1.58E+02	kg	S	1.36	g/mL	2626	kL	4.42E+01	ug/g	Jan 1 2001 12:00AM
241-SY-101	Si	Supernatant	2.16E+02	kg	S	1.36	g/mL	2626	kL	6.06E+01	ug/g	Jan 1 2001 12:00AM
241-SY-101	SO4	Supernatant	1.17E+04	kg	S	1.36	g/mL	2626	kL	3.26E+03	ug/g	Jan 1 2001 12:00AM
241-SY-101	Sr	Supernatant	1.58E+01	kg	S	1.36	g/mL	2626	kL	4.42E+00	ug/g	Jan 1 2001 12:00AM
241-SY-101	Ti	Supernatant	1.58E+01	kg	S	1.36	g/mL	2626	kL	4.42E+00	ug/g	Jan 1 2001 12:00AM
241-SY-101	TIC as CO3	Supernatant	9.02E+04	kg	S	1.36	g/mL	2626	kL	2.53E+04	ug/g	Jan 1 2001 12:00AM
241-SY-101	Tl	Supernatant	3.15E+02	kg	S	1.36	g/mL	2626	kL	8.82E+01	ug/g	Jan 1 2001 12:00AM
241-SY-101	UTOTAL	Supernatant	8.14E+00	kg	S	1.36	g/mL	2626	kL	2.28E+00	ug/g	Jan 1 2001 12:00AM
241-SY-101	V	Supernatant	7.90E+01	kg	S	1.36	g/mL	2626	kL	2.21E+01	ug/g	Jan 1 2001 12:00AM
241-SY-101	Zn	Supernatant	1.64E+01	kg	S	1.36	g/mL	2626	kL	4.59E+00	ug/g	Jan 1 2001 12:00AM
241-SY-101	Zr	Supernatant	1.58E+01	kg	S	1.36	g/mL	2626	kL	4.42E+00	ug/g	Jan 1 2001 12:00AM

Appendix D HLW BBI Data

CALCULATION SHEET

PROJECT: RPP-WTP
JOB NO.: 24590
CALC NO.: 24590-WTP-M4C-FRP-00001
SHEET REV: 0A
SHEET NO.: 90

BY: E. Berrios
DATE: 12/04/02

SUBJECT: Updated Emissions Run Feed Vector

Best Basis Inventory Data for HLW Phase I Tanks

Tank Name	Analyte	Waste Phase	Inventory	Inventory Units	Basis	Density	Density Units	Volume	Volume Units	Concentration	Concentration Units	Decay Date
241-AY-101	106Ru	Sludge (Solids)	6.53E-02	Ci	M	1.39	g/mL	309	kL	7.64E-05	uCi/g	Jan 1 2001 12:00AM
241-AY-101	113mCd	Sludge (Solids)	1.75E+03	Ci	M	1.39	g/mL	309	kL	2.04E+00	uCi/g	Jan 1 2001 12:00AM
241-AY-101	125Sb	Sludge (Solids)	1.34E+01	Ci	M	1.39	g/mL	309	kL	1.57E-02	uCi/g	Jan 1 2001 12:00AM
241-AY-101	126Sn	Sludge (Solids)	2.80E+01	Ci	S	1.59	g/mL	309	kL	5.70E-02	uCi/g	Jan 1 2001 12:00AM
241-AY-101	129I	Sludge (Solids)	9.40E-02	Ci	M	1.39	g/mL	309	kL	1.10E-04	uCi/g	Jan 1 2001 12:00AM
241-AY-101	137Cs	Sludge (Solids)	5.30E+04	Ci	S	1.59	g/mL	309	kL	1.08E+02	uCi/g	Jan 1 2001 12:00AM
241-AY-101	137mBa	Sludge (Solids)	5.02E+04	Ci	C		g/mL	309	kL		uCi/g	Jan 1 2001 12:00AM
241-AY-101	14C	Sludge (Solids)	8.70E-01	Ci	S	1.59	g/mL	309	kL	1.77E-03	uCi/g	Jan 1 2001 12:00AM
241-AY-101	151Sm	Sludge (Solids)	4.29E+05	Ci	M	1.39	g/mL	309	kL	5.02E+02	uCi/g	Jan 1 2001 12:00AM
241-AY-101	154Eu	Sludge (Solids)	4.69E+03	Ci	S	1.59	g/mL	309	kL	9.55E+00	uCi/g	Jan 1 2001 12:00AM
241-AY-101	155Eu	Sludge (Solids)	2.28E+03	Ci	S	1.59	g/mL	309	kL	4.63E+00	uCi/g	Jan 1 2001 12:00AM
241-AY-101	226Ra	Sludge (Solids)	1.02E-02	Ci	M	1.39	g/mL	309	kL	1.20E-05	uCi/g	Jan 1 2001 12:00AM
241-AY-101	227Ac	Sludge (Solids)	5.69E-02	Ci	M	1.39	g/mL	309	kL	6.65E-05	uCi/g	Jan 1 2001 12:00AM
241-AY-101	228Ra	Sludge (Solids)	4.11E-02	Ci	M	1.39	g/mL	309	kL	4.81E-05	uCi/g	Jan 1 2001 12:00AM
241-AY-101	229Th	Sludge (Solids)	6.53E-04	Ci	M	1.39	g/mL	309	kL	7.64E-07	uCi/g	Jan 1 2001 12:00AM
241-AY-101	231Pa	Sludge (Solids)	7.44E-02	Ci	M	1.39	g/mL	309	kL	8.71E-05	uCi/g	Jan 1 2001 12:00AM
241-AY-101	232Th	Sludge (Solids)	3.82E-02	Ci	S	1.59	g/mL	309	kL	7.78E-05	uCi/g	Jan 1 2001 12:00AM
241-AY-101	232U	Sludge (Solids)	9.37E-02	Ci	C	1.59	g/mL	309	kL	1.91E-04	uCi/g	Jan 1 2001 12:00AM
241-AY-101	233U	Sludge (Solids)	3.85E-01	Ci	C	1.59	g/mL	309	kL	7.84E-04	uCi/g	Jan 1 2001 12:00AM
241-AY-101	234U	Sludge (Solids)	1.71E-01	Ci	C	1.59	g/mL	309	kL	3.48E-04	uCi/g	Jan 1 2001 12:00AM
241-AY-101	235U	Sludge (Solids)	6.94E-03	Ci	C	1.59	g/mL	309	kL	1.41E-05	uCi/g	Jan 1 2001 12:00AM
241-AY-101	236U	Sludge (Solids)	5.87E-03	Ci	C	1.59	g/mL	309	kL	1.19E-05	uCi/g	Jan 1 2001 12:00AM
241-AY-101	237Np	Sludge (Solids)	1.59E-01	Ci	M	1.39	g/mL	309	kL	1.86E-04	uCi/g	Jan 1 2001 12:00AM
241-AY-101	238Pu	Sludge (Solids)	1.91E+02	Ci	S	1.59	g/mL	309	kL	3.89E-01	uCi/g	Jan 1 2001 12:00AM
241-AY-101	238U	Sludge (Solids)	1.56E-01	Ci	C	1.59	g/mL	309	kL	3.17E-04	uCi/g	Jan 1 2001 12:00AM
241-AY-101	239Pu	Sludge (Solids)	4.89E+02	Ci	C	1.59	g/mL	309	kL	9.95E-01	uCi/g	Jan 1 2001 12:00AM
241-AY-101	240Pu	Sludge (Solids)	1.48E+02	Ci	C	1.59	g/mL	309	kL	3.00E-01	uCi/g	Jan 1 2001 12:00AM
241-AY-101	241Am	Sludge (Solids)	8.79E+03	Ci	S	1.59	g/mL	309	kL	1.79E+01	uCi/g	Jan 1 2001 12:00AM
241-AY-101	241Pu	Sludge (Solids)	2.69E+03	Ci	C	1.59	g/mL	309	kL	5.48E+00	uCi/g	Jan 1 2001 12:00AM
241-AY-101	242Cm	Sludge (Solids)	1.17E+01	Ci	C	1.59	g/mL	309	kL	2.37E-02	uCi/g	Jan 1 2001 12:00AM
241-AY-101	242Pu	Sludge (Solids)	2.67E-02	Ci	C	1.59	g/mL	309	kL	5.43E-05	uCi/g	Jan 1 2001 12:00AM
241-AY-101	243Am	Sludge (Solids)	8.83E-01	Ci	C	1.59	g/mL	309	kL	1.80E-03	uCi/g	Jan 1 2001 12:00AM
241-AY-101	243Cm	Sludge (Solids)	1.19E+00	Ci	C	1.59	g/mL	309	kL	2.42E-03	uCi/g	Jan 1 2001 12:00AM
241-AY-101	244Cm	Sludge (Solids)	4.08E+01	Ci	C	1.59	g/mL	309	kL	8.30E-02	uCi/g	Jan 1 2001 12:00AM
241-AY-101	3H	Sludge (Solids)	2.38E+00	Ci	S	1.59	g/mL	309	kL	4.85E-03	uCi/g	Jan 1 2001 12:00AM
241-AY-101	59Ni	Sludge (Solids)	1.58E+02	Ci	M	1.39	g/mL	309	kL	1.85E-01	uCi/g	Jan 1 2001 12:00AM
241-AY-101	60Co	Sludge (Solids)	4.36E+02	Ci	S	1.59	g/mL	309	kL	8.86E-01	uCi/g	Jan 1 2001 12:00AM
241-AY-101	63Ni	Sludge (Solids)	1.48E+04	Ci	M	1.39	g/mL	309	kL	1.74E+01	uCi/g	Jan 1 2001 12:00AM
241-AY-101	79Se	Sludge (Solids)	1.37E+01	Ci	M	1.39	g/mL	309	kL	1.60E-02	uCi/g	Jan 1 2001 12:00AM
241-AY-101	90Sr	Sludge (Solids)	1.38E+06	Ci	S	1.59	g/mL	309	kL	2.81E+03	uCi/g	Jan 1 2001 12:00AM
241-AY-101	90Y	Sludge (Solids)	1.38E+06	Ci	C		g/mL	309	kL		uCi/g	Jan 1 2001 12:00AM
241-AY-101	93mNb	Sludge (Solids)	4.99E+02	Ci	M	1.39	g/mL	309	kL	5.84E-01	uCi/g	Jan 1 2001 12:00AM
241-AY-101	93Zr	Sludge (Solids)	6.09E+02	Ci	M	1.39	g/mL	309	kL	7.13E-01	uCi/g	Jan 1 2001 12:00AM
241-AY-101	99Tc	Sludge (Solids)	4.85E+01	Ci	M	1.39	g/mL	309	kL	5.68E-02	uCi/g	Jan 1 2001 12:00AM
241-AY-101	Ag	Sludge (Solids)	1.17E+02	kg	S	1.59	g/mL	309	kL	2.39E+02	ug/g	Jan 1 2001 12:00AM

CALCULATION SHEET

PROJECT: RPP-WTP
JOB NO.: 24590
CALC NO.: 24590-WTP-M4C-FRP-00001
SHEET REV: 0A
SHEET NO.: 91

BY: E. Berrios
DATE: 12/04/02

SUBJECT: Updated Emissions Run Feed Vector

Tank Name	Analyte	Waste Phase	Inventory	Inventory Units	Basis	Density	Density Units	Volume	Volume Units	Concentration	Concentration Units	Decay Date
241-AY-101	Al	Sludge (Solids)	2.71E+04	kg	E	1.59	g/mL	309	kL	5.52E+04	ug/g	Jan 1 2001 12:00AM
241-AY-101	As	Sludge (Solids)	9.37E+00	kg	S	1.59	g/mL	309	kL	1.91E+01	ug/g	Jan 1 2001 12:00AM
241-AY-101	B	Sludge (Solids)	1.21E+02	kg	S	1.59	g/mL	309	kL	2.47E+02	ug/g	Jan 1 2001 12:00AM
241-AY-101	Ba	Sludge (Solids)	2.63E+02	kg	S	1.59	g/mL	309	kL	5.36E+02	ug/g	Jan 1 2001 12:00AM
241-AY-101	Be	Sludge (Solids)	2.17E+00	kg	S	1.59	g/mL	309	kL	4.41E+00	ug/g	Jan 1 2001 12:00AM
241-AY-101	Bi	Sludge (Solids)	2.13E+00	kg	M	1.39	g/mL	309	kL	2.49E+00	ug/g	Jan 1 2001 12:00AM
241-AY-101	Ca	Sludge (Solids)	1.19E+03	kg	S	1.59	g/mL	309	kL	2.43E+03	ug/g	Jan 1 2001 12:00AM
241-AY-101	Cd	Sludge (Solids)	6.18E+01	kg	S	1.59	g/mL	309	kL	1.26E+02	ug/g	Jan 1 2001 12:00AM
241-AY-101	Ce	Sludge (Solids)	2.96E+02	kg	S	1.59	g/mL	309	kL	6.02E+02	ug/g	Jan 1 2001 12:00AM
241-AY-101	Cl	Sludge (Solids)	1.65E+02	kg	S	1.59	g/mL	309	kL	3.36E+02	ug/g	Jan 1 2001 12:00AM
241-AY-101	Co	Sludge (Solids)	1.56E+01	kg	S	1.59	g/mL	309	kL	3.18E+01	ug/g	Jan 1 2001 12:00AM
241-AY-101	Cr	Sludge (Solids)	1.20E+03	kg	S	1.59	g/mL	309	kL	2.44E+03	ug/g	Jan 1 2001 12:00AM
241-AY-101	Cu	Sludge (Solids)	9.75E+01	kg	S	1.59	g/mL	309	kL	1.98E+02	ug/g	Jan 1 2001 12:00AM
241-AY-101	F	Sludge (Solids)	9.48E+02	kg	S	1.59	g/mL	309	kL	1.93E+03	ug/g	Jan 1 2001 12:00AM
241-AY-101	Fe	Sludge (Solids)	3.57E+04	kg	S	1.59	g/mL	309	kL	7.27E+04	ug/g	Jan 1 2001 12:00AM
241-AY-101	Hg	Sludge (Solids)	1.20E+01	kg	S	1.59	g/mL	309	kL	2.44E+01	ug/g	Jan 1 2001 12:00AM
241-AY-101	K	Sludge (Solids)	2.93E+02	kg	S	1.59	g/mL	309	kL	5.96E+02	ug/g	Jan 1 2001 12:00AM
241-AY-101	La	Sludge (Solids)	1.23E+03	kg	S	1.59	g/mL	309	kL	2.51E+03	ug/g	Jan 1 2001 12:00AM
241-AY-101	Li	Sludge (Solids)	2.57E+00	kg	S	1.6	g/mL	309	kL	5.19E+00	ug/g	Jan 1 2001 12:00AM
241-AY-101	Mg	Sludge (Solids)	5.02E+02	kg	S	1.59	g/mL	309	kL	1.02E+03	ug/g	Jan 1 2001 12:00AM
241-AY-101	Mn	Sludge (Solids)	2.04E+03	kg	S	1.59	g/mL	309	kL	4.16E+03	ug/g	Jan 1 2001 12:00AM
241-AY-101	Mo	Sludge (Solids)	1.19E+01	kg	S	1.59	g/mL	309	kL	2.43E+01	ug/g	Jan 1 2001 12:00AM
241-AY-101	Na	Sludge (Solids)	4.78E+04	kg	S	1.59	g/mL	309	kL	9.73E+04	ug/g	Jan 1 2001 12:00AM
241-AY-101	Nd	Sludge (Solids)	7.41E+02	kg	S	1.59	g/mL	309	kL	1.51E+03	ug/g	Jan 1 2001 12:00AM
241-AY-101	NH3	Sludge (Solids)	3.62E+02	kg	S	1.59	g/mL	309	kL	7.38E+02	ug/g	Jan 1 2001 12:00AM
241-AY-101	Ni	Sludge (Solids)	1.33E+03	kg	S	1.59	g/mL	309	kL	2.71E+03	ug/g	Jan 1 2001 12:00AM
241-AY-101	NO2	Sludge (Solids)	1.35E+04	kg	S	1.59	g/mL	309	kL	2.74E+04	ug/g	Jan 1 2001 12:00AM
241-AY-101	NO3	Sludge (Solids)	1.14E+03	kg	S	1.59	g/mL	309	kL	2.31E+03	ug/g	Jan 1 2001 12:00AM
241-AY-101	Oxalate	Sludge (Solids)	1.92E+04	kg	S	1.59	g/mL	309	kL	3.92E+04	ug/g	Jan 1 2001 12:00AM
241-AY-101	Pb	Sludge (Solids)	9.56E+02	kg	S	1.59	g/mL	309	kL	1.94E+03	ug/g	Jan 1 2001 12:00AM
241-AY-101	PO4	Sludge (Solids)	3.45E+03	kg	S	1.59	g/mL	309	kL	7.03E+03	ug/g	Jan 1 2001 12:00AM
241-AY-101	Rb	Sludge (Solids)	5.93E-01	kg	S	1.59	g/mL	309	kL	1.21E+00	ug/g	Jan 1 2001 12:00AM
241-AY-101	Rh	Sludge (Solids)	6.85E+00	kg	S	1.59	g/mL	309	kL	1.39E+01	ug/g	Jan 1 2001 12:00AM
241-AY-101	Sb	Sludge (Solids)	1.18E+01	kg	S	1.6	g/mL	309	kL	2.38E+01	ug/g	Jan 1 2001 12:00AM
241-AY-101	Se	Sludge (Solids)	1.96E+01	kg	S	1.6	g/mL	309	kL	3.97E+01	ug/g	Jan 1 2001 12:00AM
241-AY-101	Si	Sludge (Solids)	4.31E+02	kg	S	1.6	g/mL	309	kL	8.73E+02	ug/g	Jan 1 2001 12:00AM
241-AY-101	SO4	Sludge (Solids)	3.04E+03	kg	S	1.59	g/mL	309	kL	6.18E+03	ug/g	Jan 1 2001 12:00AM
241-AY-101	Sr	Sludge (Solids)	6.68E+01	kg	S	1.59	g/mL	309	kL	1.36E+02	ug/g	Jan 1 2001 12:00AM
241-AY-101	Ti	Sludge (Solids)	3.52E+01	kg	S	1.59	g/mL	309	kL	7.17E+01	ug/g	Jan 1 2001 12:00AM
241-AY-101	TIC as CO3	Sludge (Solids)	8.09E+04	kg	S	1.59	g/mL	309	kL	1.65E+05	ug/g	Jan 1 2001 12:00AM
241-AY-101	Tl	Sludge (Solids)	5.61E-01	kg	S	1.59	g/mL	309	kL	1.14E+00	ug/g	Jan 1 2001 12:00AM
241-AY-101	UTOTAL	Sludge (Solids)	4.67E+02	kg	S	1.59	g/mL	309	kL	9.50E+02	ug/g	Jan 1 2001 12:00AM
241-AY-101	V	Sludge (Solids)	9.80E+00	kg	S	1.6	g/mL	309	kL	1.98E+01	ug/g	Jan 1 2001 12:00AM
241-AY-101	Zn	Sludge (Solids)	5.33E+01	kg	S	1.59	g/mL	309	kL	1.08E+02	ug/g	Jan 1 2001 12:00AM
241-AY-101	Zr	Sludge (Solids)	6.93E+02	kg	S	1.59	g/mL	309	kL	1.41E+03	ug/g	Jan 1 2001 12:00AM
241-AY-102	106Ru	Sludge (Solids)	7.54E-03	Ci	TE	1.62	g/mL	548	kL	8.01E-06	uCi/g	Jan 1 2001 12:00AM

CALCULATION SHEET

PROJECT: RPP-WTP
JOB NO.: 24590
CALC NO.: 24590-WTP-M4C-FRP-00001
SHEET REV: 0A
SHEET NO.: 92

BY: E. Berrios
DATE: 12/04/02

SUBJECT: Updated Emissions Run Feed Vector

Tank Name	Analyte	Waste Phase	Inventory	Inventory Units	Basis	Density	Density Units	Volume	Volume Units	Concentration	Concentration Units	Decay Date
241-AY-102	113mCd	Sludge (Solids)	4.83E+00	Ci	TE	1.62	g/mL	548	kL	5.13E-03	uCi/g	Jan 1 2001 12:00AM
241-AY-102	125Sb	Sludge (Solids)	1.55E+00	Ci	TE	1.62	g/mL	548	kL	1.64E-03	uCi/g	Jan 1 2001 12:00AM
241-AY-102	126Sn	Sludge (Solids)	2.78E-01	Ci	TE	1.62	g/mL	548	kL	2.95E-04	uCi/g	Jan 1 2001 12:00AM
241-AY-102	129I	Sludge (Solids)	8.43E-03	Ci	TE	1.62	g/mL	548	kL	8.96E-06	uCi/g	Jan 1 2001 12:00AM
241-AY-102	134Cs	Sludge (Solids)	2.14E+02	Ci	S	1.48	g/mL	548	kL	2.63E-01	uCi/g	Jan 1 2001 12:00AM
241-AY-102	137Cs	Sludge (Solids)	1.61E+05	Ci	S	1.48	g/mL	548	kL	1.99E+02	uCi/g	Jan 1 2001 12:00AM
241-AY-102	137mBa	Sludge (Solids)	1.53E+05	Ci	C		g/mL	548	kL		uCi/g	Jan 1 2001 12:00AM
241-AY-102	14C	Sludge (Solids)	1.74E-01	Ci	S	1.48	g/mL	548	kL	2.15E-04	uCi/g	Jan 1 2001 12:00AM
241-AY-102	151Sm	Sludge (Solids)	1.51E+03	Ci	TE	1.62	g/mL	548	kL	1.60E+00	uCi/g	Jan 1 2001 12:00AM
241-AY-102	152Eu	Sludge (Solids)	6.13E+01	Ci	TE	1.62	g/mL	548	kL	6.52E-02	uCi/g	Jan 1 2001 12:00AM
241-AY-102	154Eu	Sludge (Solids)	6.77E+03	Ci	S	1.48	g/mL	548	kL	8.35E+00	uCi/g	Jan 1 2001 12:00AM
241-AY-102	155Eu	Sludge (Solids)	5.53E+03	Ci	S	1.48	g/mL	548	kL	6.82E+00	uCi/g	Jan 1 2001 12:00AM
241-AY-102	226Ra	Sludge (Solids)	3.66E-03	Ci	TE	1.62	g/mL	548	kL	3.89E-06	uCi/g	Jan 1 2001 12:00AM
241-AY-102	227Ac	Sludge (Solids)	1.29E-02	Ci	TE	1.62	g/mL	548	kL	1.37E-05	uCi/g	Jan 1 2001 12:00AM
241-AY-102	228Ra	Sludge (Solids)	3.42E-02	Ci	TE	1.62	g/mL	548	kL	3.63E-05	uCi/g	Jan 1 2001 12:00AM
241-AY-102	229Th	Sludge (Solids)	6.93E-06	Ci	TE	1.62	g/mL	548	kL	7.37E-09	uCi/g	Jan 1 2001 12:00AM
241-AY-102	231Pa	Sludge (Solids)	3.90E-04	Ci	TE	1.62	g/mL	548	kL	4.15E-07	uCi/g	Jan 1 2001 12:00AM
241-AY-102	232Th	Sludge (Solids)	6.02E-02	Ci	S	1.56	g/mL	548	kL	7.04E-05	uCi/g	Jan 1 2001 12:00AM
241-AY-102	232U	Sludge (Solids)	2.55E-04	Ci	E	1.48	g/mL	548	kL	3.14E-07	uCi/g	Jan 1 2001 12:00AM
241-AY-102	233U	Sludge (Solids)	3.72E-06	Ci	E	1.48	g/mL	548	kL	4.59E-09	uCi/g	Jan 1 2001 12:00AM
241-AY-102	234U	Sludge (Solids)	1.04E+00	Ci	E	1.48	g/mL	548	kL	1.28E-03	uCi/g	Jan 1 2001 12:00AM
241-AY-102	235U	Sludge (Solids)	4.01E-02	Ci	E	1.48	g/mL	548	kL	4.95E-05	uCi/g	Jan 1 2001 12:00AM
241-AY-102	236U	Sludge (Solids)	7.55E-02	Ci	E	1.48	g/mL	548	kL	9.31E-05	uCi/g	Jan 1 2001 12:00AM
241-AY-102	237Np	Sludge (Solids)	3.95E+00	Ci	S	1.56	g/mL	548	kL	4.62E-03	uCi/g	Jan 1 2001 12:00AM
241-AY-102	238Pu	Sludge (Solids)	5.26E+02	Ci	S	1.48	g/mL	548	kL	6.48E-01	uCi/g	Jan 1 2001 12:00AM
241-AY-102	238U	Sludge (Solids)	8.00E-01	Ci	E	1.48	g/mL	548	kL	9.87E-04	uCi/g	Jan 1 2001 12:00AM
241-AY-102	239Pu	Sludge (Solids)	1.64E+03	Ci	E	1.48	g/mL	548	kL	2.02E+00	uCi/g	Jan 1 2001 12:00AM
241-AY-102	240Pu	Sludge (Solids)	3.55E+02	Ci	E	1.48	g/mL	548	kL	4.38E-01	uCi/g	Jan 1 2001 12:00AM
241-AY-102	241Am	Sludge (Solids)	7.62E+03	Ci	E	1.48	g/mL	548	kL	9.40E+00	uCi/g	Jan 1 2001 12:00AM
241-AY-102	241Pu	Sludge (Solids)	4.42E+03	Ci	E	1.48	g/mL	548	kL	5.45E+00	uCi/g	Jan 1 2001 12:00AM
241-AY-102	242Cm	Sludge (Solids)	1.40E+01	Ci	E	1.48	g/mL	548	kL	1.72E-02	uCi/g	Jan 1 2001 12:00AM
241-AY-102	242Pu	Sludge (Solids)	4.27E-02	Ci	E	1.48	g/mL	548	kL	5.26E-05	uCi/g	Jan 1 2001 12:00AM
241-AY-102	243Am	Sludge (Solids)	5.60E-01	Ci	E	1.48	g/mL	548	kL	6.91E-04	uCi/g	Jan 1 2001 12:00AM
241-AY-102	243Cm	Sludge (Solids)	1.27E+00	Ci	E	1.48	g/mL	548	kL	1.57E-03	uCi/g	Jan 1 2001 12:00AM
241-AY-102	244Cm	Sludge (Solids)	3.03E+01	Ci	E	1.48	g/mL	548	kL	3.73E-02	uCi/g	Jan 1 2001 12:00AM
241-AY-102	3H	Sludge (Solids)	7.31E+00	Ci	S	1.48	g/mL	548	kL	9.01E-03	uCi/g	Jan 1 2001 12:00AM
241-AY-102	59Ni	Sludge (Solids)	1.10E+02	Ci	TE	1.62	g/mL	548	kL	1.17E-01	uCi/g	Jan 1 2001 12:00AM
241-AY-102	60Co	Sludge (Solids)	5.81E-01	Ci	TE	1.62	g/mL	548	kL	6.17E-04	uCi/g	Jan 1 2001 12:00AM
241-AY-102	63Ni	Sludge (Solids)	1.04E+04	Ci	TE	1.62	g/mL	548	kL	1.10E+01	uCi/g	Jan 1 2001 12:00AM
241-AY-102	79Se	Sludge (Solids)	4.39E-02	Ci	TE	1.62	g/mL	548	kL	4.67E-05	uCi/g	Jan 1 2001 12:00AM
241-AY-102	90Sr	Sludge (Solids)	5.27E+06	Ci	S	1.48	g/mL	548	kL	6.50E+03	uCi/g	Jan 1 2001 12:00AM
241-AY-102	90Y	Sludge (Solids)	5.27E+06	Ci	C		g/mL	548	kL		uCi/g	Jan 1 2001 12:00AM
241-AY-102	93mNb	Sludge (Solids)	1.70E+00	Ci	TE	1.62	g/mL	548	kL	1.81E-03	uCi/g	Jan 1 2001 12:00AM
241-AY-102	93Zr	Sludge (Solids)	1.98E+00	Ci	TE	1.62	g/mL	548	kL	2.10E-03	uCi/g	Jan 1 2001 12:00AM
241-AY-102	99Tc	Sludge (Solids)	1.39E+01	Ci	S	1.48	g/mL	548	kL	1.72E-02	uCi/g	Jan 1 2001 12:00AM
241-AY-102	Ag	Sludge (Solids)	2.52E+01	kg	S	1.45	g/mL	548	kL	3.18E+01	ug/g	Jan 1 2001 12:00AM
241-AY-102	Al	Sludge (Solids)	3.87E+04	kg	S	1.45	g/mL	548	kL	4.87E+04	ug/g	Jan 1 2001 12:00AM

CALCULATION SHEET

PROJECT: RPP-WTP
JOB NO.: 24590
CALC NO.: 24590-WTP-M4C-FRP-00001
SHEET REV: 0A
SHEET NO.: 93

BY: E. Berrios
DATE: 12/04/02

SUBJECT: Updated Emissions Run Feed Vector

Tank Name	Analyte	Waste Phase	Inventory	Inventory Units	Basis	Density	Density Units	Volume	Volume Units	Concentration	Concentration Units	Decay Date
241-AY-102	As	Sludge (Solids)	2.09E+01	kg	S	1.56	g/mL	548	kL	2.45E+01	ug/g	Jan 1 2001 12:00AM
241-AY-102	B	Sludge (Solids)	3.52E+01	kg	S	1.45	g/mL	548	kL	4.44E+01	ug/g	Jan 1 2001 12:00AM
241-AY-102	Ba	Sludge (Solids)	6.84E+02	kg	S	1.45	g/mL	548	kL	8.61E+02	ug/g	Jan 1 2001 12:00AM
241-AY-102	Be	Sludge (Solids)	2.63E+00	kg	S	1.56	g/mL	548	kL	3.07E+00	ug/g	Jan 1 2001 12:00AM
241-AY-102	Bi	Sludge (Solids)	1.52E+02	kg	S	1.45	g/mL	548	kL	1.91E+02	ug/g	Jan 1 2001 12:00AM
241-AY-102	Ca	Sludge (Solids)	4.59E+03	kg	S	1.45	g/mL	548	kL	5.78E+03	ug/g	Jan 1 2001 12:00AM
241-AY-102	Cd	Sludge (Solids)	1.03E+02	kg	S	1.45	g/mL	548	kL	1.29E+02	ug/g	Jan 1 2001 12:00AM
241-AY-102	Ce	Sludge (Solids)	7.13E+02	kg	S	1.45	g/mL	548	kL	8.98E+02	ug/g	Jan 1 2001 12:00AM
241-AY-102	Cl	Sludge (Solids)	1.24E+02	kg	S	1.45	g/mL	548	kL	1.56E+02	ug/g	Jan 1 2001 12:00AM
241-AY-102	Co	Sludge (Solids)	2.37E+01	kg	S	1.45	g/mL	548	kL	2.99E+01	ug/g	Jan 1 2001 12:00AM
241-AY-102	Cr	Sludge (Solids)	1.48E+03	kg	S	1.45	g/mL	548	kL	1.86E+03	ug/g	Jan 1 2001 12:00AM
241-AY-102	Cu	Sludge (Solids)	2.01E+02	kg	S	1.45	g/mL	548	kL	2.54E+02	ug/g	Jan 1 2001 12:00AM
241-AY-102	F	Sludge (Solids)	2.49E+02	kg	S	1.45	g/mL	548	kL	3.13E+02	ug/g	Jan 1 2001 12:00AM
241-AY-102	Fe	Sludge (Solids)	8.69E+04	kg	S	1.45	g/mL	548	kL	1.09E+05	ug/g	Jan 1 2001 12:00AM
241-AY-102	Hg	Sludge (Solids)	1.13E+02	kg	S	1.48	g/mL	548	kL	1.39E+02	ug/g	Jan 1 2001 12:00AM
241-AY-102	K	Sludge (Solids)	5.23E+02	kg	S	1.45	g/mL	548	kL	6.58E+02	ug/g	Jan 1 2001 12:00AM
241-AY-102	La	Sludge (Solids)	1.12E+03	kg	S	1.45	g/mL	548	kL	1.42E+03	ug/g	Jan 1 2001 12:00AM
241-AY-102	Li	Sludge (Solids)	4.34E+01	kg	S	1.45	g/mL	548	kL	5.46E+01	ug/g	Jan 1 2001 12:00AM
241-AY-102	Mg	Sludge (Solids)	1.74E+03	kg	S	1.45	g/mL	548	kL	2.19E+03	ug/g	Jan 1 2001 12:00AM
241-AY-102	Mn	Sludge (Solids)	1.15E+04	kg	S	1.45	g/mL	548	kL	1.45E+04	ug/g	Jan 1 2001 12:00AM
241-AY-102	Mo	Sludge (Solids)	9.17E+00	kg	S	1.56	g/mL	548	kL	1.07E+01	ug/g	Jan 1 2001 12:00AM
241-AY-102	Na	Sludge (Solids)	5.33E+04	kg	S	1.45	g/mL	548	kL	6.71E+04	ug/g	Jan 1 2001 12:00AM
241-AY-102	Nd	Sludge (Solids)	1.02E+03	kg	S	1.45	g/mL	548	kL	1.28E+03	ug/g	Jan 1 2001 12:00AM
241-AY-102	NH3	Sludge (Solids)	1.63E+03	kg	S	1.48	g/mL	548	kL	2.01E+03	ug/g	Jan 1 2001 12:00AM
241-AY-102	Ni	Sludge (Solids)	2.11E+03	kg	S	1.45	g/mL	548	kL	2.65E+03	ug/g	Jan 1 2001 12:00AM
241-AY-102	NO2	Sludge (Solids)	5.16E+01	kg	S	1.45	g/mL	548	kL	6.50E+01	ug/g	Jan 1 2001 12:00AM
241-AY-102	NO3	Sludge (Solids)	2.91E+01	kg	S	1.45	g/mL	548	kL	3.66E+01	ug/g	Jan 1 2001 12:00AM
241-AY-102	Oxalate	Sludge (Solids)	1.77E+03	kg	S	1.45	g/mL	548	kL	2.23E+03	ug/g	Jan 1 2001 12:00AM
241-AY-102	Pb	Sludge (Solids)	3.52E+03	kg	S	1.45	g/mL	548	kL	4.43E+03	ug/g	Jan 1 2001 12:00AM
241-AY-102	PO4	Sludge (Solids)	9.04E+03	kg	S	1.45	g/mL	548	kL	1.14E+04	ug/g	Jan 1 2001 12:00AM
241-AY-102	Pr	Sludge (Solids)	3.01E+02	kg	S	1.56	g/mL	548	kL	3.52E+02	ug/g	Jan 1 2001 12:00AM
241-AY-102	Ru	Sludge (Solids)	4.36E+02	kg	S	1.56	g/mL	548	kL	5.11E+02	ug/g	Jan 1 2001 12:00AM
241-AY-102	Sb	Sludge (Solids)	2.38E+00	kg	S	1.56	g/mL	548	kL	2.78E+00	ug/g	Jan 1 2001 12:00AM
241-AY-102	Se	Sludge (Solids)	5.02E-01	kg	S	1.56	g/mL	548	kL	5.87E-01	ug/g	Jan 1 2001 12:00AM
241-AY-102	Si	Sludge (Solids)	1.13E+02	kg	S	1.45	g/mL	548	kL	1.42E+02	ug/g	Jan 1 2001 12:00AM
241-AY-102	SO4	Sludge (Solids)	1.51E+03	kg	S	1.45	g/mL	548	kL	1.91E+03	ug/g	Jan 1 2001 12:00AM
241-AY-102	Sr	Sludge (Solids)	2.28E+02	kg	S	1.45	g/mL	548	kL	2.88E+02	ug/g	Jan 1 2001 12:00AM
241-AY-102	Te	Sludge (Solids)	9.48E+01	kg	S	1.56	g/mL	548	kL	1.11E+02	ug/g	Jan 1 2001 12:00AM
241-AY-102	Th	Sludge (Solids)	4.53E+02	kg	S	1.48	g/mL	548	kL	5.58E+02	ug/g	Jan 1 2001 12:00AM
241-AY-102	Ti	Sludge (Solids)	1.10E+02	kg	S	1.45	g/mL	548	kL	1.38E+02	ug/g	Jan 1 2001 12:00AM
241-AY-102	TIC as CO3	Sludge (Solids)	5.45E+04	kg	S	1.45	g/mL	548	kL	6.86E+04	ug/g	Jan 1 2001 12:00AM
241-AY-102	Tl	Sludge (Solids)	2.96E+00	kg	S	1.56	g/mL	548	kL	3.46E+00	ug/g	Jan 1 2001 12:00AM
241-AY-102	UTOTAL	Sludge (Solids)	2.35E+03	kg	S	1.45	g/mL	548	kL	2.96E+03	ug/g	Jan 1 2001 12:00AM
241-AY-102	V	Sludge (Solids)	2.98E+01	kg	S	1.48	g/mL	548	kL	3.67E+01	ug/g	Jan 1 2001 12:00AM
241-AY-102	Y	Sludge (Solids)	9.81E+01	kg	S	1.48	g/mL	548	kL	1.21E+02	ug/g	Jan 1 2001 12:00AM
241-AY-102	Zn	Sludge (Solids)	1.52E+02	kg	S	1.45	g/mL	548	kL	1.91E+02	ug/g	Jan 1 2001 12:00AM

CALCULATION SHEET

PROJECT: RPP-WTP
JOB NO.: 24590
CALC NO.: 24590-WTP-M4C-FRP-00001
SHEET REV: 0A
SHEET NO.: 94

BY: E. Berrios
DATE: 12/04/02

SUBJECT: Updated Emissions Run Feed Vector

Tank Name	Analyte	Waste Phase	Inventory	Inventory Units	Basis	Density	Density Units	Volume	Volume Units	Concentration	Concentration Units	Decay Date
241-AY-102	Zr	Sludge (Solids)	2.86E+01	kg	S	1.45	g/mL	548	kL	3.60E+01	ug/g	Jan 1 2001 12:00AM
241-AZ-101	106Ru	Sludge (Solids)	3.86E+02	Ci	S	1.67	g/mL	173	kL	1.66E+00	uCi/g	Jan 1 2001 12:00AM
241-AZ-101	113mCd	Sludge (Solids)	1.93E+03	Ci	TE	1.51	g/mL	173	kL	8.96E+00	uCi/g	Jan 1 2001 12:00AM
241-AZ-101	125Sb	Sludge (Solids)	6.18E+03	Ci	S	1.68	g/mL	173	kL	2.13E+01	uCi/g	Jan 1 2001 12:00AM
241-AZ-101	126Sn	Sludge (Solids)	2.31E+01	Ci	S	1.68	g/mL	173	kL	7.94E-02	uCi/g	Jan 1 2001 12:00AM
241-AZ-101	129I	Sludge (Solids)	1.17E-01	Ci	TE	1.51	g/mL	173	kL	5.40E-04	uCi/g	Jan 1 2001 12:00AM
241-AZ-101	134Cs	Sludge (Solids)	2.81E+02	Ci	S	1.68	g/mL	173	kL	9.67E-01	uCi/g	Jan 1 2001 12:00AM
241-AZ-101	137Cs	Sludge (Solids)	2.98E+05	Ci	S	1.68	g/mL	173	kL	1.02E+03	uCi/g	Jan 1 2001 12:00AM
241-AZ-101	137mBa	Sludge (Solids)	2.82E+05	Ci	C		g/mL	173	kL		uCi/g	Jan 1 2001 12:00AM
241-AZ-101	14C	Sludge (Solids)	4.72E-01	Ci	S	1.68	g/mL	173	kL	1.62E-03	uCi/g	Jan 1 2001 12:00AM
241-AZ-101	151Sm	Sludge (Solids)	1.60E+05	Ci	TE	1.51	g/mL	173	kL	7.42E+02	uCi/g	Jan 1 2001 12:00AM
241-AZ-101	152Eu	Sludge (Solids)	1.31E+02	Ci	TE	1.51	g/mL	173	kL	6.07E-01	uCi/g	Jan 1 2001 12:00AM
241-AZ-101	154Eu	Sludge (Solids)	1.35E+04	Ci	S	1.68	g/mL	173	kL	4.63E+01	uCi/g	Jan 1 2001 12:00AM
241-AZ-101	155Eu	Sludge (Solids)	1.74E+04	Ci	S	1.68	g/mL	173	kL	6.00E+01	uCi/g	Jan 1 2001 12:00AM
241-AZ-101	226Ra	Sludge (Solids)	2.32E-04	Ci	TE	1.51	g/mL	173	kL	1.08E-06	uCi/g	Jan 1 2001 12:00AM
241-AZ-101	227Ac	Sludge (Solids)	2.61E-03	Ci	TE	1.51	g/mL	173	kL	1.21E-05	uCi/g	Jan 1 2001 12:00AM
241-AZ-101	228Ra	Sludge (Solids)	3.11E-03	Ci	TE	1.51	g/mL	173	kL	1.44E-05	uCi/g	Jan 1 2001 12:00AM
241-AZ-101	229Th	Sludge (Solids)	1.94E-06	Ci	TE	1.51	g/mL	173	kL	8.97E-09	uCi/g	Jan 1 2001 12:00AM
241-AZ-101	231Pa	Sludge (Solids)	7.77E-03	Ci	TE	1.51	g/mL	173	kL	3.60E-05	uCi/g	Jan 1 2001 12:00AM
241-AZ-101	232Th	Sludge (Solids)	8.12E-03	Ci	S	1.68	g/mL	173	kL	2.79E-05	uCi/g	Jan 1 2001 12:00AM
241-AZ-101	232U	Sludge (Solids)	2.77E-02	Ci	C	1.68	g/mL	173	kL	9.53E-05	uCi/g	Jan 1 2001 12:00AM
241-AZ-101	233U	Sludge (Solids)	1.13E-01	Ci	C	1.68	g/mL	173	kL	3.89E-04	uCi/g	Jan 1 2001 12:00AM
241-AZ-101	234U	Sludge (Solids)	7.86E-01	Ci	C	1.68	g/mL	173	kL	2.71E-03	uCi/g	Jan 1 2001 12:00AM
241-AZ-101	235U	Sludge (Solids)	2.99E-02	Ci	C	1.68	g/mL	173	kL	1.03E-04	uCi/g	Jan 1 2001 12:00AM
241-AZ-101	236U	Sludge (Solids)	6.37E-02	Ci	C	1.68	g/mL	173	kL	2.19E-04	uCi/g	Jan 1 2001 12:00AM
241-AZ-101	237Np	Sludge (Solids)	1.34E+01	Ci	S	1.68	g/mL	173	kL	4.60E-02	uCi/g	Jan 1 2001 12:00AM
241-AZ-101	238Pu	Sludge (Solids)	1.33E+02	Ci	C	1.68	g/mL	173	kL	4.56E-01	uCi/g	Jan 1 2001 12:00AM
241-AZ-101	238U	Sludge (Solids)	5.44E-01	Ci	C	1.68	g/mL	173	kL	1.87E-03	uCi/g	Jan 1 2001 12:00AM
241-AZ-101	239Pu	Sludge (Solids)	1.15E+03	Ci	C	1.68	g/mL	173	kL	3.95E+00	uCi/g	Jan 1 2001 12:00AM
241-AZ-101	240Pu	Sludge (Solids)	3.46E+02	Ci	C	1.68	g/mL	173	kL	1.19E+00	uCi/g	Jan 1 2001 12:00AM
241-AZ-101	241Am	Sludge (Solids)	2.55E+04	Ci	S	1.68	g/mL	173	kL	8.79E+01	uCi/g	Jan 1 2001 12:00AM
241-AZ-101	241Pu	Sludge (Solids)	1.02E+04	Ci	C	1.68	g/mL	173	kL	3.51E+01	uCi/g	Jan 1 2001 12:00AM
241-AZ-101	242Cm	Sludge (Solids)	2.30E+01	Ci	C	1.68	g/mL	173	kL	7.90E-02	uCi/g	Jan 1 2001 12:00AM
241-AZ-101	242Pu	Sludge (Solids)	5.35E-02	Ci	C	1.68	g/mL	173	kL	1.84E-04	uCi/g	Jan 1 2001 12:00AM
241-AZ-101	243Am	Sludge (Solids)	5.40E+00	Ci	C	1.68	g/mL	173	kL	1.86E-02	uCi/g	Jan 1 2001 12:00AM
241-AZ-101	243Cm	Sludge (Solids)	3.36E+00	Ci	C	1.68	g/mL	173	kL	1.15E-02	uCi/g	Jan 1 2001 12:00AM
241-AZ-101	244Cm	Sludge (Solids)	7.53E+01	Ci	C	1.68	g/mL	173	kL	2.59E-01	uCi/g	Jan 1 2001 12:00AM
241-AZ-101	3H	Sludge (Solids)	4.05E+00	Ci	S	1.68	g/mL	173	kL	1.39E-02	uCi/g	Jan 1 2001 12:00AM
241-AZ-101	59Ni	Sludge (Solids)	2.68E+01	Ci	TE	1.51	g/mL	173	kL	1.24E-01	uCi/g	Jan 1 2001 12:00AM
241-AZ-101	60Co	Sludge (Solids)	1.09E+03	Ci	S	1.68	g/mL	173	kL	3.75E+00	uCi/g	Jan 1 2001 12:00AM
241-AZ-101	63Ni	Sludge (Solids)	2.95E+03	Ci	TE	1.51	g/mL	173	kL	1.37E+01	uCi/g	Jan 1 2001 12:00AM
241-AZ-101	79Se	Sludge (Solids)	4.67E-01	Ci	S	1.67	g/mL	173	kL	2.00E-03	uCi/g	Jan 1 2001 12:00AM
241-AZ-101	90Sr	Sludge (Solids)	4.94E+06	Ci	S	1.68	g/mL	173	kL	1.70E+04	uCi/g	Jan 1 2001 12:00AM
241-AZ-101	90Y	Sludge (Solids)	4.94E+06	Ci	C		g/mL	173	kL		uCi/g	Jan 1 2001 12:00AM
241-AZ-101	93mNb	Sludge (Solids)	1.33E+02	Ci	TE	1.51	g/mL	173	kL	6.17E-01	uCi/g	Jan 1 2001 12:00AM
241-AZ-101	93Zr	Sludge (Solids)	2.35E+02	Ci	TE	1.51	g/mL	173	kL	1.09E+00	uCi/g	Jan 1 2001 12:00AM
241-AZ-101	99Tc	Sludge (Solids)	6.41E+01	Ci	S	1.68	g/mL	173	kL	2.21E-01	uCi/g	Jan 1 2001 12:00AM

CALCULATION SHEET

PROJECT: RPP-WTP
JOB NO.: 24590
CALC NO.: 24590-WTP-M4C-FRP-00001
SHEET REV: 0A
SHEET NO.: 95

BY: E. Berrios
DATE: 12/04/02

SUBJECT: Updated Emissions Run Feed Vector

Tank Name	Analyte	Waste Phase	Inventory	Inventory Units	Basis	Density	Density Units	Volume	Volume Units	Concentration	Concentration Units	Decay Date
241-AZ-101	Ag	Sludge (Solids)	4.88E+01	kg	S	1.68	g/mL	173	kL	1.68E+02	ug/g	Jan 1 2001 12:00AM
241-AZ-101	Al	Sludge (Solids)	1.61E+04	kg	S	1.68	g/mL	173	kL	5.55E+04	ug/g	Jan 1 2001 12:00AM
241-AZ-101	As	Sludge (Solids)	1.73E+01	kg	S	1.68	g/mL	173	kL	5.95E+01	ug/g	Jan 1 2001 12:00AM
241-AZ-101	B	Sludge (Solids)	7.83E+01	kg	S	1.68	g/mL	173	kL	2.69E+02	ug/g	Jan 1 2001 12:00AM
241-AZ-101	Ba	Sludge (Solids)	1.94E+02	kg	S	1.68	g/mL	173	kL	6.67E+02	ug/g	Jan 1 2001 12:00AM
241-AZ-101	Be	Sludge (Solids)	2.75E+00	kg	S	1.68	g/mL	173	kL	9.45E+00	ug/g	Jan 1 2001 12:00AM
241-AZ-101	Bi	Sludge (Solids)	1.97E+01	kg	S	1.68	g/mL	173	kL	6.80E+01	ug/g	Jan 1 2001 12:00AM
241-AZ-101	Cd	Sludge (Solids)	1.88E+03	kg	S	1.68	g/mL	173	kL	6.49E+03	ug/g	Jan 1 2001 12:00AM
241-AZ-101	Ce	Sludge (Solids)	2.30E+02	kg	S	1.68	g/mL	173	kL	7.91E+02	ug/g	Jan 1 2001 12:00AM
241-AZ-101	Cl	Sludge (Solids)	2.92E+01	kg	S	1.67	g/mL	173	kL	1.25E+02	ug/g	Jan 1 2001 12:00AM
241-AZ-101	Co	Sludge (Solids)	1.23E+01	kg	S	1.68	g/mL	173	kL	4.23E+01	ug/g	Jan 1 2001 12:00AM
241-AZ-101	Cr	Sludge (Solids)	1.64E+02	kg	S	1.68	g/mL	173	kL	5.65E+02	ug/g	Jan 1 2001 12:00AM
241-AZ-101	Cu	Sludge (Solids)	6.37E+01	kg	S	1.68	g/mL	173	kL	2.19E+02	ug/g	Jan 1 2001 12:00AM
241-AZ-101	F	Sludge (Solids)	1.41E+03	kg	S	1.68	g/mL	173	kL	4.84E+03	ug/g	Jan 1 2001 12:00AM
241-AZ-101	Fe	Sludge (Solids)	2.21E+04	kg	S	1.68	g/mL	173	kL	7.61E+04	ug/g	Jan 1 2001 12:00AM
241-AZ-101	Hg	Sludge (Solids)	5.58E-01	kg	S	1.68	g/mL	173	kL	1.92E+00	ug/g	Jan 1 2001 12:00AM
241-AZ-101	K	Sludge (Solids)	9.56E+02	kg	S	1.68	g/mL	173	kL	3.29E+03	ug/g	Jan 1 2001 12:00AM
241-AZ-101	La	Sludge (Solids)	9.85E+02	kg	S	1.68	g/mL	173	kL	3.39E+03	ug/g	Jan 1 2001 12:00AM
241-AZ-101	Li	Sludge (Solids)	1.70E+02	kg	S	1.68	g/mL	173	kL	5.85E+02	ug/g	Jan 1 2001 12:00AM
241-AZ-101	Mg	Sludge (Solids)	1.78E+02	kg	S	1.68	g/mL	173	kL	6.14E+02	ug/g	Jan 1 2001 12:00AM
241-AZ-101	Mn	Sludge (Solids)	2.84E+02	kg	S	1.68	g/mL	173	kL	9.78E+02	ug/g	Jan 1 2001 12:00AM
241-AZ-101	Mo	Sludge (Solids)	1.23E+01	kg	S	1.68	g/mL	173	kL	4.21E+01	ug/g	Jan 1 2001 12:00AM
241-AZ-101	Na	Sludge (Solids)	2.63E+04	kg	S	1.68	g/mL	173	kL	9.05E+04	ug/g	Jan 1 2001 12:00AM
241-AZ-101	Nd	Sludge (Solids)	5.99E+02	kg	S	1.68	g/mL	173	kL	2.06E+03	ug/g	Jan 1 2001 12:00AM
241-AZ-101	Ni	Sludge (Solids)	1.37E+03	kg	S	1.68	g/mL	173	kL	4.70E+03	ug/g	Jan 1 2001 12:00AM
241-AZ-101	NO2	Sludge (Solids)	1.10E+04	kg	S	1.68	g/mL	173	kL	3.78E+04	ug/g	Jan 1 2001 12:00AM
241-AZ-101	NO3	Sludge (Solids)	1.03E+04	kg	S	1.68	g/mL	173	kL	3.56E+04	ug/g	Jan 1 2001 12:00AM
241-AZ-101	OH	Sludge (Solids)	1.39E+03	kg	S	1.68	g/mL	173	kL	4.80E+03	ug/g	Jan 1 2001 12:00AM
241-AZ-101	Oxalate	Sludge (Solids)	1.47E+03	kg	S	1.68	g/mL	173	kL	5.08E+03	ug/g	Jan 1 2001 12:00AM
241-AZ-101	Pb	Sludge (Solids)	8.57E+01	kg	S	1.68	g/mL	173	kL	2.95E+02	ug/g	Jan 1 2001 12:00AM
241-AZ-101	Pd	Sludge (Solids)	3.74E-04	kg	S	1.67	g/mL	173	kL	1.60E-03	ug/g	Jan 1 2001 12:00AM
241-AZ-101	PO4	Sludge (Solids)	1.06E+02	kg	S	1.68	g/mL	173	kL	3.64E+02	ug/g	Jan 1 2001 12:00AM
241-AZ-101	Pr	Sludge (Solids)	1.28E+02	kg	S	1.68	g/mL	173	kL	4.40E+02	ug/g	Jan 1 2001 12:00AM
241-AZ-101	Rb	Sludge (Solids)	3.74E+00	kg	S	1.68	g/mL	173	kL	1.29E+01	ug/g	Jan 1 2001 12:00AM
241-AZ-101	Rh	Sludge (Solids)	4.70E+01	kg	S	1.68	g/mL	173	kL	1.62E+02	ug/g	Jan 1 2001 12:00AM
241-AZ-101	Ru	Sludge (Solids)	3.79E+02	kg	S	1.68	g/mL	173	kL	1.30E+03	ug/g	Jan 1 2001 12:00AM
241-AZ-101	Sb	Sludge (Solids)	2.15E+00	kg	S	1.68	g/mL	173	kL	7.40E+00	ug/g	Jan 1 2001 12:00AM
241-AZ-101	Se	Sludge (Solids)	7.16E+00	kg	S	1.68	g/mL	173	kL	2.46E+01	ug/g	Jan 1 2001 12:00AM
241-AZ-101	Si	Sludge (Solids)	4.47E+02	kg	S	1.68	g/mL	173	kL	1.54E+03	ug/g	Jan 1 2001 12:00AM
241-AZ-101	SO4	Sludge (Solids)	7.59E+03	kg	S	1.68	g/mL	173	kL	2.61E+04	ug/g	Jan 1 2001 12:00AM
241-AZ-101	Sr	Sludge (Solids)	9.17E+01	kg	S	1.68	g/mL	173	kL	3.16E+02	ug/g	Jan 1 2001 12:00AM
241-AZ-101	Ta	Sludge (Solids)	2.15E+00	kg	S	1.68	g/mL	173	kL	7.40E+00	ug/g	Jan 1 2001 12:00AM
241-AZ-101	Te	Sludge (Solids)	2.36E+01	kg	S	1.68	g/mL	173	kL	8.14E+01	ug/g	Jan 1 2001 12:00AM
241-AZ-101	Th	Sludge (Solids)	7.78E+01	kg	S	1.68	g/mL	173	kL	2.68E+02	ug/g	Jan 1 2001 12:00AM
241-AZ-101	Ti	Sludge (Solids)	9.62E+00	kg	S	1.68	g/mL	173	kL	3.31E+01	ug/g	Jan 1 2001 12:00AM
241-AZ-101	TIC as CO3	Sludge (Solids)	7.50E+03	kg	S	1.68	g/mL	173	kL	2.58E+04	ug/g	Jan 1 2001 12:00AM

CALCULATION SHEET

PROJECT: RPP-WTP
JOB NO.: 24590
CALC NO.: 24590-WTP-M4C-FRP-00001
SHEET REV: 0A
SHEET NO.: 96

BY: E. Berrios
DATE: 12/04/02

SUBJECT: Updated Emissions Run Feed Vector

Tank Name	Analyte	Waste Phase	Inventory	Inventory Units	Basis	Density	Density Units	Volume	Volume Units	Concentration	Concentration Units	Decay Date
241-AZ-101	Tl	Sludge (Solids)	2.15E+00	kg	S	1.68	g/mL	173	kL	7.40E+00	ug/g	Jan 1 2001 12:00AM
241-AZ-101	UTOTAL	Sludge (Solids)	1.63E+03	kg	S	1.68	g/mL	173	kL	5.62E+03	ug/g	Jan 1 2001 12:00AM
241-AZ-101	V	Sludge (Solids)	5.35E+00	kg	S	1.67	g/mL	173	kL	2.29E+01	ug/g	Jan 1 2001 12:00AM
241-AZ-101	Zn	Sludge (Solids)	2.56E+01	kg	S	1.68	g/mL	173	kL	8.81E+01	ug/g	Jan 1 2001 12:00AM
241-AZ-101	Zr	Sludge (Solids)	7.85E+03	kg	S	1.68	g/mL	173	kL	2.70E+04	ug/g	Jan 1 2001 12:00AM
241-AZ-102	106Ru	Sludge	6.21E+02	Ci	E	1.47	g/mL	396	kL	1.06E+00	uCi/g	Jan 1 2001 12:00AM
241-AZ-102	113mCd	Sludge	8.16E+02	Ci	E	1.47	g/mL	396	kL	1.40E+00	uCi/g	Jan 1 2001 12:00AM
241-AZ-102	125Sb	Sludge	4.93E+03	Ci	S	1.41	g/mL	396	kL	8.83E+00	uCi/g	Jan 1 2001 12:00AM
241-AZ-102	126Sn	Sludge	1.25E+01	Ci	E	1.47	g/mL	396	kL	2.14E-02	uCi/g	Jan 1 2001 12:00AM
241-AZ-102	129I	Sludge	1.40E+00	Ci	E	1.47	g/mL	396	kL	2.40E-03	uCi/g	Jan 1 2001 12:00AM
241-AZ-102	134Cs	Sludge	4.47E+02	Ci	S	1.41	g/mL	396	kL	8.00E-01	uCi/g	Jan 1 2001 12:00AM
241-AZ-102	137Cs	Sludge	4.92E+05	Ci	S	1.41	g/mL	396	kL	8.82E+02	uCi/g	Jan 1 2001 12:00AM
241-AZ-102	137mBa	Sludge	4.66E+05	Ci	C		g/mL	396	kL		uCi/g	Jan 1 2001 12:00AM
241-AZ-102	14C	Sludge	4.80E-01	Ci	S	1.41	g/mL	396	kL	8.60E-04	uCi/g	Jan 1 2001 12:00AM
241-AZ-102	151Sm	Sludge	6.69E+04	Ci	E	1.47	g/mL	396	kL	1.15E+02	uCi/g	Jan 1 2001 12:00AM
241-AZ-102	152Eu	Sludge	5.23E+01	Ci	E	1.47	g/mL	396	kL	8.96E-02	uCi/g	Jan 1 2001 12:00AM
241-AZ-102	154Eu	Sludge	7.29E+03	Ci	S	1.41	g/mL	396	kL	1.31E+01	uCi/g	Jan 1 2001 12:00AM
241-AZ-102	155Eu	Sludge	1.30E+04	Ci	S	1.41	g/mL	396	kL	2.33E+01	uCi/g	Jan 1 2001 12:00AM
241-AZ-102	226Ra	Sludge	8.50E-05	Ci	E	1.47	g/mL	396	kL	1.46E-07	uCi/g	Jan 1 2001 12:00AM
241-AZ-102	227Ac	Sludge	7.40E-04	Ci	E	1.47	g/mL	396	kL	1.27E-06	uCi/g	Jan 1 2001 12:00AM
241-AZ-102	228Ra	Sludge	5.30E-03	Ci	E	1.47	g/mL	396	kL	9.07E-06	uCi/g	Jan 1 2001 12:00AM
241-AZ-102	229Th	Sludge	6.83E-07	Ci	E	1.47	g/mL	396	kL	1.17E-09	uCi/g	Jan 1 2001 12:00AM
241-AZ-102	231Pa	Sludge	1.77E-03	Ci	E	1.47	g/mL	396	kL	3.03E-06	uCi/g	Jan 1 2001 12:00AM
241-AZ-102	232Th	Sludge	9.83E-03	Ci	S	1.41	g/mL	396	kL	1.76E-05	uCi/g	Jan 1 2001 12:00AM
241-AZ-102	232U	Sludge	1.07E-02	Ci	C	1.41	g/mL	396	kL	1.92E-05	uCi/g	Jan 1 2001 12:00AM
241-AZ-102	233U	Sludge	4.17E-02	Ci	C	1.41	g/mL	396	kL	7.47E-05	uCi/g	Jan 1 2001 12:00AM
241-AZ-102	234U	Sludge	2.89E+00	Ci	C	1.41	g/mL	396	kL	5.17E-03	uCi/g	Jan 1 2001 12:00AM
241-AZ-102	235U	Sludge	6.88E-02	Ci	C	1.41	g/mL	396	kL	1.23E-04	uCi/g	Jan 1 2001 12:00AM
241-AZ-102	236U	Sludge	1.41E-01	Ci	C	1.41	g/mL	396	kL	2.52E-04	uCi/g	Jan 1 2001 12:00AM
241-AZ-102	237Np	Sludge	1.31E+01	Ci	S	1.41	g/mL	396	kL	2.34E-02	uCi/g	Jan 1 2001 12:00AM
241-AZ-102	238Pu	Sludge	1.79E+02	Ci	C	1.41	g/mL	396	kL	3.20E-01	uCi/g	Jan 1 2001 12:00AM
241-AZ-102	238U	Sludge	1.16E+00	Ci	C	1.41	g/mL	396	kL	2.09E-03	uCi/g	Jan 1 2001 12:00AM
241-AZ-102	239Pu	Sludge	1.54E+03	Ci	C	1.41	g/mL	396	kL	2.75E+00	uCi/g	Jan 1 2001 12:00AM
241-AZ-102	240Pu	Sludge	4.58E+02	Ci	C	1.41	g/mL	396	kL	8.20E-01	uCi/g	Jan 1 2001 12:00AM
241-AZ-102	241Am	Sludge	1.88E+04	Ci	S	1.41	g/mL	396	kL	3.36E+01	uCi/g	Jan 1 2001 12:00AM
241-AZ-102	241Pu	Sludge	1.32E+04	Ci	C	1.41	g/mL	396	kL	2.36E+01	uCi/g	Jan 1 2001 12:00AM
241-AZ-102	242Cm	Sludge	6.52E+00	Ci	C	1.41	g/mL	396	kL	1.17E-02	uCi/g	Jan 1 2001 12:00AM
241-AZ-102	242Pu	Sludge	6.57E-02	Ci	C	1.41	g/mL	396	kL	1.18E-04	uCi/g	Jan 1 2001 12:00AM
241-AZ-102	243Am	Sludge	5.61E+00	Ci	C	1.41	g/mL	396	kL	1.00E-02	uCi/g	Jan 1 2001 12:00AM
241-AZ-102	243Cm	Sludge	8.39E-01	Ci	C	1.41	g/mL	396	kL	1.50E-03	uCi/g	Jan 1 2001 12:00AM
241-AZ-102	244Cm	Sludge	4.08E+01	Ci	C	1.41	g/mL	396	kL	7.31E-02	uCi/g	Jan 1 2001 12:00AM
241-AZ-102	3H	Sludge	1.22E+01	Ci	S	1.41	g/mL	396	kL	2.19E-02	uCi/g	Jan 1 2001 12:00AM
241-AZ-102	59Ni	Sludge	1.07E+01	Ci	E	1.47	g/mL	396	kL	1.84E-02	uCi/g	Jan 1 2001 12:00AM
241-AZ-102	60Co	Sludge	7.80E+02	Ci	S	1.41	g/mL	396	kL	1.40E+00	uCi/g	Jan 1 2001 12:00AM
241-AZ-102	63Ni	Sludge	1.19E+03	Ci	E	1.47	g/mL	396	kL	2.03E+00	uCi/g	Jan 1 2001 12:00AM
241-AZ-102	79Se	Sludge	3.51E-01	Ci	S	1.41	g/mL	396	kL	6.29E-04	uCi/g	Jan 1 2001 12:00AM
241-AZ-102	90Sr	Sludge	2.98E+06	Ci	S	1.41	g/mL	396	kL	5.34E+03	uCi/g	Jan 1 2001 12:00AM

CALCULATION SHEET

PROJECT: RPP-WTP
JOB NO.: 24590
CALC NO.: 24590-WTP-M4C-FRP-00001
SHEET REV: 0A
SHEET NO.: 97

BY: E. Berrios
DATE: 12/04/02

SUBJECT: Updated Emissions Run Feed Vector

Tank Name	Analyte	Waste Phase	Inventory	Inventory Units	Basis	Density	Density Units	Volume	Volume Units	Concentration	Concentration Units	Decay Date
241-AZ-102	90Y	Sludge	2.98E+06	Ci	C		g/mL	396	kL		uCi/g	Jan 1 2001 12:00AM
241-AZ-102	93mNb	Sludge	5.25E+01	Ci	E	1.47	g/mL	396	kL	8.99E-02	uCi/g	Jan 1 2001 12:00AM
241-AZ-102	93Zr	Sludge	9.69E+01	Ci	E	1.47	g/mL	396	kL	1.66E-01	uCi/g	Jan 1 2001 12:00AM
241-AZ-102	99Tc	Sludge	8.99E+01	Ci	S	1.41	g/mL	396	kL	1.61E-01	uCi/g	Jan 1 2001 12:00AM
241-AZ-102	Ag	Sludge	2.37E+02	kg	S	1.41	g/mL	396	kL	4.25E+02	ug/g	Jan 1 2001 12:00AM
241-AZ-102	Al	Sludge	1.99E+04	kg	E	1.41	g/mL	396	kL	3.57E+04	ug/g	Jan 1 2001 12:00AM
241-AZ-102	As	Sludge	8.60E+00	kg	S	1.41	g/mL	396	kL	1.54E+01	ug/g	Jan 1 2001 12:00AM
241-AZ-102	B	Sludge	1.52E+02	kg	S	1.41	g/mL	396	kL	2.73E+02	ug/g	Jan 1 2001 12:00AM
241-AZ-102	Be	Sludge	1.97E+00	kg	S	1.41	g/mL	396	kL	3.52E+00	ug/g	Jan 1 2001 12:00AM
241-AZ-102	Bi	Sludge	2.53E+01	kg	S	1.41	g/mL	396	kL	4.53E+01	ug/g	Jan 1 2001 12:00AM
241-AZ-102	Ca	Sludge	6.92E+02	kg	S	1.41	g/mL	396	kL	1.24E+03	ug/g	Jan 1 2001 12:00AM
241-AZ-102	Cd	Sludge	2.71E+03	kg	S	1.41	g/mL	396	kL	4.86E+03	ug/g	Jan 1 2001 12:00AM
241-AZ-102	Ce	Sludge	1.41E+02	kg	S	1.41	g/mL	396	kL	2.53E+02	ug/g	Jan 1 2001 12:00AM
241-AZ-102	Cl	Sludge	9.39E+01	kg	S	1.41	g/mL	396	kL	1.68E+02	ug/g	Jan 1 2001 12:00AM
241-AZ-102	CN	Sludge	5.64E+00	kg	S	1.41	g/mL	396	kL	1.01E+01	ug/g	Jan 1 2001 12:00AM
241-AZ-102	Co	Sludge	1.13E+01	kg	S	1.41	g/mL	396	kL	2.03E+01	ug/g	Jan 1 2001 12:00AM
241-AZ-102	Cr	Sludge	4.56E+02	kg	S	1.41	g/mL	396	kL	8.17E+02	ug/g	Jan 1 2001 12:00AM
241-AZ-102	Cu	Sludge	3.80E+01	kg	S	1.41	g/mL	396	kL	6.81E+01	ug/g	Jan 1 2001 12:00AM
241-AZ-102	F	Sludge	4.79E+02	kg	S	1.41	g/mL	396	kL	8.57E+02	ug/g	Jan 1 2001 12:00AM
241-AZ-102	Fe	Sludge	2.32E+04	kg	S	1.41	g/mL	396	kL	4.16E+04	ug/g	Jan 1 2001 12:00AM
241-AZ-102	Hg	Sludge	3.33E+00	kg	S	1.41	g/mL	396	kL	5.97E+00	ug/g	Jan 1 2001 12:00AM
241-AZ-102	K	Sludge	1.51E+03	kg	S	1.41	g/mL	396	kL	2.70E+03	ug/g	Jan 1 2001 12:00AM
241-AZ-102	La	Sludge	7.93E+02	kg	S	1.41	g/mL	396	kL	1.42E+03	ug/g	Jan 1 2001 12:00AM
241-AZ-102	Li	Sludge	1.65E+00	kg	S	1.41	g/mL	396	kL	2.96E+00	ug/g	Jan 1 2001 12:00AM
241-AZ-102	Mg	Sludge	1.78E+02	kg	S	1.41	g/mL	396	kL	3.18E+02	ug/g	Jan 1 2001 12:00AM
241-AZ-102	Mn	Sludge	5.08E+02	kg	S	1.41	g/mL	396	kL	9.10E+02	ug/g	Jan 1 2001 12:00AM
241-AZ-102	Mo	Sludge	2.02E+01	kg	S	1.41	g/mL	396	kL	3.62E+01	ug/g	Jan 1 2001 12:00AM
241-AZ-102	Na	Sludge	2.67E+04	kg	S	1.41	g/mL	396	kL	4.79E+04	ug/g	Jan 1 2001 12:00AM
241-AZ-102	Nd	Sludge	4.90E+02	kg	S	1.41	g/mL	396	kL	8.78E+02	ug/g	Jan 1 2001 12:00AM
241-AZ-102	Ni	Sludge	1.46E+03	kg	S	1.41	g/mL	396	kL	2.62E+03	ug/g	Jan 1 2001 12:00AM
241-AZ-102	NO2	Sludge	1.67E+04	kg	S	1.41	g/mL	396	kL	2.99E+04	ug/g	Jan 1 2001 12:00AM
241-AZ-102	NO3	Sludge	6.87E+03	kg	S	1.41	g/mL	396	kL	1.23E+04	ug/g	Jan 1 2001 12:00AM
241-AZ-102	OH	Sludge	2.02E+03	kg	S	1.41	g/mL	396	kL	3.62E+03	ug/g	Jan 1 2001 12:00AM
241-AZ-102	Oxalate	Sludge	1.49E+03	kg	S	1.41	g/mL	396	kL	2.66E+03	ug/g	Jan 1 2001 12:00AM
241-AZ-102	Pb	Sludge	2.71E+02	kg	S	1.41	g/mL	396	kL	4.85E+02	ug/g	Jan 1 2001 12:00AM
241-AZ-102	Pd	Sludge	1.62E+01	kg	S	1.41	g/mL	396	kL	2.91E+01	ug/g	Jan 1 2001 12:00AM
241-AZ-102	PO4	Sludge	6.31E+02	kg	S	1.41	g/mL	396	kL	1.13E+03	ug/g	Jan 1 2001 12:00AM
241-AZ-102	Pr	Sludge	9.27E+01	kg	S	1.41	g/mL	396	kL	1.66E+02	ug/g	Jan 1 2001 12:00AM
241-AZ-102	Rb	Sludge	1.39E+00	kg	S	1.41	g/mL	396	kL	2.49E+00	ug/g	Jan 1 2001 12:00AM
241-AZ-102	Rh	Sludge	9.77E+00	kg	S	1.41	g/mL	396	kL	1.75E+01	ug/g	Jan 1 2001 12:00AM
241-AZ-102	Ru	Sludge	4.37E+01	kg	S	1.41	g/mL	396	kL	7.83E+01	ug/g	Jan 1 2001 12:00AM
241-AZ-102	Sb	Sludge	9.88E+00	kg	S	1.41	g/mL	396	kL	1.77E+01	ug/g	Jan 1 2001 12:00AM
241-AZ-102	Se	Sludge	2.79E+00	kg	S	1.41	g/mL	396	kL	4.99E+00	ug/g	Jan 1 2001 12:00AM
241-AZ-102	Si	Sludge	2.49E+03	kg	S	1.41	g/mL	396	kL	4.46E+03	ug/g	Jan 1 2001 12:00AM
241-AZ-102	SO4	Sludge	7.05E+03	kg	S	1.41	g/mL	396	kL	1.26E+04	ug/g	Jan 1 2001 12:00AM
241-AZ-102	Sr	Sludge	4.79E+01	kg	S	1.41	g/mL	396	kL	8.57E+01	ug/g	Jan 1 2001 12:00AM
241-AZ-102	Ta	Sludge	6.53E-01	kg	S	1.41	g/mL	396	kL	1.17E+00	ug/g	Jan 1 2001 12:00AM

CALCULATION SHEET

PROJECT: RPP-WTP
JOB NO.: 24590
CALC NO.: 24590-WTP-M4C-FRP-00001
SHEET REV: 0A
SHEET NO.: 98

BY: E. Berrios
DATE: 12/04/02

SUBJECT: Updated Emissions Run Feed Vector

Tank Name	Analyte	Waste Phase	Inventory	Inventory Units	Basis	Density	Density Units	Volume	Volume Units	Concentration	Concentration Units	Decay Date
241-AZ-102	Te	Sludge	1.54E+01	kg	S	1.41	g/mL	396	kL	2.76E+01	ug/g	Jan 1 2001 12:00AM
241-AZ-102	Th	Sludge	8.93E+01	kg	S	1.41	g/mL	396	kL	1.60E+02	ug/g	Jan 1 2001 12:00AM
241-AZ-102	Ti	Sludge	1.06E+01	kg	S	1.41	g/mL	396	kL	1.90E+01	ug/g	Jan 1 2001 12:00AM
241-AZ-102	TIC as CO3	Sludge	1.90E+04	kg	S	1.41	g/mL	396	kL	3.40E+04	ug/g	Jan 1 2001 12:00AM
241-AZ-102	Tl	Sludge	6.53E-01	kg	S	1.41	g/mL	396	kL	1.17E+00	ug/g	Jan 1 2001 12:00AM
241-AZ-102	UTOTAL	Sludge	3.50E+03	kg	S	1.41	g/mL	396	kL	6.27E+03	ug/g	Jan 1 2001 12:00AM
241-AZ-102	V	Sludge	8.32E+00	kg	S	1.41	g/mL	396	kL	1.49E+01	ug/g	Jan 1 2001 12:00AM
241-AZ-102	W	Sludge	4.84E+00	kg	S	1.41	g/mL	396	kL	8.66E+00	ug/g	Jan 1 2001 12:00AM
241-AZ-102	Y	Sludge	3.41E+01	kg	S	1.41	g/mL	396	kL	6.10E+01	ug/g	Jan 1 2001 12:00AM
241-AZ-102	Zn	Sludge	2.45E+01	kg	S	1.41	g/mL	396	kL	4.39E+01	ug/g	Jan 1 2001 12:00AM
241-AZ-102	Zr	Sludge	3.81E+03	kg	S	1.41	g/mL	396	kL	6.83E+03	ug/g	Jan 1 2001 12:00AM
241-C-104	106Ru	Sludge	4.06E-07	Ci	TS	1.71	g/mL	227	kL	1.45E-09	uCi/g	Jan 1 2001 12:00AM
241-C-104	106Ru	Sludge	1.80E-05	Ci	TE	1.29	g/mL	88	kL	8.40E-08	uCi/g	Jan 1 2001 12:00AM
241-C-104	106Ru	Sludge	0.00E+00	Ci	TE	1.69	g/mL	103	kL	0.00E+00	uCi/g	Jan 1 2001 12:00AM
241-C-104	106Ru	Sludge	2.04E-06	Ci	TE	1.25	g/mL	80	kL	1.03E-08	uCi/g	Jan 1 2001 12:00AM
241-C-104	106Ru	Sludge	1.60E-04	Ci	M	1.46	g/mL	150	kL	5.66E-07	uCi/g	Jan 1 2001 12:00AM
241-C-104	106Ru	Sludge	4.16E-09	Ci	TS	1.49	g/mL	332	kL	8.76E-12	uCi/g	Jan 1 2001 12:00AM
241-C-104	113mCd	Sludge	1.85E+01	Ci	M	1.46	g/mL	150	kL	6.55E-02	uCi/g	Jan 1 2001 12:00AM
241-C-104	113mCd	Sludge	1.63E-01	Ci	TS	1.49	g/mL	332	kL	3.43E-04	uCi/g	Jan 1 2001 12:00AM
241-C-104	113mCd	Sludge	7.56E-02	Ci	TS	1.71	g/mL	227	kL	2.70E-04	uCi/g	Jan 1 2001 12:00AM
241-C-104	113mCd	Sludge	2.36E-01	Ci	TE	1.29	g/mL	88	kL	1.10E-03	uCi/g	Jan 1 2001 12:00AM
241-C-104	113mCd	Sludge	3.34E-01	Ci	TE	1.25	g/mL	80	kL	1.69E-03	uCi/g	Jan 1 2001 12:00AM
241-C-104	113mCd	Sludge	0.00E+00	Ci	TE	1.69	g/mL	103	kL	0.00E+00	uCi/g	Jan 1 2001 12:00AM
241-C-104	125Sb	Sludge	2.71E+01	Ci	S	1.69	g/mL	150	kL	1.07E-01	uCi/g	Jan 1 2001 12:00AM
241-C-104	125Sb	Sludge	5.99E+01	Ci	S	1.69	g/mL	332	kL	1.07E-01	uCi/g	Jan 1 2001 12:00AM
241-C-104	125Sb	Sludge	4.10E+01	Ci	S	1.69	g/mL	227	kL	1.07E-01	uCi/g	Jan 1 2001 12:00AM
241-C-104	125Sb	Sludge	1.59E+01	Ci	S	1.69	g/mL	88	kL	1.07E-01	uCi/g	Jan 1 2001 12:00AM
241-C-104	125Sb	Sludge	1.86E+01	Ci	S	1.69	g/mL	103	kL	1.07E-01	uCi/g	Jan 1 2001 12:00AM
241-C-104	125Sb	Sludge	1.44E+01	Ci	S	1.69	g/mL	80	kL	1.07E-01	uCi/g	Jan 1 2001 12:00AM
241-C-104	126Sn	Sludge	1.67E+00	Ci	M	1.46	g/mL	150	kL	5.92E-03	uCi/g	Jan 1 2001 12:00AM
241-C-104	126Sn	Sludge	8.22E-03	Ci	TS	1.49	g/mL	332	kL	1.73E-05	uCi/g	Jan 1 2001 12:00AM
241-C-104	126Sn	Sludge	2.82E-03	Ci	TS	1.71	g/mL	227	kL	1.01E-05	uCi/g	Jan 1 2001 12:00AM
241-C-104	126Sn	Sludge	7.58E-03	Ci	TE	1.29	g/mL	88	kL	3.54E-05	uCi/g	Jan 1 2001 12:00AM
241-C-104	126Sn	Sludge	0.00E+00	Ci	TE	1.69	g/mL	103	kL	0.00E+00	uCi/g	Jan 1 2001 12:00AM
241-C-104	126Sn	Sludge	2.83E-02	Ci	TE	1.25	g/mL	80	kL	1.43E-04	uCi/g	Jan 1 2001 12:00AM
241-C-104	129I	Sludge	1.15E-01	Ci	S	1.69	g/mL	150	kL	4.55E-04	uCi/g	Jan 1 2001 12:00AM
241-C-104	129I	Sludge	2.55E-01	Ci	S	1.69	g/mL	332	kL	4.55E-04	uCi/g	Jan 1 2001 12:00AM
241-C-104	129I	Sludge	1.75E-01	Ci	S	1.69	g/mL	227	kL	4.55E-04	uCi/g	Jan 1 2001 12:00AM
241-C-104	129I	Sludge	6.77E-02	Ci	S	1.69	g/mL	88	kL	4.55E-04	uCi/g	Jan 1 2001 12:00AM
241-C-104	129I	Sludge	7.92E-02	Ci	S	1.69	g/mL	103	kL	4.55E-04	uCi/g	Jan 1 2001 12:00AM
241-C-104	129I	Sludge	6.15E-02	Ci	S	1.69	g/mL	80	kL	4.55E-04	uCi/g	Jan 1 2001 12:00AM
241-C-104	134Cs	Sludge	1.21E-02	Ci	M	1.46	g/mL	150	kL	4.28E-05	uCi/g	Jan 1 2001 12:00AM
241-C-104	134Cs	Sludge	1.98E-04	Ci	TS	1.49	g/mL	332	kL	4.17E-07	uCi/g	Jan 1 2001 12:00AM
241-C-104	134Cs	Sludge	1.04E-03	Ci	TS	1.71	g/mL	227	kL	3.72E-06	uCi/g	Jan 1 2001 12:00AM
241-C-104	134Cs	Sludge	2.02E-02	Ci	TE	1.29	g/mL	88	kL	9.44E-05	uCi/g	Jan 1 2001 12:00AM
241-C-104	134Cs	Sludge	0.00E+00	Ci	TE	1.69	g/mL	103	kL	0.00E+00	uCi/g	Jan 1 2001 12:00AM

CALCULATION SHEET

PROJECT: RPP-WTP
JOB NO.: 24590
CALC NO.: 24590-WTP-M4C-FRP-00001
SHEET REV: 0A
SHEET NO.: 99

BY: E. Berrios
DATE: 12/04/02

SUBJECT: Updated Emissions Run Feed Vector

Tank Name	Analyte	Waste Phase	Inventory	Inventory Units	Basis	Density	Density Units	Volume	Volume Units	Concentration	Concentration Units	Decay Date
241-C-104	134Cs	Sludge	1.14E-02	Ci	TE	1.25	g/mL	80	kL	5.77E-05	uCi/g	Jan 1 2001 12:00AM
241-C-104	137Cs	Sludge	1.46E+04	Ci	S	1.69	g/mL	150	kL	5.77E+01	uCi/g	Jan 1 2001 12:00AM
241-C-104	137Cs	Sludge	3.24E+04	Ci	S	1.69	g/mL	332	kL	5.77E+01	uCi/g	Jan 1 2001 12:00AM
241-C-104	137Cs	Sludge	2.21E+04	Ci	S	1.69	g/mL	227	kL	5.77E+01	uCi/g	Jan 1 2001 12:00AM
241-C-104	137Cs	Sludge	8.57E+03	Ci	S	1.69	g/mL	88	kL	5.77E+01	uCi/g	Jan 1 2001 12:00AM
241-C-104	137Cs	Sludge	1.00E+04	Ci	S	1.69	g/mL	103	kL	5.77E+01	uCi/g	Jan 1 2001 12:00AM
241-C-104	137Cs	Sludge	7.80E+03	Ci	S	1.69	g/mL	80	kL	5.77E+01	uCi/g	Jan 1 2001 12:00AM
241-C-104	137mBa	Sludge	1.38E+04	Ci	C		g/mL	150	kL		uCi/g	Jan 1 2001 12:00AM
241-C-104	137mBa	Sludge	3.06E+04	Ci	C		g/mL	332	kL		uCi/g	Jan 1 2001 12:00AM
241-C-104	137mBa	Sludge	2.09E+04	Ci	C		g/mL	227	kL		uCi/g	Jan 1 2001 12:00AM
241-C-104	137mBa	Sludge	8.11E+03	Ci	C		g/mL	88	kL		uCi/g	Jan 1 2001 12:00AM
241-C-104	137mBa	Sludge	9.49E+03	Ci	C		g/mL	103	kL		uCi/g	Jan 1 2001 12:00AM
241-C-104	137mBa	Sludge	7.37E+03	Ci	C		g/mL	80	kL		uCi/g	Jan 1 2001 12:00AM
241-C-104	14C	Sludge	2.84E-01	Ci	S	1.69	g/mL	150	kL	1.12E-03	uCi/g	Jan 1 2001 12:00AM
241-C-104	14C	Sludge	6.28E-01	Ci	S	1.69	g/mL	332	kL	1.12E-03	uCi/g	Jan 1 2001 12:00AM
241-C-104	14C	Sludge	4.30E-01	Ci	S	1.69	g/mL	227	kL	1.12E-03	uCi/g	Jan 1 2001 12:00AM
241-C-104	14C	Sludge	1.67E-01	Ci	S	1.69	g/mL	88	kL	1.12E-03	uCi/g	Jan 1 2001 12:00AM
241-C-104	14C	Sludge	1.95E-01	Ci	S	1.69	g/mL	103	kL	1.12E-03	uCi/g	Jan 1 2001 12:00AM
241-C-104	14C	Sludge	1.51E-01	Ci	S	1.69	g/mL	80	kL	1.12E-03	uCi/g	Jan 1 2001 12:00AM
241-C-104	151Sm	Sludge	9.23E+03	Ci	M	1.46	g/mL	150	kL	3.27E+01	uCi/g	Jan 1 2001 12:00AM
241-C-104	151Sm	Sludge	4.50E+01	Ci	TS	1.49	g/mL	332	kL	9.48E-02	uCi/g	Jan 1 2001 12:00AM
241-C-104	151Sm	Sludge	1.58E+01	Ci	TS	1.71	g/mL	227	kL	5.64E-02	uCi/g	Jan 1 2001 12:00AM
241-C-104	151Sm	Sludge	2.74E+01	Ci	TE	1.29	g/mL	88	kL	1.28E-01	uCi/g	Jan 1 2001 12:00AM
241-C-104	151Sm	Sludge	0.00E+00	Ci	TE	1.69	g/mL	103	kL	0.00E+00	uCi/g	Jan 1 2001 12:00AM
241-C-104	151Sm	Sludge	7.20E+01	Ci	TE	1.25	g/mL	80	kL	3.64E-01	uCi/g	Jan 1 2001 12:00AM
241-C-104	152Eu	Sludge	1.81E+00	Ci	M	1.46	g/mL	150	kL	6.40E-03	uCi/g	Jan 1 2001 12:00AM
241-C-104	152Eu	Sludge	6.81E-02	Ci	TS	1.49	g/mL	332	kL	1.43E-04	uCi/g	Jan 1 2001 12:00AM
241-C-104	152Eu	Sludge	1.22E-01	Ci	TS	1.71	g/mL	227	kL	4.38E-04	uCi/g	Jan 1 2001 12:00AM
241-C-104	152Eu	Sludge	2.75E-01	Ci	TE	1.29	g/mL	88	kL	1.28E-03	uCi/g	Jan 1 2001 12:00AM
241-C-104	152Eu	Sludge	0.00E+00	Ci	TE	1.69	g/mL	103	kL	0.00E+00	uCi/g	Jan 1 2001 12:00AM
241-C-104	152Eu	Sludge	1.55E-01	Ci	TE	1.25	g/mL	80	kL	7.84E-04	uCi/g	Jan 1 2001 12:00AM
241-C-104	154Eu	Sludge	1.68E+02	Ci	S	1.69	g/mL	150	kL	6.61E-01	uCi/g	Jan 1 2001 12:00AM
241-C-104	154Eu	Sludge	3.71E+02	Ci	S	1.69	g/mL	332	kL	6.61E-01	uCi/g	Jan 1 2001 12:00AM
241-C-104	154Eu	Sludge	2.54E+02	Ci	S	1.69	g/mL	227	kL	6.61E-01	uCi/g	Jan 1 2001 12:00AM
241-C-104	154Eu	Sludge	9.84E+01	Ci	S	1.69	g/mL	88	kL	6.61E-01	uCi/g	Jan 1 2001 12:00AM
241-C-104	154Eu	Sludge	1.15E+02	Ci	S	1.69	g/mL	103	kL	6.61E-01	uCi/g	Jan 1 2001 12:00AM
241-C-104	154Eu	Sludge	8.94E+01	Ci	S	1.69	g/mL	80	kL	6.61E-01	uCi/g	Jan 1 2001 12:00AM
241-C-104	155Eu	Sludge	1.23E+02	Ci	S	1.69	g/mL	150	kL	4.86E-01	uCi/g	Jan 1 2001 12:00AM
241-C-104	155Eu	Sludge	2.73E+02	Ci	S	1.69	g/mL	332	kL	4.86E-01	uCi/g	Jan 1 2001 12:00AM
241-C-104	155Eu	Sludge	1.86E+02	Ci	S	1.69	g/mL	227	kL	4.86E-01	uCi/g	Jan 1 2001 12:00AM
241-C-104	155Eu	Sludge	7.23E+01	Ci	S	1.69	g/mL	88	kL	4.86E-01	uCi/g	Jan 1 2001 12:00AM
241-C-104	155Eu	Sludge	8.46E+01	Ci	S	1.69	g/mL	103	kL	4.86E-01	uCi/g	Jan 1 2001 12:00AM
241-C-104	155Eu	Sludge	6.57E+01	Ci	S	1.69	g/mL	80	kL	4.86E-01	uCi/g	Jan 1 2001 12:00AM
241-C-104	226Ra	Sludge	8.42E-04	Ci	M	1.46	g/mL	150	kL	2.98E-06	uCi/g	Jan 1 2001 12:00AM
241-C-104	226Ra	Sludge	1.16E-06	Ci	TS	1.49	g/mL	332	kL	2.44E-09	uCi/g	Jan 1 2001 12:00AM
241-C-104	226Ra	Sludge	2.98E-07	Ci	TS	1.71	g/mL	227	kL	1.07E-09	uCi/g	Jan 1 2001 12:00AM
241-C-104	226Ra	Sludge	2.52E-07	Ci	TE	1.29	g/mL	88	kL	1.18E-09	uCi/g	Jan 1 2001 12:00AM

CALCULATION SHEET

PROJECT: RPP-WTP
JOB NO.: 24590
CALC NO.: 24590-WTP-M4C-FRP-00001
SHEET REV: 0A
SHEET NO.: 100

BY: E. Berríos
DATE: 12/04/02

SUBJECT: Updated Emissions Run Feed Vector

Tank Name	Analyte	Waste Phase	Inventory	Inventory Units	Basis	Density	Density Units	Volume	Volume Units	Concentration	Concentration Units	Decay Date
241-C-104	226Ra	Sludge	0.00E+00	Ci	TE	1.69	g/mL	103	kL	0.00E+00	uCi/g	Jan 1 2001 12:00AM
241-C-104	226Ra	Sludge	5.43E-03	Ci	TE	1.25	g/mL	80	kL	2.74E-05	uCi/g	Jan 1 2001 12:00AM
241-C-104	227Ac	Sludge	1.20E+01	Ci	M	1.46	g/mL	150	kL	4.26E-02	uCi/g	Jan 1 2001 12:00AM
241-C-104	227Ac	Sludge	7.94E-06	Ci	TS	1.49	g/mL	332	kL	1.67E-08	uCi/g	Jan 1 2001 12:00AM
241-C-104	227Ac	Sludge	4.83E-02	Ci	TS	1.71	g/mL	227	kL	1.73E-04	uCi/g	Jan 1 2001 12:00AM
241-C-104	227Ac	Sludge	1.87E-06	Ci	TE	1.29	g/mL	88	kL	8.71E-09	uCi/g	Jan 1 2001 12:00AM
241-C-104	227Ac	Sludge	0.00E+00	Ci	TE	1.69	g/mL	103	kL	0.00E+00	uCi/g	Jan 1 2001 12:00AM
241-C-104	227Ac	Sludge	9.68E+01	Ci	TE	1.25	g/mL	80	kL	4.89E-01	uCi/g	Jan 1 2001 12:00AM
241-C-104	228Ra	Sludge	3.84E+00	Ci	M	1.46	g/mL	150	kL	1.36E-02	uCi/g	Jan 1 2001 12:00AM
241-C-104	228Ra	Sludge	4.69E-11	Ci	TS	1.49	g/mL	332	kL	9.88E-14	uCi/g	Jan 1 2001 12:00AM
241-C-104	228Ra	Sludge	7.32E-03	Ci	TS	1.71	g/mL	227	kL	2.62E-05	uCi/g	Jan 1 2001 12:00AM
241-C-104	228Ra	Sludge	6.03E-11	Ci	TE	1.29	g/mL	88	kL	2.81E-13	uCi/g	Jan 1 2001 12:00AM
241-C-104	228Ra	Sludge	0.00E+00	Ci	TE	1.69	g/mL	103	kL	0.00E+00	uCi/g	Jan 1 2001 12:00AM
241-C-104	228Ra	Sludge	1.87E+01	Ci	TE	1.25	g/mL	80	kL	9.45E-02	uCi/g	Jan 1 2001 12:00AM
241-C-104	229Th	Sludge	8.53E-02	Ci	M	1.46	g/mL	150	kL	3.02E-04	uCi/g	Jan 1 2001 12:00AM
241-C-104	229Th	Sludge	1.61E-08	Ci	TS	1.49	g/mL	332	kL	3.40E-11	uCi/g	Jan 1 2001 12:00AM
241-C-104	229Th	Sludge	6.51E-03	Ci	TS	1.71	g/mL	227	kL	2.33E-05	uCi/g	Jan 1 2001 12:00AM
241-C-104	229Th	Sludge	1.15E-08	Ci	TE	1.29	g/mL	88	kL	5.38E-11	uCi/g	Jan 1 2001 12:00AM
241-C-104	229Th	Sludge	0.00E+00	Ci	TE	1.69	g/mL	103	kL	0.00E+00	uCi/g	Jan 1 2001 12:00AM
241-C-104	229Th	Sludge	8.49E-01	Ci	TE	1.25	g/mL	80	kL	4.29E-03	uCi/g	Jan 1 2001 12:00AM
241-C-104	231Pa	Sludge	2.16E+01	Ci	M	1.46	g/mL	150	kL	7.66E-02	uCi/g	Jan 1 2001 12:00AM
241-C-104	231Pa	Sludge	1.52E-05	Ci	TS	1.49	g/mL	332	kL	3.20E-08	uCi/g	Jan 1 2001 12:00AM
241-C-104	231Pa	Sludge	6.51E-02	Ci	TS	1.71	g/mL	227	kL	2.33E-04	uCi/g	Jan 1 2001 12:00AM
241-C-104	231Pa	Sludge	4.07E-06	Ci	TE	1.29	g/mL	88	kL	1.90E-08	uCi/g	Jan 1 2001 12:00AM
241-C-104	231Pa	Sludge	0.00E+00	Ci	TE	1.69	g/mL	103	kL	0.00E+00	uCi/g	Jan 1 2001 12:00AM
241-C-104	231Pa	Sludge	2.18E+02	Ci	TE	1.25	g/mL	80	kL	1.10E+00	uCi/g	Jan 1 2001 12:00AM
241-C-104	232Th	Sludge	8.54E-01	Ci	S	1.69	g/mL	150	kL	3.37E-03	uCi/g	Jan 1 2001 12:00AM
241-C-104	232Th	Sludge	1.89E+00	Ci	S	1.69	g/mL	332	kL	3.37E-03	uCi/g	Jan 1 2001 12:00AM
241-C-104	232Th	Sludge	1.29E+00	Ci	S	1.69	g/mL	227	kL	3.37E-03	uCi/g	Jan 1 2001 12:00AM
241-C-104	232Th	Sludge	5.01E-01	Ci	S	1.69	g/mL	88	kL	3.37E-03	uCi/g	Jan 1 2001 12:00AM
241-C-104	232Th	Sludge	5.87E-01	Ci	S	1.69	g/mL	103	kL	3.37E-03	uCi/g	Jan 1 2001 12:00AM
241-C-104	232Th	Sludge	4.56E-01	Ci	S	1.69	g/mL	80	kL	3.37E-03	uCi/g	Jan 1 2001 12:00AM
241-C-104	232U	Sludge	2.38E+00	Ci	C	1.69	g/mL	150	kL	1.13E-02	uCi/g	Jan 1 2001 12:00AM
241-C-104	232U	Sludge	1.03E-04	Ci	TS	1.49	g/mL	332	kL	2.16E-07	uCi/g	Jan 1 2001 12:00AM
241-C-104	232U	Sludge	1.09E-02	Ci	TS	1.71	g/mL	227	kL	3.90E-05	uCi/g	Jan 1 2001 12:00AM
241-C-104	232U	Sludge	6.69E-04	Ci	TE	1.29	g/mL	88	kL	3.12E-06	uCi/g	Jan 1 2001 12:00AM
241-C-104	232U	Sludge	9.47E+00	Ci	TE	1.69	g/mL	103	kL	6.40E-02	uCi/g	Jan 1 2001 12:00AM
241-C-104	232U	Sludge	7.48E+00	Ci	TE	1.25	g/mL	80	kL	3.78E-02	uCi/g	Jan 1 2001 12:00AM
241-C-104	233U	Sludge	6.32E+01	Ci	S	1.69	g/mL	150	kL	2.49E-01	uCi/g	Jan 1 2001 12:00AM
241-C-104	233U	Sludge	1.40E+02	Ci	S	1.69	g/mL	332	kL	2.49E-01	uCi/g	Jan 1 2001 12:00AM
241-C-104	233U	Sludge	9.57E+01	Ci	S	1.69	g/mL	227	kL	2.49E-01	uCi/g	Jan 1 2001 12:00AM
241-C-104	233U	Sludge	3.71E+01	Ci	S	1.69	g/mL	88	kL	2.49E-01	uCi/g	Jan 1 2001 12:00AM
241-C-104	233U	Sludge	4.34E+01	Ci	S	1.69	g/mL	103	kL	2.49E-01	uCi/g	Jan 1 2001 12:00AM
241-C-104	233U	Sludge	3.37E+01	Ci	S	1.69	g/mL	80	kL	2.49E-01	uCi/g	Jan 1 2001 12:00AM
241-C-104	234U	Sludge	3.18E+00	Ci	S	1.69	g/mL	150	kL	1.26E-02	uCi/g	Jan 1 2001 12:00AM
241-C-104	234U	Sludge	7.04E+00	Ci	S	1.69	g/mL	332	kL	1.26E-02	uCi/g	Jan 1 2001 12:00AM
241-C-104	234U	Sludge	4.81E+00	Ci	S	1.69	g/mL	227	kL	1.26E-02	uCi/g	Jan 1 2001 12:00AM

CALCULATION SHEET

PROJECT: RPP-WTP
JOB NO.: 24590
CALC NO.: 24590-WTP-M4C-FRP-00001
SHEET REV: 0A
SHEET NO.: 101

BY: E. Berrios
DATE: 12/04/02

SUBJECT: Updated Emissions Run Feed Vector

Tank Name	Analyte	Waste Phase	Inventory	Inventory Units	Basis	Density	Density Units	Volume	Volume Units	Concentration	Concentration Units	Decay Date
241-C-104	234U	Sludge	1.87E+00	Ci	S	1.69	g/mL	88	kL	1.26E-02	uCi/g	Jan 1 2001 12:00AM
241-C-104	234U	Sludge	2.18E+00	Ci	S	1.69	g/mL	103	kL	1.26E-02	uCi/g	Jan 1 2001 12:00AM
241-C-104	234U	Sludge	1.70E+00	Ci	S	1.69	g/mL	80	kL	1.26E-02	uCi/g	Jan 1 2001 12:00AM
241-C-104	235U	Sludge	1.40E-01	Ci	S	1.69	g/mL	227	kL	3.64E-04	uCi/g	Jan 1 2001 12:00AM
241-C-104	235U	Sludge	5.41E-02	Ci	S	1.69	g/mL	88	kL	3.64E-04	uCi/g	Jan 1 2001 12:00AM
241-C-104	235U	Sludge	6.34E-02	Ci	S	1.69	g/mL	103	kL	3.64E-04	uCi/g	Jan 1 2001 12:00AM
241-C-104	235U	Sludge	4.92E-02	Ci	S	1.69	g/mL	80	kL	3.64E-04	uCi/g	Jan 1 2001 12:00AM
241-C-104	235U	Sludge	9.23E-02	Ci	S	1.69	g/mL	150	kL	3.64E-04	uCi/g	Jan 1 2001 12:00AM
241-C-104	235U	Sludge	2.04E-01	Ci	S	1.69	g/mL	332	kL	3.64E-04	uCi/g	Jan 1 2001 12:00AM
241-C-104	236U	Sludge	1.05E-01	Ci	S	1.69	g/mL	150	kL	4.13E-04	uCi/g	Jan 1 2001 12:00AM
241-C-104	236U	Sludge	2.32E-01	Ci	S	1.69	g/mL	332	kL	4.13E-04	uCi/g	Jan 1 2001 12:00AM
241-C-104	236U	Sludge	1.58E-01	Ci	S	1.69	g/mL	227	kL	4.13E-04	uCi/g	Jan 1 2001 12:00AM
241-C-104	236U	Sludge	6.14E-02	Ci	S	1.69	g/mL	88	kL	4.13E-04	uCi/g	Jan 1 2001 12:00AM
241-C-104	236U	Sludge	7.19E-02	Ci	S	1.69	g/mL	103	kL	4.13E-04	uCi/g	Jan 1 2001 12:00AM
241-C-104	236U	Sludge	5.58E-02	Ci	S	1.69	g/mL	80	kL	4.13E-04	uCi/g	Jan 1 2001 12:00AM
241-C-104	237Np	Sludge	6.72E-01	Ci	S	1.69	g/mL	150	kL	2.65E-03	uCi/g	Jan 1 2001 12:00AM
241-C-104	237Np	Sludge	1.49E+00	Ci	S	1.69	g/mL	332	kL	2.65E-03	uCi/g	Jan 1 2001 12:00AM
241-C-104	237Np	Sludge	1.02E+00	Ci	S	1.69	g/mL	227	kL	2.65E-03	uCi/g	Jan 1 2001 12:00AM
241-C-104	237Np	Sludge	3.94E-01	Ci	S	1.69	g/mL	88	kL	2.65E-03	uCi/g	Jan 1 2001 12:00AM
241-C-104	237Np	Sludge	4.61E-01	Ci	S	1.69	g/mL	103	kL	2.65E-03	uCi/g	Jan 1 2001 12:00AM
241-C-104	237Np	Sludge	3.58E-01	Ci	S	1.69	g/mL	80	kL	2.65E-03	uCi/g	Jan 1 2001 12:00AM
241-C-104	238Pu	Sludge	3.48E+01	Ci	C	1.69	g/mL	150	kL	6.10E-02	uCi/g	Jan 1 2001 12:00AM
241-C-104	238Pu	Sludge	7.71E+01	Ci	C	1.69	g/mL	332	kL	6.10E-02	uCi/g	Jan 1 2001 12:00AM
241-C-104	238Pu	Sludge	5.27E+01	Ci	C	1.69	g/mL	227	kL	6.10E-02	uCi/g	Jan 1 2001 12:00AM
241-C-104	238Pu	Sludge	2.04E+01	Ci	C	1.69	g/mL	88	kL	6.10E-02	uCi/g	Jan 1 2001 12:00AM
241-C-104	238Pu	Sludge	2.39E+01	Ci	C	1.69	g/mL	103	kL	6.10E-02	uCi/g	Jan 1 2001 12:00AM
241-C-104	238Pu	Sludge	1.86E+01	Ci	C	1.69	g/mL	80	kL	6.10E-02	uCi/g	Jan 1 2001 12:00AM
241-C-104	238U	Sludge	1.79E+00	Ci	S	1.69	g/mL	150	kL	7.08E-03	uCi/g	Jan 1 2001 12:00AM
241-C-104	238U	Sludge	3.97E+00	Ci	S	1.69	g/mL	332	kL	7.08E-03	uCi/g	Jan 1 2001 12:00AM
241-C-104	238U	Sludge	2.72E+00	Ci	S	1.69	g/mL	227	kL	7.08E-03	uCi/g	Jan 1 2001 12:00AM
241-C-104	238U	Sludge	1.05E+00	Ci	S	1.69	g/mL	88	kL	7.08E-03	uCi/g	Jan 1 2001 12:00AM
241-C-104	238U	Sludge	1.23E+00	Ci	S	1.69	g/mL	103	kL	7.08E-03	uCi/g	Jan 1 2001 12:00AM
241-C-104	238U	Sludge	9.57E-01	Ci	S	1.69	g/mL	80	kL	7.08E-03	uCi/g	Jan 1 2001 12:00AM
241-C-104	239Pu	Sludge	8.38E+02	Ci	C	1.69	g/mL	150	kL	1.42E+00	uCi/g	Jan 1 2001 12:00AM
241-C-104	239Pu	Sludge	1.85E+03	Ci	C	1.69	g/mL	332	kL	1.42E+00	uCi/g	Jan 1 2001 12:00AM
241-C-104	239Pu	Sludge	1.27E+03	Ci	C	1.69	g/mL	227	kL	1.42E+00	uCi/g	Jan 1 2001 12:00AM
241-C-104	239Pu	Sludge	4.91E+02	Ci	C	1.69	g/mL	88	kL	1.42E+00	uCi/g	Jan 1 2001 12:00AM
241-C-104	239Pu	Sludge	5.75E+02	Ci	C	1.69	g/mL	103	kL	1.42E+00	uCi/g	Jan 1 2001 12:00AM
241-C-104	239Pu	Sludge	4.47E+02	Ci	C	1.69	g/mL	80	kL	1.42E+00	uCi/g	Jan 1 2001 12:00AM
241-C-104	240Pu	Sludge	1.65E+02	Ci	C	1.69	g/mL	150	kL	2.79E-01	uCi/g	Jan 1 2001 12:00AM
241-C-104	240Pu	Sludge	3.65E+02	Ci	C	1.69	g/mL	332	kL	2.79E-01	uCi/g	Jan 1 2001 12:00AM
241-C-104	240Pu	Sludge	2.49E+02	Ci	C	1.69	g/mL	227	kL	2.79E-01	uCi/g	Jan 1 2001 12:00AM
241-C-104	240Pu	Sludge	9.67E+01	Ci	C	1.69	g/mL	88	kL	2.79E-01	uCi/g	Jan 1 2001 12:00AM
241-C-104	240Pu	Sludge	1.13E+02	Ci	C	1.69	g/mL	103	kL	2.79E-01	uCi/g	Jan 1 2001 12:00AM
241-C-104	240Pu	Sludge	8.79E+01	Ci	C	1.69	g/mL	80	kL	2.79E-01	uCi/g	Jan 1 2001 12:00AM
241-C-104	241Am	Sludge	9.71E+02	Ci	E	1.69	g/mL	150	kL	3.83E+00	uCi/g	Jan 1 2001 12:00AM
241-C-104	241Am	Sludge	2.15E+03	Ci	E	1.69	g/mL	332	kL	3.83E+00	uCi/g	Jan 1 2001 12:00AM

CALCULATION SHEET

PROJECT: RPP-WTP
JOB NO.: 24590
CALC NO.: 24590-WTP-M4C-FRP-00001
SHEET REV: 0A
SHEET NO.: 102

BY: E. Berrios
DATE: 12/04/02

SUBJECT: Updated Emissions Run Feed Vector

Tank Name	Analyte	Waste Phase	Inventory	Inventory Units	Basis	Density	Density Units	Volume	Volume Units	Concentration	Concentration Units	Decay Date
241-C-104	241Am	Sludge	1.47E+03	Ci	E	1.69	g/mL	227	kL	3.83E+00	uCi/g	Jan 1 2001 12:00AM
241-C-104	241Am	Sludge	5.70E+02	Ci	E	1.69	g/mL	88	kL	3.83E+00	uCi/g	Jan 1 2001 12:00AM
241-C-104	241Am	Sludge	6.67E+02	Ci	E	1.69	g/mL	103	kL	3.83E+00	uCi/g	Jan 1 2001 12:00AM
241-C-104	241Am	Sludge	5.18E+02	Ci	E	1.69	g/mL	80	kL	3.83E+00	uCi/g	Jan 1 2001 12:00AM
241-C-104	241Pu	Sludge	2.26E+03	Ci	E	1.69	g/mL	150	kL	8.92E+00	uCi/g	Jan 1 2001 12:00AM
241-C-104	241Pu	Sludge	5.00E+03	Ci	E	1.69	g/mL	332	kL	8.92E+00	uCi/g	Jan 1 2001 12:00AM
241-C-104	241Pu	Sludge	3.42E+03	Ci	E	1.69	g/mL	227	kL	8.92E+00	uCi/g	Jan 1 2001 12:00AM
241-C-104	241Pu	Sludge	1.33E+03	Ci	E	1.69	g/mL	88	kL	8.92E+00	uCi/g	Jan 1 2001 12:00AM
241-C-104	241Pu	Sludge	1.55E+03	Ci	E	1.69	g/mL	103	kL	8.92E+00	uCi/g	Jan 1 2001 12:00AM
241-C-104	241Pu	Sludge	1.21E+03	Ci	E	1.69	g/mL	80	kL	8.92E+00	uCi/g	Jan 1 2001 12:00AM
241-C-104	242Cm	Sludge	8.23E-01	Ci	C	1.69	g/mL	150	kL	3.52E-04	uCi/g	Jan 1 2001 12:00AM
241-C-104	242Cm	Sludge	1.82E+00	Ci	C	1.69	g/mL	332	kL	3.52E-04	uCi/g	Jan 1 2001 12:00AM
241-C-104	242Cm	Sludge	1.25E+00	Ci	C	1.69	g/mL	227	kL	3.52E-04	uCi/g	Jan 1 2001 12:00AM
241-C-104	242Cm	Sludge	4.83E-01	Ci	C	1.69	g/mL	88	kL	3.52E-04	uCi/g	Jan 1 2001 12:00AM
241-C-104	242Cm	Sludge	5.65E-01	Ci	C	1.69	g/mL	103	kL	3.52E-04	uCi/g	Jan 1 2001 12:00AM
241-C-104	242Cm	Sludge	4.39E-01	Ci	C	1.69	g/mL	80	kL	3.52E-04	uCi/g	Jan 1 2001 12:00AM
241-C-104	242Pu	Sludge	8.52E-03	Ci	C	1.69	g/mL	88	kL	2.46E-05	uCi/g	Jan 1 2001 12:00AM
241-C-104	242Pu	Sludge	9.97E-03	Ci	C	1.69	g/mL	103	kL	2.46E-05	uCi/g	Jan 1 2001 12:00AM
241-C-104	242Pu	Sludge	7.75E-03	Ci	C	1.69	g/mL	80	kL	2.46E-05	uCi/g	Jan 1 2001 12:00AM
241-C-104	242Pu	Sludge	1.45E-02	Ci	C	1.69	g/mL	150	kL	2.46E-05	uCi/g	Jan 1 2001 12:00AM
241-C-104	242Pu	Sludge	3.21E-02	Ci	C	1.69	g/mL	332	kL	2.46E-05	uCi/g	Jan 1 2001 12:00AM
241-C-104	242Pu	Sludge	2.20E-02	Ci	C	1.69	g/mL	227	kL	2.46E-05	uCi/g	Jan 1 2001 12:00AM
241-C-104	243Am	Sludge	4.77E-02	Ci	C	1.69	g/mL	150	kL	2.00E-05	uCi/g	Jan 1 2001 12:00AM
241-C-104	243Am	Sludge	1.06E-01	Ci	C	1.69	g/mL	332	kL	2.00E-05	uCi/g	Jan 1 2001 12:00AM
241-C-104	243Am	Sludge	7.22E-02	Ci	C	1.69	g/mL	227	kL	2.00E-05	uCi/g	Jan 1 2001 12:00AM
241-C-104	243Am	Sludge	2.80E-02	Ci	C	1.69	g/mL	88	kL	2.00E-05	uCi/g	Jan 1 2001 12:00AM
241-C-104	243Am	Sludge	3.28E-02	Ci	C	1.69	g/mL	103	kL	2.00E-05	uCi/g	Jan 1 2001 12:00AM
241-C-104	243Am	Sludge	2.55E-02	Ci	C	1.69	g/mL	80	kL	2.00E-05	uCi/g	Jan 1 2001 12:00AM
241-C-104	243Cm	Sludge	6.60E-02	Ci	C	1.69	g/mL	150	kL	3.07E-05	uCi/g	Jan 1 2001 12:00AM
241-C-104	243Cm	Sludge	1.46E-01	Ci	C	1.69	g/mL	332	kL	3.07E-05	uCi/g	Jan 1 2001 12:00AM
241-C-104	243Cm	Sludge	9.99E-02	Ci	C	1.69	g/mL	227	kL	3.07E-05	uCi/g	Jan 1 2001 12:00AM
241-C-104	243Cm	Sludge	3.87E-02	Ci	C	1.69	g/mL	88	kL	3.07E-05	uCi/g	Jan 1 2001 12:00AM
241-C-104	243Cm	Sludge	4.53E-02	Ci	C	1.69	g/mL	103	kL	3.07E-05	uCi/g	Jan 1 2001 12:00AM
241-C-104	243Cm	Sludge	3.52E-02	Ci	C	1.69	g/mL	80	kL	3.07E-05	uCi/g	Jan 1 2001 12:00AM
241-C-104	244Cm	Sludge	2.30E+00	Ci	C	1.69	g/mL	150	kL	1.14E-03	uCi/g	Jan 1 2001 12:00AM
241-C-104	244Cm	Sludge	5.09E+00	Ci	C	1.69	g/mL	332	kL	1.14E-03	uCi/g	Jan 1 2001 12:00AM
241-C-104	244Cm	Sludge	3.48E+00	Ci	C	1.69	g/mL	227	kL	1.14E-03	uCi/g	Jan 1 2001 12:00AM
241-C-104	244Cm	Sludge	1.35E+00	Ci	C	1.69	g/mL	88	kL	1.14E-03	uCi/g	Jan 1 2001 12:00AM
241-C-104	244Cm	Sludge	1.58E+00	Ci	C	1.69	g/mL	103	kL	1.14E-03	uCi/g	Jan 1 2001 12:00AM
241-C-104	244Cm	Sludge	1.23E+00	Ci	C	1.69	g/mL	80	kL	1.14E-03	uCi/g	Jan 1 2001 12:00AM
241-C-104	3H	Sludge	8.59E+00	Ci	S	1.69	g/mL	150	kL	3.39E-02	uCi/g	Jan 1 2001 12:00AM
241-C-104	3H	Sludge	1.90E+01	Ci	S	1.69	g/mL	332	kL	3.39E-02	uCi/g	Jan 1 2001 12:00AM
241-C-104	3H	Sludge	1.30E+01	Ci	S	1.69	g/mL	227	kL	3.39E-02	uCi/g	Jan 1 2001 12:00AM
241-C-104	3H	Sludge	5.04E+00	Ci	S	1.69	g/mL	88	kL	3.39E-02	uCi/g	Jan 1 2001 12:00AM
241-C-104	3H	Sludge	5.90E+00	Ci	S	1.69	g/mL	103	kL	3.39E-02	uCi/g	Jan 1 2001 12:00AM
241-C-104	3H	Sludge	4.58E+00	Ci	S	1.69	g/mL	80	kL	3.39E-02	uCi/g	Jan 1 2001 12:00AM
241-C-104	59Ni	Sludge	4.55E+00	Ci	M	1.46	g/mL	150	kL	1.61E-02	uCi/g	Jan 1 2001 12:00AM

CALCULATION SHEET

PROJECT: RPP-WTP
JOB NO.: 24590
CALC NO.: 24590-WTP-M4C-FRP-00001
SHEET REV: 0A
SHEET NO.: 103

BY: E. Berrios
DATE: 12/04/02

SUBJECT: Updated Emissions Run Feed Vector

Tank Name	Analyte	Waste Phase	Inventory	Inventory Units	Basis	Density	Density Units	Volume	Volume Units	Concentration	Concentration Units	Decay Date
241-C-104	59Ni	Sludge	1.77E-02	Ci	TS	1.49	g/mL	332	kL	3.73E-05	uCi/g	Jan 1 2001 12:00AM
241-C-104	59Ni	Sludge	5.87E-03	Ci	TS	1.71	g/mL	227	kL	2.10E-05	uCi/g	Jan 1 2001 12:00AM
241-C-104	59Ni	Sludge	5.50E-03	Ci	TE	1.29	g/mL	88	kL	2.57E-05	uCi/g	Jan 1 2001 12:00AM
241-C-104	59Ni	Sludge	0.00E+00	Ci	TE	1.69	g/mL	103	kL	0.00E+00	uCi/g	Jan 1 2001 12:00AM
241-C-104	59Ni	Sludge	0.00E+00	Ci	TE	1.25	g/mL	80	kL	0.00E+00	uCi/g	Jan 1 2001 12:00AM
241-C-104	60Co	Sludge	4.16E+01	Ci	S	1.69	g/mL	150	kL	1.64E-01	uCi/g	Jan 1 2001 12:00AM
241-C-104	60Co	Sludge	9.20E+01	Ci	S	1.69	g/mL	332	kL	1.64E-01	uCi/g	Jan 1 2001 12:00AM
241-C-104	60Co	Sludge	6.29E+01	Ci	S	1.69	g/mL	227	kL	1.64E-01	uCi/g	Jan 1 2001 12:00AM
241-C-104	60Co	Sludge	2.44E+01	Ci	S	1.69	g/mL	88	kL	1.64E-01	uCi/g	Jan 1 2001 12:00AM
241-C-104	60Co	Sludge	2.85E+01	Ci	S	1.69	g/mL	103	kL	1.64E-01	uCi/g	Jan 1 2001 12:00AM
241-C-104	60Co	Sludge	2.22E+01	Ci	S	1.69	g/mL	80	kL	1.64E-01	uCi/g	Jan 1 2001 12:00AM
241-C-104	63Ni	Sludge	4.26E+02	Ci	M	1.46	g/mL	150	kL	1.51E+00	uCi/g	Jan 1 2001 12:00AM
241-C-104	63Ni	Sludge	1.61E+00	Ci	TS	1.49	g/mL	332	kL	3.39E-03	uCi/g	Jan 1 2001 12:00AM
241-C-104	63Ni	Sludge	5.59E-01	Ci	TS	1.71	g/mL	227	kL	2.00E-03	uCi/g	Jan 1 2001 12:00AM
241-C-104	63Ni	Sludge	5.48E-01	Ci	TE	1.29	g/mL	88	kL	2.55E-03	uCi/g	Jan 1 2001 12:00AM
241-C-104	63Ni	Sludge	0.00E+00	Ci	TE	1.69	g/mL	103	kL	0.00E+00	uCi/g	Jan 1 2001 12:00AM
241-C-104	63Ni	Sludge	0.00E+00	Ci	TE	1.25	g/mL	80	kL	0.00E+00	uCi/g	Jan 1 2001 12:00AM
241-C-104	79Se	Sludge	9.81E-01	Ci	S	1.69	g/mL	150	kL	3.87E-03	uCi/g	Jan 1 2001 12:00AM
241-C-104	79Se	Sludge	2.17E+00	Ci	S	1.69	g/mL	332	kL	3.87E-03	uCi/g	Jan 1 2001 12:00AM
241-C-104	79Se	Sludge	1.48E+00	Ci	S	1.69	g/mL	227	kL	3.87E-03	uCi/g	Jan 1 2001 12:00AM
241-C-104	79Se	Sludge	5.76E-01	Ci	S	1.69	g/mL	88	kL	3.87E-03	uCi/g	Jan 1 2001 12:00AM
241-C-104	79Se	Sludge	6.74E-01	Ci	S	1.69	g/mL	103	kL	3.87E-03	uCi/g	Jan 1 2001 12:00AM
241-C-104	79Se	Sludge	5.23E-01	Ci	S	1.69	g/mL	80	kL	3.87E-03	uCi/g	Jan 1 2001 12:00AM
241-C-104	90Sr	Sludge	7.41E+04	Ci	S	1.69	g/mL	150	kL	2.92E+02	uCi/g	Jan 1 2001 12:00AM
241-C-104	90Sr	Sludge	1.64E+05	Ci	S	1.69	g/mL	332	kL	2.92E+02	uCi/g	Jan 1 2001 12:00AM
241-C-104	90Sr	Sludge	1.12E+05	Ci	S	1.69	g/mL	227	kL	2.92E+02	uCi/g	Jan 1 2001 12:00AM
241-C-104	90Sr	Sludge	4.35E+04	Ci	S	1.69	g/mL	88	kL	2.92E+02	uCi/g	Jan 1 2001 12:00AM
241-C-104	90Sr	Sludge	5.09E+04	Ci	S	1.69	g/mL	103	kL	2.92E+02	uCi/g	Jan 1 2001 12:00AM
241-C-104	90Sr	Sludge	3.95E+04	Ci	S	1.69	g/mL	80	kL	2.92E+02	uCi/g	Jan 1 2001 12:00AM
241-C-104	90Y	Sludge	7.41E+04	Ci	C		g/mL	150	kL		uCi/g	Jan 1 2001 12:00AM
241-C-104	90Y	Sludge	1.64E+05	Ci	C		g/mL	332	kL		uCi/g	Jan 1 2001 12:00AM
241-C-104	90Y	Sludge	1.12E+05	Ci	C		g/mL	227	kL		uCi/g	Jan 1 2001 12:00AM
241-C-104	90Y	Sludge	4.35E+04	Ci	C		g/mL	88	kL		uCi/g	Jan 1 2001 12:00AM
241-C-104	90Y	Sludge	5.09E+04	Ci	C		g/mL	103	kL		uCi/g	Jan 1 2001 12:00AM
241-C-104	90Y	Sludge	3.95E+04	Ci	C		g/mL	80	kL		uCi/g	Jan 1 2001 12:00AM
241-C-104	93mNb	Sludge	9.63E+00	Ci	M	1.46	g/mL	150	kL	3.41E-02	uCi/g	Jan 1 2001 12:00AM
241-C-104	93mNb	Sludge	5.32E-02	Ci	TS	1.49	g/mL	332	kL	1.12E-04	uCi/g	Jan 1 2001 12:00AM
241-C-104	93mNb	Sludge	1.76E-02	Ci	TS	1.71	g/mL	227	kL	6.30E-05	uCi/g	Jan 1 2001 12:00AM
241-C-104	93mNb	Sludge	4.33E-02	Ci	TE	1.29	g/mL	88	kL	2.02E-04	uCi/g	Jan 1 2001 12:00AM
241-C-104	93mNb	Sludge	0.00E+00	Ci	TE	1.69	g/mL	103	kL	0.00E+00	uCi/g	Jan 1 2001 12:00AM
241-C-104	93mNb	Sludge	1.56E-01	Ci	TE	1.25	g/mL	80	kL	7.89E-04	uCi/g	Jan 1 2001 12:00AM
241-C-104	93Zr	Sludge	1.13E+01	Ci	M	1.46	g/mL	150	kL	4.01E-02	uCi/g	Jan 1 2001 12:00AM
241-C-104	93Zr	Sludge	6.22E-02	Ci	TS	1.49	g/mL	332	kL	1.31E-04	uCi/g	Jan 1 2001 12:00AM
241-C-104	93Zr	Sludge	2.17E-02	Ci	TS	1.71	g/mL	227	kL	7.76E-05	uCi/g	Jan 1 2001 12:00AM
241-C-104	93Zr	Sludge	5.54E-02	Ci	TE	1.29	g/mL	88	kL	2.58E-04	uCi/g	Jan 1 2001 12:00AM
241-C-104	93Zr	Sludge	0.00E+00	Ci	TE	1.69	g/mL	103	kL	0.00E+00	uCi/g	Jan 1 2001 12:00AM
241-C-104	93Zr	Sludge	2.00E-01	Ci	TE	1.25	g/mL	80	kL	1.01E-03	uCi/g	Jan 1 2001 12:00AM

CALCULATION SHEET

PROJECT: RPP-WTP
JOB NO.: 24590
CALC NO.: 24590-WTP-M4C-FRP-00001
SHEET REV: 0A
SHEET NO.: 104

BY: E. Berrios
DATE: 12/04/02

SUBJECT: Updated Emissions Run Feed Vector

Tank Name	Analyte	Waste Phase	Inventory	Inventory Units	Basis	Density	Density Units	Volume	Volume Units	Concentration	Concentration Units	Decay Date
241-C-104	99Tc	Sludge	8.87E+00	Ci	S	1.69	g/mL	150	kL	3.50E-02	uCi/g	Jan 1 2001 12:00AM
241-C-104	99Tc	Sludge	1.96E+01	Ci	S	1.69	g/mL	332	kL	3.50E-02	uCi/g	Jan 1 2001 12:00AM
241-C-104	99Tc	Sludge	1.34E+01	Ci	S	1.69	g/mL	227	kL	3.50E-02	uCi/g	Jan 1 2001 12:00AM
241-C-104	99Tc	Sludge	5.21E+00	Ci	S	1.69	g/mL	88	kL	3.50E-02	uCi/g	Jan 1 2001 12:00AM
241-C-104	99Tc	Sludge	6.09E+00	Ci	S	1.69	g/mL	103	kL	3.50E-02	uCi/g	Jan 1 2001 12:00AM
241-C-104	99Tc	Sludge	4.73E+00	Ci	S	1.69	g/mL	80	kL	3.50E-02	uCi/g	Jan 1 2001 12:00AM
241-C-104	Ag	Sludge	8.62E+01	kg	S	1.69	g/mL	80	kL	6.37E+02	ug/g	Jan 1 2001 12:00AM
241-C-104	Ag	Sludge	9.48E+01	kg	S	1.69	g/mL	88	kL	6.37E+02	ug/g	Jan 1 2001 12:00AM
241-C-104	Ag	Sludge	3.58E+02	kg	S	1.69	g/mL	332	kL	6.37E+02	ug/g	Jan 1 2001 12:00AM
241-C-104	Ag	Sludge	2.44E+02	kg	S	1.69	g/mL	227	kL	6.37E+02	ug/g	Jan 1 2001 12:00AM
241-C-104	Ag	Sludge	1.11E+02	kg	S	1.69	g/mL	103	kL	6.37E+02	ug/g	Jan 1 2001 12:00AM
241-C-104	Ag	Sludge	1.62E+02	kg	S	1.69	g/mL	150	kL	6.37E+02	ug/g	Jan 1 2001 12:00AM
241-C-104	Al	Sludge	1.38E+04	kg	S	1.69	g/mL	150	kL	5.44E+04	ug/g	Jan 1 2001 12:00AM
241-C-104	Al	Sludge	3.05E+04	kg	S	1.69	g/mL	332	kL	5.44E+04	ug/g	Jan 1 2001 12:00AM
241-C-104	Al	Sludge	2.09E+04	kg	S	1.69	g/mL	227	kL	5.44E+04	ug/g	Jan 1 2001 12:00AM
241-C-104	Al	Sludge	8.09E+03	kg	S	1.69	g/mL	88	kL	5.44E+04	ug/g	Jan 1 2001 12:00AM
241-C-104	Al	Sludge	9.47E+03	kg	S	1.69	g/mL	103	kL	5.44E+04	ug/g	Jan 1 2001 12:00AM
241-C-104	Al	Sludge	7.36E+03	kg	S	1.69	g/mL	80	kL	5.44E+04	ug/g	Jan 1 2001 12:00AM
241-C-104	As	Sludge	3.97E+00	kg	S	1.69	g/mL	80	kL	2.94E+01	ug/g	Jan 1 2001 12:00AM
241-C-104	As	Sludge	1.65E+01	kg	S	1.69	g/mL	332	kL	2.94E+01	ug/g	Jan 1 2001 12:00AM
241-C-104	As	Sludge	4.37E+00	kg	S	1.69	g/mL	88	kL	2.94E+01	ug/g	Jan 1 2001 12:00AM
241-C-104	As	Sludge	5.12E+00	kg	S	1.69	g/mL	103	kL	2.94E+01	ug/g	Jan 1 2001 12:00AM
241-C-104	As	Sludge	7.45E+00	kg	S	1.69	g/mL	150	kL	2.94E+01	ug/g	Jan 1 2001 12:00AM
241-C-104	As	Sludge	1.13E+01	kg	S	1.69	g/mL	227	kL	2.94E+01	ug/g	Jan 1 2001 12:00AM
241-C-104	B	Sludge	6.07E+02	kg	S	1.69	g/mL	332	kL	1.08E+03	ug/g	Jan 1 2001 12:00AM
241-C-104	B	Sludge	4.15E+02	kg	S	1.69	g/mL	227	kL	1.08E+03	ug/g	Jan 1 2001 12:00AM
241-C-104	B	Sludge	2.74E+02	kg	S	1.69	g/mL	150	kL	1.08E+03	ug/g	Jan 1 2001 12:00AM
241-C-104	B	Sludge	1.46E+02	kg	S	1.69	g/mL	80	kL	1.08E+03	ug/g	Jan 1 2001 12:00AM
241-C-104	B	Sludge	1.88E+02	kg	S	1.69	g/mL	103	kL	1.08E+03	ug/g	Jan 1 2001 12:00AM
241-C-104	B	Sludge	1.61E+02	kg	S	1.69	g/mL	88	kL	1.08E+03	ug/g	Jan 1 2001 12:00AM
241-C-104	Ba	Sludge	1.20E+01	kg	S	1.69	g/mL	80	kL	8.88E+01	ug/g	Jan 1 2001 12:00AM
241-C-104	Ba	Sludge	1.55E+01	kg	S	1.69	g/mL	103	kL	8.88E+01	ug/g	Jan 1 2001 12:00AM
241-C-104	Ba	Sludge	2.25E+01	kg	S	1.69	g/mL	150	kL	8.88E+01	ug/g	Jan 1 2001 12:00AM
241-C-104	Ba	Sludge	1.32E+01	kg	S	1.69	g/mL	88	kL	8.88E+01	ug/g	Jan 1 2001 12:00AM
241-C-104	Ba	Sludge	4.99E+01	kg	S	1.69	g/mL	332	kL	8.88E+01	ug/g	Jan 1 2001 12:00AM
241-C-104	Ba	Sludge	3.41E+01	kg	S	1.69	g/mL	227	kL	8.88E+01	ug/g	Jan 1 2001 12:00AM
241-C-104	Be	Sludge	3.11E+00	kg	S	1.69	g/mL	80	kL	2.30E+01	ug/g	Jan 1 2001 12:00AM
241-C-104	Be	Sludge	1.29E+01	kg	S	1.69	g/mL	332	kL	2.30E+01	ug/g	Jan 1 2001 12:00AM
241-C-104	Be	Sludge	3.42E+00	kg	S	1.69	g/mL	88	kL	2.30E+01	ug/g	Jan 1 2001 12:00AM
241-C-104	Be	Sludge	4.01E+00	kg	S	1.69	g/mL	103	kL	2.30E+01	ug/g	Jan 1 2001 12:00AM
241-C-104	Be	Sludge	8.83E+00	kg	S	1.69	g/mL	227	kL	2.30E+01	ug/g	Jan 1 2001 12:00AM
241-C-104	Be	Sludge	5.84E+00	kg	S	1.69	g/mL	150	kL	2.30E+01	ug/g	Jan 1 2001 12:00AM
241-C-104	Bi	Sludge	1.11E+01	kg	S	1.69	g/mL	227	kL	2.90E+01	ug/g	Jan 1 2001 12:00AM
241-C-104	Bi	Sludge	4.31E+00	kg	S	1.69	g/mL	88	kL	2.90E+01	ug/g	Jan 1 2001 12:00AM
241-C-104	Bi	Sludge	5.05E+00	kg	S	1.69	g/mL	103	kL	2.90E+01	ug/g	Jan 1 2001 12:00AM
241-C-104	Bi	Sludge	3.92E+00	kg	S	1.69	g/mL	80	kL	2.90E+01	ug/g	Jan 1 2001 12:00AM
241-C-104	Bi	Sludge	7.35E+00	kg	S	1.69	g/mL	150	kL	2.90E+01	ug/g	Jan 1 2001 12:00AM

CALCULATION SHEET

PROJECT: RPP-WTP
JOB NO.: 24590
CALC NO.: 24590-WTP-M4C-FRP-00001
SHEET REV: 0A
SHEET NO.: 105

BY: E. Berrios
DATE: 12/04/02

SUBJECT: Updated Emissions Run Feed Vector

Tank Name	Analyte	Waste Phase	Inventory	Inventory Units	Basis	Density	Density Units	Volume	Volume Units	Concentration	Concentration Units	Decay Date
241-C-104	Bi	Sludge	1.63E+01	kg	S	1.69	g/mL	332	kL	2.90E+01	ug/g	Jan 1 2001 12:00AM
241-C-104	Ca	Sludge	4.57E+02	kg	S	1.69	g/mL	150	kL	1.80E+03	ug/g	Jan 1 2001 12:00AM
241-C-104	Ca	Sludge	1.01E+03	kg	S	1.69	g/mL	332	kL	1.80E+03	ug/g	Jan 1 2001 12:00AM
241-C-104	Ca	Sludge	6.91E+02	kg	S	1.69	g/mL	227	kL	1.80E+03	ug/g	Jan 1 2001 12:00AM
241-C-104	Ca	Sludge	2.68E+02	kg	S	1.69	g/mL	88	kL	1.80E+03	ug/g	Jan 1 2001 12:00AM
241-C-104	Ca	Sludge	3.14E+02	kg	S	1.69	g/mL	103	kL	1.80E+03	ug/g	Jan 1 2001 12:00AM
241-C-104	Ca	Sludge	2.44E+02	kg	S	1.69	g/mL	80	kL	1.80E+03	ug/g	Jan 1 2001 12:00AM
241-C-104	Cd	Sludge	3.48E+02	kg	S	1.69	g/mL	332	kL	6.20E+02	ug/g	Jan 1 2001 12:00AM
241-C-104	Cd	Sludge	9.21E+01	kg	S	1.69	g/mL	88	kL	6.20E+02	ug/g	Jan 1 2001 12:00AM
241-C-104	Cd	Sludge	1.08E+02	kg	S	1.69	g/mL	103	kL	6.20E+02	ug/g	Jan 1 2001 12:00AM
241-C-104	Cd	Sludge	1.57E+02	kg	S	1.69	g/mL	150	kL	6.20E+02	ug/g	Jan 1 2001 12:00AM
241-C-104	Cd	Sludge	8.38E+01	kg	S	1.69	g/mL	80	kL	6.20E+02	ug/g	Jan 1 2001 12:00AM
241-C-104	Cd	Sludge	2.38E+02	kg	S	1.69	g/mL	227	kL	6.20E+02	ug/g	Jan 1 2001 12:00AM
241-C-104	Ce	Sludge	7.45E+00	kg	S	1.69	g/mL	103	kL	4.28E+01	ug/g	Jan 1 2001 12:00AM
241-C-104	Ce	Sludge	1.64E+01	kg	S	1.69	g/mL	227	kL	4.28E+01	ug/g	Jan 1 2001 12:00AM
241-C-104	Ce	Sludge	2.40E+01	kg	S	1.69	g/mL	332	kL	4.28E+01	ug/g	Jan 1 2001 12:00AM
241-C-104	Ce	Sludge	6.37E+00	kg	S	1.69	g/mL	88	kL	4.28E+01	ug/g	Jan 1 2001 12:00AM
241-C-104	Ce	Sludge	1.09E+01	kg	S	1.69	g/mL	150	kL	4.28E+01	ug/g	Jan 1 2001 12:00AM
241-C-104	Ce	Sludge	5.79E+00	kg	S	1.69	g/mL	80	kL	4.28E+01	ug/g	Jan 1 2001 12:00AM
241-C-104	Cl	Sludge	1.22E+02	kg	S	1.69	g/mL	150	kL	4.83E+02	ug/g	Jan 1 2001 12:00AM
241-C-104	Cl	Sludge	2.71E+02	kg	S	1.69	g/mL	332	kL	4.83E+02	ug/g	Jan 1 2001 12:00AM
241-C-104	Cl	Sludge	1.85E+02	kg	S	1.69	g/mL	227	kL	4.83E+02	ug/g	Jan 1 2001 12:00AM
241-C-104	Cl	Sludge	7.19E+01	kg	S	1.69	g/mL	88	kL	4.83E+02	ug/g	Jan 1 2001 12:00AM
241-C-104	Cl	Sludge	8.41E+01	kg	S	1.69	g/mL	103	kL	4.83E+02	ug/g	Jan 1 2001 12:00AM
241-C-104	Cl	Sludge	6.53E+01	kg	S	1.69	g/mL	80	kL	4.83E+02	ug/g	Jan 1 2001 12:00AM
241-C-104	CN	Sludge	7.07E+00	kg	S	1.69	g/mL	332	kL	1.26E+01	ug/g	Jan 1 2001 12:00AM
241-C-104	CN	Sludge	1.70E+00	kg	S	1.69	g/mL	80	kL	1.26E+01	ug/g	Jan 1 2001 12:00AM
241-C-104	CN	Sludge	2.19E+00	kg	S	1.69	g/mL	103	kL	1.26E+01	ug/g	Jan 1 2001 12:00AM
241-C-104	CN	Sludge	3.19E+00	kg	S	1.69	g/mL	150	kL	1.26E+01	ug/g	Jan 1 2001 12:00AM
241-C-104	CN	Sludge	4.83E+00	kg	S	1.69	g/mL	227	kL	1.26E+01	ug/g	Jan 1 2001 12:00AM
241-C-104	CN	Sludge	1.87E+00	kg	S	1.69	g/mL	88	kL	1.26E+01	ug/g	Jan 1 2001 12:00AM
241-C-104	Co	Sludge	8.76E-01	kg	S	1.69	g/mL	88	kL	5.89E+00	ug/g	Jan 1 2001 12:00AM
241-C-104	Co	Sludge	7.96E-01	kg	S	1.69	g/mL	80	kL	5.89E+00	ug/g	Jan 1 2001 12:00AM
241-C-104	Co	Sludge	3.30E+00	kg	S	1.69	g/mL	332	kL	5.89E+00	ug/g	Jan 1 2001 12:00AM
241-C-104	Co	Sludge	1.02E+00	kg	S	1.69	g/mL	103	kL	5.89E+00	ug/g	Jan 1 2001 12:00AM
241-C-104	Co	Sludge	2.26E+00	kg	S	1.69	g/mL	227	kL	5.89E+00	ug/g	Jan 1 2001 12:00AM
241-C-104	Co	Sludge	1.49E+00	kg	S	1.69	g/mL	150	kL	5.89E+00	ug/g	Jan 1 2001 12:00AM
241-C-104	Cr	Sludge	2.24E+02	kg	S	1.69	g/mL	150	kL	8.82E+02	ug/g	Jan 1 2001 12:00AM
241-C-104	Cr	Sludge	4.95E+02	kg	S	1.69	g/mL	332	kL	8.82E+02	ug/g	Jan 1 2001 12:00AM
241-C-104	Cr	Sludge	3.38E+02	kg	S	1.69	g/mL	227	kL	8.82E+02	ug/g	Jan 1 2001 12:00AM
241-C-104	Cr	Sludge	1.31E+02	kg	S	1.69	g/mL	88	kL	8.82E+02	ug/g	Jan 1 2001 12:00AM
241-C-104	Cr	Sludge	1.53E+02	kg	S	1.69	g/mL	103	kL	8.82E+02	ug/g	Jan 1 2001 12:00AM
241-C-104	Cr	Sludge	1.19E+02	kg	S	1.69	g/mL	80	kL	8.82E+02	ug/g	Jan 1 2001 12:00AM
241-C-104	Cu	Sludge	1.41E+01	kg	S	1.69	g/mL	103	kL	8.08E+01	ug/g	Jan 1 2001 12:00AM
241-C-104	Cu	Sludge	1.20E+01	kg	S	1.69	g/mL	88	kL	8.08E+01	ug/g	Jan 1 2001 12:00AM
241-C-104	Cu	Sludge	1.09E+01	kg	S	1.69	g/mL	80	kL	8.08E+01	ug/g	Jan 1 2001 12:00AM
241-C-104	Cu	Sludge	2.05E+01	kg	S	1.69	g/mL	150	kL	8.08E+01	ug/g	Jan 1 2001 12:00AM

CALCULATION SHEET

PROJECT: RPP-WTP
JOB NO.: 24590
CALC NO.: 24590-WTP-M4C-FRP-00001
SHEET REV: 0A
SHEET NO.: 106

BY: E. Berrios
DATE: 12/04/02

SUBJECT: Updated Emissions Run Feed Vector

Tank Name	Analyte	Waste Phase	Inventory	Inventory Units	Basis	Density	Density Units	Volume	Volume Units	Concentration	Concentration Units	Decay Date
241-C-104	Cu	Sludge	4.53E+01	kg	S	1.69	g/mL	332	kL	8.08E+01	ug/g	Jan 1 2001 12:00AM
241-C-104	Cu	Sludge	3.10E+01	kg	S	1.69	g/mL	227	kL	8.08E+01	ug/g	Jan 1 2001 12:00AM
241-C-104	F	Sludge	5.29E+03	kg	S	1.69	g/mL	150	kL	2.09E+04	ug/g	Jan 1 2001 12:00AM
241-C-104	F	Sludge	1.17E+04	kg	S	1.69	g/mL	332	kL	2.09E+04	ug/g	Jan 1 2001 12:00AM
241-C-104	F	Sludge	8.01E+03	kg	S	1.69	g/mL	227	kL	2.09E+04	ug/g	Jan 1 2001 12:00AM
241-C-104	F	Sludge	3.11E+03	kg	S	1.69	g/mL	88	kL	2.09E+04	ug/g	Jan 1 2001 12:00AM
241-C-104	F	Sludge	3.64E+03	kg	S	1.69	g/mL	103	kL	2.09E+04	ug/g	Jan 1 2001 12:00AM
241-C-104	F	Sludge	2.82E+03	kg	S	1.69	g/mL	80	kL	2.09E+04	ug/g	Jan 1 2001 12:00AM
241-C-104	Fe	Sludge	4.22E+03	kg	S	1.69	g/mL	150	kL	1.67E+04	ug/g	Jan 1 2001 12:00AM
241-C-104	Fe	Sludge	9.34E+03	kg	S	1.69	g/mL	332	kL	1.67E+04	ug/g	Jan 1 2001 12:00AM
241-C-104	Fe	Sludge	6.39E+03	kg	S	1.69	g/mL	227	kL	1.67E+04	ug/g	Jan 1 2001 12:00AM
241-C-104	Fe	Sludge	2.48E+03	kg	S	1.69	g/mL	88	kL	1.67E+04	ug/g	Jan 1 2001 12:00AM
241-C-104	Fe	Sludge	2.90E+03	kg	S	1.69	g/mL	103	kL	1.67E+04	ug/g	Jan 1 2001 12:00AM
241-C-104	Fe	Sludge	2.25E+03	kg	S	1.69	g/mL	80	kL	1.67E+04	ug/g	Jan 1 2001 12:00AM
241-C-104	Hg	Sludge	1.03E+01	kg	S	1.69	g/mL	150	kL	4.06E+01	ug/g	Jan 1 2001 12:00AM
241-C-104	Hg	Sludge	2.28E+01	kg	S	1.69	g/mL	332	kL	4.06E+01	ug/g	Jan 1 2001 12:00AM
241-C-104	Hg	Sludge	1.56E+01	kg	S	1.69	g/mL	227	kL	4.06E+01	ug/g	Jan 1 2001 12:00AM
241-C-104	Hg	Sludge	6.05E+00	kg	S	1.69	g/mL	88	kL	4.06E+01	ug/g	Jan 1 2001 12:00AM
241-C-104	Hg	Sludge	7.08E+00	kg	S	1.69	g/mL	103	kL	4.06E+01	ug/g	Jan 1 2001 12:00AM
241-C-104	Hg	Sludge	5.50E+00	kg	S	1.69	g/mL	80	kL	4.06E+01	ug/g	Jan 1 2001 12:00AM
241-C-104	K	Sludge	2.04E+02	kg	S	1.69	g/mL	150	kL	8.04E+02	ug/g	Jan 1 2001 12:00AM
241-C-104	K	Sludge	4.51E+02	kg	S	1.69	g/mL	332	kL	8.04E+02	ug/g	Jan 1 2001 12:00AM
241-C-104	K	Sludge	3.09E+02	kg	S	1.69	g/mL	227	kL	8.04E+02	ug/g	Jan 1 2001 12:00AM
241-C-104	K	Sludge	1.20E+02	kg	S	1.69	g/mL	88	kL	8.04E+02	ug/g	Jan 1 2001 12:00AM
241-C-104	K	Sludge	1.40E+02	kg	S	1.69	g/mL	103	kL	8.04E+02	ug/g	Jan 1 2001 12:00AM
241-C-104	K	Sludge	1.09E+02	kg	S	1.69	g/mL	80	kL	8.04E+02	ug/g	Jan 1 2001 12:00AM
241-C-104	La	Sludge	7.45E+00	kg	S	1.69	g/mL	150	kL	2.94E+01	ug/g	Jan 1 2001 12:00AM
241-C-104	La	Sludge	1.65E+01	kg	S	1.69	g/mL	332	kL	2.94E+01	ug/g	Jan 1 2001 12:00AM
241-C-104	La	Sludge	1.13E+01	kg	S	1.69	g/mL	227	kL	2.94E+01	ug/g	Jan 1 2001 12:00AM
241-C-104	La	Sludge	4.37E+00	kg	S	1.69	g/mL	88	kL	2.94E+01	ug/g	Jan 1 2001 12:00AM
241-C-104	La	Sludge	5.11E+00	kg	S	1.69	g/mL	103	kL	2.94E+01	ug/g	Jan 1 2001 12:00AM
241-C-104	La	Sludge	3.97E+00	kg	S	1.69	g/mL	80	kL	2.94E+01	ug/g	Jan 1 2001 12:00AM
241-C-104	Li	Sludge	9.25E-01	kg	S	1.69	g/mL	150	kL	3.65E+00	ug/g	Jan 1 2001 12:00AM
241-C-104	Li	Sludge	4.93E-01	kg	S	1.69	g/mL	80	kL	3.65E+00	ug/g	Jan 1 2001 12:00AM
241-C-104	Li	Sludge	5.43E-01	kg	S	1.69	g/mL	88	kL	3.65E+00	ug/g	Jan 1 2001 12:00AM
241-C-104	Li	Sludge	2.05E+00	kg	S	1.69	g/mL	332	kL	3.65E+00	ug/g	Jan 1 2001 12:00AM
241-C-104	Li	Sludge	1.40E+00	kg	S	1.69	g/mL	227	kL	3.65E+00	ug/g	Jan 1 2001 12:00AM
241-C-104	Li	Sludge	6.35E-01	kg	S	1.69	g/mL	103	kL	3.65E+00	ug/g	Jan 1 2001 12:00AM
241-C-104	Mg	Sludge	1.85E+01	kg	S	1.69	g/mL	88	kL	1.24E+02	ug/g	Jan 1 2001 12:00AM
241-C-104	Mg	Sludge	3.15E+01	kg	S	1.69	g/mL	150	kL	1.24E+02	ug/g	Jan 1 2001 12:00AM
241-C-104	Mg	Sludge	4.77E+01	kg	S	1.69	g/mL	227	kL	1.24E+02	ug/g	Jan 1 2001 12:00AM
241-C-104	Mg	Sludge	1.68E+01	kg	S	1.69	g/mL	80	kL	1.24E+02	ug/g	Jan 1 2001 12:00AM
241-C-104	Mg	Sludge	6.98E+01	kg	S	1.69	g/mL	332	kL	1.24E+02	ug/g	Jan 1 2001 12:00AM
241-C-104	Mg	Sludge	2.17E+01	kg	S	1.69	g/mL	103	kL	1.24E+02	ug/g	Jan 1 2001 12:00AM
241-C-104	Mn	Sludge	1.07E+03	kg	S	1.69	g/mL	150	kL	4.24E+03	ug/g	Jan 1 2001 12:00AM
241-C-104	Mn	Sludge	2.38E+03	kg	S	1.69	g/mL	332	kL	4.24E+03	ug/g	Jan 1 2001 12:00AM
241-C-104	Mn	Sludge	1.62E+03	kg	S	1.69	g/mL	227	kL	4.24E+03	ug/g	Jan 1 2001 12:00AM

CALCULATION SHEET

PROJECT: RPP-WTP
JOB NO.: 24590
CALC NO.: 24590-WTP-M4C-FRP-00001
SHEET REV: 0A
SHEET NO.: 107

BY: E. Berríos
DATE: 12/04/02

SUBJECT: Updated Emissions Run Feed Vector

Tank Name	Analyte	Waste Phase	Inventory	Inventory Units	Basis	Density	Density Units	Volume	Volume Units	Concentration	Concentration Units	Decay Date
241-C-104	Mn	Sludge	6.30E+02	kg	S	1.69	g/mL	88	kL	4.24E+03	ug/g	Jan 1 2001 12:00AM
241-C-104	Mn	Sludge	7.37E+02	kg	S	1.69	g/mL	103	kL	4.24E+03	ug/g	Jan 1 2001 12:00AM
241-C-104	Mn	Sludge	5.73E+02	kg	S	1.69	g/mL	80	kL	4.24E+03	ug/g	Jan 1 2001 12:00AM
241-C-104	Mo	Sludge	8.14E+00	kg	S	1.69	g/mL	332	kL	1.45E+01	ug/g	Jan 1 2001 12:00AM
241-C-104	Mo	Sludge	3.68E+00	kg	S	1.69	g/mL	150	kL	1.45E+01	ug/g	Jan 1 2001 12:00AM
241-C-104	Mo	Sludge	1.96E+00	kg	S	1.69	g/mL	80	kL	1.45E+01	ug/g	Jan 1 2001 12:00AM
241-C-104	Mo	Sludge	2.16E+00	kg	S	1.69	g/mL	88	kL	1.45E+01	ug/g	Jan 1 2001 12:00AM
241-C-104	Mo	Sludge	5.56E+00	kg	S	1.69	g/mL	227	kL	1.45E+01	ug/g	Jan 1 2001 12:00AM
241-C-104	Mo	Sludge	2.52E+00	kg	S	1.69	g/mL	103	kL	1.45E+01	ug/g	Jan 1 2001 12:00AM
241-C-104	Na	Sludge	2.73E+04	kg	S	1.69	g/mL	150	kL	1.08E+05	ug/g	Jan 1 2001 12:00AM
241-C-104	Na	Sludge	6.03E+04	kg	S	1.69	g/mL	332	kL	1.08E+05	ug/g	Jan 1 2001 12:00AM
241-C-104	Na	Sludge	4.12E+04	kg	S	1.69	g/mL	227	kL	1.08E+05	ug/g	Jan 1 2001 12:00AM
241-C-104	Na	Sludge	1.60E+04	kg	S	1.69	g/mL	88	kL	1.08E+05	ug/g	Jan 1 2001 12:00AM
241-C-104	Na	Sludge	1.87E+04	kg	S	1.69	g/mL	103	kL	1.08E+05	ug/g	Jan 1 2001 12:00AM
241-C-104	Na	Sludge	1.45E+04	kg	S	1.69	g/mL	80	kL	1.08E+05	ug/g	Jan 1 2001 12:00AM
241-C-104	Nd	Sludge	2.48E+01	kg	S	1.69	g/mL	227	kL	6.45E+01	ug/g	Jan 1 2001 12:00AM
241-C-104	Nd	Sludge	8.72E+00	kg	S	1.69	g/mL	80	kL	6.45E+01	ug/g	Jan 1 2001 12:00AM
241-C-104	Nd	Sludge	3.62E+01	kg	S	1.69	g/mL	332	kL	6.45E+01	ug/g	Jan 1 2001 12:00AM
241-C-104	Nd	Sludge	9.60E+00	kg	S	1.69	g/mL	88	kL	6.45E+01	ug/g	Jan 1 2001 12:00AM
241-C-104	Nd	Sludge	1.12E+01	kg	S	1.69	g/mL	103	kL	6.45E+01	ug/g	Jan 1 2001 12:00AM
241-C-104	Nd	Sludge	1.64E+01	kg	S	1.69	g/mL	150	kL	6.45E+01	ug/g	Jan 1 2001 12:00AM
241-C-104	NH3	Sludge	2.25E+02	kg	M	1.46	g/mL	150	kL	7.96E+02	ug/g	Jan 1 2001 12:00AM
241-C-104	Ni	Sludge	4.03E+02	kg	S	1.69	g/mL	150	kL	1.59E+03	ug/g	Jan 1 2001 12:00AM
241-C-104	Ni	Sludge	8.92E+02	kg	S	1.69	g/mL	332	kL	1.59E+03	ug/g	Jan 1 2001 12:00AM
241-C-104	Ni	Sludge	6.10E+02	kg	S	1.69	g/mL	227	kL	1.59E+03	ug/g	Jan 1 2001 12:00AM
241-C-104	Ni	Sludge	2.36E+02	kg	S	1.69	g/mL	88	kL	1.59E+03	ug/g	Jan 1 2001 12:00AM
241-C-104	Ni	Sludge	2.77E+02	kg	S	1.69	g/mL	103	kL	1.59E+03	ug/g	Jan 1 2001 12:00AM
241-C-104	Ni	Sludge	2.15E+02	kg	S	1.69	g/mL	80	kL	1.59E+03	ug/g	Jan 1 2001 12:00AM
241-C-104	NO2	Sludge	5.59E+03	kg	S	1.69	g/mL	150	kL	2.20E+04	ug/g	Jan 1 2001 12:00AM
241-C-104	NO2	Sludge	1.24E+04	kg	S	1.69	g/mL	332	kL	2.20E+04	ug/g	Jan 1 2001 12:00AM
241-C-104	NO2	Sludge	8.46E+03	kg	S	1.69	g/mL	227	kL	2.20E+04	ug/g	Jan 1 2001 12:00AM
241-C-104	NO2	Sludge	3.28E+03	kg	S	1.69	g/mL	88	kL	2.20E+04	ug/g	Jan 1 2001 12:00AM
241-C-104	NO2	Sludge	3.84E+03	kg	S	1.69	g/mL	103	kL	2.20E+04	ug/g	Jan 1 2001 12:00AM
241-C-104	NO2	Sludge	2.98E+03	kg	S	1.69	g/mL	80	kL	2.20E+04	ug/g	Jan 1 2001 12:00AM
241-C-104	NO3	Sludge	3.00E+03	kg	S	1.69	g/mL	150	kL	1.18E+04	ug/g	Jan 1 2001 12:00AM
241-C-104	NO3	Sludge	6.63E+03	kg	S	1.69	g/mL	332	kL	1.18E+04	ug/g	Jan 1 2001 12:00AM
241-C-104	NO3	Sludge	4.53E+03	kg	S	1.69	g/mL	227	kL	1.18E+04	ug/g	Jan 1 2001 12:00AM
241-C-104	NO3	Sludge	1.76E+03	kg	S	1.69	g/mL	88	kL	1.18E+04	ug/g	Jan 1 2001 12:00AM
241-C-104	NO3	Sludge	2.06E+03	kg	S	1.69	g/mL	103	kL	1.18E+04	ug/g	Jan 1 2001 12:00AM
241-C-104	NO3	Sludge	1.60E+03	kg	S	1.69	g/mL	80	kL	1.18E+04	ug/g	Jan 1 2001 12:00AM
241-C-104	Oxalate	Sludge	5.04E+02	kg	S	1.69	g/mL	88	kL	3.39E+03	ug/g	Jan 1 2001 12:00AM
241-C-104	Oxalate	Sludge	1.90E+03	kg	S	1.69	g/mL	332	kL	3.39E+03	ug/g	Jan 1 2001 12:00AM
241-C-104	Oxalate	Sludge	4.58E+02	kg	S	1.69	g/mL	80	kL	3.39E+03	ug/g	Jan 1 2001 12:00AM
241-C-104	Oxalate	Sludge	5.90E+02	kg	S	1.69	g/mL	103	kL	3.39E+03	ug/g	Jan 1 2001 12:00AM
241-C-104	Oxalate	Sludge	1.30E+03	kg	S	1.69	g/mL	227	kL	3.39E+03	ug/g	Jan 1 2001 12:00AM
241-C-104	Oxalate	Sludge	8.59E+02	kg	S	1.69	g/mL	150	kL	3.39E+03	ug/g	Jan 1 2001 12:00AM
241-C-104	Pb	Sludge	1.94E+02	kg	S	1.69	g/mL	227	kL	5.05E+02	ug/g	Jan 1 2001 12:00AM

CALCULATION SHEET

PROJECT: RPP-WTP
JOB NO.: 24590
CALC NO.: 24590-WTP-M4C-FRP-00001
SHEET REV: 0A
SHEET NO.: 108

BY: E. Berrios
DATE: 12/04/02

SUBJECT: Updated Emissions Run Feed Vector

Tank Name	Analyte	Waste Phase	Inventory	Inventory Units	Basis	Density	Density Units	Volume	Volume Units	Concentration	Concentration Units	Decay Date
241-C-104	Pb	Sludge	7.51E+01	kg	S	1.69	g/mL	88	kL	5.05E+02	ug/g	Jan 1 2001 12:00AM
241-C-104	Pb	Sludge	8.79E+01	kg	S	1.69	g/mL	103	kL	5.05E+02	ug/g	Jan 1 2001 12:00AM
241-C-104	Pb	Sludge	6.83E+01	kg	S	1.69	g/mL	80	kL	5.05E+02	ug/g	Jan 1 2001 12:00AM
241-C-104	Pb	Sludge	1.28E+02	kg	S	1.69	g/mL	150	kL	5.05E+02	ug/g	Jan 1 2001 12:00AM
241-C-104	Pb	Sludge	2.83E+02	kg	S	1.69	g/mL	332	kL	5.05E+02	ug/g	Jan 1 2001 12:00AM
241-C-104	PO4	Sludge	4.91E+02	kg	S	1.69	g/mL	150	kL	1.94E+03	ug/g	Jan 1 2001 12:00AM
241-C-104	PO4	Sludge	1.09E+03	kg	S	1.69	g/mL	332	kL	1.94E+03	ug/g	Jan 1 2001 12:00AM
241-C-104	PO4	Sludge	7.43E+02	kg	S	1.69	g/mL	227	kL	1.94E+03	ug/g	Jan 1 2001 12:00AM
241-C-104	PO4	Sludge	2.88E+02	kg	S	1.69	g/mL	88	kL	1.94E+03	ug/g	Jan 1 2001 12:00AM
241-C-104	PO4	Sludge	3.37E+02	kg	S	1.69	g/mL	103	kL	1.94E+03	ug/g	Jan 1 2001 12:00AM
241-C-104	PO4	Sludge	2.62E+02	kg	S	1.69	g/mL	80	kL	1.94E+03	ug/g	Jan 1 2001 12:00AM
241-C-104	Pr	Sludge	5.72E+00	kg	S	1.69	g/mL	80	kL	4.23E+01	ug/g	Jan 1 2001 12:00AM
241-C-104	Pr	Sludge	1.62E+01	kg	S	1.69	g/mL	227	kL	4.23E+01	ug/g	Jan 1 2001 12:00AM
241-C-104	Pr	Sludge	6.29E+00	kg	S	1.69	g/mL	88	kL	4.23E+01	ug/g	Jan 1 2001 12:00AM
241-C-104	Pr	Sludge	2.37E+01	kg	S	1.69	g/mL	332	kL	4.23E+01	ug/g	Jan 1 2001 12:00AM
241-C-104	Pr	Sludge	1.07E+01	kg	S	1.69	g/mL	150	kL	4.23E+01	ug/g	Jan 1 2001 12:00AM
241-C-104	Pr	Sludge	7.36E+00	kg	S	1.69	g/mL	103	kL	4.23E+01	ug/g	Jan 1 2001 12:00AM
241-C-104	Rb	Sludge	2.80E+01	kg	S	1.69	g/mL	103	kL	1.61E+02	ug/g	Jan 1 2001 12:00AM
241-C-104	Rb	Sludge	4.08E+01	kg	S	1.69	g/mL	150	kL	1.61E+02	ug/g	Jan 1 2001 12:00AM
241-C-104	Rb	Sludge	9.03E+01	kg	S	1.69	g/mL	332	kL	1.61E+02	ug/g	Jan 1 2001 12:00AM
241-C-104	Rb	Sludge	6.18E+01	kg	S	1.69	g/mL	227	kL	1.61E+02	ug/g	Jan 1 2001 12:00AM
241-C-104	Rb	Sludge	2.39E+01	kg	S	1.69	g/mL	88	kL	1.61E+02	ug/g	Jan 1 2001 12:00AM
241-C-104	Rb	Sludge	2.18E+01	kg	S	1.69	g/mL	80	kL	1.61E+02	ug/g	Jan 1 2001 12:00AM
241-C-104	Rh	Sludge	4.88E+01	kg	S	1.69	g/mL	332	kL	8.70E+01	ug/g	Jan 1 2001 12:00AM
241-C-104	Rh	Sludge	1.18E+01	kg	S	1.69	g/mL	80	kL	8.70E+01	ug/g	Jan 1 2001 12:00AM
241-C-104	Rh	Sludge	1.29E+01	kg	S	1.69	g/mL	88	kL	8.70E+01	ug/g	Jan 1 2001 12:00AM
241-C-104	Rh	Sludge	3.34E+01	kg	S	1.69	g/mL	227	kL	8.70E+01	ug/g	Jan 1 2001 12:00AM
241-C-104	Rh	Sludge	1.51E+01	kg	S	1.69	g/mL	103	kL	8.70E+01	ug/g	Jan 1 2001 12:00AM
241-C-104	Rh	Sludge	2.21E+01	kg	S	1.69	g/mL	150	kL	8.70E+01	ug/g	Jan 1 2001 12:00AM
241-C-104	Sb	Sludge	3.08E+00	kg	S	1.69	g/mL	103	kL	1.77E+01	ug/g	Jan 1 2001 12:00AM
241-C-104	Sb	Sludge	2.63E+00	kg	S	1.69	g/mL	88	kL	1.77E+01	ug/g	Jan 1 2001 12:00AM
241-C-104	Se	Sludge	1.13E+01	kg	S	1.69	g/mL	227	kL	2.94E+01	ug/g	Jan 1 2001 12:00AM
241-C-104	Se	Sludge	1.65E+01	kg	S	1.69	g/mL	332	kL	2.94E+01	ug/g	Jan 1 2001 12:00AM
241-C-104	Se	Sludge	7.45E+00	kg	S	1.69	g/mL	150	kL	2.94E+01	ug/g	Jan 1 2001 12:00AM
241-C-104	Se	Sludge	3.97E+00	kg	S	1.69	g/mL	80	kL	2.94E+01	ug/g	Jan 1 2001 12:00AM
241-C-104	Si	Sludge	1.57E+03	kg	S	1.69	g/mL	150	kL	6.18E+03	ug/g	Jan 1 2001 12:00AM
241-C-104	Si	Sludge	3.47E+03	kg	S	1.69	g/mL	332	kL	6.18E+03	ug/g	Jan 1 2001 12:00AM
241-C-104	Si	Sludge	2.37E+03	kg	S	1.69	g/mL	227	kL	6.18E+03	ug/g	Jan 1 2001 12:00AM
241-C-104	Si	Sludge	9.19E+02	kg	S	1.69	g/mL	88	kL	6.18E+03	ug/g	Jan 1 2001 12:00AM
241-C-104	Si	Sludge	1.08E+03	kg	S	1.69	g/mL	103	kL	6.18E+03	ug/g	Jan 1 2001 12:00AM
241-C-104	Si	Sludge	8.35E+02	kg	S	1.69	g/mL	80	kL	6.18E+03	ug/g	Jan 1 2001 12:00AM
241-C-104	SO4	Sludge	5.23E+02	kg	S	1.69	g/mL	150	kL	2.06E+03	ug/g	Jan 1 2001 12:00AM
241-C-104	SO4	Sludge	1.16E+03	kg	S	1.69	g/mL	332	kL	2.06E+03	ug/g	Jan 1 2001 12:00AM
241-C-104	SO4	Sludge	7.92E+02	kg	S	1.69	g/mL	227	kL	2.06E+03	ug/g	Jan 1 2001 12:00AM
241-C-104	SO4	Sludge	3.07E+02	kg	S	1.69	g/mL	88	kL	2.06E+03	ug/g	Jan 1 2001 12:00AM
241-C-104	SO4	Sludge	3.59E+02	kg	S	1.69	g/mL	103	kL	2.06E+03	ug/g	Jan 1 2001 12:00AM
241-C-104	SO4	Sludge	2.79E+02	kg	S	1.69	g/mL	80	kL	2.06E+03	ug/g	Jan 1 2001 12:00AM

CALCULATION SHEET

PROJECT: RPP-WTP
JOB NO.: 24590
CALC NO.: 24590-WTP-M4C-FRP-00001
SHEET REV: 0A
SHEET NO.: 109

BY: E. Berríos
DATE: 12/04/02

SUBJECT: Updated Emissions Run Feed Vector

Tank Name	Analyte	Waste Phase	Inventory	Inventory Units	Basis	Density	Density Units	Volume	Volume Units	Concentration	Concentration Units	Decay Date
241-C-104	Sr	Sludge	1.34E+01	kg	S	1.69	g/mL	150	kL	5.28E+01	ug/g	Jan 1 2001 12:00AM
241-C-104	Sr	Sludge	2.96E+01	kg	S	1.69	g/mL	332	kL	5.28E+01	ug/g	Jan 1 2001 12:00AM
241-C-104	Sr	Sludge	2.03E+01	kg	S	1.69	g/mL	227	kL	5.28E+01	ug/g	Jan 1 2001 12:00AM
241-C-104	Sr	Sludge	7.85E+00	kg	S	1.69	g/mL	88	kL	5.28E+01	ug/g	Jan 1 2001 12:00AM
241-C-104	Sr	Sludge	9.19E+00	kg	S	1.69	g/mL	103	kL	5.28E+01	ug/g	Jan 1 2001 12:00AM
241-C-104	Sr	Sludge	7.14E+00	kg	S	1.69	g/mL	80	kL	5.28E+01	ug/g	Jan 1 2001 12:00AM
241-C-104	Ta	Sludge	1.43E-01	kg	S	1.69	g/mL	80	kL	1.05E+00	ug/g	Jan 1 2001 12:00AM
241-C-104	Ta	Sludge	4.05E-01	kg	S	1.69	g/mL	227	kL	1.05E+00	ug/g	Jan 1 2001 12:00AM
241-C-104	Ta	Sludge	1.57E-01	kg	S	1.69	g/mL	88	kL	1.05E+00	ug/g	Jan 1 2001 12:00AM
241-C-104	Ta	Sludge	2.67E-01	kg	S	1.69	g/mL	150	kL	1.05E+00	ug/g	Jan 1 2001 12:00AM
241-C-104	Ta	Sludge	1.84E-01	kg	S	1.69	g/mL	103	kL	1.05E+00	ug/g	Jan 1 2001 12:00AM
241-C-104	Ta	Sludge	5.92E-01	kg	S	1.69	g/mL	332	kL	1.05E+00	ug/g	Jan 1 2001 12:00AM
241-C-104	Th	Sludge	1.18E+04	kg	S	1.69	g/mL	227	kL	3.08E+04	ug/g	Jan 1 2001 12:00AM
241-C-104	Th	Sludge	5.35E+03	kg	S	1.69	g/mL	103	kL	3.08E+04	ug/g	Jan 1 2001 12:00AM
241-C-104	Th	Sludge	7.80E+03	kg	S	1.69	g/mL	150	kL	3.08E+04	ug/g	Jan 1 2001 12:00AM
241-C-104	Th	Sludge	1.73E+04	kg	S	1.69	g/mL	332	kL	3.08E+04	ug/g	Jan 1 2001 12:00AM
241-C-104	Th	Sludge	4.57E+03	kg	S	1.69	g/mL	88	kL	3.08E+04	ug/g	Jan 1 2001 12:00AM
241-C-104	Th	Sludge	4.16E+03	kg	S	1.69	g/mL	80	kL	3.08E+04	ug/g	Jan 1 2001 12:00AM
241-C-104	Ti	Sludge	1.03E+01	kg	S	1.69	g/mL	103	kL	5.91E+01	ug/g	Jan 1 2001 12:00AM
241-C-104	Ti	Sludge	3.32E+01	kg	S	1.69	g/mL	332	kL	5.91E+01	ug/g	Jan 1 2001 12:00AM
241-C-104	Ti	Sludge	2.27E+01	kg	S	1.69	g/mL	227	kL	5.91E+01	ug/g	Jan 1 2001 12:00AM
241-C-104	Ti	Sludge	8.00E+00	kg	S	1.69	g/mL	80	kL	5.91E+01	ug/g	Jan 1 2001 12:00AM
241-C-104	Ti	Sludge	1.50E+01	kg	S	1.69	g/mL	150	kL	5.91E+01	ug/g	Jan 1 2001 12:00AM
241-C-104	Ti	Sludge	8.80E+00	kg	S	1.69	g/mL	88	kL	5.91E+01	ug/g	Jan 1 2001 12:00AM
241-C-104	TIC as CO3	Sludge	7.42E+03	kg	S	1.69	g/mL	150	kL	2.93E+04	ug/g	Jan 1 2001 12:00AM
241-C-104	TIC as CO3	Sludge	1.64E+04	kg	S	1.69	g/mL	332	kL	2.93E+04	ug/g	Jan 1 2001 12:00AM
241-C-104	TIC as CO3	Sludge	1.12E+04	kg	S	1.69	g/mL	227	kL	2.93E+04	ug/g	Jan 1 2001 12:00AM
241-C-104	TIC as CO3	Sludge	4.36E+03	kg	S	1.69	g/mL	88	kL	2.93E+04	ug/g	Jan 1 2001 12:00AM
241-C-104	TIC as CO3	Sludge	5.10E+03	kg	S	1.69	g/mL	103	kL	2.93E+04	ug/g	Jan 1 2001 12:00AM
241-C-104	TIC as CO3	Sludge	3.96E+03	kg	S	1.69	g/mL	80	kL	2.93E+04	ug/g	Jan 1 2001 12:00AM
241-C-104	Tl	Sludge	3.30E+01	kg	S	1.69	g/mL	332	kL	5.89E+01	ug/g	Jan 1 2001 12:00AM
241-C-104	Tl	Sludge	1.49E+01	kg	S	1.69	g/mL	150	kL	5.89E+01	ug/g	Jan 1 2001 12:00AM
241-C-104	Tl	Sludge	1.02E+01	kg	S	1.69	g/mL	103	kL	5.89E+01	ug/g	Jan 1 2001 12:00AM
241-C-104	Tl	Sludge	2.26E+01	kg	S	1.69	g/mL	227	kL	5.89E+01	ug/g	Jan 1 2001 12:00AM
241-C-104	Tl	Sludge	7.96E+00	kg	S	1.69	g/mL	80	kL	5.89E+01	ug/g	Jan 1 2001 12:00AM
241-C-104	Tl	Sludge	8.76E+00	kg	S	1.69	g/mL	88	kL	5.89E+01	ug/g	Jan 1 2001 12:00AM
241-C-104	UTOTAL	Sludge	5.40E+03	kg	S	1.69	g/mL	150	kL	2.13E+04	ug/g	Jan 1 2001 12:00AM
241-C-104	UTOTAL	Sludge	1.20E+04	kg	S	1.69	g/mL	332	kL	2.13E+04	ug/g	Jan 1 2001 12:00AM
241-C-104	UTOTAL	Sludge	3.17E+03	kg	S	1.69	g/mL	88	kL	2.13E+04	ug/g	Jan 1 2001 12:00AM
241-C-104	UTOTAL	Sludge	3.71E+03	kg	S	1.69	g/mL	103	kL	2.13E+04	ug/g	Jan 1 2001 12:00AM
241-C-104	UTOTAL	Sludge	2.88E+03	kg	S	1.69	g/mL	80	kL	2.13E+04	ug/g	Jan 1 2001 12:00AM

CALCULATION SHEET

PROJECT: RPP-WTP
JOB NO.: 24590
CALC NO.: 24590-WTP-M4C-FRP-00001
SHEET REV: 0A
SHEET NO.: 110

BY: E. Berrios
DATE: 12/04/02

SUBJECT: Updated Emissions Run Feed Vector

Tank Name	Analyte	Waste Phase	Inventory	Inventory Units	Basis	Density	Density Units	Volume	Volume Units	Concentration	Concentration Units	Decay Date
241-C-104	UTOTAL	Sludge	8.17E+03	kg	S	1.69	g/mL	227	kL	2.13E+04	ug/g	Jan 1 2001 12:00AM
241-C-104	V	Sludge	9.22E+00	kg	S	1.69	g/mL	332	kL	1.64E+01	ug/g	Jan 1 2001 12:00AM
241-C-104	V	Sludge	2.44E+00	kg	S	1.69	g/mL	88	kL	1.64E+01	ug/g	Jan 1 2001 12:00AM
241-C-104	V	Sludge	4.16E+00	kg	S	1.69	g/mL	150	kL	1.64E+01	ug/g	Jan 1 2001 12:00AM
241-C-104	V	Sludge	2.22E+00	kg	S	1.69	g/mL	80	kL	1.64E+01	ug/g	Jan 1 2001 12:00AM
241-C-104	V	Sludge	2.86E+00	kg	S	1.69	g/mL	103	kL	1.64E+01	ug/g	Jan 1 2001 12:00AM
241-C-104	V	Sludge	6.30E+00	kg	S	1.69	g/mL	227	kL	1.64E+01	ug/g	Jan 1 2001 12:00AM
241-C-104	W	Sludge	3.25E+02	kg	S	1.69	g/mL	332	kL	5.80E+02	ug/g	Jan 1 2001 12:00AM
241-C-104	W	Sludge	7.83E+01	kg	S	1.69	g/mL	80	kL	5.80E+02	ug/g	Jan 1 2001 12:00AM
241-C-104	W	Sludge	2.22E+02	kg	S	1.69	g/mL	227	kL	5.80E+02	ug/g	Jan 1 2001 12:00AM
241-C-104	W	Sludge	1.01E+02	kg	S	1.69	g/mL	103	kL	5.80E+02	ug/g	Jan 1 2001 12:00AM
241-C-104	W	Sludge	8.62E+01	kg	S	1.69	g/mL	88	kL	5.80E+02	ug/g	Jan 1 2001 12:00AM
241-C-104	W	Sludge	1.47E+02	kg	S	1.69	g/mL	150	kL	5.80E+02	ug/g	Jan 1 2001 12:00AM
241-C-104	Y	Sludge	4.31E+00	kg	S	1.69	g/mL	150	kL	1.70E+01	ug/g	Jan 1 2001 12:00AM
241-C-104	Y	Sludge	6.52E+00	kg	S	1.69	g/mL	227	kL	1.70E+01	ug/g	Jan 1 2001 12:00AM
241-C-104	Y	Sludge	2.30E+00	kg	S	1.69	g/mL	80	kL	1.70E+01	ug/g	Jan 1 2001 12:00AM
241-C-104	Y	Sludge	2.53E+00	kg	S	1.69	g/mL	88	kL	1.70E+01	ug/g	Jan 1 2001 12:00AM
241-C-104	Y	Sludge	2.96E+00	kg	S	1.69	g/mL	103	kL	1.70E+01	ug/g	Jan 1 2001 12:00AM
241-C-104	Y	Sludge	9.54E+00	kg	S	1.69	g/mL	332	kL	1.70E+01	ug/g	Jan 1 2001 12:00AM
241-C-104	Zn	Sludge	2.06E+02	kg	S	1.69	g/mL	332	kL	3.67E+02	ug/g	Jan 1 2001 12:00AM
241-C-104	Zn	Sludge	5.46E+01	kg	S	1.69	g/mL	88	kL	3.67E+02	ug/g	Jan 1 2001 12:00AM
241-C-104	Zn	Sludge	6.39E+01	kg	S	1.69	g/mL	103	kL	3.67E+02	ug/g	Jan 1 2001 12:00AM
241-C-104	Zn	Sludge	4.96E+01	kg	S	1.69	g/mL	80	kL	3.67E+02	ug/g	Jan 1 2001 12:00AM
241-C-104	Zn	Sludge	1.41E+02	kg	S	1.69	g/mL	227	kL	3.67E+02	ug/g	Jan 1 2001 12:00AM
241-C-104	Zn	Sludge	9.31E+01	kg	S	1.69	g/mL	150	kL	3.67E+02	ug/g	Jan 1 2001 12:00AM
241-C-104	Zr	Sludge	9.93E+03	kg	S	1.69	g/mL	150	kL	3.92E+04	ug/g	Jan 1 2001 12:00AM
241-C-104	Zr	Sludge	2.20E+04	kg	S	1.69	g/mL	332	kL	3.92E+04	ug/g	Jan 1 2001 12:00AM
241-C-104	Zr	Sludge	1.50E+04	kg	S	1.69	g/mL	227	kL	3.92E+04	ug/g	Jan 1 2001 12:00AM
241-C-104	Zr	Sludge	5.83E+03	kg	S	1.69	g/mL	88	kL	3.92E+04	ug/g	Jan 1 2001 12:00AM
241-C-104	Zr	Sludge	6.82E+03	kg	S	1.69	g/mL	103	kL	3.92E+04	ug/g	Jan 1 2001 12:00AM
241-C-104	Zr	Sludge	5.30E+03	kg	S	1.69	g/mL	80	kL	3.92E+04	ug/g	Jan 1 2001 12:00AM
241-C-106	106Ru	Sludge	5.77E-06	Ci	TE	1.3	g/mL	23	kL	8.08E-08	uCi/g	Jan 1 2001 12:00AM
241-C-106	113mCd	Sludge	5.84E+00	Ci	TE	1.3	g/mL	23	kL	8.17E-02	uCi/g	Jan 1 2001 12:00AM
241-C-106	125Sb	Sludge	4.01E-01	Ci	TE	1.3	g/mL	23	kL	5.62E-03	uCi/g	Jan 1 2001 12:00AM
241-C-106	126Sn	Sludge	1.81E+00	Ci	TE	1.3	g/mL	23	kL	2.53E-02	uCi/g	Jan 1 2001 12:00AM
241-C-106	129I	Sludge	8.28E-03	Ci	TE	1.3	g/mL	23	kL	1.16E-04	uCi/g	Jan 1 2001 12:00AM
241-C-106	134Cs	Sludge	1.00E-02	Ci	TE	1.3	g/mL	23	kL	1.41E-04	uCi/g	Jan 1 2001 12:00AM
241-C-106	137Cs	Sludge	1.14E+04	Ci	S	1.56	g/mL	23	kL	3.17E+02	uCi/g	Jan 1 2001 12:00AM
241-C-106	137mBa	Sludge	1.08E+04	Ci	C		g/mL	23	kL		uCi/g	Jan 1 2001 12:00AM
241-C-106	14C	Sludge	8.28E-03	Ci	S	1.56	g/mL	23	kL	2.31E-04	uCi/g	Jan 1 2001 12:00AM
241-C-106	151Sm	Sludge	1.01E+04	Ci	TE	1.3	g/mL	23	kL	1.41E+02	uCi/g	Jan 1 2001 12:00AM
241-C-106	152Eu	Sludge	2.85E+00	Ci	TE	1.3	g/mL	23	kL	3.99E-02	uCi/g	Jan 1 2001 12:00AM
241-C-106	154Eu	Sludge	2.64E+02	Ci	S	1.56	g/mL	23	kL	7.36E+00	uCi/g	Jan 1 2001 12:00AM
241-C-106	155Eu	Sludge	1.82E+02	Ci	S	1.56	g/mL	23	kL	5.08E+00	uCi/g	Jan 1 2001 12:00AM
241-C-106	226Ra	Sludge	3.93E-04	Ci	TE	1.3	g/mL	23	kL	5.50E-06	uCi/g	Jan 1 2001 12:00AM
241-C-106	227Ac	Sludge	2.21E-03	Ci	TE	1.3	g/mL	23	kL	3.09E-05	uCi/g	Jan 1 2001 12:00AM
241-C-106	228Ra	Sludge	2.46E-05	Ci	TE	1.3	g/mL	23	kL	3.44E-07	uCi/g	Jan 1 2001 12:00AM

CALCULATION SHEET

PROJECT: RPP-WTP
JOB NO.: 24590
CALC NO.: 24590-WTP-M4C-FRP-00001
SHEET REV: 0A
SHEET NO.: 111

BY: E. Berrios
DATE: 12/04/02

SUBJECT: Updated Emissions Run Feed Vector

Tank Name	Analyte	Waste Phase	Inventory	Inventory Units	Basis	Density	Density Units	Volume	Volume Units	Concentration	Concentration Units	Decay Date
241-C-106	229Th	Sludge	2.10E-05	Ci	TE	1.3	g/mL	23	kL	2.95E-07	uCi/g	Jan 1 2001 12:00AM
241-C-106	231Pa	Sludge	2.82E-03	Ci	TE	1.3	g/mL	23	kL	3.95E-05	uCi/g	Jan 1 2001 12:00AM
241-C-106	232Th	Sludge	2.53E-03	Ci	S	1.56	g/mL	23	kL	7.04E-05	uCi/g	Jan 1 2001 12:00AM
241-C-106	232U	Sludge	1.65E-04	Ci	C	1.52	g/mL	23	kL	1.60E-05	uCi/g	Jan 1 2001 12:00AM
241-C-106	233U	Sludge	6.81E-04	Ci	C	1.52	g/mL	23	kL	6.16E-05	uCi/g	Jan 1 2001 12:00AM
241-C-106	234U	Sludge	1.34E-02	Ci	C	1.52	g/mL	23	kL	1.21E-03	uCi/g	Jan 1 2001 12:00AM
241-C-106	235U	Sludge	5.73E-04	Ci	C	1.52	g/mL	23	kL	5.18E-05	uCi/g	Jan 1 2001 12:00AM
241-C-106	236U	Sludge	2.39E-04	Ci	C	1.52	g/mL	23	kL	2.16E-05	uCi/g	Jan 1 2001 12:00AM
241-C-106	237Np	Sludge	1.66E-01	Ci	S	1.56	g/mL	23	kL	4.62E-03	uCi/g	Jan 1 2001 12:00AM
241-C-106	238Pu	Sludge	3.48E+00	Ci	C	1.56	g/mL	23	kL	4.44E-02	uCi/g	Jan 1 2001 12:00AM
241-C-106	238U	Sludge	1.37E-02	Ci	C	1.52	g/mL	23	kL	1.24E-03	uCi/g	Jan 1 2001 12:00AM
241-C-106	239Pu	Sludge	7.52E+01	Ci	C	1.56	g/mL	23	kL	9.07E-01	uCi/g	Jan 1 2001 12:00AM
241-C-106	240Pu	Sludge	1.54E+01	Ci	C	1.56	g/mL	23	kL	1.85E-01	uCi/g	Jan 1 2001 12:00AM
241-C-106	241Am	Sludge	2.25E+02	Ci	E	1.56	g/mL	23	kL	6.27E+00	uCi/g	Jan 1 2001 12:00AM
241-C-106	241Pu	Sludge	1.84E+02	Ci	E	1.56	g/mL	23	kL	5.14E+00	uCi/g	Jan 1 2001 12:00AM
241-C-106	242Cm	Sludge	3.42E-01	Ci	C	1.56	g/mL	23	kL	1.85E-03	uCi/g	Jan 1 2001 12:00AM
241-C-106	242Pu	Sludge	1.64E-03	Ci	C	1.56	g/mL	23	kL	1.98E-05	uCi/g	Jan 1 2001 12:00AM
241-C-106	243Am	Sludge	2.02E-03	Ci	TE	1.3	g/mL	23	kL	2.83E-05	uCi/g	Jan 1 2001 12:00AM
241-C-106	243Cm	Sludge	2.74E-02	Ci	C	1.56	g/mL	23	kL	1.70E-04	uCi/g	Jan 1 2001 12:00AM
241-C-106	244Cm	Sludge	5.82E-01	Ci	C	1.56	g/mL	23	kL	3.99E-03	uCi/g	Jan 1 2001 12:00AM
241-C-106	3H	Sludge	1.45E-01	Ci	S	1.56	g/mL	23	kL	4.04E-03	uCi/g	Jan 1 2001 12:00AM
241-C-106	59Ni	Sludge	6.13E+00	Ci	TE	1.3	g/mL	23	kL	8.59E-02	uCi/g	Jan 1 2001 12:00AM
241-C-106	60Co	Sludge	2.46E-01	Ci	TE	1.3	g/mL	23	kL	3.44E-03	uCi/g	Jan 1 2001 12:00AM
241-C-106	63Ni	Sludge	5.71E+02	Ci	TE	1.3	g/mL	23	kL	8.00E+00	uCi/g	Jan 1 2001 12:00AM
241-C-106	79Se	Sludge	2.77E-01	Ci	TE	1.3	g/mL	23	kL	3.88E-03	uCi/g	Jan 1 2001 12:00AM
241-C-106	90Sr	Sludge	2.82E+05	Ci	S	1.56	g/mL	23	kL	7.86E+03	uCi/g	Jan 1 2001 12:00AM
241-C-106	90Y	Sludge	2.82E+05	Ci	C		g/mL	23	kL		uCi/g	Jan 1 2001 12:00AM
241-C-106	93mNb	Sludge	1.08E+01	Ci	TE	1.3	g/mL	23	kL	1.52E-01	uCi/g	Jan 1 2001 12:00AM
241-C-106	93Zr	Sludge	1.16E+01	Ci	TE	1.3	g/mL	23	kL	1.63E-01	uCi/g	Jan 1 2001 12:00AM
241-C-106	99Tc	Sludge	1.03E+00	Ci	S	1.56	g/mL	23	kL	2.88E-02	uCi/g	Jan 1 2001 12:00AM
241-C-106	Ag	Sludge	2.63E+01	kg	S	1.52	g/mL	23	kL	7.53E+02	ug/g	Jan 1 2001 12:00AM
241-C-106	Al	Sludge	1.83E+03	kg	S	1.52	g/mL	23	kL	5.24E+04	ug/g	Jan 1 2001 12:00AM
241-C-106	As	Sludge	8.79E-01	kg	S	1.56	g/mL	23	kL	2.45E+01	ug/g	Jan 1 2001 12:00AM
241-C-106	B	Sludge	8.98E+00	kg	S	1.52	g/mL	23	kL	2.57E+02	ug/g	Jan 1 2001 12:00AM
241-C-106	Ba	Sludge	1.52E+01	kg	S	1.52	g/mL	23	kL	4.36E+02	ug/g	Jan 1 2001 12:00AM
241-C-106	Be	Sludge	1.10E-01	kg	S	1.56	g/mL	23	kL	3.07E+00	ug/g	Jan 1 2001 12:00AM
241-C-106	Bi	Sludge	1.11E-01	kg	TE	1.3	g/mL	23	kL	1.55E+00	ug/g	Jan 1 2001 12:00AM
241-C-106	Ca	Sludge	7.85E+01	kg	S	1.52	g/mL	23	kL	2.25E+03	ug/g	Jan 1 2001 12:00AM
241-C-106	Cd	Sludge	2.11E+00	kg	S	1.52	g/mL	23	kL	6.03E+01	ug/g	Jan 1 2001 12:00AM
241-C-106	Ce	Sludge	2.34E+01	kg	S	1.52	g/mL	23	kL	6.71E+02	ug/g	Jan 1 2001 12:00AM
241-C-106	Cl	Sludge	3.78E+00	kg	S	1.52	g/mL	23	kL	1.08E+02	ug/g	Jan 1 2001 12:00AM
241-C-106	CN	Sludge	3.53E-01	kg	S	1.56	g/mL	23	kL	9.85E+00	ug/g	Jan 1 2001 12:00AM
241-C-106	Co	Sludge	1.11E+00	kg	S	1.52	g/mL	23	kL	3.18E+01	ug/g	Jan 1 2001 12:00AM
241-C-106	Cr	Sludge	5.71E+01	kg	S	1.52	g/mL	23	kL	1.63E+03	ug/g	Jan 1 2001 12:00AM
241-C-106	Cu	Sludge	6.86E+00	kg	S	1.52	g/mL	23	kL	1.96E+02	ug/g	Jan 1 2001 12:00AM
241-C-106	F	Sludge	2.38E+00	kg	S	1.52	g/mL	23	kL	6.81E+01	ug/g	Jan 1 2001 12:00AM
241-C-106	Fe	Sludge	3.05E+03	kg	S	1.52	g/mL	23	kL	8.73E+04	ug/g	Jan 1 2001 12:00AM

CALCULATION SHEET

PROJECT: RPP-WTP
JOB NO.: 24590
CALC NO.: 24590-WTP-M4C-FRP-00001
SHEET REV: 0A
SHEET NO.: 112

BY: E. Berríos
DATE: 12/04/02

SUBJECT: Updated Emissions Run Feed Vector

Tank Name	Analyte	Waste Phase	Inventory	Inventory Units	Basis	Density	Density Units	Volume	Volume Units	Concentration	Concentration Units	Decay Date
241-C-106	Hg	Sludge	4.39E+00	kg	S	1.52	g/mL	23	kL	1.26E+02	ug/g	Jan 1 2001 12:00AM
241-C-106	K	Sludge	2.11E+01	kg	S	1.52	g/mL	23	kL	6.03E+02	ug/g	Jan 1 2001 12:00AM
241-C-106	La	Sludge	1.23E+01	kg	S	1.52	g/mL	23	kL	3.52E+02	ug/g	Jan 1 2001 12:00AM
241-C-106	Li	Sludge	1.33E+00	kg	S	1.52	g/mL	23	kL	3.80E+01	ug/g	Jan 1 2001 12:00AM
241-C-106	Mg	Sludge	2.02E+01	kg	S	1.52	g/mL	23	kL	5.79E+02	ug/g	Jan 1 2001 12:00AM
241-C-106	Mn	Sludge	7.59E+02	kg	S	1.52	g/mL	23	kL	2.17E+04	ug/g	Jan 1 2001 12:00AM
241-C-106	Mo	Sludge	3.85E-01	kg	S	1.56	g/mL	23	kL	1.07E+01	ug/g	Jan 1 2001 12:00AM
241-C-106	Na	Sludge	2.45E+03	kg	S	1.52	g/mL	23	kL	7.02E+04	ug/g	Jan 1 2001 12:00AM
241-C-106	Nd	Sludge	3.53E+01	kg	S	1.52	g/mL	23	kL	1.01E+03	ug/g	Jan 1 2001 12:00AM
241-C-106	Ni	Sludge	1.06E+02	kg	S	1.52	g/mL	23	kL	3.03E+03	ug/g	Jan 1 2001 12:00AM
241-C-106	NO2	Sludge	8.08E+01	kg	S	1.52	g/mL	23	kL	2.31E+03	ug/g	Jan 1 2001 12:00AM
241-C-106	NO3	Sludge	1.18E+01	kg	S	1.52	g/mL	23	kL	3.36E+02	ug/g	Jan 1 2001 12:00AM
241-C-106	Oxalate	Sludge	6.92E+01	kg	S	1.52	g/mL	23	kL	1.98E+03	ug/g	Jan 1 2001 12:00AM
241-C-106	Pb	Sludge	1.57E+02	kg	S	1.52	g/mL	23	kL	4.50E+03	ug/g	Jan 1 2001 12:00AM
241-C-106	Pd	Sludge	3.88E-01	kg	S	1.56	g/mL	23	kL	1.08E+01	ug/g	Jan 1 2001 12:00AM
241-C-106	PO4	Sludge	3.75E+02	kg	S	1.52	g/mL	23	kL	1.07E+04	ug/g	Jan 1 2001 12:00AM
241-C-106	Pr	Sludge	1.26E+01	kg	S	1.56	g/mL	23	kL	3.52E+02	ug/g	Jan 1 2001 12:00AM
241-C-106	Rb	Sludge	9.07E-02	kg	S	1.56	g/mL	23	kL	2.53E+00	ug/g	Jan 1 2001 12:00AM
241-C-106	Rh	Sludge	8.92E-01	kg	S	1.56	g/mL	23	kL	2.49E+01	ug/g	Jan 1 2001 12:00AM
241-C-106	Ru	Sludge	1.83E+01	kg	S	1.56	g/mL	23	kL	5.11E+02	ug/g	Jan 1 2001 12:00AM
241-C-106	Sb	Sludge	9.97E-02	kg	S	1.56	g/mL	23	kL	2.78E+00	ug/g	Jan 1 2001 12:00AM
241-C-106	Se	Sludge	2.11E-02	kg	S	1.56	g/mL	23	kL	5.87E-01	ug/g	Jan 1 2001 12:00AM
241-C-106	Si	Sludge	4.15E+01	kg	S	1.52	g/mL	23	kL	1.19E+03	ug/g	Jan 1 2001 12:00AM
241-C-106	SO4	Sludge	6.06E+01	kg	S	1.52	g/mL	23	kL	1.73E+03	ug/g	Jan 1 2001 12:00AM
241-C-106	Sr	Sludge	6.49E+00	kg	S	1.52	g/mL	23	kL	1.86E+02	ug/g	Jan 1 2001 12:00AM
241-C-106	Ta	Sludge	8.79E-02	kg	S	1.56	g/mL	23	kL	2.45E+00	ug/g	Jan 1 2001 12:00AM
241-C-106	Te	Sludge	3.98E+00	kg	S	1.56	g/mL	23	kL	1.11E+02	ug/g	Jan 1 2001 12:00AM
241-C-106	Th	Sludge	1.89E+01	kg	S	1.52	g/mL	23	kL	5.41E+02	ug/g	Jan 1 2001 12:00AM
241-C-106	Ti	Sludge	4.09E+00	kg	S	1.52	g/mL	23	kL	1.17E+02	ug/g	Jan 1 2001 12:00AM
241-C-106	TIC as CO3	Sludge	3.25E+03	kg	S	1.56	g/mL	23	kL	9.05E+04	ug/g	Jan 1 2001 12:00AM
241-C-106	Tl	Sludge	1.24E-01	kg	S	1.56	g/mL	23	kL	3.46E+00	ug/g	Jan 1 2001 12:00AM
241-C-106	UTOTAL	Sludge	4.11E+01	kg	S	1.52	g/mL	23	kL	1.18E+03	ug/g	Jan 1 2001 12:00AM
241-C-106	V	Sludge	1.37E+00	kg	S	1.52	g/mL	23	kL	3.91E+01	ug/g	Jan 1 2001 12:00AM
241-C-106	Y	Sludge	4.46E+00	kg	S	1.52	g/mL	23	kL	1.28E+02	ug/g	Jan 1 2001 12:00AM
241-C-106	Zn	Sludge	4.36E+00	kg	S	1.52	g/mL	23	kL	1.25E+02	ug/g	Jan 1 2001 12:00AM
241-C-106	Zr	Sludge	2.65E+00	kg	S	1.52	g/mL	23	kL	7.59E+01	ug/g	Jan 1 2001 12:00AM
241-SY-102	106Ru	Sludge (Solids)	7.01E-06	Ci	TS	1.59	g/mL	194	kL	2.47E-08	uCi/g	Jan 1 2001 12:00AM
241-SY-102	106Ru	Sludge (Solids)	6.47E-06	Ci	M	1.84	g/mL	186	kL	1.89E-08	uCi/g	Jan 1 2001 12:00AM
241-SY-102	113mCd	Sludge (Solids)	8.33E+00	Ci	TS	1.59	g/mL	194	kL	2.93E-02	uCi/g	Jan 1 2001 12:00AM
241-SY-102	113mCd	Sludge (Solids)	7.69E+00	Ci	M	1.84	g/mL	186	kL	2.25E-02	uCi/g	Jan 1 2001 12:00AM
241-SY-102	125Sb	Sludge (Solids)	3.92E+00	Ci	TS	1.59	g/mL	194	kL	1.38E-02	uCi/g	Jan 1 2001 12:00AM
241-SY-102	125Sb	Sludge (Solids)	3.62E+00	Ci	M	1.84	g/mL	186	kL	1.06E-02	uCi/g	Jan 1 2001 12:00AM
241-SY-102	126Sn	Sludge (Solids)	2.76E-01	Ci	TS	1.59	g/mL	194	kL	9.72E-04	uCi/g	Jan 1 2001 12:00AM
241-SY-102	126Sn	Sludge (Solids)	2.55E-01	Ci	M	1.84	g/mL	186	kL	7.46E-04	uCi/g	Jan 1 2001 12:00AM
241-SY-102	129I	Sludge (Solids)	4.55E-02	Ci	S	1.65	g/mL	186	kL	1.48E-04	uCi/g	Jan 1 2001 12:00AM
241-SY-102	129I	Sludge (Solids)	4.75E-02	Ci	S	1.65	g/mL	194	kL	1.48E-04	uCi/g	Jan 1 2001 12:00AM

CALCULATION SHEET

PROJECT: RPP-WTP
JOB NO.: 24590
CALC NO.: 24590-WTP-M4C-FRP-00001
SHEET REV: 0A
SHEET NO.: 113

BY: E. Berríos
DATE: 12/04/02

SUBJECT: Updated Emissions Run Feed Vector

Tank Name	Analyte	Waste Phase	Inventory	Inventory Units	Basis	Density	Density Units	Volume	Volume Units	Concentration	Concentration Units	Decay Date
241-SY-102	134Cs	Sludge (Solids)	4.48E-02	Ci	TS	1.59	g/mL	194	kL	1.58E-04	uCi/g	Jan 1 2001 12:00AM
241-SY-102	134Cs	Sludge (Solids)	5.79E-02	Ci	M	1.84	g/mL	186	kL	1.69E-04	uCi/g	Jan 1 2001 12:00AM
241-SY-102	137Cs	Sludge (Solids)	3.34E+04	Ci	S	1.65	g/mL	194	kL	1.04E+02	uCi/g	Jan 1 2001 12:00AM
241-SY-102	137Cs	Sludge (Solids)	3.20E+04	Ci	S	1.65	g/mL	186	kL	1.04E+02	uCi/g	Jan 1 2001 12:00AM
241-SY-102	137mBa	Sludge (Solids)	3.16E+04	Ci	C		g/mL	194	kL		uCi/g	Jan 1 2001 12:00AM
241-SY-102	137mBa	Sludge (Solids)	3.03E+04	Ci	C		g/mL	186	kL		uCi/g	Jan 1 2001 12:00AM
241-SY-102	14C	Sludge (Solids)	2.85E-01	Ci	S	1.65	g/mL	194	kL	8.91E-04	uCi/g	Jan 1 2001 12:00AM
241-SY-102	14C	Sludge (Solids)	2.73E-01	Ci	S	1.65	g/mL	186	kL	8.91E-04	uCi/g	Jan 1 2001 12:00AM
241-SY-102	151Sm	Sludge (Solids)	1.53E+03	Ci	TS	1.59	g/mL	194	kL	5.38E+00	uCi/g	Jan 1 2001 12:00AM
241-SY-102	151Sm	Sludge (Solids)	1.41E+03	Ci	M	1.84	g/mL	186	kL	4.12E+00	uCi/g	Jan 1 2001 12:00AM
241-SY-102	152Eu	Sludge (Solids)	3.90E-01	Ci	TS	1.59	g/mL	194	kL	1.37E-03	uCi/g	Jan 1 2001 12:00AM
241-SY-102	152Eu	Sludge (Solids)	3.59E-01	Ci	M	1.84	g/mL	186	kL	1.05E-03	uCi/g	Jan 1 2001 12:00AM
241-SY-102	154Eu	Sludge (Solids)	1.48E+02	Ci	S	1.44	g/mL	194	kL	5.29E-01	uCi/g	Jan 1 2001 12:00AM
241-SY-102	154Eu	Sludge (Solids)	4.25E+01	Ci	M	1.84	g/mL	186	kL	1.24E-01	uCi/g	Jan 1 2001 12:00AM
241-SY-102	155Eu	Sludge (Solids)	9.35E+01	Ci	S	1.44	g/mL	194	kL	3.35E-01	uCi/g	Jan 1 2001 12:00AM
241-SY-102	155Eu	Sludge (Solids)	1.15E+01	Ci	M	1.84	g/mL	186	kL	3.35E-02	uCi/g	Jan 1 2001 12:00AM
241-SY-102	226Ra	Sludge (Solids)	2.04E-05	Ci	TS	1.59	g/mL	194	kL	7.18E-08	uCi/g	Jan 1 2001 12:00AM
241-SY-102	226Ra	Sludge (Solids)	1.88E-05	Ci	M	1.84	g/mL	186	kL	5.50E-08	uCi/g	Jan 1 2001 12:00AM
241-SY-102	227Ac	Sludge (Solids)	2.13E-04	Ci	TS	1.59	g/mL	194	kL	7.49E-07	uCi/g	Jan 1 2001 12:00AM
241-SY-102	227Ac	Sludge (Solids)	1.96E-04	Ci	M	1.84	g/mL	186	kL	5.74E-07	uCi/g	Jan 1 2001 12:00AM
241-SY-102	228Ra	Sludge (Solids)	1.46E-02	Ci	TS	1.59	g/mL	194	kL	5.13E-05	uCi/g	Jan 1 2001 12:00AM
241-SY-102	228Ra	Sludge (Solids)	1.56E-02	Ci	M	1.84	g/mL	186	kL	4.55E-05	uCi/g	Jan 1 2001 12:00AM
241-SY-102	229Th	Sludge (Solids)	3.52E-04	Ci	TS	1.59	g/mL	194	kL	1.24E-06	uCi/g	Jan 1 2001 12:00AM
241-SY-102	229Th	Sludge (Solids)	3.25E-04	Ci	M	1.84	g/mL	186	kL	9.51E-07	uCi/g	Jan 1 2001 12:00AM
241-SY-102	231Pa	Sludge (Solids)	5.62E-04	Ci	TS	1.59	g/mL	194	kL	1.98E-06	uCi/g	Jan 1 2001 12:00AM
241-SY-102	231Pa	Sludge (Solids)	5.19E-04	Ci	M	1.84	g/mL	186	kL	1.52E-06	uCi/g	Jan 1 2001 12:00AM
241-SY-102	232Th	Sludge (Solids)	1.65E-02	Ci	S	1.65	g/mL	194	kL	5.14E-05	uCi/g	Jan 1 2001 12:00AM
241-SY-102	232Th	Sludge (Solids)	1.58E-02	Ci	S	1.65	g/mL	186	kL	5.14E-05	uCi/g	Jan 1 2001 12:00AM
241-SY-102	232U	Sludge (Solids)	3.66E-02	Ci	C	1.65	g/mL	194	kL	1.14E-04	uCi/g	Jan 1 2001 12:00AM
241-SY-102	232U	Sludge (Solids)	6.75E-02	Ci	C	1.65	g/mL	186	kL	2.20E-04	uCi/g	Jan 1 2001 12:00AM
241-SY-102	233U	Sludge (Solids)	1.50E-01	Ci	C	1.65	g/mL	194	kL	4.69E-04	uCi/g	Jan 1 2001 12:00AM
241-SY-102	233U	Sludge (Solids)	2.77E-01	Ci	C	1.65	g/mL	186	kL	9.03E-04	uCi/g	Jan 1 2001 12:00AM
241-SY-102	234U	Sludge (Solids)	8.38E-02	Ci	C	1.65	g/mL	194	kL	2.62E-04	uCi/g	Jan 1 2001 12:00AM
241-SY-102	234U	Sludge (Solids)	1.54E-01	Ci	C	1.65	g/mL	186	kL	5.02E-04	uCi/g	Jan 1 2001 12:00AM
241-SY-102	235U	Sludge (Solids)	3.53E-03	Ci	C	1.65	g/mL	194	kL	1.10E-05	uCi/g	Jan 1 2001 12:00AM
241-SY-102	235U	Sludge (Solids)	6.46E-03	Ci	C	1.65	g/mL	186	kL	2.11E-05	uCi/g	Jan 1 2001 12:00AM
241-SY-102	236U	Sludge (Solids)	2.02E-03	Ci	C	1.65	g/mL	194	kL	6.32E-06	uCi/g	Jan 1 2001 12:00AM
241-SY-102	236U	Sludge (Solids)	3.76E-03	Ci	C	1.65	g/mL	186	kL	1.23E-05	uCi/g	Jan 1 2001 12:00AM
241-SY-102	237Np	Sludge (Solids)	3.80E-01	Ci	S	1.65	g/mL	194	kL	1.19E-03	uCi/g	Jan 1 2001 12:00AM
241-SY-102	237Np	Sludge (Solids)	3.64E-01	Ci	S	1.65	g/mL	186	kL	1.19E-03	uCi/g	Jan 1 2001 12:00AM
241-SY-102	238Pu	Sludge (Solids)	2.83E+02	Ci	S	1.65	g/mL	194	kL	8.85E-01	uCi/g	Jan 1 2001 12:00AM
241-SY-102	238Pu	Sludge (Solids)	2.72E+02	Ci	S	1.65	g/mL	186	kL	8.85E-01	uCi/g	Jan 1 2001 12:00AM
241-SY-102	238U	Sludge (Solids)	7.99E-02	Ci	C	1.65	g/mL	194	kL	2.50E-04	uCi/g	Jan 1 2001 12:00AM
241-SY-102	238U	Sludge (Solids)	1.46E-01	Ci	C	1.65	g/mL	186	kL	4.76E-04	uCi/g	Jan 1 2001 12:00AM
241-SY-102	239Pu	Sludge (Solids)	2.67E+03	Ci	C	1.65	g/mL	194	kL	8.33E+00	uCi/g	Jan 1 2001 12:00AM
241-SY-102	239Pu	Sludge (Solids)	1.15E+03	Ci	S	1.44	g/mL	186	kL	4.30E+00	uCi/g	Jan 1 2001 12:00AM
241-SY-102	240Pu	Sludge (Solids)	4.19E+02	Ci	C	1.65	g/mL	194	kL	1.31E+00	uCi/g	Jan 1 2001 12:00AM

CALCULATION SHEET

PROJECT: RPP-WTP
JOB NO.: 24590
CALC NO.: 24590-WTP-M4C-FRP-00001
SHEET REV: 0A
SHEET NO.: 114

BY: E. Berríos
DATE: 12/04/02

SUBJECT: Updated Emissions Run Feed Vector

Tank Name	Analyte	Waste Phase	Inventory	Inventory Units	Basis	Density	Density Units	Volume	Volume Units	Concentration	Concentration Units	Decay Date
241-SY-102	240Pu	Sludge (Solids)	4.42E+02	Ci	S	1.44	g/mL	186	kL	1.65E+00	uCi/g	Jan 1 2001 12:00AM
241-SY-102	241Am	Sludge (Solids)	1.20E+04	Ci	S	1.65	g/mL	194	kL	3.75E+01	uCi/g	Jan 1 2001 12:00AM
241-SY-102	241Am	Sludge (Solids)	1.15E+04	Ci	S	1.65	g/mL	186	kL	3.75E+01	uCi/g	Jan 1 2001 12:00AM
241-SY-102	241Pu	Sludge (Solids)	3.24E+03	Ci	C	1.65	g/mL	194	kL	1.01E+01	uCi/g	Jan 1 2001 12:00AM
241-SY-102	241Pu	Sludge (Solids)	5.87E+01	Ci	S	1.44	g/mL	186	kL	2.19E-01	uCi/g	Jan 1 2001 12:00AM
241-SY-102	242Cm	Sludge (Solids)	5.07E-02	Ci	C	1.65	g/mL	194	kL	1.58E-04	uCi/g	Jan 1 2001 12:00AM
241-SY-102	242Cm	Sludge (Solids)	7.60E-04	Ci	C	1.65	g/mL	186	kL	2.48E-06	uCi/g	Jan 1 2001 12:00AM
241-SY-102	242Pu	Sludge (Solids)	2.47E-02	Ci	C	1.65	g/mL	194	kL	7.72E-05	uCi/g	Jan 1 2001 12:00AM
241-SY-102	242Pu	Sludge (Solids)	1.80E-01	Ci	S	1.44	g/mL	186	kL	6.72E-04	uCi/g	Jan 1 2001 12:00AM
241-SY-102	243Am	Sludge (Solids)	3.93E-01	Ci	C	1.65	g/mL	194	kL	1.23E-03	uCi/g	Jan 1 2001 12:00AM
241-SY-102	243Am	Sludge (Solids)	2.80E-03	Ci	C	1.65	g/mL	186	kL	9.13E-06	uCi/g	Jan 1 2001 12:00AM
241-SY-102	243Cm	Sludge (Solids)	4.61E-01	Ci	C		g/mL	194	kL		uCi/g	Jan 1 2001 12:00AM
241-SY-102	243Cm	Sludge (Solids)	4.85E-05	Ci	C	1.65	g/mL	186	kL	1.58E-07	uCi/g	Jan 1 2001 12:00AM
241-SY-102	244Cm	Sludge (Solids)	1.10E+01	Ci	C		g/mL	194	kL		uCi/g	Jan 1 2001 12:00AM
241-SY-102	244Cm	Sludge (Solids)	5.23E-04	Ci	C	1.65	g/mL	186	kL	1.70E-06	uCi/g	Jan 1 2001 12:00AM
241-SY-102	3H	Sludge (Solids)	3.50E-01	Ci	S	1.65	g/mL	194	kL	1.09E-03	uCi/g	Jan 1 2001 12:00AM
241-SY-102	3H	Sludge (Solids)	3.35E-01	Ci	S	1.65	g/mL	186	kL	1.09E-03	uCi/g	Jan 1 2001 12:00AM
241-SY-102	59Ni	Sludge (Solids)	1.44E-01	Ci	TS	1.59	g/mL	194	kL	5.06E-04	uCi/g	Jan 1 2001 12:00AM
241-SY-102	59Ni	Sludge (Solids)	1.14E-01	Ci	M	1.84	g/mL	186	kL	3.32E-04	uCi/g	Jan 1 2001 12:00AM
241-SY-102	60Co	Sludge (Solids)	6.24E+00	Ci	TS	1.59	g/mL	194	kL	2.20E-02	uCi/g	Jan 1 2001 12:00AM
241-SY-102	60Co	Sludge (Solids)	1.89E+00	Ci	M	1.84	g/mL	186	kL	5.52E-03	uCi/g	Jan 1 2001 12:00AM
241-SY-102	63Ni	Sludge (Solids)	1.34E+01	Ci	TS	1.59	g/mL	194	kL	4.72E-02	uCi/g	Jan 1 2001 12:00AM
241-SY-102	63Ni	Sludge (Solids)	1.06E+01	Ci	M	1.84	g/mL	186	kL	3.10E-02	uCi/g	Jan 1 2001 12:00AM
241-SY-102	79Se	Sludge (Solids)	4.57E-02	Ci	TS	1.59	g/mL	194	kL	1.61E-04	uCi/g	Jan 1 2001 12:00AM
241-SY-102	79Se	Sludge (Solids)	4.22E-02	Ci	M	1.84	g/mL	186	kL	1.23E-04	uCi/g	Jan 1 2001 12:00AM
241-SY-102	90Sr	Sludge (Solids)	3.44E+04	Ci	S	1.65	g/mL	194	kL	1.07E+02	uCi/g	Jan 1 2001 12:00AM
241-SY-102	90Sr	Sludge (Solids)	3.29E+04	Ci	S	1.65	g/mL	186	kL	1.07E+02	uCi/g	Jan 1 2001 12:00AM
241-SY-102	90Y	Sludge (Solids)	3.44E+04	Ci	C		g/mL	194	kL		uCi/g	Jan 1 2001 12:00AM
241-SY-102	90Y	Sludge (Solids)	3.29E+04	Ci	C		g/mL	186	kL		uCi/g	Jan 1 2001 12:00AM
241-SY-102	93mNb	Sludge (Solids)	1.82E+00	Ci	TS	1.59	g/mL	194	kL	6.40E-03	uCi/g	Jan 1 2001 12:00AM
241-SY-102	93mNb	Sludge (Solids)	1.68E+00	Ci	M	1.84	g/mL	186	kL	4.91E-03	uCi/g	Jan 1 2001 12:00AM
241-SY-102	93Zr	Sludge (Solids)	2.24E+00	Ci	TS	1.59	g/mL	194	kL	7.90E-03	uCi/g	Jan 1 2001 12:00AM
241-SY-102	93Zr	Sludge (Solids)	2.07E+00	Ci	M	1.84	g/mL	186	kL	6.05E-03	uCi/g	Jan 1 2001 12:00AM
241-SY-102	99Tc	Sludge (Solids)	6.47E+01	Ci	S	1.65	g/mL	194	kL	2.02E-01	uCi/g	Jan 1 2001 12:00AM
241-SY-102	99Tc	Sludge (Solids)	6.20E+01	Ci	S	1.65	g/mL	186	kL	2.02E-01	uCi/g	Jan 1 2001 12:00AM
241-SY-102	Ag	Sludge (Solids)	2.83E+01	kg	S	1.65	g/mL	186	kL	9.21E+01	ug/g	Jan 1 2001 12:00AM
241-SY-102	Ag	Sludge (Solids)	1.54E+00	kg	S	1.65	g/mL	194	kL	4.80E+00	ug/g	Jan 1 2001 12:00AM
241-SY-102	Al	Sludge (Solids)	1.39E+04	kg	S	1.65	g/mL	194	kL	4.33E+04	ug/g	Jan 1 2001 12:00AM
241-SY-102	Al	Sludge (Solids)	8.87E+03	kg	S	1.65	g/mL	186	kL	2.89E+04	ug/g	Jan 1 2001 12:00AM
241-SY-102	As	Sludge (Solids)	3.04E+00	kg	S	1.65	g/mL	194	kL	9.49E+00	ug/g	Jan 1 2001 12:00AM
241-SY-102	As	Sludge (Solids)	2.91E+00	kg	S	1.65	g/mL	186	kL	9.49E+00	ug/g	Jan 1 2001 12:00AM
241-SY-102	B	Sludge (Solids)	1.38E+01	kg	S	1.65	g/mL	186	kL	4.51E+01	ug/g	Jan 1 2001 12:00AM
241-SY-102	B	Sludge (Solids)	1.52E+01	kg	S	1.65	g/mL	194	kL	4.75E+01	ug/g	Jan 1 2001 12:00AM
241-SY-102	Ba	Sludge (Solids)	1.31E+01	kg	S	1.65	g/mL	186	kL	4.27E+01	ug/g	Jan 1 2001 12:00AM
241-SY-102	Ba	Sludge (Solids)	7.81E+00	kg	S	1.65	g/mL	194	kL	2.44E+01	ug/g	Jan 1 2001 12:00AM
241-SY-102	Be	Sludge (Solids)	5.47E-01	kg	S	1.44	g/mL	194	kL	1.96E+00	ug/g	Jan 1 2001 12:00AM
241-SY-102	Be	Sludge (Solids)	1.49E+00	kg	S	1.65	g/mL	186	kL	4.84E+00	ug/g	Jan 1 2001 12:00AM

CALCULATION SHEET

PROJECT: RPP-WTP
JOB NO.: 24590
CALC NO.: 24590-WTP-M4C-FRP-00001
SHEET REV: 0A
SHEET NO.: 115

BY: E. Berrios
DATE: 12/04/02

SUBJECT: Updated Emissions Run Feed Vector

Tank Name	Analyte	Waste Phase	Inventory	Inventory Units	Basis	Density	Density Units	Volume	Volume Units	Concentration	Concentration Units	Decay Date
241-SY-102	Bi	Sludge (Solids)	6.66E+01	kg	S	1.65	g/mL	194	kL	2.08E+02	ug/g	Jan 1 2001 12:00AM
241-SY-102	Bi	Sludge (Solids)	2.73E+03	kg	S	1.65	g/mL	186	kL	8.91E+03	ug/g	Jan 1 2001 12:00AM
241-SY-102	Ca	Sludge (Solids)	1.74E+02	kg	S	1.65	g/mL	194	kL	5.43E+02	ug/g	Jan 1 2001 12:00AM
241-SY-102	Ca	Sludge (Solids)	8.95E+02	kg	S	1.65	g/mL	186	kL	2.92E+03	ug/g	Jan 1 2001 12:00AM
241-SY-102	Cd	Sludge (Solids)	3.26E+01	kg	S	1.65	g/mL	194	kL	1.02E+02	ug/g	Jan 1 2001 12:00AM
241-SY-102	Cd	Sludge (Solids)	8.77E+01	kg	S	1.65	g/mL	186	kL	2.86E+02	ug/g	Jan 1 2001 12:00AM
241-SY-102	Ce	Sludge (Solids)	1.48E+01	kg	S	1.65	g/mL	194	kL	4.63E+01	ug/g	Jan 1 2001 12:00AM
241-SY-102	Ce	Sludge (Solids)	2.43E+01	kg	S	1.65	g/mL	186	kL	7.91E+01	ug/g	Jan 1 2001 12:00AM
241-SY-102	Cl	Sludge (Solids)	7.81E+02	kg	S	1.65	g/mL	194	kL	2.44E+03	ug/g	Jan 1 2001 12:00AM
241-SY-102	Cl	Sludge (Solids)	8.16E+02	kg	S	1.65	g/mL	186	kL	2.66E+03	ug/g	Jan 1 2001 12:00AM
241-SY-102	Co	Sludge (Solids)	4.47E+00	kg	S	1.65	g/mL	194	kL	1.39E+01	ug/g	Jan 1 2001 12:00AM
241-SY-102	Co	Sludge (Solids)	3.44E+00	kg	S	1.65	g/mL	186	kL	1.12E+01	ug/g	Jan 1 2001 12:00AM
241-SY-102	Cr	Sludge (Solids)	9.47E+03	kg	S	1.65	g/mL	194	kL	2.96E+04	ug/g	Jan 1 2001 12:00AM
241-SY-102	Cr	Sludge (Solids)	3.92E+03	kg	S	1.65	g/mL	186	kL	1.28E+04	ug/g	Jan 1 2001 12:00AM
241-SY-102	Cu	Sludge (Solids)	1.09E+00	kg	S	1.44	g/mL	194	kL	3.92E+00	ug/g	Jan 1 2001 12:00AM
241-SY-102	Cu	Sludge (Solids)	1.74E+01	kg	S	1.65	g/mL	186	kL	5.67E+01	ug/g	Jan 1 2001 12:00AM
241-SY-102	F	Sludge (Solids)	2.67E+02	kg	S	1.65	g/mL	194	kL	8.35E+02	ug/g	Jan 1 2001 12:00AM
241-SY-102	F	Sludge (Solids)	3.25E+02	kg	S	1.65	g/mL	186	kL	1.06E+03	ug/g	Jan 1 2001 12:00AM
241-SY-102	Fe	Sludge (Solids)	6.76E+02	kg	S	1.65	g/mL	194	kL	2.11E+03	ug/g	Jan 1 2001 12:00AM
241-SY-102	Fe	Sludge (Solids)	6.93E+03	kg	S	1.65	g/mL	186	kL	2.26E+04	ug/g	Jan 1 2001 12:00AM
241-SY-102	Hg	Sludge (Solids)	2.97E+00	kg	S	1.65	g/mL	194	kL	9.29E+00	ug/g	Jan 1 2001 12:00AM
241-SY-102	Hg	Sludge (Solids)	2.85E+00	kg	S	1.65	g/mL	186	kL	9.29E+00	ug/g	Jan 1 2001 12:00AM
241-SY-102	K	Sludge (Solids)	3.58E+02	kg	S	1.65	g/mL	194	kL	1.12E+03	ug/g	Jan 1 2001 12:00AM
241-SY-102	K	Sludge (Solids)	4.05E+02	kg	S	1.65	g/mL	186	kL	1.32E+03	ug/g	Jan 1 2001 12:00AM
241-SY-102	La	Sludge (Solids)	1.10E+01	kg	S	1.65	g/mL	194	kL	3.45E+01	ug/g	Jan 1 2001 12:00AM
241-SY-102	La	Sludge (Solids)	3.72E+01	kg	S	1.65	g/mL	186	kL	1.21E+02	ug/g	Jan 1 2001 12:00AM
241-SY-102	Li	Sludge (Solids)	1.04E+01	kg	S	1.65	g/mL	194	kL	3.24E+01	ug/g	Jan 1 2001 12:00AM
241-SY-102	Li	Sludge (Solids)	1.45E+01	kg	S	1.65	g/mL	186	kL	4.72E+01	ug/g	Jan 1 2001 12:00AM
241-SY-102	Mg	Sludge (Solids)	2.22E+02	kg	S	1.65	g/mL	186	kL	7.22E+02	ug/g	Jan 1 2001 12:00AM
241-SY-102	Mg	Sludge (Solids)	1.13E+01	kg	S	1.44	g/mL	194	kL	4.04E+01	ug/g	Jan 1 2001 12:00AM
241-SY-102	Mn	Sludge (Solids)	1.84E+02	kg	S	1.65	g/mL	194	kL	5.76E+02	ug/g	Jan 1 2001 12:00AM
241-SY-102	Mn	Sludge (Solids)	1.60E+03	kg	S	1.65	g/mL	186	kL	5.21E+03	ug/g	Jan 1 2001 12:00AM
241-SY-102	Na	Sludge (Solids)	4.06E+04	kg	S	1.65	g/mL	194	kL	1.27E+05	ug/g	Jan 1 2001 12:00AM
241-SY-102	Na	Sludge (Solids)	3.40E+04	kg	S	1.65	g/mL	186	kL	1.11E+05	ug/g	Jan 1 2001 12:00AM
241-SY-102	Nd	Sludge (Solids)	2.79E+01	kg	S	1.65	g/mL	186	kL	9.08E+01	ug/g	Jan 1 2001 12:00AM
241-SY-102	Nd	Sludge (Solids)	4.04E+01	kg	S	1.65	g/mL	194	kL	1.26E+02	ug/g	Jan 1 2001 12:00AM
241-SY-102	Ni	Sludge (Solids)	1.26E+02	kg	S	1.65	g/mL	194	kL	3.95E+02	ug/g	Jan 1 2001 12:00AM
241-SY-102	Ni	Sludge (Solids)	1.01E+02	kg	S	1.65	g/mL	186	kL	3.29E+02	ug/g	Jan 1 2001 12:00AM
241-SY-102	NO2	Sludge (Solids)	1.25E+04	kg	S	1.65	g/mL	194	kL	3.89E+04	ug/g	Jan 1 2001 12:00AM
241-SY-102	NO2	Sludge (Solids)	1.06E+04	kg	S	1.65	g/mL	186	kL	3.45E+04	ug/g	Jan 1 2001 12:00AM
241-SY-102	NO3	Sludge (Solids)	1.90E+04	kg	S	1.65	g/mL	194	kL	5.95E+04	ug/g	Jan 1 2001 12:00AM
241-SY-102	NO3	Sludge (Solids)	2.36E+04	kg	S	1.65	g/mL	186	kL	7.70E+04	ug/g	Jan 1 2001 12:00AM
241-SY-102	OH	Sludge (Solids)	4.11E+03	kg	S	1.44	g/mL	194	kL	1.47E+04	ug/g	Jan 1 2001 12:00AM
241-SY-102	Oxalate	Sludge (Solids)	2.60E+04	kg	S	1.65	g/mL	194	kL	8.12E+04	ug/g	Jan 1 2001 12:00AM
241-SY-102	Oxalate	Sludge (Solids)	7.62E+03	kg	S	1.65	g/mL	186	kL	2.48E+04	ug/g	Jan 1 2001 12:00AM
241-SY-102	Pb	Sludge (Solids)	1.79E+02	kg	S	1.65	g/mL	194	kL	5.59E+02	ug/g	Jan 1 2001 12:00AM
241-SY-102	Pb	Sludge (Solids)	3.74E+02	kg	S	1.65	g/mL	186	kL	1.22E+03	ug/g	Jan 1 2001 12:00AM

CALCULATION SHEET

PROJECT: RPP-WTP
JOB NO.: 24590
CALC NO.: 24590-WTP-M4C-FRP-00001
SHEET REV: 0A
SHEET NO.: 116

BY: E. Berrios
DATE: 12/04/02

SUBJECT: Updated Emissions Run Feed Vector

Tank Name	Analyte	Waste Phase	Inventory	Inventory Units	Basis	Density	Density Units	Volume	Volume Units	Concentration	Concentration Units	Decay Date
241-SY-102	PO4	Sludge (Solids)	1.10E+03	kg	S	1.65	g/mL	194	kL	3.44E+03	ug/g	Jan 1 2001 12:00AM
241-SY-102	PO4	Sludge (Solids)	5.36E+03	kg	S	1.65	g/mL	186	kL	1.75E+04	ug/g	Jan 1 2001 12:00AM
241-SY-102	Rb	Sludge (Solids)	1.23E+01	kg	S	1.65	g/mL	194	kL	3.85E+01	ug/g	Jan 1 2001 12:00AM
241-SY-102	Rb	Sludge (Solids)	1.18E+01	kg	S	1.65	g/mL	186	kL	3.85E+01	ug/g	Jan 1 2001 12:00AM
241-SY-102	Sb	Sludge (Solids)	9.22E-01	kg	S	1.65	g/mL	194	kL	2.88E+00	ug/g	Jan 1 2001 12:00AM
241-SY-102	Sb	Sludge (Solids)	8.84E-01	kg	S	1.65	g/mL	186	kL	2.88E+00	ug/g	Jan 1 2001 12:00AM
241-SY-102	Se	Sludge (Solids)	2.89E+00	kg	S	1.65	g/mL	186	kL	9.42E+00	ug/g	Jan 1 2001 12:00AM
241-SY-102	Se	Sludge (Solids)	3.01E+00	kg	S	1.65	g/mL	194	kL	9.42E+00	ug/g	Jan 1 2001 12:00AM
241-SY-102	Si	Sludge (Solids)	1.30E+02	kg	S	1.65	g/mL	194	kL	4.07E+02	ug/g	Jan 1 2001 12:00AM
241-SY-102	Si	Sludge (Solids)	8.10E+02	kg	S	1.65	g/mL	186	kL	2.64E+03	ug/g	Jan 1 2001 12:00AM
241-SY-102	SO4	Sludge (Solids)	6.50E+02	kg	S	1.65	g/mL	194	kL	2.03E+03	ug/g	Jan 1 2001 12:00AM
241-SY-102	SO4	Sludge (Solids)	1.29E+03	kg	S	1.65	g/mL	186	kL	4.21E+03	ug/g	Jan 1 2001 12:00AM
241-SY-102	Sr	Sludge (Solids)	2.75E+00	kg	S	1.65	g/mL	194	kL	8.59E+00	ug/g	Jan 1 2001 12:00AM
241-SY-102	Sr	Sludge (Solids)	3.56E+01	kg	S	1.65	g/mL	186	kL	1.16E+02	ug/g	Jan 1 2001 12:00AM
241-SY-102	Ta	Sludge (Solids)	1.27E+00	kg	S	1.65	g/mL	194	kL	3.98E+00	ug/g	Jan 1 2001 12:00AM
241-SY-102	Ta	Sludge (Solids)	1.22E+00	kg	S	1.65	g/mL	186	kL	3.98E+00	ug/g	Jan 1 2001 12:00AM
241-SY-102	Te	Sludge (Solids)	7.23E-01	kg	S	1.65	g/mL	186	kL	2.36E+00	ug/g	Jan 1 2001 12:00AM
241-SY-102	Te	Sludge (Solids)	7.54E-01	kg	S	1.65	g/mL	194	kL	2.36E+00	ug/g	Jan 1 2001 12:00AM
241-SY-102	Th	Sludge (Solids)	1.68E+02	kg	S	1.65	g/mL	194	kL	5.26E+02	ug/g	Jan 1 2001 12:00AM
241-SY-102	Th	Sludge (Solids)	1.61E+02	kg	S	1.65	g/mL	186	kL	5.26E+02	ug/g	Jan 1 2001 12:00AM
241-SY-102	Ti	Sludge (Solids)	2.85E+00	kg	S	1.65	g/mL	194	kL	8.90E+00	ug/g	Jan 1 2001 12:00AM
241-SY-102	Ti	Sludge (Solids)	9.12E+00	kg	S	1.65	g/mL	186	kL	2.97E+01	ug/g	Jan 1 2001 12:00AM
241-SY-102	TIC as CO3	Sludge (Solids)	5.84E+03	kg	S	1.65	g/mL	194	kL	1.82E+04	ug/g	Jan 1 2001 12:00AM
241-SY-102	TIC as CO3	Sludge (Solids)	5.60E+03	kg	S	1.65	g/mL	186	kL	1.82E+04	ug/g	Jan 1 2001 12:00AM
241-SY-102	Tl	Sludge (Solids)	2.35E-01	kg	S	1.65	g/mL	194	kL	7.33E-01	ug/g	Jan 1 2001 12:00AM
241-SY-102	Tl	Sludge (Solids)	2.25E-01	kg	S	1.65	g/mL	186	kL	7.33E-01	ug/g	Jan 1 2001 12:00AM
241-SY-102	UTOTAL	Sludge (Solids)	2.39E+02	kg	S	1.65	g/mL	194	kL	7.47E+02	ug/g	Jan 1 2001 12:00AM
241-SY-102	UTOTAL	Sludge (Solids)	4.38E+02	kg	S	1.65	g/mL	186	kL	1.43E+03	ug/g	Jan 1 2001 12:00AM
241-SY-102	V	Sludge (Solids)	4.02E+00	kg	S	1.44	g/mL	186	kL	1.50E+01	ug/g	Jan 1 2001 12:00AM
241-SY-102	V	Sludge (Solids)	5.04E+00	kg	S	1.65	g/mL	194	kL	1.57E+01	ug/g	Jan 1 2001 12:00AM
241-SY-102	Y	Sludge (Solids)	5.52E+00	kg	S	1.65	g/mL	186	kL	1.80E+01	ug/g	Jan 1 2001 12:00AM
241-SY-102	Y	Sludge (Solids)	5.76E+00	kg	S	1.65	g/mL	194	kL	1.80E+01	ug/g	Jan 1 2001 12:00AM
241-SY-102	Zn	Sludge (Solids)	3.06E+01	kg	S	1.65	g/mL	194	kL	9.55E+01	ug/g	Jan 1 2001 12:00AM
241-SY-102	Zn	Sludge (Solids)	6.79E+01	kg	S	1.65	g/mL	186	kL	2.21E+02	ug/g	Jan 1 2001 12:00AM
241-SY-102	Zr	Sludge (Solids)	2.03E+01	kg	S	1.65	g/mL	194	kL	6.35E+01	ug/g	Jan 1 2001 12:00AM
241-SY-102	Zr	Sludge (Solids)	5.48E+01	kg	S	1.65	g/mL	186	kL	1.79E+02	ug/g	Jan 1 2001 12:00AM
241-AW-104	106Ru	Total	4.14E-05	Ci	E							Jan 1 2001 12:00AM
241-AW-104	106Ru	Salt Cake (Liquids)	5.15E-06	Ci	TE	1.6	g/mL	136	kL	2.37E-08	uCi/g	Jan 1 2001 12:00AM
241-AW-104	106Ru	Salt Cake (Solids)	3.46E-05	Ci	TS	1.58	g/mL	457	kL	4.79E-08	uCi/g	Jan 1 2001 12:00AM
241-AW-104	106Ru	Sludge (Liquids)	1.65E-06	Ci	TE	1.6	g/mL	62	kL	1.66E-08	uCi/g	Jan 1 2001 12:00AM
241-AW-104	106Ru	Sludge (Solids)	0.00E+00	Ci	TE	1.2	g/mL	188	kL	0.00E+00	uCi/g	Jan 1 2001 12:00AM
241-AW-104	106Ru	Supernatant	0.00E+00	Ci	TE	1.02	g/mL	347	kL	0.00E+00	uCi/g	Jan 1 2001 12:00AM
241-AW-104	113mCd	Total	3.76E+01	Ci	E							Jan 1 2001 12:00AM
241-AW-104	113mCd	Salt Cake (Liquids)	4.68E+00	Ci	TE	1.6	g/mL	136	kL	2.15E-02	uCi/g	Jan 1 2001 12:00AM
241-AW-104	113mCd	Salt Cake (Solids)	3.14E+01	Ci	TS	1.58	g/mL	457	kL	4.35E-02	uCi/g	Jan 1 2001 12:00AM

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CALCULATION SHEET

PROJECT: RPP-WTP
JOB NO.: 24590
CALC NO.: 24590-WTP-M4C-FRP-00001
SHEET REV: 0A
SHEET NO.: 118

BY: E. Berrios
DATE: 12/04/02

SUBJECT: Updated Emissions Run Feed Vector

Tank Name	Analyte	Waste Phase	Inventory	Inventory Units	Basis	Density	Density Units	Volume	Volume Units	Concentration	Concentration Units	Decay Date
241-AW-104	151Sm	Salt Cake (Solids)	5.35E+03	Ci	TS	1.58	g/mL	457	kL	7.41E+00	uCi/g	Jan 1 2001 12:00AM
241-AW-104	151Sm	Sludge (Liquids)	2.55E+02	Ci	TE	1.6	g/mL	62	kL	2.57E+00	uCi/g	Jan 1 2001 12:00AM
241-AW-104	151Sm	Sludge (Solids)	0.00E+00	Ci	TE	1.2	g/mL	188	kL	0.00E+00	uCi/g	Jan 1 2001 12:00AM
241-AW-104	151Sm	Supernatant	0.00E+00	Ci	TE	1.02	g/mL	347	kL	0.00E+00	uCi/g	Jan 1 2001 12:00AM
241-AW-104	152Eu	Total	1.93E+00	Ci	E							Jan 1 2001 12:00AM
241-AW-104	152Eu	Salt Cake (Liquids)	2.41E-01	Ci	TE	1.6	g/mL	136	kL	1.11E-03	uCi/g	Jan 1 2001 12:00AM
241-AW-104	152Eu	Salt Cake (Solids)	1.62E+00	Ci	TS	1.58	g/mL	457	kL	2.24E-03	uCi/g	Jan 1 2001 12:00AM
241-AW-104	152Eu	Sludge (Liquids)	7.70E-02	Ci	TE	1.6	g/mL	62	kL	7.76E-04	uCi/g	Jan 1 2001 12:00AM
241-AW-104	152Eu	Sludge (Solids)	0.00E+00	Ci	TE	1.2	g/mL	188	kL	0.00E+00	uCi/g	Jan 1 2001 12:00AM
241-AW-104	152Eu	Supernatant	0.00E+00	Ci	TE	1.02	g/mL	347	kL	0.00E+00	uCi/g	Jan 1 2001 12:00AM
241-AW-104	154Eu	Total	2.20E+02	Ci	E							Jan 1 2001 12:00AM
241-AW-104	154Eu	Salt Cake (Liquids)	2.74E+01	Ci	TE	1.6	g/mL	136	kL	1.26E-01	uCi/g	Jan 1 2001 12:00AM
241-AW-104	154Eu	Salt Cake (Solids)	1.84E+02	Ci	TS	1.58	g/mL	457	kL	2.55E-01	uCi/g	Jan 1 2001 12:00AM
241-AW-104	154Eu	Sludge (Liquids)	8.75E+00	Ci	TE	1.6	g/mL	62	kL	8.82E-02	uCi/g	Jan 1 2001 12:00AM
241-AW-104	154Eu	Sludge (Solids)	0.00E+00	Ci	TE	1.2	g/mL	188	kL	0.00E+00	uCi/g	Jan 1 2001 12:00AM
241-AW-104	154Eu	Supernatant	0.00E+00	Ci	TE	1.02	g/mL	347	kL	0.00E+00	uCi/g	Jan 1 2001 12:00AM
241-AW-104	155Eu	Total	6.06E+01	Ci	E							Jan 1 2001 12:00AM
241-AW-104	155Eu	Salt Cake (Liquids)	7.54E+00	Ci	TE	1.6	g/mL	136	kL	3.46E-02	uCi/g	Jan 1 2001 12:00AM
241-AW-104	155Eu	Salt Cake (Solids)	5.07E+01	Ci	TS	1.58	g/mL	457	kL	7.02E-02	uCi/g	Jan 1 2001 12:00AM
241-AW-104	155Eu	Sludge (Liquids)	2.41E+00	Ci	TE	1.6	g/mL	62	kL	2.43E-02	uCi/g	Jan 1 2001 12:00AM
241-AW-104	155Eu	Sludge (Solids)	0.00E+00	Ci	TE	1.2	g/mL	188	kL	0.00E+00	uCi/g	Jan 1 2001 12:00AM
241-AW-104	155Eu	Supernatant	0.00E+00	Ci	TE	1.02	g/mL	347	kL	0.00E+00	uCi/g	Jan 1 2001 12:00AM
241-AW-104	226Ra	Total	7.72E-05	Ci	E							Jan 1 2001 12:00AM
241-AW-104	226Ra	Salt Cake (Liquids)	9.61E-06	Ci	TE	1.6	g/mL	136	kL	4.42E-08	uCi/g	Jan 1 2001 12:00AM
241-AW-104	226Ra	Salt Cake (Solids)	6.45E-05	Ci	TS	1.58	g/mL	457	kL	8.94E-08	uCi/g	Jan 1 2001 12:00AM
241-AW-104	226Ra	Sludge (Liquids)	3.07E-06	Ci	TE	1.6	g/mL	62	kL	3.10E-08	uCi/g	Jan 1 2001 12:00AM
241-AW-104	226Ra	Sludge (Solids)	0.00E+00	Ci	TE	1.2	g/mL	188	kL	0.00E+00	uCi/g	Jan 1 2001 12:00AM
241-AW-104	226Ra	Supernatant	0.00E+00	Ci	TE	1.02	g/mL	347	kL	0.00E+00	uCi/g	Jan 1 2001 12:00AM
241-AW-104	227Ac	Total	7.87E-04	Ci	E							Jan 1 2001 12:00AM
241-AW-104	227Ac	Salt Cake (Liquids)	9.81E-05	Ci	TE	1.6	g/mL	136	kL	4.51E-07	uCi/g	Jan 1 2001 12:00AM
241-AW-104	227Ac	Salt Cake (Solids)	6.58E-04	Ci	TS	1.58	g/mL	457	kL	9.11E-07	uCi/g	Jan 1 2001 12:00AM
241-AW-104	227Ac	Sludge (Liquids)	3.14E-05	Ci	TE	1.6	g/mL	62	kL	3.16E-07	uCi/g	Jan 1 2001 12:00AM
241-AW-104	227Ac	Sludge (Solids)	0.00E+00	Ci	TE	1.2	g/mL	188	kL	0.00E+00	uCi/g	Jan 1 2001 12:00AM
241-AW-104	227Ac	Supernatant	0.00E+00	Ci	TE	1.02	g/mL	347	kL	0.00E+00	uCi/g	Jan 1 2001 12:00AM
241-AW-104	228Ra	Total	9.30E-02	Ci	E							Jan 1 2001 12:00AM
241-AW-104	228Ra	Salt Cake (Liquids)	1.16E-02	Ci	TE	1.6	g/mL	136	kL	5.32E-05	uCi/g	Jan 1 2001 12:00AM
241-AW-104	228Ra	Salt Cake (Solids)	7.77E-02	Ci	TS	1.58	g/mL	457	kL	1.08E-04	uCi/g	Jan 1 2001 12:00AM
241-AW-104	228Ra	Sludge (Liquids)	3.70E-03	Ci	TE	1.6	g/mL	62	kL	3.73E-05	uCi/g	Jan 1 2001 12:00AM
241-AW-104	228Ra	Sludge (Solids)	0.00E+00	Ci	TE	1.2	g/mL	188	kL	0.00E+00	uCi/g	Jan 1 2001 12:00AM
241-AW-104	228Ra	Supernatant	0.00E+00	Ci	TE	1.02	g/mL	347	kL	0.00E+00	uCi/g	Jan 1 2001 12:00AM
241-AW-104	229Th	Total	3.94E-03	Ci	E							Jan 1 2001 12:00AM
241-AW-104	229Th	Salt Cake (Liquids)	4.91E-04	Ci	TE	1.6	g/mL	136	kL	2.26E-06	uCi/g	Jan 1 2001 12:00AM
241-AW-104	229Th	Salt Cake (Solids)	3.29E-03	Ci	TS	1.58	g/mL	457	kL	4.56E-06	uCi/g	Jan 1 2001 12:00AM
241-AW-104	229Th	Sludge (Liquids)	1.57E-04	Ci	TE	1.6	g/mL	62	kL	1.58E-06	uCi/g	Jan 1 2001 12:00AM
241-AW-104	229Th	Sludge (Solids)	0.00E+00	Ci	TE	1.2	g/mL	188	kL	0.00E+00	uCi/g	Jan 1 2001 12:00AM
241-AW-104	229Th	Supernatant	0.00E+00	Ci	TE	1.02	g/mL	347	kL	0.00E+00	uCi/g	Jan 1 2001 12:00AM
241-AW-104	231Pa	Total	2.12E-03	Ci	E							Jan 1 2001 12:00AM

CALCULATION SHEET

PROJECT: RPP-WTP
JOB NO.: 24590
CALC NO.: 24590-WTP-M4C-FRP-00001
SHEET REV: 0A
SHEET NO.: 119

BY: E. Berrios
DATE: 12/04/02

SUBJECT: Updated Emissions Run Feed Vector

Tank Name	Analyte	Waste Phase	Inventory	Inventory Units	Basis	Density	Density Units	Volume	Volume Units	Concentration	Concentration Units	Decay Date
241-AW-104	231Pa	Salt Cake (Liquids)	2.65E-04	Ci	TE	1.6	g/mL	136	kL	1.22E-06	uCi/g	Jan 1 2001 12:00AM
241-AW-104	231Pa	Salt Cake (Solids)	1.77E-03	Ci	TS	1.58	g/mL	457	kL	2.46E-06	uCi/g	Jan 1 2001 12:00AM
241-AW-104	231Pa	Sludge (Liquids)	8.46E-05	Ci	TE	1.6	g/mL	62	kL	8.53E-07	uCi/g	Jan 1 2001 12:00AM
241-AW-104	231Pa	Sludge (Solids)	0.00E+00	Ci	TE	1.2	g/mL	188	kL	0.00E+00	uCi/g	Jan 1 2001 12:00AM
241-AW-104	231Pa	Supernatant	0.00E+00	Ci	TE	1.02	g/mL	347	kL	0.00E+00	uCi/g	Jan 1 2001 12:00AM
241-AW-104	232Th	Total	2.07E-02	Ci	E							Jan 1 2001 12:00AM
241-AW-104	232Th	Salt Cake (Liquids)	2.58E-03	Ci	TE	1.6	g/mL	136	kL	1.18E-05	uCi/g	Jan 1 2001 12:00AM
241-AW-104	232Th	Salt Cake (Solids)	1.73E-02	Ci	TS	1.58	g/mL	457	kL	2.40E-05	uCi/g	Jan 1 2001 12:00AM
241-AW-104	232Th	Sludge (Liquids)	8.24E-04	Ci	TE	1.6	g/mL	62	kL	8.30E-06	uCi/g	Jan 1 2001 12:00AM
241-AW-104	232Th	Sludge (Solids)	0.00E+00	Ci	TE	1.2	g/mL	188	kL	0.00E+00	uCi/g	Jan 1 2001 12:00AM
241-AW-104	232Th	Supernatant	0.00E+00	Ci	TE	1.02	g/mL	347	kL	0.00E+00	uCi/g	Jan 1 2001 12:00AM
241-AW-104	232U	Total	4.26E-03	Ci	E/C							Jan 1 2001 12:00AM
241-AW-104	232U	Salt Cake (Liquids)	1.59E-03	Ci	TE	1.6	g/mL	136	kL	7.32E-06	uCi/g	Jan 1 2001 12:00AM
241-AW-104	232U	Salt Cake (Solids)	6.47E-05	Ci	C		g/mL	457	kL	8.85E-08	uCi/g	Jan 1 2001 12:00AM
241-AW-104	232U	Sludge (Liquids)	5.09E-04	Ci	TE	1.6	g/mL	62	kL	5.14E-06	uCi/g	Jan 1 2001 12:00AM
241-AW-104	232U	Sludge (Solids)	2.09E-03	Ci	C		g/mL	188	kL	8.70E-06	uCi/g	Jan 1 2001 12:00AM
241-AW-104	232U	Supernatant	5.63E-07	Ci	C		g/mL	347	kL	1.42E-09	uCi/g	Jan 1 2001 12:00AM
241-AW-104	233U	Total	1.46E-02	Ci	E/C							Jan 1 2001 12:00AM
241-AW-104	233U	Salt Cake (Liquids)	6.54E-03	Ci	TE	1.6	g/mL	136	kL	3.01E-05	uCi/g	Jan 1 2001 12:00AM
241-AW-104	233U	Salt Cake (Solids)	1.77E-04	Ci	C		g/mL	457	kL	2.43E-07	uCi/g	Jan 1 2001 12:00AM
241-AW-104	233U	Sludge (Liquids)	2.09E-03	Ci	TE	1.6	g/mL	62	kL	2.11E-05	uCi/g	Jan 1 2001 12:00AM
241-AW-104	233U	Sludge (Solids)	5.74E-03	Ci	C		g/mL	188	kL	2.39E-05	uCi/g	Jan 1 2001 12:00AM
241-AW-104	233U	Supernatant	1.54E-06	Ci	C		g/mL	347	kL	3.90E-09	uCi/g	Jan 1 2001 12:00AM
241-AW-104	234U	Total	3.46E+00	Ci	E/C							Jan 1 2001 12:00AM
241-AW-104	234U	Salt Cake (Liquids)	2.23E-03	Ci	TE	1.6	g/mL	136	kL	1.02E-05	uCi/g	Jan 1 2001 12:00AM
241-AW-104	234U	Salt Cake (Solids)	1.04E-01	Ci	C		g/mL	457	kL	1.42E-04	uCi/g	Jan 1 2001 12:00AM
241-AW-104	234U	Sludge (Liquids)	7.12E-04	Ci	TE	1.6	g/mL	62	kL	7.17E-06	uCi/g	Jan 1 2001 12:00AM
241-AW-104	234U	Sludge (Solids)	3.35E+00	Ci	C		g/mL	188	kL	1.39E-02	uCi/g	Jan 1 2001 12:00AM
241-AW-104	234U	Supernatant	9.01E-04	Ci	C		g/mL	347	kL	2.28E-06	uCi/g	Jan 1 2001 12:00AM
241-AW-104	235U	Total	1.31E-01	Ci	E/C							Jan 1 2001 12:00AM
241-AW-104	235U	Salt Cake (Liquids)	9.14E-05	Ci	TE	1.6	g/mL	136	kL	4.20E-07	uCi/g	Jan 1 2001 12:00AM
241-AW-104	235U	Sludge (Liquids)	2.92E-05	Ci	TE	1.6	g/mL	62	kL	2.95E-07	uCi/g	Jan 1 2001 12:00AM
241-AW-104	235U	Sludge (Solids)	1.27E-01	Ci	C		g/mL	188	kL	5.29E-04	uCi/g	Jan 1 2001 12:00AM
241-AW-104	235U	Supernatant	3.42E-05	Ci	C		g/mL	347	kL	8.65E-08	uCi/g	Jan 1 2001 12:00AM
241-AW-104	235U	Salt Cake (Solids)	3.94E-03	Ci	C		g/mL	457	kL	5.38E-06	uCi/g	Jan 1 2001 12:00AM
241-AW-104	236U	Total	2.84E-01	Ci	E/C							Jan 1 2001 12:00AM
241-AW-104	236U	Salt Cake (Liquids)	7.78E-05	Ci	TE	1.6	g/mL	136	kL	3.57E-07	uCi/g	Jan 1 2001 12:00AM
241-AW-104	236U	Salt Cake (Solids)	8.52E-03	Ci	C		g/mL	457	kL	1.17E-05	uCi/g	Jan 1 2001 12:00AM
241-AW-104	236U	Sludge (Liquids)	2.49E-05	Ci	TE	1.6	g/mL	62	kL	2.51E-07	uCi/g	Jan 1 2001 12:00AM
241-AW-104	236U	Sludge (Solids)	2.76E-01	Ci	C		g/mL	188	kL	1.15E-03	uCi/g	Jan 1 2001 12:00AM
241-AW-104	236U	Supernatant	7.41E-05	Ci	C		g/mL	347	kL	1.87E-07	uCi/g	Jan 1 2001 12:00AM
241-AW-104	237Np	Total	3.61E-01	Ci	E							Jan 1 2001 12:00AM
241-AW-104	237Np	Salt Cake (Liquids)	1.65E-01	Ci	TE	1.6	g/mL	136	kL	7.60E-04	uCi/g	Jan 1 2001 12:00AM
241-AW-104	237Np	Salt Cake (Solids)	1.43E-01	Ci	TS	1.58	g/mL	457	kL	1.97E-04	uCi/g	Jan 1 2001 12:00AM
241-AW-104	237Np	Sludge (Liquids)	5.29E-02	Ci	TE	1.6	g/mL	62	kL	5.33E-04	uCi/g	Jan 1 2001 12:00AM
241-AW-104	237Np	Sludge (Solids)	0.00E+00	Ci	TE	1.2	g/mL	188	kL	0.00E+00	uCi/g	Jan 1 2001 12:00AM
241-AW-104	237Np	Supernatant	0.00E+00	Ci	TE	1.02	g/mL	347	kL	0.00E+00	uCi/g	Jan 1 2001 12:00AM

CALCULATION SHEET

PROJECT: RPP-WTP
JOB NO.: 24590
CALC NO.: 24590-WTP-M4C-FRP-00001
SHEET REV: 0A
SHEET NO.: 120

BY: E. Berrios
DATE: 12/04/02

SUBJECT: Updated Emissions Run Feed Vector

Tank Name	Analyte	Waste Phase	Inventory	Inventory Units	Basis	Density	Density Units	Volume	Volume Units	Concentration	Concentration Units	Decay Date
241-AW-104	238Pu	Total	5.78E+01	Ci	C							Jan 1 2001 12:00AM
241-AW-104	238Pu	Salt Cake (Liquids)	1.15E-01	Ci	C		g/mL	136	kL	5.87E-04	uCi/g	Jan 1 2001 12:00AM
241-AW-104	238Pu	Salt Cake (Solids)	6.23E+00	Ci	C		g/mL	457	kL	8.52E-03	uCi/g	Jan 1 2001 12:00AM
241-AW-104	238Pu	Sludge (Liquids)	3.43E-02	Ci	C		g/mL	62	kL	3.87E-04	uCi/g	Jan 1 2001 12:00AM
241-AW-104	238Pu	Sludge (Solids)	5.14E+01	Ci	C		g/mL	188	kL	2.13E-01	uCi/g	Jan 1 2001 12:00AM
241-AW-104	238Pu	Supernatant	6.40E-03	Ci	C		g/mL	347	kL	1.62E-05	uCi/g	Jan 1 2001 12:00AM
241-AW-104	238U	Total	2.37E+00	Ci	E/C							Jan 1 2001 12:00AM
241-AW-104	238U	Salt Cake (Liquids)	2.00E-03	Ci	TE	1.6	g/mL	136	kL	9.21E-06	uCi/g	Jan 1 2001 12:00AM
241-AW-104	238U	Salt Cake (Solids)	7.11E-02	Ci	C		g/mL	457	kL	9.73E-05	uCi/g	Jan 1 2001 12:00AM
241-AW-104	238U	Sludge (Liquids)	6.41E-04	Ci	TE	1.6	g/mL	62	kL	6.46E-06	uCi/g	Jan 1 2001 12:00AM
241-AW-104	238U	Sludge (Solids)	2.30E+00	Ci	C		g/mL	188	kL	9.56E-03	uCi/g	Jan 1 2001 12:00AM
241-AW-104	238U	Supernatant	6.18E-04	Ci	C		g/mL	347	kL	1.56E-06	uCi/g	Jan 1 2001 12:00AM
241-AW-104	239/240Pu	Total	7.15E-02	Ci	S							Jan 1 2001 12:00AM
241-AW-104	239/240Pu	Supernatant	7.15E-02	Ci	S	1.14	g/mL	347	kL	1.81E-04	uCi/g	Jan 1 2001 12:00AM
241-AW-104	239Pu	Total	4.94E+02	Ci	C							Jan 1 2001 12:00AM
241-AW-104	239Pu	Salt Cake (Liquids)	9.85E-01	Ci	C		g/mL	136	kL	5.03E-03	uCi/g	Jan 1 2001 12:00AM
241-AW-104	239Pu	Salt Cake (Solids)	5.33E+01	Ci	C		g/mL	457	kL	7.29E-02	uCi/g	Jan 1 2001 12:00AM
241-AW-104	239Pu	Sludge (Liquids)	2.94E-01	Ci	C		g/mL	62	kL	3.32E-03	uCi/g	Jan 1 2001 12:00AM
241-AW-104	239Pu	Sludge (Solids)	4.40E+02	Ci	C		g/mL	188	kL	1.83E+00	uCi/g	Jan 1 2001 12:00AM
241-AW-104	239Pu	Supernatant	5.48E-02	Ci	C		g/mL	347	kL	1.39E-04	uCi/g	Jan 1 2001 12:00AM
241-AW-104	240Pu	Total	1.50E+02	Ci	C							Jan 1 2001 12:00AM
241-AW-104	240Pu	Salt Cake (Liquids)	2.99E-01	Ci	C		g/mL	136	kL	1.53E-03	uCi/g	Jan 1 2001 12:00AM
241-AW-104	240Pu	Salt Cake (Solids)	1.62E+01	Ci	C		g/mL	457	kL	2.21E-02	uCi/g	Jan 1 2001 12:00AM
241-AW-104	240Pu	Sludge (Liquids)	8.93E-02	Ci	C		g/mL	62	kL	1.01E-03	uCi/g	Jan 1 2001 12:00AM
241-AW-104	240Pu	Sludge (Solids)	1.34E+02	Ci	C		g/mL	188	kL	5.55E-01	uCi/g	Jan 1 2001 12:00AM
241-AW-104	240Pu	Supernatant	1.66E-02	Ci	C		g/mL	347	kL	4.21E-05	uCi/g	Jan 1 2001 12:00AM
241-AW-104	241Am	Total	5.94E+01	Ci	S/C							Jan 1 2001 12:00AM
241-AW-104	241Am	Salt Cake (Liquids)	1.18E-01	Ci	C		g/mL	136	kL	6.03E-04	uCi/g	Jan 1 2001 12:00AM
241-AW-104	241Am	Salt Cake (Solids)	6.40E+00	Ci	C		g/mL	457	kL	8.75E-03	uCi/g	Jan 1 2001 12:00AM
241-AW-104	241Am	Sludge (Liquids)	3.53E-02	Ci	C		g/mL	62	kL	3.98E-04	uCi/g	Jan 1 2001 12:00AM
241-AW-104	241Am	Sludge (Solids)	5.28E+01	Ci	C		g/mL	188	kL	2.19E-01	uCi/g	Jan 1 2001 12:00AM
241-AW-104	241Am	Supernatant	1.05E-01	Ci	S	1.14	g/mL	347	kL	2.64E-04	uCi/g	Jan 1 2001 12:00AM
241-AW-104	241Pu	Total	4.45E+03	Ci	C							Jan 1 2001 12:00AM
241-AW-104	241Pu	Salt Cake (Liquids)	8.86E+00	Ci	C		g/mL	136	kL	4.53E-02	uCi/g	Jan 1 2001 12:00AM
241-AW-104	241Pu	Salt Cake (Solids)	4.80E+02	Ci	C		g/mL	457	kL	6.57E-01	uCi/g	Jan 1 2001 12:00AM
241-AW-104	241Pu	Sludge (Liquids)	2.65E+00	Ci	C		g/mL	62	kL	2.99E-02	uCi/g	Jan 1 2001 12:00AM
241-AW-104	241Pu	Sludge (Solids)	3.96E+03	Ci	C		g/mL	188	kL	1.65E+01	uCi/g	Jan 1 2001 12:00AM
241-AW-104	241Pu	Supernatant	4.94E-01	Ci	C		g/mL	347	kL	1.25E-03	uCi/g	Jan 1 2001 12:00AM
241-AW-104	242Cm	Total	1.11E-03	Ci	C							Jan 1 2001 12:00AM
241-AW-104	242Cm	Salt Cake (Liquids)	2.20E-06	Ci	C		g/mL	136	kL	1.13E-08	uCi/g	Jan 1 2001 12:00AM
241-AW-104	242Cm	Salt Cake (Solids)	1.19E-04	Ci	C		g/mL	457	kL	1.63E-07	uCi/g	Jan 1 2001 12:00AM
241-AW-104	242Cm	Sludge (Liquids)	6.58E-07	Ci	C		g/mL	62	kL	7.42E-09	uCi/g	Jan 1 2001 12:00AM
241-AW-104	242Cm	Sludge (Solids)	9.84E-04	Ci	C		g/mL	188	kL	4.09E-06	uCi/g	Jan 1 2001 12:00AM
241-AW-104	242Cm	Supernatant	2.34E-06	Ci	C		g/mL	347	kL	5.92E-09	uCi/g	Jan 1 2001 12:00AM
241-AW-104	242Pu	Total	2.32E-02	Ci	C							Jan 1 2001 12:00AM
241-AW-104	242Pu	Salt Cake (Liquids)	4.63E-05	Ci	C		g/mL	136	kL	2.36E-07	uCi/g	Jan 1 2001 12:00AM
241-AW-104	242Pu	Salt Cake (Solids)	2.51E-03	Ci	C		g/mL	457	kL	3.43E-06	uCi/g	Jan 1 2001 12:00AM

CALCULATION SHEET

PROJECT: RPP-WTP
JOB NO.: 24590
CALC NO.: 24590-WTP-M4C-FRP-00001
SHEET REV: 0A
SHEET NO.: 121

BY: E. Berrios
DATE: 12/04/02

SUBJECT: Updated Emissions Run Feed Vector

Tank Name	Analyte	Waste Phase	Inventory	Inventory Units	Basis	Density	Density Units	Volume	Volume Units	Concentration	Concentration Units	Decay Date
241-AW-104	242Pu	Sludge (Liquids)	1.38E-05 Ci		C		g/mL	62	kL	1.56E-07	uCi/g	Jan 1 2001 12:00AM
241-AW-104	242Pu	Sludge (Solids)	2.07E-02 Ci		C		g/mL	188	kL	8.59E-05	uCi/g	Jan 1 2001 12:00AM
241-AW-104	242Pu	Supernatant	2.58E-06 Ci		C		g/mL	347	kL	6.52E-09	uCi/g	Jan 1 2001 12:00AM
241-AW-104	243Am	Total	4.22E-05 Ci		C							Jan 1 2001 12:00AM
241-AW-104	243Am	Salt Cake (Liquids)	8.39E-08 Ci		C		g/mL	136	kL	4.29E-10	uCi/g	Jan 1 2001 12:00AM
241-AW-104	243Am	Salt Cake (Solids)	4.55E-06 Ci		C		g/mL	457	kL	6.22E-09	uCi/g	Jan 1 2001 12:00AM
241-AW-104	243Am	Sludge (Liquids)	2.51E-08 Ci		C		g/mL	62	kL	2.83E-10	uCi/g	Jan 1 2001 12:00AM
241-AW-104	243Am	Sludge (Solids)	3.75E-05 Ci		C		g/mL	188	kL	1.56E-07	uCi/g	Jan 1 2001 12:00AM
241-AW-104	243Am	Supernatant	8.93E-08 Ci		C		g/mL	347	kL	2.26E-10	uCi/g	Jan 1 2001 12:00AM
241-AW-104	243Cm	Total	1.52E-04 Ci		C							Jan 1 2001 12:00AM
241-AW-104	243Cm	Salt Cake (Liquids)	3.03E-07 Ci		C		g/mL	136	kL	1.55E-09	uCi/g	Jan 1 2001 12:00AM
241-AW-104	243Cm	Salt Cake (Solids)	1.64E-05 Ci		C		g/mL	457	kL	2.24E-08	uCi/g	Jan 1 2001 12:00AM
241-AW-104	243Cm	Sludge (Liquids)	9.05E-08 Ci		C		g/mL	62	kL	1.02E-09	uCi/g	Jan 1 2001 12:00AM
241-AW-104	243Cm	Sludge (Solids)	1.35E-04 Ci		C		g/mL	188	kL	5.62E-07	uCi/g	Jan 1 2001 12:00AM
241-AW-104	243Cm	Supernatant	3.22E-07 Ci		C		g/mL	347	kL	8.15E-10	uCi/g	Jan 1 2001 12:00AM
241-AW-104	244Cm	Total	6.63E-04 Ci		C							Jan 1 2001 12:00AM
241-AW-104	244Cm	Salt Cake (Liquids)	1.32E-06 Ci		C		g/mL	136	kL	6.73E-09	uCi/g	Jan 1 2001 12:00AM
241-AW-104	244Cm	Salt Cake (Solids)	7.14E-05 Ci		C		g/mL	457	kL	9.76E-08	uCi/g	Jan 1 2001 12:00AM
241-AW-104	244Cm	Sludge (Liquids)	3.94E-07 Ci		C		g/mL	62	kL	4.44E-09	uCi/g	Jan 1 2001 12:00AM
241-AW-104	244Cm	Sludge (Solids)	5.89E-04 Ci		C		g/mL	188	kL	2.45E-06	uCi/g	Jan 1 2001 12:00AM
241-AW-104	244Cm	Supernatant	1.40E-06 Ci		C		g/mL	347	kL	3.54E-09	uCi/g	Jan 1 2001 12:00AM
241-AW-104	3H	Total	5.33E+01 Ci		E							Jan 1 2001 12:00AM
241-AW-104	3H	Salt Cake (Liquids)	2.44E+01 Ci		TE		1.6 g/mL	136	kL	1.12E-01	uCi/g	Jan 1 2001 12:00AM
241-AW-104	3H	Salt Cake (Solids)	2.11E+01 Ci		TS		1.58 g/mL	457	kL	2.92E-02	uCi/g	Jan 1 2001 12:00AM
241-AW-104	3H	Sludge (Liquids)	7.81E+00 Ci		TE		1.6 g/mL	62	kL	7.87E-02	uCi/g	Jan 1 2001 12:00AM
241-AW-104	3H	Sludge (Solids)	0.00E+00 Ci		TE		1.2 g/mL	188	kL	0.00E+00	uCi/g	Jan 1 2001 12:00AM
241-AW-104	3H	Supernatant	0.00E+00 Ci		TE		1.02 g/mL	347	kL	0.00E+00	uCi/g	Jan 1 2001 12:00AM
241-AW-104	59Ni	Salt Cake (Liquids)	5.18E-02 Ci		TE		1.6 g/mL	136	kL	2.38E-04	uCi/g	Jan 1 2001 12:00AM
241-AW-104	59Ni	Salt Cake (Solids)	1.05E+00 Ci		TS		1.58 g/mL	457	kL	1.45E-03	uCi/g	Jan 1 2001 12:00AM
241-AW-104	59Ni	Sludge (Liquids)	1.66E-02 Ci		TE		1.6 g/mL	62	kL	1.67E-04	uCi/g	Jan 1 2001 12:00AM
241-AW-104	59Ni	Sludge (Solids)	0.00E+00 Ci		TE		1.2 g/mL	188	kL	0.00E+00	uCi/g	Jan 1 2001 12:00AM
241-AW-104	59Ni	Supernatant	0.00E+00 Ci		TE		1.02 g/mL	347	kL	0.00E+00	uCi/g	Jan 1 2001 12:00AM
241-AW-104	59Ni	Total	1.12E+00 Ci		E							Jan 1 2001 12:00AM
241-AW-104	60Co	Total	1.56E+01 Ci		S/E							Jan 1 2001 12:00AM
241-AW-104	60Co	Salt Cake (Liquids)	1.26E+00 Ci		TE		1.6 g/mL	136	kL	5.80E-03	uCi/g	Jan 1 2001 12:00AM
241-AW-104	60Co	Salt Cake (Solids)	1.15E+01 Ci		TS		1.58 g/mL	457	kL	1.59E-02	uCi/g	Jan 1 2001 12:00AM
241-AW-104	60Co	Sludge (Liquids)	4.03E-01 Ci		TE		1.6 g/mL	62	kL	4.07E-03	uCi/g	Jan 1 2001 12:00AM
241-AW-104	60Co	Sludge (Solids)	0.00E+00 Ci		TE		1.2 g/mL	188	kL	0.00E+00	uCi/g	Jan 1 2001 12:00AM
241-AW-104	60Co	Supernatant	2.42E+00 Ci		S		1.14 g/mL	347	kL	6.12E-03	uCi/g	Jan 1 2001 12:00AM
241-AW-104	63Ni	Total	1.06E+02 Ci		E							Jan 1 2001 12:00AM
241-AW-104	63Ni	Salt Cake (Liquids)	4.89E+00 Ci		TE		1.6 g/mL	136	kL	2.25E-02	uCi/g	Jan 1 2001 12:00AM
241-AW-104	63Ni	Salt Cake (Solids)	9.96E+01 Ci		TS		1.58 g/mL	457	kL	1.38E-01	uCi/g	Jan 1 2001 12:00AM
241-AW-104	63Ni	Sludge (Liquids)	1.56E+00 Ci		TE		1.6 g/mL	62	kL	1.58E-02	uCi/g	Jan 1 2001 12:00AM
241-AW-104	63Ni	Sludge (Solids)	0.00E+00 Ci		TE		1.2 g/mL	188	kL	0.00E+00	uCi/g	Jan 1 2001 12:00AM
241-AW-104	63Ni	Supernatant	0.00E+00 Ci		TE		1.02 g/mL	347	kL	0.00E+00	uCi/g	Jan 1 2001 12:00AM
241-AW-104	79Se	Total	1.92E-01 Ci		E							Jan 1 2001 12:00AM
241-AW-104	79Se	Salt Cake (Liquids)	2.40E-02 Ci		TE		1.6 g/mL	136	kL	1.10E-04	uCi/g	Jan 1 2001 12:00AM

CALCULATION SHEET

PROJECT: RPP-WTP
JOB NO.: 24590
CALC NO.: 24590-WTP-M4C-FRP-00001
SHEET REV: 0A
SHEET NO.: 122

BY: E. Berrios
DATE: 12/04/02

SUBJECT: Updated Emissions Run Feed Vector

Tank Name	Analyte	Waste Phase	Inventory	Inventory Units	Basis	Density	Density Units	Volume	Volume Units	Concentration	Concentration Units	Decay Date
241-AW-104	79Se	Salt Cake (Solids)	1.61E-01	Ci	TS	1.58	g/mL	457	kL	2.22E-04	uCi/g	Jan 1 2001 12:00AM
241-AW-104	79Se	Sludge (Liquids)	7.66E-03	Ci	TE	1.6	g/mL	62	kL	7.72E-05	uCi/g	Jan 1 2001 12:00AM
241-AW-104	79Se	Sludge (Solids)	0.00E+00	Ci	TE	1.2	g/mL	188	kL	0.00E+00	uCi/g	Jan 1 2001 12:00AM
241-AW-104	79Se	Supernatant	0.00E+00	Ci	TE	1.02	g/mL	347	kL	0.00E+00	uCi/g	Jan 1 2001 12:00AM
241-AW-104	90Sr	Total	5.11E+03	Ci	S/E							Jan 1 2001 12:00AM
241-AW-104	90Sr	Salt Cake (Liquids)	3.41E+03	Ci	TE	1.6	g/mL	136	kL	1.57E+01	uCi/g	Jan 1 2001 12:00AM
241-AW-104	90Sr	Salt Cake (Solids)	6.00E+02	Ci	E	1.44	g/mL	457	kL	9.12E-01	uCi/g	Jan 1 2001 12:00AM
241-AW-104	90Sr	Sludge (Liquids)	1.09E+03	Ci	TE	1.6	g/mL	62	kL	1.10E+01	uCi/g	Jan 1 2001 12:00AM
241-AW-104	90Sr	Sludge (Solids)	0.00E+00	Ci	TE	1.2	g/mL	188	kL	0.00E+00	uCi/g	Jan 1 2001 12:00AM
241-AW-104	90Sr	Supernatant	1.19E+01	Ci	S	1.14	g/mL	347	kL	3.01E-02	uCi/g	Jan 1 2001 12:00AM
241-AW-104	90Y	Total	5.11E+03	Ci	C							Jan 1 2001 12:00AM
241-AW-104	90Y	Salt Cake (Liquids)	3.41E+03	Ci	C		g/mL	136	kL	1.57E+01	uCi/g	Jan 1 2001 12:00AM
241-AW-104	90Y	Salt Cake (Solids)	6.00E+02	Ci	C		g/mL	457	kL	9.12E-01	uCi/g	Jan 1 2001 12:00AM
241-AW-104	90Y	Sludge (Liquids)	1.09E+03	Ci	C		g/mL	62	kL	1.10E+01	uCi/g	Jan 1 2001 12:00AM
241-AW-104	90Y	Sludge (Solids)	0.00E+00	Ci	C		g/mL	188	kL	0.00E+00	uCi/g	Jan 1 2001 12:00AM
241-AW-104	90Y	Supernatant	1.19E+01	Ci	C		g/mL	347	kL	3.01E-02	uCi/g	Jan 1 2001 12:00AM
241-AW-104	93mNb	Total	7.62E+00	Ci	E							Jan 1 2001 12:00AM
241-AW-104	93mNb	Salt Cake (Liquids)	9.49E-01	Ci	TE	1.6	g/mL	136	kL	4.36E-03	uCi/g	Jan 1 2001 12:00AM
241-AW-104	93mNb	Salt Cake (Solids)	6.36E+00	Ci	TS	1.58	g/mL	457	kL	8.81E-03	uCi/g	Jan 1 2001 12:00AM
241-AW-104	93mNb	Sludge (Liquids)	3.04E-01	Ci	TE	1.6	g/mL	62	kL	3.06E-03	uCi/g	Jan 1 2001 12:00AM
241-AW-104	93mNb	Sludge (Solids)	0.00E+00	Ci	TE	1.2	g/mL	188	kL	0.00E+00	uCi/g	Jan 1 2001 12:00AM
241-AW-104	93mNb	Supernatant	0.00E+00	Ci	TE	1.02	g/mL	347	kL	0.00E+00	uCi/g	Jan 1 2001 12:00AM
241-AW-104	93Zr	Total	9.49E+00	Ci	E							Jan 1 2001 12:00AM
241-AW-104	93Zr	Salt Cake (Liquids)	1.18E+00	Ci	TE	1.6	g/mL	136	kL	5.44E-03	uCi/g	Jan 1 2001 12:00AM
241-AW-104	93Zr	Salt Cake (Solids)	7.93E+00	Ci	TS	1.58	g/mL	457	kL	1.10E-02	uCi/g	Jan 1 2001 12:00AM
241-AW-104	93Zr	Sludge (Liquids)	3.78E-01	Ci	TE	1.6	g/mL	62	kL	3.81E-03	uCi/g	Jan 1 2001 12:00AM
241-AW-104	93Zr	Sludge (Solids)	0.00E+00	Ci	TE	1.2	g/mL	188	kL	0.00E+00	uCi/g	Jan 1 2001 12:00AM
241-AW-104	93Zr	Supernatant	0.00E+00	Ci	TE	1.02	g/mL	347	kL	0.00E+00	uCi/g	Jan 1 2001 12:00AM
241-AW-104	99Tc	Salt Cake (Solids)	1.39E+02	Ci	E	1.44	g/mL	457	kL	2.11E-01	uCi/g	Jan 1 2001 12:00AM
241-AW-104	99Tc	Sludge (Liquids)	1.49E+01	Ci	TE	1.6	g/mL	62	kL	1.51E-01	uCi/g	Jan 1 2001 12:00AM
241-AW-104	99Tc	Sludge (Solids)	0.00E+00	Ci	TE	1.2	g/mL	188	kL	0.00E+00	uCi/g	Jan 1 2001 12:00AM
241-AW-104	99Tc	Supernatant	0.00E+00	Ci	TE	1.02	g/mL	347	kL	0.00E+00	uCi/g	Jan 1 2001 12:00AM
241-AW-104	99Tc	Total	2.01E+02	Ci	E							Jan 1 2001 12:00AM
241-AW-104	99Tc	Salt Cake (Liquids)	4.67E+01	Ci	TE	1.6	g/mL	136	kL	2.15E-01	uCi/g	Jan 1 2001 12:00AM
241-AW-104	Ag	Salt Cake (Solids)	5.65E+00	kg	S	1.6	g/mL	457	kL	7.73E+00	ug/g	Jan 1 2001 12:00AM
241-AW-104	Ag	Sludge (Liquids)	7.19E-01	kg	S	1.43	g/mL	62	kL	8.11E+00	ug/g	Jan 1 2001 12:00AM
241-AW-104	Ag	Total	3.18E+01	kg	S							Jan 1 2001 12:00AM
241-AW-104	Ag	Sludge (Solids)	2.42E+01	kg	S	1.4	g/mL	188	kL	9.21E+01	ug/g	Jan 1 2001 12:00AM
241-AW-104	Ag	Salt Cake (Liquids)	8.17E-01	kg	S	1.45	g/mL	136	kL	4.14E+00	ug/g	Jan 1 2001 12:00AM
241-AW-104	Ag	Supernatant	3.50E-01	kg	S	1.08	g/mL	347	kL	9.35E-01	ug/g	Jan 1 2001 12:00AM
241-AW-104	Al	Total	2.28E+04	kg	S							Jan 1 2001 12:00AM
241-AW-104	Al	Salt Cake (Liquids)	4.04E+03	kg	S	1.44	g/mL	136	kL	2.06E+04	ug/g	Jan 1 2001 12:00AM
241-AW-104	Al	Salt Cake (Solids)	1.46E+04	kg	S	1.6	g/mL	457	kL	2.00E+04	ug/g	Jan 1 2001 12:00AM
241-AW-104	Al	Sludge (Liquids)	1.02E+03	kg	S	1.43	g/mL	62	kL	1.15E+04	ug/g	Jan 1 2001 12:00AM
241-AW-104	Al	Sludge (Solids)	2.57E+03	kg	S	1.28	g/mL	188	kL	1.07E+04	ug/g	Jan 1 2001 12:00AM
241-AW-104	Al	Supernatant	5.73E+02	kg	S	1.08	g/mL	347	kL	1.53E+03	ug/g	Jan 1 2001 12:00AM
241-AW-104	As	Salt Cake (Liquids)	8.17E+00	kg	S	1.45	g/mL	136	kL	4.14E+01	ug/g	Jan 1 2001 12:00AM

CALCULATION SHEET

PROJECT: RPP-WTP
JOB NO.: 24590
CALC NO.: 24590-WTP-M4C-FRP-00001
SHEET REV: 0A
SHEET NO.: 123

BY: E. Berrios
DATE: 12/04/02

SUBJECT: Updated Emissions Run Feed Vector

Tank Name	Analyte	Waste Phase	Inventory	Inventory Units	Basis	Density	Density Units	Volume	Volume Units	Concentration	Concentration Units	Decay Date
241-AW-104	As	Supernatant	3.50E+00	kg	S	1.08	g/mL	347	kL	9.35E+00	ug/g	Jan 1 2001 12:00AM
241-AW-104	As	Salt Cake (Solids)	3.90E+01	kg	S	1.6	g/mL	457	kL	5.33E+01	ug/g	Jan 1 2001 12:00AM
241-AW-104	As	Total	6.57E+01	kg	S/E							Jan 1 2001 12:00AM
241-AW-104	As	Sludge (Liquids)	3.73E+00	kg	S	1.33	g/mL	62	kL	4.52E+01	ug/g	Jan 1 2001 12:00AM
241-AW-104	As	Sludge (Solids)	1.13E+01	kg	S	1.4	g/mL	188	kL	4.30E+01	ug/g	Jan 1 2001 12:00AM
241-AW-104	B	Sludge (Solids)	6.01E+00	kg	S	1.4	g/mL	188	kL	2.29E+01	ug/g	Jan 1 2001 12:00AM
241-AW-104	B	Sludge (Liquids)	2.05E+00	kg	S	1.43	g/mL	62	kL	2.31E+01	ug/g	Jan 1 2001 12:00AM
241-AW-104	B	Supernatant	2.22E+00	kg	S	1.08	g/mL	347	kL	5.92E+00	ug/g	Jan 1 2001 12:00AM
241-AW-104	B	Salt Cake (Liquids)	6.34E+00	kg	S	1.44	g/mL	136	kL	3.24E+01	ug/g	Jan 1 2001 12:00AM
241-AW-104	B	Salt Cake (Solids)	2.22E+01	kg	S	1.6	g/mL	457	kL	3.04E+01	ug/g	Jan 1 2001 12:00AM
241-AW-104	B	Total	3.88E+01	kg	S							Jan 1 2001 12:00AM
241-AW-104	Ba	Salt Cake (Solids)	1.95E+01	kg	S	1.6	g/mL	457	kL	2.67E+01	ug/g	Jan 1 2001 12:00AM
241-AW-104	Ba	Sludge (Liquids)	1.87E+00	kg	S	1.33	g/mL	62	kL	2.26E+01	ug/g	Jan 1 2001 12:00AM
241-AW-104	Ba	Total	3.36E+01	kg	S/E							Jan 1 2001 12:00AM
241-AW-104	Ba	Salt Cake (Liquids)	4.09E+00	kg	S	1.45	g/mL	136	kL	2.08E+01	ug/g	Jan 1 2001 12:00AM
241-AW-104	Ba	Sludge (Solids)	6.40E+00	kg	S	1.4	g/mL	188	kL	2.43E+01	ug/g	Jan 1 2001 12:00AM
241-AW-104	Ba	Supernatant	1.75E+00	kg	S	1.08	g/mL	347	kL	4.68E+00	ug/g	Jan 1 2001 12:00AM
241-AW-104	Be	Sludge (Solids)	9.25E-01	kg	S	1.4	g/mL	188	kL	3.52E+00	ug/g	Jan 1 2001 12:00AM
241-AW-104	Be	Salt Cake (Solids)	1.95E+00	kg	S	1.6	g/mL	457	kL	2.67E+00	ug/g	Jan 1 2001 12:00AM
241-AW-104	Be	Total	3.65E+00	kg	S/E							Jan 1 2001 12:00AM
241-AW-104	Be	Sludge (Liquids)	1.86E-01	kg	S	1.43	g/mL	62	kL	2.10E+00	ug/g	Jan 1 2001 12:00AM
241-AW-104	Be	Salt Cake (Liquids)	4.08E-01	kg	S	1.44	g/mL	136	kL	2.08E+00	ug/g	Jan 1 2001 12:00AM
241-AW-104	Be	Supernatant	1.75E-01	kg	S	1.08	g/mL	347	kL	4.68E-01	ug/g	Jan 1 2001 12:00AM
241-AW-104	Bi	Total	4.56E+01	kg	S/E							Jan 1 2001 12:00AM
241-AW-104	Bi	Salt Cake (Liquids)	5.01E+00	kg	TE	1.6	g/mL	136	kL	2.30E+01	ug/g	Jan 1 2001 12:00AM
241-AW-104	Bi	Salt Cake (Solids)	3.90E+01	kg	S	1.6	g/mL	457	kL	5.33E+01	ug/g	Jan 1 2001 12:00AM
241-AW-104	Bi	Sludge (Liquids)	1.60E+00	kg	TE	1.6	g/mL	62	kL	1.62E+01	ug/g	Jan 1 2001 12:00AM
241-AW-104	Bi	Sludge (Solids)	0.00E+00	kg	TE	1.2	g/mL	188	kL	0.00E+00	ug/g	Jan 1 2001 12:00AM
241-AW-104	Bi	Supernatant	0.00E+00	kg	TE	1.02	g/mL	347	kL	0.00E+00	ug/g	Jan 1 2001 12:00AM
241-AW-104	Ca	Total	1.22E+03	kg	S/E							Jan 1 2001 12:00AM
241-AW-104	Ca	Salt Cake (Liquids)	8.17E+00	kg	S	1.45	g/mL	136	kL	4.14E+01	ug/g	Jan 1 2001 12:00AM
241-AW-104	Ca	Salt Cake (Solids)	3.01E+02	kg	S	1.6	g/mL	457	kL	4.11E+02	ug/g	Jan 1 2001 12:00AM
241-AW-104	Ca	Sludge (Liquids)	2.56E+00	kg	TE	1.6	g/mL	62	kL	2.59E+01	ug/g	Jan 1 2001 12:00AM
241-AW-104	Ca	Sludge (Solids)	9.05E+02	kg	S	1.28	g/mL	188	kL	3.76E+03	ug/g	Jan 1 2001 12:00AM
241-AW-104	Ca	Supernatant	3.50E+00	kg	S	1.08	g/mL	347	kL	9.35E+00	ug/g	Jan 1 2001 12:00AM
241-AW-104	Cd	Supernatant	1.81E-01	kg	S	1.08	g/mL	347	kL	4.83E-01	ug/g	Jan 1 2001 12:00AM
241-AW-104	Cd	Sludge (Solids)	2.94E+01	kg	S	1.28	g/mL	188	kL	1.22E+02	ug/g	Jan 1 2001 12:00AM
241-AW-104	Cd	Sludge (Liquids)	1.86E-01	kg	S	1.43	g/mL	62	kL	2.10E+00	ug/g	Jan 1 2001 12:00AM
241-AW-104	Cd	Total	3.46E+01	kg	S/E							Jan 1 2001 12:00AM
241-AW-104	Cd	Salt Cake (Solids)	4.45E+00	kg	S	1.6	g/mL	457	kL	6.08E+00	ug/g	Jan 1 2001 12:00AM
241-AW-104	Cd	Salt Cake (Liquids)	4.08E-01	kg	S	1.44	g/mL	136	kL	2.08E+00	ug/g	Jan 1 2001 12:00AM
241-AW-104	Ce	Salt Cake (Solids)	3.90E+01	kg	S	1.6	g/mL	457	kL	5.33E+01	ug/g	Jan 1 2001 12:00AM
241-AW-104	Ce	Sludge (Solids)	1.13E+01	kg	S	1.4	g/mL	188	kL	4.30E+01	ug/g	Jan 1 2001 12:00AM
241-AW-104	Ce	Supernatant	3.50E+00	kg	S	1.08	g/mL	347	kL	9.35E+00	ug/g	Jan 1 2001 12:00AM
241-AW-104	Ce	Salt Cake (Liquids)	8.17E+00	kg	S	1.45	g/mL	136	kL	4.14E+01	ug/g	Jan 1 2001 12:00AM
241-AW-104	Ce	Total	6.57E+01	kg	S/E							Jan 1 2001 12:00AM
241-AW-104	Ce	Sludge (Liquids)	3.73E+00	kg	S	1.33	g/mL	62	kL	4.52E+01	ug/g	Jan 1 2001 12:00AM

CALCULATION SHEET

PROJECT: RPP-WTP
JOB NO.: 24590
CALC NO.: 24590-WTP-M4C-FRP-00001
SHEET REV: 0A
SHEET NO.: 124

BY: E. Berrios
DATE: 12/04/02

SUBJECT: Updated Emissions Run Feed Vector

Tank Name	Analyte	Waste Phase	Inventory	Inventory Units	Basis	Density	Density Units	Volume	Volume Units	Concentration	Concentration Units	Decay Date
241-AW-104	Cl	Total	3.76E+03	kg	S							Jan 1 2001 12:00AM
241-AW-104	Cl	Salt Cake (Liquids)	7.59E+02	kg	S	1.44	g/mL	136	kL	3.88E+03	ug/g	Jan 1 2001 12:00AM
241-AW-104	Cl	Salt Cake (Solids)	2.30E+03	kg	S	1.6	g/mL	457	kL	3.14E+03	ug/g	Jan 1 2001 12:00AM
241-AW-104	Cl	Sludge (Liquids)	2.40E+02	kg	S	1.43	g/mL	62	kL	2.71E+03	ug/g	Jan 1 2001 12:00AM
241-AW-104	Cl	Sludge (Solids)	3.18E+02	kg	S	1.28	g/mL	188	kL	1.32E+03	ug/g	Jan 1 2001 12:00AM
241-AW-104	Cl	Supernatant	1.46E+02	kg	S	1.08	g/mL	347	kL	3.91E+02	ug/g	Jan 1 2001 12:00AM
241-AW-104	Co	Salt Cake (Solids)	7.82E+00	kg	S	1.6	g/mL	457	kL	1.07E+01	ug/g	Jan 1 2001 12:00AM
241-AW-104	Co	Supernatant	7.01E-01	kg	S	1.08	g/mL	347	kL	1.87E+00	ug/g	Jan 1 2001 12:00AM
241-AW-104	Co	Sludge (Solids)	2.26E+00	kg	S	1.4	g/mL	188	kL	8.60E+00	ug/g	Jan 1 2001 12:00AM
241-AW-104	Co	Salt Cake (Liquids)	1.63E+00	kg	S	1.45	g/mL	136	kL	8.28E+00	ug/g	Jan 1 2001 12:00AM
241-AW-104	Co	Total	1.32E+01	kg	S/E							Jan 1 2001 12:00AM
241-AW-104	Co	Sludge (Liquids)	7.44E-01	kg	S	1.33	g/mL	62	kL	9.02E+00	ug/g	Jan 1 2001 12:00AM
241-AW-104	Cr	Total	2.54E+03	kg	S							Jan 1 2001 12:00AM
241-AW-104	Cr	Salt Cake (Liquids)	1.02E+01	kg	S	1.44	g/mL	136	kL	5.23E+01	ug/g	Jan 1 2001 12:00AM
241-AW-104	Cr	Salt Cake (Solids)	2.37E+03	kg	S	1.6	g/mL	457	kL	3.24E+03	ug/g	Jan 1 2001 12:00AM
241-AW-104	Cr	Sludge (Liquids)	3.78E+00	kg	S	1.43	g/mL	62	kL	4.26E+01	ug/g	Jan 1 2001 12:00AM
241-AW-104	Cr	Sludge (Solids)	1.57E+02	kg	S	1.28	g/mL	188	kL	6.52E+02	ug/g	Jan 1 2001 12:00AM
241-AW-104	Cr	Supernatant	1.28E+00	kg	S	1.08	g/mL	347	kL	3.42E+00	ug/g	Jan 1 2001 12:00AM
241-AW-104	Cu	Sludge (Liquids)	3.73E-01	kg	S	1.33	g/mL	62	kL	4.52E+00	ug/g	Jan 1 2001 12:00AM
241-AW-104	Cu	Sludge (Solids)	1.45E+01	kg	S	1.4	g/mL	188	kL	5.51E+01	ug/g	Jan 1 2001 12:00AM
241-AW-104	Cu	Salt Cake (Solids)	3.90E+00	kg	S	1.6	g/mL	457	kL	5.33E+00	ug/g	Jan 1 2001 12:00AM
241-AW-104	Cu	Supernatant	3.50E-01	kg	S	1.08	g/mL	347	kL	9.35E-01	ug/g	Jan 1 2001 12:00AM
241-AW-104	Cu	Salt Cake (Liquids)	8.17E-01	kg	S	1.45	g/mL	136	kL	4.14E+00	ug/g	Jan 1 2001 12:00AM
241-AW-104	Cu	Total	2.00E+01	kg	S/E							Jan 1 2001 12:00AM
241-AW-104	F	Total	3.28E+04	kg	S							Jan 1 2001 12:00AM
241-AW-104	F	Salt Cake (Liquids)	1.66E+01	kg	S	1.45	g/mL	136	kL	8.41E+01	ug/g	Jan 1 2001 12:00AM
241-AW-104	F	Salt Cake (Solids)	3.19E+04	kg	S	1.6	g/mL	457	kL	4.36E+04	ug/g	Jan 1 2001 12:00AM
241-AW-104	F	Sludge (Liquids)	7.13E+01	kg	S	1.43	g/mL	62	kL	8.04E+02	ug/g	Jan 1 2001 12:00AM
241-AW-104	F	Sludge (Solids)	7.17E+02	kg	S	1.28	g/mL	188	kL	2.98E+03	ug/g	Jan 1 2001 12:00AM
241-AW-104	F	Supernatant	7.74E+01	kg	S	1.08	g/mL	347	kL	2.07E+02	ug/g	Jan 1 2001 12:00AM
241-AW-104	Fe	Total	2.56E+03	kg	S/E							Jan 1 2001 12:00AM
241-AW-104	Fe	Salt Cake (Liquids)	4.09E+00	kg	S	1.45	g/mL	136	kL	2.08E+01	ug/g	Jan 1 2001 12:00AM
241-AW-104	Fe	Salt Cake (Solids)	2.72E+02	kg	S	1.6	g/mL	457	kL	3.72E+02	ug/g	Jan 1 2001 12:00AM
241-AW-104	Fe	Sludge (Liquids)	1.28E+00	kg	TE	1.6	g/mL	62	kL	1.29E+01	ug/g	Jan 1 2001 12:00AM
241-AW-104	Fe	Sludge (Solids)	2.28E+03	kg	S	1.28	g/mL	188	kL	9.49E+03	ug/g	Jan 1 2001 12:00AM
241-AW-104	Fe	Supernatant	1.75E+00	kg	S	1.08	g/mL	347	kL	4.68E+00	ug/g	Jan 1 2001 12:00AM
241-AW-104	Hg	Total	0.00E+00	kg	E							Jan 1 2001 12:00AM
241-AW-104	Hg	Salt Cake (Liquids)	0.00E+00	kg	TE	1.6	g/mL	136	kL	0.00E+00	ug/g	Jan 1 2001 12:00AM
241-AW-104	Hg	Salt Cake (Solids)	0.00E+00	kg	TS	1.58	g/mL	457	kL	0.00E+00	ug/g	Jan 1 2001 12:00AM
241-AW-104	Hg	Sludge (Liquids)	0.00E+00	kg	TE	1.6	g/mL	62	kL	0.00E+00	ug/g	Jan 1 2001 12:00AM
241-AW-104	Hg	Sludge (Solids)	0.00E+00	kg	TE	1.2	g/mL	188	kL	0.00E+00	ug/g	Jan 1 2001 12:00AM
241-AW-104	Hg	Supernatant	0.00E+00	kg	TE	1.02	g/mL	347	kL	0.00E+00	ug/g	Jan 1 2001 12:00AM
241-AW-104	K	Total	1.07E+04	kg	S							Jan 1 2001 12:00AM
241-AW-104	K	Salt Cake (Liquids)	2.04E+03	kg	S	1.44	g/mL	136	kL	1.04E+04	ug/g	Jan 1 2001 12:00AM
241-AW-104	K	Salt Cake (Solids)	5.93E+03	kg	S	1.6	g/mL	457	kL	8.11E+03	ug/g	Jan 1 2001 12:00AM
241-AW-104	K	Sludge (Liquids)	5.79E+02	kg	S	1.43	g/mL	62	kL	6.53E+03	ug/g	Jan 1 2001 12:00AM
241-AW-104	K	Sludge (Solids)	1.17E+03	kg	S	1.4	g/mL	188	kL	4.46E+03	ug/g	Jan 1 2001 12:00AM

CALCULATION SHEET

PROJECT: RPP-WTP
JOB NO.: 24590
CALC NO.: 24590-WTP-M4C-FRP-00001
SHEET REV: 0A
SHEET NO.: 125

BY: E. Berrios
DATE: 12/04/02

SUBJECT: Updated Emissions Run Feed Vector

Tank Name	Analyte	Waste Phase	Inventory	Inventory Units	Basis	Density	Density Units	Volume	Volume Units	Concentration	Concentration Units	Decay Date
241-AW-104	K	Supernatant	9.92E+02	kg	S	1.08	g/mL	347	kL	2.65E+03	ug/g	Jan 1 2001 12:00AM
241-AW-104	La	Total	3.97E+01	kg	S/E							Jan 1 2001 12:00AM
241-AW-104	La	Salt Cake (Liquids)	1.76E-01	kg	TE	1.6	g/mL	136	kL	8.11E-01	ug/g	Jan 1 2001 12:00AM
241-AW-104	La	Salt Cake (Solids)	1.95E+01	kg	S	1.6	g/mL	457	kL	2.67E+01	ug/g	Jan 1 2001 12:00AM
241-AW-104	La	Sludge (Liquids)	5.64E-02	kg	TE	1.6	g/mL	62	kL	5.69E-01	ug/g	Jan 1 2001 12:00AM
241-AW-104	La	Sludge (Solids)	2.00E+01	kg	S	1.4	g/mL	188	kL	7.60E+01	ug/g	Jan 1 2001 12:00AM
241-AW-104	La	Supernatant	0.00E+00	kg	TE	1.02	g/mL	347	kL	0.00E+00	ug/g	Jan 1 2001 12:00AM
241-AW-104	Li	Supernatant	3.50E-01	kg	S	1.08	g/mL	347	kL	9.35E-01	ug/g	Jan 1 2001 12:00AM
241-AW-104	Li	Total	8.18E+00	kg	S/E							Jan 1 2001 12:00AM
241-AW-104	Li	Sludge (Liquids)	3.73E-01	kg	S	1.33	g/mL	62	kL	4.52E+00	ug/g	Jan 1 2001 12:00AM
241-AW-104	Li	Salt Cake (Solids)	3.90E+00	kg	S	1.6	g/mL	457	kL	5.33E+00	ug/g	Jan 1 2001 12:00AM
241-AW-104	Li	Sludge (Solids)	2.74E+00	kg	S	1.4	g/mL	188	kL	1.04E+01	ug/g	Jan 1 2001 12:00AM
241-AW-104	Li	Salt Cake (Liquids)	8.17E-01	kg	S	1.45	g/mL	136	kL	4.14E+00	ug/g	Jan 1 2001 12:00AM
241-AW-104	Mg	Sludge (Solids)	1.96E+02	kg	S	1.4	g/mL	188	kL	7.44E+02	ug/g	Jan 1 2001 12:00AM
241-AW-104	Mg	Total	2.50E+02	kg	S/E							Jan 1 2001 12:00AM
241-AW-104	Mg	Salt Cake (Solids)	3.90E+01	kg	S	1.6	g/mL	457	kL	5.33E+01	ug/g	Jan 1 2001 12:00AM
241-AW-104	Mg	Supernatant	3.50E+00	kg	S	1.08	g/mL	347	kL	9.35E+00	ug/g	Jan 1 2001 12:00AM
241-AW-104	Mg	Salt Cake (Liquids)	8.17E+00	kg	S	1.45	g/mL	136	kL	4.14E+01	ug/g	Jan 1 2001 12:00AM
241-AW-104	Mg	Sludge (Liquids)	3.73E+00	kg	S	1.33	g/mL	62	kL	4.52E+01	ug/g	Jan 1 2001 12:00AM
241-AW-104	Mn	Total	1.13E+03	kg	S							Jan 1 2001 12:00AM
241-AW-104	Mn	Salt Cake (Liquids)	8.17E-01	kg	S	1.45	g/mL	136	kL	4.14E+00	ug/g	Jan 1 2001 12:00AM
241-AW-104	Mn	Salt Cake (Solids)	3.41E+02	kg	S	1.6	g/mL	457	kL	4.66E+02	ug/g	Jan 1 2001 12:00AM
241-AW-104	Mn	Sludge (Liquids)	5.27E-01	kg	S	1.43	g/mL	62	kL	5.94E+00	ug/g	Jan 1 2001 12:00AM
241-AW-104	Mn	Sludge (Solids)	7.87E+02	kg	S	1.28	g/mL	188	kL	3.27E+03	ug/g	Jan 1 2001 12:00AM
241-AW-104	Mn	Supernatant	3.50E-01	kg	S	1.08	g/mL	347	kL	9.35E-01	ug/g	Jan 1 2001 12:00AM
241-AW-104	Mo	Sludge (Solids)	1.00E+01	kg	S	1.4	g/mL	188	kL	3.81E+01	ug/g	Jan 1 2001 12:00AM
241-AW-104	Mo	Supernatant	2.19E+00	kg	S	1.08	g/mL	347	kL	5.85E+00	ug/g	Jan 1 2001 12:00AM
241-AW-104	Mo	Salt Cake (Solids)	3.33E+01	kg	S	1.6	g/mL	457	kL	4.56E+01	ug/g	Jan 1 2001 12:00AM
241-AW-104	Mo	Salt Cake (Liquids)	8.95E+00	kg	S	1.44	g/mL	136	kL	4.57E+01	ug/g	Jan 1 2001 12:00AM
241-AW-104	Mo	Sludge (Liquids)	2.90E+00	kg	S	1.43	g/mL	62	kL	3.27E+01	ug/g	Jan 1 2001 12:00AM
241-AW-104	Mo	Total	5.74E+01	kg	S							Jan 1 2001 12:00AM
241-AW-104	Na	Total	2.37E+05	kg	S							Jan 1 2001 12:00AM
241-AW-104	Na	Salt Cake (Liquids)	2.75E+04	kg	S	1.44	g/mL	136	kL	1.40E+05	ug/g	Jan 1 2001 12:00AM
241-AW-104	Na	Salt Cake (Solids)	1.65E+05	kg	S	1.6	g/mL	457	kL	2.25E+05	ug/g	Jan 1 2001 12:00AM
241-AW-104	Na	Sludge (Liquids)	9.98E+03	kg	S	1.43	g/mL	62	kL	1.13E+05	ug/g	Jan 1 2001 12:00AM
241-AW-104	Na	Sludge (Solids)	2.31E+04	kg	S	1.28	g/mL	188	kL	9.61E+04	ug/g	Jan 1 2001 12:00AM
241-AW-104	Na	Supernatant	1.20E+04	kg	S	1.08	g/mL	347	kL	3.20E+04	ug/g	Jan 1 2001 12:00AM
241-AW-104	Nd	Supernatant	3.50E+00	kg	S	1.08	g/mL	347	kL	9.35E+00	ug/g	Jan 1 2001 12:00AM
241-AW-104	Nd	Sludge (Liquids)	3.73E+00	kg	S	1.33	g/mL	62	kL	4.52E+01	ug/g	Jan 1 2001 12:00AM
241-AW-104	Nd	Sludge (Solids)	1.13E+01	kg	S	1.4	g/mL	188	kL	4.30E+01	ug/g	Jan 1 2001 12:00AM
241-AW-104	Nd	Salt Cake (Solids)	3.90E+01	kg	S	1.6	g/mL	457	kL	5.33E+01	ug/g	Jan 1 2001 12:00AM
241-AW-104	Nd	Salt Cake (Liquids)	8.17E+00	kg	S	1.45	g/mL	136	kL	4.14E+01	ug/g	Jan 1 2001 12:00AM
241-AW-104	Nd	Total	6.57E+01	kg	S/E							Jan 1 2001 12:00AM
241-AW-104	Ni	Total	8.91E+01	kg	S							Jan 1 2001 12:00AM
241-AW-104	Ni	Salt Cake (Liquids)	1.63E+00	kg	S	1.44	g/mL	136	kL	8.33E+00	ug/g	Jan 1 2001 12:00AM
241-AW-104	Ni	Salt Cake (Solids)	2.38E+01	kg	S	1.6	g/mL	457	kL	3.25E+01	ug/g	Jan 1 2001 12:00AM
241-AW-104	Ni	Sludge (Liquids)	7.44E-01	kg	S	1.43	g/mL	62	kL	8.39E+00	ug/g	Jan 1 2001 12:00AM

CALCULATION SHEET

PROJECT: RPP-WTP
JOB NO.: 24590
CALC NO.: 24590-WTP-M4C-FRP-00001
SHEET REV: 0A
SHEET NO.: 126

BY: E. Berrios
DATE: 12/04/02

SUBJECT: Updated Emissions Run Feed Vector

Tank Name	Analyte	Waste Phase	Inventory	Inventory Units	Basis	Density	Density Units	Volume	Volume Units	Concentration	Concentration Units	Decay Date
241-AW-104	Ni	Sludge (Solids)	6.22E+01	kg	S	1.4	g/mL	188	kL	2.37E+02	ug/g	Jan 1 2001 12:00AM
241-AW-104	Ni	Supernatant	7.01E-01	kg	S	1.08	g/mL	347	kL	1.87E+00	ug/g	Jan 1 2001 12:00AM
241-AW-104	NO2	Total	6.83E+04	kg	S							Jan 1 2001 12:00AM
241-AW-104	NO2	Salt Cake (Liquids)	1.36E+04	kg	S	1.44	g/mL	136	kL	6.94E+04	ug/g	Jan 1 2001 12:00AM
241-AW-104	NO2	Salt Cake (Solids)	4.17E+04	kg	S	1.6	g/mL	457	kL	5.70E+04	ug/g	Jan 1 2001 12:00AM
241-AW-104	NO2	Sludge (Liquids)	4.32E+03	kg	S	1.43	g/mL	62	kL	4.87E+04	ug/g	Jan 1 2001 12:00AM
241-AW-104	NO2	Sludge (Solids)	5.82E+03	kg	S	1.28	g/mL	188	kL	2.42E+04	ug/g	Jan 1 2001 12:00AM
241-AW-104	NO2	Supernatant	2.85E+03	kg	S	1.08	g/mL	347	kL	7.61E+03	ug/g	Jan 1 2001 12:00AM
241-AW-104	NO3	Total	1.04E+05	kg	S							Jan 1 2001 12:00AM
241-AW-104	NO3	Salt Cake (Liquids)	2.03E+04	kg	S	1.44	g/mL	136	kL	1.03E+05	ug/g	Jan 1 2001 12:00AM
241-AW-104	NO3	Salt Cake (Solids)	5.97E+04	kg	S	1.6	g/mL	457	kL	8.16E+04	ug/g	Jan 1 2001 12:00AM
241-AW-104	NO3	Sludge (Liquids)	7.25E+03	kg	S	1.43	g/mL	62	kL	8.18E+04	ug/g	Jan 1 2001 12:00AM
241-AW-104	NO3	Sludge (Solids)	1.02E+04	kg	S	1.28	g/mL	188	kL	4.25E+04	ug/g	Jan 1 2001 12:00AM
241-AW-104	NO3	Supernatant	6.24E+03	kg	S	1.08	g/mL	347	kL	1.66E+04	ug/g	Jan 1 2001 12:00AM
241-AW-104	OH	Total	1.66E+05	kg	C							Jan 1 2001 12:00AM
241-AW-104	OH	Salt Cake (Liquids)	6.68E+03	kg	S	1.45	g/mL	136	kL	3.39E+04	ug/g	Jan 1 2001 12:00AM
241-AW-104	OH	Sludge (Liquids)	1.27E+03	kg	S	1.33	g/mL	62	kL	1.54E+04	ug/g	Jan 1 2001 12:00AM
241-AW-104	OH	Supernatant	2.99E+03	kg	S	1.08	g/mL	347	kL	7.98E+03	ug/g	Jan 1 2001 12:00AM
241-AW-104	Oxalate	Sludge (Liquids)	4.68E-02	kg	TE	1.6	g/mL	62	kL	4.72E-01	ug/g	Jan 1 2001 12:00AM
241-AW-104	Oxalate	Supernatant	9.21E+01	kg	S	1.08	g/mL	347	kL	2.46E+02	ug/g	Jan 1 2001 12:00AM
241-AW-104	Oxalate	Sludge (Solids)	6.14E+02	kg	S	1.28	g/mL	188	kL	2.55E+03	ug/g	Jan 1 2001 12:00AM
241-AW-104	Oxalate	Salt Cake (Solids)	8.19E+03	kg	S	1.6	g/mL	457	kL	1.12E+04	ug/g	Jan 1 2001 12:00AM
241-AW-104	Oxalate	Total	8.90E+03	kg	S/E							Jan 1 2001 12:00AM
241-AW-104	Pb	Total	1.36E+02	kg	S							Jan 1 2001 12:00AM
241-AW-104	Pb	Salt Cake (Liquids)	8.17E+00	kg	S	1.45	g/mL	136	kL	4.14E+01	ug/g	Jan 1 2001 12:00AM
241-AW-104	Pb	Salt Cake (Solids)	4.20E+01	kg	S	1.6	g/mL	457	kL	5.75E+01	ug/g	Jan 1 2001 12:00AM
241-AW-104	Pb	Sludge (Liquids)	3.73E-01	kg	S	1.43	g/mL	62	kL	4.20E+00	ug/g	Jan 1 2001 12:00AM
241-AW-104	Pb	Sludge (Solids)	8.16E+01	kg	S	1.4	g/mL	188	kL	3.10E+02	ug/g	Jan 1 2001 12:00AM
241-AW-104	Pb	Supernatant	3.50E+00	kg	S	1.08	g/mL	347	kL	9.35E+00	ug/g	Jan 1 2001 12:00AM
241-AW-104	PO4	Total	3.29E+03	kg	S							Jan 1 2001 12:00AM
241-AW-104	PO4	Salt Cake (Liquids)	1.66E+02	kg	S	1.45	g/mL	136	kL	8.41E+02	ug/g	Jan 1 2001 12:00AM
241-AW-104	PO4	Salt Cake (Solids)	2.78E+03	kg	S	1.6	g/mL	457	kL	3.80E+03	ug/g	Jan 1 2001 12:00AM
241-AW-104	PO4	Sludge (Liquids)	3.08E+01	kg	S	1.33	g/mL	62	kL	3.74E+02	ug/g	Jan 1 2001 12:00AM
241-AW-104	PO4	Sludge (Solids)	1.46E+02	kg	S	1.28	g/mL	188	kL	6.06E+02	ug/g	Jan 1 2001 12:00AM
241-AW-104	PO4	Supernatant	1.65E+02	kg	S	1.08	g/mL	347	kL	4.40E+02	ug/g	Jan 1 2001 12:00AM
241-AW-104	Sb	Sludge (Liquids)	2.24E+00	kg	S	1.33	g/mL	62	kL	2.71E+01	ug/g	Jan 1 2001 12:00AM
241-AW-104	Sb	Salt Cake (Liquids)	4.91E+00	kg	S	1.45	g/mL	136	kL	2.49E+01	ug/g	Jan 1 2001 12:00AM
241-AW-104	Sb	Sludge (Solids)	6.79E+00	kg	S	1.4	g/mL	188	kL	2.58E+01	ug/g	Jan 1 2001 12:00AM
241-AW-104	Sb	Supernatant	2.10E+00	kg	S	1.08	g/mL	347	kL	5.61E+00	ug/g	Jan 1 2001 12:00AM
241-AW-104	Sb	Salt Cake (Solids)	2.34E+01	kg	S	1.6	g/mL	457	kL	3.20E+01	ug/g	Jan 1 2001 12:00AM
241-AW-104	Sb	Total	3.94E+01	kg	S/E							Jan 1 2001 12:00AM
241-AW-104	Se	Salt Cake (Solids)	3.90E+01	kg	S	1.6	g/mL	457	kL	5.33E+01	ug/g	Jan 1 2001 12:00AM
241-AW-104	Se	Supernatant	3.50E+00	kg	S	1.08	g/mL	347	kL	9.35E+00	ug/g	Jan 1 2001 12:00AM
241-AW-104	Se	Sludge (Solids)	1.13E+01	kg	S	1.4	g/mL	188	kL	4.30E+01	ug/g	Jan 1 2001 12:00AM
241-AW-104	Se	Total	6.20E+01	kg	S/E							Jan 1 2001 12:00AM
241-AW-104	Se	Salt Cake (Liquids)	8.17E+00	kg	S	1.45	g/mL	136	kL	4.14E+01	ug/g	Jan 1 2001 12:00AM
241-AW-104	Si	Total	1.45E+03	kg	S							Jan 1 2001 12:00AM

CALCULATION SHEET

PROJECT: RPP-WTP
JOB NO.: 24590
CALC NO.: 24590-WTP-M4C-FRP-00001
SHEET REV: 0A
SHEET NO.: 127

BY: E. Berríos
DATE: 12/04/02

SUBJECT: Updated Emissions Run Feed Vector

Tank Name	Analyte	Waste Phase	Inventory	Inventory Units	Basis	Density	Density Units	Volume	Volume Units	Concentration	Concentration Units	Decay Date
241-AW-104	Si	Salt Cake (Liquids)	2.19E+01	kg	S	1.44	g/mL	136	kL	1.12E+02	ug/g	Jan 1 2001 12:00AM
241-AW-104	Si	Salt Cake (Solids)	9.29E+02	kg	S	1.6	g/mL	457	kL	1.27E+03	ug/g	Jan 1 2001 12:00AM
241-AW-104	Si	Sludge (Liquids)	6.39E+00	kg	S	1.43	g/mL	62	kL	7.20E+01	ug/g	Jan 1 2001 12:00AM
241-AW-104	Si	Sludge (Solids)	4.72E+02	kg	S	1.28	g/mL	188	kL	1.96E+03	ug/g	Jan 1 2001 12:00AM
241-AW-104	Si	Supernatant	2.53E+01	kg	S	1.08	g/mL	347	kL	6.76E+01	ug/g	Jan 1 2001 12:00AM
241-AW-104	SO4	Total	1.93E+04	kg	S							Jan 1 2001 12:00AM
241-AW-104	SO4	Salt Cake (Liquids)	1.92E+02	kg	S	1.45	g/mL	136	kL	9.72E+02	ug/g	Jan 1 2001 12:00AM
241-AW-104	SO4	Salt Cake (Solids)	1.80E+04	kg	S	1.6	g/mL	457	kL	2.47E+04	ug/g	Jan 1 2001 12:00AM
241-AW-104	SO4	Sludge (Liquids)	1.95E+02	kg	S	1.43	g/mL	62	kL	2.20E+03	ug/g	Jan 1 2001 12:00AM
241-AW-104	SO4	Sludge (Solids)	5.41E+02	kg	S	1.28	g/mL	188	kL	2.25E+03	ug/g	Jan 1 2001 12:00AM
241-AW-104	SO4	Supernatant	3.36E+02	kg	S	1.08	g/mL	347	kL	8.96E+02	ug/g	Jan 1 2001 12:00AM
241-AW-104	Sr	Total	9.29E+00	kg	S/C/E							Jan 1 2001 12:00AM
241-AW-104	Sr	Salt Cake (Liquids)	8.33E-02	kg	C		g/mL	136	kL	3.83E-01	ug/g	Jan 1 2001 12:00AM
241-AW-104	Sr	Salt Cake (Solids)	3.90E+00	kg	S	1.6	g/mL	457	kL	5.33E+00	ug/g	Jan 1 2001 12:00AM
241-AW-104	Sr	Sludge (Liquids)	3.73E-01	kg	S	1.33	g/mL	62	kL	4.52E+00	ug/g	Jan 1 2001 12:00AM
241-AW-104	Sr	Sludge (Solids)	4.94E+00	kg	S	1.4	g/mL	188	kL	1.88E+01	ug/g	Jan 1 2001 12:00AM
241-AW-104	Sr	Supernatant	2.91E-04	kg	C		g/mL	347	kL	7.36E-04	ug/g	Jan 1 2001 12:00AM
241-AW-104	Th	Sludge (Liquids)	3.73E+00	kg	S	1.33	g/mL	62	kL	4.52E+01	ug/g	Jan 1 2001 12:00AM
241-AW-104	Th	Salt Cake (Liquids)	8.17E+00	kg	S	1.45	g/mL	136	kL	4.14E+01	ug/g	Jan 1 2001 12:00AM
241-AW-104	Th	Salt Cake (Solids)	3.90E+01	kg	S	1.6	g/mL	457	kL	5.33E+01	ug/g	Jan 1 2001 12:00AM
241-AW-104	Th	Supernatant	3.50E+00	kg	S	1.08	g/mL	347	kL	9.35E+00	ug/g	Jan 1 2001 12:00AM
241-AW-104	Th	Total	6.57E+01	kg	S/E							Jan 1 2001 12:00AM
241-AW-104	Th	Sludge (Solids)	1.13E+01	kg	S	1.4	g/mL	188	kL	4.30E+01	ug/g	Jan 1 2001 12:00AM
241-AW-104	Ti	Salt Cake (Liquids)	8.17E-01	kg	S	1.45	g/mL	136	kL	4.14E+00	ug/g	Jan 1 2001 12:00AM
241-AW-104	Ti	Total	2.10E+01	kg	S/E							Jan 1 2001 12:00AM
241-AW-104	Ti	Supernatant	3.50E-01	kg	S	1.08	g/mL	347	kL	9.35E-01	ug/g	Jan 1 2001 12:00AM
241-AW-104	Ti	Sludge (Liquids)	3.73E-01	kg	S	1.33	g/mL	62	kL	4.52E+00	ug/g	Jan 1 2001 12:00AM
241-AW-104	Ti	Salt Cake (Solids)	3.90E+00	kg	S	1.6	g/mL	457	kL	5.33E+00	ug/g	Jan 1 2001 12:00AM
241-AW-104	Ti	Sludge (Solids)	1.56E+01	kg	S	1.4	g/mL	188	kL	5.93E+01	ug/g	Jan 1 2001 12:00AM
241-AW-104	TIC as CO3	Total	5.68E+04	kg	S/E							Jan 1 2001 12:00AM
241-AW-104	TIC as CO3	Salt Cake (Liquids)	4.69E+03	kg	S	1.44	g/mL	136	kL	2.40E+04	ug/g	Jan 1 2001 12:00AM
241-AW-104	TIC as CO3	Salt Cake (Solids)	3.48E+04	kg	S	1.6	g/mL	457	kL	4.76E+04	ug/g	Jan 1 2001 12:00AM
241-AW-104	TIC as CO3	Sludge (Liquids)	9.17E+02	kg	TE	1.6	g/mL	62	kL	9.24E+03	ug/g	Jan 1 2001 12:00AM
241-AW-104	TIC as CO3	Sludge (Solids)	1.22E+04	kg	S	1.4	g/mL	188	kL	4.64E+04	ug/g	Jan 1 2001 12:00AM
241-AW-104	TIC as CO3	Supernatant	4.16E+03	kg	S	1.08	g/mL	347	kL	1.11E+04	ug/g	Jan 1 2001 12:00AM
241-AW-104	Tl	Total	1.32E+02	kg	S/E							Jan 1 2001 12:00AM
241-AW-104	Tl	Sludge (Liquids)	7.44E+00	kg	S	1.33	g/mL	62	kL	9.02E+01	ug/g	Jan 1 2001 12:00AM
241-AW-104	Tl	Supernatant	7.01E+00	kg	S	1.08	g/mL	347	kL	1.87E+01	ug/g	Jan 1 2001 12:00AM
241-AW-104	Tl	Salt Cake (Liquids)	1.63E+01	kg	S	1.45	g/mL	136	kL	8.28E+01	ug/g	Jan 1 2001 12:00AM
241-AW-104	Tl	Salt Cake (Solids)	7.82E+01	kg	S	1.6	g/mL	457	kL	1.07E+02	ug/g	Jan 1 2001 12:00AM
241-AW-104	Tl	Sludge (Solids)	2.26E+01	kg	S	1.4	g/mL	188	kL	8.60E+01	ug/g	Jan 1 2001 12:00AM

CALCULATION SHEET

PROJECT: RPP-WTP
JOB NO.: 24590
CALC NO.: 24590-WTP-M4C-FRP-00001
SHEET REV: 0A
SHEET NO.: 128

BY: E. Berrios
DATE: 12/04/02

SUBJECT: Updated Emissions Run Feed Vector

Tank Name	Analyte	Waste Phase	Inventory	Inventory Units	Basis	Density	Density Units	Volume	Volume Units	Concentration	Concentration Units	Decay Date
241-AW-104	TOC	Total	9.37E+03	kg	S/E							Jan 1 2001 12:00AM
241-AW-104	TOC	Salt Cake (Liquids)	5.14E+02	kg	S	1.44	g/mL	136	kL	2.63E+03	ug/g	Jan 1 2001 12:00AM
241-AW-104	TOC	Salt Cake (Solids)	4.51E+03	kg	S	1.6	g/mL	457	kL	6.17E+03	ug/g	Jan 1 2001 12:00AM
241-AW-104	TOC	Sludge (Liquids)	9.46E+02	kg	TE	1.6	g/mL	62	kL	9.53E+03	ug/g	Jan 1 2001 12:00AM
241-AW-104	TOC	Sludge (Solids)	2.84E+03	kg	S	1.4	g/mL	188	kL	1.08E+04	ug/g	Jan 1 2001 12:00AM
241-AW-104	TOC	Supernatant	5.59E+02	kg	S	1.14	g/mL	347	kL	1.41E+03	ug/g	Jan 1 2001 12:00AM
241-AW-104	TotalAlpha	Salt Cake (Solids)	7.97E+01	Ci	S	1.6	g/mL	457	kL	1.09E-01	uCi/g	Jan 1 2001 12:00AM
241-AW-104	TotalAlpha	Total	7.43E+02	Ci	S							Jan 1 2001 12:00AM
241-AW-104	TotalAlpha	Salt Cake (Liquids)	1.48E+00	Ci	S	1.44	g/mL	136	kL	7.57E-03	uCi/g	Jan 1 2001 12:00AM
241-AW-104	TotalAlpha	Sludge (Liquids)	4.45E-01	Ci	S	1.43	g/mL	62	kL	5.02E-03	uCi/g	Jan 1 2001 12:00AM
241-AW-104	TotalAlpha	Sludge (Solids)	6.62E+02	Ci	S	1.28	g/mL	188	kL	2.75E+00	uCi/g	Jan 1 2001 12:00AM
241-AW-104	UTOTAL	Total	7.13E+03	kg	S/E							Jan 1 2001 12:00AM
241-AW-104	UTOTAL	Salt Cake (Liquids)	6.01E+00	kg	TE	1.6	g/mL	136	kL	2.76E+01	ug/g	Jan 1 2001 12:00AM
241-AW-104	UTOTAL	Salt Cake (Solids)	2.14E+02	kg	S	1.6	g/mL	457	kL	2.92E+02	ug/g	Jan 1 2001 12:00AM
241-AW-104	UTOTAL	Sludge (Liquids)	1.92E+00	kg	TE	1.6	g/mL	62	kL	1.94E+01	ug/g	Jan 1 2001 12:00AM
241-AW-104	UTOTAL	Sludge (Solids)	6.91E+03	kg	S	1.28	g/mL	188	kL	2.87E+04	ug/g	Jan 1 2001 12:00AM
241-AW-104	UTOTAL	Supernatant	1.86E+00	kg	S	1.14	g/mL	347	kL	4.69E+00	ug/g	Jan 1 2001 12:00AM
241-AW-104	V	Salt Cake (Liquids)	4.09E+00	kg	S	1.45	g/mL	136	kL	2.08E+01	ug/g	Jan 1 2001 12:00AM
241-AW-104	V	Sludge (Solids)	5.66E+00	kg	S	1.4	g/mL	188	kL	2.15E+01	ug/g	Jan 1 2001 12:00AM
241-AW-104	V	Salt Cake (Solids)	1.95E+01	kg	S	1.6	g/mL	457	kL	2.67E+01	ug/g	Jan 1 2001 12:00AM
241-AW-104	V	Sludge (Liquids)	1.87E+00	kg	S	1.33	g/mL	62	kL	2.26E+01	ug/g	Jan 1 2001 12:00AM
241-AW-104	V	Supernatant	1.75E+00	kg	S	1.08	g/mL	347	kL	4.68E+00	ug/g	Jan 1 2001 12:00AM
241-AW-104	V	Total	3.29E+01	kg	S/E							Jan 1 2001 12:00AM
241-AW-104	Y	Salt Cake (Liquids)	8.17E-01	kg	S	1.45	g/mL	136	kL	4.14E+00	ug/g	Jan 1 2001 12:00AM
241-AW-104	Y	Supernatant	3.50E-01	kg	S	1.08	g/mL	347	kL	9.35E-01	ug/g	Jan 1 2001 12:00AM
241-AW-104	Y	Sludge (Liquids)	3.73E-01	kg	S	1.33	g/mL	62	kL	4.52E+00	ug/g	Jan 1 2001 12:00AM
241-AW-104	Y	Total	6.57E+00	kg	S/E							Jan 1 2001 12:00AM
241-AW-104	Y	Salt Cake (Solids)	3.90E+00	kg	S	1.6	g/mL	457	kL	5.33E+00	ug/g	Jan 1 2001 12:00AM
241-AW-104	Y	Sludge (Solids)	1.13E+00	kg	S	1.4	g/mL	188	kL	4.29E+00	ug/g	Jan 1 2001 12:00AM
241-AW-104	Zn	Supernatant	3.50E-01	kg	S	1.08	g/mL	347	kL	9.35E-01	ug/g	Jan 1 2001 12:00AM
241-AW-104	Zn	Salt Cake (Solids)	3.90E+00	kg	S	1.6	g/mL	457	kL	5.33E+00	ug/g	Jan 1 2001 12:00AM
241-AW-104	Zn	Sludge (Solids)	2.76E+01	kg	S	1.4	g/mL	188	kL	1.05E+02	ug/g	Jan 1 2001 12:00AM
241-AW-104	Zn	Sludge (Liquids)	3.73E-01	kg	S	1.33	g/mL	62	kL	4.52E+00	ug/g	Jan 1 2001 12:00AM
241-AW-104	Zn	Salt Cake (Liquids)	8.17E-01	kg	S	1.45	g/mL	136	kL	4.14E+00	ug/g	Jan 1 2001 12:00AM
241-AW-104	Zn	Total	3.31E+01	kg	S/E							Jan 1 2001 12:00AM
241-AW-104	Zr	Total	2.41E+03	kg	S/E							Jan 1 2001 12:00AM
241-AW-104	Zr	Salt Cake (Liquids)	1.20E+00	kg	S	1.44	g/mL	136	kL	6.12E+00	ug/g	Jan 1 2001 12:00AM
241-AW-104	Zr	Salt Cake (Solids)	3.04E+02	kg	S	1.6	g/mL	457	kL	4.16E+02	ug/g	Jan 1 2001 12:00AM
241-AW-104	Zr	Sludge (Liquids)	5.05E-01	kg	S	1.43	g/mL	62	kL	5.70E+00	ug/g	Jan 1 2001 12:00AM
241-AW-104	Zr	Sludge (Solids)	2.10E+03	kg	E	1.28	g/mL	188	kL	8.73E+03	ug/g	Jan 1 2001 12:00AM
241-AW-104	Zr	Supernatant	3.50E-01	kg	S	1.08	g/mL	347	kL	9.35E-01	ug/g	Jan 1 2001 12:00AM
241-C-107	106Ru	Total	1.13E-02	Ci	E							Jan 1 2001 12:00AM
241-C-107	106Ru	Sludge	6.83E-11	Ci	TS	1.41	g/mL	511	kL	9.48E-14	uCi/g	Jan 1 2001 12:00AM
241-C-107	106Ru	Sludge	1.50E-07	Ci	TS	1.71	g/mL	90	kL	9.78E-10	uCi/g	Jan 1 2001 12:00AM
241-C-107	106Ru	Sludge	1.13E-02	Ci	TE	1.32	g/mL	339	kL	2.52E-05	uCi/g	Jan 1 2001 12:00AM
241-C-107	113mCd	Total	1.19E+03	Ci	E							Jan 1 2001 12:00AM
241-C-107	113mCd	Sludge	1.69E-01	Ci	TS	1.41	g/mL	511	kL	2.34E-04	uCi/g	Jan 1 2001 12:00AM

CALCULATION SHEET

PROJECT: RPP-WTP
JOB NO.: 24590
CALC NO.: 24590-WTP-M4C-FRP-00001
SHEET REV: 0A
SHEET NO.: 129

BY: E. Berrios
DATE: 12/04/02

SUBJECT: Updated Emissions Run Feed Vector

Tank Name	Analyte	Waste Phase	Inventory	Inventory Units	Basis	Density	Density Units	Volume	Volume Units	Concentration	Concentration Units	Decay Date
241-C-107	113mCd	Sludge	2.80E-02	Ci	TS	1.71	g/mL	90	kL	1.82E-04	uCi/g	Jan 1 2001 12:00AM
241-C-107	113mCd	Sludge	1.19E+03	Ci	TE	1.32	g/mL	339	kL	2.65E+00	uCi/g	Jan 1 2001 12:00AM
241-C-107	125Sb	Total	7.42E+00	Ci	E							Jan 1 2001 12:00AM
241-C-107	125Sb	Sludge	3.37E-03	Ci	TS	1.41	g/mL	511	kL	4.67E-06	uCi/g	Jan 1 2001 12:00AM
241-C-107	125Sb	Sludge	1.06E-02	Ci	TS	1.71	g/mL	90	kL	6.88E-05	uCi/g	Jan 1 2001 12:00AM
241-C-107	125Sb	Sludge	7.41E+00	Ci	TE	1.32	g/mL	339	kL	1.66E-02	uCi/g	Jan 1 2001 12:00AM
241-C-107	126Sn	Total	6.37E+01	Ci	S							Jan 1 2001 12:00AM
241-C-107	126Sn	Sludge	3.46E+01	Ci	S	1.55	g/mL	511	kL	4.37E-02	uCi/g	Jan 1 2001 12:00AM
241-C-107	126Sn	Sludge	6.10E+00	Ci	S	1.55	g/mL	90	kL	4.37E-02	uCi/g	Jan 1 2001 12:00AM
241-C-107	126Sn	Sludge	2.30E+01	Ci	S	1.55	g/mL	339	kL	4.37E-02	uCi/g	Jan 1 2001 12:00AM
241-C-107	129I	Total	4.83E-02	Ci	E							Jan 1 2001 12:00AM
241-C-107	129I	Sludge	1.27E-03	Ci	TS	1.41	g/mL	511	kL	1.77E-06	uCi/g	Jan 1 2001 12:00AM
241-C-107	129I	Sludge	1.09E-04	Ci	TS	1.71	g/mL	90	kL	7.07E-07	uCi/g	Jan 1 2001 12:00AM
241-C-107	129I	Sludge	4.69E-02	Ci	TE	1.32	g/mL	339	kL	1.05E-04	uCi/g	Jan 1 2001 12:00AM
241-C-107	134Cs	Total	4.90E-01	Ci	E							Jan 1 2001 12:00AM
241-C-107	134Cs	Sludge	7.47E-05	Ci	TS	1.41	g/mL	511	kL	1.04E-07	uCi/g	Jan 1 2001 12:00AM
241-C-107	134Cs	Sludge	3.85E-04	Ci	TS	1.71	g/mL	90	kL	2.50E-06	uCi/g	Jan 1 2001 12:00AM
241-C-107	134Cs	Sludge	4.90E-01	Ci	TE	1.32	g/mL	339	kL	1.09E-03	uCi/g	Jan 1 2001 12:00AM
241-C-107	137Cs	Total	6.35E+04	Ci	S							Jan 1 2001 12:00AM
241-C-107	137Cs	Sludge	3.45E+04	Ci	S	1.55	g/mL	511	kL	4.36E+01	uCi/g	Jan 1 2001 12:00AM
241-C-107	137Cs	Sludge	6.08E+03	Ci	S	1.55	g/mL	90	kL	4.36E+01	uCi/g	Jan 1 2001 12:00AM
241-C-107	137Cs	Sludge	2.29E+04	Ci	S	1.55	g/mL	339	kL	4.36E+01	uCi/g	Jan 1 2001 12:00AM
241-C-107	137mBa	Total	6.01E+04	Ci	C							Jan 1 2001 12:00AM
241-C-107	137mBa	Sludge	3.27E+04	Ci	C		g/mL	511	kL	4.12E+01	uCi/g	Jan 1 2001 12:00AM
241-C-107	137mBa	Sludge	5.75E+03	Ci	C		g/mL	90	kL	4.12E+01	uCi/g	Jan 1 2001 12:00AM
241-C-107	137mBa	Sludge	2.17E+04	Ci	C		g/mL	339	kL	4.12E+01	uCi/g	Jan 1 2001 12:00AM
241-C-107	14C	Total	3.80E+00	Ci	E							Jan 1 2001 12:00AM
241-C-107	14C	Sludge	2.25E-01	Ci	TS	1.41	g/mL	511	kL	3.13E-04	uCi/g	Jan 1 2001 12:00AM
241-C-107	14C	Sludge	7.67E-03	Ci	TS	1.71	g/mL	90	kL	4.98E-05	uCi/g	Jan 1 2001 12:00AM
241-C-107	14C	Sludge	3.57E+00	Ci	TE	1.32	g/mL	339	kL	7.98E-03	uCi/g	Jan 1 2001 12:00AM
241-C-107	151Sm	Total	6.36E+05	Ci	E							Jan 1 2001 12:00AM
241-C-107	151Sm	Sludge	7.27E+01	Ci	TS	1.41	g/mL	511	kL	1.01E-01	uCi/g	Jan 1 2001 12:00AM
241-C-107	151Sm	Sludge	5.84E+00	Ci	TS	1.71	g/mL	90	kL	3.79E-02	uCi/g	Jan 1 2001 12:00AM
241-C-107	151Sm	Sludge	6.36E+05	Ci	TE	1.32	g/mL	339	kL	1.42E+03	uCi/g	Jan 1 2001 12:00AM
241-C-107	152Eu	Total	1.17E+02	Ci	E							Jan 1 2001 12:00AM
241-C-107	152Eu	Sludge	1.89E-02	Ci	TS	1.41	g/mL	511	kL	2.63E-05	uCi/g	Jan 1 2001 12:00AM
241-C-107	152Eu	Sludge	4.54E-02	Ci	TS	1.71	g/mL	90	kL	2.95E-04	uCi/g	Jan 1 2001 12:00AM
241-C-107	152Eu	Sludge	1.17E+02	Ci	TE	1.32	g/mL	339	kL	2.62E-01	uCi/g	Jan 1 2001 12:00AM
241-C-107	154Eu	Total	1.60E+03	Ci	E							Jan 1 2001 12:00AM
241-C-107	154Eu	Sludge	1.67E+00	Ci	TS	1.41	g/mL	511	kL	2.31E-03	uCi/g	Jan 1 2001 12:00AM
241-C-107	154Eu	Sludge	1.26E-01	Ci	TS	1.71	g/mL	90	kL	8.19E-04	uCi/g	Jan 1 2001 12:00AM
241-C-107	154Eu	Sludge	1.60E+03	Ci	E	1.55	g/mL	339	kL	3.04E+00	uCi/g	Jan 1 2001 12:00AM
241-C-107	155Eu	Total	1.04E+03	Ci	E							Jan 1 2001 12:00AM
241-C-107	155Eu	Sludge	1.26E+00	Ci	TS	1.41	g/mL	511	kL	1.75E-03	uCi/g	Jan 1 2001 12:00AM
241-C-107	155Eu	Sludge	1.74E+00	Ci	TS	1.71	g/mL	90	kL	1.13E-02	uCi/g	Jan 1 2001 12:00AM
241-C-107	155Eu	Sludge	1.04E+03	Ci	E	1.55	g/mL	339	kL	1.98E+00	uCi/g	Jan 1 2001 12:00AM
241-C-107	226Ra	Sludge	2.16E-02	Ci	TE	1.32	g/mL	339	kL	4.82E-05	uCi/g	Jan 1 2001 12:00AM

CALCULATION SHEET

PROJECT: RPP-WTP
JOB NO.: 24590
CALC NO.: 24590-WTP-M4C-FRP-00001
SHEET REV: 0A
SHEET NO.: 130

BY: E. Berrios
DATE: 12/04/02

SUBJECT: Updated Emissions Run Feed Vector

Tank Name	Analyte	Waste Phase	Inventory	Inventory Units	Basis	Density	Density Units	Volume	Volume Units	Concentration	Concentration Units	Decay Date
241-C-107	226Ra	Total	2.16E-02	Ci	E							Jan 1 2001 12:00AM
241-C-107	226Ra	Sludge	5.91E-06	Ci	TS	1.41	g/mL	511	kL	8.20E-09	uCi/g	Jan 1 2001 12:00AM
241-C-107	226Ra	Sludge	1.10E-07	Ci	TS	1.71	g/mL	90	kL	7.18E-10	uCi/g	Jan 1 2001 12:00AM
241-C-107	227Ac	Total	1.41E-01	Ci	E							Jan 1 2001 12:00AM
241-C-107	227Ac	Sludge	3.72E-05	Ci	TS	1.41	g/mL	511	kL	5.16E-08	uCi/g	Jan 1 2001 12:00AM
241-C-107	227Ac	Sludge	1.79E-02	Ci	TS	1.71	g/mL	90	kL	1.16E-04	uCi/g	Jan 1 2001 12:00AM
241-C-107	227Ac	Sludge	1.23E-01	Ci	TE	1.32	g/mL	339	kL	2.75E-04	uCi/g	Jan 1 2001 12:00AM
241-C-107	228Ra	Total	4.85E-02	Ci	E							Jan 1 2001 12:00AM
241-C-107	228Ra	Sludge	2.52E-02	Ci	TS	1.41	g/mL	511	kL	3.50E-05	uCi/g	Jan 1 2001 12:00AM
241-C-107	228Ra	Sludge	5.25E-03	Ci	TS	1.71	g/mL	90	kL	3.41E-05	uCi/g	Jan 1 2001 12:00AM
241-C-107	228Ra	Sludge	1.80E-02	Ci	TE	1.32	g/mL	339	kL	4.02E-05	uCi/g	Jan 1 2001 12:00AM
241-C-107	229Th	Total	2.43E-03	Ci	E							Jan 1 2001 12:00AM
241-C-107	229Th	Sludge	2.21E-08	Ci	TS	1.41	g/mL	511	kL	3.07E-11	uCi/g	Jan 1 2001 12:00AM
241-C-107	229Th	Sludge	2.41E-03	Ci	TS	1.71	g/mL	90	kL	1.57E-05	uCi/g	Jan 1 2001 12:00AM
241-C-107	229Th	Sludge	1.63E-05	Ci	TE	1.32	g/mL	339	kL	3.65E-08	uCi/g	Jan 1 2001 12:00AM
241-C-107	231Pa	Total	1.92E-01	Ci	E							Jan 1 2001 12:00AM
241-C-107	231Pa	Sludge	6.53E-05	Ci	TS	1.41	g/mL	511	kL	9.06E-08	uCi/g	Jan 1 2001 12:00AM
241-C-107	231Pa	Sludge	2.41E-02	Ci	TS	1.71	g/mL	90	kL	1.57E-04	uCi/g	Jan 1 2001 12:00AM
241-C-107	231Pa	Sludge	1.68E-01	Ci	TE	1.32	g/mL	339	kL	3.74E-04	uCi/g	Jan 1 2001 12:00AM
241-C-107	232Th	Total	7.28E-02	Ci	S							Jan 1 2001 12:00AM
241-C-107	232Th	Sludge	3.96E-02	Ci	S	1.55	g/mL	511	kL	5.00E-05	uCi/g	Jan 1 2001 12:00AM
241-C-107	232Th	Sludge	6.97E-03	Ci	S	1.55	g/mL	90	kL	5.00E-05	uCi/g	Jan 1 2001 12:00AM
241-C-107	232Th	Sludge	2.63E-02	Ci	S	1.55	g/mL	339	kL	5.00E-05	uCi/g	Jan 1 2001 12:00AM
241-C-107	232U	Total	5.45E-03	Ci	E							Jan 1 2001 12:00AM
241-C-107	232U	Sludge	8.59E-06	Ci	TS	1.41	g/mL	511	kL	1.08E-08	uCi/g	Jan 1 2001 12:00AM
241-C-107	232U	Sludge	5.44E-03	Ci	TS	1.71	g/mL	90	kL	3.90E-05	uCi/g	Jan 1 2001 12:00AM
241-C-107	232U	Sludge	3.05E-06	Ci	TE	1.32	g/mL	339	kL	5.80E-09	uCi/g	Jan 1 2001 12:00AM
241-C-107	233U	Total	2.26E-02	Ci	E							Jan 1 2001 12:00AM
241-C-107	233U	Sludge	4.66E-07	Ci	TS	1.41	g/mL	511	kL	5.88E-10	uCi/g	Jan 1 2001 12:00AM
241-C-107	233U	Sludge	2.26E-02	Ci	TS	1.71	g/mL	90	kL	1.62E-04	uCi/g	Jan 1 2001 12:00AM
241-C-107	233U	Sludge	4.56E-08	Ci	TE	1.32	g/mL	339	kL	8.68E-11	uCi/g	Jan 1 2001 12:00AM
241-C-107	234U	Sludge	5.19E-01	Ci	TS	1.41	g/mL	511	kL	6.55E-04	uCi/g	Jan 1 2001 12:00AM
241-C-107	234U	Sludge	3.04E-02	Ci	TS	1.71	g/mL	90	kL	2.18E-04	uCi/g	Jan 1 2001 12:00AM
241-C-107	234U	Sludge	1.37E-02	Ci	TE	1.32	g/mL	339	kL	2.60E-05	uCi/g	Jan 1 2001 12:00AM
241-C-107	234U	Total	5.63E-01	Ci	E							Jan 1 2001 12:00AM
241-C-107	235U	Total	1.37E-01	Ci	E							Jan 1 2001 12:00AM
241-C-107	235U	Sludge	8.95E-02	Ci	E	1.55	g/mL	511	kL	1.13E-04	uCi/g	Jan 1 2001 12:00AM
241-C-107	235U	Sludge	2.59E-02	Ci	E	1.55	g/mL	90	kL	1.86E-04	uCi/g	Jan 1 2001 12:00AM
241-C-107	235U	Sludge	2.11E-02	Ci	E	1.55	g/mL	339	kL	4.01E-05	uCi/g	Jan 1 2001 12:00AM
241-C-107	236U	Total	8.92E-02	Ci	E							Jan 1 2001 12:00AM
241-C-107	236U	Sludge	5.84E-02	Ci	E	1.55	g/mL	511	kL	7.37E-05	uCi/g	Jan 1 2001 12:00AM
241-C-107	236U	Sludge	1.70E-02	Ci	E	1.55	g/mL	90	kL	1.22E-04	uCi/g	Jan 1 2001 12:00AM
241-C-107	236U	Sludge	1.38E-02	Ci	E	1.55	g/mL	339	kL	2.63E-05	uCi/g	Jan 1 2001 12:00AM
241-C-107	237Np	Total	8.07E-02	Ci	E							Jan 1 2001 12:00AM
241-C-107	237Np	Sludge	4.17E-03	Ci	TS	1.41	g/mL	511	kL	5.79E-06	uCi/g	Jan 1 2001 12:00AM
241-C-107	237Np	Sludge	4.22E-04	Ci	TS	1.71	g/mL	90	kL	2.74E-06	uCi/g	Jan 1 2001 12:00AM
241-C-107	237Np	Sludge	7.61E-02	Ci	TE	1.32	g/mL	339	kL	1.70E-04	uCi/g	Jan 1 2001 12:00AM

CALCULATION SHEET

PROJECT: RPP-WTP
JOB NO.: 24590
CALC NO.: 24590-WTP-M4C-FRP-00001
SHEET REV: 0A
SHEET NO.: 131

BY: E. Berríos
DATE: 12/04/02

SUBJECT: Updated Emissions Run Feed Vector

Tank Name	Analyte	Waste Phase	Inventory	Inventory Units	Basis	Density	Density Units	Volume	Volume Units	Concentration	Concentration Units	Decay Date
241-C-107	238Pu	Total	6.81E+01	Ci	C							Jan 1 2001 12:00AM
241-C-107	238Pu	Sludge	3.70E+01	Ci	C		g/mL	511	kL	4.67E-02	uCi/g	Jan 1 2001 12:00AM
241-C-107	238Pu	Sludge	6.52E+00	Ci	C		g/mL	90	kL	4.67E-02	uCi/g	Jan 1 2001 12:00AM
241-C-107	238Pu	Sludge	2.46E+01	Ci	C		g/mL	339	kL	4.67E-02	uCi/g	Jan 1 2001 12:00AM
241-C-107	238U	Total	3.10E+00	Ci	E							Jan 1 2001 12:00AM
241-C-107	238U	Sludge	2.03E+00	Ci	E	1.55	g/mL	511	kL	2.56E-03	uCi/g	Jan 1 2001 12:00AM
241-C-107	238U	Sludge	5.91E-01	Ci	E	1.55	g/mL	90	kL	4.24E-03	uCi/g	Jan 1 2001 12:00AM
241-C-107	238U	Sludge	4.81E-01	Ci	E	1.55	g/mL	339	kL	9.15E-04	uCi/g	Jan 1 2001 12:00AM
241-C-107	239/240Pu	Sludge	9.20E+02	Ci	S	1.55	g/mL	339	kL	1.75E+00	uCi/g	Jan 1 2001 12:00AM
241-C-107	239/240Pu	Sludge	1.39E+03	Ci	S	1.55	g/mL	511	kL	1.75E+00	uCi/g	Jan 1 2001 12:00AM
241-C-107	239/240Pu	Total	2.55E+03	Ci	S							Jan 1 2001 12:00AM
241-C-107	239/240Pu	Sludge	2.44E+02	Ci	S	1.55	g/mL	90	kL	1.75E+00	uCi/g	Jan 1 2001 12:00AM
241-C-107	239Pu	Sludge	7.79E+02	Ci	C		g/mL	339	kL	1.48E+00	uCi/g	Jan 1 2001 12:00AM
241-C-107	239Pu	Total	2.16E+03	Ci	C							Jan 1 2001 12:00AM
241-C-107	239Pu	Sludge	1.17E+03	Ci	C		g/mL	511	kL	1.48E+00	uCi/g	Jan 1 2001 12:00AM
241-C-107	239Pu	Sludge	2.07E+02	Ci	C		g/mL	90	kL	1.48E+00	uCi/g	Jan 1 2001 12:00AM
241-C-107	240Pu	Total	3.93E+02	Ci	C							Jan 1 2001 12:00AM
241-C-107	240Pu	Sludge	2.14E+02	Ci	C		g/mL	511	kL	2.70E-01	uCi/g	Jan 1 2001 12:00AM
241-C-107	240Pu	Sludge	3.77E+01	Ci	C		g/mL	90	kL	2.70E-01	uCi/g	Jan 1 2001 12:00AM
241-C-107	240Pu	Sludge	1.42E+02	Ci	C		g/mL	339	kL	2.70E-01	uCi/g	Jan 1 2001 12:00AM
241-C-107	241Am	Total	6.75E+03	Ci	S							Jan 1 2001 12:00AM
241-C-107	241Am	Sludge	3.67E+03	Ci	S	1.55	g/mL	511	kL	4.63E+00	uCi/g	Jan 1 2001 12:00AM
241-C-107	241Am	Sludge	6.46E+02	Ci	S	1.55	g/mL	90	kL	4.63E+00	uCi/g	Jan 1 2001 12:00AM
241-C-107	241Am	Sludge	2.43E+03	Ci	S	1.55	g/mL	339	kL	4.63E+00	uCi/g	Jan 1 2001 12:00AM
241-C-107	241Pu	Total	3.73E+03	Ci	C							Jan 1 2001 12:00AM
241-C-107	241Pu	Sludge	2.03E+03	Ci	C		g/mL	511	kL	2.56E+00	uCi/g	Jan 1 2001 12:00AM
241-C-107	241Pu	Sludge	3.57E+02	Ci	C		g/mL	90	kL	2.56E+00	uCi/g	Jan 1 2001 12:00AM
241-C-107	241Pu	Sludge	1.35E+03	Ci	C		g/mL	339	kL	2.56E+00	uCi/g	Jan 1 2001 12:00AM
241-C-107	242Cm	Total	5.37E+00	Ci	C							Jan 1 2001 12:00AM
241-C-107	242Cm	Sludge	2.92E+00	Ci	C		g/mL	511	kL	3.69E-03	uCi/g	Jan 1 2001 12:00AM
241-C-107	242Cm	Sludge	5.14E-01	Ci	C		g/mL	90	kL	3.69E-03	uCi/g	Jan 1 2001 12:00AM
241-C-107	242Cm	Sludge	1.94E+00	Ci	C		g/mL	339	kL	3.69E-03	uCi/g	Jan 1 2001 12:00AM
241-C-107	242Pu	Total	2.74E-02	Ci	C							Jan 1 2001 12:00AM
241-C-107	242Pu	Sludge	1.49E-02	Ci	C		g/mL	511	kL	1.88E-05	uCi/g	Jan 1 2001 12:00AM
241-C-107	242Pu	Sludge	2.62E-03	Ci	C		g/mL	90	kL	1.88E-05	uCi/g	Jan 1 2001 12:00AM
241-C-107	242Pu	Sludge	9.87E-03	Ci	C		g/mL	339	kL	1.88E-05	uCi/g	Jan 1 2001 12:00AM
241-C-107	243Am	Total	3.47E-01	Ci	C							Jan 1 2001 12:00AM
241-C-107	243Am	Sludge	1.89E-01	Ci	C		g/mL	511	kL	2.38E-04	uCi/g	Jan 1 2001 12:00AM
241-C-107	243Am	Sludge	3.32E-02	Ci	C		g/mL	90	kL	2.38E-04	uCi/g	Jan 1 2001 12:00AM
241-C-107	243Am	Sludge	1.25E-01	Ci	C		g/mL	339	kL	2.38E-04	uCi/g	Jan 1 2001 12:00AM
241-C-107	243Cm	Total	4.21E-01	Ci	C							Jan 1 2001 12:00AM
241-C-107	243Cm	Sludge	2.29E-01	Ci	C		g/mL	511	kL	2.89E-04	uCi/g	Jan 1 2001 12:00AM
241-C-107	243Cm	Sludge	4.03E-02	Ci	C		g/mL	90	kL	2.89E-04	uCi/g	Jan 1 2001 12:00AM
241-C-107	243Cm	Sludge	1.52E-01	Ci	C		g/mL	339	kL	2.89E-04	uCi/g	Jan 1 2001 12:00AM
241-C-107	244Cm	Sludge	8.46E+00	Ci	C		g/mL	511	kL	1.07E-02	uCi/g	Jan 1 2001 12:00AM
241-C-107	244Cm	Sludge	1.49E+00	Ci	C		g/mL	90	kL	1.07E-02	uCi/g	Jan 1 2001 12:00AM
241-C-107	244Cm	Sludge	5.61E+00	Ci	C		g/mL	339	kL	1.07E-02	uCi/g	Jan 1 2001 12:00AM

CALCULATION SHEET

PROJECT: RPP-WTP
JOB NO.: 24590
CALC NO.: 24590-WTP-M4C-FRP-00001
SHEET REV: 0A
SHEET NO.: 132

BY: E. Berríos
DATE: 12/04/02

SUBJECT: Updated Emissions Run Feed Vector

Tank Name	Analyte	Waste Phase	Inventory	Inventory Units	Basis	Density	Density Units	Volume	Volume Units	Concentration	Concentration Units	Decay Date
241-C-107	244Cm	Total	1.56E+01	Ci	C							Jan 1 2001 12:00AM
241-C-107	3H	Total	2.99E+01	Ci	E							Jan 1 2001 12:00AM
241-C-107	3H	Sludge	3.10E-01	Ci	TS	1.41	g/mL	511	kL	4.30E-04	uCi/g	Jan 1 2001 12:00AM
241-C-107	3H	Sludge	3.70E-02	Ci	TS	1.71	g/mL	90	kL	2.40E-04	uCi/g	Jan 1 2001 12:00AM
241-C-107	3H	Sludge	2.95E+01	Ci	TE	1.32	g/mL	339	kL	6.60E-02	uCi/g	Jan 1 2001 12:00AM
241-C-107	59Ni	Total	3.22E+02	Ci	E							Jan 1 2001 12:00AM
241-C-107	59Ni	Sludge	2.77E-02	Ci	TS	1.41	g/mL	511	kL	3.85E-05	uCi/g	Jan 1 2001 12:00AM
241-C-107	59Ni	Sludge	2.17E-03	Ci	TS	1.71	g/mL	90	kL	1.41E-05	uCi/g	Jan 1 2001 12:00AM
241-C-107	59Ni	Sludge	3.22E+02	Ci	TE	1.32	g/mL	339	kL	7.19E-01	uCi/g	Jan 1 2001 12:00AM
241-C-107	60Co	Total	2.47E+02	Ci	E							Jan 1 2001 12:00AM
241-C-107	60Co	Sludge	8.55E-03	Ci	TS	1.41	g/mL	511	kL	1.19E-05	uCi/g	Jan 1 2001 12:00AM
241-C-107	60Co	Sludge	4.45E-03	Ci	TS	1.71	g/mL	90	kL	2.89E-05	uCi/g	Jan 1 2001 12:00AM
241-C-107	60Co	Sludge	2.47E+02	Ci	E	1.55	g/mL	339	kL	4.71E-01	uCi/g	Jan 1 2001 12:00AM
241-C-107	63Ni	Total	3.01E+04	Ci	E							Jan 1 2001 12:00AM
241-C-107	63Ni	Sludge	2.37E+00	Ci	TS	1.41	g/mL	511	kL	3.29E-03	uCi/g	Jan 1 2001 12:00AM
241-C-107	63Ni	Sludge	2.07E-01	Ci	TS	1.71	g/mL	90	kL	1.35E-03	uCi/g	Jan 1 2001 12:00AM
241-C-107	63Ni	Sludge	3.01E+04	Ci	TE	1.32	g/mL	339	kL	6.72E+01	uCi/g	Jan 1 2001 12:00AM
241-C-107	79Se	Total	1.79E+01	Ci	E							Jan 1 2001 12:00AM
241-C-107	79Se	Sludge	2.06E-03	Ci	TS	1.41	g/mL	511	kL	2.86E-06	uCi/g	Jan 1 2001 12:00AM
241-C-107	79Se	Sludge	1.71E-04	Ci	TS	1.71	g/mL	90	kL	1.11E-06	uCi/g	Jan 1 2001 12:00AM
241-C-107	79Se	Sludge	1.79E+01	Ci	TE	1.32	g/mL	339	kL	4.01E-02	uCi/g	Jan 1 2001 12:00AM
241-C-107	90Sr	Total	2.24E+06	Ci	S							Jan 1 2001 12:00AM
241-C-107	90Sr	Sludge	3.69E+05	Ci	S	1.55	g/mL	511	kL	4.66E+02	uCi/g	Jan 1 2001 12:00AM
241-C-107	90Sr	Sludge	6.50E+04	Ci	S	1.55	g/mL	90	kL	4.66E+02	uCi/g	Jan 1 2001 12:00AM
241-C-107	90Sr	Sludge	1.81E+06	Ci	S	1.55	g/mL	339	kL	3.44E+03	uCi/g	Jan 1 2001 12:00AM
241-C-107	90Y	Total	2.24E+06	Ci	C							Jan 1 2001 12:00AM
241-C-107	90Y	Sludge	3.69E+05	Ci	C		g/mL	511	kL	4.66E+02	uCi/g	Jan 1 2001 12:00AM
241-C-107	90Y	Sludge	6.50E+04	Ci	C		g/mL	90	kL	4.66E+02	uCi/g	Jan 1 2001 12:00AM
241-C-107	90Y	Sludge	1.81E+06	Ci	C		g/mL	339	kL	3.44E+03	uCi/g	Jan 1 2001 12:00AM
241-C-107	93mNb	Total	6.98E+02	Ci	E							Jan 1 2001 12:00AM
241-C-107	93mNb	Sludge	8.72E-02	Ci	TS	1.41	g/mL	511	kL	1.21E-04	uCi/g	Jan 1 2001 12:00AM
241-C-107	93mNb	Sludge	6.52E-03	Ci	TS	1.71	g/mL	90	kL	4.24E-05	uCi/g	Jan 1 2001 12:00AM
241-C-107	93mNb	Sludge	6.98E+02	Ci	TE	1.32	g/mL	339	kL	1.56E+00	uCi/g	Jan 1 2001 12:00AM
241-C-107	93Zr	Sludge	8.04E-03	Ci	TS	1.71	g/mL	90	kL	5.22E-05	uCi/g	Jan 1 2001 12:00AM
241-C-107	93Zr	Sludge	7.75E+02	Ci	TE	1.32	g/mL	339	kL	1.73E+00	uCi/g	Jan 1 2001 12:00AM
241-C-107	93Zr	Total	7.75E+02	Ci	E							Jan 1 2001 12:00AM
241-C-107	93Zr	Sludge	9.78E-02	Ci	TS	1.41	g/mL	511	kL	1.36E-04	uCi/g	Jan 1 2001 12:00AM
241-C-107	99Tc	Total	3.79E+01	Ci	S							Jan 1 2001 12:00AM
241-C-107	99Tc	Sludge	2.06E+01	Ci	S	1.55	g/mL	511	kL	2.60E-02	uCi/g	Jan 1 2001 12:00AM
241-C-107	99Tc	Sludge	3.63E+00	Ci	S	1.55	g/mL	90	kL	2.60E-02	uCi/g	Jan 1 2001 12:00AM
241-C-107	99Tc	Sludge	1.37E+01	Ci	S	1.55	g/mL	339	kL	2.60E-02	uCi/g	Jan 1 2001 12:00AM
241-C-107	Ag	Total	2.94E+02	kg	S							Jan 1 2001 12:00AM
241-C-107	Ag	Sludge	7.83E+01	kg	S	1.55	g/mL	511	kL	9.89E+01	ug/g	Jan 1 2001 12:00AM
241-C-107	Ag	Sludge	1.89E+02	kg	S	1.55	g/mL	339	kL	3.60E+02	ug/g	Jan 1 2001 12:00AM
241-C-107	Ag	Sludge	2.64E+01	kg	S	1.55	g/mL	90	kL	1.89E+02	ug/g	Jan 1 2001 12:00AM
241-C-107	Al	Total	5.86E+04	kg	S							Jan 1 2001 12:00AM
241-C-107	Al	Sludge	1.90E+04	kg	S	1.55	g/mL	511	kL	2.41E+04	ug/g	Jan 1 2001 12:00AM

CALCULATION SHEET

PROJECT: RPP-WTP
JOB NO.: 24590
CALC NO.: 24590-WTP-M4C-FRP-00001
SHEET REV: 0A
SHEET NO.: 133

BY: E. Berríos
DATE: 12/04/02

SUBJECT: Updated Emissions Run Feed Vector

Tank Name	Analyte	Waste Phase	Inventory	Inventory Units	Basis	Density	Density Units	Volume	Volume Units	Concentration	Concentration Units	Decay Date
241-C-107	Al	Sludge	1.66E+04	kg	S	1.55	g/mL	90	kL	1.19E+05	ug/g	Jan 1 2001 12:00AM
241-C-107	Al	Sludge	2.29E+04	kg	S	1.55	g/mL	339	kL	4.37E+04	ug/g	Jan 1 2001 12:00AM
241-C-107	As	Sludge	5.41E+00	kg	S	1.55	g/mL	511	kL	6.83E+00	ug/g	Jan 1 2001 12:00AM
241-C-107	As	Sludge	3.59E+00	kg	S	1.55	g/mL	339	kL	6.83E+00	ug/g	Jan 1 2001 12:00AM
241-C-107	As	Total	9.95E+00	kg	S							Jan 1 2001 12:00AM
241-C-107	As	Sludge	9.53E-01	kg	S	1.55	g/mL	90	kL	6.83E+00	ug/g	Jan 1 2001 12:00AM
241-C-107	B	Sludge	1.06E+00	kg	S	1.55	g/mL	90	kL	7.60E+00	ug/g	Jan 1 2001 12:00AM
241-C-107	B	Sludge	1.81E+02	kg	S	1.55	g/mL	511	kL	2.28E+02	ug/g	Jan 1 2001 12:00AM
241-C-107	B	Total	2.08E+02	kg	S/E							Jan 1 2001 12:00AM
241-C-107	B	Sludge	2.59E+01	kg	S	1.55	g/mL	339	kL	4.94E+01	ug/g	Jan 1 2001 12:00AM
241-C-107	Ba	Sludge	1.53E+01	kg	S	1.55	g/mL	90	kL	1.10E+02	ug/g	Jan 1 2001 12:00AM
241-C-107	Ba	Sludge	4.49E+02	kg	S	1.55	g/mL	339	kL	8.55E+02	ug/g	Jan 1 2001 12:00AM
241-C-107	Ba	Total	7.29E+02	kg	S							Jan 1 2001 12:00AM
241-C-107	Ba	Sludge	2.64E+02	kg	S	1.55	g/mL	511	kL	3.34E+02	ug/g	Jan 1 2001 12:00AM
241-C-107	Be	Sludge	8.50E-01	kg	S	1.55	g/mL	511	kL	1.07E+00	ug/g	Jan 1 2001 12:00AM
241-C-107	Be	Sludge	1.50E-01	kg	S	1.55	g/mL	90	kL	1.07E+00	ug/g	Jan 1 2001 12:00AM
241-C-107	Be	Sludge	5.64E-01	kg	S	1.55	g/mL	339	kL	1.07E+00	ug/g	Jan 1 2001 12:00AM
241-C-107	Be	Total	1.56E+00	kg	S							Jan 1 2001 12:00AM
241-C-107	Bi	Total	1.04E+04	kg	S							Jan 1 2001 12:00AM
241-C-107	Bi	Sludge	9.88E+03	kg	S	1.55	g/mL	511	kL	1.25E+04	ug/g	Jan 1 2001 12:00AM
241-C-107	Bi	Sludge	4.89E+02	kg	S	1.55	g/mL	90	kL	3.50E+03	ug/g	Jan 1 2001 12:00AM
241-C-107	Bi	Sludge	5.27E+01	kg	S	1.55	g/mL	339	kL	1.00E+02	ug/g	Jan 1 2001 12:00AM
241-C-107	Ca	Total	1.24E+03	kg	S							Jan 1 2001 12:00AM
241-C-107	Ca	Sludge	4.84E+02	kg	S	1.55	g/mL	511	kL	6.11E+02	ug/g	Jan 1 2001 12:00AM
241-C-107	Ca	Sludge	8.49E+01	kg	S	1.55	g/mL	90	kL	6.09E+02	ug/g	Jan 1 2001 12:00AM
241-C-107	Ca	Sludge	6.73E+02	kg	S	1.55	g/mL	339	kL	1.28E+03	ug/g	Jan 1 2001 12:00AM
241-C-107	Cd	Sludge	1.29E+00	kg	S	1.55	g/mL	90	kL	9.24E+00	ug/g	Jan 1 2001 12:00AM
241-C-107	Cd	Total	9.52E+01	kg	S							Jan 1 2001 12:00AM
241-C-107	Cd	Sludge	3.26E+01	kg	S	1.55	g/mL	511	kL	4.11E+01	ug/g	Jan 1 2001 12:00AM
241-C-107	Cd	Sludge	6.13E+01	kg	S	1.55	g/mL	339	kL	1.17E+02	ug/g	Jan 1 2001 12:00AM
241-C-107	Ce	Sludge	4.07E+01	kg	S	1.55	g/mL	90	kL	2.92E+02	ug/g	Jan 1 2001 12:00AM
241-C-107	Ce	Total	7.79E+02	kg	S							Jan 1 2001 12:00AM
241-C-107	Ce	Sludge	3.14E+02	kg	S	1.55	g/mL	511	kL	3.97E+02	ug/g	Jan 1 2001 12:00AM
241-C-107	Ce	Sludge	4.24E+02	kg	S	1.55	g/mL	339	kL	8.07E+02	ug/g	Jan 1 2001 12:00AM
241-C-107	Cl	Total	8.70E+02	kg	S							Jan 1 2001 12:00AM
241-C-107	Cl	Sludge	5.76E+02	kg	S	1.55	g/mL	511	kL	7.28E+02	ug/g	Jan 1 2001 12:00AM
241-C-107	Cl	Sludge	5.95E+01	kg	S	1.55	g/mL	90	kL	4.27E+02	ug/g	Jan 1 2001 12:00AM
241-C-107	Cl	Sludge	2.34E+02	kg	S	1.55	g/mL	339	kL	4.45E+02	ug/g	Jan 1 2001 12:00AM
241-C-107	CN	Sludge	5.85E-01	kg	S	1.55	g/mL	90	kL	4.19E+00	ug/g	Jan 1 2001 12:00AM
241-C-107	CN	Sludge	2.20E+00	kg	S	1.55	g/mL	339	kL	4.19E+00	ug/g	Jan 1 2001 12:00AM
241-C-107	CN	Sludge	3.32E+00	kg	S	1.55	g/mL	511	kL	4.19E+00	ug/g	Jan 1 2001 12:00AM
241-C-107	CN	Total	6.11E+00	kg	S/E							Jan 1 2001 12:00AM
241-C-107	Co	Sludge	1.08E+01	kg	S	1.55	g/mL	511	kL	1.36E+01	ug/g	Jan 1 2001 12:00AM
241-C-107	Co	Sludge	1.07E+00	kg	S	1.55	g/mL	90	kL	7.70E+00	ug/g	Jan 1 2001 12:00AM
241-C-107	Co	Total	2.65E+01	kg	S							Jan 1 2001 12:00AM
241-C-107	Co	Sludge	1.46E+01	kg	S	1.55	g/mL	339	kL	2.78E+01	ug/g	Jan 1 2001 12:00AM
241-C-107	Cr	Total	9.30E+02	kg	S							Jan 1 2001 12:00AM

CALCULATION SHEET

PROJECT: RPP-WTP
JOB NO.: 24590
CALC NO.: 24590-WTP-M4C-FRP-00001
SHEET REV: 0A
SHEET NO.: 134

BY: E. Berríos
DATE: 12/04/02

SUBJECT: Updated Emissions Run Feed Vector

Tank Name	Analyte	Waste Phase	Inventory	Inventory Units	Basis	Density	Density Units	Volume	Volume Units	Concentration	Concentration Units	Decay Date
241-C-107	Cr	Sludge	5.33E+02	kg	S	1.55	g/mL	511	kL	6.73E+02	ug/g	Jan 1 2001 12:00AM
241-C-107	Cr	Sludge	3.65E+01	kg	S	1.55	g/mL	90	kL	2.62E+02	ug/g	Jan 1 2001 12:00AM
241-C-107	Cr	Sludge	3.61E+02	kg	S	1.55	g/mL	339	kL	6.87E+02	ug/g	Jan 1 2001 12:00AM
241-C-107	Cu	Sludge	1.76E+01	kg	S	1.55	g/mL	90	kL	1.26E+02	ug/g	Jan 1 2001 12:00AM
241-C-107	Cu	Total	2.28E+02	kg	S							Jan 1 2001 12:00AM
241-C-107	Cu	Sludge	8.43E+01	kg	S	1.55	g/mL	511	kL	1.06E+02	ug/g	Jan 1 2001 12:00AM
241-C-107	Cu	Sludge	1.27E+02	kg	S	1.55	g/mL	339	kL	2.41E+02	ug/g	Jan 1 2001 12:00AM
241-C-107	F	Total	6.39E+03	kg	S							Jan 1 2001 12:00AM
241-C-107	F	Sludge	5.82E+03	kg	S	1.55	g/mL	511	kL	7.35E+03	ug/g	Jan 1 2001 12:00AM
241-C-107	F	Sludge	3.19E+02	kg	S	1.55	g/mL	339	kL	6.07E+02	ug/g	Jan 1 2001 12:00AM
241-C-107	F	Sludge	2.52E+02	kg	S	1.55	g/mL	90	kL	1.80E+03	ug/g	Jan 1 2001 12:00AM
241-C-107	Fe	Total	1.03E+05	kg	S							Jan 1 2001 12:00AM
241-C-107	Fe	Sludge	4.20E+04	kg	S	1.55	g/mL	511	kL	5.31E+04	ug/g	Jan 1 2001 12:00AM
241-C-107	Fe	Sludge	2.86E+03	kg	S	1.55	g/mL	90	kL	2.05E+04	ug/g	Jan 1 2001 12:00AM
241-C-107	Fe	Sludge	5.79E+04	kg	S	1.55	g/mL	339	kL	1.10E+05	ug/g	Jan 1 2001 12:00AM
241-C-107	Hg	Total	6.70E+01	kg	S							Jan 1 2001 12:00AM
241-C-107	Hg	Sludge	3.64E+01	kg	S	1.55	g/mL	511	kL	4.60E+01	ug/g	Jan 1 2001 12:00AM
241-C-107	Hg	Sludge	6.41E+00	kg	S	1.55	g/mL	90	kL	4.60E+01	ug/g	Jan 1 2001 12:00AM
241-C-107	Hg	Sludge	2.41E+01	kg	S	1.55	g/mL	339	kL	4.60E+01	ug/g	Jan 1 2001 12:00AM
241-C-107	K	Total	4.47E+02	kg	S/E							Jan 1 2001 12:00AM
241-C-107	K	Sludge	2.48E+02	kg	S	1.55	g/mL	511	kL	3.13E+02	ug/g	Jan 1 2001 12:00AM
241-C-107	K	Sludge	2.63E+01	kg	S	1.55	g/mL	90	kL	1.88E+02	ug/g	Jan 1 2001 12:00AM
241-C-107	K	Sludge	1.73E+02	kg	E	1.55	g/mL	339	kL	3.29E+02	ug/g	Jan 1 2001 12:00AM
241-C-107	La	Total	2.70E+02	kg	S							Jan 1 2001 12:00AM
241-C-107	La	Sludge	9.95E+01	kg	S	1.55	g/mL	511	kL	1.26E+02	ug/g	Jan 1 2001 12:00AM
241-C-107	La	Sludge	1.73E+01	kg	S	1.55	g/mL	90	kL	1.24E+02	ug/g	Jan 1 2001 12:00AM
241-C-107	La	Sludge	1.53E+02	kg	S	1.55	g/mL	339	kL	2.92E+02	ug/g	Jan 1 2001 12:00AM
241-C-107	Li	Total	1.67E+02	kg	S							Jan 1 2001 12:00AM
241-C-107	Li	Sludge	1.96E+01	kg	S	1.55	g/mL	339	kL	3.73E+01	ug/g	Jan 1 2001 12:00AM
241-C-107	Li	Sludge	1.32E+02	kg	S	1.55	g/mL	511	kL	1.67E+02	ug/g	Jan 1 2001 12:00AM
241-C-107	Li	Sludge	1.46E+01	kg	S	1.55	g/mL	90	kL	1.05E+02	ug/g	Jan 1 2001 12:00AM
241-C-107	Mg	Total	4.77E+02	kg	S							Jan 1 2001 12:00AM
241-C-107	Mg	Sludge	3.53E+01	kg	S	1.55	g/mL	90	kL	2.53E+02	ug/g	Jan 1 2001 12:00AM
241-C-107	Mg	Sludge	2.08E+02	kg	S	1.55	g/mL	339	kL	3.96E+02	ug/g	Jan 1 2001 12:00AM
241-C-107	Mg	Sludge	2.33E+02	kg	S	1.55	g/mL	511	kL	2.95E+02	ug/g	Jan 1 2001 12:00AM
241-C-107	Mn	Total	5.02E+03	kg	S							Jan 1 2001 12:00AM
241-C-107	Mn	Sludge	1.85E+03	kg	S	1.55	g/mL	511	kL	2.34E+03	ug/g	Jan 1 2001 12:00AM
241-C-107	Mn	Sludge	2.20E+02	kg	S	1.55	g/mL	90	kL	1.58E+03	ug/g	Jan 1 2001 12:00AM
241-C-107	Mn	Sludge	2.95E+03	kg	S	1.55	g/mL	339	kL	5.62E+03	ug/g	Jan 1 2001 12:00AM
241-C-107	Mo	Total	4.58E+01	kg	S/E							Jan 1 2001 12:00AM
241-C-107	Mo	Sludge	2.63E+00	kg	S	1.55	g/mL	90	kL	1.88E+01	ug/g	Jan 1 2001 12:00AM
241-C-107	Mo	Sludge	2.28E+01	kg	S	1.55	g/mL	339	kL	4.34E+01	ug/g	Jan 1 2001 12:00AM
241-C-107	Mo	Sludge	2.03E+01	kg	S	1.55	g/mL	511	kL	2.56E+01	ug/g	Jan 1 2001 12:00AM
241-C-107	Na	Total	9.52E+04	kg	S							Jan 1 2001 12:00AM
241-C-107	Na	Sludge	5.90E+04	kg	S	1.55	g/mL	511	kL	7.45E+04	ug/g	Jan 1 2001 12:00AM
241-C-107	Na	Sludge	7.97E+03	kg	S	1.55	g/mL	90	kL	5.71E+04	ug/g	Jan 1 2001 12:00AM
241-C-107	Na	Sludge	2.83E+04	kg	S	1.55	g/mL	339	kL	5.38E+04	ug/g	Jan 1 2001 12:00AM

CALCULATION SHEET

PROJECT: RPP-WTP
JOB NO.: 24590
CALC NO.: 24590-WTP-M4C-FRP-00001
SHEET REV: 0A
SHEET NO.: 135

BY: E. Berrios
DATE: 12/04/02

SUBJECT: Updated Emissions Run Feed Vector

Tank Name	Analyte	Waste Phase	Inventory	Inventory Units	Basis	Density	Density Units	Volume	Volume Units	Concentration	Concentration Units	Decay Date
241-C-107	Nd	Sludge	3.65E+02	kg	S	1.55	g/mL	339	kL	6.95E+02	ug/g	Jan 1 2001 12:00AM
241-C-107	Nd	Sludge	2.33E+02	kg	S	1.55	g/mL	511	kL	2.94E+02	ug/g	Jan 1 2001 12:00AM
241-C-107	Nd	Total	6.33E+02	kg	S							Jan 1 2001 12:00AM
241-C-107	Nd	Sludge	3.46E+01	kg	S	1.55	g/mL	90	kL	2.48E+02	ug/g	Jan 1 2001 12:00AM
241-C-107	Ni	Total	3.09E+03	kg	S							Jan 1 2001 12:00AM
241-C-107	Ni	Sludge	9.45E+02	kg	S	1.55	g/mL	511	kL	1.19E+03	ug/g	Jan 1 2001 12:00AM
241-C-107	Ni	Sludge	6.56E+02	kg	S	1.55	g/mL	90	kL	4.70E+03	ug/g	Jan 1 2001 12:00AM
241-C-107	Ni	Sludge	1.49E+03	kg	S	1.55	g/mL	339	kL	2.84E+03	ug/g	Jan 1 2001 12:00AM
241-C-107	NO2	Total	3.53E+04	kg	S							Jan 1 2001 12:00AM
241-C-107	NO2	Sludge	2.07E+04	kg	S	1.55	g/mL	511	kL	2.61E+04	ug/g	Jan 1 2001 12:00AM
241-C-107	NO2	Sludge	2.61E+03	kg	S	1.55	g/mL	90	kL	1.87E+04	ug/g	Jan 1 2001 12:00AM
241-C-107	NO2	Sludge	1.21E+04	kg	S	1.55	g/mL	339	kL	2.29E+04	ug/g	Jan 1 2001 12:00AM
241-C-107	NO3	Total	4.78E+04	kg	S							Jan 1 2001 12:00AM
241-C-107	NO3	Sludge	3.45E+04	kg	S	1.55	g/mL	511	kL	4.36E+04	ug/g	Jan 1 2001 12:00AM
241-C-107	NO3	Sludge	3.24E+03	kg	S	1.55	g/mL	90	kL	2.32E+04	ug/g	Jan 1 2001 12:00AM
241-C-107	NO3	Sludge	1.00E+04	kg	S	1.55	g/mL	339	kL	1.91E+04	ug/g	Jan 1 2001 12:00AM
241-C-107	OH	Total	2.29E+05	kg	C							Jan 1 2001 12:00AM
241-C-107	Pb	Total	1.01E+04	kg	S							Jan 1 2001 12:00AM
241-C-107	Pb	Sludge	3.48E+03	kg	S	1.55	g/mL	511	kL	4.40E+03	ug/g	Jan 1 2001 12:00AM
241-C-107	Pb	Sludge	1.68E+03	kg	S	1.55	g/mL	90	kL	1.21E+04	ug/g	Jan 1 2001 12:00AM
241-C-107	Pb	Sludge	4.96E+03	kg	S	1.55	g/mL	339	kL	9.44E+03	ug/g	Jan 1 2001 12:00AM
241-C-107	PO4	Total	5.88E+04	kg	S							Jan 1 2001 12:00AM
241-C-107	PO4	Sludge	4.55E+04	kg	S	1.55	g/mL	511	kL	5.75E+04	ug/g	Jan 1 2001 12:00AM
241-C-107	PO4	Sludge	8.34E+03	kg	S	1.55	g/mL	90	kL	5.98E+04	ug/g	Jan 1 2001 12:00AM
241-C-107	PO4	Sludge	4.95E+03	kg	S	1.55	g/mL	339	kL	9.42E+03	ug/g	Jan 1 2001 12:00AM
241-C-107	Pr	Sludge	1.13E+02	kg	S	1.55	g/mL	511	kL	1.43E+02	ug/g	Jan 1 2001 12:00AM
241-C-107	Pr	Sludge	1.99E+01	kg	S	1.55	g/mL	90	kL	1.43E+02	ug/g	Jan 1 2001 12:00AM
241-C-107	Pr	Sludge	7.50E+01	kg	S	1.55	g/mL	339	kL	1.43E+02	ug/g	Jan 1 2001 12:00AM
241-C-107	Pr	Total	2.08E+02	kg	S							Jan 1 2001 12:00AM
241-C-107	Rb	Sludge	8.07E-02	kg	S	1.55	g/mL	90	kL	5.79E-01	ug/g	Jan 1 2001 12:00AM
241-C-107	Rb	Sludge	3.04E-01	kg	S	1.55	g/mL	339	kL	5.79E-01	ug/g	Jan 1 2001 12:00AM
241-C-107	Rb	Sludge	4.58E-01	kg	S	1.55	g/mL	511	kL	5.79E-01	ug/g	Jan 1 2001 12:00AM
241-C-107	Rb	Total	8.43E-01	kg	S							Jan 1 2001 12:00AM
241-C-107	Rh	Sludge	2.37E+01	kg	S	1.55	g/mL	511	kL	2.99E+01	ug/g	Jan 1 2001 12:00AM
241-C-107	Rh	Total	4.36E+01	kg	S							Jan 1 2001 12:00AM
241-C-107	Rh	Sludge	1.57E+01	kg	S	1.55	g/mL	339	kL	2.99E+01	ug/g	Jan 1 2001 12:00AM
241-C-107	Rh	Sludge	4.17E+00	kg	S	1.55	g/mL	90	kL	2.99E+01	ug/g	Jan 1 2001 12:00AM
241-C-107	Ru	Sludge	3.43E+02	kg	S	1.55	g/mL	339	kL	6.53E+02	ug/g	Jan 1 2001 12:00AM
241-C-107	Ru	Sludge	5.17E+02	kg	S	1.55	g/mL	511	kL	6.53E+02	ug/g	Jan 1 2001 12:00AM
241-C-107	Ru	Sludge	9.10E+01	kg	S	1.55	g/mL	90	kL	6.53E+02	ug/g	Jan 1 2001 12:00AM
241-C-107	Ru	Total	9.51E+02	kg	S							Jan 1 2001 12:00AM
241-C-107	Sb	Sludge	1.31E+00	kg	S	1.55	g/mL	511	kL	1.65E+00	ug/g	Jan 1 2001 12:00AM
241-C-107	Sb	Sludge	8.68E-01	kg	S	1.55	g/mL	339	kL	1.65E+00	ug/g	Jan 1 2001 12:00AM
241-C-107	Sb	Total	2.41E+00	kg	S							Jan 1 2001 12:00AM
241-C-107	Sb	Sludge	2.31E-01	kg	S	1.55	g/mL	90	kL	1.65E+00	ug/g	Jan 1 2001 12:00AM
241-C-107	Se	Sludge	4.80E-01	kg	S	1.55	g/mL	90	kL	3.44E+00	ug/g	Jan 1 2001 12:00AM
241-C-107	Se	Total	5.01E+00	kg	S							Jan 1 2001 12:00AM

CALCULATION SHEET

PROJECT: RPP-WTP
JOB NO.: 24590
CALC NO.: 24590-WTP-M4C-FRP-00001
SHEET REV: 0A
SHEET NO.: 136

BY: E. Berrios
DATE: 12/04/02

SUBJECT: Updated Emissions Run Feed Vector

Tank Name	Analyte	Waste Phase	Inventory	Inventory Units	Basis	Density	Density Units	Volume	Volume Units	Concentration	Concentration Units	Decay Date
241-C-107	Se	Sludge	2.73E+00	kg	S	1.55	g/mL	511	kL	3.44E+00	ug/g	Jan 1 2001 12:00AM
241-C-107	Se	Sludge	1.81E+00	kg	S	1.55	g/mL	339	kL	3.44E+00	ug/g	Jan 1 2001 12:00AM
241-C-107	Si	Total	1.87E+03	kg	S							Jan 1 2001 12:00AM
241-C-107	Si	Sludge	9.85E+02	kg	S	1.55	g/mL	511	kL	1.24E+03	ug/g	Jan 1 2001 12:00AM
241-C-107	Si	Sludge	1.24E+02	kg	S	1.55	g/mL	90	kL	8.86E+02	ug/g	Jan 1 2001 12:00AM
241-C-107	Si	Sludge	7.58E+02	kg	S	1.55	g/mL	339	kL	1.44E+03	ug/g	Jan 1 2001 12:00AM
241-C-107	SO4	Total	8.43E+03	kg	S							Jan 1 2001 12:00AM
241-C-107	SO4	Sludge	4.97E+03	kg	S	1.55	g/mL	511	kL	6.27E+03	ug/g	Jan 1 2001 12:00AM
241-C-107	SO4	Sludge	5.06E+02	kg	S	1.55	g/mL	90	kL	3.63E+03	ug/g	Jan 1 2001 12:00AM
241-C-107	SO4	Sludge	2.95E+03	kg	S	1.55	g/mL	339	kL	5.61E+03	ug/g	Jan 1 2001 12:00AM
241-C-107	Sr	Total	2.57E+02	kg	S							Jan 1 2001 12:00AM
241-C-107	Sr	Sludge	1.65E+02	kg	S	1.55	g/mL	511	kL	2.08E+02	ug/g	Jan 1 2001 12:00AM
241-C-107	Sr	Sludge	2.45E+01	kg	S	1.55	g/mL	90	kL	1.75E+02	ug/g	Jan 1 2001 12:00AM
241-C-107	Sr	Sludge	6.84E+01	kg	S	1.55	g/mL	339	kL	1.30E+02	ug/g	Jan 1 2001 12:00AM
241-C-107	Ta	Sludge	4.60E-01	kg	S	1.55	g/mL	511	kL	5.81E-01	ug/g	Jan 1 2001 12:00AM
241-C-107	Ta	Sludge	8.11E-02	kg	S	1.55	g/mL	90	kL	5.81E-01	ug/g	Jan 1 2001 12:00AM
241-C-107	Ta	Total	8.47E-01	kg	S/E							Jan 1 2001 12:00AM
241-C-107	Ta	Sludge	3.05E-01	kg	S	1.55	g/mL	339	kL	5.81E-01	ug/g	Jan 1 2001 12:00AM
241-C-107	Te	Sludge	9.76E+01	kg	S	1.55	g/mL	511	kL	1.23E+02	ug/g	Jan 1 2001 12:00AM
241-C-107	Te	Sludge	6.47E+01	kg	S	1.55	g/mL	339	kL	1.23E+02	ug/g	Jan 1 2001 12:00AM
241-C-107	Te	Total	1.80E+02	kg	S							Jan 1 2001 12:00AM
241-C-107	Te	Sludge	1.72E+01	kg	S	1.55	g/mL	90	kL	1.23E+02	ug/g	Jan 1 2001 12:00AM
241-C-107	Th	Sludge	2.39E+02	kg	S	1.55	g/mL	339	kL	4.54E+02	ug/g	Jan 1 2001 12:00AM
241-C-107	Th	Total	6.61E+02	kg	S							Jan 1 2001 12:00AM
241-C-107	Th	Sludge	3.60E+02	kg	S	1.55	g/mL	511	kL	4.54E+02	ug/g	Jan 1 2001 12:00AM
241-C-107	Th	Sludge	6.33E+01	kg	S	1.55	g/mL	90	kL	4.54E+02	ug/g	Jan 1 2001 12:00AM
241-C-107	Ti	Sludge	1.50E+01	kg	S	1.55	g/mL	90	kL	1.08E+02	ug/g	Jan 1 2001 12:00AM
241-C-107	Ti	Sludge	7.16E+01	kg	S	1.55	g/mL	339	kL	1.36E+02	ug/g	Jan 1 2001 12:00AM
241-C-107	Ti	Sludge	3.70E+01	kg	S	1.55	g/mL	511	kL	4.67E+01	ug/g	Jan 1 2001 12:00AM
241-C-107	Ti	Total	1.24E+02	kg	S							Jan 1 2001 12:00AM
241-C-107	TIC as CO3	Sludge	4.12E+03	kg	S	1.55	g/mL	339	kL	7.84E+03	ug/g	Jan 1 2001 12:00AM
241-C-107	TIC as CO3	Total	1.14E+04	kg	S							Jan 1 2001 12:00AM
241-C-107	TIC as CO3	Sludge	6.21E+03	kg	S	1.55	g/mL	511	kL	7.84E+03	ug/g	Jan 1 2001 12:00AM
241-C-107	TIC as CO3	Sludge	1.09E+03	kg	S	1.55	g/mL	90	kL	7.84E+03	ug/g	Jan 1 2001 12:00AM
241-C-107	Tl	Sludge	2.95E+00	kg	S	1.55	g/mL	511	kL	3.73E+00	ug/g	Jan 1 2001 12:00AM
241-C-107	Tl	Total	5.43E+00	kg	S							Jan 1 2001 12:00AM
241-C-107	Tl	Sludge	5.20E-01	kg	S	1.55	g/mL	90	kL	3.73E+00	ug/g	Jan 1 2001 12:00AM
241-C-107	Tl	Sludge	1.96E+00	kg	S	1.55	g/mL	339	kL	3.73E+00	ug/g	Jan 1 2001 12:00AM
241-C-107	TOC	Total	7.36E+02	kg	S							Jan 1 2001 12:00AM
241-C-107	TOC	Sludge	4.00E+02	kg	S	1.55	g/mL	511	kL	5.05E+02	ug/g	Jan 1 2001 12:00AM
241-C-107	TOC	Sludge	7.05E+01	kg	S	1.55	g/mL	90	kL	5.05E+02	ug/g	Jan 1 2001 12:00AM
241-C-107	TOC	Sludge	2.66E+02	kg	S	1.55	g/mL	339	kL	5.05E+02	ug/g	Jan 1 2001 12:00AM
241-C-107	UTOTAL	Total	9.29E+03	kg	S							Jan 1 2001 12:00AM

CALCULATION SHEET

PROJECT: RPP-WTP
JOB NO.: 24590
CALC NO.: 24590-WTP-M4C-FRP-00001
SHEET REV: 0A
SHEET NO.: 137

BY: E. Berrios
DATE: 12/04/02

SUBJECT: Updated Emissions Run Feed Vector

Tank Name	Analyte	Waste Phase	Inventory	Inventory Units	Basis	Density	Density Units	Volume	Volume Units	Concentration	Concentration Units	Decay Date
241-C-107	UTOTAL	Sludge	6.08E+03	kg	S	1.55	g/mL	511	kL	7.68E+03	ug/g	Jan 1 2001 12:00AM
241-C-107	UTOTAL	Sludge	1.77E+03	kg	S	1.55	g/mL	90	kL	1.27E+04	ug/g	Jan 1 2001 12:00AM
241-C-107	UTOTAL	Sludge	1.44E+03	kg	S	1.55	g/mL	339	kL	2.74E+03	ug/g	Jan 1 2001 12:00AM
241-C-107	V	Sludge	9.05E+00	kg	S	1.55	g/mL	339	kL	1.72E+01	ug/g	Jan 1 2001 12:00AM
241-C-107	V	Sludge	2.40E+00	kg	S	1.55	g/mL	90	kL	1.72E+01	ug/g	Jan 1 2001 12:00AM
241-C-107	V	Sludge	1.36E+01	kg	S	1.55	g/mL	511	kL	1.72E+01	ug/g	Jan 1 2001 12:00AM
241-C-107	V	Total	2.51E+01	kg	S/E							Jan 1 2001 12:00AM
241-C-107	W	Sludge	6.46E+01	kg	S	1.55	g/mL	90	kL	4.63E+02	ug/g	Jan 1 2001 12:00AM
241-C-107	W	Sludge	2.43E+02	kg	S	1.55	g/mL	339	kL	4.63E+02	ug/g	Jan 1 2001 12:00AM
241-C-107	W	Sludge	3.67E+02	kg	S	1.55	g/mL	511	kL	4.63E+02	ug/g	Jan 1 2001 12:00AM
241-C-107	W	Total	6.75E+02	kg	S							Jan 1 2001 12:00AM
241-C-107	Y	Total	9.48E+01	kg	S							Jan 1 2001 12:00AM
241-C-107	Y	Sludge	5.15E+01	kg	S	1.55	g/mL	511	kL	6.51E+01	ug/g	Jan 1 2001 12:00AM
241-C-107	Y	Sludge	3.42E+01	kg	S	1.55	g/mL	339	kL	6.51E+01	ug/g	Jan 1 2001 12:00AM
241-C-107	Y	Sludge	9.08E+00	kg	S	1.55	g/mL	90	kL	6.51E+01	ug/g	Jan 1 2001 12:00AM
241-C-107	Zn	Sludge	7.46E+01	kg	S	1.55	g/mL	511	kL	9.42E+01	ug/g	Jan 1 2001 12:00AM
241-C-107	Zn	Sludge	1.58E+01	kg	S	1.55	g/mL	90	kL	1.14E+02	ug/g	Jan 1 2001 12:00AM
241-C-107	Zn	Sludge	8.66E+01	kg	S	1.55	g/mL	339	kL	1.65E+02	ug/g	Jan 1 2001 12:00AM
241-C-107	Zn	Total	1.77E+02	kg	S							Jan 1 2001 12:00AM
241-C-107	Zr	Total	7.39E+01	kg	S							Jan 1 2001 12:00AM
241-C-107	Zr	Sludge	2.69E+01	kg	S	1.55	g/mL	511	kL	3.39E+01	ug/g	Jan 1 2001 12:00AM
241-C-107	Zr	Sludge	1.74E+00	kg	S	1.55	g/mL	90	kL	1.25E+01	ug/g	Jan 1 2001 12:00AM
241-C-107	Zr	Sludge	4.53E+01	kg	S	1.55	g/mL	339	kL	8.62E+01	ug/g	Jan 1 2001 12:00AM

CALCULATION SHEET

PROJECT: RPP-WTP
JOB NO.: 24590
CALC NO.: 24590-WTP-M4C-FRP-00001
SHEET REV: 1
SHEET NO.: 137

BY: E. Berrios
DATE: 10/24/02

SUBJECT: Updated Emissions Run Feed Vector

E

Appendix E
Calculation: Integrated Emissions Report PIC Estimation

24590-WTP-M4C-FRP-00002, Rev 0A

R10045070

Calculation Cover Sheet

ISSUED BY
RPP-WTP PDC
INIT 3/27/03 DATE

RIVER PROTECTION PROJECT-WASTE TREATMENT PLANT		JOB NO.:	24590
CALC NO.	24590-WTP-M4C-FRP-00002	GROUP	Process Operations
SUBJECT	Integrated Emissions Report PIC Estimation		

CALCULATION STATUS DESIGNATION: ☒ PRELIMINARY ☐ COMMITTED ☐ CONFIRMED ☐ SUPERSEDED ☐ VOIDED

SOFTWARE APPLICATION	N/A	QAS	PROGRAM NAME	VERSION/RELEASE NO.
	☒	☐ YES ☐ NO		

Notes/Comments

This calculation updates the PIC estimation in accordance with the latest WTP emissions profile and also incorporates the new calculation procedure requirements. The new calculation requirements required a significant re-write on this calculation, therefore no revision bars were used.

Calculations were performed on a Compaq Personal Computer using the software Microsoft Excel® 97 SR-2

John Cook and Cuong Nguyen checked the whole calculation for the accuracy and procedural compliance.

NO.	REASON FOR REVISION	TOTAL NO. OF SHEETS	LAST SHEET NO.	BY	CHECKED	APPROVED/ ACCEPTED	DATE
0A	Update due to new Emissions Profile	19	19	E. Berrios	J. Cook/ C. Nguyen	O. Block	03/27/03
0	Initial Issue	25	25	E. Berrios	J. Bernards	O. Block	04/25/02

RECORD OF REVISIONS

3/27/03
☒ Processed/ Data Entry ☐ Copied/ QA ☐ Scanned ☐ Filed

Contents

1 Objective 2
2 Inputs 2
3 Background 2
4 Applicable Codes and Standards 3
5 Methodology 3
6 Assumptions 3
7 Calculations 3
7.1 Pretreatment Facility 3
7.2 LAW Vitrification Facility 4
7.3 HLW Vitrification Facility 5
8 Results and Conclusions 6
9 References 6
10 Attachments 6
Appendix A Stream Reports 13

Table 1 Constituents Stack Detection Limits 7
Table 2 Pretreatment PIC Emissions 10
Table 3 LAW Vitrification Facility PIC Emissions 11
Table 4 HLW Vitrification Facility PIC Emissions 12

1 Objective

The purpose of this calculation is to estimate the emission rates of Products of Incomplete Combustion (PIC) generated from the Waste Treatment and Immobilization Plant (WTP). The results from this calculation will be reflected in the next revision of the *Integrated Emissions Baseline Report for the River Protection Project Waste Treatment Plant* (RPT-W375-ES00001).

2 Inputs

The methodology for calculating the PIC emissions is equivalent to the methodology presented in the *Estimation of Product of Incomplete Combustion Emissions for the River Protection Project Waste Treatment Plant* (RPT-24590-EN-00005). Stack detection limits are the same as those used in the above mentioned report. Table 1 shows the detection limits used.

Stacks stream information was obtained from the stream reports generated via the Model Run Request titled *Emissions Maximum Case Runs with Updated Parameters* (24590-WTP-MRQ-PT-03-002) and are shown in Appendix A. Data used is the following:

- Stream PVP12 (Pretreatment Stack)
  - Volumetric flow : 2.74E+03 aft^3/min
  - Pressure = 1000 mbar = 1 bar
  - Temperature = 37.3°C
  - Water mass flowrate = 5.43E+03 lb/d
- Stream LVP26 (LAW Vit Stack)
  - Volumetric flow : 5.99E+03 aft^3/min
  - Pressure = 1000 mbar = 1 bar
  - Temperature = 100°C
  - Water mass flowrate = 1.91E+04 lb/d
- Stream HOP33 (HLW Vit Stack). Flows are given for 2 melters thus to get generation per individual melter, the flowrates are divided by 2.
  - Volumetric flow : 3.04E+03 / 2 = 1.52E+03 aft^3/min
  - Pressure = 1000 mbar = 1 bar
  - Temperature = 80°C
  - Water mass flowrate = 1.89E+04 / 2 = 9.45E+03 lb/d

Standard conditions are considered to be 1.01325 bars and 20°C (293 K) per Section 5 of the EPA Method 0030 (EPA 1986).

The ideal gas law constant used was 0.08314 l*bar/(mol*K) (Perry 1984, Table 1-9).

3 Background

An updated emissions profile for the new WTP 2+2 melter configuration has been generated. As part of this update, the estimation of the Products of Incomplete Combustion needs to be re-generated. This calculation provides this update.

4 Applicable Codes and Standards

NA

5 Methodology

Generation of PICs from WTP were estimated using the methodology described below.

- Stack detection limits were obtained from Table 2 of the *Estimation of Product of Incomplete Combustion Emissions for the River Protection Project Waste Treatment Plant* (RPT-24590-EN-00005).
- Stream information for each stack was obtained from the Model Run Request titled *Emissions Maximum Case Runs with Updated Parameters* (24590-WTP-MRQ-PT-03-002). Streams analyzed were HOP33 (HLW Vit. Stack), LVP26 (LAW Vit Stack), PVP12 (Pretreatment Stack). Stack flowrate was converted from actual cubic feet per minute (ACFM) to standard cubic feet per minute (SCFM). This number was then converted to dry standard cubic meters per minute (DSCM/min).
- Information was tabulated using the software Microsoft Excel® 97 SR-2.
- Based on the stream conditions at the stack, the PIC emission rates were calculated in grams per second.

6 Assumptions

NA

7 Calculations

7.1 Pretreatment Facility

First, the ACFM was converted to SCFM:
T = 37.3°C = 310.3K
T(std) = 20°C = 293K
P = 1 bar
P(std) = 1.01325 bars
(2.74E+03 ACFM)*(293/310.3)*(1/1.01325) = 2.55E+03 SCFM

To convert the SCFM to DSCM/hr, the following calculation was done. Stream volumetric flowrate was converted from SCFM to SCMH by dividing by 35.3 and multiplying by 60 min/hr.
2.55E+03 SCFM * 1 m^3/35.3 ft^3 * 60 min/hr = 4.34E+03 SCMH

Water mass flow was then converted to molar flowrate.
5.43E+03 lb/d * 1 kg/2.2 lb * 1000g/kg * 1d/24hr * 1 mole H_2O/18 g = 5.71E+03 gmole/hr

The water volumetric flowrate was calculated by using the ideal gas law.
PV = nRT
R = 0.08314 l*bar/(mol*K)
T = 37.3°C = 310.3 K
P = 1 bar
P (std) = 1.01325 bar
V = nRT/P

V = (5.71E+03)(0.08314)(310.3)/(1)
V = 1.47E+05 l/hr * 1 m^3/1000 l = 1.47E+02 m^3/hr
Converting to sm^3/hr:
(1.47E+02)*(293/310.3)*(1/1.01325) = 1.37E+02 sm^3/hr

Water percent was calculated by dividing the water volumetric flowrate by the stream volumetric flowrate.
Water % = (1.37E+02/4.34E+03)*100 = 3.2%

SCMH value was then converted to DSCM/hr the following way:
4.33E+03 SCMH * (1-3.2/100) = 4.19E+03 DSCM/hr

Constituents stack flowrate was then calculated by multiplying the stack concentration with the DSCM/hr value. The calculation for 4-Nitrophenol is shown below as an example. All other constituent calculations were performed using the Microsoft Excel® 97 spreadsheet on a Compaq PC workstation and can be found in Table 2. Spreadsheet formulas are identical to the ones shown below.

Stack concentration = 15 μg/dscm (cell C5 of Table 2)
15 μg/dscm * 4.19E+03 DSCM/hr * 1 mg/1000μg = 63 mg/hr (calculated in cell D5 of Table 2)
Converting to g/sec:
63 mg/hr * 1 hr/3600 sec * 1 g/1000 mg = 1.75E-05 g/sec (calculated in cell E5 of Table 2)

Table 2 shows the calculations for all the PICs throughout the Pretreatment Facility.

7.2 LAW Vitrification Facility

First, the ACFM was converted to SCFM:
T = 100°C = 373K
T(std) = 20°C = 293K
P = 1 bar
P(std) = 1.01325 bars
(5.99E+03 ACFH)*(293/373)*(1/1.01325) = 4.64E+03 SCFM
To convert the SCFM to DSCM/hr, the following calculation was done. Stream volumetric flowrate was converted from SCFM to SCMH by diving by 35.3 and multiplying by 60 min/hr.
4.64E+03 SCFM * 1 m^3/35.3 ft^3 * 60 min/hr = 7.89E+03 SCMH

Water mass flow was then converted to molar flowrate.
1.91E+04 lb/d * 1 kg/2.2 lb * 1000g/kg * 1d/24hr * 1 mole H_2O/18 g = 2.01E+04 gmole/hr

The water volumetric flowrate was calculated by using the ideal gas law.
PV = nRT
R = 0.08314 l*bar/(mol*K)
T = 100°C = 373 K
P = 1 bar
V = nRT/P
V = (2.01E+04)(0.08314)(373)/(1)
V = 6.23E+05 l/hr * 1 m^3/1000 l = 6.23E+02 m^3/hr
Converting to sm^3/hr:
(6.23E+02)*(293/373)*(1/1.01325) = 4.83E+02 sm^3/hr

Water percent was calculated by dividing the water volumetric flowrate by the stream volumetric flowrate.
Water % = (4.83E+02/7.89E+03)*100 = 6.1%

SCMH value was then converted to DSCM/hr the following way:
7.89E+03 SCMH * (1-6.1/100) = 7.42E+03 DSCM/hr

Constituents stack flowrate was then calculated by multiplying the stack concentration with the DSCM/hr value. The calculation for 4-Nitrophenol is shown below as an example. All other constituent calculations were performed using the Microsoft Excel® 97 spreadsheet on a Compaq PC workstation and can be found in Table 3. Spreadsheet formulas are identical to the ones shown below.

Stack concentration = 15 μg/dscm (cell D5 of Table 3)
15 μg/dscm * 7.42E+03 DSCM/hr * 1 mg/1000μg = 111.3 mg/hr (calculated in cell E5 of Table 3)
Converting to g/sec:
111.3 mg/hr * 1 hr/3600 sec * 1 g/1000 mg = 3.09E-05 g/sec (calculated in cell F5 of Table 3)

Table 3 shows the calculations for all the PICs throughout the LAW Vitrification Facility.

7.3 HLW Vitrification Facility

First, the ACFM was converted to SCFM:
T = 80°C = 353K
T(stp) = 20°C = 293K
P = 1 bar
P(stp) = 1.01325 bars
(1.52E+03 ACFH)*(293/353)*(1/1.01325) = 1.25E+03 SCFM

To convert the SCFM to DSCM/hr, the following calculation was done. Stream volumetric flowrate was converted from SCFM to SCMH by diving by 35.3 and multiplying by 60 min/hr.
1.25E+03 SCFM * 1 m^3/35.3 ft^3 * 60 min/hr = 2.12E+03 SCMH

Water mass flow was then converted to molar flowrate.
9.45E+03 lb/d * 1 kg/2.2 lb * 1000g/kg * 1d/24hr * 1 mole H_2O/18 g = 9.94E+03 gmole/hr

The water volumetric flowrate was calculated by using the ideal gas law.
PV = nRT
R = 0.08314 l*bar/(mol*K)
T = 80°C = 353 K
P = 1 bar
V = nRT/P
V = (9.94E+03)(0.08314)(353)/(1)
V = 2.92E+05 l/hr * 1 m^3/1000 l = 2.92E+02 m^3/hr
Converting to sm^3/hr:
(2.92E+02)*(293/353)*(1/1.01325) = 2.39E+02 sm^3/hr

Water percent was calculated by dividing the water volumetric flowrate by the stream volumetric flowrate.
Water % = (2.39E+02/2.12E+03)*100 = 11.3%

SCMH value was then converted to DSCM/hr the following way:

2.12E+03 SCMH *(1-11.3/100) = 1.87E+03 DSCM/hr

Constituents stack flowrate was then calculated by multiplying the stack concentration with the DSCM/hr value. The calculation for 4-Nitrophenol is shown below as an example. All other constituent calculations were performed using the Microsoft Excel® 97 spreadsheet on a Compaq PC workstation and can be found in Table 4. Spreadsheet formulas are identical to the ones shown below.

Stack concentration = 15 μg/dscm (cell D5 of Table 4)
15 μg/dscm * 1.87E+03 DSCM/hr * 1 mg/1000μg = 28.1 mg/hr (calculated in cell E5 of Table 4)
Converting to g/sec:
28.1 mg/hr * 1 hr/3600 sec * 1 g/1000 mg = 7.81E-06 g/sec (calculated in cell F5 of Table 4)

Table 4 shows the calculations for all the PICs throughout the HLW Vitrification Facility.

8 Results and Conclusions

Tables 2, 3, and 4 show the emissions results for the PICs. The PIC generation estimates for the WTP have been updated per the latest generated emissions profile.

9 References

Project Documents

24590-WTP-MRQ-PT-03-002, Rev 0, *Emissions Maximum Case Runs with Updated Parameters*

RPT-24590-EN00005, Rev 0, *Estimation of Product of Incomplete Combustion Emissions for the River Protection Project Waste Treatment Plant*, Table 2

RPT-W375-ES00001, Rev 1, *Integrated Emissions Baseline Report for the River Protection Project Waste Treatment Plant*

Other Documents

EPA, 1986, *Test Methods for Evaluating Solid Waste, Physical/Chemical Methods (SW-846),* U.S. Environmental Protection Agency (EPA), Method 0030 Volatile Organic Sampling Train, Revision 0, September 1986, Section 5 (http://www.epa.gov/epaoswer/hazwaste/test/pdfs/0030.pdf)

Perry, R, 1984, *Perry's Chemical Engineers' Handbook*, Sixth Edition, McGraw Hill Company, New York, 1984, Table 1-9

10 Attachments

There are no attachments for this calculation.

CALCULATION SHEET

PROJECT: RPP-WTP
JOB NO.: 24590
CALC NO.: 24590-WTP-M4C-FRP-00002
SHEET REV: 0A
SHEET NO.: 7

BY: E. Berríos
DATE: 03/27/03

SUBJECT: Integrated Emissions Report PIC Estimation

Table 1 Constituents Stack Detection Limits

CAS Registry Number	Compound	Stack concentrations (µg/dscm)
100-02-7	4-Nitrophenol	15
100-44-7	Benzyl chloride	2
100-51-6	Benzyl alcohol	15
100-52-7	Benzaldehyde	15
101-77-9	4,4-Methylenedianiline	15
103-33-3	Azobenzene	15
103-65-1	n-Propyl benzene (Isocumene)	2
104-51-8	n-Butylbenzene	2
105-67-9	2,4-Dimethylphenol	15
106-43-4	4-Chlorotoluene (p-Tolyl chloride)	2
106-44-5	p-Cresol (4-Methyl phenol)	15
106-47-8	p-Chloroaniline	15
106-49-0	p-Toluidine	15
106-51-4	Quinone	15
106-89-8	Epichlorohydrin (1-chloro-2,3-epoxypropane)	2
107-19-7	Propargyl alcohol	2
107-21-1	Ethylene glycol	2
107-98-2	Propylene gylcol monomethyl ether	15
108-60-1	Dichloroisopropyl ether	15
108-67-8	1,3,5-Trimethyl benzene	2
108-86-1	Bromobenzene (Phenyl bromide)	2
109-77-3	Malononitrile	2
109-86-4	2-Methoxyethanol	15
110-80-5	2-Ethoxyethanol	15
111-15-9	Ethylene glycol monoethyl ether acetate	15
111-44-4	Bis(2-chloroethyl) ether	15
111-91-1	Bis(2-chloroethoxy)methane	15
1120-71-4	1,3-Propane sultone	15
119-90-4	3,3'-Dimethoxybenzidine (ortol-dianisidine)	15
121-14-2	2,4-Dinitrotoluene	15
122-66-7	1,2-Diphenylhydrazine	15
123-33-1	Maleic hydrazide	15
124-48-1	Chlorodibromomethane	2
131-11-3	Dimethylphthalate	15
131-89-5	2-Cyclohexyl-4,6-dinitrophenol	15
133-06-2	Captan	15
135-98-8	sec-Butylbenzene	2
145-73-3	Endothall	15
156-59-2	cis-1,2-Dichloroethene	2
1746-01-6	2,3,7,8-Tetrachlorodibenzo(p)dioxin (TCDD)	9.38E-06
192-97-2	Benzo(e)pyrene	3

CALCULATION SHEET

PROJECT: RPP-WTP
JOB NO.: 24590
CALC NO.: 24590-WTP-M4C-FRP-00002
SHEET REV: 0A
SHEET NO.: 8

BY: E. Berríos
DATE: 03/27/03

SUBJECT: Integrated Emissions Report PIC Estimation

Table 1 Constituents Stack Detection Limits

CAS Registry Number	Compound	Stack concentrations (µg/dscm)
19408-74-3	1,2,3,7,8,9-Hexachlorodibenzo(p)dioxin	1.56E-05
23950-58-5	Pronamide	15
25013-15-4	Methyl styrene (mixed isomers)	2
3268-87-9	Octachlorodibenzo(p)dioxin	7.81E-05
35822-46-9	1,2,3,4,6,7,8-Heptachlorodibenzo(p)dioxin	3.13E-05
39001-02-0	Octachlorodibenzofuran	6.25E-05
39227-28-6	1,2,3,4,7,8-Hexachlorodibenzo(p)dioxin	1.56E-05
40321-76-4	1,2,3,7,8-Pentachlorodibenzo(p)dioxin	1.56E-05
41851-50-7	Chlorocyclopentadiene	2
460-19-5	Cyanogen	2
506-68-3	Cyanogen bromide	15
506-77-4	Cyanogen chloride	2
510-15-6	Chlorobenzilate	15
51207-31-9	2,3,7,8-Tetrachlorodibenzofuran	7.81E-06
51-28-5	2,4-Dinitrophenol	15
51-79-6	Ethyl Carbamate (urethane)	15
528-29-0	o-Dinitrobenzene	15
532-27-4	2-Chloroacetophenone	15
534-52-1	4,6-Dinitro-o-cresol	15
5385-75-1	Dibenzo(a,e)fluoranthene	3
540-73-8	1,2-Dimethylhydrazine	2
542-75-6	1,3-Dichloropropene	2
542-88-1	Dichloromethyl ether	2
55673-89-7	1,2,3,4,7,8,9-Heptachlorodibenzofuran	1.56E-05
57117-31-4	2,3,4,7,8-Pentachlorodibenzofuran	7.81E-06
57117-41-6	1,2,3,7,8-Pentachlorodibenzofuran	7.81E-06
57117-44-9	1,2,3,6,7,8-Hexachlorodibenzofuran	1.25E-05
57-24-9	Strychnine	15
57653-85-7	1,2,3,6,7,8-Hexachlorodibenzo(p)dioxin	1.56E-05
57-74-9	Chlordane	15
584-84-9	2,4-Toluene diisocyante	15
593-60-2	Bromoethene	2
60-11-7	Dimethyl aminoazobenzene	15
606-20-2	2,6-Dinitrotoluene	15
60851-34-5	2,3,4,6,7,8-Hexachlorodibenzofuran	1.41E-05
608-93-5	Pentachlorobenzene	15
61626-71-9	Dichloropentadiene	2
62-50-0	Ethyl methanesulfonate	15
62-53-3	Aniline	15
65-85-0	Benzoic acid	15
67562-39-4	1,2,3,4,6,7,8-Heptachlorodibenzofuran	1.56E-05
70-30-4	Hexachlorophene	15

CALCULATION SHEET

PROJECT: RPP-WTP
JOB NO.: 24590
CALC NO.: 24590-WTP-M4C-FRP-00002
SHEET REV: 0A
SHEET NO.: 9

BY: E. Berrios
DATE: 03/27/03

SUBJECT: Integrated Emissions Report PIC Estimation

Table 1 Constituents Stack Detection Limits

CAS Registry Number	Compound	Stack concentrations (µg/dscm)
70648-26-9	1,2,3,4,7,8-Hexachlorodibenzofuran	1.41E-05
72918-21-9	1,2,3,7,8,9-Hexachlorodibenzofuran	1.56E-05
74-88-4	Iodomethane (Methyl iodide)	2
74-95-3	Methylene bromide	2
75-25-2	Bromoform	2
75-29-6	2-Chloropropane	2
75-44-5	Phosgene	2
76-01-7	Pentachloroethane	2
764-41-0	1,4-Dichloro-2-butene	2
765-34-4	Glycidylaldehyde	15
77-47-4	Hexachlorocyclopentadiene	15
77-78-1	Dimethyl sulfate	15
80-62-6	Methyl methacrylate	2
822-06-0	Hexamethylene-1,5-diisocyanate	15
823-40-5	Toluene-2,6-diamine	15
85-44-9	Phthalic anhydride	15
87-61-6	1,2,3-Trichlorobenzene	2
88-74-4	o-Nitroaniline (2-Nitroaniline)	15
90-04-0	o-Anisidine	15
91-57-6	2-Methylnaphthalene	3
91-94-1	3,3'-Dichlorobenzidine	15
924-16-3	N-Nitrosodi-n-butylamine	2
94-59-7	Safrole	15
95-53-4	o-Toluidine	2
95-63-6	1,2,4-Trimethyl benzene	2
95-94-3	1,2,4,5-Tetrachlorobenzene	15
96-12-8	1,2-Dibromo-3-chloropropane	15
96-18-4	1,2,3-Trichloropropane	2
96-45-7	Ethylene thiourea	15
97-63-2	Ethyl methacrylate	2
98-01-1	Furfural	15
98-06-6	tert-Butyl benzene	2
98-07-7	Benzotrichloride	15
99-35-4	1,3,5-Trinitrobenzene	15
99-65-0	1,3-Dinitrobenzene	15
99-87-6	p-Cymene	2
no cas #	Dibenzo(a,h)fluoranthene	3

By: E. Barrios
Date: 03/27/03

Subject : Integrated Emissions Report PIC Estimation

CALCULATION SHEET

PROJECT: RPP-WTP
JOB NO.:24590
CALC NO.:24590-WTP-M4C-FRP-00002
SHEET REV:0A
SHEET NO.:10

	A	B	C	D	E
1	Table 2 Pretreatment PIC Emissions				
2			Pretreatment PIC Emissions		
3			Stack (PVP12)		
4	CAS Registry Number	Compound	Stack Concentrations (µg/dscm)	Stack Flowrate (mg/hr)	Stack Flowrate (g/sec)
5	100-02-7	4-Nitrophenol	15	63.0	1.75E-05
6	100-44-7	Benzyl chloride	2	8.4	2.33E-06
7	100-51-6	Benzyl alcohol	15	63.0	1.75E-05
8	100-52-7	Benzaldehyde	15	63.0	1.75E-05
9	101-77-9	4,4-Methylenedianiline	15	63.0	1.75E-05
10	103-33-3	Azobenzene	15	63.0	1.75E-05
11	103-65-1	n-Propyl benzene (Isocumene)	2	8.4	2.33E-06
12	104-51-8	n-Butylbenzene	2	8.4	2.33E-06
13	105-67-9	2,4-Dimethylphenol	15	63.0	1.75E-05
14	106-43-4	4-Chlorotoluene (p-Tolyl chloride)	2	8.4	2.33E-06
15	106-44-5	p-Cresol (4-Methyl phenol)	15	63.0	1.75E-05
16	106-47-8	p-Chloroaniline	15	63.0	1.75E-05
17	106-49-0	p-Toluidine	15	63.0	1.75E-05
18	106-51-4	Quinone	15	63.0	1.75E-05
19	106-89-8	Epichlorohydrin (1-chloro-2,3-epoxypropane)	2	8.4	2.33E-06
20	107-19-7	Propargyl alcohol	2	8.4	2.33E-06
21	107-21-1	Ethylene glycol	2	8.4	2.33E-06
22	107-98-2	Propylene gylcol monomethyl ether	15	63.0	1.75E-05
23	108-60-1	Dichloroisopropyl ether	15	63.0	1.75E-05
24	108-67-8	1,3,5-Trimethyl benzene	2	8.4	2.33E-06
25	108-86-1	Bromobenzene (Phenyl bromide)	2	8.4	2.33E-06
26	109-77-3	Malononitrile	2	8.4	2.33E-06
27	109-86-4	2-Methoxyethanol	15	63.0	1.75E-05
28	110-80-5	2-Ethoxyethanol	15	63.0	1.75E-05
29	111-15-9	Ethylene glycol monoethyl ether acetate	15	63.0	1.75E-05
30	111-44-4	Bis(2-chloroethyl) ether	15	63.0	1.75E-05
31	111-91-1	Bis(2-chloroethoxy)methane	15	63.0	1.75E-05
32	1120-71-4	1,3-Propane sultone	15	63.0	1.75E-05
33	119-90-4	3,3'-Dimethoxybenzidine (ortol-dianisidine)	15	63.0	1.75E-05
34	121-14-2	2,4-Dinitrotoluene	15	63.0	1.75E-05
35	122-66-7	1,2-Diphenylhydrazine	15	63.0	1.75E-05
36	123-33-1	Maleic hydrazide	15	63.0	1.75E-05
37	124-48-1	Chlorodibromomethane	2	8.4	2.33E-06
38	131-11-3	Dimethylphthalate	15	63.0	1.75E-05
39	131-89-5	2-Cyclohexyl-4,6-dinitrophenol	15	63.0	1.75E-05
40	133-06-2	Captan	15	63.0	1.75E-05
41	135-98-8	sec-Butylbenzene	2	8.4	2.33E-06
42	145-73-3	Endothall	15	63.0	1.75E-05
43	156-59-2	cis-1,2-Dichloroethene	2	8.4	2.33E-06
44	1746-01-6	2,3,7,8-Tetrachlorodibenzo(p)dioxin (TCDD)	9.38E-06	0.0	1.10E-11
45	192-97-2	Benzo(e)pyrene	3	12.6	3.50E-06
46	19408-74-3	1,2,3,7,8,9-Hexachlorodibenzo(p)dioxin	1.56E-05	0.0	1.82E-11
47	23950-58-5	Pronamide	15	63.0	1.75E-05
48	25013-15-4	Methyl styrene (mixed isomers)	2	8.4	2.33E-06
49	3268-87-9	Octachlorodibenzo(p)dioxin	7.81E-05	0.0	9.12E-11
50	35822-46-9	1,2,3,4,6,7,8-Heptachlorodibenzo(p)dioxin	3.13E-05	0.0	3.65E-11
51	39001-02-0	Octachlorodibenzofuran	6.25E-05	0.0	7.30E-11
52	39227-28-6	1,2,3,4,7,8-Hexachlorodibenzo(p)dioxin	1.56E-05	0.0	1.82E-11
53	40321-76-4	1,2,3,7,8-Pentachlorodibenzo(p)dioxin	1.56E-05	0.0	1.82E-11
54	41851-50-7	Chlorocyclopentadiene	2	8.4	2.33E-06
55	460-19-5	Cyanogen	2	8.4	2.33E-06
56	506-68-3	Cyanogen bromide	15	63.0	1.75E-05
57	506-77-4	Cyanogen chloride	2	8.4	2.33E-06
58	510-15-6	Chlorobenzilate	15	63.0	1.75E-05
59	51207-31-9	2,3,7,8-Tetrachlorodibenzofuran	7.81E-06	0.0	9.12E-12
60	51-28-5	2,4-Dinitrophenol	15	63.0	1.75E-05
61	51-79-6	Ethyl Carbamate (urethane)	15	63.0	1.75E-05
62	528-29-0	o-Dinitrobenzene	15	63.0	1.75E-05
63	532-27-4	2-Chloroacetophenone	15	63.0	1.75E-05
64	534-52-1	4,6-Dinitro-o-cresol	15	63.0	1.75E-05
65	5385-75-1	Dibenzo(a,e)fluoranthene	3	12.6	3.50E-06
66	540-73-8	1,2-Dimethylhydrazine	2	8.4	2.33E-06
67	542-75-6	1,3-Dichloropropene	2	8.4	2.33E-06
68	542-88-1	Dichloromethyl ether	2	8.4	2.33E-06
69	55673-89-7	1,2,3,4,7,8,9-Heptachlorodibenzofuran	1.56E-05	0.0	1.82E-11
70	57117-31-4	2,3,4,7,8-Pentachlorodibenzofuran	7.81E-06	0.0	9.12E-12
71	57117-41-6	1,2,3,7,8-Pentachlorodibenzofuran	7.81E-06	0.0	9.12E-12
72	57117-44-9	1,2,3,6,7,8-Hexachlorodibenzofuran	1.25E-05	0.0	1.46E-11
73	57-24-9	Strychnine	15	63.0	1.75E-05
74	57653-85-7	1,2,3,6,7,8-Hexachlorodibenzo(p)dioxin	1.56E-05	0.0	1.82E-11
75	57-74-9	Chlordane	15	63.0	1.75E-05
76	584-84-9	2,4-Toluene diisocyante	15	63.0	1.75E-05
77	593-60-2	Bromoethene	2	8.4	2.33E-06
78	60-11-7	Dimethyl aminoazobenzene	15	63.0	1.75E-05
79	606-20-2	2,6-Dinitrotoluene	15	63.0	1.75E-05
80	60851-34-5	2,3,4,6,7,8-Hexachlorodibenzofuran	1.41E-05	0.0	1.65E-11
81	608-93-5	Pentachlorobenzene	15	63.0	1.75E-05
82	61626-71-9	Dichloropentadiene	2	8.4	2.33E-06
83	62-50-0	Ethyl methanesulfonate	15	63.0	1.75E-05
84	62-53-3	Aniline	15	63.0	1.75E-05
85	65-85-0	Benzoic acid	15	63.0	1.75E-05
86	67562-39-4	1,2,3,4,6,7,8-Heptachlorodibenzofuran	1.56E-05	0.0	1.82E-11
87	70-30-4	Hexachlorophene	15	63.0	1.75E-05
88	70648-26-9	1,2,3,4,7,8-Hexachlorodibenzofuran	1.41E-05	0.0	1.65E-11
89	72918-21-9	1,2,3,7,8,9-Hexachlorodibenzofuran	1.56E-05	0.0	1.82E-11
90	74-88-4	Iodomethane (Methyl iodide)	2	8.4	2.33E-06
91	74-95-3	Methylene bromide	2	8.4	2.33E-06
92	75-25-2	Bromoform	2	8.4	2.33E-06
93	75-29-6	2-Chloropropane	2	8.4	2.33E-06
94	75-44-5	Phosgene	2	8.4	2.33E-06
95	76-01-7	Pentachloroethane	2	8.4	2.33E-06
96	764-41-0	1,4-Dichloro-2-butene	2	8.4	2.33E-06
97	765-34-4	Glycidylaldehyde	15	63.0	1.75E-05
98	77-47-4	Hexachlorocyclopentadiene	15	63.0	1.75E-05
99	77-78-1	Dimethyl sulfate	15	63.0	1.75E-05
100	80-62-6	Methyl methacrylate	2	8.4	2.33E-06
101	822-06-0	Hexamethylene-1,5-diisocyanate	15	63.0	1.75E-05
102	823-40-5	Toluene-2,6-diamine	15	63.0	1.75E-05
103	85-44-9	Phthalic anhydride	15	63.0	1.75E-05
104	87-61-6	1,2,3-Trichlorobenzene	2	8.4	2.33E-06
105	88-74-4	o-Nitroaniline (2-Nitroaniline)	15	63.0	1.75E-05
106	90-04-0	o-Anisidine	15	63.0	1.75E-05
107	91-57-6	2-Methylnaphthalene	3	12.6	3.50E-06
108	91-94-1	3,3'-Dichlorobenzidine	15	63.0	1.75E-05
109	924-16-3	N-Nitrosodi-n-butylamine	2	8.4	2.33E-06
110	94-59-7	Safrole	15	63.0	1.75E-05
111	95-53-4	o-Toluidine	2	8.4	2.33E-06
112	95-63-6	1,2,4-Trimethyl benzene	2	8.4	2.33E-06
113	95-94-3	1,2,4,5-Tetrachlorobenzene	15	63.0	1.75E-05
114	96-12-8	1,2-Dibromo-3-chloropropane	15	63.0	1.75E-05
115	96-18-4	1,2,3-Trichloropropane	2	8.4	2.33E-06
116	96-45-7	Ethylene thiourea	15	63.0	1.75E-05
117	97-63-2	Ethyl methacrylate	2	8.4	2.33E-06
118	98-01-1	Furfural	15	63.0	1.75E-05
119	98-06-6	tert-Butyl benzene	2	8.4	2.33E-06
120	98-07-7	Benzotrichloride	15	63.0	1.75E-05
121	99-35-4	1,3,5-Trinitrobenzene	15	63.0	1.75E-05
122	99-65-0	1,3-Dinitrobenzene	15	63.0	1.75E-05
123	99-87-6	p-Cymene	2	8.4	2.33E-06
124	no cas #	Dibenzo(a,h)fluoranthene	3	12.6	3.50E-06

	B	C	D	E	F
1	Table 3 LAW Vitrification Facility PIC Emissions				
2			Low Activity Waste (LAW) PIC Emissions		
3			LAW Stack (LVP28)		
4	CAS Registry Number	Compound	Stack concentrations (ug/dscm)	Stack Flowrate (mg/hr)	Stack Flowrate (g/sec)
5	100-02-7	4-Nitrophenol	15	111.3	3.09E-05
6	100-44-7	Benzyl chloride	2	14.8	4.12E-06
7	100-51-6	Benzyl alcohol	15	111.3	3.09E-05
8	100-52-7	Benzaldehyde	15	111.3	3.09E-05
9	101-77-9	4,4-Methylenedianiline	15	111.3	3.09E-05
10	103-33-3	Azobenzene	15	111.3	3.09E-05
11	103-65-1	n-Propyl benzene (Isocumene)	2	14.8	4.12E-06
12	104-51-8	n-Butylbenzene	2	14.8	4.12E-06
13	105-67-9	2,4-Dimethylphenol	15	111.3	3.09E-05
14	106-43-4	4-Chlorotoluene (p-Tolyl chloride)	2	14.8	4.12E-06
15	106-44-5	p-Cresol (4-Methyl phenol)	15	111.3	3.09E-05
16	106-47-8	p-Chloroaniline	15	111.3	3.09E-05
17	106-49-0	p-Toluidine	15	111.3	3.09E-05
18	106-51-4	Quinone	15	111.3	3.09E-05
19	106-89-8	Epichlorohydrin (1-chloro-2,3-epoxypropane)	2	14.8	4.12E-06
20	107-19-7	Propargyl alcohol	2	14.8	4.12E-06
21	107-21-1	Ethylene glycol	2	14.8	4.12E-06
22	107-98-2	Propylene gylcol monomethyl ether	15	111.3	3.09E-05
23	108-60-1	Dichloroisopropyl ether	15	111.3	3.09E-05
24	108-67-8	1,3,5-Trimethyl benzene	2	14.8	4.12E-06
25	108-86-1	Bromobenzene (Phenyl bromide)	2	14.8	4.12E-06
26	109-77-3	Malononitrile	2	14.8	4.12E-06
27	109-86-4	2-Methoxyethanol	15	111.3	3.09E-05
28	110-80-5	2-Ethoxyethanol	15	111.3	3.09E-05
29	111-15-9	Ethylene glycol monoethyl ether acetate	15	111.3	3.09E-05
30	111-44-4	Bis(2-chloroethyl) ether	15	111.3	3.09E-05
31	111-91-1	Bis(2-chloroethoxy)methane	15	111.3	3.09E-05
32	1120-71-4	1,3-Propane sultone	15	111.3	3.09E-05
33	119-90-4	3,3'-Dimethoxybenzidine (ortol-dianisidine)	15	111.3	3.09E-05
34	121-14-2	2,4-Dinitrotoluene	15	111.3	3.09E-05
35	122-66-7	1,2-Diphenylhydrazine	15	111.3	3.09E-05
36	123-33-1	Maleic hydrazide	15	111.3	3.09E-05
37	124-48-1	Chlorodibromomethane	2	14.8	4.12E-06
38	131-11-3	Dimethylphthalate	15	111.3	3.09E-05
39	131-89-5	2-Cyclohexyl-4,6-dinitrophenol	15	111.3	3.09E-05
40	133-06-2	Captan	15	111.3	3.09E-05
41	135-98-8	sec-Butylbenzene	2	14.8	4.12E-06
42	145-73-3	Endothall	15	111.3	3.09E-05
43	156-59-2	cis-1,2-Dichloroethene	2	14.8	4.12E-06
44	1746-01-6	2,3,7,8-Tetrachlorodibenzo(p)dioxin (TCDD)	9.38E-06	7.0E-05	1.93E-11
45	192-97-2	Benzo(e)pyrene	3	22.3	6.19E-06
46	19408-74-3	1,2,3,7,8,9-Hexachlorodibenzo(p)dioxin	1.56E-05	1.2E-04	3.22E-11
47	23950-58-5	Pronamide	15	111.3	3.09E-05
48	25013-15-4	Methyl styrene (mixed isomers)	2	14.8	4.12E-06
49	3268-87-9	Octachlorodibenzo(p)dioxin	7.81E-05	5.8E-04	1.61E-10
50	35822-46-9	1,2,3,4,6,7,8-Heptachlorodibenzo(p)dioxin	3.13E-05	2.3E-04	6.45E-11
51	39001-02-0	Octachlorodibenzofuran	6.25E-05	4.6E-04	1.29E-10
52	39227-28-6	1,2,3,4,7,8-Hexachlorodibenzo(p)dioxin	1.56E-05	1.2E-04	3.22E-11
53	40321-76-4	1,2,3,7,8-Pentachlorodibenzo(p)dioxin	1.56E-05	1.2E-04	3.22E-11
54	41851-50-7	Chlorocyclopentadiene	2	14.8	4.12E-06
55	460-19-5	Cyanogen	2	14.8	4.12E-06
56	506-68-3	Cyanogen bromide	15	111.3	3.09E-05
57	506-77-4	Cyanogen chloride	2	14.8	4.12E-06
58	510-15-6	Chlorobenzilate	15	111.3	3.09E-05
59	51207-31-9	2,3,7,8-Tetrachlorodibenzofuran	7.81E-06	5.8E-05	1.61E-11
60	51-28-5	2,4-Dinitrophenol	15	111.3	3.09E-05
61	51-79-6	Ethyl Carbamate (urethane)	15	111.3	3.09E-05
62	528-29-0	o-Dinitrobenzene	15	111.3	3.09E-05
63	532-27-4	2-Chloroacetophenone	15	111.3	3.09E-05
64	534-52-1	4,6-Dinitro-o-cresol	15	111.3	3.09E-05
65	5385-75-1	Dibenzo(a,e)fluoranthene	3	22.3	6.19E-06
66	540-73-8	1,2-Dimethylhydrazine	2	14.8	4.12E-06
67	542-75-6	1,3-Dichloropropene	2	14.8	4.12E-06
68	542-88-1	Dichloromethyl ether	2	14.8	4.12E-06
69	55673-89-7	1,2,3,4,7,8,9-Heptachlorodibenzofuran	1.56E-05	1.2E-04	3.22E-11
70	57117-31-4	2,3,4,7,8-Pentachlorodibenzofuran	7.81E-06	5.8E-05	1.61E-11
71	57117-41-6	1,2,3,7,8-Pentachlorodibenzofuran	7.81E-06	5.8E-05	1.61E-11
72	57117-44-9	1,2,3,6,7,8-Hexachlorodibenzofuran	1.25E-05	9.3E-05	2.58E-11
73	57-24-9	Strychnine	15	111.3	3.09E-05
74	57653-85-7	1,2,3,6,7,8-Hexachlorodibenzo(p)dioxin	1.56E-05	1.2E-04	3.22E-11
75	57-74-9	Chlordane	15	111.3	3.09E-05
76	584-84-9	2,4-Toluene diisocyanate	15	111.3	3.09E-05
77	593-60-2	Bromoethene	2	14.8	4.12E-06
78	60-11-7	Dimethyl aminoazobenzene	15	111.3	3.09E-05
79	606-20-2	2,6-Dinitrotoluene	15	111.3	3.09E-05
80	60851-34-5	2,3,4,6,7,8-Hexachlorodibenzofuran	1.41E-05	1.0E-04	2.91E-11
81	608-93-5	Pentachlorobenzene	15	111.3	3.09E-05
82	61826-71-9	Dichloropentadiene	2	14.8	4.12E-06
83	62-50-0	Ethyl methanesulfonate	15	111.3	3.09E-05
84	62-53-3	Aniline	15	111.3	3.09E-05
85	65-85-0	Benzoic acid	15	111.3	3.09E-05
86	67562-39-4	1,2,3,4,6,7,8-Heptachlorodibenzofuran	1.56E-05	1.2E-04	3.22E-11
87	70-30-4	Hexachlorophene	15	111.3	3.09E-05
88	70648-26-9	1,2,3,4,7,8-Hexachlorodibenzofuran	1.41E-05	1.0E-04	2.91E-11
89	72918-21-9	1,2,3,7,8,9-Hexachlorodibenzofuran	1.56E-05	1.2E-04	3.22E-11
90	74-88-4	Iodomethane (Methyl iodide)	2	14.8	4.12E-06
91	74-95-3	Methylene bromide	2	14.8	4.12E-06
92	75-25-2	Bromoform	2	14.8	4.12E-06
93	75-29-6	2-Chloropropane	2	14.8	4.12E-06
94	75-44-5	Phosgene	2	14.8	4.12E-06
95	76-01-7	Pentachloroethane	2	14.8	4.12E-06
96	764-41-0	1,4-Dichloro-2-butene	2	14.8	4.12E-06
97	765-34-4	Glycidylaldehyde	15	111.3	3.09E-05
98	77-47-4	Hexachlorocyclopentadiene	15	111.3	3.09E-05
99	77-78-1	Dimethyl sulfate	15	111.3	3.09E-05
100	80-62-6	Methyl methacrylate	2	14.8	4.12E-06
101	822-06-0	Hexamethylene-1,5-diisocyanate	15	111.3	3.09E-05
102	823-40-5	Toluene-2,6-diamine	15	111.3	3.09E-05
103	85-44-9	Phthalic anhydride	15	111.3	3.09E-05
104	87-61-6	1,2,3-Trichlorobenzene	2	14.8	4.12E-06
105	88-74-4	o-Nitroaniline (2-Nitroaniline)	15	111.3	3.09E-05
106	90-04-0	o-Anisidine	15	111.3	3.09E-05
107	91-57-6	2-Methylnaphthalene	3	22.3	6.19E-06
108	91-94-1	3,3'-Dichlorobenzidine	15	111.3	3.09E-05
109	924-16-3	N-Nitrosodi-n-butylamine	2	14.8	4.12E-06
110	94-59-7	Safrole	15	111.3	3.09E-05
111	95-53-4	o-Toluidine	2	14.8	4.12E-06
112	95-63-6	1,2,4-Trimethyl benzene	2	14.8	4.12E-06
113	95-94-3	1,2,4,5-Tetrachlorobenzene	15	111.3	3.09E-05
114	96-12-8	1,2-Dibromo-3-chloropropane	15	111.3	3.09E-05
115	96-18-4	1,2,3-Trichloropropane	2	14.8	4.12E-06
116	96-45-7	Ethylene thiourea	15	111.3	3.09E-05
117	97-63-2	Ethyl methacrylate	2	14.8	4.12E-06
118	98-01-1	Furfural	15	111.3	3.09E-05
119	98-06-6	tert-Butyl benzene	2	14.8	4.12E-06
120	98-07-7	Benzotrichloride	15	111.3	3.09E-05
121	99-35-4	1,3,5-Trinitrobenzene	15	111.3	3.09E-05
122	99-65-0	1,3-Dinitrobenzene	15	111.3	3.09E-05
123	99-87-6	p-Cymene	2	14.8	4.12E-06
124	no cas #	Dibenzo(a,h)fluoranthene	3	22.3	6.19E-06

	B	C	D	E	F
1	Table 4 HLW Vitrification Facility PIC Emissions				
2			High Level Waste (HLW) PIC Emissions		
3			HLW Stack (HOP33)		
4	CAS Registry Number	Compound	Stack Concentrations (µg/dscm)	Stack Flowrate (mg/hr)	Stack Flowrate (g/sec)
5	100-02-7	4-Nitrophenol	15	28.1	7.81E-06
6	100-44-7	Benzyl chloride	2	3.7	1.04E-06
7	100-51-6	Benzyl alcohol	15	28.1	7.81E-06
8	100-52-7	Benzaldehyde	15	28.1	7.81E-06
9	101-77-9	4,4-Methylenedianiline	15	28.1	7.81E-06
10	103-33-3	Azobenzene	15	28.1	7.81E-06
11	103-65-1	n-Propyl benzene (Isocumene)	2	3.7	1.04E-06
12	104-51-8	n-Butylbenzene	2	3.7	1.04E-06
13	105-67-9	2,4-Dimethylphenol	15	28.1	7.81E-06
14	106-43-4	4-Chlorotoluene (p-Tolyl chloride)	2	3.7	1.04E-06
15	106-44-5	p-Cresol (4-Methyl phenol)	15	28.1	7.81E-06
16	106-47-8	p-Chloroaniline	15	28.1	7.81E-06
17	106-49-0	p-Toluidine	15	28.1	7.81E-06
18	106-51-4	Quinone	15	28.1	7.81E-06
19	106-89-8	Epichlorohydrin (1-chloro-2,3-epoxypropane)	2	3.7	1.04E-06
20	107-19-7	Propargyl alcohol	2	3.7	1.04E-06
21	107-21-1	Ethylene glycol	2	3.7	1.04E-06
22	107-98-2	Propylene gylcol monomethyl ether	15	28.1	7.81E-06
23	108-60-1	Dichloroisopropyl ether	15	28.1	7.81E-06
24	108-67-8	1,3,5-Trimethyl benzene	2	3.7	1.04E-06
25	108-86-1	Bromobenzene (Phenyl bromide)	2	3.7	1.04E-06
26	109-77-3	Malononitrile	2	3.7	1.04E-06
27	109-86-4	2-Methoxyethanol	15	28.1	7.81E-06
28	110-80-5	2-Ethoxyethanol	15	28.1	7.81E-06
29	111-15-9	Ethylene glycol monoethyl ether acetate	15	28.1	7.81E-06
30	111-44-4	Bis(2-chloroethyl) ether	15	28.1	7.81E-06
31	111-91-1	Bis(2-chloroethoxy)methane	15	28.1	7.81E-06
32	1120-71-4	1,3-Propane sultone	15	28.1	7.81E-06
33	119-90-4	3,3'-Dimethoxybenzidine (ortol-dianisidine)	15	28.1	7.81E-06
34	121-14-2	2,4-Dinitrotoluene	15	28.1	7.81E-06
35	122-66-7	1,2-Diphenylhydrazine	15	28.1	7.81E-06
36	123-33-1	Maleic hydrazide	15	28.1	7.81E-06
37	124-48-1	Chlorodibromomethane	2	3.7	1.04E-06
38	131-11-3	Dimethylphthalate	15	28.1	7.81E-06
39	131-89-5	2-Cyclohexyl-4,6-dinitrophenol	15	28.1	7.81E-06
40	133-06-2	Captan	15	28.1	7.81E-06
41	135-98-8	sec-Butylbenzene	2	3.7	1.04E-06
42	145-73-3	Endothall	15	28.1	7.81E-06
43	156-59-2	cis-1,2-Dichloroethene	2	3.7	1.04E-06
44	1746-01-6	2,3,7,8-Tetrachlorodibenzo(p)dioxin (TCDD)	9.38E-06	0.0	4.88E-12
45	192-97-2	Benzo(e)pyrene	3	5.6	1.56E-06
46	19408-74-3	1,2,3,7,8,9-Hexachlorodibenzo(p)dioxin	1.56E-05	0.0	8.12E-12
47	23950-58-5	Pronamide	15	28.1	7.81E-06
48	25013-15-4	Methyl styrene (mixed isomers)	2	3.7	1.04E-06
49	3268-87-9	Octachlorodibenzo(p)dioxin	7.81E-05	0.0	4.07E-11
50	35822-46-9	1,2,3,4,6,7,8-Heptachlorodibenzo(p)dioxin	3.13E-05	0.0	1.63E-11
51	39001-02-0	Octachlorodibenzofuran	6.25E-05	0.0	3.25E-11
52	39227-28-6	1,2,3,4,7,8-Hexachlorodibenzo(p)dioxin	1.56E-05	0.0	8.12E-12
53	40321-76-4	1,2,3,7,8-Pentachlorodibenzo(p)dioxin	1.56E-05	0.0	8.12E-12
54	41851-50-7	Chlorocyclopentadiene	2	3.7	1.04E-06
55	460-19-5	Cyanogen	2	3.7	1.04E-06
56	506-68-3	Cyanogen bromide	15	28.1	7.81E-06
57	506-77-4	Cyanogen chloride	2	3.7	1.04E-06
58	510-15-6	Chlorobenzilate	15	28.1	7.81E-06
59	51207-31-9	2,3,7,8-Tetrachlorodibenzofuran	7.81E-06	0.0	4.07E-12
60	51-28-5	2,4-Dinitrophenol	15	28.1	7.81E-06
61	51-79-6	Ethyl Carbamate (urethane)	15	28.1	7.81E-06
62	528-29-0	o-Dinitrobenzene	15	28.1	7.81E-06
63	532-27-4	2-Chloroacetophenone	15	28.1	7.81E-06
64	534-52-1	4,6-Dinitro-o-cresol	15	28.1	7.81E-06
65	5385-75-1	Dibenzo(a,e)fluoranthene	3	5.6	1.56E-06
66	540-73-8	1,2-Dimethylhydrazine	2	3.7	1.04E-06
67	542-75-6	1,3-Dichloropropene	2	3.7	1.04E-06
68	542-88-1	Dichloromethyl ether	2	3.7	1.04E-06
69	55673-89-7	1,2,3,4,7,8,9-Heptachlorodibenzofuran	1.56E-05	0.0	8.12E-12
70	57117-31-4	2,3,4,7,8-Pentachlorodibenzofuran	7.81E-06	0.0	4.07E-12
71	57117-41-6	1,2,3,7,8-Pentachlorodibenzofuran	7.81E-06	0.0	4.07E-12
72	57117-44-9	1,2,3,6,7,8-Hexachlorodibenzofuran	1.25E-05	0.0	6.51E-12
73	57-24-9	Strychnine	15	28.1	7.81E-06
74	57653-85-7	1,2,3,6,7,8-Hexachlorodibenzo(p)dioxin	1.56E-05	0.0	8.12E-12
75	57-74-9	Chlordane	15	28.1	7.81E-06
76	584-84-9	2,4-Toluene diisocyante	15	28.1	7.81E-06
77	593-60-2	Bromoethene	2	3.7	1.04E-06
78	60-11-7	Dimethyl aminoazobenzene	15	28.1	7.81E-06
79	606-20-2	2,6-Dinitrotoluene	15	28.1	7.81E-06
80	60851-34-5	2,3,4,6,7,8-Hexachlorodibenzofuran	1.41E-05	0.0	7.34E-12
81	608-93-5	Pentachlorobenzene	15	28.1	7.81E-06
82	61626-71-9	Dichloropentadiene	2	3.7	1.04E-06
83	62-50-0	Ethyl methanesulfonate	15	28.1	7.81E-06
84	62-53-3	Aniline	15	28.1	7.81E-06
85	65-85-0	Benzoic acid	15	28.1	7.81E-06
86	67562-39-4	1,2,3,4,6,7,8-Heptachlorodibenzofuran	1.56E-05	0.0	8.12E-12
87	70-30-4	Hexachlorophene	15	28.1	7.81E-06
88	70648-26-9	1,2,3,4,7,8-Hexachlorodibenzofuran	1.41E-05	0.0	7.34E-12
89	72918-21-9	1,2,3,7,8,9-Hexachlorodibenzofuran	1.56E-05	0.0	8.12E-12
90	74-88-4	Iodomethane (Methyl iodide)	2	3.7	1.04E-06
91	74-95-3	Methylene bromide	2	3.7	1.04E-06
92	75-25-2	Bromoform	2	3.7	1.04E-06
93	75-29-6	2-Chloropropane	2	3.7	1.04E-06
94	75-44-5	Phosgene	2	3.7	1.04E-06
95	76-01-7	Pentachloroethane	2	3.7	1.04E-06
96	764-41-0	1,4-Dichloro-2-butene	2	3.7	1.04E-06
97	765-34-4	Glycidylaldehyde	15	28.1	7.81E-06
98	77-47-4	Hexachlorocyclopentadiene	15	28.1	7.81E-06
99	77-78-1	Dimethyl sulfate	15	28.1	7.81E-06
100	80-62-6	Methyl methacrylate	2	3.7	1.04E-06
101	822-06-0	Hexamethylene-1,5-diisocyanate	15	28.1	7.81E-06
102	823-40-5	Toluene-2,6-diamine	15	28.1	7.81E-06
103	85-44-9	Phthalic anhydride	15	28.1	7.81E-06
104	87-61-6	1,2,3-Trichlorobenzene	2	3.7	1.04E-06
105	88-74-4	o-Nitroaniline (2-Nitroaniline)	15	28.1	7.81E-06
106	90-04-0	o-Anisidine	15	28.1	7.81E-06
107	91-57-6	2-Methylnaphthalene	3	5.6	1.56E-06
108	91-94-1	3,3'-Dichlorobenzidine	15	28.1	7.81E-06
109	924-16-3	N-Nitrosodi-n-butylamine	2	3.7	1.04E-06
110	94-59-7	Safrole	15	28.1	7.81E-06
111	95-53-4	o-Toluidine	2	3.7	1.04E-06
112	95-63-6	1,2,4-Trimethyl benzene	2	3.7	1.04E-06
113	95-94-3	1,2,4,5-Tetrachlorobenzene	15	28.1	7.81E-06
114	96-12-8	1,2-Dibromo-3-chloropropane	15	28.1	7.81E-06
115	96-18-4	1,2,3-Trichloropropane	2	3.7	1.04E-06
116	96-45-7	Ethylene thiourea	15	28.1	7.81E-06
117	97-63-2	Ethyl methacrylate	2	3.7	1.04E-06
118	98-01-1	Furfural	15	28.1	7.81E-06
119	98-06-6	tert-Butyl benzene	2	3.7	1.04E-06
120	98-07-7	Benzotrichloride	15	28.1	7.81E-06
121	99-35-4	1,3,5-Trinitrobenzene	15	28.1	7.81E-06
122	99-65-0	1,3-Dinitrobenzene	15	28.1	7.81E-06
123	99-87-6	p-Cymene	2	3.7	1.04E-06
124	no cas #	Dibenzo(a,h)fluoranthene	3	5.6	1.56E-06

Appendix A Stream Reports

BY: E. Berrios
Date: 03/27/03

CALCULATION SHEET

PROJECT: RPP-WTP
JOB NO.: 24590
CALC NO.: 24590-WTP-M4C-FRP-00002
SHEET REV: 0A
SHEET NO.: 14

Subject: Integrated Emissions Report PIC Estimation

River Protection Project - Waste Treatment Plant

Stream Number: PVP12
Stream Name: Carbon bed adsorber discharge
Configuration: 0
0
Run Data File: H:\Working Folder 2 (john)\MRQ_03_002_run2a_Streams.csv
Run Date / Time: 1/16/2003 - 1:27:28 PM

Stream Properties Variable	Value	Units
Density	1.10E-03	g/cm^3
Enthalpy	-1.25E+06	BTU/hr
Mass Flow	1.12E+04	Lb/hr
	2.69E+05	Lb/day
Volumetric Flow	2.02E+04	GPM
Molar Flow	3.93E+02	Lbmol/hr
Volumetric Flow	2.74E+03	ft^3/min
Molecular Weight	2.85E+01	Lb/Lbmol
Pressure	1.00E+03	mbar
Temperature	3.73E+01	C
Viscosity	1.88E-02	cP
Na Molarity	0.00E+00	mol/L
pH	#NUM!	pH
Total TRU	3.17E-19	Ci/L
Total Activity	2.37E-09	Ci/L

Gaseous Components (1) Component	mol/L	Lb/day
CO	2.25E-27	1.53E-20
CO_2	1.39E-07	1.48E+00
H_2O	1.24E-03	5.43E+03
NO	5.52E-31	4.02E-24
NO_2	3.40E-40	3.80E-33
N_2	2.96E-02	2.02E+05
O_2	7.88E-03	6.13E+04
SO_2	3.82E-28	5.95E-21
NH_3	2.64E-06	1.09E+01
HNO_3	5.46E-10	8.36E-03
HCl	2.21E-33	1.96E-26
HF	3.38E-33	1.64E-26

(1) All radionuclides in gaseous streams are assumed to exist as solid particulate.

Component	Aqueous Components mol/L	Lb/gal	Lb/day	Solid Components Lb/day	Total Component Lb/day	mt/day
Total	0.00E+00	0.00E+00	0.00E+00	2.66E-04	2.66E-04	1.20764E-07
Ag^+	0.00E+00	0.00E+00	0.00E+00	9.74E-13	9.74E-13	4.42522E-16
Al^{+3}	0.00E+00	0.00E+00	0.00E+00	2.01E-10	2.01E-10	9.14472E-14
As^{+3}	0.00E+00	0.00E+00	0.00E+00	2.61E-10	2.61E-10	1.18571E-13
B^{+3}	0.00E+00	0.00E+00	0.00E+00	7.28E-12	7.28E-12	3.31054E-15
Ba^{+2}	0.00E+00	0.00E+00	0.00E+00	4.89E-12	4.89E-12	2.22341E-15
Bi^{+3}	0.00E+00	0.00E+00	0.00E+00	2.69E-12	2.69E-12	1.22474E-15
$C_2O_4^{-2}$	0.00E+00	0.00E+00	0.00E+00	2.74E-12	2.74E-12	1.2443E-15
Ca^{+2}	0.00E+00	0.00E+00	0.00E+00	6.88E-10	6.88E-10	3.12801E-13
Cd^{+2}	0.00E+00	0.00E+00	0.00E+00	1.35E-11	1.35E-11	6.14347E-15
Ce^{+3}	0.00E+00	0.00E+00	0.00E+00	4.33E-12	4.33E-12	1.96717E-15
Cl^-	0.00E+00	0.00E+00	0.00E+00	4.34E-11	4.34E-11	1.97377E-14
CO_3^{-2}	0.00E+00	0.00E+00	0.00E+00	4.59E-10	4.59E-10	2.08653E-13
Cr^{+3}	0.00E+00	0.00E+00	0.00E+00	2.36E-11	2.36E-11	1.07048E-14
Cu^{+2}	0.00E+00	0.00E+00	0.00E+00	9.22E-13	9.22E-13	4.19243E-16
F^-	0.00E+00	0.00E+00	0.00E+00	5.02E-11	5.02E-11	2.28161E-14
Fe^{+3}	0.00E+00	0.00E+00	0.00E+00	4.80E-11	4.80E-11	2.1802E-14
H^+	0.00E+00	0.00E+00	0.00E+00		0.00E+00	0
H_2O	0.00E+00	0.00E+00	0.00E+00		0.00E+00	0
Hg^{+2}	0.00E+00	0.00E+00	0.00E+00	2.66E-04	2.66E-04	1.20762E-07
K^+	0.00E+00	0.00E+00	0.00E+00	1.78E-10	1.78E-10	8.06942E-14
La^{+3}	0.00E+00	0.00E+00	0.00E+00	2.72E-12	2.72E-12	1.23799E-15
Li^+	0.00E+00	0.00E+00	0.00E+00	1.05E-12	1.05E-12	4.75862E-16
Mg^{+2}	0.00E+00	0.00E+00	0.00E+00	2.61E-11	2.61E-11	1.18833E-14
Mn^{+3}	0.00E+00	0.00E+00	0.00E+00	1.45E-11	1.45E-11	6.58001E-15
MnO_4^-	0.00E+00	0.00E+00	0.00E+00		0.00E+00	0
Na^+	0.00E+00	0.00E+00	0.00E+00	6.93E-10	6.93E-10	3.15038E-13
NH_4^+	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0
Ni^{+2}	0.00E+00	0.00E+00	0.00E+00	5.51E-12	5.51E-12	2.50279E-15
NO_2^-	0.00E+00	0.00E+00	0.00E+00	2.05E-10	2.05E-10	9.31115E-14
NO_3^-	0.00E+00	0.00E+00	0.00E+00	1.09E-09	1.09E-09	4.95164E-13

River Protection Project - Waste Treatment Plant

Stream Number: PVP12
Stream Name: Carbon bed adsorber discharge
Configuration: 0
0
Run Data File: H:\Working Folder 2 (john)\MRQ_03_002_run2a_Streams.csv
Run Date / Time: 1/16/2003 - 1:27:28 PM

O^{-2}				1.05E-10	1.05E-10	4.77097E-14
OH^{-}	0.00E+00	0.00E+00	0.00E+00	8.20E-10	8.20E-10	3.72926E-13
$OH(b)^{-}$	0.00E+00	0.00E+00	0.00E+00		0.00E+00	0
P^{+5}				9.14E-17	9.14E-17	4.15479E-20
Pb^{+2}	0.00E+00	0.00E+00	0.00E+00	3.81E-12	3.81E-12	1.73308E-15
Pd^{+2}	0.00E+00	0.00E+00	0.00E+00	1.01E-13	1.01E-13	4.60419E-17
PO_4^{-3}	0.00E+00	0.00E+00	0.00E+00	2.05E-10	2.05E-10	9.34071E-14
S^{+6}				2.04E-13	2.04E-13	9.29222E-17
Si^{+4}				3.73E-11	3.73E-11	1.69654E-14
SiO_4^{-4}	0.00E+00	0.00E+00	0.00E+00		0.00E+00	0
SO_4^{-2}	0.00E+00	0.00E+00	0.00E+00	8.39E-11	8.39E-11	3.81357E-14
Sr^{+2}	0.00E+00	0.00E+00	0.00E+00	4.19E-13	4.19E-13	1.90495E-16
Ti^{+4}	0.00E+00	0.00E+00	0.00E+00	5.70E-12	5.70E-12	2.58866E-15
Zn^{+2}	0.00E+00	0.00E+00	0.00E+00	2.01E-12	2.01E-12	9.12022E-16
Zr^{+4}	0.00E+00	0.00E+00	0.00E+00	1.60E-11	1.60E-11	7.25411E-15

Rad. Component	Aqueous Rad. Components			Solids Rad. Components (1)		
	Ci/L	Ci/day	Lb/day	Ci/L	Ci/day	Lb/day
Total	0.00E+00	0.00E+00	0.00E+00	2.37E-09	2.61E-01	8.82E-07
^{241}Am	0	0.00E+00	0.00E+00	2.31E-19	2.55E-11	1.64E-14
^{14}C	0.00E+00	0.00E+00	0.00E+00	1.36E-13	1.50E-05	7.42E-09
^{60}Co	0.00E+00	0.00E+00	0.00E+00	3.82E-20	4.21E-12	8.21E-18
^{243}Cm	0.00E+00	0.00E+00	0.00E+00	1.10E-20	1.22E-12	5.31E-17
^{244}Cm	0.00E+00	0.00E+00	0.00E+00	8.28E-21	9.13E-13	2.49E-17
^{137}Cs	0.00E+00	0.00E+00	0.00E+00	4.09E-17	4.51E-09	1.14E-13
^{152}Eu	0.00E+00	0.00E+00	0.00E+00	4.43E-21	4.89E-13	6.20E-18
^{154}Eu	0.00E+00	0.00E+00	0.00E+00	1.44E-19	1.59E-11	1.29E-16
^{155}Eu	0.00E+00	0.00E+00	0.00E+00	9.26E-20	1.02E-11	4.63E-17
^{3}H	0.00E+00	0.00E+00	0.00E+00	2.37E-09	2.61E-01	6.00E-08
^{129}I	0.00E+00	0.00E+00	0.00E+00	5.92E-16	6.53E-08	8.15E-07
^{63}Ni	0.00E+00	0.00E+00	0.00E+00	1.83E-20	2.02E-12	7.84E-17
^{237}Np	0.00E+00	0.00E+00	0.00E+00	2.75E-22	3.04E-14	9.50E-14
^{238}Pu	0.00E+00	0.00E+00	0.00E+00	9.02E-22	9.94E-14	1.28E-17
^{239}Pu	0.00E+00	0.00E+00	0.00E+00	8.00E-21	8.82E-13	3.13E-14
^{240}Pu	0.00E+00	0.00E+00	0.00E+00	4.46E-22	4.92E-14	4.77E-16
^{241}Pu	0.00E+00	0.00E+00	0.00E+00	5.66E-20	6.24E-12	1.34E-16
^{125}Sb	0.00E+00	0.00E+00	0.00E+00	1.32E-19	1.45E-11	3.09E-17
^{151}Sm	0.00E+00	0.00E+00	0.00E+00	8.64E-19	9.53E-11	7.98E-15
^{126}Sn	0.00E+00	0.00E+00	0.00E+00	7.54E-22	8.32E-14	1.61E-14
^{90}Sr	0.00E+00	0.00E+00	0.00E+00	2.77E-17	3.06E-09	4.88E-14
^{99}Tc	0.00E+00	0.00E+00	0.00E+00	1.04E-19	1.15E-11	1.50E-12
^{232}Th	0.00E+00	0.00E+00	0.00E+00	4.80E-24	5.29E-16	1.06E-11
^{233}U	0.00E+00	0.00E+00	0.00E+00	4.23E-23	4.67E-15	1.07E-15
^{234}U	0.00E+00	0.00E+00	0.00E+00	3.47E-23	3.83E-15	1.36E-15
^{235}U	0.00E+00	0.00E+00	0.00E+00	1.80E-24	1.98E-16	2.02E-13

BY: E. Berrios
Date: 03/27/03

CALCULATION SHEET

PROJECT: RPP-WTP
JOB NO.: 24590
CALC NO.: 24590-WTP-M4C-FRP-00002
SHEET REV: 0A
SHEET NO.: 16

Subject: Integrated Emissions Report PIC Estimation

River Protection Project - Waste Treatment Plant

Stream Number: LVP26
Stream Name: Activated Carbon Column discharge to stack
Configuration: 0
0
Run Data File: H:\Working Folder 2 (john)\MRQ_03_002_run2a_Streams.csv
Run Date / Time: 1/16/2003 - 1:27:28 PM

Stream Properties Variable	Value	Units
Density	9.16E-04	g/cm^3
Enthalpy	-6.56E+06	BTU/hr
Mass Flow	1.56E+04	Lb/hr
	3.75E+05	Lb/day
Volumetric Flow	3.40E+04	GPM
Molar Flow	5.50E+02	Lbmol/hr
Volumetric Flow	5.99E+03	ft^3/min
Molecular Weight	2.84E+01	Lb/Lbmol
Pressure	1.00E+03	mbar
Temperature	1.00E+02	C
Viscosity	2.14E-02	cP
Na Molarity	0.00E+00	mol/L
pH	#NUM!	pH
Total TRU	6.08E-19	Ci/L
Total Activity	5.27E-09	Ci/L

Gaseous Components (1) Component	mol/L	Lb/day
CO	1.05E-06	1.21E+01
CO_2	8.62E-04	1.55E+04
H_2O	2.59E-03	1.91E+04
NO	1.44E-05	1.76E+02
NO_2	1.31E-06	2.46E+01
N_2	2.25E-02	2.58E+05
O_2	6.27E-03	8.21E+04
SO_2	7.69E-07	2.01E+01
NH_3	8.92E-07	6.22E+00
HNO_3	3.21E-27	8.29E-20
HCl	4.99E-07	7.45E+00
HF	1.32E-07	1.08E+00

(1) All radionuclides in gaseous streams are assumed to exist as solid particulate.

Component	Aqueous Components mol/L	Lb/gal	Lb/day	Solid Components Lb/day	Total Component Lb/day	mt/day
Total	0.00E+00	0.00E+00	0.00E+00	4.21E+01	4.21E+01	0.019121167
Ag^+	0.00E+00	0.00E+00	0.00E+00	7.05E-09	7.05E-09	3.20523E-12
Al^{+3}	0.00E+00	0.00E+00	0.00E+00	4.33E-07	4.33E-07	1.96948E-10
As^{+3}	0.00E+00	0.00E+00	0.00E+00	8.88E-05	8.88E-05	4.03514E-08
B^{+3}	0.00E+00	0.00E+00	0.00E+00	1.99E-06	1.99E-06	9.05419E-10
Ba^{+2}	0.00E+00	0.00E+00	0.00E+00	1.99E-10	1.99E-10	9.0331E-14
Bi^{+3}	0.00E+00	0.00E+00	0.00E+00	7.74E-09	7.74E-09	3.51926E-12
$C_2O_4^{-2}$	0.00E+00	0.00E+00	0.00E+00	2.72E+01	2.72E+01	0.01235332
Ca^{+2}	0.00E+00	0.00E+00	0.00E+00	1.59E-06	1.59E-06	7.20568E-10
Cd^{+2}	0.00E+00	0.00E+00	0.00E+00	5.52E-07	5.52E-07	2.50836E-10
Ce^{+3}	0.00E+00	0.00E+00	0.00E+00	2.08E-09	2.08E-09	9.46574E-13
Cl^-	0.00E+00	0.00E+00	0.00E+00	1.33E-06	1.33E-06	6.04154E-10
CO_3^{-2}	0.00E+00	0.00E+00	0.00E+00	7.05E-10	7.05E-10	3.20546E-13
Cr^{+3}	0.00E+00	0.00E+00	0.00E+00	3.65E-07	3.65E-07	1.65872E-10
Cu^{+2}	0.00E+00	0.00E+00	0.00E+00	1.15E-09	1.15E-09	5.2105E-13
F^-	0.00E+00	0.00E+00	0.00E+00	2.06E-06	2.06E-06	9.3532E-10
Fe^{+3}	0.00E+00	0.00E+00	0.00E+00	2.56E-07	2.56E-07	1.16526E-10
H^+	0.00E+00	0.00E+00	0.00E+00		0.00E+00	0
H_2O	0.00E+00	0.00E+00	0.00E+00		0.00E+00	0
Hg^{+2}	0.00E+00	0.00E+00	0.00E+00	1.33E-02	1.33E-02	6.0228E-06
K^+	0.00E+00	0.00E+00	0.00E+00	5.15E-06	5.15E-06	2.34107E-09
La^{+3}	0.00E+00	0.00E+00	0.00E+00	4.32E-10	4.32E-10	1.96591E-13
Li^+	0.00E+00	0.00E+00	0.00E+00	1.24E-06	1.24E-06	5.62212E-10
Mg^{+2}	0.00E+00	0.00E+00	0.00E+00	1.94E-07	1.94E-07	8.80755E-11
Mn^{+3}	0.00E+00	0.00E+00	0.00E+00	1.70E-08	1.70E-08	7.73996E-12
MnO_4^-	0.00E+00	0.00E+00	0.00E+00		0.00E+00	0
Na^+	0.00E+00	0.00E+00	0.00E+00	6.73E-06	6.73E-06	3.0612E-09
NH_4^+	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0
Ni^{+2}	0.00E+00	0.00E+00	0.00E+00	2.41E-08	2.41E-08	1.0973E-11
NO_2^-	0.00E+00	0.00E+00	0.00E+00	2.55E-10	2.55E-10	1.1576E-13
NO_3^-	0.00E+00	0.00E+00	0.00E+00	1.32E-09	1.32E-09	5.98822E-13

BY: E. Berrios
Date: 03/27/03

CALCULATION SHEET

PROJECT: RPP-WTP
JOB NO.: 24590
CALC NO.: 24590-WTP-M4C-FRP-00002
SHEET REV: 0A
SHEET NO.: 17

Subject: Integrated Emissions Report PIC Estimation

River Protection Project - Waste Treatment Plant

Stream Number: LVP26
Stream Name: Activated Carbon Column discharge to stack
Configuration: 0
0
Run Data File: H:\Working Folder 2 (john)\MRQ_03_002_run2a_Streams.csv
Run Date / Time: 1/16/2003 - 1:27:28 PM

O^{-2}				1.29E+01	1.29E+01	0.005844906
OH^-	0.00E+00	0.00E+00	0.00E+00	6.10E-10	6.10E-10	2.77228E-13
$OH(b)^-$	0.00E+00	0.00E+00	0.00E+00		0.00E+00	0
P^{+5}				7.32E-05	7.32E-05	3.3282E-08
Pb^{+2}	0.00E+00	0.00E+00	0.00E+00	1.45E-08	1.45E-08	6.59743E-12
Pd^{+2}	0.00E+00	0.00E+00	0.00E+00	1.51E-11	1.51E-11	6.87093E-15
PO_4^{-3}	0.00E+00	0.00E+00	0.00E+00	1.80E-10	1.80E-10	8.1639E-14
S^{+6}				2.02E+00	2.02E+00	0.000916828
Si^{+4}				1.33E-06	1.33E-06	6.03056E-10
SiO_4^{-4}	0.00E+00	0.00E+00	0.00E+00		0.00E+00	0
SO_4^{-2}	0.00E+00	0.00E+00	0.00E+00	9.79E-11	9.79E-11	4.44956E-14
Sr^{+2}	0.00E+00	0.00E+00	0.00E+00	1.51E-10	1.51E-10	6.87732E-14
Ti^{+4}	0.00E+00	0.00E+00	0.00E+00	1.16E-05	1.16E-05	5.2849E-09
Zn^{+2}	0.00E+00	0.00E+00	0.00E+00	6.12E-07	6.12E-07	2.78335E-10
Zr^{+4}	0.00E+00	0.00E+00	0.00E+00	1.37E-07	1.37E-07	6.20706E-11

Rad. Component	Aqueous Rad. Components			Solids Rad. Components (1)		
	Ci/L	Ci/day	Lb/day	Ci/L	Ci/day	Lb/day
Total	0.00E+00	0.00E+00	0.00E+00	5.27E-09	9.78E-01	1.56E-03
^{241}Am	0	0.00E+00	0.00E+00	4.39E-19	8.16E-11	5.25E-14
^{14}C	0.00E+00	0.00E+00	0.00E+00	4.93E-09	9.14E-01	4.51E-04
^{60}Co	0.00E+00	0.00E+00	0.00E+00	2.73E-18	5.07E-10	9.88E-16
^{243}Cm	0.00E+00	0.00E+00	0.00E+00	1.18E-21	2.18E-13	9.52E-18
^{244}Cm	0.00E+00	0.00E+00	0.00E+00	1.26E-21	2.34E-13	6.38E-18
^{137}Cs	0.00E+00	0.00E+00	0.00E+00	1.73E-16	3.22E-08	8.17E-13
^{152}Eu	0.00E+00	0.00E+00	0.00E+00	1.53E-18	2.84E-10	3.60E-15
^{154}Eu	0.00E+00	0.00E+00	0.00E+00	5.08E-18	9.42E-10	7.68E-15
^{155}Eu	0.00E+00	0.00E+00	0.00E+00	8.74E-18	1.62E-09	7.36E-15
^{3}H	0.00E+00	0.00E+00	0.00E+00	3.44E-10	6.39E-02	1.47E-08
^{129}I	0.00E+00	0.00E+00	0.00E+00	4.78E-13	8.87E-05	1.11E-03
^{63}Ni	0.00E+00	0.00E+00	0.00E+00	2.13E-17	3.96E-09	1.54E-13
^{237}Np	0.00E+00	0.00E+00	0.00E+00	1.89E-21	3.50E-13	1.10E-12
^{238}Pu	0.00E+00	0.00E+00	0.00E+00	2.55E-21	4.73E-13	6.09E-17
^{239}Pu	0.00E+00	0.00E+00	0.00E+00	2.98E-20	5.53E-12	1.96E-13
^{240}Pu	0.00E+00	0.00E+00	0.00E+00	5.13E-21	9.53E-13	9.25E-15
^{241}Pu	0.00E+00	0.00E+00	0.00E+00	1.27E-19	2.36E-11	5.05E-16
^{125}Sb	0.00E+00	0.00E+00	0.00E+00	4.61E-16	8.56E-08	1.82E-13
^{151}Sm	0.00E+00	0.00E+00	0.00E+00	2.90E-16	5.39E-08	4.51E-12
^{126}Sn	0.00E+00	0.00E+00	0.00E+00	1.76E-19	3.26E-11	6.33E-12
^{90}Sr	0.00E+00	0.00E+00	0.00E+00	1.90E-15	3.52E-07	5.62E-12
^{99}Tc	0.00E+00	0.00E+00	0.00E+00	1.29E-16	2.40E-08	3.12E-09
^{232}Th	0.00E+00	0.00E+00	0.00E+00	6.50E-22	1.21E-13	2.42E-09
^{233}U	0.00E+00	0.00E+00	0.00E+00	1.21E-20	2.24E-12	5.13E-13
^{234}U	0.00E+00	0.00E+00	0.00E+00	7.03E-21	1.30E-12	4.63E-13
^{235}U	0.00E+00	0.00E+00	0.00E+00	2.71E-22	5.03E-14	5.14E-11

BY: E. Berrios
Date: 03/27/03

CALCULATION SHEET

PROJECT: RPP-WTP
JOB NO.: 24590
CALC NO.: 24590-WTP-M4C-FRP-00002
SHEET REV: 0A
SHEET NO.: 18

Subject: Integrated Emissions Report PIC Estimation

River Protection Project - Waste Treatment Plant

Stream Number: HOP33
Stream Name: Activated Carbon Adsorber Discharge
Configuration: 0
0
Run Data File: H:\Working Folder 2 (john)\MRQ_03_002_run2a_Streams.csv
Run Date / Time: 1/16/2003 - 1:27:28 PM

Stream Properties Variable	Value	Units
Density	9.12E-04	g/cm^3
Enthalpy	-4.93E+06	BTU/hr
Mass Flow	5.38E+03	Lb/hr
	1.29E+05	Lb/day
Volumetric Flow	1.18E+04	GPM
Molar Flow	2.01E+02	Lbmol/hr
Volumetric Flow	3.04E+03	ft^3/min
Molecular Weight	2.67E+01	Lb/Lbmol
Pressure	1.00E+03	mbar
Temperature	8.00E+01	C
Viscosity	1.99E-02	cP
Na Molarity	0.00E+00	mol/L
pH	#NUM!	pH
Total TRU	1.42E-17	Ci/L
Total Activity	1.03E-08	Ci/L

Gaseous Components (1) Component	mol/L	Lb/day
CO	5.04E-07	2.00E+00
CO_2	5.29E-04	3.29E+03
H_2O	7.41E-03	1.89E+04
NO	9.63E-06	4.09E+01
NO_2	8.78E-07	5.71E+00
N_2	2.05E-02	8.13E+04
O_2	5.61E-03	2.54E+04
SO_2	2.93E-06	2.65E+01
NH_3	1.49E-06	3.59E+00
HNO_3	4.97E-13	4.43E-06
HCl	3.63E-09	1.87E-02
HF	6.36E-10	1.80E-03

(1) All radionuclides in gaseous streams are assumed to exist as solid particulate.

Component	Aqueous Components mol/L	Lb/gal	Lb/day	Solid Components Lb/day	Total Component Lb/day	mt/day
Total	0.00E+00	0.00E+00	0.00E+00	3.51E+01	3.51E+01	0.015963128
Ag^+	0.00E+00	0.00E+00	0.00E+00	2.56E-10	2.56E-10	1.16498E-13
Al^{+3}	0.00E+00	0.00E+00	0.00E+00	7.33E-10	7.33E-10	3.33301E-13
As^{+3}	0.00E+00	0.00E+00	0.00E+00	3.15E-06	3.15E-06	1.43147E-09
B^{+3}	0.00E+00	0.00E+00	0.00E+00	2.28E-09	2.28E-09	1.03759E-12
Ba^{+2}	0.00E+00	0.00E+00	0.00E+00	6.12E-11	6.12E-11	2.78132E-14
Bi^{+3}	0.00E+00	0.00E+00	0.00E+00	4.37E-10	4.37E-10	1.98494E-13
$C_2O_4^{-2}$	0.00E+00	0.00E+00	0.00E+00	6.19E+00	6.19E+00	0.002814666
Ca^{+2}	0.00E+00	0.00E+00	0.00E+00	8.01E-10	8.01E-10	3.642E-13
Cd^{+2}	0.00E+00	0.00E+00	0.00E+00	4.70E-09	4.70E-09	2.13689E-12
Ce^{+3}	0.00E+00	0.00E+00	0.00E+00	1.58E-11	1.58E-11	7.16399E-15
Cl^-	0.00E+00	0.00E+00	0.00E+00	1.50E-12	1.50E-12	6.82381E-16
CO_3^{-2}	0.00E+00	0.00E+00	0.00E+00	6.97E-13	6.97E-13	3.16673E-16
Cr^{+3}	0.00E+00	0.00E+00	0.00E+00	6.22E-10	6.22E-10	2.82712E-13
Cu^{+2}	0.00E+00	0.00E+00	0.00E+00	3.40E-11	3.40E-11	1.544E-14
F^-	0.00E+00	0.00E+00	0.00E+00	4.85E-12	4.85E-12	2.20682E-15
Fe^{+3}	0.00E+00	0.00E+00	0.00E+00	4.92E-10	4.92E-10	2.23791E-13
H^+	0.00E+00	0.00E+00	0.00E+00		0.00E+00	0
H_2O	0.00E+00	0.00E+00	0.00E+00		0.00E+00	0
Hg^{+2}	0.00E+00	0.00E+00	0.00E+00	2.40E-03	2.40E-03	1.09181E-06
K^+	0.00E+00	0.00E+00	0.00E+00	5.71E-09	5.71E-09	2.59329E-12
La^{+3}	0.00E+00	0.00E+00	0.00E+00	9.17E-11	9.17E-11	4.16849E-14
Li^+	0.00E+00	0.00E+00	0.00E+00	6.46E-10	6.46E-10	2.93521E-13
Mg^{+2}	0.00E+00	0.00E+00	0.00E+00	7.12E-11	7.12E-11	3.23559E-14
Mn^{+3}	0.00E+00	0.00E+00	0.00E+00	4.05E-10	4.05E-10	1.84053E-13
MnO_4^-	0.00E+00	0.00E+00	0.00E+00		0.00E+00	0
Na^+	0.00E+00	0.00E+00	0.00E+00	1.16E-08	1.16E-08	5.27802E-12
NH_4^+	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0
Ni^{+2}	0.00E+00	0.00E+00	0.00E+00	3.31E-10	3.31E-10	1.50242E-13
NO_2^-	0.00E+00	0.00E+00	0.00E+00	2.59E-13	2.59E-13	1.17807E-16
NO_3^-	0.00E+00	0.00E+00	0.00E+00	1.81E-12	1.81E-12	8.20992E-16

BY: E. Berrios
Date: 03/27/03

CALCULATION SHEET

PROJECT: RPP-WTP
JOB NO.: 24590
CALC NO.: 24590-WTP-M4C-FRP-00002
SHEET REV: 0A
SHEET NO.: 19

Subject: Integrated Emissions Report PIC Estimation

River Protection Project - Waste Treatment Plant

Stream Number: HOP33
Stream Name: Activated Carbon Adsorber Discharge
Configuration: 0
0
Run Data File: H:\Working Folder 2 (john)\MRQ_03_002_run2a_Streams.csv
Run Date / Time: 1/16/2003 - 1:27:28 PM

O^{-2}				2.63E+01	2.63E+01	0.011941357
OH^-	0.00E+00	0.00E+00	0.00E+00	2.26E-12	2.26E-12	1.02795E-15
$OH(b)^-$	0.00E+00	0.00E+00	0.00E+00		0.00E+00	0
P^{+5}				1.62E-05	1.62E-05	7.37293E-09
Pb^{+2}	0.00E+00	0.00E+00	0.00E+00	1.09E-10	1.09E-10	4.96216E-14
Pd^{+2}	0.00E+00	0.00E+00	0.00E+00	2.17E-12	2.17E-12	9.87862E-16
PO_4^{-3}	0.00E+00	0.00E+00	0.00E+00	2.65E-13	2.65E-13	1.20571E-16
S^{+6}				2.65E+00	2.65E+00	0.001206005
Si^{+4}				1.51E-09	1.51E-09	6.85979E-13
SiO_4^{-4}	0.00E+00	0.00E+00	0.00E+00		0.00E+00	0
SO_4^{-2}	0.00E+00	0.00E+00	0.00E+00	8.58E-14	8.58E-14	3.90203E-17
Sr^{+2}	0.00E+00	0.00E+00	0.00E+00	1.75E-11	1.75E-11	7.95438E-15
Ti^{+4}	0.00E+00	0.00E+00	0.00E+00	9.37E-09	9.37E-09	4.26096E-12
Zn^{+2}	0.00E+00	0.00E+00	0.00E+00	4.69E-10	4.69E-10	2.13289E-13
Zr^{+4}	0.00E+00	0.00E+00	0.00E+00	2.21E-10	2.21E-10	1.00502E-13

Rad. Component	Aqueous Rad. Components			Solids Rad. Components (1)		
	Ci/L	Ci/day	Lb/day	Ci/L	Ci/day	Lb/day
Total	0.00E+00	0.00E+00	0.00E+00	1.03E-08	6.61E-01	1.26E-04
^{241}Am	0	0.00E+00	0.00E+00	1.06E-17	6.77E-10	4.36E-13
^{14}C	0.00E+00	0.00E+00	0.00E+00	2.51E-09	1.61E-01	7.96E-05
^{60}Co	0.00E+00	0.00E+00	0.00E+00	6.57E-18	4.22E-10	8.22E-16
^{243}Cm	0.00E+00	0.00E+00	0.00E+00	3.52E-19	2.26E-11	9.84E-16
^{244}Cm	0.00E+00	0.00E+00	0.00E+00	2.64E-19	1.69E-11	4.61E-16
^{137}Cs	0.00E+00	0.00E+00	0.00E+00	3.46E-14	2.22E-06	5.63E-11
^{152}Eu	0.00E+00	0.00E+00	0.00E+00	6.12E-20	3.92E-12	4.98E-17
^{154}Eu	0.00E+00	0.00E+00	0.00E+00	6.12E-18	3.92E-10	3.20E-15
^{155}Eu	0.00E+00	0.00E+00	0.00E+00	3.43E-18	2.20E-10	9.98E-16
^{3}H	0.00E+00	0.00E+00	0.00E+00	7.78E-09	4.99E-01	1.15E-07
^{129}I	0.00E+00	0.00E+00	0.00E+00	5.73E-14	3.67E-06	4.58E-05
^{63}Ni	0.00E+00	0.00E+00	0.00E+00	4.31E-18	2.76E-10	1.07E-14
^{237}Np	0.00E+00	0.00E+00	0.00E+00	8.68E-21	5.57E-13	1.74E-12
^{238}Pu	0.00E+00	0.00E+00	0.00E+00	4.11E-20	2.63E-12	3.39E-16
^{239}Pu	0.00E+00	0.00E+00	0.00E+00	3.64E-19	2.33E-11	8.29E-13
^{240}Pu	0.00E+00	0.00E+00	0.00E+00	1.99E-20	1.28E-12	1.24E-14
^{241}Pu	0.00E+00	0.00E+00	0.00E+00	2.58E-18	1.66E-10	3.54E-15
^{125}Sb	0.00E+00	0.00E+00	0.00E+00	6.77E-17	4.35E-09	9.23E-15
^{151}Sm	0.00E+00	0.00E+00	0.00E+00	1.27E-17	8.12E-10	6.80E-14
^{126}Sn	0.00E+00	0.00E+00	0.00E+00	1.82E-20	1.16E-12	2.26E-13
^{90}Sr	0.00E+00	0.00E+00	0.00E+00	2.36E-15	1.52E-07	2.42E-12
^{99}Tc	0.00E+00	0.00E+00	0.00E+00	9.36E-16	6.00E-08	7.81E-09
^{232}Th	0.00E+00	0.00E+00	0.00E+00	9.41E-23	6.04E-15	1.21E-10
^{233}U	0.00E+00	0.00E+00	0.00E+00	1.45E-22	9.27E-15	2.12E-15
^{234}U	0.00E+00	0.00E+00	0.00E+00	4.06E-22	2.61E-14	9.25E-15
^{235}U	0.00E+00	0.00E+00	0.00E+00	3.02E-23	1.94E-15	1.98E-12

F

Appendix F
Phase Determination for COPCs Potentially Emitted from the Hanford Tank Waste Treatment and Immobilization Plant (WTP)

CNN 057415

057415 R10007466

Memorandum

An Employee-Owned Company

To: John Cook

From: Gary Bertolin

Date: 5/2/2003

Re: Phase Determination for COPCs Potentially Emitted from the Hanford Tank Waste Treatment and Immobilization Plant (WTP)

1.0 Purpose

This memorandum presents the methodology used to determine the phase type (vapor phase, particle-bound phase, and particle phase) for constituents of potential concern (COPCs) that have been identified as important to ongoing WTP risk assessment and air permitting activities. The phase type assigned to each COPC is important because it affects the decontamination factor assigned to that COPC through each step of the offgas processing system.

2.0 Criteria and Design Inputs

The calculation procedure and some of the data for COPCs were derived from the draft *Human Health Risk Assessment Protocol for Hazardous Waste Combustion Facilities* [HHRAP] (EPA, 1998). Other vapor pressure data were obtained from Syracuse Research Corporation's online Physical Properties Database PhysProp at the website: http://www.chemfinder.com.

3.0 Applicable Codes and Standards

None.

4.0 Methodology

For the purposes of developing the project emissions inventory and air dispersion modeling, the constituents of potential concern (COPCs) were partitioned into three phase types: vapor phase, particle phase, and particle-bound phase. The phase type of a COPC affects the efficiency of the offgas control system for that compound. For example, the particle and particle-bound phases will be attenuated by HEPA filtration, whereas the vapor phase constituents will not.

Most metals and organic COPCs with very low volatility (or vapor pressure) are assumed to occur only in the particle phase. Organic COPCs with higher vapor pressures occur entirely in the vapor phase, while organic COPCs with low volatility are condensed onto the surface of particulates (particle-bound). This memorandum documents the approach used to establish the phase type for each COPC.

The draft Human Health Risk Assessment Protocol (HHRAP) for Hazardous Waste Combustion Facilities (EPA Region 6, 1998) provides a suggested approach for determining the phase of each COPC. It is based on a unitless parameter (F_v) with a range of 0.0 to 1.0, defined as the fraction of the COPC that is in the vapor phase. COPCs with F_v values approaching 0.0 have low vapor pressures and are considered to be primarily in the particle phase, while COPCs with F_v values of 1.0 have high vapor pressures and are therefore considered to exist primarily in the vapor phase. COPCs with intermediate F_v values are considered to be in the particle-bound phase.

The following criteria are the basis for determining the phase type of a COPC:

$F_v < 0.05$; phase type = particle
$F_v = 1.0$; phase type = vapor
$0.05 \leq F_v < 1.0$; phase type = particle-bound

Certain COPCs, such as all metals (with the exception of mercury), are considered to be nonvolatile and are therefore assigned an F_v of 0.0 and are particles (EPA Region 6, 1998). Mercury, however, is slightly volatile with a vapor pressure of 2.0×10^{-3} mm Hg at 25°C, and is assigned an F_v of 1.0. Radionuclides, with the exception of tritium, carbon-14, and iodine-129, are also considered to be metals and are therefore assigned an F_v of 0.0. Tritium is always found as a vapor at ambient conditions. Carbon-14 is assumed to exist as $^{14}CO_2$, and is therefore considered to be a vapor phase compound. Iodine-129 has a vapor pressure of 0.3 mm Hg at 20°C and has an F_v of 1.0.

The F_v value and phase type for all other COPCs is determined by using the equations presented in Section 7.

5.0 Assumptions and Other Applicable Data

Assumptions and other applicable data applied within this calculation include:

- The vapor pressure and other physical parameters of each COPC,
- The use of F_v as a method of determining the phase type.

6.0 References

Bidleman, T.F., 1988. Atmospheric Processes. *Environmental Science and Technology.* Volume 22, Pages 361-367.

EPA, 1998. *Human Health Risk Assessment Protocol for Hazardous Waste Combustion Facilities, Volume 1 (Text).* Peer Review Draft. EPA530-D-98-001A, Office of Solid Waste and Emergency Response.

EPA, 1998. *Human Health Risk Assessment Protocol for Hazardous Waste Combustion Facilities, Volume 2 (Appendix A).* Peer Review Draft. EPA530-D-98-001B, Office of Solid Waste and Emergency Response.

EPA, 1999. Errata - *Human Health Risk Assessment Protocol for Hazardous Waste Combustion Facilities.* Peer Review Draft. Office of Solid Waste and Emergency Response.

7.0 Calculations

This section presents the calculations used to determine the Fv.

7.1 Calculation of F_v Values

For organic COPCs that are liquid at ambient conditions, F_v is defined by the following equation

$$F_v = 1 - (cS_T)/(p°_L + cS_T) \qquad \textbf{Equation 1}$$

where,

F_v = Fraction of compound in the vapor phase (unitless)
c = Junge constant (1.7×10^{-04} atm-cm)
$p°_L$ = Liquid phase vapor pressure of compound (atm)
S_T = Whitby's average surface area of particulates (3.5×10^{-06} cm^2/cm^3 air)

Bidleman (1998) determined that F_v is explained better by the liquid phase vapor pressure ($p°_L$) then the solid phase vapor pressure ($p°_s$). Therefore, if a COPC is a solid at ambient conditions, the following equation must be used to determine the liquid phase vapor pressure of the COPC before calculating F_v in Equation 1.

$$\text{Ln}\,(p°_L / p°_s) = \Delta S_f/R \cdot (T_m - T_a)/ T_a \qquad \textbf{Equation 2}$$

where,

p^{o}_{L} = Liquid-phase vapor pressure of chemical (atm)
p^{o}_{s} = Solid-phase vapor pressure of chemical (atm)
$\Delta S_f/R$ = Entropy of fusion over the universal gas constant = 6.79 (unitless)
T_m = Melting point of chemical (^{o}K)
T_a = Ambient temperature = 298°K

7.2 Source and Interpretation of F_v Values

F_v is a unitless parameter used to classify a COPC as being in one of three categories: a vapor phase, particle phase, or particle-bound compound. F_v is defined as the fraction of the COPC in the vapor phase, so assigning a COPC to a single state is a somewhat simplistic method. However, because most organic COPCs are identified as being in the vapor phase, this is a conservative (or health-protective) approach when determining destruction efficiencies and emission rates, because vapor phase compounds are more difficult to control as effectively as particle or particle-bound compounds.

Appendix A-3 specifies the individual Fv values for 163 of the WTP's 370 organic COPCs. The Fv values for 11 of the compounds listed in Appendix A-3 were found to have been corrected and/or added by EPA in an Errata to the HHRAP dated August 2, 1999 (EPA 1999). The corrected values were used in the emissions analysis. The Fv values for organic constituents not specified in the HHRAP documents were calculated using Equations 1 & 2, presented above. Finally, there were 11 organic COPCs whose vapor pressures were not readily available. The offgas phase for these constituents were determined by reviewing the physical properties of the constituent and by comparison to Fv values available for constituents with similar structure and physical properties.

The following hierarchy and criteria was established and followed in determining organic constituent phase.

- If an Fv value is specified in EPA's Errata (EPA 1999), the value has been taken exactly as it appears with no rounding applied. For example, in the Errata the COPC 4-chloro-3-methyl phenol has an Fv of 0.999972. This constituent was therefore considered to be a particle-bound compound.

- If an Fv value is not available in the Errata, but is available in Appendix A-3 of the HHRAP (EPA 1998), it also has been taken as it appears with no rounding applied. In nearly all cases, the Fv values in Appendix A-3 are provided to three decimal places.

- If no Fv value is available in EPA guidance and the vapor pressure of the COPC could be readily obtained, the Fv has been calculated and rounded to three decimal places. The decision to round to three decimal places was made to maintain consistency with EPA in their handling of the values provided in Appendix A-3.

- If no vapor pressure data was readily available for a constituent, the phase of the constituent was established by considering the Fv value of a known constituent that had similar properties. For example, in 6 of the 11 cases, the missing vapor pressures were associated with polychlorinated biphenyl compounds (PCBs). The phase for these constituents was assumed to be particle-bound, since other PCBs for which Fv values were available fell within the particle-bound range.

7.4 Temperature Dependence on Phase Type

For those COPCs already classified as vapor phase compounds, increases in the temperature during the vitrification process will not have an effect on the phase type. This is also true of the metals, which are classified as particle phase substances, with the exception of mercury.

The only potential temperature effect may be on some of the semi-volatile organic COPCs, which might shift phase type from particle-bound to vapor phase. The temperature range of interest during the processing was determined to be 25°C and 70°C. Most of the compounds in the particle-bound phase were solids throughout this temperature range. Unfortunately, vapor pressure data for temperatures other than the standard 25°C were not readily available.

However, vapor pressures for one compound were found, dibutyl phthalate. The calculated F_v values for dibutyl phthalate were 0.989 at 25°C and 0.999 at 70°C. The conclusion is that this compound is in the particle-bound phase at both temperatures, and temperatures within this range do not appear to have significant effect on the phase type of a compound.

7.5 Discussion on the Phase Type of Dioxin and Furan Compounds

Because of the high toxicity associated with dioxin and furan compounds, a special emphasis was placed on correctly identifying their phase types. The HHRAP document discusses the partitioning of dioxin-like compounds between the vapor and particle phases (Section 2.3.1). It states that evaluation of ambient air monitoring studies suggests that the higher chlorinated congeners (hexa through hepta congeners) were principally absorbed to airborne particulates, whereas the tetra and penta congeners were significantly partitioned to the vapor phase.

However, in the very next section of the HHRAP document (Section 3-16), a quantitative method was presented to determine the primary phase of a COPC. This approach is the method outlined in this memo, using the F_v parameter. Table 1 provides the F_v values for a number of tetra through octa congeners of dioxins and furans. The F_v values come directly from Volume 2, Appendix A of the HHRAP document.

Note that the F_v values in Table 1 for the tetra and penta congeners of dioxins and furans are all in the particle-bound range (F_v = 0.21 to 0.66), well below the vapor phase threshold (F_v = 1.0). F_v values for the hexa, hepta, and octa congeners are in the range of 0.0017 to 0.0596, meaning that these compounds are all at or below the 0.05 threshold for particles. In conclusion, this quantitative analysis indicates that the congeners of dioxins and furans should all be classified as either particle-bound or particles. This conclusion is supported by review of the physical state of these compounds, since they are all solids at ambient conditions, with melting points ranging from 196°C to 325°C.

8.0 Summary

These calculations provide the basis for determining the phase type of each COPC identified in the WTP emissions estimate used to support permitting. Appendix A presents selected data for each of the COPCs being evaluated, including phase type, F_v value, and vapor pressure (when available). The results are used in determining the decontamination factor for each COPC in the offgas processing system

9.0 Conclusion

The sources of data, methods, and results of this analysis are consistent with appropriate regulatory guidance.

Table 1. Vapor Phase Partitioning (F_v) for Congeners of Dioxins and Furans.

Congener	*F_v Value for Dioxin*	*F_v Value for Furan*
Tetra		
2,3,7,8-	0.490	0.663
Penta		
1,2,3,7,8-	0.219	0.364
2,3,4,7,8-	n/a	0.263
Hexa		
1,2,3,4,7,8-	0.0596	0.0486
1,2,3,6,7,8-	0.0289	0.0515
1,2,3,7,8,9-	0.0153	0.0576
2,3,4,6,7,8-	n/a	0.0547
Hepta		
1,2,3,4,6,7,8-	0.0162	0.0347
1,2,3,4,7,8,9-	n/a	0.0201
Octa		
1,2,3,4,6,7,8,9-	0.00169	0.00167

Appendix A

Data for Individual COPCs

COPC Identification

No.	CAS Registry Number	Compound	Offgas Phase Type	Fv	Vapor Pressure at Ambient Conditions (atm)	Source/Basis for Fv Value
1	100-00-5	p-Nitrochlorobenzene	vapor	1.000	2.88E-05	calc
2	100-21-0	p-Phthalic acid	vapor	1.000	1.21E-08	calc
3	100-25-4	1,4-Dinitrobenzene	particle-bound	0.999	3.43E-08	calc
4	100-41-4	Ethyl benzene	vapor	1	1.26E-02	App. A-3
5	100-42-5	Styrene	vapor	1	8.21E-02	App. A-3
6	10061-01-5	cis-1,3-Dichloropropene	vapor	1.000	4.11E-02	calc
7	10061-02-6	trans-1,3-Dichloropropene	vapor	1.000	4.63E-01	calc
8	101-55-3	4-Bromophenylphenyl ether	vapor	1	1.97E-06	App. A-3
9	101-84-8	Diphenyl ether	vapor	1.000	2.96E-05	calc
10	106-35-4	3-Heptanone	vapor	1.000	3.40E-03	calc
11	106-42-3	p-Xylene (Dimethyl benzene)	vapor	1	1.06E-02	App. A-3
12	106-46-7	1,4-Dichlorobenzene	vapor	1	1.39E-03	App. A-3
13	106-88-7	1,2-Epoxybutane	vapor	1.000	2.36E-01	calc
14	106-93-4	Ethylene dibromide (Dibromethane)	vapor	1	1.00E-02	App. A-3
15	106-97-8	Butane	vapor	1.000	2.40E+00	calc
16	106-99-0	1,3-Butadiene	vapor	1.000	2.78E+00	calc
17	107-02-8	Acrolein	vapor	1	3.50E+00	App. A-3
18	107-05-1	3-Chloropropene (Allyl chloride)	vapor	1.000	4.84E-01	calc
19	107-06-2	1,2-Dichloroethane (Ethylene chloride)	vapor	1	1.07E-01	App. A-3
20	107-12-0	Propionitrile	vapor	1.000	6.20E-02	calc
21	107-13-1	Acrylonitrile	vapor	1	1.40E-01	App. A-3
22	107-18-6	2-Propene-1-ol	vapor	1.000	3.40E-02	calc
23	107-31-3	Formic acid, methyl ester	vapor	1.000	7.71E-01	calc
24	107-66-4	Dibutylphosphate	particle-bound	0.995	1.26E-07	calc
25	107-87-9	2-Pentanone	vapor	1.000	4.60E-02	calc
26	108-03-2	1-Nitropropane	vapor	1.000	1.30E-02	calc
27	108-05-4	Vinyl acetate	vapor	1	1.43E-01	App. A-3
28	108-10-1	Hexone (4-Methyl-2-pentanone or MIBK)	vapor	1	2.50E-02	App. A-3
29	108-20-3	Bis(isopropyl)ether	vapor	1.000	1.96E-01	calc
30	108-38-3	m-Xylene (Dimethyl benzene)	vapor	1	1.06E-02	App. A-3

039415

COPC Identification

No.	CAS Registry Number	Compound	Offgas Phase Type	Fv	Vapor Pressure at Ambient Conditions (atm)	Source/Basis for Fv Value
31	108-39-4	m-Cresol	vapor	1	1.90E-04	App. A-3
32	108-87-2	Methylcyclohexane	vapor	1.000	6.10E-02	calc
33	108-88-3	Toluene	vapor	1	3.71E-02	App. A-3
34	108-90-7	Chlorobenzene	vapor	1	1.59E-02	App. A-3
35	108-93-0	Cyclohexanol	vapor	1.000	1.05E-03	calc
36	108-94-1	Cyclohexanone	vapor	1.000	5.70E-03	calc
37	108-95-2	Phenol	vapor	1	5.74E-04	App. A-3
38	109-66-0	n-Pentane	vapor	1.000	6.76E-01	calc
39	109-99-9	Tetrahydrofuran	vapor	1	2.14E-01	App. A-3
40	110-12-3	5-Methyl-2-hexanone	vapor	1.000	0.0076	calc
41	110-43-0	2-Heptanone	vapor	1.000	5.07E-02	calc
42	110-54-3	n-Hexane	vapor	1.000	1.99E-01	calc
43	110-62-3	n-Valeraldehyde	vapor	1.000	3.42E-02	calc
44	110-82-7	Cyclohexane	vapor	1.000	1.28E-01	calc
45	110-83-8	Cyclohexene	vapor	1.000	1.17E-01	calc
46	110-86-1	Pyridine	vapor	1	2.60E-02	App. A-3
47	111-65-9	n-Octane	vapor	1.000	1.86E-02	calc
48	111-76-2	Ethylene glycol monobutyl ether	vapor	1.000	1.17E-03	calc
49	111-84-2	n-Nonane	vapor	1.000	5.90E-03	calc
50	117-81-7	Bis(2-ethylhexyl)phthalate (DEHP)	particle-bound	0.935	8.49E-09	Errata
51	117-84-0	n-Dioctyl phthalate	particle-bound	0.90811	5.88E-09	Errata
52	118-74-1	Hexachlorobenzene	vapor	1	1.62E-08	App. A-3
53	120-12-7	Anthracene	vapor	1	3.35E-08	App. A-3
54	120-82-1	1,2,4-Trichlorobenzene	vapor	1	4.42E-04	App. A-3
55	120-83-2	2,4-Dichlorophenol	vapor	1	7.21E-06	App. A-3
56	121-44-8	Triethylamine	vapor	1.000	7.51E-02	calc
57	121-69-7	Dimethylaniline	vapor	1.000	9.20E-04	calc
58	122-39-4	N,N-Diphenylamine	vapor	1.000	1.06E-06	calc
59	123-19-3	4-Heptanone	vapor	1.000	8.05E-03	calc
60	123-38-6	n-Propionaldehyde	vapor	1.000	4.17E-01	calc
61	123-51-3	3-Methyl-1-butanol	vapor	1.000	3.12E-03	calc
62	123-86-4	Acetic acid n-butyl ester	vapor	1.000	1.51E-02	calc
63	123-91-1	1,4-Dioxane	vapor	1	5.00E-02	App. A-3

052475

COPC Identification

No.	CAS Registry Number	Compound	Offgas Phase Type	Fv	Vapor Pressure at Ambient Conditions (atm)	Source/Basis for Fv Value
64	126-73-8	Tributyl phosphate	vapor	1.000	5.26E-06	calc
65	126-98-7	2-Methyl-2-propenenitrile (Methacrylonitrile)	vapor	1	8.90E-02	App. A-3
66	127-18-4	Perchloroethylene (tetrachloroethylene)	vapor	1	2.42E-02	App. A-3
67	127-19-5	N,N-Dimethylacetamide	vapor	1.000	0.00263	calc
68	128-37-0	2,6-Bis(tert-butyl)-4-methylphenol	vapor	1.000	6.78E-06	calc
69	129-00-0	Pyrene	particle-bound	0.994635	5.59E-09	Errata
70	1321-64-8	Pentachloronaphthalene	particle-bound	0.971	1.96E-08	calc
71	1321-65-9	Trichloronaphthalene	vapor	1.000	4.13E-07	calc
72	132-64-9	Dibenzofuran	vapor	1.000	3.26E-06	calc
73	1335-87-1	Hexachloronaphthalene	particle-bound	0.990	4.38E-09	calc
74	1335-88-2	Tetrachloronaphthalene	particle-bound	0.945	1.32E-09	calc
75	1336-36-3	Polychlorinated biphenyls (PCBs)	particle-bound	0.999	6.50E-07	calc
76	141-78-6	Acetic acid ethyl ester (Ethyl acetate)	vapor	1.000	1.22E-01	calc
77	141-79-7	4-Methyl-3-penten-2-one	vapor	1.000	1.08E-02	calc
78	14265-44-2	Phosphate	particle	0	n/a	guidance
79	14280-30-9	Hydroxide	particle	0	n/a	guidance
80	142-82-5	n-Heptane	vapor	1.000	6.05E-02	calc
81	144-62-7	Oxalic acid	vapor	1.000	3.08E-07	calc
82	14797-55-8	Nitrate	particle	0	n/a	guidance
83	14797-65-0	Nitrite	particle	0	n/a	guidance
84	14808-79-8	Sulfate	particle	0	n/a	guidance
85	156-60-5	trans-1,2-Dichloroethylene	vapor	1	4.63E-01	App. A-3
86	1582-09-8	Trifluralin	particle-bound	0.994	6.03E-08	calc
87	1634-04-4	Methyl tert-butyl ether	vapor	1.000	3.29E-01	calc
88	16887-00-6	Chloride	particle	0	n/a	guidance
89	16984-48-8	Fluoride	particle	0	n/a	guidance
90	1836-75-5	Nitrofen	particle-bound	0.980	1.05E-08	calc
91	18540-29-9	Chromium (hexavalent)	particle	0	n/a	guidance
92	189-55-9	Dibenzo[a,i]pyrene	particle	0.014	2.37E-14	calc
93	189-64-0	Dibenzo[a,h]pyrene	particle	0.010	7.89E-15	calc
94	191-24-2	Benzo(g,h,i)perylene	particle-bound	0.067	1.32E-13	calc
95	191-30-0	Benzo[a,i]pyrene	particle	0.024	6.32E-13	calc
96	192-65-4	Dibenzo[a,e]pyrene	particle	0.021	9.21E-14	calc

057415

COPC Identification

No.	CAS Registry Number	Compound	Offgas Phase Type	Fv	Vapor Pressure at Ambient Conditions (atm)	Source/Basis for Fv Value
97	193-39-5	Indeno(1,2,3-cd)pyrene	particle	0.007	1.88E-13	App. A-3
98	205-82-3	Benzo(j)fluoranthene	particle-bound	0.591	3.45E-11	calc
99	205-99-2	Benzo(b)fluoranthene	particle-bound	0.822	1.60E-10	App. A-3
100	206-44-0	Fluoranthene	particle-bound	0.992	1.70E-08	App. A-3
101	207-08-9	Benzo(k)fluoranthene	particle-bound	0.149	1.32E-12	App. A-3
102	208-96-8	Acenaphthylene	vapor	1.000	1.20E-06	calc
103	218-01-9	Chrysene	particle-bound	0.761	1.03E-11	App. A-3
104	2234-13-1	Octachloronaphthalene	particle-bound	0.564	2.00E-11	calc
105	224-42-0	Dibenz[a,j]acridine	particle-bound	0.241	2.43E-12	calc
106	226-36-8	Dibenz[a,h]acridine	particle-bound	0.295	2.43E-12	calc
107	2385-85-5	Mirex	vapor	1.000	1.05E-09	calc
108	24959-67-9	Bromide	particle	0.017	1.04E-11	calc
109	25551-13-7	Trimethyl benzene	vapor	1.000	2.76E-03	calc
110	26140-60-3	Terphenyls	particle-bound	0.872	4.07E-09	calc
111	27154-33-2	Trichlorofluoroethane	vapor	1.000	n/a	assoc.
112	287-92-3	Cyclopentane	vapor	1.000	4.18E-01	calc
113	309-00-2	Aldrin	particle-bound	0.99554	2.20E-08	Errata
114	31508-00-6	2,3',4,4',5-Pentachlorobiphenyl (PBC 118)	particle-bound	0.952	1.18E-08	calc
115	319-84-6	Hexachlorocyclohexane (Lindane) Alpha BHC	vapor	1	5.61E-08	App. A-3
116	319-85-7	Hexachlorocyclohexane (Lindane) Beta BHC	particle-bound	0.999	6.45E-10	App. A-3
117	319-86-8	Delta-BHC	particle-bound	0.999	4.63E-08	calc
118	32598-13-3	3,3',4,4'-Tetrachlorobiphenyl (TCB)	particle-bound	0.973	2.16E-08	calc
119	32598-14-4	2,3,3',4,4'-Pentachlorobiphenyl (PCB 105)	particle-bound	0.935	8.59E-09	calc
120	32774-16-6	3,3',4,4',5,5'-Hexachlorobiphenyl	particle-bound	0.534	6.82E-10	calc
121	35065-29-3	2,2',3,4,4',5,5'-Heptachlorobiphenyl	particle-bound	0.684	1.29E-09	calc
122	35065-30-6	2,2',3,3',4,4',5-Heptachlorobiphenyl	particle-bound	0.581	8.26E-10	calc
123	3697-24-3	5-Methylchrysene	particle-bound	0.820	3.33E-10	calc
124	3825-26-1	Ammonium perfluorooctanoate	particle-bound	n/a	n/a	assoc.
125	38380-08-4	2,3,3',4,4',5-Hexachlorobiphenyl (PCB 157)	particle-bound	0.781	2.12E-09	calc
126	39635-31-9	2,3,3',4,4',5,5'-Heptachlorobiphenyl	particle-bound	n/a	n/a	assoc.
127	4170-30-3	2-Butenaldehyde (2-Butenal or Crotonaldehyde)	vapor	1.000	3.95E-02	calc

054745

COPC Identification

No.	CAS Registry Number	Compound	Offgas Phase Type	Fv	Vapor Pressure at Ambient Conditions (atm)	Source/Basis for Fv Value
128	465-73-6	Isodrin	vapor	1.000	5.79E-08	calc
129	50-00-0	Formaldehyde	vapor	1	5.1	App. A-3
130	50-29-3	4,4-DDT	particle-bound	0.852	5.17E-10	App. A-3
131	50-32-8	Benzo(a)pyrene	particle-bound	0.265	6.43E-12	App. A-3
132	52663-72-6	2,3',4,4',5,5'-Hexachlorobiphenyl	particle-bound	0.114	7.64E-11	calc
133	53-70-3	Dibenzo(a,h)anthracene	particle	0.011	2.70E-14	App. A-3
134	540-59-0	1,2-Dichloroethylene	vapor	1.000	0.264	calc
135	540-84-1	2,2,4-Trimethylpentane	vapor	1.000	0.065	calc
136	541-73-1	1,3-Dichlorobenzene	vapor	1	3.03E-03	App. A-3
137	56-23-5	Carbon tetrachloride	vapor	1	0.148	App. A-3
138	563-80-4	3-Methyl-2-butanone	vapor	1.000	0.069	calc
139	56-49-5	3-Methylcholanthrene	particle-bound	0.714	4.34E-11	calc
140	56-55-3	Benzo(a)anthracene	particle-bound	0.881	2.03E-10	App. A-3
141	57-12-5	Cyanide	particle	0	n/a	guidance
142	57-14-7	1,1-Dimethylhydrazine	vapor	1.000	0.207	calc
143	57465-28-8	3,3',4,4',5-Pentachlorobiphenyl	particle-bound	n/a	n/a	assoc.
144	58-89-9	gamma-BHC (Lindane)	particle-bound	0.999	5.53E-08	calc
145	58-90-2	2,3,4,6-Tetrachlorophenol	vapor	1	6.60E-06	App. A-3
146	591-78-6	2-Hexanone	vapor	1.000	0.015	calc
147	59-50-7	4-Chloro-3-methylphenol	particle-bound	0.999972	1.08E-05	Errata
148	59-89-2	N-Nitrosomorpholine	vapor	1.000	4.74E-05	calc
149	602-87-9	5-Nitroacenaphthene	particle-bound	0.997	3.49E-08	calc
150	60-29-7	Ethyl ether	vapor	1.000	0.708	calc
151	603-34-9	Triphenylamine	vapor	1.000	5.15E-07	calc
152	60-34-4	Methylhydrazine	vapor	1.000	0.066	calc
153	60-35-5	Acetamide	vapor	1.000	5.26E-05	calc
154	60-57-1	Dieldrin	particle-bound	0.986	1.31E-09	Errata
155	621-64-7	Di-n-Propylnitrosamine (N-Nitroso-di-n-propylamine)	vapor	1	4.63E-03	App. A-3
156	624-83-9	Methyl isocyanate	vapor	1.000	0.458	calc
157	627-13-4	Nitric acid, propyl ester	vapor	1.000	0.031	calc
158	62-75-9	N-Nitroso-N,N-dimethylamine (Dimethylnitrosamine)	vapor	1.000	3.55E-03	calc

057415

COPC Identification

No.	CAS Registry Number	Compound	Offgas Phase Type	Fv	Vapor Pressure at Ambient Conditions (atm)	Source/Basis for Fv Value
159	630-20-6	1,1,1,2-Tetrachloroethane	vapor	1	1.60E-02	App. A-3
160	63705-05-5	Total sulfur	particle	0	n/a	guidance
161	64-17-5	Ethyl alcohol	vapor	1.000	0.078	calc
162	64-18-6	Formic acid	vapor	1	5.40E-02	App. A-3
163	64-19-7	Acetic acid	vapor	1.000	0.021	calc
164	65510-44-3	2',3,4,4',5-Pentachlorobiphenyl	particle-bound	n/a	n/a	assoc.
165	67-56-1	Methyl alcohol (Methanol)	vapor	1	0.13	App. A-3
166	67-63-0	2-Propyl alcohol (Isopropanol; Propan-2-01)	vapor	1.000	0.06	calc
167	67-64-1	2-Propanone (Acetone)	vapor	1	0.299	App. A-3
168	67-66-3	Chloroform	vapor	1	0.269	App. A-3
169	67-72-1	Hexachloroethane	vapor	1	6.21E-04	App. A-3
170	684-16-2	Hexafluoroacetone	vapor	1.000	2.934	calc
171	69782-90-7	2,3,3',4,4',5'-Hexachlorobiphenyl	particle-bound	n/a	n/a	assoc.
172	70362-50-4	3,4,4',5-Tetrachlorobiphenyl	particle-bound	n/a	n/a	assoc.
173	71-23-8	n-Propyl alcohol	vapor	1.000	0.028	calc
174	71-36-3	n-Butyl alcohol	vapor	1.000	0.0088	calc
175	71-43-2	Benzene	vapor	1	0.125	App. A-3
176	71-55-6	Methyl chloroform (1,1,1-Trichloroethane)	vapor	1	0.163	App. A-3
177	72-20-8	Endrin	particle-bound	0.986	7.68E-10	calc
178	72-43-5	Methoxychlor	particle-bound	0.901	1.62E-09	App. A-3
179	72-54-8	4,4-DDD	particle-bound	0.925	1.14E-09	App. A-3
180	72-55-9	4,4-DDE	particle-bound	0.981	7.45E-09	App. A-3
181	7429-90-5	Aluminum	particle	0	n/a	guidance
182	7439-89-6	Iron	particle	0	n/a	guidance
183	7439-92-1	Lead	particle	0	n/a	guidance
184	7439-93-2	Lithium	particle	0	n/a	guidance
185	7439-95-4	Magnesium	particle	0	n/a	guidance
186	7439-96-5	Manganese	particle	0	n/a	guidance
187	7439-97-6	Mercury	vapor	1	2.63E-06	Errata
188	7439-98-7	Molybdenum	particle	0	n/a	guidance
189	7440-02-0	Nickel	particle	0	n/a	guidance
190	7440-09-7	Potassium	particle	0	n/a	guidance
191	7440-16-6	Rhodium	particle	0	n/a	guidance

057415

COPC Identification

No.	CAS Registry Number	Compound	Offgas Phase Type	Fv	Vapor Pressure at Ambient Conditions (atm)	Source/Basis for Fv Value
192	7440-21-3	Silicon	particle	0	n/a	guidance
193	7440-22-4	Silver	particle	0	n/a	guidance
194	7440-23-5	Sodium	particle	0	n/a	guidance
195	7440-25-7	Tantalum	particle	0	n/a	guidance
196	7440-28-0	Thallium	particle	0	n/a	guidance
197	7440-31-5	Tin	particle	0	n/a	guidance
198	7440-33-7	Tungsten	particle	0	n/a	guidance
199	7440-36-0	Antimony	particle	0	n/a	guidance
200	7440-38-2	Arsenic	particle	0	n/a	guidance
201	7440-39-3	Barium	particle	0	n/a	guidance
202	7440-41-7	Beryllium	particle	0	n/a	guidance
203	7440-42-8	Boron	particle	0	n/a	guidance
204	7440-43-9	Cadmium	particle	0	n/a	guidance
205	7440-48-4	Cobalt	particle	0	n/a	guidance
206	7440-50-8	Copper	particle	0	n/a	guidance
207	7440-61-1	Uranium	particle	0	n/a	guidance
208	7440-62-2	Vanadium	particle	0	n/a	guidance
209	7440-65-5	Yttrium	particle	0	n/a	guidance
210	7440-66-6	Zinc	particle	0	n/a	guidance
211	7440-67-7	Zirconium	particle	0	n/a	guidance
212	7440-69-9	Bismuth	particle	0	n/a	guidance
213	7440-70-2	Calcium	particle	0	n/a	guidance
214	74472-37-0	2,3,4,4',5-Pentachlorobiphenyl	particle-bound	n/a	n/a	assoc.
215	74-83-9	Bromomethane (Methyl bromide)	vapor	1	2.16	App. A-3
216	74-87-3	Chloromethane (Methyl chloride)	vapor	1	5.68	App. A-3
217	74-97-5	Bromochloromethane	vapor	1.000	1.88E-01	calc
218	74-99-7	Methylacetylene	vapor	1.000	5.67	calc
219	75-00-3	Chloroethane	vapor	1	159.88	App. A-3
220	75-01-4	Vinyl chloride (1-Chloroethene)	vapor	1	3.68	App. A-3
221	75-05-8	Acetonitrile	vapor	1	0.12	App. A-3
222	75-07-0	Acetaldehyde	vapor	1	1.19	App. A-3
223	75-09-2	Dichloromethane (Methylene chloride)	vapor	1	0.487	App. A-3
224	75-12-7	Formamide	vapor	1.000	8.02E-05	calc

057415

COPC Identification

No.	CAS Registry Number	Compound	Offgas Phase Type	Fv	Vapor Pressure at Ambient Conditions (atm)	Source/Basis for Fv Value
225	75-15-0	Carbon disulfide	vapor	1	0.447	App. A-3
226	75-21-8	Ethylene oxide (Oxirane)	vapor	1	1.44	App. A-3
227	75-27-4	Bromodichloromethane	vapor	1	7.68E-02	App. A-3
228	75-34-3	1,1-Dichloroethane	vapor	1	0.3	App. A-3
229	75-35-4	1,1-Dichloroethene (Vinylidene chloride)	vapor	1	0.788	App. A-3
230	75-43-4	Dichlorofluoromethane	vapor	1.000	1.79	calc
231	75-45-6	Chlorodifluoromethane	vapor	1	5.63	App. A-3
232	75-50-3	Trimethylamine	vapor	1.000	2.12	calc
233	75-52-5	Nitromethane	vapor	1.000	4.71E-02	calc
234	75-55-8	2-Methylaziridine	vapor	1.000	1.47E-01	calc
235	75-61-6	Difluorodibromomethane	vapor	1.000	1.08	calc
236	75-63-8	Trifluorobromomethane	vapor	1.000	16	calc
237	75-65-0	2-Methyl-2-propanol	vapor	1.000	5.36E-02	calc
238	75-69-4	Trichlorofluoromethane	vapor	1	1.1	App. A-3
239	75-71-8	Dichlorodifluoromethane	vapor	1	6.4	App. A-3
240	75-99-0	2,2-Dichloropropionic acid	vapor	1.000	2.50E-04	calc
241	76-03-9	Trichloroacetic acid	vapor	1.000	7.89E-05	calc
242	76-11-9	1,1,1,2-Tetrachloro-2,2-difluoroethane	vapor	1.000	7.89E-02	calc
243	76-12-0	1,1,2,2-Tetrachloro-1,2-difluoroethane	vapor	1.000	6.64E-02	calc
244	76-13-1	1,2,2-Trichloro-1,1,2-trifluoroethane (Freon 113)	vapor	1.000	4.78E-01	calc
245	76-14-2	1,2-Dichloro-1,1,2,2-tetrafluoroethane	vapor	1.000	2.64	calc
246	76-15-3	Chloropentafluoroethane	vapor	1.000	9.03	calc
247	76-44-8	Heptachlor	vapor	1	4.29E-07	App. A-3
248	7664-41-7	Ammonia/Ammonium	vapor	1	9.88	App. A-3
249	7723-14-0	Phosphorous	particle	0.023	8.92E-12	calc
250	7782-49-2	Selenium	particle	0.027	1.86E-13	calc
251	78-83-1	2-Methylpropyl alcohol (Isobutyl alcohol)	vapor	1.000	1.38E-02	calc
252	78-87-5	1,2-Dichloropropane	vapor	1	6.66E-02	App. A-3
253	78-92-2	1-Methylpropyl alcohol (2-Butanol)	vapor	1.000	2.41E-02	calc
254	78-93-3	Methyl ethyl ketone (MEK, 2-Butanone)	vapor	1	0.12	App. A-3
255	79-00-5	1,1,2-Trichloroethane	vapor	1	3.31E-02	App. A-3
256	79-01-6	Trichloroethylene	vapor	1	9.48E-02	App. A-3

057415

COPC Identification

No.	CAS Registry Number	Compound	Offgas Phase Type	Fv	Vapor Pressure at Ambient Conditions (atm)	Source/Basis for Fv Value
257	79-09-4	Propionic acid	vapor	1.000	4.64E-03	calc
258	79-10-7	2-Propenoic acid	vapor	1.000	5.22E-03	calc
259	79-20-9	Methyl acetate	vapor	1	0.284	App. A-3
260	79-34-5	1,1,2,2-Tetrachloroethane	vapor	1	6.80E-03	App. A-3
261	8001-35-2	Toxaphene	particle-bound	0.980	8.80E-09	calc
262	82-68-8	Pentachloronitrobenzene (PCBN or quintobenzene)	vapor	1	3.10E-06	App. A-3
263	83-32-9	Acenaphthene	vapor	1	4.93E-06	App. A-3
264	84-66-2	Diethyl phthalate	vapor	1	2.17E-06	App. A-3
265	84-74-2	Dibutyl phthalate	particle-bound	0.989	5.55E-08	App. A-3
266	85-01-8	Phenanthrene	vapor	1	1.35E-03	App. A-3
267	85-68-7	Butylbenzyl phthalate	particle-bound	0.964	1.58E-08	App. A-3
268	86-73-7	Fluorene	particle-bound	0.935	1.08E-09	App. A-3
269	87-68-3	Hexachlorobutadiene	vapor	1	2.33E-04	App. A-3
270	87-86-5	Pentachlorophenol	vapor	1	7.11E-07	App. A-3
271	88-06-2	2,4,6-Trichlorophenol	vapor	1	1.55E-05	App. A-3
272	88-72-2	2-Nitrotoluene	vapor	1.000	2.47E-04	calc
273	88-75-5	2-Nitrophenol	vapor	1	2.63E-04	App. A-3
274	88-85-7	2-sec-Butyl-4,6-dinitrophenol (Dinoseb)	particle-bound	0.996	9.87E-08	calc
275	88-89-1	Picric acid	particle-bound	0.938	9.87E-10	calc
276	91-20-3	Naphthalene	vapor	1	1.07E-04	App. A-3
277	91-22-5	Quinoline	vapor	1.000	7.89E-05	calc
278	91-58-7	2-Chloronapthalene	vapor	1	1.05E-05	App. A-3
279	92-52-4	1,1`-Biphenyl	vapor	1.000	1.18E-05	calc
280	92-93-3	4-Nitrobiphenyl	particle-bound	0.998	4.28E-08	calc
281	93-72-1	Silvex (2,4,5-TP)	particle-bound	0.999	1.31E-08	calc
282	93-76-5	2,4,5-T	particle-bound	0.999	4.93E-08	calc
283	94-75-7	2,4-D and esters (160C typed)	vapor	1.000	1.09E-07	calc
284	95-13-6	Indene	vapor	1.000	1.44E-03	calc
285	95-47-6	o-Xylene	vapor	1	1.06E-02	App. A-3
286	95-48-7	o-Cresol (2-Methylphenol)	vapor	1	4.16E-04	App. A-3
287	95-49-8	2-Chlorotoluene	vapor	1.000	4.51E-03	calc
288	95-50-1	o-Dichlorobenzene (1,2-Dichlorobenzene)	vapor	1	1.79E-03	App. A-3

057415

COPC Identification

No.	CAS Registry Number	Compound	Offgas Phase Type	Fv	Vapor Pressure at Ambient Conditions (atm)	Source/Basis for Fv Value
289	95-57-8	2-Chlorophenol	vapor	1	2.77E-03	App. A-3
290	95-95-4	2,4,5-Trichlorophenol	vapor	1	2.15E-05	App. A-3
291	96-22-0	3-Pentanone	vapor	1.000	4.96E-02	calc
292	96-69-5	Bis(3-tert-butyl-4-hydroxy-6-methyl-phenyl)sulfide	particle-bound	n/a	n/a	assoc.
293	98-51-1	p-tert-Butyltoluene	vapor	1.000	8.82E-04	calc
294	98-82-8	Cumene	vapor	1	6.00E-03	App. A-3
295	98-83-9	alpha-Methylstyrene	vapor	1.000	2.50E-03	calc
296	98-86-2	Acetophenone	vapor	1	5.20E-04	App. A-3
297	98-95-3	Nitrobenzene	vapor	1	3.20E-04	App. A-3
298	100-02-7	4-Nitrophenol	vapor	1	1.32E-06	App. A-3
299	100-44-7	Benzyl chloride	vapor	1	1.60E-03	App. A-3
300	100-51-6	Benzyl alcohol	vapor	1	1.40E-04	App. A-3
301	100-52-7	Benzaldehyde	vapor	1	1.30E-03	App. A-3
302	10102-44-0	Nitrogen dioxide	vapor	1.000	1.18	calc
303	101-77-9	4,4-Methylenedianiline	vapor	1.000	3.91E-03	calc
304	103-33-3	Azobenzene	vapor	1.000	4.75E-07	calc
305	103-65-1	n-Propyl benzene (Isocumene)	vapor	1.000	4.50E-03	calc
306	104-51-8	n-Butylbenzene	vapor	1.000	1.39E-03	calc
307	105-67-9	2,4-Dimethylphenol	vapor	1	1.66E-04	Errata
308	106-43-4	4-Chlorotoluene (p-Tolyl chloride)	vapor	1.000	3.54E-03	calc
309	106-44-5	p-Cresol (4-Methyl phenol)	vapor	1	1.70E-04	App. A-3
310	106-47-8	p-Chloroaniline	vapor	1	3.09E-05	App. A-3
311	106-49-0	p-Toluidine	vapor	1.000	3.76E-04	calc
312	106-51-4	Quinone	vapor	1.000	1.18E-04	calc
313	106-89-8	Epichlorohydrin (1-chloro-2,3-epoxypropane)	vapor	1.000	2.20E-02	App. A-3
314	107-19-7	Propargyl alcohol	vapor	1.000	2.05E-02	calc
315	107-21-1	Ethylene glycol	vapor	1.000	1.21E-04	calc
316	107-98-2	Propylene glycol monomethyl ether	vapor	1.000	1.64E-02	calc
317	108-60-1	Dichloroisopropyl ether (2,2'-Oxybis(1-chloropropane))	vapor	1.000	7.37E-04	calc
318	108-67-8	1,3,5-Trimethyl benzene	vapor	1	1.30E-03	App. A-3
319	108-86-1	Bromobenzene (Phenyl bromide)	vapor	1.000	5.50E-03	calc

057415

COPC Identification

No.	CAS Registry Number	Compound	Offgas Phase Type	Fv	Vapor Pressure at Ambient Conditions (atm)	Source/Basis for Fv Value
320	109-77-3	Malononitrile	vapor	1.000	2.64E-02	calc
321	109-86-4	2-Methoxyethanol	vapor	1.000	1.25E-02	calc
322	110-80-5	2-Ethoxyethanol	vapor	1.000	6.99E-03	calc
323	111-15-9	Ethylene glycol monoethyl ether acetate	vapor	1.000	3.08E-03	calc
324	111-44-4	Bis(2-chloroethyl) ether	vapor	1	1.76E-03	App. A-3
325	111-91-1	Bis(2-chloroethoxy)methane	vapor	1.000	1.74E-04	calc
326	1120-71-4	1,3-Propane sultone	vapor	1.000	3.55E-04	calc
327	119-90-4	3,3'-Dimethoxybenzidine (ortol-dianisidine)	particle-bound	0.877	3.30E-10	App. A-3
328	121-14-2	2,4-Dinitrotoluene	particle-bound	0.999	2.29E-07	App. A-3
329	122-66-7	1,2-Diphenylhydrazine	particle-bound	0.999	4.74E-08	App. A-3
330	123-33-1	Maleic hydrazide	particle-bound	0.978	3.64E-09	calc
331	124-48-1	Chlorodibromomethane	vapor	1	2.00E-02	App. A-3
332	131-11-3	Dimethylphthalate	vapor	1	2.17E-06	App. A-3
333	131-89-5	2-Cyclohexyl-4,6-dinitrophenol	particle-bound	0.376	5.51E-11	calc
334	133-06-2	Captan	particle-bound	0.867	1.18E-10	calc
335	135-98-8	sec-Butylbenzene	vapor	1.000	2.30E-03	calc
336	145-73-3	Endothall	particle	0.005	2.07E-13	calc
337	156-59-2	cis-1,2-Dichloroethene	vapor	1.000	0.23	App. A-3
338	1746-01-6	2,3,7,8-Tetrachlorodibenzo(p)dioxin (TCDD)	particle-bound	0.490154	9.74E-13	Errata
339	192-97-2	Benzo(e)pyrene	particle-bound	0.292	7.50E-12	calc
340	19408-74-3	1,2,3,7,8,9-Hexachlorodibenzo(p)dioxin	particle	0.0153	6.45E-14	App. A-3
341	23950-58-5	Pronamide	vapor	1	5.30E-07	App. A-3
342	25013-15-4	Methyl styrene (mixed isomers)	vapor	1.000	1.97E-03	calc
343	3268-87-9	Octachlorodibenzo(p)dioxin	particle	0.001694	1.09E-15	Errata
344	35822-46-9	1,2,3,4,6,7,8-Heptachlorodibenzo(p)dioxin	particle	0.0162	4.22E-14	App. A-3
345	39001-02-0	Octachlorodibenzofuran	particle	0.00167	4.93E-15	App. A-3
346	39227-28-6	1,2,3,4,7,8-Hexachlorodibenzo(p)dioxin	particle-bound	0.0596	1.33E-13	App. A-3
347	40321-76-4	1,2,3,7,8-Pentachlorodibenzo(p)dioxin	particle-bound	0.219	1.25E-12	App. A-3
348	41851-50-7	Chlorocyclopentadiene	vapor	1.000	2.68E-02	calc
349	460-19-5	Cyanogen	vapor	1.000	5.66	calc
350	506-68-3	Cyanogen bromide	vapor	1.000	1.61E-01	calc
351	506-77-4	Cyanogen chloride	vapor	1.000	1.61	calc
352	510-15-6	Chlorobenzilate	particle-bound	0.862	2.90E-09	App. A-3

057415

COPC Identification

No.	CAS Registry Number	Compound	Offgas Phase Type	Fv	Vapor Pressure at Ambient Conditions (atm)	Source/Basis for Fv Value
353	51207-31-9	2,3,7,8-Tetrachlorodibenzofuran	particle-bound	0.663449	1.17E-11	Errata
354	51-28-5	2,4-Dinitrophenol	particle-bound	0.999	1.52E-07	App. A-3
355	51-79-6	Ethyl Carbamate (urethane)	vapor	1.000	3.45E-04	calc
356	528-29-0	o-Dinitrobenzene	particle-bound	0.999	5.99E-08	calc
357	532-27-4	2-Chloroacetophenone	vapor	1.000	7.11E-06	calc
358	534-52-1	4,6-Dinitro-o-cresol (4,6-Dinitro-2-methylphenol)	particle-bound	0.999	1.39E-07	calc
359	5385-75-1	Dibenzo(a,e)fluoranthene	particle	0.018	9.64E-14	calc
360	540-73-8	1,2-Dimethylhydrazine	vapor	1.000	9.20E-02	calc
361	542-75-6	1,3-Dichloropropene	vapor	1	4.11E-02	App. A-3
362	542-88-1	Dichloromethyl ether	vapor	1.000	3.87E-02	calc
363	55673-89-7	1,2,3,4,7,8,9-Heptachlorodibenzofuran	particle	0.0201	1.41E-13	App. A-3
364	57117-31-4	2,3,4,7,8-Pentachlorodibenzofuran	particle-bound	0.263	4.33E-12	App. A-3
365	57117-41-6	1,2,3,7,8-Pentachlorodibenzofuran	particle-bound	0.364	3.58E-12	App. A-3
366	57117-44-9	1,2,3,6,7,8-Hexachlorodibenzofuran	particle-bound	0.0515	2.89E-13	App. A-3
367	57-24-9	Strychnine	particle-bound	0.086	2.20E-13	App. A-3
368	57653-85-7	1,2,3,6,7,8-Hexachlorodibenzo(p)dioxin	particle	0.0289	4.74E-14	App. A-3
369	57-74-9	Chlordane	particle-bound	0.997	3.55E-08	App. A-3
370	584-84-9	2,4-Toluene diisocyante	vapor	1.000	1.05E-05	calc
371	593-60-2	Bromoethene	vapor	1.000	1.36	calc
372	60-11-7	Dimethyl aminoazobenzene	particle-bound	0.524	9.21E-11	calc
373	606-20-2	2,6-Dinitrotoluene	vapor	1	7.47E-07	App. A-3
374	60851-34-5	2,3,4,6,7,8-Hexachlorodibenzofuran	particle-bound	0.0547	2.63E-13	App. A-3
375	608-93-5	Pentachlorobenzene	vapor	1	3.10E-06	App. A-3
376	61626-71-9	Dichloropentadiene	vapor	n/a	n/a	assoc.
377	62-50-0	Ethyl methanesulfonate	vapor	1	3.50E-04	App. A-3
378	62-53-3	Aniline	vapor	1	8.80E-04	App. A-3
379	65-85-0	Benzoic acid	vapor	1	8.57E-06	App. A-3
380	67562-39-4	1,2,3,4,6,7,8-Heptachlorodibenzofuran	particle	0.0347	1.75E-13	App. A-3
381	70-30-4	Hexachlorophene	particle	0.00014	3.60E-15	App. A-3
382	70648-26-9	1,2,3,4,7,8-Hexachlorodibenzofuran	particle	0.0486	3.16E-13	App. A-3
383	72918-21-9	1,2,3,7,8,9-Hexachlorodibenzofuran	particle-bound	0.0576	2.37E-13	App. A-3
384	74-88-4	Iodomethane (Methyl iodide)	vapor	1.000	5.33E-01	calc

057415

COPC Identification

No.	CAS Registry Number	Compound	Offgas Phase Type	Fv	Vapor Pressure at Ambient Conditions (atm)	Source/Basis for Fv Value
385	74-95-3	Methylene bromide	vapor	1	2.2	App. A-3
386	75-25-2	Bromoform	vapor	1	7.82E-03	App. A-3
387	75-29-6	2-Chloropropane	vapor	1.000	6.78E-01	calc
388	75-44-5	Phosgene	vapor	1.000	1.87	calc
389	76-01-7	Pentachloroethane	vapor	1.000	4.67E-03	calc
390	764-41-0	1,4-Dichloro-2-butene	vapor	1.000	3.95E-03	calc
391	765-34-4	Glycidylaldehyde	vapor	1.000	5.96E-02	calc
392	77-47-4	Hexachlorocyclopentadiene	vapor	1	9.63E-05	App. A-3
393	77-78-1	Dimethyl sulfate	vapor	1.000	8.91E-04	calc
394	80-62-6	Methyl methacrylate	vapor	1.000	5.07E-02	calc
395	822-06-0	Hexamethylene-1,5-diisocyanate	vapor	1.000	3.95E-05	calc
396	823-40-5	Toluene-2,6-diamine	vapor	1.000	3.24E-06	calc
397	85-44-9	Phthalic anhydride	vapor	1	2.63E-07	App. A-3
398	87-61-6	1,2,3-Trichlorobenzene	vapor	1	3.20E-04	App. A-3
399	88-74-4	o-Nitroaniline (2-Nitroaniline)	vapor	1	1.07E-05	App. A-3
400	90-04-0	o-Anisidine	vapor	1.000	1.05E-04	calc
401	91-57-6	2-Methylnaphthalene	vapor	1.000	7.24E-05	calc
402	91-94-1	3,3'-Dichlorobenzidine	particle-bound	0.847	2.89E-10	App. A-3
403	924-16-3	N-Nitrosodi-n-butylamine	vapor	1	3.80E-04	App. A-3
404	94-59-7	Safrole	vapor	1.000	1.10E-04	calc
405	95-53-4	o-Toluidine	vapor	1	3.94E-04	App. A-3
406	95-63-6	1,2,4-Trimethyl benzene	vapor	1.000	2.76E-03	calc
407	95-94-3	1,2,4,5-Tetrachlorobenzene	vapor	1	7.10E-06	App. A-3
408	96-12-8	1,2-Dibromo-3-chloropropane	vapor	1	1.00E-03	App. A-3
409	96-18-4	1,2,3-Trichloropropane	vapor	1	4.90E-03	App. A-3
410	96-45-7	Ethylene thiourea	particle-bound	0.963	2.66E-09	calc
411	97-63-2	Ethyl methacrylate	vapor	1.000	2.30E-02	calc
412	98-01-1	Furfural	vapor	1.000	2.91E-03	calc
413	98-06-6	tert-Butyl benzene	vapor	1.000	2.89E-03	calc
414	98-07-7	Benzotrichloride	vapor	1.000	5.45E-04	calc
415	99-35-4	1,3,5-Trinitrobenzene	vapor	1	1.30E-07	App. A-3
416	99-65-0	1,3-Dinitrobenzene	vapor	1	4.00E-07	App. A-3
417	99-87-6	p-Cymene	vapor	1.000	1.92E-03	calc

057415

COPC Identification

No.	CAS Registry Number	Compound	Offgas Phase Type	Fv	Vapor Pressure at Ambient Conditions (atm)	Source/Basis for Fv Value
418	no cas #	Dibenzo(a,h)fluoranthene	particle-bound	n/a	n/a	assoc.
419	10028-15-6	Ozone	vapor	1.000	n/a	guidance
420	630-08-0	Carbon monoxide	vapor	1.000	n/a	guidance
421	7446-09-5	Sulfur dioxide	vapor	1.000	n/a	guidance
422	no cas #	Particulate matter	particle	0	n/a	guidance
423	10028-17-8	Tritium	vapor	1	n/a	guidance
424	10045-97-3	Cesium-137	particle	0	n/a	guidance
425	10098-91-6	Yttrium-90	particle	0	n/a	guidance
426	10098-97-2	Strontium-90	particle	0	n/a	guidance
427	10198-40-0	Cobalt-60	particle	0	n/a	guidance
428	13966-29-5	Uranium-234	particle	0	n/a	guidance
429	13967-48-1	Ruthenium-106	particle	0	n/a	guidance
430	13967-70-9	Cesium-134	particle	0	n/a	guidance
431	13968-55-3	Uranium-233	particle	0	n/a	guidance
432	13981-15-2	Curium-244	particle	0	n/a	guidance
433	13981-16-3	Plutonium-238	particle	0	n/a	guidance
434	13981-37-8	Nickel-63	particle	0	n/a	guidance
435	13981-97-0	Barium-137m	particle	0	n/a	guidance
436	13982-10-0	Plutonium-242	particle	0	n/a	guidance
437	13982-63-3	Radium-226	particle	0	n/a	guidance
438	13982-70-2	Uranium-236	particle	0	n/a	guidance
439	13994-20-2	Neptunium-237	particle	0	n/a	guidance
440	14119-32-5	Plutonium-241	particle	0	n/a	guidance
441	14119-33-6	Plutonium-240	particle	0	n/a	guidance
442	14133-76-7	Technetium-99	particle	0	n/a	guidance
443	14158-29-3	Uranium-232	particle	0	n/a	guidance
444	14234-35-6	Antimony-125	particle	0	n/a	guidance
445	14331-85-2	Protactinium-231	particle	0	n/a	guidance
446	14336-70-0	Nickel-59	particle	0	n/a	guidance
447	14391-16-3	Europium-155	particle	0	n/a	guidance
448	14596-10-2	Americium-241	particle	0	n/a	guidance
449	14683-23-9	Europium-152	particle	0	n/a	guidance
450	14762-75-5	Carbon-14	vapor	1	n/a	guidance

057415

COPC Identification

No.	CAS Registry Number	Compound	Offgas Phase Type	Fv	Vapor Pressure at Ambient Conditions (atm)	Source/Basis for Fv Value
451	14952-40-0	Actinium-227	particle	0	n/a	guidance
452	14993-75-0	Americium-243	particle	0	n/a	guidance
453	15046-84-1	Iodine-129	vapor	1	n/a	guidance
454	15117-48-3	Plutonium-239	particle	0	n/a	guidance
455	15117-96-1	Uranium-235	particle	0	n/a	guidance
456	15262-20-1	Radium-228	particle	0	n/a	guidance
457	15510-73-3	Curium-242	particle	0	n/a	guidance
458	15585-10-1	Europium-154	particle	0	n/a	guidance
459	15594-54-4	Thorium-229	particle	0	n/a	guidance
460	15715-94-3	Samarium-151	particle	0	n/a	guidance
461	15751-77-6	Zirconium-93	particle	0	n/a	guidance
462	15757-87-6	Curium-243	particle	0	n/a	guidance
463	15832-50-5	Tin-126	particle	0	n/a	guidance
464	7440-03-1	Niobium-93m	particle	0	n/a	guidance
465	7440-24-6	Strontium (total)	particle	0.009	5.58E-12	calc
466	7440-29-1	Thorium-232	particle	0	n/a	guidance
467	7440-61-1	Uranium-238	particle	0	n/a	guidance
468	no cas #	Cadmium-113m	particle	0	n/a	guidance
469	no cas #	Selenium-79	particle	0	n/a	guidance

Notes for Source/Basis of Fv Value:

1. App. A-3 – Fv values taken directly from Appendix A, HHRAP, 1998.
2. Calc – Fv values calculated using equations given in HHRAP, 1998.
3. Errata – Fv values taken directly from Errata sheet for HHRAP, 1999.
4. Assoc. – Offgas phase type determined by comparison with Fv values for similar compounds.
5. Guidance – Offgas phase type identified by general EPA guidance in HHRAP, 1998 (e.g., metals with the exception of mercury have an Fv = 0.0).

057415

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Appendix G
Organic Abatement DFs in Pretreatment PVP System

Appendix G provides the methodology used to determine the organic constituents decontamination factors through the pretreatment vessel vent system thermal oxidizer and carbon beds. The numbers provided are conservative and provide bounding conditions for the emissions profile analysis.

Appendix G

Pretreatment Vessel Vent Organic Constituents Decontamination Factor Analysis

Contents

1 Objective G-1
2 Existing Design Inputs G-1
2.1 RTO Design Criteria G-1
2.2 Carbon Adsorber Design Criteria G-1
3 Background G-1
3.1 Origins of Organic Compounds in the PVP system G-1
3.2 Organic Abatement in PVP system G-1
3.3 Organic Characterization of Hanford Tank Wastes G-2
3.4 Constituents of Potential Concern G-2
3.5 Organic Destruction via Combustion –Theory G-2
3.6 Organic Removal via Adsorption – Theory G-3
3.7 Compound Physical Property Sources G-5
3.8 Representative Organic Compounds G-5
3.9 Compound Physical Properties G-6
3.10 Destruction Criteria G-6
3.11 Removal Criteria G-7
4 Methodology G-7
4.1 Definition of DF G-7
4.2 Destruction DF G-7
4.3 Removal DF G-7
4.4 Combined DF G-8
5 Assumptions G-8
5.1 Physical Property Sources G-8
5.2 Physical Property Values G-8
5.3 Unidentified and Non-included Organic Compounds G-9
5.4 Destruction Efficiency G-9
5.5 Removal Efficiency G-12

5.6 Adsorption RE and DF relationship G-14
6 Analysis G-15
6.1 Trans-1,3-Dichloropropene G-15
6.2 Ethylene Dibromide G-16
6.3 1-Heptanol G-17
7 Results and Conclusion G-18
8 References G-19
9 Attachments G-20

List of Acronyms

Acronym	Description
AIT	Auto Ignition Temperature
CAS #	Chemical Abstract Service registry number
COPC	Constituent of Potential Concern
DF	Decontamination Factor
MSDS	Material Safety Data Sheet
MW	Molecular Weight
NFPA	National Fire Protection Association
PCBs	Poly-Chlorinated Biphenyls
ppmv	part per million by volume
PT	Pretreatment
PVP	Pretreatment Vessel Vent Process System
RTO	Regenerative Thermal Oxidizer
DF	Decontamination Factor
DE	Destruction Efficiency
RE	Removal Efficiency
LFL	Lower Flammability Limit
SLRA	Final Work Plan for Screening Level Risk Assessment for the RPP-WTP
VLE	Vapor-Liquid Equilibrium
VOC	Volatile Organic Compound
EPA	Environmental Protection Agency
WTP	Hanford Tank Waste Treatment and Immobilization Plant

1 Objective

The objective of this analysis is to determine the decontamination factors (DFs) for abatement of potential organic constituents in the pretreatment (PT) vessel vent process (PVP) system.

2 Existing Design Inputs

2.1 RTO Design Criteria

Conditions of combustion within the regenerative thermal oxidizer (RTO) unit are 1.0 second residence time at 1600 °F according to the *System Description for Pretreatment Vessel Vent Process System* (24590-PTF-3YD-PVP-00001).

2.2 Carbon Adsorber Design Criteria

Carbon adsorbers are designed to contain the largest volume of carbon media possible within the limits of pressure drop and facility size limitations for exchanging spent adsorbers with freshly charged adsorbers (24590-PTF-M0C-PVP-00003, p 3-4).

3 Background

3.1 Origins of Organic Compounds in the PVP system

Historical characterization of Hanford tank waste shows various organic compounds in the solids, liquids, and headspace vapors of numerous double and single shelled tanks. Organic solvents and complexants were used in nuclear fuel processing and account for the bulk of the original organic material sent to the waste tanks. Since then, complex reactions have taken place where the original organic waste compounds have undergone radiolytic decomposition to form other compounds. The decomposition products can continuously change in composition since many of them are reactive with other organic decomposition products or may undergo further radiolytic decay. The sustained radioactive exposure to original organic waste material accounts for potentially thousands of different organic compounds present in the waste at trace quantities.

Waste batches will be sent from Hanford tank farms to the Hanford Tank Waste Treatment and Immobilization Plant (WTP) PT facility for processing prior to vitrification. While in PT, process vessels are swept with forced and passive air purges to ensure that radiolytically generated hydrogen does not concentrate in vessel headspaces to a flammable level. The sweeping of process vessel headspaces allows for the removal of organic compounds as governed by the vapor-liquid equilibrium (VLE) of each compound at the system conditions.

3.2 Organic Abatement in PVP system

Air purges from PT process vessels are removed, and treated through the Pretreatment Vessel Vent Process System (PVP) prior to discharge to the environment. To ensure that the concentration of Volatile Organic Compounds (VOCs) in the PT off gas is reduced before release to the environment, the stream is processed through a Regenerative Thermal Oxidizer (RTO) and a carbon adsorber. In the RTO, organic compounds are destroyed via combustion. The combustion reaction is induced by the application of high temperature and the availability of excess oxygen. Destruction of contaminants is followed by a polishing

step in the adsorber where some removal of remaining organic compounds takes place. In the adsorber, organic contaminants are removed from the vent gas by capture on the surface of the activated carbon media.

3.3 Organic Characterization of Hanford Tank Wastes

Due to the difficulties associated with sample handling and analysis of radioactive tank waste, the organic characterization of waste liquid and solids remains largely incomplete with respect to the species and concentration of each organic compound. The most abundant organic characterization data comes from tank headspace analyses. A wide range of target organic compounds have been detected in various tank headspace samples on behalf of the relative ease of vapor phase sample handling during analysis. Over 1200 different organic compounds have been detected through historical sampling and analyses of Hanford tank wastes (Wiemers 1998 p 4.13). Nearly all 1200 of these compounds have been detected in the headspace samples of single shell tanks (Stock 2000, p 2).

In spite of the organic analysis data available to date, there is still significant uncertainty in determining the potential concentrations of the individual and collective organic compounds within the PVP vent stream. Arguably, organic concentrations will be appreciably less in the PVP vent gas than detected concentrations from historical headspace analysis. Most of the data was collected several years ago and the organic compounds continue to be depleted by ventilation of the waste tanks. However, those compounds which have been detected at higher concentrations are generally the most credible in terms of their presence in multiple tanks. As such, the organic compounds most likely to be detectable in the PVP system vent gas are those which have been detected in some abundance in several different waste tanks.

3.4 Constituents of Potential Concern

In the *Integrated Emissions Baseline Report for the River Protection Project Waste Treatment Plant* (RPT-W375-ES00001), 250 organic Constituents of Potential Concern (COPCs) were identified as being relevant to emissions estimates for permitting. These 250 COPCs were identified during development of the *Final Work Plan for Screening Level Risk Assessment* (SLRA) *for the RPP-WTP* (RPT-W375-EN00001). These constituents have been included in emissions estimates used for permitting the WTP. As such, they are also considered in this analysis to establish conservative DFs to be included when determining future emissions estimates used in permitting activities.

Of the 250 COPCs, 14 are coplanar Poly-Chlorinated Biphenyls (PCBs). These 14 PCBs have been included individually in the list on behalf of the tendency for the coplanar molecules to exhibit dioxin-like properties (RPT-W375-ES00001, p 13). The specific PCBs are shown in addition to the generally identified compound, PCB (CAS # 1336-36-3), which is inclusive of the entire family of individual PCBs.

3.5 Organic Destruction via Combustion –Theory

Thermal oxidation of organic material is a combustion process. Combustion is defined as the burning of gases, liquids, or solids, in which the substance is oxidized, evolving heat and often light (Lewandowski 2000, p 1). For combustion to occur, 3 elements of the reaction need to be in place. These are fuel (the organic contaminant in this case), oxygen (present in the vent gas which is mostly air), and an ignition source. The ignition source can be thought of as the source of activation energy to initiate the chemical (combustion) reaction. In general, combustion reactions are exothermic and under the correct conditions of oxygen and fuel, initiated combustion can release enough heat to sustain a continuous ignition source (the burning process or a "fire"). The following chemical equation shows the products of combustion for a typical hydrocarbon.

Equation G-1

$$C_xH_{2y} + \left(X + \frac{Y}{2}\right)O_2 + Q_{activation} \rightarrow XCO_2 + YH_2O + Q_{combustion}$$

Where:

X and Y	= stoichiometric coefficients
C	= Carbon
H	= Hydrogen
CO_2	= carbon dioxide combustion product
H_2O	= water vapor combustion product
$Q_{activation}$	= activation energy to initiate the reaction
$Q_{combustion}$	= combustion energy released by forming the combustion products

Within a thermal oxidation system, the primary performance requirement is the extent of destruction or Destruction Efficiency (DE) of the organic contaminants. Important parameters which affect the DE of organics by thermal oxidation are sometimes called the "three T's" of combustion. The "T's" are time, temperature, and turbulence. The other most important parameter is availability of oxygen. The extent of oxygen present in a combustion system essentially determines the importance of time and turbulence. As the availability of oxygen increases, the need for time and turbulence (mixing) will decrease for the same DE since there is more likelihood for the same number of contaminants to contact and react with an oxygen molecule. Typically, thermal oxidizers use a fuel supply and burner system to maintain the system operating temperature. In such cases, the excess oxygen is usually managed to levels which are only slightly higher than the stoichiometric requirement. The reason for limiting the excess oxygen is a cost consideration which limits the fuel required to maintain the system temperature (fuel efficiency). In systems where oxygen is rigorously controlled, time and turbulence become a vital design consideration to ensure equivalent DE.

The PVP system will use a RTO which will maintain operating temperature by heat input from an electric element as opposed to a burner system. In this service, the extent of excess oxygen is very near 20.9% (the oxygen concentration in ambient air) since the organic contaminants in the PVP stream are expected to be extremely dilute. The RTO will recover energy from the high temperature exhaust by exchanging heat with (preheating) the feed gas via ceramic heat transfer beds. Oxidizers which use ceramic heat transfer beds in alternating flow cycles are known as "regenerative". This manner of heat recovery will maximize the energy efficiency of the oxidizer as well as providing some additional residence time at temperatures very near the operating temperature.

The design parameters required for the PVP oxidizer are 1.0 second residence time at 1600 degrees Fahrenheit. This is consistent with EPA reported results of commercial incinerators (fuel-fired) where 0.75 seconds and 1600 °F have been shown to ensure DEs remain above 98% for non-halogenated VOCs (EPA 1999, p 1). Additionally, electric heating elements used in existing RTOs have demonstrated proven reliability when operating at 1500 °F and the capability of operating as high as 1800 °F. It should be noted here that the EPA reference which states destruction performance for this operating temperature has derived the information from historical performance of fired oxidizers (as opposed to electric). The reference states the importance of mixing and residence time in this type of system since the availability of oxygen is limited by the system's operationally practical fuel efficiency.

3.6 Organic Removal via Adsorption – Theory

The adsorption of VOCs on activated carbon media occurs by a physical adsorption mechanism in which weak attractive forces, resulting from Van der Waals forces between the contaminant and the carbon adsorbent (also known as Hydrogen bonding forces or London dispersion forces) adhere the contaminant to the surface of the carbon. The process is exothermic and usually evolves slightly more energy than the heat of vaporization of the adsorbed compound (Cooper 1994, p 381). The contaminant essentially

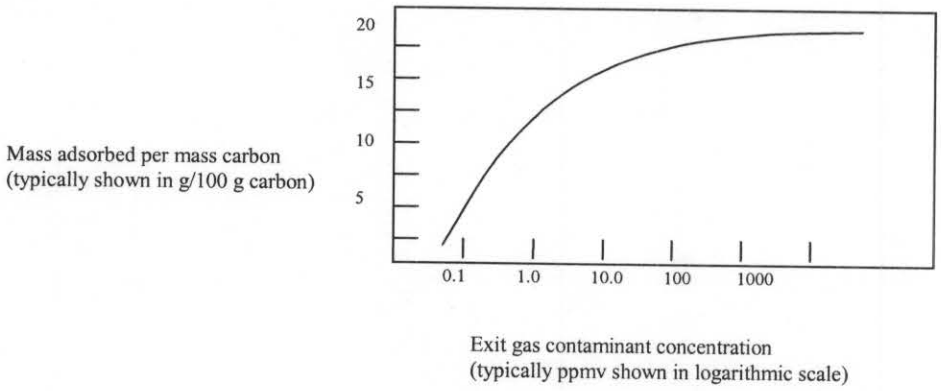
moves out of the vapor phase to behave like a liquid or solid phase trapped on the solid surface of the adsorbent media. Adsorption is usually reversible. Under appropriate sustained conditions of temperature, pressure, and concentration, most adsorbed compounds can re-enter the vapor phase as governed by thermodynamic equilibrium.

In general, the potential for activated carbon to adsorb a particular contaminant depends primarily on the boiling point and molecular weight (MW) of that compound. The reason is that some molecules tend to have more potential for intermolecular attraction via London dispersion forces. A generally predictive measure of intermolecular forces is normal boiling point since the change of phase requires enough energy to break the intermolecular forces which hold the compound together in its liquid phase. A higher boiling point corresponds with a higher intermolecular attraction (Brown 1994, p 374) and hence more potential for strong adsorption. Consequently, boiling point is the strongest indicator for the "adsorbability" of a particular VOC. Boiling point is followed closely by MW as an indicator of adsorption potential. Large molecules with large MWs tend to have more atoms and therefore more potential to be polarized. The polar characteristic of a molecule adds to the attractive forces due to the pull between dissimilar charges. The more "polarizable" a molecule is, the more intermolecular force it exhibits and hence the more adsorbable it may be.

3.6.1 Adsorption Isotherms

Adsorption is governed by thermodynamics of chemical equilibrium; therefore, contaminant concentration in the treated gas is an important factor in determining the capacity of the carbon to collect or load a particular constituent. Temperature and pressure conditions also impact the extent of adsorption so that higher pressure and lower temperature favor a higher adsorption capacity. This is consistent with the observation that gas phase adsorption is exothermic at essentially the latent heat of vaporization. The adsorption behaves like a phase change; both high pressure and low temperature favor this transition. At constant pressure and temperature, the relationship between contaminant concentration in the exit gas and the equilibrium capacity of the adsorbent is known as an adsorption isotherm. Figure G-1, below, depicts a generalized relationship between carbon loading capacity and equilibrium exit gas concentration.

Figure G-1



Isotherms are empirically created from experimental or industrial data and are commonly available for numerous VOCs on adsorbents developed for several types of gas cleaning services. However, at extremely dilute concentrations, the predictive capability of empirically developed isotherms becomes unreliable. The reason is that adsorption data is not widely available at extremely low concentrations since there is not normally a regulatory driver to apply adsorption technology to significantly dilute streams. Industrial experience would suggest that adsorption capacities for dilute contaminant concentrations should be determined through pilot testing of each adsorbent media considered for the service. The performance or Removal Efficiency (RE) of activated carbon will vary depending on media

particle size, type of activation processing (internal pore size, pore distribution, and void fraction), and carbon source material.

3.6.2 Multi Component Adsorption

In multi component adsorption, the adsorption capacity of any particular compound may no longer follow its particular single compound isotherm. Complex and unpredictable component-to-component interactions may take place. This can change the thermodynamic equilibrium of the collective adsorption system. It is known however, that in systems where a weakly attracted compound has been adsorbed, it can later be displaced by a more strongly adsorbed compound if the relative concentrations favor the exchange. This "selective" behavior greatly adds to the complexity and unpredictability of multi component adsorption.

Processing of each batch of Hanford tank waste is likely to evolve multiple species of VOCs at dilute concentrations, each with its own unique organic signature. In the case where potentially hundreds of different organic compounds may be present at different concentrations, the contaminants will be competing for the same adsorption sites. The prediction of equilibrium for any given compound becomes virtually impossible. Given the unpredictable mix of compounds and concentrations in the PVP system vent gas, those compounds which are only slightly adsorbable are not likely to exhibit any appreciable removal from the stream.

3.7 Compound Physical Property Sources

The list of contaminants considered by this analysis includes compounds that have been detected through various historical analysis of Hanford tank wastes and those which have been given consideration due to regulatory concern. These compounds exhibit a wide range of physical properties. Not all of the relevant physical property values were found to be readily available. For the most part, chemistry and engineering handbooks and texts have been referenced to supply the important physical properties used in this analysis. In addition, several internet databases containing information on chemical compounds, chemistry, and chemical safety were used to further complete the collection of physical properties. In some cases, manufacturer's material safety data sheets (MSDS) were used to provide the Auto-Ignition Temperatures (AITs), solubilities, and/or boiling points of certain compounds.

This group of sources however, did not provide all of the required information for every compound. To fill the remaining gaps, comparisons were made to similar compounds for which data was found available. The missing physical property information was then conservatively estimated. Primarily, chemical structure was used to assign AITs and normal boiling points. To a lesser extent, molecular weight, solubility, and National Fire Prevention Association (NFPA) hazard rankings were taken into consideration. General chemical trends were accounted for when assessing the conservatism of each estimated value. Examples of trends would include: 1) the polarity of a compound with respect to estimated boiling point and 2) the number of halogen substitutions, chemical resonance, or length of alkane chain with respect to estimated AIT.

3.8 Representative Organic Compounds

Given the total number of historically detected organic compounds which could be considered for tracking through the PVP system, a criteria was needed to select a smaller and more manageable number of representative compounds. The "representative" compounds will include organic COPCs identified by the SLRA. The organic COPCs contain numerous halogenated and aromatic compounds which appear at the extreme ends of the range of physical property values used to assign DFs. The representative compounds can then bound the behavior of those which may not be tracked in the PVP system. By including several compounds which are difficult to destroy or remove from the PVP vent gas, future

emissions estimates can establish bounding conservatism by assigning higher concentrations to these low abated compounds.

Since the compounds under consideration are those which may be present within the PVP vent gas, the considerable data collected from headspace (vapor) samples of the single shell tanks was considered to be the widest and most representative information. A single source document containing the maximum detected concentration of nearly 1200 compounds (Stock 2000) was used to set the selection criteria for some of the representative compounds. It is appropriate to include the organic COPCs in this analysis because of their inclusion in emissions estimates which affect WTP permitting. The criteria for selecting the remaining compounds was decided to be a maximum detected concentration of 0.1 part per million by volume (ppmv) or higher.

Some of the compounds detected at 0.1 ppmv or higher are COPCs[CJD1][1]. However, all tabular data presented in this analysis are shown as two lists: 1) the COPCs and 2) those detected over the concentration threshold. This is done to more easily locate particular compound information based on the different end uses expected from this analysis. The total number of individual compounds considered in this analysis is 436. Tables 1-1 and 1-2 of the Appendix show the COPCs and detected compounds in tank headspace respectively.

All organic COPCs identified in the SLRA will be included in this analysis with the exception of the individual coplanar PCBs. Due to the similarity of PCBs across all the various specific structures and physical properties, the 14 listed coplanar PCBs will not be treated individually in this analysis. Those compounds are assigned a single DF identified by the descriptive name (PCBs) and the Chemical Abstract Service number (CAS #) 1336-36-3.

3.9 Compound Physical Properties

Tables 1-1 and 1-2 show a CAS #, MW, chemical formula, boiling point, and AIT for each compound. A two dimensional structure is also shown for each compound where the structure is not obvious by its compound name and/or where it is significant to the determination of any estimated physical property value. Values which could not be found in available references have been estimated as described in Section 3.7 of this analysis. Source information and notes concerning particular physical property values are included at the end of each table. As can be expected with such a large collection of data from several different references, some values may be found to be inconsistent with other references. However, since conservatism has been exercised at each occurrence of estimation or enabling assumption, the individual and collective physical property inputs are considered to be bounding as supported by the best available information. As such, their effect on the analysis result with respect to the accuracy of assigned DFs is expected to be conservatively bounding.

3.10 Destruction Criteria

Section 2.1 gives the design conditions of residence time and operating temperature of the RTO. For a given constituent, the availability of oxygen and its AIT are the other important factors for determining DE in the RTO system.

3.10.1 Oxygen Concentration

Final Vapor-Liquid Equilibrium (VLE) for organic compounds in the PVP vent gas will take place in the caustic scrubber which is controlled to near standard conditions. These conditions are essentially the same as waste tank storage conditions at the Hanford Site. Therefore the expected concentration of

[1] Not all of the COPCs have been detected in analysis of headspace samples of Hanford tank waste.

organic compounds will be much less than 1% since most volatile compounds have already been depleted from the waste. As such, the oxygen concentration of the vent gas is essentially that of saturated ambient air (>20%) and well in excess of typical combustion systems where excess oxygen is controlled for fuel efficiency.

3.10.2 Basis of Destruction

Given the design criteria of the RTO and the extent of available oxygen for combustion, the DF for destruction of each compound will be determined by their AIT. See Section 5.4 for a detailed explanation on AIT and the relationship of destruction efficiency in the RTO.

3.11 Removal Criteria

For the assigning of DFs across the carbon adsorber, normal boiling point, MW, and concentration is considered. It is understood that the concentration of any given constituent in the PVP vent gas can not be accurately predicted. However, some constituents are known to be extensively destroyed in the oxidizer leaving a very small concentration in the feed gas to the downstream adsorber. This qualitative behavior is taken into consideration on those compounds which have high DFs across the RTO. For a detailed explanation of how boiling point, MW, and concentration are used to assign adsorber DFs, see Section 5.5.

4 Methodology

4.1 Definition of DF

The mathematical definition of DF is generally the ratio of mass flow in the feed to mass flow in the treated stream. DFs will be calculated by using the DE or RE in the following relationship.

Equation G-2

$$DF = \frac{1}{\left[1 - \frac{eff}{100}\right]}$$

where:

eff = the contaminant DE or RE in %

4.2 Destruction DF

Each compound's referenced or estimated AIT will be compared with the operating temperature of the RTO. The difference in these two temperatures will be used to assign a destruction DF based on the criteria from Table G-2.

4.3 Removal DF

Compound removal DFs across carbon adsorption will be assigned based on the estimated adsorption capacity of each compound. The estimated adsorption capacities are based on normal boiling point, molecular weight, and available calculated adsorption capacities (Yaws 1995) for certain compounds which are included in this analysis. Where the capacity estimation via molecular weight and normal boiling point differs from the calculated prediction for a specific compound, the lower value is used to ensure conservatism. For the 35 instances where the correlation gives the lower capacity estimate, the

correlation value was rounded down to the nearest graduated capacity from Table G-3. The selected adsorption capacity is then used to assign the removal DFs according to Table G-4.

4.4 Combined DF

The carbon adsorption system normally treats gas that has been processed in the RTO. As such, the inlet concentration of certain constituents has the potential of being extremely low (<<0.1 ppmv for compounds which are readily combustible). The potential for extremely low contaminant concentrations will be accounted for by applying a reduction scalar on compounds which have a DF of 50 and higher across the RTO. For these compounds, the adsorption DF used to calculate the combined DF will be reduced by a factor of 10 (not to decrease below 1.0). The combined DF will then be determined by multiplication of the DFs for the RTO and carbon adsorber.

5 Assumptions

5.1 Physical Property Sources

Due to the number and species of the organic compounds considered by this analysis, not all physical property values were found to be readily available. In addition, certain sources were found in contradiction of each other regarding AIT and normal boiling point. A good example of this is the chemical compound Pyridine (CAS # 110-86-1). Physical property source #1 and #6 from Table 1-2 show the normal boiling point to be 115.2 °C and 208 °C respectively. Another example is Naphthalene (CAS # 91-20-3). Source #1 and #23 from Table 1-2 show the AIT as 568 °C and 526 °C respectively. Likewise, numerous AIT temperatures were found by searching MSDS and chemical safety databases, and in some cases, two available sources will show different AITs. In all instances where differing values were found, the more conservative (high AIT and low boiling point) were used. However, due to the number of discrepancies found and the apparent potential for inaccuracy, the physical data has been treated with conservatism in determining the destruction and removal DFs. The physical property data as assembled in Tables 1-1 and 1-2 is assumed to be best available information and appropriate to determine combined DFs. This assumption (and any specific physical property value) is not unreasonable since the inaccuracy of the physical property data is not likely to significantly impact the combined DF of any compound. In addition, the DFs determined by this analysis are likely to be used with a very conservative estimation of unabated organic emissions due to the uncertainty of organic content in the tank waste. In this manner, an estimation of abated organic emissions from the PT PVP system can be considered bounding.

5.2 Physical Property Values

Numerous uncommon organic species are contained within the collective compounds considered by this analysis. As not all physical properties were found for several of these compounds, the AIT and normal boiling point were estimated in some cases to enable the DFs to be assigned. As discussed in Section 3.7, the compound physical structures were used to estimate the AIT and/or boiling point by comparison to similar compounds for which the values were known. When estimating the AITs, certain trends related to elemental composition and chemical structure were recognized. In general, the following patterns are reflected in the reference AITs:

- Aromatics tend to have higher AITs due to resonance stability.
- Halogenated compounds have higher AITs.
- Higher Carbon to Halogen atomic ratios have lower AITs.
- Methyl or alkane substitutions of otherwise identical structures lowers the AIT.

- Compounds with longer alkane chains tend to have lower AIT.
- Carbon, Nitrogen, or Oxygen double bonds tend to raise AIT in most compounds.
- Higher Hydrogen to Carbon ratios tend to lower AIT temperature.

All of these trends were taken into consideration to ensure that the estimated AITs were bounded by conservatism. When estimating normal boiling point, more extreme conservatism was exercised to ensure that the lower boiling point compounds were reflected as lower than the actual value (resulting in conservative adsorption DF). At higher values of boiling point, the accuracy of the estimates becomes less important as the graduated categories for adsorption capacities are associated with wide ranges of boiling point. In many cases, the molecular weight of compounds with unknown boiling points were so high that the boiling point of similar structures was far in excess of the maximum criteria for assigning adsorption DF. On behalf of these measures of conservatism, the estimated physical properties which affect the destruction or removal are assumed to be bounding and their criteria will not contribute any non-conservative error to the assigned DFs.

5.3 Unidentified and Non-included Organic Compounds

It is assumed that previously unidentified or lesser detected compounds will behave similarly to the 400+ compounds considered by this analysis. The COPCs include an abundance of halogenated compounds which are most difficult to destroy in the thermal oxidizer. In addition, several of the halogenated compounds are methanes and ethanes (refrigerants) which have little or no adsorption potential. For this reason, the individual compounds considered by this analysis are assumed to be conservatively representative of the potential organic compounds which could be evolved from the waste. In order for an emissions estimate to establish a conservative bound for emissions, both the implementation of the DFs established by this analysis and a conservative estimate of organic compounds in the feed is required.

5.4 Destruction Efficiency

Time, turbulence, and temperature are commonly referred to as the most important factors on the extent of complete combustion in thermal oxidation or incineration abatement systems. The three "T's" however do not specifically address the availability of oxygen (one of the components of the combustion triangle). The reason is that most commonly the systems under consideration are fired with auxiliary fuel in some type of burner arrangement. In such cases, the oxygen content is usually regulated at a concentration slightly in excess of stoichiometric for the sake of fuel efficiency. Stoichiometric oxygen is typically limited at 3.0 volume percent in the exhaust gas of fired systems. Predictions of destruction efficiency in systems with limited oxygen are not based purely on temperature. The following sections discuss the basis for assigning combustion DFs in the PVP system.

5.4.1 Excess Oxygen

A general relationship between operating temperature, contaminant AIT, residence time, turbulence, percent excess oxygen in the exhaust gas, and DE has been developed and used in the design of incineration systems. Data showing the dependency of DE on temperature and residence time is shown in the table below (Lewandowski 2000 p 27).

Table G-1

Destruction Efficiency (%)	Degrees Above AIT (°F)	Residence Time (s)
95	300	0.5
98	400	0.5
99	475	0.75
99.9	550	1.0
99.99	650	2.0

The table shows DE as a function of the operating temperature in excess of contaminant AIT. This relationship assumes that a threshold turbulence (Reynolds number ≥10,000) and 3.0% excess oxygen are achieved. The upper bound values given in the table suggest that not all of a contaminant is completely destroyed. Even at a temperature of 650 °F above the AIT of a contaminant, 0.01% of the compound is shown to remain undestroyed in the stream.

Oxygen starved pathways are presumed to be responsible for the un-combusted residual (Lewandowski 2000 p-26). A study of destruction mechanisms to help predict the DEs in oxygen deficient systems was conducted by the EPA. The resulting EPA Incinerability Ranking was developed to provide relative destruction of compounds under oxygen deficient conditions. The study and its results were published in an Environmental Science and Technology article entitled *Development of a Thermal Stability Based Ranking of Hazardous Organic Compound Incinerability* (Dellinger 1990). Various relationships were discussed in the article suggesting factors such as elemental composition of the contaminants and the potential for formation of reactive radicals are primary indicators of thermal stability (or instability). Figure 9 of the article shows a 2-dimensional plot of temperature vs the remaining fraction of contaminant (see Attachment 5) illustrating the effect of varying excess oxygen. Numerous data sets are plotted, each representing a different extent of excess oxygen (shown as oxygen equivalence ratio {stoichiometric oxygen/actual oxygen}). A dramatic separation occurs between the plots of oxygen equivalence ratios 1.0 and 1.001. With only the additional 1/1000th of stoichiometric oxygen provided when moving from the equivalence ratio of 1.001 to 1.0, equal destruction is achieved at a significantly lower temperature (more than 100°C lower). In general, the plots all follow the trend of higher available oxygen equating to a lower temperature of equal destruction. However, the differences are subtle until the ratio drops below a value of 1.01. This established trend is a clear indication that oxygen content is the most significant variable to account for when determining destruction efficiency at temperatures above the AIT. As oxygen availability increases, the required temperature for equivalent destruction decreases toward the AIT.

5.4.2 Basis of Destruction

Based on the results shown in Figure 9 of the reference discussed above, and the expected concentration of oxygen in the treated gas of the RTO, the contaminant AIT is assumed to be the single determining variable in assigning organic DFs. Considering the design residence time of 1.0 second under the conditions of excess oxygen in the PVP vent gas (see Section 3.10.1), the DEs shown in Table G-1 are considered to be conservatively bounding and valid for assigning DFs in the PVP system RTO. In order to assign DFs at lower extents than what is shown in Table G-1, data points were extrapolated and fitted to a well behaved plotted function (see trendline of Figure G-2 below). Table G-2 shows the data points for the DFs associated with each predicted destruction efficiency.

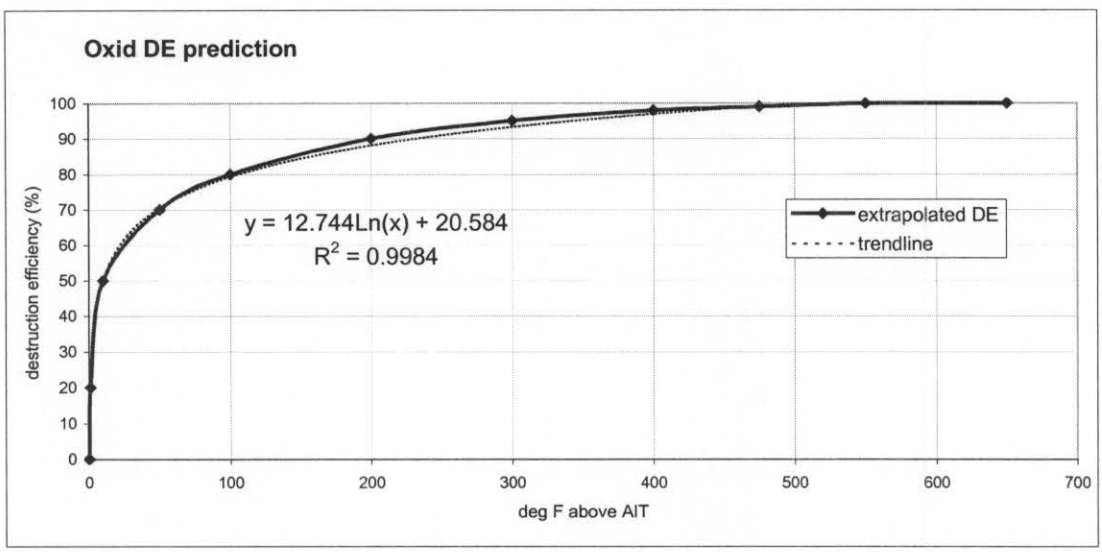
Table G-2

Degrees Above AIT (°F)	Destruction Efficiency (%)	DF (massflow in/massflow out)
<0.2	0	1
1	20	1.25
10	50	2
50	70	3.33
100	80	5
200	90	10
300	95	20
400	98	50
475	99	100
550	99.9	1000
≥650	99.99	10000

The data point for 0.2 °F at zero destruction efficiency is included for the sake of fitting the extrapolated data to the trend line on the plot and for establishing the lower boundary of DE at a conservative fixed point. Given the 1.0 second residence time at operating temperature, some destruction can be expected to take place at the AIT threshold. However, to remain conservative the DF assigned to compounds with AITs of higher than 1599 °F (operating temperature is 1600 degrees) will be 1.0.

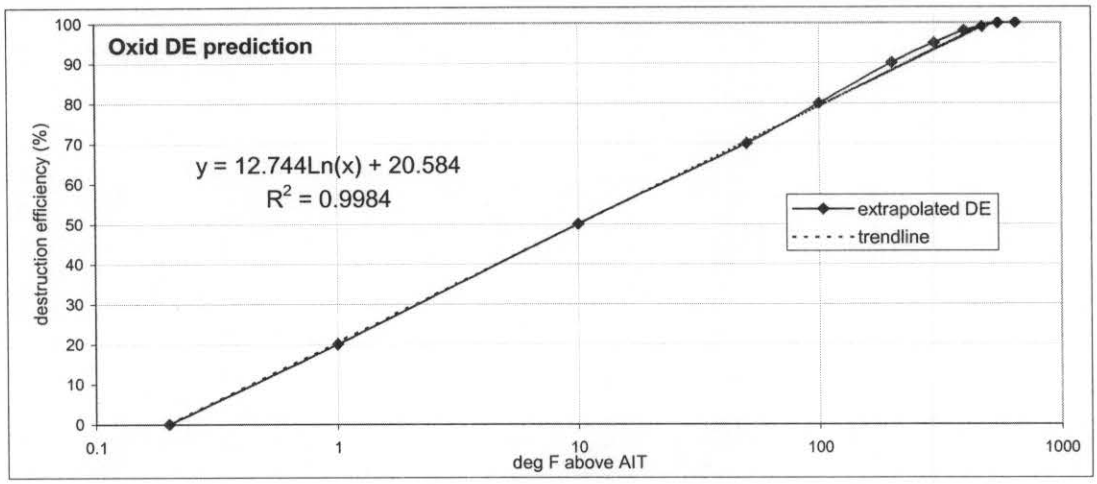
Figure G-2 shows the plotted data points on normal scale and Figure G-3 show the data on a logarithmic scale to better resolve the DE at temperatures just above the AIT.

Figure G-2



General behavior of the plot is reasonable for DE since one would expect the efficiency to be near zero at the initial occurrence of the AIT and then become appreciable rapidly as the temperature increases.

Figure G-3



The plot shown on logarithmic scale indicates that the prediction for destruction efficiency decreases to zero before the operating temperature decreases below the AIT.

While the extrapolation is not expected to be perfectly accurate for each compound, it does reflect reasonable behavior under the combustion conditions of the electric RTO. Given the conservatism applied in assigning AITs and the maximum extent of available oxygen in the treated stream, the DFs are assumed to be both appropriate and achievable.

5.4.3 Residence Time

The design residence time of 1.0 second is assumed to be adequate for all of the above AITs and associated DFs to be valid. This assumption is made while taking into consideration the data shown in Table G-1. The DE of 99.99% is shown for 650 °F above the AIT and a 2.0 second residence time. The extra second of residence time (2 seconds compared to 1.0 in this system) can be thought of as increasing the likelihood of small remaining amounts of contaminant finding an available oxygen and reacting. Given that the data was derived from systems operating with 3.0% excess oxygen, the increase to nearly 21% oxygen (in this system) should more than compensate for the shortened residence time at equal predicted DE.

5.5 Removal Efficiency

The extent of removal for a contaminant depends on its adsorption potential and concentration. Adsorption potential can be estimated for individual compounds based on physical properties; provided the concentration of the contaminant is not dilute beyond the limits of isotherm data. Multi component adsorption is much more difficult since contaminant interactions can be unpredictable. The organic signature of the PVP vent gas will change throughout the operation of the WTP. As such, enabling assumptions are needed to assign individual adsorption potentials. Given that the adsorbers will be designed within the recommended gas loading rate of 10-100 ft/min (24590-PTF-M0C-PVP-00003, p 6), the following assumptions are conservatively bounding with respect to adsorption potential and removal DFs.

5.5.1 Equilibrium Gas Concentrations

No definitive information exists which can predict the concentration of an individual contaminant in the feed to the carbon adsorber. Arguably, the more volatile compounds may already be depleted from the waste due to the continuous removal by the ventilation systems of the waste tanks in the tank farm.

Those which are not volatile enough to have already escaped from the tank waste are not likely to be volatile enough to be appreciably present in the PVP system due to the comparable conditions of temperature and pressure. Overall, the probability of any single constituent to exceed 0.1 ppmv in the adsorber feed is quite small. This presents difficulty when assigning adsorption capacity for any compound since adsorption technology is not traditionally applied to such dilute concentrations of contaminants. As such, little or no isotherm data are available for compounds at below 0.1 ppmv.

To enable adsorption assignments, the exit gas concentration will be assumed to be 0.1 ppmv for each compound. This concentration is the lowest for which reference data can be reasonably extrapolated. Selecting this reference point will establish the best available comparison for use in assigning a conservative adsorption capacity for each contaminant from Tables 1-1 and 1-2.

5.5.2 Adsorption Capacity Estimate Methodology

As a starting point to consider the various different adsorption potentials in this analysis, molecular weight, and boiling point criteria from a technology paper on vapor phase carbon adsorption was used to set graduated thresholds of capacity. The paper, *Activated Carbon Adsorption for Treatment of VOC Emissions* (Shepherd 2001), provides relative adsorption capacities of several common organic compounds (see Attachment 6). The capacities exhibit the governing behavior of adsorption potential based primarily on boiling point and MW of each compound. From the relative capacities and trends shown by the compounds included in this source, the following table was developed to assign the graduated capacities for the same criteria of PVP contaminants:

Table G-3

Contaminant Normal Boiling Point	Contaminant Molecular Weight	Estimated Adsorption Capacity
°C	g/mol	g adsorbed/100g carbon
<25	-	0
-	<50	0
25-50	<150	0.5
<50	-	1
50-100	<150	1
50-100	-	2
100-150	<150	2
100-150	-	5
>150	<150	10
150-200	-	20
>200	-	40

*Note- The dash (-) indicates all values are applicable - given that the compound is not classified by criteria from a previous row.

This graduated assignment of capacity is potentially too general with respect to compounds in a given classification of boiling point and MW since the property value ranges are large. Additionally, no reference is made to compound concentration within the relative capacities presented by the technology paper.

To qualify the values of Table G-3, the assigned capacities of several compounds were compared to the corresponding predicted results of a correlation equation. The equation was developed from available isotherm data of numerous organic compounds (Yaws 1995). The results for common organic compounds having 4 or less carbon atoms were obtained from a quadratic equation as a function each contaminant's assumed concentration and compound-specific quadratic coefficients (see Attachment 7). The logarithmic series expansion equation is shown below:

Equation G-3

$$\log_{10} Q = A + B \log_{10} y + C[\log_{10} y]^2$$

Where:

Q = adsorption capacity at equilibrium (g/100 g carbon)
y = contaminant concentration in ppmv
A, B, & C = quadratic coefficients (contaminant specific)

Of the 436 compounds considered by this analysis, 95 of them were found to have coefficients for prediction of their adsorption capacity by this correlation. In general, the predicted results were in alignment with the estimated capacities assigned from Table G-3 criteria. However, the correlation capacity results were lower than the estimated capacities for 35 of the 95 compounds. The differences in predicted capacities (difference = correlation results - estimated capacity) ranged from -1.9 to 16 (g/100 g carbon). This shows that the graduated capacities determined by the estimation method are generally conservative and in agreement with the correlation. For most compounds, the estimation method is well below the correlation result. It is assumed that the lower predicted capacity from either Table G-3 criteria or the correlation equation (where contaminant constants are available) is achievable by carbon in the PVP adsorption system.

Lastly, it is recognized that some contaminants will be extensively destroyed in the thermal oxidizer and will appear in the adsorption system at extremely dilute concentrations. These low concentrations may be considerably lower than the valid lower limit of either predictive method for capacity. To account for this uncertainty, the estimated adsorption DF of those compounds which show a high DF in the RTO will be reduced by a safety factor. It is assumed that a reduction factor of 10 for adsorption DFs on compounds which have an assigned DF of ≥ 50 in the RTO will adequately compensate for uncertainties in the predicted value based on low concentration. This assumption is incorporated in the analysis methodology (Section 4.4). However, since the combustion DFs have been assigned conservatively, it is recognized that some compounds may achieve a DF of greater than 50 in the RTO even though they have been assigned a lower DF. In these cases, or where the originating evolved contaminant concentrations are appreciably lower than 0.1 ppmv, it is possible that the conservatism of each assigned removal efficiency (adsorption DF) may no longer be conservatively bounding. While this may be the case for numerous identified (or unidentified) compounds, the effect of introduced error on predictions made using the estimated removal DFs will be insignificant. In those cases where the adsorption removal efficiencies may not be bounding due to low concentration, the effect on a mass balance or emissions estimate will be negligible.

5.6 Adsorption RE and DF relationship

As discussed in Section 3.6, removal of a contaminant from a gas stream via adsorption is dependant on the attraction between the contaminant and the adsorbent, the concentration of the contaminant, and the physical properties of the contaminant. These factors are used with empirical data to generate carbon loading capacities and adsorption isotherms. However, the generated (or calculated) isotherms are typically valid for gas phase concentrations above 0.1 or 1.0 ppmv. Extrapolations of equations or relationships which predict loading capacity or isotherm data to concentrations below 0.1 ppmv may become quite inexact. Historical process knowledge would suggest that pilot scale tests should be

conducted to determine exact adsorption performance. This is impractical for the PVP adsorption system since wastes processed in PT contain numerous trace organic compounds and each waste has a different organic signature. Information from pilot testing of a single waste may not be applicable to a different waste source. Therefore the relationship between removal efficiency and DF will be estimated on a more general basis by the following table.

Table G-4

Adsorption Capacity (g adsorbed/100 g carbon)	Removal Efficiency (RE) %	DF mass flow in / mass flow out
0	0	1
0.5	20	1.25
1	50	2
2	80	5
5	90	10
10	95	20
≥20	98	50

This relationship takes into account the conservatism which has been placed on the assignment of each adsorption capacity. Each assigned adsorption capacity has taken into account the potential for selective adsorption (replacement of a weakly attracted contaminant by a strongly attracted compound) and the potential for compounds to be present in much lower than reference concentrations (<0.1 ppmv).

The relationship between estimated adsorption capacity and DF is an enabling assumption. While every attempt has been made to add reasonable conservatism, the above DFs are only a generalized estimate. Any other more accurate means of assigning DFs would require both of two virtually non-attainable pieces of information: 1) the specific compounds and concentrations of adsorbable contaminants in the post oxidizer PVP vent gas, and 2) the specific multi component isotherm for each compound. Once the adsorption system is in service with off gas evolved from PT waste processing, it will be possible to take upstream and downstream samples and establish the extent to which this assumption is conservatively bounding.

6 Analysis

In order to handle data for the numerous compounds maintained in each of the separate lists, the computations were performed on Microsoft® Excel spreadsheets. Example compounds are shown in the remainder of this section to illustrate how the compound physical property data and analysis methodology are used in the computations to assign the DFs. Trans-1,3-Dichloropropene, Ethylene Dibromide, (compound numbers 7 and 14 from Table 1-1) and 1-Heptanol (compound number 95 from Table 1-2), are examples which show the various considerations underpinning the assigned DF methodology.

6.1 Trans-1,3-Dichloropropene

The AIT of Trans-1,3-Dichloropropene is shown as 1130 °F (an estimated value see source 29 at the end of Table 1-1). This value is subtracted from the operating temperature of the RTO (1600 °F) to establish the extent of destruction temperature above the AIT.

1600-1130 = 470 °F

The difference is then compared to the criteria of Table G-2. The difference of 470 °F is higher than 400 °F but not higher than 475 °F. The assigned destruction DE for this compound in the RTO is 98% as associated with compounds having AITs of at least 400 °F below the operating temperature. This value is shown in Table 2-1 of Attachment 2 (compound no. 7).

The DF is calculated using the DE of 98% and Equation G-2 as follows:

$$DF = \frac{1}{\left(1 - \frac{98}{100}\right)} = 50$$

The DF is shown in Table 2-1 beside the DE value.

Next, the boiling point and molecular weight are compared with the criteria from Table G-3 to assign an adsorption capacity. Trans-1,3-Dichloropropene shows a molecular weight of 111 g/mol and a normal boiling point of 112 °C. The uppermost row of Table G-3 for which this compound fits is the boiling range of 100-150 °C and molecular weight of <150. The estimated capacity is 2.0 g/100 g carbon. No quadratic constants for this compound are provided in the prediction correlation from Yaws 1995, therefore the assigned capacity is 2.0 g/100 g carbon. This capacity is compared to the criteria from Table G-4 which shows the corresponding RE of 80%. Equation G-2 applied to this RE gives a DF of 5. The adsorption RE and DF are shown in Table 3-1.

The final consideration for Trans-1,3-Dichloropropene is the potential for extremely low concentration in the feed gas to the adsorption process on behalf of extensive destruction in the RTO. Table 4-1 shows the assigned DFs for combustion and adsorption (see compound no. 7). Since the oxidizer DF is at least 50, the adsorption DF is reduced by a factor of 10. The reduced adsorption DF becomes 5/10 or 0.5 but the minimum DF as defined in Equation is 1.0. The reduced DF for Trans-1,3-Dichloropropene is shown as 1.0 in Table 4-1. This DF will result in a more conservative combined DF since credit is no longer being taken for removal via adsorption. The combined DF is:

oxidation DF x reduced adsorption DF = combined DF = 50 x 1 = 50 (as shown in Attachment 4, Table 4-1)

6.2 Ethylene Dibromide

The AIT of Ethylene Dibromide is shown as 1600 °F (an estimated value). According to the cited physical property source, the compound is considered non-flammable. Given that brominated methanes and ethanes (commonly classified as halons) are used as fire suppression agents and no other information was found available, the AIT value was assigned to be 1600 °F. This ensures that no credit for destruction will be taken in the RTO since the difference between AIT and operating temperature is zero. Criteria from Table G-2 shows that no credit for destruction is taken unless the operating temperature is at least 1.0 degree higher than the AIT. The corresponding DE is 0% and so the DF has been assigned as 1.0 in accordance with Equation . The DF is shown in Attachment 2 - Table 2-1 beside the DE value (compound no. 14).

Next, the boiling point and molecular weight are compared with the criteria from Table G-3 to assign an adsorption capacity. Ethylene Dibromide shows a molecular weight of ~188 g/mol and a normal boiling point of 131.7 °C. The uppermost row of Table G-3 for which this compound fits is the boiling range of 100-150 °C and molecular weight of at least 150. The corresponding estimated adsorption capacity is 5.0 g/100 g carbon.

Quadratic constants were found for using the capacity prediction correlation from Yaws 1995. The constants cited are:

A = 1.4423
B = 0.255
C= -0.0267

The predicted capacity by Equation G-3 is:

$$\log_{10} Q = A + B\log_{10} y + C[\log_{10} y]^2 = 1.4423 + 0.255\log_{10}(0.1) + (^{-}0.0267)[\log_{10}(0.1)]^2 = 1.16$$

Q = $10^{1.16}$ = 14.5 g ads/100 g carbon

This predicted value is higher than the estimated value using the graduated criteria from Table G-3 and so the estimated adsorption capacity of 5.0 (g /100 g carbon) is selected for this compound.

This capacity is compared to the criteria from Table G-4 which shows the corresponding RE of 90%. Equation G-2 applied to this RE gives a DF of 10. The adsorption RE and DF are shown in Table 4-1.

The final consideration for Ethylene Dibromide is the potential for extremely low concentration in the feed gas to the adsorption process on behalf of extensive destruction in the RTO. Since no credit is taken for combustion of this compound, it does not have a destruction DF of 50 or higher. The combined DF and adsorption DF are the same for Ethylene Dibromide as shown in Table 4-1.

6.3 1-Heptanol

The AIT of 1-Heptanol is shown as 320 °C (608°F). This is a conservatively estimated value which is based on a referenced compound and the recognized trend of longer alkane chains associated with lower AITs (see source 34 at the end of Table 1-2). This value is subtracted from the operating temperature of the RTO (1600 °F) to establish the extent of combustion temperature above the AIT.

1600-608 = 992 °F

This difference is then compared to the criteria of Table G-2. The difference of 992 °F is higher than the maximum DE temperature criteria of 650 °F. The assigned destruction DE for this compound in the RTO is 99.99% as associated with compounds having AITs of at least 650 °F below the operating temperature. This value is shown in Table 2-2 of Appendix 2 (compound no. 95).

The DF is calculated using the DE of 99.99% and Equation G-2 as follows:

$$DF = \frac{1}{\left(1 - \frac{99.99}{100}\right)} = 10{,}000$$

The DF is shown in Table 2-2 beside the DE value.

Next, the boiling point and molecular weight are compared with the criteria from Table G-3 to assign an estimated adsorption capacity. 1-Heptanol shows a molecular weight of 116 g/mol and a normal boiling point of 176 °C. The uppermost row of Table G-3 for which this compound fits is the boiling range of >150 °C and molecular weight of <150. The assigned capacity is 10.0 g/100 g carbon. This capacity is

compared to the criteria from Table G-4 which shows the corresponding RE of 95%. Equation G-2 applied to this RE gives a DF of 20. The adsorption RE and DF are shown in Table 3-2.

The final consideration for 1-Heptanol is the potential for extremely low concentration in the feed gas to the adsorption process on behalf of extensive destruction in the RTO. Table 4-2 shows the assigned DFs for combustion and adsorption (see compound no. 95). Since the oxidizer DF for 1-Heptanol (10,000) is at least 50, the adsorption DF is reduced by a factor of 10. The reduced adsorption DF becomes 20/10 or 2.0 as shown in Table 4-2.

Each of the compounds from Table 1-1 and 1-2 are assigned DFs by the same methodology as these example compounds and are shown in Attachments 2, 3, and 4 in their respective tables.

7 Results and Conclusion

Results of this analysis as defined in the objective are shown in Tables 4-1 and 4-2 of Attachment 4. Without the correct identification of exact species and concentrations of organic contaminants in the PVP system off gas, a more sophisticated method for estimating adsorption performance cannot be used. For contaminants which may be present at less than measurable quantities in the adsorber feed gas, the extent of adsorption capacity may be significantly lower than what would be shown by criteria from Table G-3. However, at concentrations which may be relevant to environmental emissions estimates (near 0.1 ppmv), the analysis methodology can be considered conservative with respect to oxidation DFs. For adsorption DFs, every effort has been made to ensure that the methodology is reasonable and conservative. Pending the operational confirmation that criteria in Table G-4 is bounding behavior for the organic contaminants, the methodology for RE can be considered reasonable for contaminant concentrations near 0.1 ppmv.

The reduction of adsorption DF for use in calculating the combined DF of compounds with high DEs has been implemented to provide additional conservatism. Although the specific adsorption behavior of contaminants at ultra low concentrations is not known, the cumulative effect of compounds at trace quantities is negligible in terms of regulatory importance. As such, the assigned adsorption DFs from this analysis do not present any special requirements for the design of the adsorption system. The adsorption system can be considered complimentary to the oxidation abatement system as exemplified by Ethylene Dibromide (Section 6.2).

8 References

Project Documents

RPT-W375-EN00001, Rev 1, *Final Work Plan for Screening Level Risk Assessment for the RPP-WTP.*

RPT-W375-ES00001, Rev 1, *Integrated Emissions Baseline Report for the River Protection Project Waste Treatment Plant.*

24590-PTF-3YD-PVP-00001, Rev 0, *System Description for Pretreatment Vessel Vent Process System.*

24590-PTF-M0C-PVP-00003, Rev A, *Batch Size of Pretreatment Vessel Vent Carbon Adsorbers (PVP-ABS-00001A/B).*

Other Documents

Brown, T, LeMay, H, and Bursten, B. 1994. *Chemistry – The Central Science*, Sixth Edition, Prentice Hall Inc., Englewood Cliffs, New Jersey.

Cooper, D and Alley, F. 1994. *Air Pollution Control – A Design Approach*, second edition, Waveland Press, Inc., Prospect Heights Illinois.

Dellinger, B, Taylor P, and Lee, C. 1990. "Development of a Thermal Stability Based Ranking of Hazardous Organic Compound Incinerability", *Environmental Science and Technology*, Vol. 24, No. 3.

EPA-CICA. 1999. Environmental Protection Agency, *Air Pollution Technology Fact Sheet, Incinerator-Recuperative Type.*

Lewandowski, D. 2000. *Design of Thermal Oxidation Systems for Volatile Organic Compounds*, CRC Press LLC, Boca Raton, Florida.

Shepherd, A. 2001. Technology Paper: *Activated Carbon Adsorption for Treatment of VOC Emissions*, presented at the 13th EnviroExpo, Boston, Massachusetts, May 2001, Carbtrol Corporation, Bridgeport Connecticut.

Stock, L and Huckaby J. 2000. *A survey of Vapors in the Headspaces of Single-Shell Waste Tanks*, PNNL-13366, Pacific Northwest Nation Laboratory, Richland, WA. October 2000.

Wiemers, KD et al. 1998. *Regulatory Data Quality Objectives Supporting Tank Waste Remediation System Privatization Project*, PNNL-12040, Pacific Northwest National Laboratory, Richland, WA.

Yaws, C, Bu, L, and Nijhawan, S. 1995. *Determining VOC Adsorption Capacity,* Pollution Engineering. February 1995.

9 Attachments

Attachment	Content
Attachment 1	Tables of Contaminants and Physical Properties
Table 1-1	COPCs
Table 1-2	Compounds detected >0.1 ppmv
Attachment 2	Tables of Destruction DFs
Table 2-1	COPCs
Table 2-2	Compounds detected >0.1 ppmv
Attachment 3	Tables of Removal DFs
Table 3-1	COPCs
Table 3-2	Compounds detected >0.1 ppmv
Attachment 4	Tables of DF Analysis Results
Table 4-1	COPCs
Table 4-2	Compounds detected >0.1 ppmv
Attachment 5	Thermal Stability Ranking Study: Figure 9 of Technical Article *Development of a Thermal Stability Based Ranking of Hazardous Organic Compound Incinerability* (Dellinger 2000)
Attachment 6	VOC Properties and Adsorption Potential: Technology Paper *Activated Carbon Adsorption for Treatment of VOC Emissions* (Shepherd 2001)
Attachment 7	Prediction of VOC Adsorption Capacity: Technical Article *Determining VOC Adsorption Capacity* (Yaws 1995)

Attachment 1 Tables of Contaminants and Physical Properties

Table 1-1 COPCs
Table 1-2 Compounds detected >0.1 ppmv

Table 1-1 COPCs

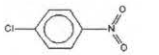
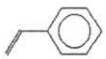
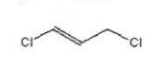
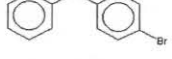
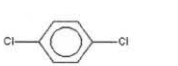
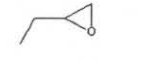
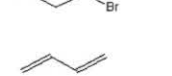
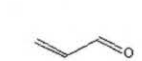
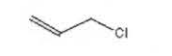
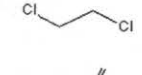
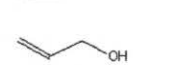
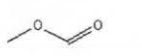
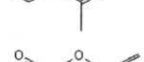
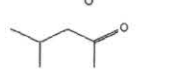
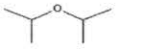
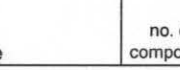
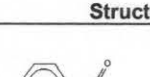
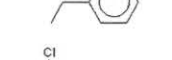
Structure	no. of compound	CAS #	COPCs	MW	formula	melting point (if above 0°C)	normal boiling point	water solubility	AIT	AIT	AIT source	Compound information Note
			Compound	g/mol		°C	°C	g/100mL	deg C	deg F		
	1	100-00-5	p-Nitrochlorobenzene	157.56	C6H4ClNO2		242	0.01	510	950	47	
	2	100-21-0	p-Phthalic acid	166.13	C8H6O4	300	sublimes	0.6	677	1250	51	
 	3	100-25-4	1,4-Dinitrobenzene	168.11	C6H4N2O4	173	173	0.05	450	842	54	
	4	100-41-4	Ethyl benzene	106.16	C8H10		136.2	0.026	432	810	1	
 	5	100-42-5	Styrene	104.14	C8H8		145.2	0.032	490	915	22	
 	6	10061-01-5	cis-1,3-Dichloropropene	110.97	C3H4Cl2		104.3	0.1	600	1112	27	
 	7	10061-02-6	trans-1,3-Dichloropropene	110.97	C3H4Cl2		112	0.1	610	1130	29	
 	8	101-55-3	4-Bromophenylphenyl ether	249.11	C12H9BrO		310.14	0.000001	839	1542.02	none	4
	9	101-84-8	Diphenyl ether	170.21	C12H10O	26.8	498	insoluble	618	1144	5	
 	10	106-35-4	3-Heptanone	114.19	C7H14O		147	0.43	390	734	47	
	11	106-42-3	p-Xylene (Dimethyl benzene)	106.16	C8H10		138.3	0.02	530	986	1	
	12	106-46-7	1,4-Dichlorobenzene	147.01	C6H4Cl2	53.1	173.4	0.00813	640	1184	47	
	13	106-88-7	1,2-Epoxybutane	72.12	C4H8O		63.3	6	479	894.2	17	
	14	106-93-4	Ethylene dibromide (Dibromoethane)	187.88	C2H4Br2		131.7	0.41	871	1600	31	1
	15	106-97-8	Butane (R-600)	58.123	C4H10		-0.45	0.0061	405	761	1	
 	16	106-99-0	1,3-Butadiene	54.091	C4H6		-4.4	0.05	449	840.2	22	
	17	107-02-8	Acrolein	56.06	C3H4O		52.7	21.25	235	455	1	
	18	107-05-1	3-Chloropropene (Allyl chloride)	76.526	C3H5Cl		44	0.337	485	905	1	
	19	107-06-2	1,2-Dichloroethane (Ethylene chloride) (freon 150	98.96	C2H4Cl2		83.5	0.86	412	773.6	1	
	20	107-12-0	Propionitrile	55.079	C3H5N		97.2	decomposes	510	950	7	
	21	107-13-1	Acrylonitrile	53.06	C3H3N		77.3	7.45	481	897.8	1	
	22	107-18-6	2-Propene-1-ol	58.08	C3H6O		97	32	378	712.4	1	
	23	107-31-3	Formic acid, methyl ester	60.05	C2H4O2		32	10	465	869	1	
	24	107-66-4	Dibutylphosphate	210.21	C8H19O4P		100	slightly	510	950	26	
	25	107-87-9	2-Pentanone	86.133	C5H10O		100	4.3	505	941	1	
	26	108-03-2	1-Nitropropane	89.09	C3H7NO2		131	1.4	420	788	1	
	27	108-05-4	Vinyl acetate	86.09	C4H6O2		72.3	2	427	800.6	1	
	28	108-10-1	Hexone (4-Methyl-2-pentanone or MIBK)	100.16	C6H12O		117.4	1.9	459	858	1	
	29	108-20-3	Bis(isopropyl)ether	102.18	C6H14O		68.5	0.2	443	829	9	
	30	108-38-3	m-Xylene (Dimethyl benzene)	106.16	C8H10		139.1	0.02	530	986	1	
	31	108-39-4	m-Cresol	108.13	C7H8O		202	1	559	1038.2	5	
	32	108-87-2	Methylcyclohexane	98.188	C7H14		101	insoluble	250	482	1	
	33	108-88-3	Toluene	92.13	C7H8		110.6	0.053	480	896	1	

Table 1-1 COPCs

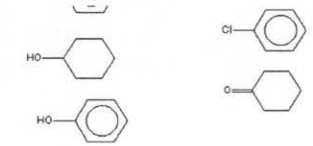
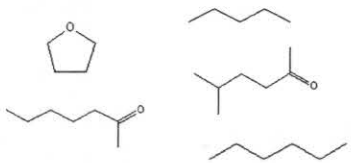
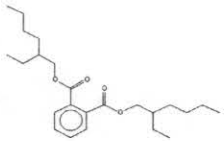
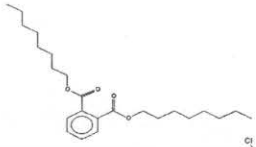
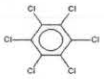
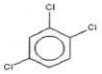
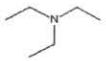
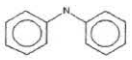
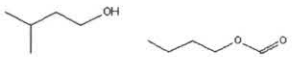
Structure	no. of compound	CAS #	COPCs	MW	formula	melting point (if above 0°C)	normal boiling point	water solubility	AIT	AIT	AIT source	Compound information Note
			Compound	g/mol		°C	°C	g/100mL	deg C	deg F		
	34	108-90-7	Chlorobenzene	112.56	C6H5Cl		130	0.05	674	1245	22	
	35	108-93-0	Cyclohexanol	100.16	C6H12O		161	3.6	300	572	5	
	36	108-94-1	Cyclohexanone	98.2	C6H10O		155.6	5	420	788	1	
	37	108-95-2	Phenol	94.11	C6H6O		181.7	8.3	715	1319	21	
	38	109-66-0	n-Pentane	72.15	C5H12		36.1	0.04	260	500	1	
	39	109-99-9	Tetrahydrofuran	72.1	C4H8O		66	30	321	609.8	1	
	40	110-12-3	5-Methyl-2-hexanone	114.19	C7H14O		144	0.5	191	376	6	
	41	110-43-0	2-Heptanone	114.19	C7H14O		150	0.43	393	739	5	
	42	110-54-3	n-Hexane	86.177	C6H14		69	0.00095	225	437	1	
	43	110-62-3	n-Valeraldehyde	86.13	C5H10O		103	0.1	260	500	3	
	44	110-82-7	Cyclohexane	84.161	C6H12		80.7	0.1	245	473	1	
	45	110-83-8	Cyclohexene	82.145	C6H10		83	0.02	310	590	1	
	46	110-86-1	Pyridine	79.1	C5H5N		115.2	miscible	482	899.6	1	
	47	111-65-9	n-Octane	114.23	C8H18		126	slightly	220	428	1	
	48	111-76-2	Ethylene glycol monobutyl ether	118	C6H14O2		171	5	238	460.4	5	
straight chain C-9 	49	111-84-2	n-Nonane	128.26	C9H20		150.8	0.1	190	374	1	
	50	117-81-7	Bis(2-ethylhexyl)phthalate (DEHP)	390.54	C24H38O4		386.9	0.000034	390	734	5	
	51	117-84-0	n-Dioctyl phthalate	390.56	C24H38O4		220	0.0003	391	735.08	55	
	52	118-74-1	Hexachlorobenzene	284.8	C6Cl6		332	0.00000062	839	1542.02	none	4
	53	120-12-7	Anthracene	178.22	C14H10		340	0.00000434	538	1000.4	55	
	54	120-82-1	1,2,4-Trichlorobenzene	181.46	C6H3Cl3		214.4	0.0049	571	1060	50	
	55	120-83-2	2,4-Dichlorophenol	163.01	C6H4Cl2O		210	0.45	839	1542.02	none	4
	56	121-44-8	Triethylamine	101.19	C6H15N		88.9	0.02	249	480	5	
	57	121-69-7	Dimethylaniline	121.18	C8H11N		194	1.6	371	699.8	5	
	58	122-39-4	N,N-Diphenylamine	169.23	C12H11N	52	302	0.03	634	1173	5	
	59	123-19-3	4-Heptanone	114.19	C7H14O		144	0.53	450	842	34	
	60	123-38-6	n-Propionaldehyde	58.08	C3H6O		49	5	207	404.6	1	
	61	123-51-3	3-Methyl-1-butanol	88.15	C5H12O		130	5.4	350	662	1	

Table 1-1 COPCs

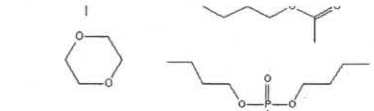
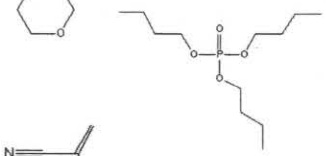
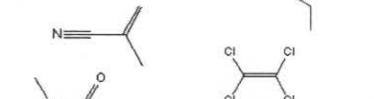
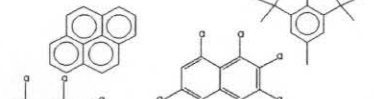
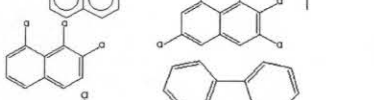
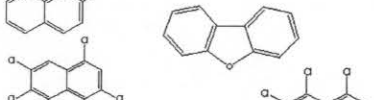
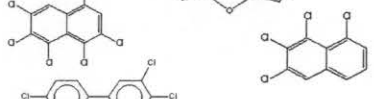
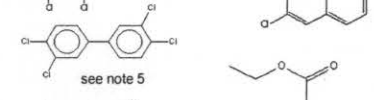
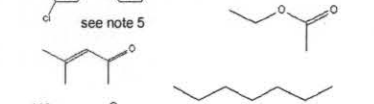
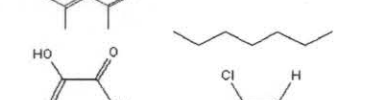
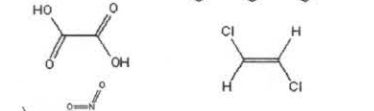
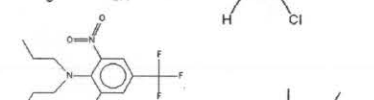
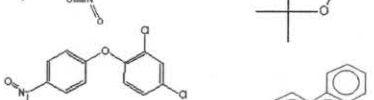
Structure	no. of compound	CAS #	COPCs	MW	formula	melting point (if above 0°C)	normal boiling point	water solubility	AIT	AIT	AIT source	Compound information Note
			Compound	g/mol		°C	°C	g/100mL	deg C	deg F		
	62	123-86-4	Acetic acid n-butyl ester	116.16	C6H12O2		126.1	0.68	425	797	1	
	63	123-91-1	1,4-Dioxane	88.1	C4H8O2		101.1	miscible	180	356	1	
	64	126-73-8	Tributyl phosphate	266.32	C12H27O4P		289	0.1	482	899.6	47	
	65	126-98-7	2-Methyl-2-propenenitrile (Methacrylonitrile)	67.09	C4H5N		90.3	2.5	460	860	11	
	66	127-18-4	Perchloroethylene (tetrachloroethylene)	165.85	C2Cl4		121.1	0.015	871	1600	30	1
	67	127-19-5	N,N-Dimethylacetamide	87.12	C4H9NO		166	miscible	490	914	1	
	68	128-37-0	2,6-Bis(tert-butyl)-4-methylphenol	220.35	C15H24O		265	insoluble	470	878	47	
	69	129-00-0	Pyrene	202.24	C16H10	156	404	0.0000013	839	1542.02	none	4
	70	1321-64-8	Pentachloronaphthalene	300.4	C10H3Cl5		327	insoluble	839	1542.02	none	4
	71	1321-65-9	Trichloronaphthalene	231.51	C10H5Cl3		304	insoluble	839	1542.02	none	4
	72	132-64-9	Dibenzofuran	168.19	C12H8O		285	0.1	839	1542.02	none	4
	73	1335-87-1	Hexachloronaphthalene	334.84	C10H2Cl6		343	insoluble	839	1542.02	none	4
	74	1335-88-2	Tetrachloronaphthalene	265.95	C10 H4 Cl4		316	insoluble	839	1542.02	none	4
see note 5	75	1336-36-3	Polychlorinated biphenyls (PCBs)	322	C12HxCly (x+y=10		>195	slightly	839	1542.02	none	4 & 5
	76	141-78-6	Acetic acid ethyl ester (Ethyl acetate)	88.1	C4H8O2		77.1	8	486	906.8	22	
	77	141-79-7	4-Methyl-3-penten-2-one	98.16	C6H10O		127	3	344	651	1	
	78	142-82-5	n-Heptane	100.2	C7H16		98.4	<0.01	223	433.4	1	
	79	144-62-7	Oxalic acid	90.035	C2H2O4		190	10	760	1400	39	
	80	156-60-5	trans-1,2-Dichloroethylene	96.95	C2H2Cl2		47.5	0.63	460	860	1	
	81	1582-09-8	Trifluralin	335.29	C13H16F3N3O4		139	0.01	471	880	33	
	82	1634-04-4	Methyl tert-butyl ether	88.15	C5H12O		55.2	5.1	435	815	5	
	83	1836-75-5	Nitrofen	284.1	C12H7Cl2NO3		180	<0.1	839	1542.02	35	4
	84	189-55-9	Dibenzo[a,i]pyrene	302.37	C24H14	308	404	0.0000013	839	1542.02	none	4
	85	189-64-0	Dibenzo[a,h]pyrene	302.37	C24H14	308	404	0.0000013	839	1542.02	none	4
	86	191-24-2	Benzo(g,h,i)perylene	276.34	C22H12		500	0.000000026	839	1542.02	none	4
	87	191-30-0	Benzo[a,i]pyrene	302.37	C24H14	162	404	0.0000013	839	1542.02	none	4

Table 1-1 COPCs

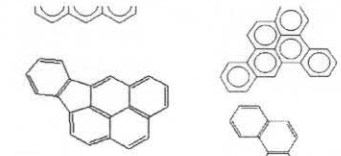
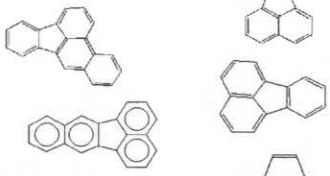
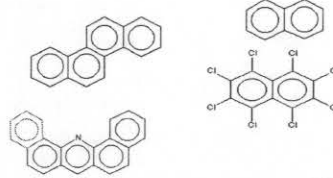
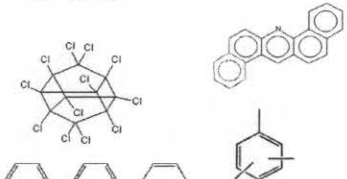
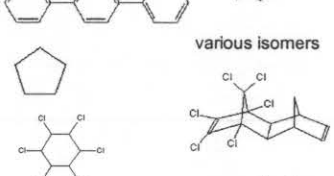
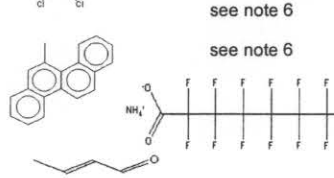
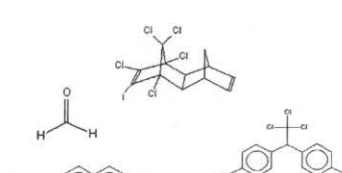
Structure	no. of compound	CAS #	COPCs	MW	formula	melting point (if above 0°C)	normal boiling point	water solubility	AIT	AIT	AIT source	Compound information Note
			Compound	g/mol		°C	°C	g/100mL	deg C	deg F		
	88	192-65-4	Dibenzo[a,e]pyrene	302.37	C24H14	241	sublimes	0.0000013	839	1542.02	none	4
	89	193-39-5	Indeno(1,2,3-cd)pyrene	276.34	C22H12	162.5	536	0.0000062	839	1542.02	none	4
	90	205-82-3	Benzo(j)fluoranthene	252.31	C20H12	165	350	0.00000012	839	1542.02	none	4
	91	205-99-2	Benzo(b)fluoranthene	252.32	C20H12	167	357	0.00000012	839	1542.02	none	4
	92	206-44-0	Fluoranthene	202.26	C16H10	110.8	375	0.0000265	839	1542.02	none	4
	93	207-08-9	Benzo(k)fluoranthene	252.32	C20H12	215.7	480	0.000000055	839	1542.02	none	4
	94	208-96-8	Acenaphthylene	152.21	C12H8	93.5	265	0.000393	839	1542.02	none	4
	95	218-01-9	Chrysene	228.28	C18H12	255.8	448	0.00000018	839	1542.02	none	4
	96	2234-13-1	Octachloronaphthalene	403.73	C10Cl8	185	440	insoluble	839	1542.02	none	4
	97	224-42-0	Dibenz[a,j]acridine	279.34	C21H13N	216	>346	not found	839	1542.02	none	4
	98	226-36-8	Dibenz[a,h]acridine	279.34	C21H13N	228	>346	not found	839	1542.02	none	4
	99	2385-85-5	Mirex	545.55	C10Cl12	485	composes	<0.1	839	1542.02	none	4
	100	25551-13-7	Trimethyl benzene	120.19	C9H12		164.7	insoluble	550	1022	1	
	101	26140-60-3	Terphenyls	230.31	C18H14	68	337	insoluble	839	1542.02	none	4
various isomers	102	27154-33-2	Trichlorofluoroethane	151.4	C2H2Cl3F		146.5	0.3	871	1600	36	2
	103	287-92-3	Cyclopentane	70.134	C5H10		49	insoluble	380	716	1	
	104	309-00-2	Aldrin	364.93	C12H8Cl6	104	145	0.000018	839	1542.02	35	
	105	319-84-6	Hexachlorocyclohexane (Lindane) Alpha BHC	290	C6H6Cl6	112	288	0.0002	839	1542.02	none	4
see note 6	106	319-85-7	Hexachlorocyclohexane (Lindane) Beta BHC	290.83	C6H6Cl6	112	288	0.0005	839	1542.02	none	4 & 6
see note 6	107	319-86-8	Delta-BHC	290.85	C6H6Cl6	112	288	0.00213	839	1542.02	none	4 & 6
	108	3697-24-3	5-Methylchrysene	242.32	C19H14	171	404	0.0000013	839	1542.02	none	4
	109	3825-26-1	Ammonium perfluorooctanoate	431.1	C8H4F15NO2	59	192	not found	839	1542.02	none	4
	110	4170-30-3	2-Butenaldehyde (2-Butenal)	70.091	C4H6O		102	18	230	446	16	
	111	465-73-6	Isodrin	364.91	C12H8Cl6	93	304	insoluble	839	1542.02	none	4
	112	50-00-0	Formaldehyde	30.03	CH2O		-19.5	55	430	806	1	
	113	50-29-3	4,4-DDT	354.48	C14H9Cl5	108.5	260	0.000000017	839	1542.02	none	4

Table 1-1 COPCs

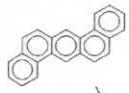
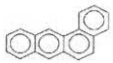
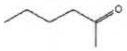
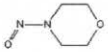
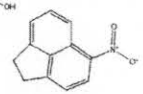
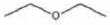
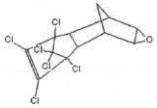
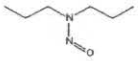
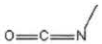
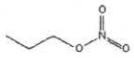
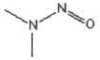
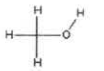
Structure	no. of compound	CAS #	COPCs	MW	formula	melting point (if above 0°C)	normal boiling point	water solubility	AIT	AIT	AIT source	Compound information Note
			Compound	g/mol		°C	°C	g/100mL	deg C	deg F		
	114	50-32-8	Benzo(a)pyrene	252.3	C20H12	176.5	495	0.00000038	839	1542.02	none	4
	115	53-70-3	Dibenzo(a,h)anthracene	278.33	C22H14	266	524	0.00000005	839	1542.02	none	4
	116	540-59-0	1,2-Dichloroethylene	96.94	C2H2Cl2		48	0.5	460	860	21	
	117	540-84-1	2,2,4-Trimethylpentane	114.23	C8H18		99.2	insoluble	415	779	1	
	118	541-73-1	1,3-Dichlorobenzene	147.01	C6H4Cl2		173	0.0125	640	1184	47	
	119	56-23-5	Carbon tetrachloride (R-10)	153.84	CCl4		76.7	0.0805	871	1600	8	1
	120	563-80-4	3-Methyl-2-butanone	86.133	C5H10O		94	slightly	452	845.6	6	
	121	56-49-5	3-Methylcholanthrene	268.36	C21H16	179	280	0.0000013	839	1542.02	none	4
	122	56-55-3	Benzo(a)anthracene	228.28	C18H12	159.8	437.6	0.0000014	839	1542.02	none	4
	123	57-14-7	1,1-Dimethylhydrazine	60.099	C2H8N2		63	decomposes	249	480.2	1	
see note 6	124	58-89-9	gamma-BHC (Lindane)	290.83	C6H6Cl6	112.9	323.4	decomposes	839	1542.02	none	4
	125	58-90-2	2,3,4,6-Tetrachlorophenol	231.9	C6H2Cl4O	70	150	slightly	839	1542.02	none	4
	126	591-78-6	2-Hexanone	100.16	C6H12O		127	1.4	533	991	1	
	127	59-50-7	4-Chloro-3-methylphenol	142.58	C7H7ClO	67	235	0.385	839	1542.02	none	4
	128	59-89-2	N-Nitrosomorpholine	116.12	C4H8N2O2	29	224	10	500	932	40	
	129	602-87-9	5-Nitroacenaphthene	199.21	C12H9NO2	102	279	0.1	839	1542.02	none	4
	130	60-29-7	Ethyl ether	74.12	C4H10O		34.6	6.9	160	320	1	
	131	603-34-9	Triphenylamine	245.32	C18H15N	127	347	0.1	839	1542.02	none	4
	132	60-34-4	Methylhydrazine	46.072	CH6N2		87.8	0.1	196	384.8	1	
	133	60-35-5	Acetamide	59.07	C2H5NO		221	10	480	896	15	
	134	60-57-1	Dieldrin	380.93	C12H8Cl6O	176	385	0.00002	839	1542.02	none	4
	135	621-64-7	Di-n-Propylnitrosamine	130.19	C6H14N2O		206	0.9894	275	527	43	
	36	624-83-9	Methyl isocyanate	57.052	C2H3NO		39	decomposes	535	995	13	
	37	627-13-4	Nitric acid, propyl ester	105.09	C3H7NO3		110	insoluble	420	788	28	
	138	62-75-9	N-Nitroso-N,N-dimethylamine	74.1	C2H6N2O		153	10	500	932	37	
	139	630-20-6	1,1,1,2-Tetrachloroethane	167.85	C2H2Cl4		130.5	0.1	871	1600	24	1
	140	64-17-5	Ethyl alcohol	46.069	C2H6O		78.3	10	426	798.8	22	
	141	64-18-6	Formic acid	46.03	CH2O2		100.7	miscible	434	813.2	1	
	142	64-19-7	Acetic acid	60.052	C2H4O2		118	miscible	465	869	1	
	143	67-56-1	Methyl alcohol (Methanol)	32.04	CH4O		64.6	miscible	470	878	1	
	144	67-63-0	2-Propyl alcohol (Isopropanol)	60.096	C3H8O		82.4	miscible	456	852.8	1	
	145	67-64-1	2-Propanone (Acetone)	58.08	C3H6O		56.2	miscible	465	869	1	

Table 1-1 COPCs

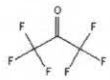
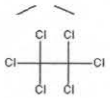
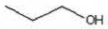
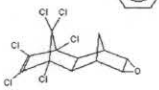
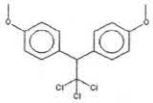
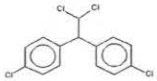
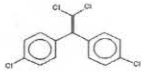
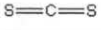
Structure	no. of compound	CAS #	COPCs	MW	formula	melting point (if above 0°C)	normal boiling point	water solubility	AIT	AIT	AIT source	Compound information Note
			Compound	g/mol		°C	°C	g/100mL	deg C	deg F		
	146	67-66-3	Chloroform (R-20)	119.39	CHCl3		61.7	0.795	1000	1832	6	
 	147	67-72-1	Hexachloroethane	236.74	C2Cl6	187	sublimes	0.005	871	1600	none	4
	148	684-16-2	Hexafluoroacetone	166.02	C3F6O		-26	niscible/reacts	871	1600	23	1
	149	71-23-8	n-Propyl alcohol	60.096	C3H8O		97.2	miscible	440	824	1	
	150	71-36-3	n-Butyl alcohol	74.1	C4H10O		117.6	6.32	367	692.6	22	
	151	71-43-2	Benzene	78.11	C6H6		80.1	0.18	592	1097.6	22	
	152	71-55-6	Methyl chloroform (1,1,1-Trichloroethane)	133.42	C2H3Cl3		74.1	0.1495	537	999	9	
	153	72-20-8	Endrin	380.93	C12H8Cl6O	200	245	0.000026	839	1542.02	none	4
	154	72-43-5	Methoxychlor	345.65	C16H15Cl3O2	78	346	0.0001	839	1542.02	none	4
	155	72-54-8	4,4-DDD	320.05	C14H10Cl4	109	193	0.000016	839	1542.02	none	4
	156	72-55-9	4,4-DDE	319.03	C14H8Cl4	88.4	316.5	0.00000013	839	1542.02	none	4
	157	74-83-9	Bromomethane (Methyl bromide) (halon 1001)	94.95	CH3Br		3.56	1.5	537	998.6	9	
	158	74-87-3	Chloromethane (Methyl chloride) (R-40)	50.49	CH3Cl		-24.2	0.533	662	1223.6	22	
	159	74-97-5	Bromochloromethane (halon 1011)	129.39	CH2BrCl		67.8	0.1	871	1600	24	1
	160	74-99-7	Methylacetylene	40.07	C3H4		-23	not found	340	644	12	
	161	75-00-3	Chloroethane	64.52	C2H5Cl		12.3	0.574	519	966.2	8	
	162	75-01-4	Vinyl chloride (1-Chloroethene)	62.5	C2H3Cl		-13.9	0.11	472	881.6	9	
	163	75-05-8	Acetonitrile	41.05	C2H3N		81.6	miscible	524	975.2	1	
	164	75-07-0	Acetaldehyde	44.05	C2H4O		20.1	miscible	175	347	1	
	165	75-09-2	Dichloromethane (Methylene chloride) (R-30)	84.94	CH2Cl2		39.8	1.32	662	1223.6	58	
	166	75-12-7	Formamide	45.04	CH3NO		210	miscible	500	932	4	
	167	75-15-0	Carbon disulfide	76.14	CS2		46.2	0.12	125	257	1	
	168	75-21-8	Ethylene oxide (Oxirane)	44.05	C2H4O		10.7	miscible	429	804.2	1	
	169	75-27-4	Bromodichloromethane	163.83	CHBrCl2		90.1	0.674	871	1600	none	3
	170	75-34-3	1,1-Dichloroethane	98.97	C2H4Cl2		57.3	0.51	456	852.8	1	
	171	75-35-4	1,1-Dichloroethene (Vinylidene chloride)	96.95	C2H2Cl2		31.7	0.23	457	854.6	9	
	172	75-43-4	Dichlorofluoromethane (R-21)	102.92	CHCl2F		9	insoluble	552	1026	56	2
	173	75-45-6	Chlorodifluoromethane (R-22)	86.47	CHClF2		-40.8	0.3	632	1170	9	
	174	75-50-3	Trimethylamine	59.11	C3H9N		2.87	miscible	190	374	6	
	175	75-52-5	Nitromethane	61.04	CH3NO2		101	9.5	418	784.4	1	
	176	75-55-8	2-Methylaziridine	57.1	C3H7N		66	miscible	490	914	14	
	177	75-61-6	Difluorodibromomethane (freon 12B2- halon 120	209.82	CBr2F2		24	0.1	871	1600	9	2
	178	75-63-8	Trifluorobromomethane (R-13B1)	148.91	CBrF3		-57.8	0.03	871	1600	9	1

Table 1-1 COPCs

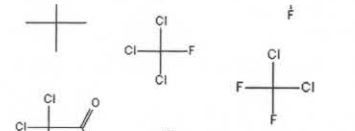
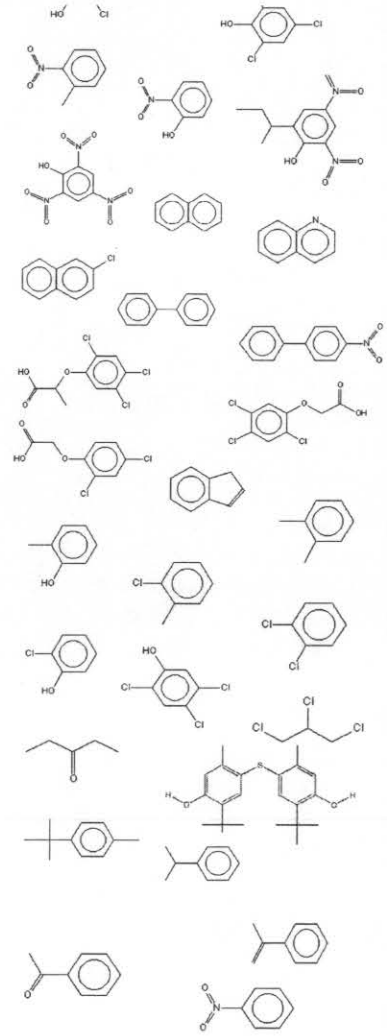
Structure	no. of compound	CAS #	COPCs	MW	formula	melting point (if above 0°C)	normal boiling point	water solubility	AIT	AIT	AIT source	Compound information Note
			Compound	g/mol		°C	°C	g/100mL	deg C	deg F		
	179	75-65-0	2-Methyl-2-propanol	74.122	C4H10O		82.2	miscible	478	892.4	5	
	180	75-69-4	Trichlorofluoromethane (R-11)	137.38	CCl3F		23.8	0.124	871	1600	8	2
	181	75-71-8	Dichlorodifluoromethane (R-12)	120.92	CCl2F2		-29.79	0.03	871	1600	9	2
	182	75-99-0	2,2-Dichloropropionic acid	142.97	C3H4Cl2O2		202	50.2	600	1112	46	
	183	76-03-9	Trichloroacetic acid	163.39	C2HCl3O2	57	196	10	871	1600	5	2
	184	76-11-9	1,1,1,2-Tetrachloro-2,2-difluoroethane (R-112a)	203.83	C2Cl4F2	41	91	0.01	732	1350	25	
	185	76-12-0	1,1,2,2-Tetrachloro-1,2-difluoroethane (R-112)	203.83	C2Cl4F2	26	93	0.01	732	1350	25	
	186	76-13-1	1,2,2-Trichloro-1,1,2-trifluoroethane (Freon 113)	187.38	C2Cl3F3		47.6	0.02	680	1256	9	
	187	76-14-2	1,2-Dichloro-1,1,2,2-tetrafluoroethane (R-114)	170.92	C2Cl2F4		3.8	slightly	871	1600	9	2
	188	76-15-3	Chloropentafluoroethane (R-115)	154.47	C2ClF5		-39.1	insoluble	871	1600	9	2
	189	76-44-8	Heptachlor	373.35	C10H5Cl7	95	135	0.000018	839	1542.02	none	4
	190	78-83-1	2-Methylpropyl alcohol (Isobutyl alcohol)	74.12	C4H10O		107.9	9.5	415	779	9	
	191	78-87-5	1,2-Dichloropropane	112.99	C3H6Cl2		96.8	0.27	557	1034	1	
	192	78-92-2	1-Methylpropyl alcohol (2-Butanol)	74.122	C4H10O		99.5	15	406	762.8	1	
	193	78-93-3	Methyl ethyl ketone (MEK, 2-Butanone)	72.1	C4H8O		79.6	25.6	516	960.8	2	
	194	79-00-5	1,1,2-Trichloroethane	133.42	C2H3Cl3		113.8	0.442	500	932	22	2
	195	79-01-6	Trichloroethylene	131.4	C2HCl3		86.7	0.11	420	788	5	
	196	79-09-4	Propionic acid	74.08	C3H6O2		140.7	37	490	914	18	
	197	79-10-7	2-Propenoic acid	72.06	C3H4O2	12	141.6	10	438	820.4	5	
	198	79-20-9	Methyl acetate	74.08	C3H6O2		56.9	24.5	502	935.6	1	
	199	79-34-5	1,1,2,2-Tetrachloroethane	167.86	C2H2Cl4		146.3	0.3	871	1600	9	2
see note 7	200	8001-35-2	Toxaphene	414	C10H10Cl8	65	composes	0.000055	839	1542.02	none	4 & 7
	201	82-68-8	Pentachloronitrobenzene (PCBN)	295.36	C6Cl5NO2	144	328	0.000059	839	1542.02	none	4
	202	83-32-9	Acenaphthene	154.21	C12H10	95	279	0.00035	839	1542.02	none	4
	203	84-66-2	Diethyl phthalate	222.24	C12H14O4		298	0.09	457	855	5	
	204	84-74-2	Dibutyl phthalate	278.34	C16H22O4		340	0.0013	402	756	5	
	205	85-01-8	Phenanthrene	178.22	C14H10	99.5	340	0.00012	839	1542.02	none	4
	206	85-68-7	Butylbenzyl phthalate	312.39	C19H20O4		370	0.00027	233	451.4	52	
	207	86-73-7	Fluorene	166.22	C13H10	116	295	0.000019	839	1542.02	none	4
	208	87-68-3	Hexachlorobutadiene	260.76	C4Cl6		210	0.00032	610	1130	55	
	209	87-86-5	Pentachlorophenol	266.34	C6HCl5O	174	310	0.0014	839	1542.02	none	4

Table 1-1 COPCs



Structure	no. of compound	CAS #	COPCs	MW	formula	melting point (if above 0°C)	normal boiling point	water solubility	AIT	AIT	AIT source	Compound information Note
			Compound	g/mol		°C	°C	g/100mL	deg C	deg F		
	210	88-06-2	2,4,6-Trichlorophenol	197.46	C6H3Cl3O	69.5	244.5	0.08	839	1542.02	none	4
	211	88-72-2	2-Nitrotoluene	137.13	C7H7NO2		221	0.06	305	581	44	
	212	88-75-5	2-Nitrophenol	139.11	C6H5NO3	45.3	214.6	0.21	839	1542.02	none	4
	213	88-85-7	2-sec-Butyl-4,6-dinitrophenol (Dinoseb)	240.22	C10H12N2O5	55.5	>300	0.0052	839	1542.02	none	4
	214	88-89-1	Picric acid	229.11	C6H3N3O7	122	>300	1.4	300	572	none	
	215	91-20-3	Naphthalene	128.16	C10H8	80.6	218	0.00031	568	1054	1	
	216	91-22-5	Quinoline	129.16	C9H7N		238	0.01	480	896	5	
	217	91-58-7	2-Chloronapthalene	162.61	C10H7Cl	59.5	256	0.000674	839	1542.02	none	4
	218	92-52-4	1,1`-Biphenyl	154.21	C12H10	70	255	insoluble	540	1004	55	
	219	92-93-3	4-Nitrobiphenyl	199.21	C12H9NO2	113.8	340	insoluble	839	1542.02	none	4
	220	93-72-1	Silvex (2,4,5-TP)	269.51	C9H7Cl3O3	176	200	0.014	839	1542.02	none	4
	221	93-76-5	2,4,5-T	255.48	C8H5Cl3O3	158	decomposes	decomposes	839	1542.02	none	4
	222	94-75-7	2,4-D and esters (160C typed)	221.04	C8H6Cl2O3	138	160	decomposes	839	1542.02	none	4
	223	95-13-6	Indene	116.16	C9H8	58	181.6	insoluble	526	979	41	
	224	95-47-6	o-Xylene	106.16	C8H10		144	0.017	465	869	1	
	225	95-48-7	o-Cresol (2-Methylphenol)	108.13	C7H8O	30.9	191	0.1	559	1038.2	5	
	226	95-49-8	2-Chlorotoluene	126.59	C7H7Cl		159	slightly	500	932	37	
	227	95-50-1	o-Dichlorobenzene (1,2-Dichlorobenzene)	147.01	C6H4Cl2		180.5	0.0084	640	1184	47	
	228	95-57-8	2-Chlorophenol	128.56	C6H5ClO	7	175.6	2.85	415	779	53	
	229	95-95-4	2,4,5-Trichlorophenol	197.46	C6H3Cl3O	68	253	0.12	839	1542.02	none	4
	230	96-18-4	1,2,3-Trichloropropane	147.43	C3H5Cl3		156	0.18	500	932	37	
	231	96-22-0	3-Pentanone	86.133	C5H10O		101	4.7	450	842	1	
	232	96-69-5	Bis(3-tert-butyl-4-hydroxy-6-methyl-phenyl)sulfide	358.54	C22H30O2S	150	316	<0.01	839	1542.02	none	4
	233	98-51-1	p-tert-Butyltoluene	148.25	C11H16		193	<0.1	510	950	47	
	234	98-82-8	Cumene	120.19	C9H12		151	0.005	424	795	1	
	235	98-83-9	alpha-Methylstyrene	118.18	C9H10		165.4	<0.1	574	1065.2	42	
	236	98-86-2	Acetophenone	120.5	C8H8O	19.6	201.7	0.55	571	1059.8	5	
	237	98-95-3	Nitrobenzene	123.11	C6H5NO2	5.7	210.8	0.19	482	899.6		

Table 1-1 COPCs

Structure	no. of compound	CAS #	COPCs	MW	formula	melting point (if above 0°C)	normal boiling point	water solubility	AIT	AIT	AIT source	Compound information Note
			Compound	g/mol		°C	°C	g/100mL	deg C	deg F		

Notes:
General- Boiling points were taken from Chemfinder (http://chemfinder.cambridgesoft.com) or NIST (http://webbook.nist.gov/chemistry/) where lowest value is not found with the AIT source.
1- MSDS shows compound is non flammable. AIT shown is reported as 1600 deg F to ensure that minimal credit is taken for removal efficiency through thermal oxidizer.
2- MSDS shows no AIT information and reports neglible fire hazard. AIT shown is 1600 deg F for same reason as note 1.
3- No MSDS or AIT information can be found for this compound. Due to its single carbon and 3 halogen structure, it will be treated similar to chloroform.
4- compounds with normal boiling points above 200, contain aromatic rings, and contain numerous halogen substitutions are treated as PCB in terms of AIT - in cases where no AIT information could be found - an AIT of 1542 will be used in this case in accordance with TSCA guidlines for destruction of PCBs of 2192 deg F, 2 sec res time, and 3% excess air in combustion products (this is a back calculated AIT from the efficiency predicted in table 3-2 of Lewandowski - Design on Thermal Oxidation Systems. This will be used for non halogenated napthalenic compounds as well in order to be conservative (pyrene, perlene etc).
5- structure shown is 1-1'-biphenyl,3,3',4,4'-tetrachloro (CAS# 32598-13-3) and is shown under the general context of PCBs to present a typical structure for chlorine substitutions on the biphenyl structure. Numerous variations of chlorine substitutions exist with the broad group of PCBs, however within this calculation, the treatment of PCBs under one set of compound properties is appropriate since the important properties do not range across DF boundary threshold values.
6- All BHC compound structures are the same except for the cis/trans orientation of the chlorine substitutions. (see Alpha BHC - CAS#319-84-6)
7- Camphene is the root structure of toxaphene which has 8 chlorine substitutions - no structure was found for toxaphene

AIT Sources

1 Lange's Handbook of Chemistry - 14th edition
2 MSDS - EXXON CHEMICAL AMERICAS DIV. (http://www.temarry.com/MSDS/Methyl_Ethyl_Ketone_msds.htm)
3 n-Valeraldehyde is a synonym for pentanal. The AIT is estimated from the sequence of increasing carbon aldehydes: acetaldehyde (ethanal)-175 deg C, propionaldehyde (propanal)-207 deg C, butanal-230 deg C.
4 MSDS from Internation Programme on Chemical Safety (http://www.ilo.org/public/english/protection/safework/cis/products/icsc/dtasht/_icsc08/icsc0891.pdf)
5 MSDS from JT Baker (http://www.jtbaker.com/msds/a0120.htm)
6 MSDS (http://www.bandj.com/MainWindowPages/MSDS/DimAcetaMSDS.htm#5)
7 estimated from MSDS of acetonitrile - precision pure solvents (http://www.purificationtech.com/techacmsds3.htm)-524 deg C and safety data of butyronitrile from Physical and Theoretical Chemistry Lab (http://physchem.ox.ac.uk/MSDS/BU/butyronitrile.html)-488 deg C.
8 MSDS - BOC Gases (http://www.vngas.com/pdf/g32.pdf)

9 MSDS - MATHESON TRI-GAS, INC (http://www.matheson-trigas.com/mathportal/msds/)

10 estimated from Langes Handbook of chemistry for 1,1-dichloroethylene - (570 deg C) instead of cis-1,2-dichloroethylene - (460 deg C)
11 AIT is estimated by comparison with the following compounds: (see structures to the right)

2-methyl propane - 462 deg C (source #1)
2-methyl butane - 420 deg C (source #9)
2-nitropropane - 428 deg C (source #1)
dimethylamine - 400 deg C (source #1)
diethylamine - 312 deg C (source #1)
acrylonitrile - 481 deg C (source #1)
isopropyl amine - 402 deg C (source #1)

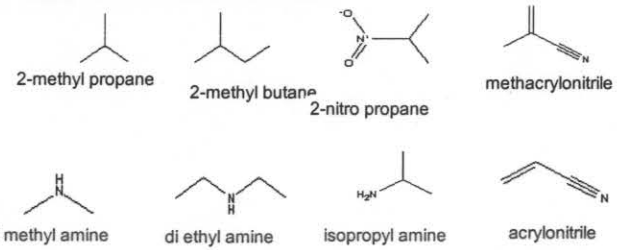
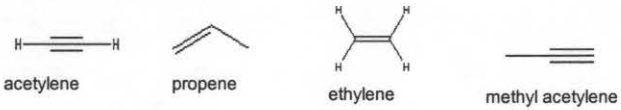


Table 1-1 COPCs

Structure	no. of compound	CAS #	COPCs	MW	formula	melting point (if above 0°C)	normal boiling point	water solubility	AIT	AIT	AIT source	Compound information Note
			Compound	g/mol		°C	°C	g/100mL	deg C	deg F		

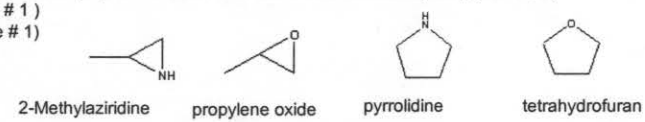
12 AIT is estimated by comparison with the following compounds: (see structures to the right)

acetylene - 305 deg C (source # 1)
propene - 460 deg C (source # 1)
ethylene - 490 deg C (source # 1)



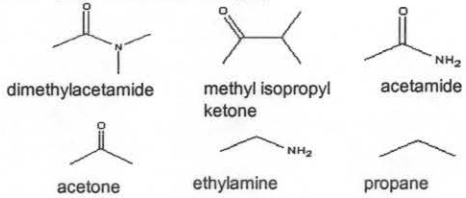
13 University of Akron Hazardous Chemical Database (http://ull.chemistry.uakron.edu/erd/)
14 AIT is estimated by comparison with the following compounds: (see structures to the right)

pyrrolidine - 345 deg C (source: BASF MSDS (http://www.basf.com/businesses/chemicals/pdfs/pyrrdine.pdf)
tetrahydrofuran - 321 deg C (source # 1)
propylene oxide - 449 deg C (source # 1)



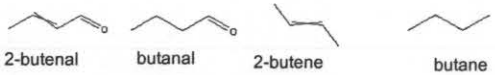
15 AIT is estimated by comparison with the following compounds: (see structures to the right)

ethylamine - 385 deg C (source: #1)
propane - 450 deg C (source # 1)
acetone - 465 deg C (source # 1)
dimethylacetamide - 490 deg C (source #1)
methyl isopropyl ketone - 452 deg C (source #6)



16 AIT is estimated by comparison with the following compounds: (see structures to the right)

butanal - 230 deg C (source #1)
butane - 405 deg C (source #1)
2-butene - 324 deg C (source #1)



17 AIT is estimated from ethylene oxide (429 deg C) and propylene oxide (449 deg C) (CAS# 's 75-21-6 and 75-56-9 from AIT source #1)
18 AIT is estimated from formic acid (434 deg C) and acetic acid (465 deg C) CAS#'s 64-18-6 and 64-19-7 from AIT source #1
19 AIT is estimated by comparison with the following compounds: (see structures to the right)

trimethyl amine - 249 deg C (source #1)
methyl isocyanate - 535 deg C (source #1)
2-nitropropane - 428 deg C (source #1)
dimethyl hydrazine - 249 deg C (source #1)

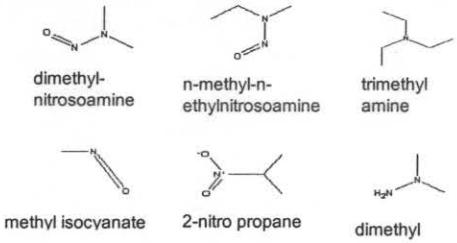
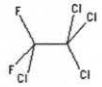


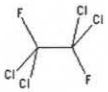
Table 1-1 COPCs

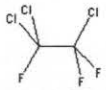
Structure	no. of compound	CAS #	COPCs	MW	formula	melting point (if above 0°C)	normal boiling point	water solubility	AIT	AIT	AIT source	Compound information Note
			Compound	g/mol		°C	°C	g/100mL	deg C	deg F		

20 sigma chemical MSDS (http://msds.pdc.cornell.edu/msds/siri/msds/h/q427/q266.html)
21 occupational safety and health guideline for phenol (http://www.osha-slc.gov/SLTC/healthguidelines/phenol/)
22 "Optimized Design and Operating Parameters for Minimixing Emissions During VOC Thermal Oxidation", Edward Donley and David Lewandowski. 88th Annual Meeting of Air & Waste Mgmt Assoc., 1995
23 MSDS from P & M Scientific Industrial Assoc (http://www.fluorine.ru/products/msds/others/hexafluoroacetone_msds.html)
24 International Chemical safety cards (http://hazard.com/msds/mf/cards/list.html)
25 AIT is estimated from 1,1,2-trichloro-1,2,2-trifluoroethane (see structures to below)

1,1,2,-trichloro-1,2,2-trifluoroethane - 680 deg C
1,1,1,2-tetrachloro-2,2-difluoroethane - 732 deg C
1,1,2,2-tetrachloro-1,2-difluoroethane - 732 deg C

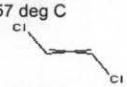

1,1,1,2-tetrachloro-2,2-difluoroethane

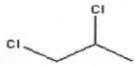

1,1,2,2-tetrachloro-1,2-difluoroethane


1,1,2,-trichloro-1,2,2-trifluoroethane

26 MSDS from OxyChem (http://new-www.oxychem.com/products/msds/m7623.pdf)
27 estimated from 1,2-dichloropropane (AIT is 557 deg C from source 1)
28 estimated from 1-nitropropane (AIT is 420 deg C from source 1)
29 AIT is estimated from 1,2 dichloropropane (see structures to below)
1,2-dichloroethane - 412 deg C
1,2-dichloroethylene - 460 deg C
1,2-dichloropropane - 557 deg C

1,2-dichloroethane


1,2-dichloroethylene

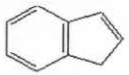

1,2-dichloropropane

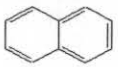
1,3-dichloropropene

30 Hill Brothers Chemical Co. MSDS (http://hillbrothers.com/msds/perchloro.htm)
31 OCCUPATIONAL SAFETY AND HEALTH GUIDELINE FOR ETHYLENE DIBROMIDE (http://www.osha-slc.gov/SLTC/healthguidelines/ethylenedibromide/recognition.html#healthhazard)
32 OCCUPATIONAL SAFETY AND HEALTH GUIDELINE FOR HEPTACHLOR (http://www.osha-slc.gov/SLTC/healthguidelines/heptachlor/)
33 Albaugh, INC. MSDS (http://www.cdms.net/ldat/mp4JE001.pdf)
34 AIT estimated from 2-heptanone - 393 deg C (source #5)
35 No AIT information was found available. Because this molecule has multiple unsaturated bonds and chlorine attachments, its AIT is estimated at 1542 deg F. This temperature fits the prediction table by back calculation when using TSCA guidelines on incineration of PCBs at minimum temperatures of 2192 deg F for achieving 99.99% destruction.

36 AIT is estimated by comparison with tetrachloroethanes from above (CAS#'s 630-20-6 and 79-34-5)
37 AIT is Conservatively estimated at 500 deg C since MSDS has no stated AIT but uses NFPA fire rating of 2 - compound is therefore assumed flammable at a reasonable AIT

38 AIT is estimated from N-Nitroso-N,N-dimethylamine (CAS# 62-75-9)
39 Compound is shown to decompose at high temperatures. AIT is estimated at 1400 deg F to be conservative
40 Compound is conservatively estimated to have AIT of less than 500 deg C based on its lack of halogens and double bonds (resonance stabilized structure)
41 AIT is estimated by Napthalene (see structures below)


indene


naphthalene

42 AMS MSDS (http://www.kpb.co.kr/eng/product/msds_AMS.htm)
43 Chemical Land 21.com Phys and Chem properties (http://www.chemicalland21.com/arokorhi/industrialchem/organic/DIPROPYLAMINE.htm)
44 Physical and Theoretical Chemistry Laboratory - Oxford University (http://physchem.ox.ac.uk/MSDS/)
45 AIT is conservatively estimated at 1600 deg F by comparison to Phenol with additional chlorine substitutions

Table 1-1 COPCs

Structure	no. of compound	CAS #	COPCs	MW	formula	melting point (if above 0°C)	normal boiling point	water solubility	AIT	AIT	AIT source	Compound information Note
			Compound	g/mol		°C	°C	g/100mL	deg C	deg F		

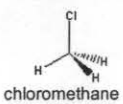
46 AIT is conservatively estimated from Trans-1,3-dichloropropene (610 deg C) and 1,2 dichloropropane (557 deg C)
47 MSDS - Fisher Scientific Canada (http://www.fishersci.ca/homepage2.nsf/frmSearch?CreateDocument&lang=E&AID=waSearch&DB=msds.nsf) or by link at (http://www-woc.sci.kun.nl/cgi-bin/view?xylenol)
48 occupational safety and health guideline (http://www.osha-slc.gov/SLTC/healthguidelines)
49 No AIT information was found available - AIT is conservatively estimated at 1600 deg F since compound has multiple halogen substitutions
50 MSDS - Baxter Healthcare Burdick & Jackson Div. (http://www-woc.sci.kun.nl/cgi-bin/view?xylenol)
51 MSDS - Amoco (http://www-woc.sci.kun.nl/cgi-bin/view?xylenol)
52 MSDS from NPS chemical repository (http://ntp-support.niehs.nih.gov/ntp_reports/ntp_chem_h&s/ntp_chem8/radian85-68-7.txt)
53 AIT is estimated from 4-chlorophenol which is listed in source 5
54 AIT is estimated from 1-chloro-4-nitrobenzene (CAS# 100-00-5)
55 MSDS - NTP chemical repository (http://157.98.10.135/NTP_Reports/NTP_Chem_H&S/NTP_Chem1/Radian117-84-0.txt)
56 Chemical Properties Handbook, C. L. Yaws, 1999 McGraw-Hill Publishing
57 estimated from the following sources and structural comparison:

Sources:
* 1,1 difluoroethane AIT of 849 deg F - from Dupont chemical MSDS (http://www.dupont.com/msds/40_37_3027fr.html)
* difluoromethane AIT of 986 deg F - from Mational Industrial Chemicals Notification and assessment Scheme Report: (http://www.nicnas.gov.au/publications/CAR/new/NA/NAFULLR/NA0500FR/NA563FR.pdf)
* No AIT for flouromethane could be found - however, the NFPA flammability rating for this compound is 4 and the AIT is assumed to be much less than difluoromethane.

*1,2 dichloromethane AIT of 1186 deg F is listed above
*chloromethane AIT of 1224 deg F is listed above
*1,2 dichloroethane AIT of 774 deg F is listed above
*1,1 dichloroethane AIT of 853 deg F is from Langes Handbook (source 1 from above)
* 1,2,3 trichloropropane AIT of 580 deg F - from NTP chemical repository MSDS: (http://ntp-server.niehs.nih.gov/htdocs/Chem_H&S/NTP_Chem9/Radian96-18-4.html)

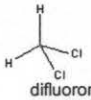
*bromomethane AIT of 998.6 deg F is listed above

Estimation


chloromethane
AIT=1224 deg F

fluoromethane
AIT<<1198 deg F

bromomethane
AIT=998.6 deg F


dichloromethane
AIT=1139 deg F

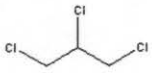
difluoromethane
AIT=1198 deg F

1,2 dibromoethane
Estimated AIT=1100 deg F

1,2 dichloroethane
AIT=774 deg F

1,1 dichloroethane
AIT=853 deg F

1,1 difluoroethane
AIT=849 deg F


1,2,3 trichloropropane
Estimated AIT=1000 deg F

58 University of Akron - Chemical Database (http://ull.chemistry.uakron.edu/erd/)

Table 1-2 Compounds detected > 0.1 ppmv

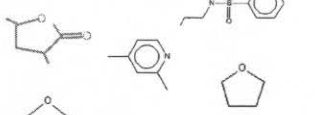
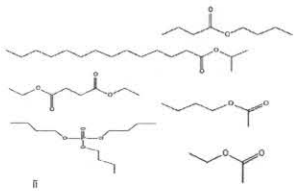
Structure (some obvious structures are not shown due to chain length)	no. of compounds	Chemical Name	Molecular Weight	Chemical Id	formula	melting pt	normal boiling pt	(water) solubility[1]	phys prop source	AIT	AIT source	NFPA flammability rating	comments
		UNITS				°C	°C	g/100 ml		°C			
	1	Cyclotrisiloxane, hexamethyl-	222.5	541-05-9	C6H18O3Si3	65	134	"moisture sensitive"	1	400	53		
	2	Cyclotetrasiloxane, octamethyl-	296.6	556-67-2	C8H24O4Si4	17.5	175	"insoluble"	6	400	42	2	typically found in adhesives and sealant materials
none	3	tetramethylcyclotrisiloxane	194.0	USI000-06	C4H14O3Si3	-65	135	"insoluble"	3	250	2	3	msds for tetramethylcyclotetrasiloxane - also shows reactive with water
	4	Benzenesulfonamide, N-butyl-	213.3	3622-84-2	C10H15NO2S		314	practically insoluble"	2	800	54	1	
	5	2(3H)-Furanone, dihydro-3,5-dimethyl-	114.1	5145-07-1	C6H10O2	-31	206	"completely"	4	425	13		
	6	Pyridine, 2,4-dimethyl-	107.2	108-47-4	C7H9N	-60	159		5	482	3		
	7	Furan, tetrahydro-	72.1	109-99-9	C4H8O		66	<0.1	1	321	1		
	8	Furan	68.1	110-00-9	C4H4O	-85.6	31.4	<0.1	1	360	42		
	9	Pyridine	79.1	110-86-1	C5H5N	-41.6	115.2	"miscible"	1	482	1		
	10	Furan, 2,5-dihydro-	70.1	1708-29-8	C4H6O		67		5	450	10		
	11	2H-Pyran-2-one, tetrahydro-5,6-dimethyl-, tra	128.2	24405-16-1	C7H12O2		180		7	350	12		
	12	Pyrimidine	80.1	289-95-2	C4H4N2	20	123		1	450	11		
	13	Pyrazine	80.1	290-37-9	C4H4N2	52	115		1	450	11		
	14	Furan, 2-methyl-	82.1	534-22-5	C5H6O	-88.7	63	<0.1	1	450	10		
	15	Oxirane, ethenyl-	70.1	930-22-3	C4H6O	-85.7	67	1-5	5	429	14		
	16	2(3H)-Furanone, dihydro- (gamma butyrolact	86.1	96-48-0	C4H6O2	-43	205	10	5	450	10		
	17	1,3-Propanediol, dinitrate	166.1	3457-90-7	C3H6N2O6		100		7	450	9		boiling pt estimated by nitric acid propyl ester
	18	1,4-Butanediol, dinitrate	180.1	3457-91-8	C4H8N2O6	12	130		5*	450	9		boiling pt estimated by nitric acid butyl ester
	19	Nitrous acid, butyl ester	103.1	544-16-1	C4H9NO2		78		5	450	7	3	
	20	Nitrous acid, methyl ester	61.0	624-91-9	CH3NO2	-83	64.6		6	500	8		
	21	Nitric acid, ethyl ester	91.1	625-58-1	C2H5NO3	-102	88	"decomposes"	5	90	1		
	22	Butane, 1-nitro-	103.1	627-05-4	C4H9NO2	-81	153	slightly	5	450	4		
	23	Nitric acid, propyl ester	105.1	627-13-4	C3H7NO3	-100	110	"insoluble"	1	175	1		reported as "insoluble"
	24	Methanamine, N-methyl-N-nitroso- and other	74.1	62-75-9	C2H6N2O		153		5	500	17		
	25	Nitric acid, butyl ester	119.1	928-45-0	C4H9NO3		136		5	400	5		
	26	Pyrrolidine	71.1	123-75-1	C4H9N	-61	87		5	450	6		
	27	Methanamine, N-(1-methylbutylidene)-	99.2	22431-09-0	C6H13N		130		7	350	16		boiling pt estimated from hexamethyleneimine
	28	2-Pyrrolidinone	85.1	616-45-5	C4H7NO	24	245		1	450	15		
	29	Methanamine, N,N-dimethyl-	59.1	75-50-3	C3H9N	-117	2.9	miscible	1	190	1		
	30	Propanenitrile	55.1	107-12-0	C3H5N	-93	97	5-10	5	510	17		reported to decompose in aqueous solution
	31	Butanenitrile	69.1	109-74-0	C4H7N	-112	118	slightly	1	488	18		
	32	Pentanenitrile	83.1	110-59-8	C5H9N	-96	139	0.1-0.5	1	475	19		
similar to above	33	Octanenitrile	125.2	124-12-9	C8H15N	-45	199		1	450	19		
similar to above	34	Nonanenitrile	139.2	2243-27-8	C9H17N	-35	224		1	440	19		
similar to above	35	Hexanenitrile	97.2	628-73-9	C6H11N	-80	162		5	470	19		
similar to above	36	Heptanenitrile	111.2	629-08-3	C7H13N	-63	180		5	460	19		
	37	Acetonitrile	41.1	75-05-8	C2H3N	-48	81	miscible	1	524	1		
	38	Butanoic acid, butyl ester	144.2	109-21-7	C8H16O2	-92	166		1	450	20		
	39	Tetradecanoic acid, 1-methylethyl ester	270.5	110-27-0	C17H27O2		300		1*	400	21		boiling pt estimated from Pentadecanoic acid
	40	Butanedioic acid, diethyl ester	174.2	123-25-1	C8H14O4	-20	217		1	350	24	1	
	41	Acetic acid, butyl ester	116.2	123-86-4	C6H12O2	-106	126	0.68	1	425	1		
	42	Phosphoric acid tributyl ester	266.3	126-73-8	C12H27O4P	-80	289	0.1	1	482	17		
	43	Acetic acid ethyl ester	88.1	141-78-6	C4H8O2	-83	77.1	8	1	482	17		

Table 1-2 Compounds detected > 0.1 ppmv

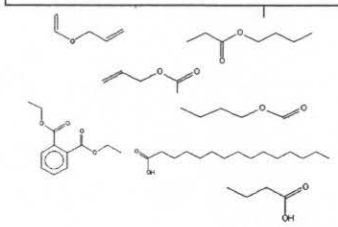
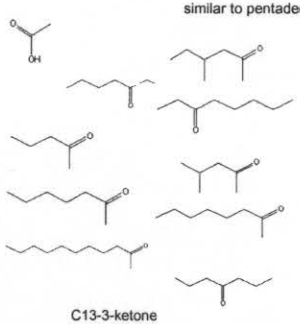
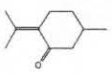
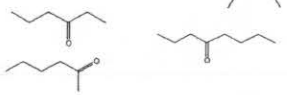
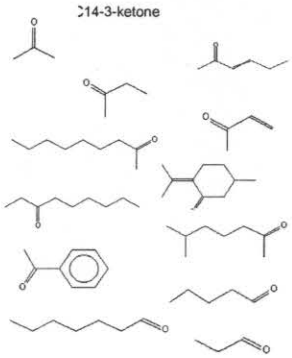
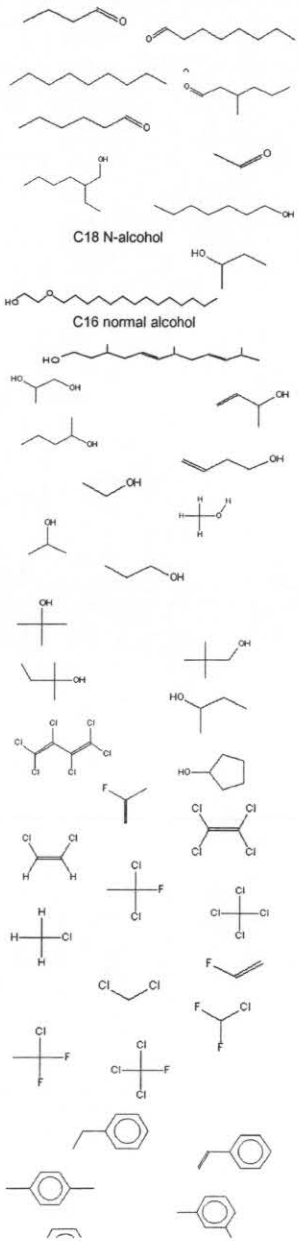
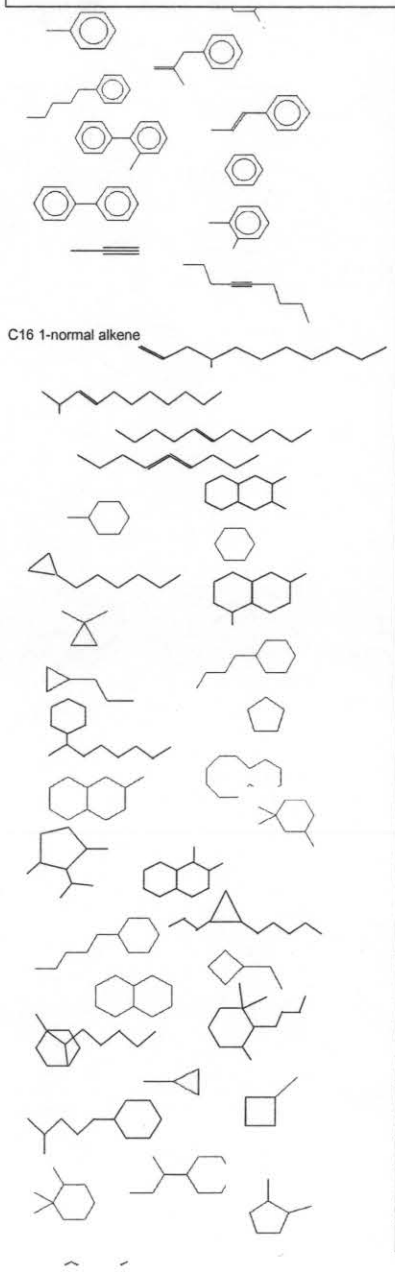
Structure (some obvious structures are not shown due to chain length)	no. of compounds	Chemical Name	Molecular Weight	Chemical Id	formula	melting pt	normal boiling pt	(water) solubility[1]	phys prop source	AIT	AIT source	NFPA flammability rating	comments
		UNITS				°C	°C	g/100 ml		°C			
	44	Formic acid, 2-propenyl ester	86.1	1838-59-1	C4H6O2		83		6	500	25		
	45	Propanoic acid, butyl ester	130.2	590-01-2	C7H14O2	-75	145		1	427	1		
	46	Acetic acid, 2-propenyl ester	100.1	591-87-7	C5H8O2		103	"slightly"	1	475	26		
	47	Formic acid, butyl ester	102.1	592-84-7	C5H10O2	-90	107	"slightly"	1	322	1		
	48	1,2-Benzenedicarboxylic acid, diethyl ester	222.2	84-66-2	C12H14O4	-3	298	0.0896	1	540	22		
	49	Pentadecanoic acid	242.4	1002-84-2	C15H30O2	52	339		1	400	27		
	50	Butanoic acid	88.1	107-92-6	C4H8O2	-7.9	163.5	soluble	1	450	1		
	51	9-Hexadecenoic acid	254.4	2091-29-4	C16H30O2		350		7	400	27		boiling pt estimated by hexadecanoic acid
similar to pentadecanoic acid	52	Tetradecanoic acid	228.4	544-63-8	C14H28O2	53.9	326		8	400	27		
similar to pentadecanoic acid	53	Hexadecanoic acid	256.4	57-10-3	C16H32O2	62	399		5	400	27		
	54	Acetic acid	60.1	64-19-7	C2H4O2	16.3	118	miscible	5	465	1		
	55	2-Hexanone, 4-methyl-	114.2	105-42-0	C7H14O		140		5	457	28		
	56	3-Heptanone	114.2	106-35-4	C7H14O		147		5	390	17		
	57	3-Octanone	128.2	106-68-3	C8H16O		166		5	525	28		
	58	2-Pentanone	86.1	107-87-9	C5H10O	-77	102		5	505	1		
	59	2-Pentanone, 4-methyl- (MIBK)	100.2	108-10-1	C6H12O	-80	117.4		1	457	13		
	60	2-Heptanone	114.2	110-43-0	C7H14O	-35	150		5	533	13		
	61	2-Octanone	128.2	111-13-7	C8H16O	-21	173		5	525	28		
	62	2-Undecanone	170.3	112-12-9	C11H22O	17	229		5	400	27		
	63	4-Heptanone	114.2	123-19-3	C7H14O	-33	144		5	533	28		
C13-3-ketone	64	3-Tridecanone	198.4	1534-26-5	C13H26O	31	263		5*	400	27		boiling pt estimated by 2-tridecanone
C12-3-ketone	65	3-Dodecanone	184.3	1534-27-6	C12H24O	20	250		5*	400	27		boiling pt estimated by 2-tridecanone
	66	Cyclohexanone, 5-methyl-2-(1-methylethylid	152.2	15932-80-6	C10H16O	<25	224		8	500	29		
C13-6-ketone	67	6-Tridecanone	198.4	22026-12-6	C13H26O		263		6*	400	27		boiling pt estimated from 2-tridecanone (phys prop ref 6)
C11-3-ketone	68	3-Undecanone	170.3	2216-87-7	C11H22O	12	227		5	400	27		
C11-5-ketone-2-meth	69	5-Undecanone, 2-methyl-	184.3	50639-02-6	C12H24O		210		7	400	27		
	70	2-Butanone, 3-methyl-	86.1	563-80-4	C5H10O	-93	94		5	500	30		
	71	3-Hexanone	100.2	589-38-8	C6H12O	-55.6	123		5	533	28		
	72	4-Octanone	128.2	589-63-9	C8H16O		166		5	525	28		
	73	2-Hexanone	100.2	591-78-6	C6H12O	-57	127		5	533	23		
C13-2-ketone	74	2-Tridecanone	198.4	593-08-8	C13H26O		255		5	400	27		
C14-3-ketone	75	3-Tetradecanone	212.4	629-23-2	C14H28O		263		5*	400	27		boiling pt estimated by 2-tridecanone
	76	2-Propanone	58.1	67-64-1	C3H6O	-95	56		5	465	1		
	77	3-Hexen-2-one	98.1	763-93-9	C6H10O		140		8	550	28		
	78	2-Butanone	72.1	78-93-3	C4H8O	-86	80	25.6	1	516	1		
	79	3-Buten-2-one	70.1	78-94-4	C4H6O		82		5	550	31		
	80	2-Nonanone	142.2	821-55-6	C9H18O	-67	195		5	500	32		
	81	Cyclohexanone, 5-methyl-2-(1-methylethylid	152.2	89-82-7	C10H16O	<25	224		8	500	29		
	82	3-Nonanone	142.2	925-78-0	C9H18O	-8	188		1	500	32		
	83	2-Heptanone, 6-methyl-	128.2	928-68-7	C8H16O		165		5	525	28		
	84	Ethanone, 1-phenyl-	120.2	98-86-2	C8H8O	19.6	201.7	0.55	1	571	1		
	85	Pentanal	86.1	110-62-3	C5H10O	-91.5	103	0.1	1	222	23		
	86	Heptanal	114.2	111-71-7	C7H14O	-43	153	<0.1	1	300	33		
	87	Propanal	58.1	123-38-6	C3H6O	-81	49	10	1	207	1		

Table 1-2 Compounds detected > 0.1 ppmv



Structure (some obvious structures are not shown due to chain length)	no. of compounds	Chemical Name	Molecular Weight	Chemical Id	formula	melting pt	normal boiling pt	(water) solubility[1]	phys prop source	AIT	AIT source	NFPA flammability rating	comments
		UNITS				°C	°C	g/100 ml		°C			
	88	Butanal	72.1	123-72-8	C4H8O	-96	76	<0.1	1	230	1		
	89	Octanal	128.2	124-13-0	C8H16O	12	171		1	300	33		
	90	Nonanal	142.2	124-19-6	C9H18O	63	191	<0.1	8	300	33		
	91	Hexanal, 3-methyl-	114.2	19269-28-4	C7H14O		143		8	200	33		
	92	Hexanal	100.2	66-25-1	C6H12O	-56	131		1	300	33		
	93	Acetaldehyde	44.1	75-07-0	C2H4O	-124	20.1	miscible	1	175	1		
	94	1-Hexanol, 2-ethyl-	130.2	104-76-7	C8H18O	-76	183	0.1	1	300	34		
	95	1-Heptanol	116.2	111-70-6	C7H16O	-36	176		1	320	34		
	96	1-Octadecanol	270.5	112-92-5	C18H38O	61	336		1	300	34		
	97	2-Butanol	74.1	14898-79-4	C4H10O	-114	100		1	406	1		
	98	Ethanol, 2-(tetradecyloxy)-	258.4	2136-70-1	C16H34O2		253		7	300	34		boiling pt estimated by tetradecane
	99	1-Hexadecanol	242.4	36653-82-4	C16H34O	49	344		6	300	34		
	100	6,10-Dodecadien-1-ol, 3,7,11-trimethyl-	224.4	51411-24-6	C15H28O		216		7	300	34		boiling pt estimated by dodecane
	101	1,2-Propanediol	76.1	57-55-6	C3H8O2	-59	187.6	>10	1	371	1		
	102	3-Buten-2-ol	72.1	598-32-3	C4H8O		96		1	450	36		
	103	2-Pentanol	88.2	6032-29-7	C5H12O	-50	118		1	343	1		
	104	3-Buten-1-ol	72.1	627-27-0	C4H8O		113		1	450	36		
	105	Ethanol	46.1	64-17-5	C2H6O	-114	78.3	miscible	1	423	1		
	106	Methanol	32.0	67-56-1	CH4O	-98	64.6	miscible	1	470	1		
	107	2-Propanol	60.1	67-63-0	C3H8O	-88.5	82.4	miscible	1	399	23		
	108	1-Propanol	60.1	71-23-8	C3H8O	-126	97.2	miscible	1	440	1		
	109	2-Propanol, 2-methyl-	74.1	75-65-0	C4H10O	25.5	82.2	miscible	1	480	1		
	110	1-Propanol, 2,2-dimethyl-	88.2	75-84-3	C5H12O	50	113		1	480	36		
	111	2-Butanol, 2-methyl-	88.2	75-85-4	C5H12O	-12	102		1	437	1		
	112	2-Butanol	74.1	78-92-2	C4H10O	-115	99.5	15	1	406	1		
	113	1,3-Butadiene, 1,1,2,3,4,4-hexachloro-	260.8	87-68-3	C4Cl6	-21	210	0.00032	1	610	1		
	114	Cyclopentanol	86.1	96-41-3	C5H10O	-19	139	slightly	1	350	37		
	115	1-Propene, 2-fluoro-	60.1	1184-60-7	C3H5F		-24		8	600	35		
	116	Ethene, tetrachloro-	165.8	127-18-4	C2Cl4	-22.3	121.1	0.015	1	871	40	0	flammability of zero is from MSDS - JT Baker (http://www.rose-
	117	Ethene, 1,2-dichloro-, (Z)-	96.9	156-59-2	C2H2Cl2	-80.5	60	0.08	1	460	38		
	118	Ethane, 1,1-dichloro-1-fluoro- (freon 14b)	117.0	1717-00-6	C2H3Cl2F	-104	32	0.17	6	550	42	0	flammability of zero is from MSDS- Static Specialists Co. (flammability of zero is from MSDS)
	119	Methane, tetrachloro-	153.8	56-23-5	CCl4	-22.9	76.7	0.0805	1	900	41	3	described as non-flammable by phys property source 6 - rating of 3 is for evolved gases
	120	Methane, chloro- (R-40)	50.5	74-87-3	CH3Cl	-97	-24.2	0.5325	1	662	40		
	121	Ethene, fluoro-	46.0	75-02-5	C2H3F	-161	-72	insoluble	6	385	42		
	122	Methane, dichloro-	84.9	75-09-2	CH2Cl2	-96.7	39.8	05-Jan	6	662	42		
	123	Methane, chlorodifluoro- (R-22)	86.5	75-45-6	CHClF2	-146	-40.8	0.3	6	632	42		
	124	Ethane, 1-chloro-1,1-difluoro- (R-142)	100.5	75-68-3	C2H3ClF2	-131	-10	slightly	6	632	42		
	125	Methane, trichlorofluoro- (R-11)	137.4	75-69-4	CCl3F	-111	23.7	0.1	6	900	41	0	
	126	Benzene, (1-methylpentyl)-	162.3	6031-02-3	C12H18		208		6	490	43		
	127	Benzene, ethyl-	106.2	100-41-4	C8H10	-94.9	136.2	0.0206	1	432	1		
	128	Benzene, ethenyl-	104.2	100-42-5	C8H8	-30.6	145.2	0.032	1	490	23		
	129	Benzene, 1,4-dimethyl-	106.2	106-42-3	C8H10	13.3	1.38E+02	insoluble	1	529	23		
	130	Benzene, 1,3-dimethyl-	106.2	108-38-3	C8H10	-47.8	139.1	insoluble	1	528	23		

Table 1-2 Compounds detected > 0.1 ppmv



Structure (some obvious structures are not shown due to chain length)	no. of compounds	Chemical Name	Molecular Weight	Chemical Id	formula	melting pt	normal boiling pt	(water) solubility[1]	phys prop source	AIT	AIT source	NFPA flammability rating	comments
		UNITS				°C	°C	g/100 ml		°C			
	131	Benzene, methyl-	92.1	108-88-3	C7H8	-93	110.6	0.0526	1	482	42		
	132	Benzene, (2-methyl-2-propenyl)-	132.2	3290-53-7	C10H12	-48	183		6	490	43		
	133	Benzene, pentyl-	148.3	538-68-1	C11H16	-75	205		1	420	43		
	134	Benzene, 1-propenyl-	118.2	637-50-3	C9H10	-27.1	175.5		1	490	43		
	135	1,1`-Biphenyl, 2-methyl-	168.2	643-58-3	C13H12	-0.2	255		6	495	23		
	136	Benzene	78.1	71-43-2	C6H6	5.5	80.1	0.18	1	562	1		
	137	1,1`-Biphenyl	154.2	92-52-4	C12H10	70	255	insoluble	1	540	23		
	138	Benzene, 1,2-dimethyl-	106.2	95-47-6	C8H10	-25.2	144	insoluble	1	464	23		
	139	1-Propyne	40.1	74-99-7	C3H4	-103	-23	0.36	6	340	40		
	140	4-Nonyne	124.2	20184-91-2	C9H16		154		6	320	39		
	141	4-Undecene, 4-methyl-	168.3	61142-40-3	C12H26		193		7	500	44		boiling pt estimated by 3-undecene and 1-undecene
	142	1-Hexadecene	224.4	629-73-2	C16H32	4	274		1	500	44		
	143	1-Undecene, 4-methyl-	168.3	74630-39-0	C12H24		193		7	500	44		boiling pt estimated by 3-undecene and 1-undecene
	144	3-Undecene, 2-methyl-, (Z)-	168.3	74630-48-1	C12H24		193		7	500	44		boiling pt estimated by 3-undecene and 1-undecene
	145	5-Undecene, (Z)-	154.3	764-96-5	C11H22	-107	192.3		6	500	44		
	146	4,5-Nonadiene	124.2	821-74-9	C9H16		142.5		7	550	44		boiling pt estimated by 1,8-nonadiene
	147	Naphthalene, decahydro-2,3-dimethyl-	166.3	1008-80-6	C12H22		187		7	288	45		boiling pt estimated by Decahydronaphthalene
	148	Cyclohexane, methyl-	98.2	108-87-2	C7H14	-126	101	insoluble	1	250	1		
	149	Cyclohexane	84.2	110-82-7	C6H12	6.6	80.7	<0.1	1	245	1		
	150	Cyclopropane, octyl-	154.3	1472-09-9	C11H22		150.8		7	498	46		boiling pt estimated by nonane
	151	Naphthalene, decahydro-2,6-dimethyl-	166.3	1618-22-0	C12H22		187		7	288	45		boiling pt estimated by Decahydronaphthalene
	152	Cyclopropane, 1,1-dimethyl-	70.1	1630-94-0	C5H10	-109	21		1	498	46		
	153	Cyclohexane, butyl-	140.3	1678-93-9	C10H20	-75	181		1	246	23		
	154	Cyclopropane, propyl-	84.2	2415-72-7	C6H12		69		1	498	46		
	155	Cyclopentane	70.1	287-92-3	C5H10	-93.9	49.3	insoluble	1	380	1		
	156	Octane, 2-cyclohexyl-	196.4	2883-05-8	C14H28		181		7	246	47		boiling pt estimated by butylcyclohexane
	157	Cyclododecane	168.3	294-62-2	C12H24	61	239		1	235	48		
	158	Naphthalene, decahydro-2-methyl-	152.3	2958-76-1	C11H20		201		6	288	45		
	159	Cyclohexane, 1,1,3-trimethyl-	126.2	3073-66-3	C9H18	-65.7	136.6		5	320	49		
	160	Cyclopentane, 1,3-dimethyl-2-(1-methylethyl	140.3	32281-85-9	C10H20		92		7	350	49		boiling pt estimated by Cyclopentane, 1,2-dimethyl-, trans-
	161	Naphthalene, decahydro-1,2-dimethyl-	166.3	3604-14-6	C12H22		187		7	288	45		boiling pt estimated by Decahydronaphthalene
	162	Cyclopropane, 1-pentyl-2-propyl-	154.3	41977-33-7	C11H22		151		7	498	46		boiling pt estimated by nonane
	163	Cyclohexane, pentyl-	154.3	4292-92-6	C11H22	-57.5	203.7		6	270	51		
	164	Cyclobutane, ethyl-	84.2	4806-61-5	C6H12	-143	71		1	212	23		
	165	Naphthalene, decahydro-, trans-	138.3	493-02-7	C10H18	-30.4	187.3		6	288	45		
	166	Cyclohexane, 2-butyl-1,1,3-trimethyl-	182.4	54676-39-0	C13H26		203.7		7	320	49		boiling pt estimated by pentylcyclohexane
	167	Bicyclo[4.1.0]heptane, 2-methyl-7-pentyl-	180.3	55937-92-3	C13H24		203.7		7	320	49		boiling pt estimated by pentylcyclohexane
	168	Cyclopropane, methyl-	56.1	594-11-6	C4H8	-178	0.7		6	498	46		
	169	Cyclobutane, methyl-	70.1	598-61-8	C5H10	-162	36.3		6	250	50		
	170	Cyclohexane, (4-methylpentyl)-	168.3	61142-20-9	C12H24		203.7		7	270	51		boiling pt estimated by pentylcyclohexane
	171	Cyclohexane, (1-methylpropyl)-	140.3	7058-01-7	C10H20		179.3		6	270	51		
	172	Cyclohexane, 1,1,2-trimethyl-	126.2	7094-26-0	C9H18	-29	145.2		6	270	51		
	173	Cyclopentane, 1,2-dimethyl-, trans-	98.2	822-50-4	C7H14	-118	92		6	350	49		
	174	Undecane, 3-methyl-	170.3	1002-43-3	C12H26	-54.5	195		5*	500	44		boiling pt estimated by undecane

Table 1-2 Compounds detected > 0.1 ppmv

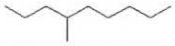
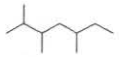
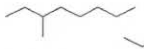
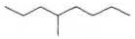
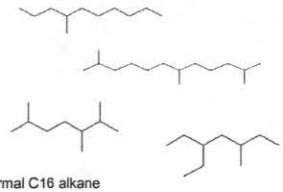
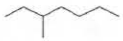
Structure (some obvious structures are not shown due to chain length)	no. of compounds	Chemical Name	Molecular Weight	Chemical Id	formula	melting pt	normal boiling pt	(water) solubility[1]	phys prop source	AIT	AIT source	NFPA flammability rating	comments
		UNITS				°C	°C	g/100 ml		°C			
	175	Butane	58.1	106-97-8	C4H10	-139	-0.45	0.0061	1	405	1		
	176	Pentane, 2-methyl-	86.2	107-83-5	C6H14	-154	62	insoluble	1	306	42		
	177	Pentane, 2,4-dimethyl-	100.2	108-08-7	C7H16	-119	81		1	337	42		
	178	Pentane	72.2	109-66-0	C5H12	-130	36.1	0.04	1	260	23		
	179	Hexane	86.2	110-54-3	C6H14	-95	69	0.00095	1	225	1		
	180	Octane	114.2	111-65-9	C8H18	-56.8	126	slightly	1	220	1		
	181	Nonane	128.3	111-84-2	C9H20	-53	150.8	<0.1	1	206	42		
normal C-11 alkane	182	Undecane	156.3	1120-21-4	C11H24	-25.6	195.6	insoluble	1	202	42		
normal C-12 alkane	183	Dodecane	170.3	112-40-3	C12H26	-9.6	216.3	0.37	6	204	42		
normal C-10 alkane	184	Decane	142.3	124-18-5	C10H22	-29.7	174.1	insoluble	6	210	1		
	185	Decane, 3-methyl-	156.3	13151-34-3	C11H24	-76	190		1	225	52		
	186	Decane, 5-methyl-	156.3	13151-35-4	C11H24		190		7	225	52		boiling pt estimated by Decane, 3-methyl-
	187	Tridecane, 3-ethyl-	212.4	13286-73-2	C15H32		252		7	220	52		boiling pt estimated by tetradecane
	188	Tridecane, 6-methyl-	198.4	13287-21-3	C14H30		235		7	220	52		boiling pt estimated by tridecane
	189	Heptane	100.2	142-82-5	C7H16	-90.6	98.4	0.01	1	223	1		
	190	Heptane, 2,2,4-trimethyl-	142.3	14720-74-2	C10H22		148		1	275	52		
	191	Tridecane, 2-methyl-	198.4	1560-96-9	C14H30	-25	248		1	205	52		
	192	Undecane, 5-methyl-	170.3	1632-70-8	C12H26	-67.7	195		5*	220	52		boiling pt estimated by undecane
	193	Undecane, 2,6-dimethyl-	184.4	17301-23-4	C13H28		195		7	250	52		boiling pt estimated by undecane
	194	Undecane, 2,8-dimethyl-	184.4	17301-25-6	C13H28		195		7	250	52		boiling pt estimated by undecane
	195	Undecane, 2,10-dimethyl-	184.4	17301-27-8	C13H28		195		7	250	52		boiling pt estimated by undecane
	196	Undecane, 3,7-dimethyl-	184.4	17301-29-0	C13H28		195		7	250	52		boiling pt estimated by undecane
	197	Undecane, 3,8-dimethyl-	184.4	17301-30-3	C13H28		195		7	250	52		boiling pt estimated by undecane
	198	Undecane, 4,7-dimethyl-	184.4	17301-32-5	C13H28		195		7	250	52		boiling pt estimated by undecane
	199	Nonane, 4-methyl-	142.3	17301-94-9	C10H22	-99	165.7		6	220	52		
	200	Nonane, 2,6-dimethyl-	156.3	17302-28-2	C11H24		165		7	250	52		boiling pt estimated by 4-methyl nonane
	201	Nonane, 3,7-dimethyl-	156.3	17302-32-8	C11H24		165		7	250	52		boiling pt estimated by 4-methyl nonane
	202	Decane, 2,5-dimethyl-	170.3	17312-50-4	C12H26	-61.8	195		5*	250	52		boiling pt estimated by undecane
	203	Dodecane, 3-methyl-	184.4	17312-57-1	C13H28	-59.4	216		5*	220	52		boiling pt estimated by dodecane
	204	Undecane, 6-ethyl-	184.4	17312-60-6	C13H28		216		7	220	52		boiling pt estimated by dodecane
	205	Undecane, 5,5-dimethyl-	184.4	17312-73-1	C13H28		216		7	250	52		boiling pt estimated by dodecane
	206	Undecane, 6,6-dimethyl-	184.4	17312-76-4	C13H28		216		7	250	52		boiling pt estimated by dodecane
	207	Undecane, 2,3-dimethyl-	184.4	17312-77-5	C13H28		216		7	250	52		boiling pt estimated by dodecane
	208	Undecane, 2,4-dimethyl-	184.4	17312-80-0	C13H28		216		7	250	52		boiling pt estimated by dodecane
	209	Undecane, 4,6-dimethyl-	184.4	17312-82-2	C13H28		216		7	250	52		boiling pt estimated by dodecane
	210	Undecane, 5-ethyl-	184.4	17453-94-0	C13H28		216		7	220	52		boiling pt estimated by dodecane
	211	Heptane, 2,3,5-trimethyl-	142.3	20278-85-7	C10H22		160.7		6	275	52		
	212	Heptane, 2,4-dimethyl-	128.3	2213-23-2	C9H20		133		1	330	52		
	213	Octane, 3-methyl-	128.3	2216-33-3	C9H20	-108	144		1	220	23		
	214	Octane, 4-methyl-	128.3	2216-34-4	C9H20	-113	142		1	220	23		
	215	Tetradecane, 4-methyl-	212.4	25117-24-2	C15H32	-33	253.7		5*	220	52		boiling pt estimated by tetradecane
	216	Tridecane, 5-methyl-	198.4	25117-31-1	C14H30	-53.5	235		5*	220	52		boiling pt estimated by tridecane
	217	Tridecane, 4-methyl-	198.4	26730-12-1	C14H30	-45.7	235		5*	220	52		boiling pt estimated by tridecane
	218	Tridecane, 7-methyl-	198.4	26730-14-3	C14H30	-37.2	235		6*	225	52		boiling pt estimated by tridecane

Table 1-2 Compounds detected > 0.1 ppmv

Structure (some obvious structures are not shown due to chain length)	no. of compounds	Chemical Name	Molecular Weight	Chemical Id	formula	melting pt	normal boiling pt	(water) solubility[1]	phys prop source	AIT	AIT source	NFPA flammability rating	comments
		UNITS				°C	°C	g/100 ml		°C			
 normal C16 alkane	219	Decane, 4-methyl-	156.3	2847-72-5	C11H24	-77.5	187		6	225	52		
	220	Undecane, 4-methyl-	170.3	2980-69-0	C12H26	-66.5	210		5	220	52		
	221	Dodecane, 2,6,11-trimethyl-	212.4	31295-56-4	C15H32		252		7	250	52		boiling pt is estimated by Dodecane, 2,6,10-trimethyl-
	222	Dodecane, 2,6,10-trimethyl-	212.4	3891-98-3	C15H32		252		5	250	52		
	223	Heptane, 2,3,6-trimethyl-	142.3	4032-93-3	C10H22		156		1	275	52		
	224	Heptane, 3-ethyl-5-methyl-	142.3	52896-90-9	C10H22		158.2		6	275	52		
	225	Hexadecane	226.4	544-76-3	C16H34	18.2	287	insoluble	6	202	23		
	226	Tridecane, 4,8-dimethyl-	212.4	55030-62-1	C15H32		253.7		7	250	52		boiling pt estimated by tetradecane
	227	Dodecane, 2-methyl-8-propyl-	226.4	55045-07-3	C16H34		253.7		7	250	52		boiling pt estimated by tetradecane
	228	Tridecane, 5-propyl-	226.4	55045-11-9	C18H38		253.7		7	225	52		boiling pt estimated by tetradecane
	229	Pentane, 3,3-dimethyl-	100.2	562-49-2	C7H16	-135	90		5	350	52		
	230	Dodecane, 2,5-dimethyl-	198.4	56292-65-0	C14H30		235		7	225	52		boiling pt estimated by tridecane
	231	Pentane, 2,3-dimethyl-	100.2	565-59-3	C7H16	-134	90		5	337	42		
	232	Hexane, 3-methyl-	100.2	589-34-4	C7H16	-119	92		1	280	23		
	233	Hexane, 2,4-dimethyl-	114.2	589-43-5	C8H18		109		1	437	42		
	234	Heptane, 4-methyl-	114.2	589-53-7	C8H18	-121	118		1	250	52		
	235	Heptane, 3-methyl-	114.2	589-81-1	C8H18	-121	119		1	239	42		
	236	Hexane, 2-methyl-	100.2	591-76-4	C7H16	-118	90		1	280	23		
	237	Heptane, 2-methyl-	114.2	592-27-8	C8H18	-109	118	insoluble	6	247	42		
	238	Dodecane, 4,6-dimethyl-	198.4	61141-72-8	C14H30		235		7	225	52		boiling pt estimated by tridecane
	239	Dodecane, 4-methyl-	184.4	6117-97-1	C13H28		216		7	220	52		boiling pt estimated by dodecane
	240	3-Ethylpentane	100.2	617-78-7	C7H16	-119	93		1	275	52		
	241	Octane, 2,3,3-trimethyl-	156.3	62016-30-2	C11H24		174		7	290	52		boiling pt estimated by decane
	242	Octane, 2,3,7-trimethyl-	156.3	62016-34-6	C11H24		174		7	290	52		boiling pt estimated by decane
	243	Decane, 6-ethyl-2-methyl-	184.4	62108-21-8	C13H28		216		7	275	52		boiling pt estimated by dodecane
	244	Decane, 2,6,7-trimethyl-	184.4	62108-25-2	C13H28		216		7	290	52		boiling pt estimated by dodecane
	245	Decane, 2,4,6-trimethyl-	184.4	62108-27-4	C13H28		216		7	290	52		boiling pt estimated by dodecane
	246	Decane, 2,3,7-trimethyl-	184.4	62238-13-5	C13H28		216		7	290	52		boiling pt estimated by dodecane
	247	Tridecane	184.4	629-50-5	C13H28	-5.5	235.4		1	202	42		
C-14 alkane	248	Tetradecane	198.4	629-59-4	C14H30	5.9	253.7		1	200	23		
C-15 alkane	249	Pentadecane	212.4	629-62-9	C15H32	9.9	270.6		1	202	42		
C-17 alkane	250	Heptadecane	240.5	629-78-7	C17H36	22	301.8		1	202	42		
	251	Propane	44.1	74-98-6	C3H8	-188	-42	0.01	1	450	1		
	252	Propane, 2-methyl-	58.1	75-28-5	C4H10	-255	-11.7	slightly	6	462	1		
	253	Butane, 2-methyl-	72.2	78-78-4	C5H12	-160	30	<0.1	1	420	42		
	254	Pentane, 3-methyl-	86.2	96-14-0	C6H14	-118	64	insoluble	6	278	23		
	255	Pentane, trimethyl-, isomer	114.3	565-75-3	C8H18	-109	113.5		1	427	42		

Notes

1 "quotes" imply the information is shown as written in the source
2 this compound was assigned two different CAS numbers in TWINS
* boiling point was estimated based on criteria of physical property source #7 and the available melting pt of the compound

pysical property sources

1 chemfinder (http://chemfinder.cambridgesoft.com/)
2 msds (http://www.unitexchemical.com/MSD/Uniplex214.htm)

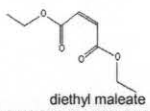
Table 1-2 Compounds detected > 0.1 ppmv

Structure (some obvious structures are not shown due to chain length)	no. of compounds	Chemical Name	Molecular Weight	Chemical Id	formula	melting pt	normal boiling pt	(water) solubility[1]	phys prop source	AIT	AIT source	NFPA flammability rating	comments
		UNITS				°C	°C	g/100 ml		°C			

3 estimated from msds for tetramethylcyclotetrasiloxane (http://www.schumacher.com/products/msds/tomcat 0926.pdf)
4 esimated from 2(3H)-Furanone, dihydro-5-methyl- msds (http://www.pschem.com/MSDS/pdf/GammaValerolactonePENN.PDF)
5 National Instutute of Standards and Technology (NIST) database (http://webbook.nist.gov)
6 University of Akron - Chemical Database (http://ull.chemistry.uakron.edu/erd/)
7 values estimated from similar structures - boiling pt is reported conservatively low as to not overstate adsorption potential on activated carbon
8 Interactive PhysProp Database Demo: (http://esc.syrres.com/interkow/physdemo.htm)

AIT sources (estimates are considered conservatively high based on trends within similar chemical structures)

1 Lange's Handbook of Chemistry - 14th edition
2 estimated from msds for tetramethylcyclotetrasiloxane (http://www.schumacher.com/products/msds/tomcat 0926.pdf)
3 estimated from pyridine which has same root structure - in general, alkane substitutions on any root will lower the AIT
4 estimated from 2-nitrobutane (reference 2 shows 1-nitropropane AIT is 420, nitroethane is 414, nitromethane is 418)
5 estimated from nitric acid ethyl ester (90 deg C) and nitric acid propyl ester (175 deg C)
6 estimated based on pyrolidine and tetrahydrofuran
7 estimated from MSDS which shows this compound is explosive when heated (Matheson Tri-Gas MSDS)
8 Estimated from nitrous acid -butyl ester (butyl nitrite)
9 estimated from nitric acid - propyl ester -shown with an AIT of 175 deg C by reference 2
10 estimated from tetrahydrofuran - accounting for double bonds (e.g. cyclo hexane AIT=245, benzene=562 and butane = 405, 1,3-butadiene = 420)
11 estimated from pyradine and benzene (AIT 482 and 562 respectively) accounting for the nitrogen reactivity to help oxidize the molecule
12 estimated from BASF technical data sheet (http://www.basf.com/businesses/chemicals/diols/pdfs/dihydro.pdf) showing 3,4-dihydro-2H-pyran AIT of 240 deg C.
13 estimated from 2(3H)-Furanone, dihydro-
14 estimated based on ethylene oxide AIT=429, this compound is expected to have lower AIT based on the alkane branch
15 estimated from pyridine and taking into acount that there is no resonant structure containing double bonds
16 estimated from trimethylamine AIT of 190 deg C
17 AIT reference is on COPC sheet
18 safety data from (http://physchem.ox.ac.uk/MSDS/BU/butyronitrile.html)
19 estimated based on propanenitrile and butanenitrile - in general, as the alkane chain grows, the AIT will decrease
20 estimated based on butanoic acid - alkane esters will lower the AIT below 450 deg C as shown by reference 2
21 estimated to be less than 400 deg C based on length of alkane chain
22 estimated from dimethyl phthalate and dibutylphthalate 556 and 403 deg C respectively - shown in reference 23
23 Rules of Thumb for Chemical Engineers, Gulf Publishing 1994, by Carl Branan
24 estimated from diethyl maleate (see structure on left) AIT = 350 deg C shown by reference 23
25 estimated from ethyl formate AIT of 455 deg C from reference 23
26 estimated from propyl acetate AIT of 450 deg C from reference 23
27 estimated from stearic acid (heptadecanoic (C17) acid) AIT of 395 deg C from reference 23 - this is considered valid for all of the longer chain carboxylic acids, esters, and keytones.
28 estimated from MIBK (4-methyl-2-pentanone) and 2-heptanone (AIT=457, and 533 deg C respectively) from reference 23
29 estimated from methyl phenyl ketone and cyclohexanone (AIT 570 and 420 repsectively) from reference 23 - see structures to left
30 estimated from butanone (AIT=516 deg C) considering the extra methyl substitution as an element which lowers the AIT
31 estimated from butanone (AIT=516 deg C) considering the double bond which raises the AIT
32 estimated from heptanone and nonane (AIT = 533 and 190 deg C respectively) from reference 1 - accounting for the longer alkane chain which will lower the AIT from that of heptanone
33 estimated from the trend of AITs for increasing alkane chain length within available aldehydes from reference 23
34 estimated from 1-dodecanol (AIT=275) and the trend of AIT temperature which increases as the alkane chain length decreases
35 estimated from ethyl chloride, propyl chloride, 1-2-dichloropropane, dichloroethylene, hexachlorobutadiene, and perfluorodimethylcyclohexane
36 estimated from 2-butanol, isopropyl alcohol, and 2-pentanol from reference 23
37 estimated based on cyclohexanol (AIT=300 deg C) from reference 23
38 taken from OSHA Safety and Heath Guideline database: (http://www.osha-slc.gov/SLTC/healthguidelines/1 2-dichloroethylene/recognition.html)
39 estimated from acetylene and similar length alkene from reference 1 (i.e. decene AIT = 244 deg C)
40 see AIT sources for COPCs
41 AIT for this compound can not be found - available references for safety data and MSDS indicate the compound is not flammable - to show that no credit will be taken for destruction via oxidation, the AIT is reported as 900 deg C
42 University of Akron - Chemical Database (http://ull.chemistry.uakron.edu/erd/)
43 estimated from isoproyl benzene, styrene, and butyl benzene from reference 23
44 estimated from 2-methylundecane from reference 23, however the general trend for long chain branched alkanes is a low AIT - this value (500 deg C) is considered unreasonable high - it is used here to be most conservative
45 estimated from decahydronaphthalene from reference 23 (288 deg C) -the methyl substitutions will lower the AIT
46 estimated from cyclopropane (AIT = 498 deg C)- long alkane substitution should appreciably lower the AIT
47 estimated from octylcyclohexane, cyclohexane, and methylcyclohexane from reference 1 and 23 (AIT=236, 245, and 250 respectively)
48 estmated from cyclo decane (AIT=235 deg C from reference 23)
49 estimated from methyl cyclopentane, hexylcyclopentane, and 1,2,4 and 1,3,5 trimethylcyclohexane from reference 23
50 estimated from ethyl cyclobutane from reference 23
51 estimated from propylcyclohexane from reference 23 (AIT = 269 deg C)
52 estimated from reference 23 which shows AIT for common alkanes, and their single, double and triple branched derivatives - not all compounds are represented, however general trends appear and all AITs (except methane) are below 500 deg C
53 estimated from reference 42 indication that this compound is a flammable solid
54 estimated from the compound structure - no data or similar compound data were found available - the 800 deg C estimate will ensure that the compound is conservatively accounted for (Benzene AIT is 562 deg C and referenceable amines range from the low 300 deg C to mid 600 deg C for aromatic amines)



diethyl maleate
(2-betenedioic acid, diethyl ester)

cyclohexanone

methyl phenyl ketone

Attachment 2 Tables of Destruction DFs

Table 2-1 COPCs
Table 2-2 Compounds detected >0.1 ppmv

Table 2-1 COPCs

no. of compound	CAS #	COPC Compound	AIT deg F	RTO degrees above AIT deg F	est DE %	est DF mass in / mass out
1	100-00-5	p-Nitrochlorobenzene	950.0	650.0	99.99	10000
2	100-21-0	p-Phthalic acid	1250.0	350.0	95	20
3	100-25-4	1,4-Dinitrobenzene	842.0	758.0	99.99	10000
4	100-41-4	Ethyl benzene	810.0	790.0	99.99	10000
5	100-42-5	Styrene	915.0	685.0	99.99	10000
6	10061-01-5	cis-1,3-Dichloropropene	1112.0	488.0	99	100
7	10061-02-6	trans-1,3-Dichloropropene	1130.0	470.0	98	50
8	101-55-3	4-Bromophenylphenyl ether	1542.0	58.0	70	3.33
9	101-84-8	Diphenyl ether	1144.0	456.0	98	50
10	106-35-4	3-Heptanone	734.0	866.0	99.99	10000
11	106-42-3	p-Xylene (Dimethyl benzene)	986.0	614.0	99.9	1000
12	106-46-7	1,4-Dichlorobenzene	1184.0	416.0	98	50
13	106-88-7	1,2-Epoxybutane	894.2	705.8	99.99	10000
14	106-93-4	Ethylene dibromide (Dibromoethane)	1600.0	0.0	0	1
15	106-97-8	Butane (R-600)	761.0	839.0	99.99	10000
16	106-99-0	1,3-Butadiene	840.2	759.8	99.99	10000
17	107-02-8	Acrolein	455.0	1145.0	99.99	10000
18	107-05-1	3-Chloropropene (Allyl chloride)	905.0	695.0	99.99	10000
19	107-06-2	1,2-Dichloroethane (Ethylene chloride) (freon 150)	773.6	826.4	99.99	10000
20	107-12-0	Propionitrile	950.0	650.0	99.99	10000
21	107-13-1	Acrylonitrile	897.8	702.2	99.99	10000
22	107-18-6	2-Propene-1-ol	712.4	887.6	99.99	10000
23	107-31-3	Formic acid, methyl ester	869.0	731.0	99.99	10000
24	107-66-4	Dibutylphosphate	950.0	650.0	99.99	10000
25	107-87-9	2-Pentanone	941.0	659.0	99.99	10000
26	108-03-2	1-Nitropropane	788.0	812.0	99.99	10000
27	108-05-4	Vinyl acetate	800.6	799.4	99.99	10000
28	108-10-1	Hexone (4-Methyl-2-pentanone or MIBK)	858.0	742.0	99.99	10000
29	108-20-3	Bis(isopropyl)ether	829.0	771.0	99.99	10000
30	108-38-3	m-Xylene (Dimethyl benzene)	986.0	614.0	99.9	1000
31	108-39-4	m-Cresol	1038.2	561.8	99.9	1000
32	108-87-2	Methylcyclohexane	482.0	1118.0	99.99	10000
33	108-88-3	Toluene	896.0	704.0	99.99	10000
34	108-90-7	Chlorobenzene	1245.0	355.0	95	20
35	108-93-0	Cyclohexanol	572.0	1028.0	99.99	10000
36	108-94-1	Cyclohexanone	788.0	812.0	99.99	10000
37	108-95-2	Phenol	1319.0	281.0	90	10
38	109-66-0	n-Pentane	500.0	1100.0	99.99	10000
39	109-99-9	Tetrahydrofuran	609.8	990.2	99.99	10000
40	110-12-3	5-Methyl-2-hexanone	376.0	1224.0	99.99	10000
41	110-43-0	2-Heptanone	739.0	861.0	99.99	10000
42	110-54-3	n-Hexane	437.0	1163.0	99.99	10000
43	110-62-3	n-Valeraldehyde	500.0	1100.0	99.99	10000

Table 2-1 COPCs

no. of compound	CAS #	COPC Compound	AIT deg F	RTO degrees above AIT deg F	est DE %	est DF mass in / mass out
44	110-82-7	Cyclohexane	473.0	1127.0	99.99	10000
45	110-83-8	Cyclohexene	590.0	1010.0	99.99	10000
46	110-86-1	Pyridine	899.6	700.4	99.99	10000
47	111-65-9	n-Octane	428.0	1172.0	99.99	10000
48	111-76-2	Ethylene glycol monobutyl ether	460.4	1139.6	99.99	10000
49	111-84-2	n-Nonane	374.0	1226.0	99.99	10000
50	117-81-7	Bis(2-ethylhexyl)phthalate (DEHP)	734.0	866.0	99.99	10000
51	117-84-0	n-Dioctyl phthalate	735.1	864.9	99.99	10000
52	118-74-1	Hexachlorobenzene	1542.0	58.0	70	3.33
53	120-12-7	Anthracene	1000.4	599.6	99.9	1000
54	120-82-1	1,2,4-Trichlorobenzene	1060.0	540.0	99	100
55	120-83-2	2,4-Dichlorophenol	1542.0	58.0	70	3.33
56	121-44-8	Triethylamine	480.0	1120.0	99.99	10000
57	121-69-7	Dimethylaniline	699.8	900.2	99.99	10000
58	122-39-4	N,N-Diphenylamine	1173.0	427.0	98	50
59	123-19-3	4-Heptanone	842.0	758.0	99.99	10000
60	123-38-6	n-Propionaldehyde	404.6	1195.4	99.99	10000
61	123-51-3	3-Methyl-1-butanol	662.0	938.0	99.99	10000
62	123-86-4	Acetic acid n-butyl ester	797.0	803.0	99.99	10000
63	123-91-1	1,4-Dioxane	356.0	1244.0	99.99	10000
64	126-73-8	Tributyl phosphate	899.6	700.4	99.99	10000
65	126-98-7	2-Methyl-2-propenenitrile (Methacrylonitrile)	860.0	740.0	99.99	10000
66	127-18-4	Perchloroethylene (tetrachloroethylene)	1600.0	0.0	0	1
67	127-19-5	N,N-Dimethylacetamide	914.0	686.0	99.99	10000
68	128-37-0	2,6-Bis(tert-butyl)-4-methylphenol	878.0	722.0	99.99	10000
69	129-00-0	Pyrene	1542.0	58.0	70	3.33
70	1321-64-8	Pentachloronaphthalene	1542.0	58.0	70	3.33
71	1321-65-9	Trichloronaphthalene	1542.0	58.0	70	3.33
72	132-64-9	Dibenzofuran	1542.0	58.0	70	3.33
73	1335-87-1	Hexachloronaphthalene	1542.0	58.0	70	3.33
74	1335-88-2	Tetrachloronaphthalene	1542.0	58.0	70	3.33
75	1336-36-3	Polychlorinated biphenyls (PCBs)	1542.0	58.0	70	3.33
76	141-78-6	Acetic acid ethyl ester (Ethyl acetate)	906.8	693.2	99.99	10000
77	141-79-7	4-Methyl-3-penten-2-one	651.0	949.0	99.99	10000
78	142-82-5	n-Heptane	433.4	1166.6	99.99	10000
79	144-62-7	Oxalic acid	1400.0	200.0	90	10
80	156-60-5	trans-1,2-Dichloroethylene	860.0	740.0	99.99	10000
81	1582-09-8	Trifluralin	880.0	720.0	99.99	10000
82	1634-04-4	Methyl tert-butyl ether	815.0	785.0	99.99	10000
83	1836-75-5	Nitrofen	1542.0	58.0	70	3.33
84	189-55-9	Dibenzo[a,i]pyrene	1542.0	58.0	70	3.33
85	189-64-0	Dibenzo[a,h]pyrene	1542.0	58.0	70	3.33
86	191-24-2	Benzo(g,h,i)perylene	1542.0	58.0	70	3.33
87	191-30-0	Benzo[a,i]pyrene	1542.0	58.0	70	3.33

Table 2-1 COPCs

no. of compound	CAS #	COPC Compound	AIT deg F	RTO degrees above AIT deg F	est DE %	est DF mass in / mass out
88	192-65-4	Dibenzo[a,e]pyrene	1542.0	58.0	70	3.33
89	193-39-5	Indeno(1,2,3-cd)pyrene	1542.0	58.0	70	3.33
90	205-82-3	Benzo(j)fluoranthene	1542.0	58.0	70	3.33
91	205-99-2	Benzo(b)fluoranthene	1542.0	58.0	70	3.33
92	206-44-0	Fluoranthene	1542.0	58.0	70	3.33
93	207-08-9	Benzo(k)fluoranthene	1542.0	58.0	70	3.33
94	208-96-8	Acenaphthylene	1542.0	58.0	70	3.33
95	218-01-9	Chrysene	1542.0	58.0	70	3.33
96	2234-13-1	Octachloronaphthalene	1542.0	58.0	70	3.33
97	224-42-0	Dibenz[a,j]acridine	1542.0	58.0	70	3.33
98	226-36-8	Dibenz[a,h]acridine	1542.0	58.0	70	3.33
99	2385-85-5	Mirex	1542.0	58.0	70	3.33
100	25551-13-7	Trimethyl benzene	1022.0	578.0	99.9	1000
101	26140-60-3	Terphenyls	1542.0	58.0	70	3.33
102	27154-33-2	Trichlorofluoroethane	1600.0	0.0	0	1
103	287-92-3	Cyclopentane	716.0	884.0	99.99	10000
104	309-00-2	Aldrin	1542.0	58.0	70	3.33
105	319-84-6	Hexachlorocyclohexane (Lindane) Alpha BHC	1542.0	58.0	70	3.33
106	319-85-7	Hexachlorocyclohexane (Lindane) Beta BHC	1542.0	58.0	70	3.33
107	319-86-8	Delta-BHC	1542.0	58.0	70	3.33
108	3697-24-3	5-Methylchrysene	1542.0	58.0	70	3.33
109	3825-26-1	Ammonium perfluorooctanoate	1542.0	58.0	70	3.33
110	4170-30-3	2-Butenaldehyde (2-Butenal)	446.0	1154.0	99.99	10000
111	465-73-6	Isodrin	1542.0	58.0	70	3.33
112	50-00-0	Formaldehyde	806.0	794.0	99.99	10000
113	50-29-3	4,4-DDT	1542.0	58.0	70	3.33
114	50-32-8	Benzo(a)pyrene	1542.0	58.0	70	3.33
115	53-70-3	Dibenzo(a,h)anthracene	1542.0	58.0	70	3.33
116	540-59-0	1,2-Dichloroethylene	860.0	740.0	99.99	10000
117	540-84-1	2,2,4-Trimethylpentane	779.0	821.0	99.99	10000
118	541-73-1	1,3-Dichlorobenzene	1184.0	416.0	98	50
119	56-23-5	Carbon tetrachloride (R-10)	1600.0	0.0	0	1
120	563-80-4	3-Methyl-2-butanone	845.6	754.4	99.99	10000
121	56-49-5	3-Methylcholanthrene	1542.0	58.0	70	3.33
122	56-55-3	Benzo(a)anthracene	1542.0	58.0	70	3.33
123	57-14-7	1,1-Dimethylhydrazine	480.2	1119.8	99.99	10000
124	58-89-9	gamma-BHC (Lindane)	1542.0	58.0	70	3.33
125	58-90-2	2,3,4,6-Tetrachlorophenol	1542.0	58.0	70	3.33
126	591-78-6	2-Hexanone	991.0	609.0	99.9	1000
127	59-50-7	4-Chloro-3-methylphenol	1542.0	58.0	70	3.33
128	59-89-2	N-Nitrosomorpholine	932.0	668.0	99.99	10000
129	602-87-9	5-Nitroacenaphthene	1542.0	58.0	70	3.33
130	60-29-7	Ethyl ether	320.0	1280.0	99.99	10000
131	603-34-9	Triphenylamine	1542.0	58.0	70	3.33

Table 2-1 COPCs

no. of compound	CAS #	COPC Compound	AIT deg F	RTO degrees above AIT deg F	est DE %	est DF mass in / mass out
132	60-34-4	Methylhydrazine	384.8	1215.2	99.99	10000
133	60-35-5	Acetamide	896.0	704.0	99.99	10000
134	60-57-1	Dieldrin	1542.0	58.0	70	3.33
135	621-64-7	Di-n-Propylnitrosamine	527.0	1073.0	99.99	10000
136	624-83-9	Methyl isocyanate	995.0	605.0	99.9	1000
137	627-13-4	Nitric acid, propyl ester	788.0	812.0	99.99	10000
138	62-75-9	N-Nitroso-N,N-dimethylamine	932.0	668.0	99.99	10000
139	630-20-6	1,1,1,2-Tetrachloroethane	1600.0	0.0	0	1
140	64-17-5	Ethyl alcohol	798.8	801.2	99.99	10000
141	64-18-6	Formic acid	813.2	786.8	99.99	10000
142	64-19-7	Acetic acid	869.0	731.0	99.99	10000
143	67-56-1	Methyl alcohol (Methanol)	878.0	722.0	99.99	10000
144	67-63-0	2-Propyl alcohol (Isopropanol)	852.8	747.2	99.99	10000
145	67-64-1	2-Propanone (Acetone)	869.0	731.0	99.99	10000
146	67-66-3	Chloroform (R-20)	1832.0	-232.0	0	1
147	67-72-1	Hexachloroethane	1600.0	0.0	0	1
148	684-16-2	Hexafluoroacetone	1600.0	0.0	0	1
149	71-23-8	n-Propyl alcohol	824.0	776.0	99.99	10000
150	71-36-3	n-Butyl alcohol	692.6	907.4	99.99	10000
151	71-43-2	Benzene	1097.6	502.4	99	100
152	71-55-6	Methyl chloroform (1,1,1-Trichloroethane)	999.0	601.0	99.9	1000
153	72-20-8	Endrin	1542.0	58.0	70	3.33
154	72-43-5	Methoxychlor	1542.0	58.0	70	3.33
155	72-54-8	4,4-DDD	1542.0	58.0	70	3.33
156	72-55-9	4,4-DDE	1542.0	58.0	70	3.33
157	74-83-9	Bromomethane (Methyl bromide) (halon 1001)	998.6	601.4	99.9	1000
158	74-87-3	Chloromethane (Methyl chloride) (R-40)	1223.6	376.4	95	20
159	74-97-5	Bromochloromethane (halon 1011)	1600.0	0.0	0	1
160	74-99-7	Methylacetylene	644.0	956.0	99.99	10000
161	75-00-3	Chloroethane	966.2	633.8	99.9	1000
162	75-01-4	Vinyl chloride (1-Chloroethene)	881.6	718.4	99.99	10000
163	75-05-8	Acetonitrile	975.2	624.8	99.9	1000
164	75-07-0	Acetaldehyde	347.0	1253.0	99.99	10000
165	75-09-2	Dichloromethane (Methylene chloride) (R-30)	1223.6	376.4	95	20
166	75-12-7	Formamide	932.0	668.0	99.99	10000
167	75-15-0	Carbon disulfide	257.0	1343.0	99.99	10000
168	75-21-8	Ethylene oxide (Oxirane)	804.2	795.8	99.99	10000
169	75-27-4	Bromodichloromethane	1600.0	0.0	0	1
170	75-34-3	1,1-Dichloroethane	852.8	747.2	99.99	10000
171	75-35-4	1,1-Dichloroethene (Vinylidene chloride)	854.6	745.4	99.99	10000
172	75-43-4	Dichlorofluoromethane (R-21)	1026.0	574.0	99.9	1000
173	75-45-6	Chlorodifluoromethane (R-22)	1170.0	430.0	98	50
174	75-50-3	Trimethylamine	374.0	1226.0	99.99	10000
175	75-52-5	Nitromethane	784.4	815.6	99.99	10000

Table 2-1 COPCs

no. of compound	CAS #	COPC Compound	AIT deg F	RTO degrees above AIT deg F	est DE %	est DF mass in / mass out
176	75-55-8	2-Methylaziridine	914.0	686.0	99.99	10000
177	75-61-6	Difluorodibromomethane (freon 12B2- halon 1202)	1600.0	0.0	0	1
178	75-63-8	Trifluorobromomethane (R-13B1)	1600.0	0.0	0	1
179	75-65-0	2-Methyl-2-propanol	892.4	707.6	99.99	10000
180	75-69-4	Trichlorofluoromethane (R-11)	1600.0	0.0	0	1
181	75-71-8	Dichlorodifluoromethane (R-12)	1600.0	0.0	0	1
182	75-99-0	2,2-Dichloropropionic acid	1112.0	488.0	99	100
183	76-03-9	Trichloroacetic acid	1600.0	0.0	0	1
184	76-11-9	1,1,1,2-Tetrachloro-2,2-difluoroethane (R-112a)	1350.0	250.0	90	10
185	76-12-0	1,1,2,2-Tetrachloro-1,2-difluoroethane (R-112)	1350.0	250.0	90	10
186	76-13-1	1,2,2-Trichloro-1,1,2-trifluoroethane (Freon 113)	1256.0	344.0	95	20
187	76-14-2	1,2-Dichloro-1,1,2,2-tetrafluoroethane (R-114)	1600.0	0.0	0	1
188	76-15-3	Chloropentafluoroethane (R-115)	1600.0	0.0	0	1
189	76-44-8	Heptachlor	1542.0	58.0	70	3.33
190	78-83-1	2-Methylpropyl alcohol (Isobutyl alcohol)	779.0	821.0	99.99	10000
191	78-87-5	1,2-Dichloropropane	1034.0	566.0	99.9	1000
192	78-92-2	1-Methylpropyl alcohol (2-Butanol)	762.8	837.2	99.99	10000
193	78-93-3	Methyl ethyl ketone (MEK, 2-Butanone)	960.8	639.2	99.9	1000
194	79-00-5	1,1,2-Trichloroethane	932.0	668.0	99.99	10000
195	79-01-6	Trichloroethylene	788.0	812.0	99.99	10000
196	79-09-4	Propionic acid	914.0	686.0	99.99	10000
197	79-10-7	2-Propenoic acid	820.4	779.6	99.99	10000
198	79-20-9	Methyl acetate	935.6	664.4	99.99	10000
199	79-34-5	1,1,2,2-Tetrachloroethane	1600.0	0.0	0	1
200	8001-35-2	Toxaphene	1542.0	58.0	70	3.33
201	82-68-8	Pentachloronitrobenzene (PCBN)	1542.0	58.0	70	3.33
202	83-32-9	Acenaphthene	1542.0	58.0	70	3.33
203	84-66-2	Diethyl phthalate	855.0	745.0	99.99	10000
204	84-74-2	Dibutyl phthalate	756.0	844.0	99.99	10000
205	85-01-8	Phenanthrene	1542.0	58.0	70	3.33
206	85-68-7	Butylbenzyl phthalate	451.4	1148.6	99.99	10000
207	86-73-7	Fluorene	1542.0	58.0	70	3.33
208	87-68-3	Hexachlorobutadiene	1130.0	470.0	98	50
209	87-86-5	Pentachlorophenol	1542.0	58.0	70	3.33
210	88-06-2	2,4,6-Trichlorophenol	1542.0	58.0	70	3.33
211	88-72-2	2-Nitrotoluene	581.0	1019.0	99.99	10000
212	88-75-5	2-Nitrophenol	1542.0	58.0	70	3.33
213	88-85-7	2-sec-Butyl-4,6-dinitrophenol (Dinoseb)	1542.0	58.0	70	3.33
214	88-89-1	Picric acid	572.0	1028.0	99.99	10000
215	91-20-3	Naphthalene	1054.0	546.0	99	100
216	91-22-5	Quinoline	896.0	704.0	99.99	10000
217	91-58-7	2-Chloronapthalene	1542.0	58.0	70	3.33
218	92-52-4	1,1`-Biphenyl	1004.0	596.0	99.9	1000

Table 2-1 COPCs

no. of compound	CAS #	COPC Compound	AIT deg F	RTO degrees above AIT deg F	est DE %	est DF mass in / mass out
219	92-93-3	4-Nitrobiphenyl	1542.0	58.0	70	3.33
220	93-72-1	Silvex (2,4,5-TP)	1542.0	58.0	70	3.33
221	93-76-5	2,4,5-T	1542.0	58.0	70	3.33
222	94-75-7	2,4-D and esters (160C typed)	1542.0	58.0	70	3.33
223	95-13-6	Indene	979.0	621.0	99.9	1000
224	95-47-6	o-Xylene	869.0	731.0	99.99	10000
225	95-48-7	o-Cresol (2-Methylphenol)	1038.2	561.8	99.9	1000
226	95-49-8	2-Chlorotoluene	932.0	668.0	99.99	10000
227	95-50-1	o-Dichlorobenzene (1,2-Dichlorobenzene)	1184.0	416.0	98	50
228	95-57-8	2-Chlorophenol	779.0	821.0	99.99	10000
229	95-95-4	2,4,5-Trichlorophenol	1542.0	58.0	70	3.33
230	96-18-4	1,2,3-Trichloropropane	932.0	668.0	99.99	10000
231	96-22-0	3-Pentanone	842.0	758.0	99.99	10000
232	96-69-5	Bis(3-tert-butyl-4-hydroxy-6-methyl-phenyl)sulfide	1542.0	58.0	70	3.33
233	98-51-1	p-tert-Butyltoluene	950.0	650.0	99.99	10000
234	98-82-8	Cumene	795.0	805.0	99.99	10000
235	98-83-9	alpha-Methylstyrene	1065.2	534.8	99	100
236	98-86-2	Acetophenone	1059.8	540.2	99	100
237	98-95-3	Nitrobenzene	899.6	700.4	99.99	10000

Table 2-2 Compounds detected >0.1 ppmv

no of compound	CAS #	headspace detects >0.1 ppmv Compound name	AIT deg C	AIT deg F	RTO degrees above AIT deg F	est DE %	est DF mass in / mass out
1	541-05-9	Cyclotrisiloxane, hexamethyl-	400	752	848	99.99	10000
2	556-67-2	Cyclotetrasiloxane, octamethyl-	400	752	848	99.99	10000
3	USI000-06	tetramethylcyclotrisiloxane	250	482	1118	99.99	10000
4	3622-84-2	Benzenesulfonamide, N-butyl-	800	1472	128	80	5
5	5145-07-1	2(3H)-Furanone, dihydro-3,5-dimethyl-	425	797	803	99.99	10000
6	108-47-4	Pyridine, 2,4-dimethyl-	482	899.6	700.4	99.99	10000
7	109-99-9	Furan, tetrahydro-	321	609.8	990.2	99.99	10000
8	110-00-9	Furan	360	680	920	99.99	10000
9	110-86-1	Pyridine	482	899.6	700.4	99.99	10000
10	1708-29-8	Furan, 2,5-dihydro-	450	842	758	99.99	10000
11	24405-16-1	2H-Pyran-2-one, tetrahydro-5,6-dimethyl-, trans-	350	662	938	99.99	10000
12	289-95-2	Pyrimidine	450	842	758	99.99	10000
13	290-37-9	Pyrazine	450	842	758	99.99	10000
14	534-22-5	Furan, 2-methyl-	450	842	758	99.99	10000
15	930-22-3	Oxirane, ethenyl-	429	804.2	795.8	99.99	10000
16	96-48-0	2(3H)-Furanone, dihydro- (gamma butyrolactone)	450	842	758	99.99	10000
17	3457-90-7	1,3-Propanediol, dinitrate	450	842	758	99.99	10000
18	3457-91-8	1,4-Butanediol, dinitrate	450	842	758	99.99	10000
19	544-16-1	Nitrous acid, butyl ester	450	842	758	99.99	10000
20	624-91-9	Nitrous acid, methyl ester	500	932	668	99.99	10000
21	625-58-1	Nitric acid, ethyl ester	90	194	1406	99.99	10000
22	627-05-4	Butane, 1-nitro-	450	842	758	99.99	10000
23	627-13-4	Nitric acid, propyl ester	175	347	1253	99.99	10000
24	62-75-9M	Methanamine, N-methyl-N-nitroso- and others	500	932	668	99.99	10000
25	928-45-0	Nitric acid, butyl ester	400	752	848	99.99	10000
26	123-75-1	Pyrrolidine	450	842	758	99.99	10000
27	22431-09-0	Methanamine, N-(1-methylbutylidene)-	350	662	938	99.99	10000
28	616-45-5	2-Pyrrolidinone	450	842	758	99.99	10000
29	75-50-3	Methanamine, N,N-dimethyl-	190	374	1226	99.99	10000
30	107-12-0	Propanenitrile	510	950	650	99.99	10000
31	109-74-0	Butanenitrile	488	910.4	689.6	99.99	10000
32	110-59-8	Pentanenitrile	475	887	713	99.99	10000
33	124-12-9	Octanenitrile	450	842	758	99.99	10000
34	2243-27-8	Nonanenitrile	440	824	776	99.99	10000
35	628-73-9	Hexanenitrile	470	878	722	99.99	10000
36	629-08-3	Heptanenitrile	460	860	740	99.99	10000
37	75-05-8	Acetonitrile	524	975.2	624.8	99.9	1000
38	109-21-7	Butanoic acid, butyl ester	450	842	758	99.99	10000
39	110-27-0	Tetradecanoic acid, 1-methylethyl ester	400	752	848	99.99	10000
40	123-25-1	Butanedioic acid, diethyl ester	350	662	938	99.99	10000
41	123-86-4	Acetic acid, butyl ester	425	797	803	99.99	10000

Table 2-2 Compounds detected >0.1 ppmv

no of compound	CAS #	headspace detects >0.1 ppmv Compound name	AIT deg C	AIT deg F	RTO degrees above AIT deg F	est DE %	est DF mass in / mass out
42	126-73-8	Phosphoric acid tributyl ester	482	899.6	700.4	99.99	10000
43	141-78-6	Acetic acid ethyl ester	482	899.6	700.4	99.99	10000
44	1838-59-1	Formic acid, 2-propenyl ester	500	932	668	99.99	10000
45	590-01-2	Propanoic acid, butyl ester	427	800.6	799.4	99.99	10000
46	591-87-7	Acetic acid, 2-propenyl ester	475	887	713	99.99	10000
47	592-84-7	Formic acid, butyl ester	322	611.6	988.4	99.99	10000
48	84-66-2	1,2-Benzenedicarboxylic acid, diethyl ester	540	1004	596	99.9	1000
49	1002-84-2	Pentadecanoic acid	400	752	848	99.99	10000
50	107-92-6	Butanoic acid	450	842	758	99.99	10000
51	2091-29-4	9-Hexadecenoic acid	400	752	848	99.99	10000
52	544-63-8	Tetradecanoic acid	400	752	848	99.99	10000
53	57-10-3	Hexadecanoic acid	400	752	848	99.99	10000
54	64-19-7	Acetic acid	465	869	731	99.99	10000
55	105-42-0	2-Hexanone, 4-methyl-	457	854.6	745.4	99.99	10000
56	106-35-4	3-Heptanone	390	734	866	99.99	10000
57	106-68-3	3-Octanone	525	977	623	99.9	1000
58	107-87-9	2-Pentanone	505	941	659	99.99	10000
59	108-10-1	2-Pentanone, 4-methyl- (MIBK)	457	854.6	745.4	99.99	10000
60	110-43-0	2-Heptanone	533	991.4	608.6	99.9	1000
61	111-13-7	2-Octanone	525	977	623	99.9	1000
62	112-12-9	2-Undecanone	400	752	848	99.99	10000
63	123-19-3	4-Heptanone	533	991.4	608.6	99.9	1000
64	1534-26-5	3-Tridecanone	400	752	848	99.99	10000
65	1534-27-6	3-Dodecanone	400	752	848	99.99	10000
66	15932-80-6	Cyclohexanone, 5-methyl-2-(1-methylethylidene)-	500	932	668	99.99	10000
67	22026-12-6	6-Tridecanone	400	752	848	99.99	10000
68	2216-87-7	3-Undecanone	400	752	848	99.99	10000
69	50639-02-6	5-Undecanone, 2-methyl-	400	752	848	99.99	10000
70	563-80-4	2-Butanone, 3-methyl-	500	932	668	99.99	10000
71	589-38-8	3-Hexanone	533	991.4	608.6	99.9	1000
72	589-63-9	4-Octanone	525	977	623	99.9	1000
73	591-78-6	2-Hexanone	533	991.4	608.6	99.9	1000
74	593-08-8	2-Tridecanone	400	752	848	99.99	10000
75	629-23-2	3-Tetradecanone	400	752	848	99.99	10000
76	67-64-1	2-Propanone	465	869	731	99.99	10000
77	763-93-9	3-Hexen-2-one	550	1022	578	99.9	1000
78	78-93-3	2-Butanone	516	960.8	639.2	99.9	1000
79	78-94-4	3-Buten-2-one	550	1022	578	99.9	1000
80	821-55-6	2-Nonanone	500	932	668	99.99	10000
81	89-82-7	Cyclohexanone, 5-methyl-2-(1-methylethylidene)	500	932	668	99.99	10000
82	925-78-0	3-Nonanone	500	932	668	99.99	10000

Table 2-2 Compounds detected >0.1 ppmv

no of compound	CAS #	headspace detects >0.1 ppmv Compound name	AIT deg C	AIT deg F	RTO degrees above AIT deg F	est DE %	est DF mass in / mass out
83	928-68-7	2-Heptanone, 6-methyl-	525	977	623	99.9	1000
84	98-86-2	Ethanone, 1-phenyl-	571	1059.8	540.2	99	100
85	110-62-3	Pentanal	222	431.6	1168.4	99.99	10000
86	111-71-7	Heptanal	300	572	1028	99.99	10000
87	123-38-6	Propanal	207	404.6	1195.4	99.99	10000
88	123-72-8	Butanal	230	446	1154	99.99	10000
89	124-13-0	Octanal	300	572	1028	99.99	10000
90	124-19-6	Nonanal	300	572	1028	99.99	10000
91	19269-28-4	Hexanal, 3-methyl-	200	392	1208	99.99	10000
92	66-25-1	Hexanal	300	572	1028	99.99	10000
93	75-07-0	Acetaldehyde	175	347	1253	99.99	10000
94	104-76-7	1-Hexanol, 2-ethyl-	300	572	1028	99.99	10000
95	111-70-6	1-Heptanol	320	608	992	99.99	10000
96	112-92-5	1-Octadecanol	300	572	1028	99.99	10000
97	14898-79-4	2-Butanol	406	762.8	837.2	99.99	10000
98	2136-70-1	Ethanol, 2-(tetradecyloxy)-	300	572	1028	99.99	10000
99	36653-82-4	1-Hexadecanol	300	572	1028	99.99	10000
100	51411-24-6	6,10-Dodecadien-1-ol, 3,7,11-trimethyl-	300	572	1028	99.99	10000
101	57-55-6	1,2-Propanediol	371	699.8	900.2	99.99	10000
102	598-32-3	3-Buten-2-ol	450	842	758	99.99	10000
103	6032-29-7	2-Pentanol	343	649.4	950.6	99.99	10000
104	627-27-0	3-Buten-1-ol	450	842	758	99.99	10000
105	64-17-5	Ethanol	423	793.4	806.6	99.99	10000
106	67-56-1	Methanol	470	878	722	99.99	10000
107	67-63-0	2-Propanol	399	750.2	849.8	99.99	10000
108	71-23-8	1-Propanol	440	824	776	99.99	10000
109	75-65-0	2-Propanol, 2-methyl-	480	896	704	99.99	10000
110	75-84-3	1-Propanol, 2,2-dimethyl-	480	896	704	99.99	10000
111	75-85-4	2-Butanol, 2-methyl-	437	818.6	781.4	99.99	10000
112	78-92-2	2-Butanol	406	762.8	837.2	99.99	10000
113	87-68-3	1,3-Butadiene, 1,1,2,3,4,4-hexachloro-	610	1130	470	98	50
114	96-41-3	Cyclopentanol	350	662	938	99.99	10000
115	1184-60-7	1-Propene, 2-fluoro-	600	1112	488	99	100
116	127-18-4	Ethene, tetrachloro-	871	1599.8	0.2	0	1
117	156-59-2	Ethene, 1,2-dichloro-, (Z)-	460	860	740	99.99	10000
118	1717-00-6	Ethane, 1,1-dichloro-1-fluoro- (freon 14b)	550	1022	578	99.9	1000
119	56-23-5	Methane, tetrachloro-	900	1652	-52	0	1
120	74-87-3	Methane, chloro- (R-40)	662	1223.6	376.4	95	20
121	75-02-5	Ethene, fluoro-	385	725	875	99.99	10000
122	75-09-2	Methane, dichloro-	662	1223.6	376.4	95	20
123	75-45-6	Methane, chlorodifluoro- (R-22)	632	1169.6	430.4	98	50

Table 2-2 Compounds detected >0.1 ppmv

no of compound	CAS #	headspace detects >0.1 ppmv Compound name	AIT deg C	AIT deg F	RTO degrees above AIT deg F	est DE %	est DF mass in / mass out
124	75-68-3	Ethane, 1-chloro-1,1-difluoro- (R-142)	632	1169.6	430.4	98	50
125	75-69-4	Methane, trichlorofluoro- (R-11)	900	1652	-52	0	1
126	6031-02-3	Benzene, (1-methylpentyl)-	490	914	686	99.99	10000
127	100-41-4	Benzene, ethyl-	432	809.6	790.4	99.99	10000
128	100-42-5	Benzene, ethenyl-	490	914	686	99.99	10000
129	106-42-3	Benzene, 1,4-dimethyl-	529	984.2	615.8	99.9	1000
130	108-38-3	Benzene, 1,3-dimethyl-	528	982.4	617.6	99.9	1000
131	108-88-3	Benzene, methyl-	482	899.6	700.4	99.99	10000
132	3290-53-7	Benzene, (2-methyl-2-propenyl)-	490	914	686	99.99	10000
133	538-68-1	Benzene, pentyl-	420	788	812	99.99	10000
134	637-50-3	Benzene, 1-propenyl-	490	914	686	99.99	10000
135	643-58-3	1,1`-Biphenyl, 2-methyl-	495	923	677	99.99	10000
136	71-43-2	Benzene	562	1043.6	556.4	99.9	1000
137	92-52-4	1,1`-Biphenyl	540	1004	596	99.9	1000
138	95-47-6	Benzene, 1,2-dimethyl-	464	867.2	732.8	99.99	10000
139	74-99-7	1-Propyne	340	644	956	99.99	10000
140	20184-91-2	4-Nonyne	320	608	992	99.99	10000
141	61142-40-3	4-Undecene, 4-methyl-	500	932	668	99.99	10000
142	629-73-2	1-Hexadecene	500	932	668	99.99	10000
143	74630-39-0	1-Undecene, 4-methyl-	500	932	668	99.99	10000
144	74630-48-1	3-Undecene, 2-methyl-, (Z)-	500	932	668	99.99	10000
145	764-96-5	5-Undecene, (Z)-	500	932	668	99.99	10000
146	821-74-9	4,5-Nonadiene	550	1022	578	99.9	1000
147	1008-80-6	Naphthalene, decahydro-2,3-dimethyl-	288	550.4	1049.6	99.99	10000
148	108-87-2	Cyclohexane, methyl-	250	482	1118	99.99	10000
149	110-82-7	Cyclohexane	245	473	1127	99.99	10000
150	1472-09-9	Cyclopropane, octyl-	498	928.4	671.6	99.99	10000
151	1618-22-0	Naphthalene, decahydro-2,6-dimethyl-	288	550.4	1049.6	99.99	10000
152	1630-94-0	Cyclopropane, 1,1-dimethyl-	498	928.4	671.6	99.99	10000
153	1678-93-9	Cyclohexane, butyl-	246	474.8	1125.2	99.99	10000
154	2415-72-7	Cyclopropane, propyl-	498	928.4	671.6	99.99	10000
155	287-92-3	Cyclopentane	380	716	884	99.99	10000
156	2883-05-8	Octane, 2-cyclohexyl-	246	474.8	1125.2	99.99	10000
157	294-62-2	Cyclododecane	235	455	1145	99.99	10000
158	2958-76-1	Naphthalene, decahydro-2-methyl-	288	550.4	1049.6	99.99	10000
159	3073-66-3	Cyclohexane, 1,1,3-trimethyl-	320	608	992	99.99	10000
160	32281-85-9	Cyclopentane, 1,3-dimethyl-2-(1-methylethyl)-	350	662	938	99.99	10000
161	3604-14-6	Naphthalene, decahydro-1,2-dimethyl-	288	550.4	1049.6	99.99	10000
162	41977-33-7	Cyclopropane, 1-pentyl-2-propyl-	498	928.4	671.6	99.99	10000
163	4292-92-6	Cyclohexane, pentyl-	270	518	1082	99.99	10000
164	4806-61-5	Cyclobutane, ethyl-	212	413.6	1186.4	99.99	10000

Table 2-2 Compounds detected >0.1 ppmv

no of compound	CAS #	headspace detects >0.1 ppmv Compound name	AIT deg C	AIT deg F	RTO degrees above AIT deg F	est DE %	est DF mass in / mass out
165	493-02-7	Naphthalene, decahydro-, trans-	288	550.4	1049.6	99.99	10000
166	54676-39-0	Cyclohexane, 2-butyl-1,1,3-trimethyl-	320	608	992	99.99	10000
167	55937-92-3	Bicyclo[4.1.0]heptane, 2-methyl-7-pentyl-	320	608	992	99.99	10000
168	594-11-6	Cyclopropane, methyl-	498	928.4	671.6	99.99	10000
169	598-61-8	Cyclobutane, methyl-	250	482	1118	99.99	10000
170	61142-20-9	Cyclohexane, (4-methylpentyl)-	270	518	1082	99.99	10000
171	7058-01-7	Cyclohexane, (1-methylpropyl)-	270	518	1082	99.99	10000
172	7094-26-0	Cyclohexane, 1,1,2-trimethyl-	270	518	1082	99.99	10000
173	822-50-4	Cyclopentane, 1,2-dimethyl-, trans-	350	662	938	99.99	10000
174	1002-43-3	Undecane, 3-methyl-	500	932	668	99.99	10000
175	106-97-8	Butane	405	761	839	99.99	10000
176	107-83-5	Pentane, 2-methyl-	306	582.8	1017.2	99.99	10000
177	108-08-7	Pentane, 2,4-dimethyl-	337	638.6	961.4	99.99	10000
178	109-66-0	Pentane	260	500	1100	99.99	10000
179	110-54-3	Hexane	225	437	1163	99.99	10000
180	111-65-9	Octane	220	428	1172	99.99	10000
181	111-84-2	Nonane	206	402.8	1197.2	99.99	10000
182	1120-21-4	Undecane	202	395.6	1204.4	99.99	10000
183	112-40-3	Dodecane	204	399.2	1200.8	99.99	10000
184	124-18-5	Decane	210	410	1190	99.99	10000
185	13151-34-3	Decane, 3-methyl-	225	437	1163	99.99	10000
186	13151-35-4	Decane, 5-methyl-	225	437	1163	99.99	10000
187	13286-73-2	Tridecane, 3-ethyl-	220	428	1172	99.99	10000
188	13287-21-3	Tridecane, 6-methyl-	220	428	1172	99.99	10000
189	142-82-5	Heptane	223	433.4	1166.6	99.99	10000
190	14720-74-2	Heptane, 2,2,4-trimethyl-	275	527	1073	99.99	10000
191	1560-96-9	Tridecane, 2-methyl-	205	401	1199	99.99	10000
192	1632-70-8	Undecane, 5-methyl-	220	428	1172	99.99	10000
193	17301-23-4	Undecane, 2,6-dimethyl-	250	482	1118	99.99	10000
194	17301-25-6	Undecane, 2,8-dimethyl-	250	482	1118	99.99	10000
195	17301-27-8	Undecane, 2,10-dimethyl-	250	482	1118	99.99	10000
196	17301-29-0	Undecane, 3,7-dimethyl-	250	482	1118	99.99	10000
197	17301-30-3	Undecane, 3,8-dimethyl-	250	482	1118	99.99	10000
198	17301-32-5	Undecane, 4,7-dimethyl-	250	482	1118	99.99	10000
199	17301-94-9	Nonane, 4-methyl-	220	428	1172	99.99	10000
200	17302-28-2	Nonane, 2,6-dimethyl-	250	482	1118	99.99	10000
201	17302-32-8	Nonane, 3,7-dimethyl-	250	482	1118	99.99	10000
202	17312-50-4	Decane, 2,5-dimethyl-	250	482	1118	99.99	10000
203	17312-57-1	Dodecane, 3-methyl-	220	428	1172	99.99	10000
204	17312-60-6	Undecane, 6-ethyl-	220	428	1172	99.99	10000
205	17312-73-1	Undecane, 5,5-dimethyl-	250	482	1118	99.99	10000

Table 2-2 Compounds detected >0.1 ppmv

no of compound	CAS #	headspace detects >0.1 ppmv Compound name	AIT deg C	AIT deg F	RTO degrees above AIT deg F	est DE %	est DF mass in / mass out
206	17312-76-4	Undecane, 6,6-dimethyl-	250	482	1118	99.99	10000
207	17312-77-5	Undecane, 2,3-dimethyl-	250	482	1118	99.99	10000
208	17312-80-0	Undecane, 2,4-dimethyl-	250	482	1118	99.99	10000
209	17312-82-2	Undecane, 4,6-dimethyl-	250	482	1118	99.99	10000
210	17453-94-0	Undecane, 5-ethyl-	220	428	1172	99.99	10000
211	20278-85-7	Heptane, 2,3,5-trimethyl-	275	527	1073	99.99	10000
212	2213-23-2	Heptane, 2,4-dimethyl-	330	626	974	99.99	10000
213	2216-33-3	Octane, 3-methyl-	220	428	1172	99.99	10000
214	2216-34-4	Octane, 4-methyl-	220	428	1172	99.99	10000
215	25117-24-2	Tetradecane, 4-methyl-	220	428	1172	99.99	10000
216	25117-31-1	Tridecane, 5-methyl-	220	428	1172	99.99	10000
217	26730-12-1	Tridecane, 4-methyl-	220	428	1172	99.99	10000
218	26730-14-3	Tridecane, 7-methyl-	225	437	1163	99.99	10000
219	2847-72-5	Decane, 4-methyl-	225	437	1163	99.99	10000
220	2980-69-0	Undecane, 4-methyl-	220	428	1172	99.99	10000
221	31295-56-4	Dodecane, 2,6,11-trimethyl-	250	482	1118	99.99	10000
222	3891-98-3	Dodecane, 2,6,10-trimethyl-	250	482	1118	99.99	10000
223	4032-93-3	Heptane, 2,3,6-trimethyl-	275	527	1073	99.99	10000
224	52896-90-9	Heptane, 3-ethyl-5-methyl-	275	527	1073	99.99	10000
225	544-76-3	Hexadecane	202	395.6	1204.4	99.99	10000
226	55030-62-1	Tridecane, 4,8-dimethyl-	250	482	1118	99.99	10000
227	55045-07-3	Dodecane, 2-methyl-8-propyl-	250	482	1118	99.99	10000
228	55045-11-9	Tridecane, 5-propyl-	225	437	1163	99.99	10000
229	562-49-2	Pentane, 3,3-dimethyl-	350	662	938	99.99	10000
230	56292-65-0	Dodecane, 2,5-dimethyl-	225	437	1163	99.99	10000
231	565-59-3	Pentane, 2,3-dimethyl-	337	638.6	961.4	99.99	10000
232	589-34-4	Hexane, 3-methyl-	280	536	1064	99.99	10000
233	589-43-5	Hexane, 2,4-dimethyl-	437	818.6	781.4	99.99	10000
234	589-53-7	Heptane, 4-methyl-	250	482	1118	99.99	10000
235	589-81-1	Heptane, 3-methyl-	239	462.2	1137.8	99.99	10000
236	591-76-4	Hexane, 2-methyl-	280	536	1064	99.99	10000
237	592-27-8	Heptane, 2-methyl-	247	476.6	1123.4	99.99	10000
238	61141-72-8	Dodecane, 4,6-dimethyl-	225	437	1163	99.99	10000
239	6117-97-1	Dodecane, 4-methyl-	220	428	1172	99.99	10000
240	617-78-7	3-Ethylpentane	275	527	1073	99.99	10000
241	62016-30-2	Octane, 2,3,3-trimethyl-	290	554	1046	99.99	10000
242	62016-34-6	Octane, 2,3,7-trimethyl-	290	554	1046	99.99	10000
243	62108-21-8	Decane, 6-ethyl-2-methyl-	275	527	1073	99.99	10000
244	62108-25-2	Decane, 2,6,7-trimethyl-	290	554	1046	99.99	10000
245	62108-27-4	Decane, 2,4,6-trimethyl-	290	554	1046	99.99	10000
246	62238-13-5	Decane, 2,3,7-trimethyl-	290	554	1046	99.99	10000

Table 2-2 Compounds detected >0.1 ppmv

no of compound	CAS #	headspace detects >0.1 ppmv Compound name	AIT deg C	AIT deg F	RTO degrees above AIT deg F	est DE %	est DF mass in / mass out
247	629-50-5	Tridecane	202	395.6	1204.4	99.99	10000
248	629-59-4	Tetradecane	200	392	1208	99.99	10000
249	629-62-9	Pentadecane	202	395.6	1204.4	99.99	10000
250	629-78-7	Heptadecane	202	395.6	1204.4	99.99	10000
251	74-98-6	Propane	450	842	758	99.99	10000
252	75-28-5	Propane, 2-methyl-	462	863.6	736.4	99.99	10000
253	78-78-4	Butane, 2-methyl-	420	788	812	99.99	10000
254	96-14-0	Pentane, 3-methyl-	278	532.4	1067.6	99.99	10000
255	565-75-3	Pentane, trimethyl-, isomer	427	800.6	799.4	99.99	10000

Attachment 3 Tables of Removal DFs

Table 3-1 COPCs
Table 3-2 Compounds detected >0.1 ppmv

no of compo und	CAS	Compound Name (COPC)	MW	Boiling pt.	Yaws capacity correlation carbon loading quadratic constants			assumed outlet equilibrium of isotherm-PPMV (y)	difference with BP and MW estimation	% error with Yaws prediction	estimated by BP and MW as per A. Shepherd (Shepherd 2001)			estimated by BP and MW with conservativatism for mixing and values no higher than predicted by Yaws (Yaws 1995)		
								0.10			Estimated Carbon Capacity	Predicted RE	DF	Estimated Carbon Capacity	Predicted RE	DF
			g/mol	deg C	A	B	C	g ads/100 g carbon			g/100 g C	%	mass in / mass out	g/100 g C	%	mass in / mass out
1	100-00-5	p-Nitrochlorobenzene	157.6	242							40	98	50	40	98	50
2	100-21-0	p-Phthalic acid	166.1	sublimes							40	98	50	40	98	50
3	100-25-4	1,4-Dinitrobenzene	168.1	173							20	98	50	20	98	50
4	100-41-4	Ethyl benzene	106.2	136.2							2	80	5	2	80	5
5	100-42-5	Styrene	104.1	145.2							2	80	5	2	80	5
6	10061-01-5	cis-1,3-Dichloropropene	111.0	104.3							2	80	5	2	80	5
7	10061-02-6	trans-1,3-Dichloropropene	111.0	112							2	80	5	2	80	5
8	101-55-3	4-Bromophenylphenyl ether	249.1	310.14							40	98	50	40	98	50
9	101-84-8	Diphenyl ether	170.2	498							40	98	50	40	98	50
10	106-35-4	3-Heptanone	114.2	147							2	80	5	2	80	5
11	106-42-3	p-Xylene (Dimethyl benzene)	106.2	138.3							2	80	5	2	80	5
12	106-46-7	1,4-Dichlorobenzene	147.0	173.4							10	95	20	10	95	20
13	106-88-7	1,2-Epoxybutane	72.1	63.3	0.36719	0.37654	-0.0236	0.93	(0.07)	(7.88)	1	50	2	0.5	20	1.25
14	106-93-4	Ethylene dibromide (Dibromoethane)	187.9	131.7	1.44231	0.255	-0.02666	14.48	9.48	65.46	5	90	10	5	90	10
15	106-97-8	Butane	58.1	-0.45	0.03071	0.34304	-0.01596	0.47	0.47	100.00	0	0	1	0	0	1
16	106-99-0	1,3-Butadiene	54.1	-4.4	-0.03359	0.34764	-0.01297	0.40	0.40	100.00	0	0	1	0	0	1
17	107-02-8	Acrolein	56.1	52.7	-0.29632	0.49437	-0.02471	0.15	(0.85)	(553.73)	1	50	2	0	0	1
18	107-05-1	3-Chloropropene (Allyl chloride)	76.5	44	0.32792	0.36553	-0.01853	0.88	0.38	43.10	0.5	20	1.25	0.5	20	1.25
19	107-06-2	1,2-Dichloroethane (Ethylene chloride)	99.0	83.5	0.55343	0.37072	-0.02161	1.45	0.45	30.99	1	50	2	1	50	2
20	107-12-0	Propionitrile	55.1	97.2	0.05925	0.51747	-0.03781	0.32	(0.68)	(213.35)	1	50	2	0	0	1
21	107-13-1	Acrylonitrile	53.1	77.3	0.07669	0.49986	-0.035	0.35	(0.65)	(187.19)	1	50	2	0	0	1
22	107-18-6	2-Propene-1-ol	58.1	97	0.3239	0.49368	-0.0437	0.61	(0.39)	(63.49)	1	50	2	0.5	20	1.25
23	107-31-3	Formic acid, methyl ester	60.1	32	-0.99586	0.61693	-0.01847	0.02	(0.48)	(2039.09)	0.5	20	1.25	0	0	1
24	107-66-4	Dibutylphosphate	210.2	100							2	80	5	2	80	5
25	107-87-9	2-Pentanone	86.1	100							1	50	2	1	50	2
26	108-03-2	1-Nitropropane	89.1	131	0.91328	0.34648	-0.0373	3.38	1.38	40.91	2	80	5	2	80	5
27	108-05-4	Vinyl acetate	86.1	72.3	0.61067	0.34797	-0.02595	1.72	0.72	42.02	1	50	2	1	50	2
28	108-10-1	Hexone (4-Methyl-2-pentanone or MIBK)	100.2	117.4							2	80	5	2	80	5
29	108-20-3	Bis(isopropyl)ether	102.2	68.5							1	50	2	1	50	2
30	108-38-3	m-Xylene (Dimethyl benzene)	106.2	139.1							2	80	5	2	80	5
31	108-39-4	m-Cresol	108.1	202							10	95	20	10	95	20
32	108-87-2	Methylcyclohexane	98.2	101							2	80	5	2	80	5
33	108-88-3	Toluene	92.1	110.6							2	80	5	2	80	5
34	108-90-7	Chlorobenzene	112.6	130							2	80	5	2	80	5
35	108-93-0	Cyclohexanol	100.2	161							10	95	20	10	95	20
36	108-94-1	Cyclohexanone	98.2	155.6							10	95	20	10	95	20
37	108-95-2	Phenol	94.1	181.7							10	95	20	10	95	20
38	109-66-0	n-Pentane	72.2	36.1							0.5	20	1.25	0.5	20	1.25
39	109-99-9	Tetrahydrofuran	72.1	66	0.29856	0.35648	-0.0155	0.84	(0.16)	(18.42)	1	50	2	0.5	20	1.25
40	110-12-3	5-Methyl-2-hexanone	114.2	144							2	80	5	2	80	5
41	110-43-0	2-Heptanone	114.2	150							2	80	5	2	80	5
42	110-54-3	n-Hexane	86.2	69							1	50	2	1	50	2
43	110-62-3	n-Valeraldehyde	86.1	103							2	80	5	2	80	5
44	110-82-7	Cyclohexane	84.2	80.7							1	50	2	1	50	2
45	110-83-8	Cyclohexene	82.1	83							1	50	2	1	50	2
46	110-86-1	Pyridine	79.1	115.2							2	80	5	2	80	5
47	111-65-9	n-Octane	114.2	126							2	80	5	2	80	5
48	111-76-2	Ethylene glycol monobutyl ether	118.0	171							10	95	20	10	95	20
49	111-84-2	n-Nonane	128.3	150.8							10	95	20	10	95	20
50	117-81-7	Bis(2-ethylhexyl)phthalate (DEHP)	390.5	386.9							40	98	50	40	98	50
51	117-84-0	n-Dioctyl phthalate	390.6	220							40	98	50	40	98	50

no of compo und	CAS	Compound Name (COPC)	MW	Boiling pt.	Yaws capacity correlation carbon loading quadratic constants			assumed outlet equilibrium of isotherm-PPMV (y)	difference with BP and MW estimation	% error with Yaws prediction	estimated by BP and MW as per A. Shepherd (Shepherd 2001)			estimated by BP and MW with conservativatism for mixing and values no higher than predicted by Yaws (Yaws 1995)		
								0.10			Estimated Carbon Capacity	Predicted RE	DF	Estimated Carbon Capacity	Predicted RE	DF
			g/mol	deg C	A	B	C	g ads/100 g carbon			g/100 g C	%	mass in / mass out	g/100 g C	%	mass in / mass out
52	118-74-1	Hexachlorobenzene	284.8	332							40	98	50	40	98	50
53	120-12-7	Anthracene	178.2	340							40	98	50	40	98	50
54	120-82-1	1,2,4-Trichlorobenzene	181.5	214.4							40	98	50	40	98	50
55	120-83-2	2,4-Dichlorophenol	163.0	210							40	98	50	40	98	50
56	121-44-8	Triethylamine	101.2	88.9							1	50	2	1	50	2
57	121-69-7	Dimethylaniline	121.2	194							10	95	20	10	95	20
58	122-39-4	N,N-Diphenylamine	169.2	302							40	98	50	40	98	50
59	123-19-3	4-Heptanone	114.2	144							2	80	5	2	80	5
60	123-38-6	n-Propionaldehyde	58.1	49	0.05519	0.49738	-0.04331	0.33	(0.17)	(52.92)	0.5	20	1.25	0	0	1
61	123-51-3	3-Methyl-1-butanol	88.2	130							2	80	5	2	80	5
62	123-86-4	Acetic acid n-butyl ester	116.2	126.1							2	80	5	2	80	5
63	123-91-1	1,4-Dioxane	88.1	101.1	0.66781	0.36208	-0.03034	1.89	(0.11)	(6.08)	2	80	5	1	50	2
64	126-73-8	Tributyl phosphate	266.3	289							40	98	50	40	98	50
65	126-98-7	2-Methyl-2-propenenitrile (Methacrylonitrile)	67.1	90.3	0.46655	0.3889	-0.03042	1.11	0.11	10.30	1	50	2	1	50	2
66	127-18-4	Perchloroethylene (tetrachloroethylene)	165.9	121.1	1.40596	0.20802	-0.02097	15.03	10.03	66.73	5	90	10	5	90	10
67	127-19-5	N,N-Dimethylacetamide	87.1	166	1.20026	0.25124	-0.03263	8.25	(1.75)	(21.23)	10	95	20	5	90	10
68	128-37-0	2,6-Bis(tert-butyl)-4-methylphenol	220.4	265							40	98	50	40	98	50
69	129-00-0	Pyrene	202.2	404							40	98	50	40	98	50
70	1321-64-8	Pentachloronaphthalene	300.4	327							40	98	50	40	98	50
71	1321-65-9	Trichloronaphthalene	231.5	304							40	98	50	40	98	50
72	132-64-9	Dibenzofuran	168.2	285							40	98	50	40	98	50
73	1335-87-1	Hexachloronaphthalene	334.8	343							40	98	50	40	98	50
74	1335-88-2	Tetrachloronaphthalene	266.0	316							40	98	50	40	98	50
75	1336-36-3	Polychlorinated biphenyls (PCBs)	322.0	>195							40	98	50	40	98	50
76	141-78-6	Acetic acid ethyl ester (Ethyl acetate)	88.1	77.1	0.63612	0.34441	-0.02691	1.84	0.84	45.65	1	50	2	1	50	2
77	141-79-7	4-Methyl-3-penten-2-one	98.2	127							2	80	5	2	80	5
78	142-82-5	n-Heptane	100.2	98.4							1	50	2	1	50	2
79	144-62-7	Oxalic acid	90.0	190							10	95	20	10	95	20
80	156-60-5	trans-1,2-Dichloroethylene	97.0	47.5	0.47567	0.39061	-0.02554	1.15	0.65	56.40	0.5	20	1.25	0.5	20	1.25
81	1582-09-8	Trifluralin	335.3	139							5	90	10	5	90	10
82	1634-04-4	Methyl tert-butyl ether	88.2	55.2							1	50	2	1	50	2
83	1836-75-5	Nitrofen	284.1	180							20	98	50	20	98	50
84	189-55-9	Dibenzo[a,i]pyrene	302.4	404							40	98	50	40	98	50
85	189-64-0	Dibenzo[a,h]pyrene	302.4	404							40	98	50	40	98	50
86	191-24-2	Benzo(g,h,i)perylene	276.3	500							40	98	50	40	98	50
87	191-30-0	Benzo[a,i]pyrene	302.4	404							40	98	50	40	98	50
88	192-65-4	Dibenzo[a,e]pyrene	302.4	sublimes							40	98	50	40	98	50
89	193-39-5	Indeno(1,2,3-cd)pyrene	276.3	536							40	98	50	40	98	50
90	205-82-3	Benzo(j)fluoranthene	252.3	350							40	98	50	40	98	50
91	205-99-2	Benzo(b)fluoranthene	252.3	357							40	98	50	40	98	50
92	206-44-0	Fluoranthene	202.3	375							40	98	50	40	98	50
93	207-08-9	Benzo(k)fluoranthene	252.3	480							40	98	50	40	98	50
94	208-96-8	Acenaphthylene	152.2	265							40	98	50	40	98	50
95	218-01-9	Chrysene	228.3	448							40	98	50	40	98	50
96	2234-13-1	Octachloronaphthalene	403.7	440							40	98	50	40	98	50
97	224-42-0	Dibenz[a,j]acridine	279.3	>346							40	98	50	40	98	50
98	226-36-8	Dibenz[a,h]acridine	279.3	>346							40	98	50	40	98	50
99	2385-85-5	Mirex	545.6	composes							40	98	50	40	98	50
100	25551-13-7	Trimethyl benzene	120.2	164.7							10	95	20	10	95	20
101	26140-60-3	Terphenyls	230.3	337							40	98	50	40	98	50
102	27154-33-2	Trichlorofluoroethane	151.4	146.5							5	90	10	5	90	10

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								0.10			Estimated Carbon Capacity	Predicted RE	DF	Estimated Carbon Capacity	Predicted RE	DF
			g/mol	deg C	A	B	C	g ads/100 g carbon			g/100 g C	%	mass in / mass out	g/100 g C	%	mass in / mass out
103	287-92-3	Cyclopentane	70.1	49							0.5	20	1.25	0.5	20	1.25
104	309-00-2	Aldrin	364.9	145							5	90	10	5	90	10
105	319-84-6	Hexachlorocyclohexane (Lindane) Alpha BHC	290.0	288							40	98	50	40	98	50
106	319-85-7	Hexachlorocyclohexane (Lindane) Beta BHC	290.8	288							40	98	50	40	98	50
107	319-86-8	Delta-BHC	290.9	288							40	98	50	40	98	50
108	3697-24-3	5-Methylchrysene	242.3	404							40	98	50	40	98	50
109	3825-26-1	Ammonium perfluorooctanoate	431.1	192							20	98	50	20	98	50
110	4170-30-3	2-Butenaldehyde (2-Butenal)	70.1	102	0.68353	0.3656	-0.034	1.92	(0.08)	(4.02)	2	80	5	1	50	2
111	465-73-6	Isodrin	364.9	304							40	98	50	40	98	50
112	50-00-0	Formaldehyde	30.0	-19.5	-2.48524	0.69123	-0.00375	0.00	0.00	100.00	0	0	1	0	0	1
113	50-29-3	4,4-DDT	354.5	260							40	98	50	40	98	50
114	50-32-8	Benzo(a)pyrene	252.3	495							40	98	50	40	98	50
115	53-70-3	Dibenzo(a,h)anthracene	278.3	524							40	98	50	40	98	50
116	540-59-0	1,2-Dichloroethylene	96.9	48	0.47567	0.39061	-0.02554	1.15	0.65	56.40	0.5	20	1.25	0.5	20	1.25
117	540-84-1	2,2,4-Trimethylpentane	114.2	99.2							1	50	2	1	50	2
118	541-73-1	1,3-Dichlorobenzene	147.0	173							10	95	20	10	95	20
119	56-23-5	Carbon tetrachloride	153.8	76.7	1.07481	0.28186	-0.02276	5.89	3.89	66.05	2	80	5	2	80	5
120	563-80-4	3-Methyl-2-butanone	86.1	94							1	50	2	1	50	2
121	56-49-5	3-Methylcholanthrene	268.4	280							40	98	50	40	98	50
122	56-55-3	Benzo(a)anthracene	228.3	437.6							40	98	50	40	98	50
123	57-14-7	1,1-Dimethylhydrazine	60.1	63							1	50	2	1	50	2
124	58-89-9	gamma-BHC (Lindane)	290.8	323.4							40	98	50	40	98	50
125	58-90-2	2,3,4,6-Tetrachlorophenol	231.9	150							5	90	10	5	90	10
126	591-78-6	2-Hexanone	100.2	127							2	80	5	2	80	5
127	59-50-7	4-Chloro-3-methylphenol	142.6	235							10	95	20	10	95	20
128	59-89-2	N-Nitrosomorpholine	116.1	224							10	95	20	10	95	20
129	602-87-9	5-Nitroacenaphthene	199.2	279							40	98	50	40	98	50
130	60-29-7	Ethyl ether	74.1	34.6	0.23477	0.36044	-0.02236	0.71	0.21	29.69	0.5	20	1.25	0.5	20	1.25
131	603-34-9	Triphenylamine	245.3	347							40	98	50	40	98	50
132	60-34-4	Methylhydrazine	46.1	87.8							0	0	1	0	0	1
133	60-35-5	Acetamide	59.1	221	1.23333	0.21723		10.38	0.38	3.64	10	95	20	10	95	20
134	60-57-1	Dieldrin	380.9	385							40	98	50	40	98	50
135	621-64-7	Di-n-Propylnitrosamine	130.2	206							10	95	20	10	95	20
136	624-83-9	Methyl isocyanate	57.1	39	-1.07579	0.85881	-0.06876	0.01	(0.49)	(4938.83)	0.5	20	1.25	0	0	1
137	627-13-4	Nitric acid, propyl ester	105.1	110							2	80	5	2	80	5
138	62-75-9	N-Nitroso-N,N-dimethylamine	74.1	153							2	95	20	2	95	20
139	630-20-6	1,1,1,2-Tetrachloroethane	167.9	130.5							5	90	10	5	90	10
140	64-17-5	Ethyl alcohol	46.1	78.3	-0.51153	0.67525	-0.04473	0.06	0.06	100.00	0	0	1	0	0	1
141	64-18-6	Formic acid	46.0	100.7	-1.77731	1.09503	-0.06354	1.16E-03	0.00	100.00	0	0	1	0	0	1
142	64-19-7	Acetic acid	60.1	118	-0.05553	0.6841	-0.06071	0.16	(1.84)	(1162.90)	2	80	5	0	0	1
143	67-56-1	Methyl alcohol (Methanol)	32.0	64.6							0	0	1	0	0	1
144	67-63-0	2-Propyl alcohol (Isopropanol)	60.1	82.4	0.27183	0.46419	-0.03682	0.59	(0.41)	(69.50)	1	50	2	0.5	20	1.25
145	67-64-1	2-Propanone (Acetone)	58.1	56.2	-0.14546	0.47497	-0.02286	0.23	(0.77)	(339.84)	1	50	2	0	0	1
146	67-66-3	Chloroform	119.4	61.7	0.67102	0.36148	-0.02288	1.93	0.93	48.32	1	50	2	1	50	2
147	67-72-1	Hexachloroethane	236.7	sublimes							40	98	50	40	98	50
148	684-16-2	Hexafluoroacetone	166.0	-26							0	0	1	0	0	1
149	71-23-8	n-Propyl alcohol	60.1	97.2	0.38644	0.48033	-0.04505	0.73	(0.27)	(37.70)	1	50	2	0.5	20	1.25
150	71-36-3	n-Butyl alcohol	74.1	117.6	0.89881	0.32534	-0.03648	3.44	1.44	41.92	2	80	5	2	80	5
151	71-43-2	Benzene	78.1	80.1							1	50	2	1	50	2
152	71-55-6	Methyl chloroform (1,1,1-Trichloroethane)	133.4	74.1	0.97331	0.28737	-0.02277	4.60	3.60	78.28	1	50	2	1	50	2
153	72-20-8	Endrin	380.9	245							40	98	50	40	98	50

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								0.10			Estimated Carbon Capacity	Predicted RE	DF	Estimated Carbon Capacity	Predicted RE	DF
			g/mol	deg C	A	B	C	g ads/100 g carbon			g/100 g C	%	mass in / mass out	g/100 g C	%	mass in / mass out
154	72-43-5	Methoxychlor	345.7	346							40	98	50	40	98	50
155	72-54-8	4,4-DDD	320.1	193							20	98	50	20	98	50
156	72-55-9	4,4-DDE	319.0	316.5							40	98	50	40	98	50
157	74-83-9	Bromomethane (Methyl bromide)	95.0	3.56	-1.23835	0.78564	-0.05521	0.01	0.01	100.00	0	0	1	0	0	1
158	74-87-3	Chloromethane (Methyl chloride)	50.5	-24.2	-1.91871	0.62053	-0.00549	0.00	0.00	100.00	0	0	1	0	0	1
159	74-97-5	Bromochloromethane	129.4	67.8	0.61399	0.41353	-0.02531	1.50	0.50	33.19	1	50	2	1	50	2
160	74-99-7	Methylacetylene	40.1	-23	-2.52865	1.74715	-0.21635	0.00	0.00	100.00	0	0	1	0	0	1
161	75-00-3	Chloroethane	64.5	12.3	-0.50828	0.50364	-0.02179	0.09	0.09	100.00	0	0	1	0	0	1
162	75-01-4	Vinyl chloride (1-Chloroethene)	62.5	-13.9	-0.98889	0.66564	-0.0432	0.02	0.02	100.00	0	0	1	0	0	1
163	75-05-8	Acetonitrile	41.1	81.6	-0.79666	0.63512	-0.02598	0.03	0.03	100.00	0	0	1	0	0	1
164	75-07-0	Acetaldehyde	44.1	20.1	-1.17047	0.62766	-0.02475	0.02	0.02	100.00	0	0	1	0	0	1
165	75-09-2	Dichloromethane (Methylene chloride)	84.9	39.8	-0.07043	0.4921	-0.02276	0.26	(0.24)	(92.42)	0.5	20	1.25	0	0	1
166	75-12-7	Formamide	45.0	210	1.30981	0.25274		11.40	11.40	100.00	0	0	1	0	0	1
167	75-15-0	Carbon disulfide	76.1	46.2							0.5	20	1.25	0.5	20	1.25
168	75-21-8	Ethylene oxide (Oxirane)	44.1	10.7	-2.42379	0.94878	-0.04062	0.00	0.00	100.00	0	0	1	0	0	1
169	75-27-4	Bromodichloromethane	163.8	90.1							2	80	5	2	80	5
170	75-34-3	1,1-Dichloroethane	99.0	57.3	0.54485	0.36091	-0.02192	1.45	0.45	31.14	1	50	2	1	50	2
171	75-35-4	1,1-Dichloroethene (Vinylidene chloride)	97.0	31.7							0.5	20	1.25	0.5	20	1.25
172	75-43-4	Dichlorofluoromethane	102.9	9							0	0	1	0	0	1
173	75-45-6	Chlorodifluoromethane	86.5	-40.8							0	0	1	0	0	1
174	75-50-3	Trimethylamine	59.1	2.87	-0.09422	0.32583	-0.00337	0.38	0.38	100.00	0	0	1	0	0	1
175	75-52-5	Nitromethane	61.0	101	-0.32847	0.70602	-0.05111	0.08	(1.92)	(2335.73)	2	80	5	0	0	1
176	75-55-8	2-Methylaziridine	57.1	66	0.06919	0.43529	-0.02293	0.41	(0.59)	(144.92)	1	50	2	0	0	1
177	75-61-6	Difluorodibromomethane	209.8	24	0.82076	0.30701	-0.01384	3.16	3.16	100.00	0	0	1	0	0	1
178	75-63-8	Trifluorobromomethane	148.9	-57.8							0	0	1	0	0	1
179	75-65-0	2-Methyl-2-propanol	74.1	82.2							1	50	2	1	50	2
180	75-69-4	Trichlorofluoromethane	137.4	23.8	0.17307	0.40715	-0.01915	0.56	0.56	100.00	0	0	1	0	0	1
181	75-71-8	Dichlorodifluoromethane	120.9	-29.79	-0.0735	0.40145	-0.01404	0.32	0.32	100.00	0	0	1	0	0	1
182	75-99-0	2,2-Dichloropropionic acid	143.0	202							10	95	20	10	95	20
183	76-03-9	Trichloroacetic acid	163.4	196							20	98	50	20	98	50
184	76-11-9	1,1,1,2-Tetrachloro-2,2-difluoroethane	203.8	91							2	80	5	2	80	5
185	76-12-0	1,1,2,2-Tetrachloro-1,2-difluoroethane	203.8	93	1.37307	0.17625	-0.01465	15.21	13.21	86.85	2	80	5	2	80	5
186	76-13-1	1,2,2-Trichloro-1,1,2-trifluoroethane (Freon 113)	187.4	47.6	1.27368	0.18656	-0.01231	11.88	10.88	91.58	1	50	2	1	50	2
187	76-14-2	1,2-Dichloro-1,1,2,2-tetrafluoroethane	170.9	3.8							0	0	1	0	0	1
188	76-15-3	Chloropentafluoroethane	154.5	-39.1	0.08264	0.34756	-0.01343	0.53	0.53	100.00	0	0	1	0	0	1
189	76-44-8	Heptachlor	373.4	135							5	90	10	5	90	10
190	78-83-1	2-Methylpropyl alcohol (Isobutyl alcohol)	74.1	107.9	0.84818	0.33155	-0.03559	3.03	1.03	33.93	2	80	5	2	80	5
191	78-87-5	1,2-Dichloropropane	113.0	96.8	0.98872	0.287	-0.02571	4.74	3.74	78.91	1	50	2	1	50	2
192	78-92-2	1-Methylpropyl alcohol (2-Butanol)	74.1	99.5	0.76814	0.34611	-0.03478	2.44	1.44	59.00	1	50	2	1	50	2
193	78-93-3	Methyl ethyl ketone (MEK, 2-Butanone)	72.1	79.6	0.46525	0.37688	-0.02801	1.15	0.15	12.98	1	50	2	1	50	2
194	79-00-5	1,1,2-Trichloroethane	133.4	113.8	1.17163	0.27791	-0.02746	7.35	5.35	72.79	2	80	5	2	80	5
195	79-01-6	Trichloroethylene	131.4	86.7	1.02411	0.29929	-0.02539	5.01	4.01	80.02	1	50	2	1	50	2
196	79-09-4	Propionic acid	74.1	140.7	0.77846	0.4457	-0.05209	1.91	(0.09)	(4.80)	2	80	5	1	50	2
197	79-10-7	2-Propenoic acid	72.1	141.6	0.75549	0.47108	-0.05615	1.69	(0.31)	(18.24)	2	80	5	1	50	2
198	79-20-9	Methyl acetate	74.1	56.9	0.13314	0.42849	-0.02188	0.48	(0.52)	(107.60)	1	50	2	0	0	1
199	79-34-5	1,1,2,2-Tetrachloroethane	167.9	146.3	1.52322	0.17848	-0.02019	21.11	16.11	76.32	5	90	10	5	90	10
200	8001-35-2	Toxaphene	414.0	ecomposes							40	98	50	40	98	50
201	82-68-8	Pentachloronitrobenzene (PCBN)	295.4	328							40	98	50	40	98	50
202	83-32-9	Acenaphthene	154.2	279							40	98	50	40	98	50
203	84-66-2	Diethyl phthalate	222.2	298							40	98	50	40	98	50
204	84-74-2	Dibutyl phthalate	278.3	340							40	98	50	40	98	50

no of compo und	CAS	Compound Name (COPC)	MW	Boiling pt.	Yaws capacity correlation carbon loading quadratic constants			assumed outlet equilibrium of isotherm-PPMV (y)	difference with BP and MW estimation	% error with Yaws prediction	estimated by BP and MW as per A. Shepherd (Shepherd 2001)			estimated by BP and MW with conservativatism for mixing and values no higher than predicted by Yaws (Yaws 1995)		
								0.10			Estimated Carbon Capacity	Predicted RE	DF	Estimated Carbon Capacity	Predicted RE	DF
			g/mol	deg C	A	B	C	g ads/100 g carbon			g/100 g C	%	mass in / mass out	g/100 g C	%	mass in / mass out
205	85-01-8	Phenanthrene	178.2	340							40	98	50	40	98	50
206	85-68-7	Butylbenzyl phthalate	312.4	370							40	98	50	40	98	50
207	86-73-7	Fluorene	166.2	295							40	98	50	40	98	50
208	87-68-3	Hexachlorobutadiene	260.8	210							40	98	50	40	98	50
209	87-86-5	Pentachlorophenol	266.3	310							40	98	50	40	98	50
210	88-06-2	2,4,6-Trichlorophenol	197.5	244.5							40	98	50	40	98	50
211	88-72-2	2-Nitrotoluene	137.1	221							10	95	20	10	95	20
212	88-75-5	2-Nitrophenol	139.1	214.6							10	95	20	10	95	20
213	88-85-7	2-sec-Butyl-4,6-dinitrophenol (Dinoseb)	240.2	>300							40	98	50	40	98	50
214	88-89-1	Picric acid	229.1	>300							40	98	50	40	98	50
215	91-20-3	Naphthalene	128.2	218							10	95	20	10	95	20
216	91-22-5	Quinoline	129.2	238							10	95	20	10	95	20
217	91-58-7	2-Chloronapthalene	162.6	256							40	98	50	40	98	50
218	92-52-4	1,1`-Biphenyl	154.2	255							40	98	50	40	98	50
219	92-93-3	4-Nitrobiphenyl	199.2	340							40	98	50	40	98	50
220	93-72-1	Silvex (2,4,5-TP)	269.5	200							20	98	50	20	98	50
221	93-76-5	2,4,5-T	255.5	ecomposes							40	98	50	40	98	50
222	94-75-7	2,4-D and esters (160C typed)	221.0	160							20	98	50	20	98	50
223	95-13-6	Indene	116.2	181.6							10	95	20	10	95	20
224	95-47-6	o-Xylene	106.2	144							2	80	5	2	80	5
225	95-48-7	o-Cresol (2-Methylphenol)	108.1	191							10	95	20	10	95	20
226	95-49-8	2-Chlorotoluene	126.6	159							10	95	20	10	95	20
227	95-50-1	o-Dichlorobenzene (1,2-Dichlorobenzene)	147.0	180.5							10	95	20	10	95	20
228	95-57-8	2-Chlorophenol	128.6	175.6							10	95	20	10	95	20
229	95-95-4	2,4,5-Trichlorophenol	197.5	253							40	98	50	40	98	50
230	96-18-4	1,2,3-Trichloropropane	147.4	156	1.47241	0.18136	-0.02165	18.60	8.60	46.22	10	95	20	10	95	20
231	96-22-0	3-Pentanone	86.1	101							2	80	5	2	80	5
232	96-69-5	Bis(3-tert-butyl-4-hydroxy-6-methyl-phenyl)sulfide	358.5	316							40	98	50	40	98	50
233	98-51-1	p-tert-Butyltoluene	148.3	193							10	95	20	10	95	20
234	98-82-8	Cumene	120.2	151							10	95	20	10	95	20
235	98-83-9	alpha-Methylstyrene	118.2	165.4							10	95	20	10	95	20
236	98-86-2	Acetophenone	120.5	201.7							10	95	20	10	95	20
237	98-95-3	Nitrobenzene	123.1	210.8							10	95	20	10	95	20

no of compound	CAS	Compound Name (COPC)	MW	Boiling pt.	carbon loading estimate constants			assumed outlet equilibrium of isotherm PPMV (y)	difference with BP and MW estimation	% error with Yaws prediction	estimated by BP and MW as per A. Shepherd (Shepherd 2001)			estimated by BP and MW with conservativatism for mixing and values no higher than predicted by Yaws (Yaws 1995)		
								0.100			Estimated Carbon Capacity	Predicted RE	DF	Estimated Carbon Capacity	Predicted RE	DF
					A	B	C	g ads/100 g carbon			g/100 g C	%	mass in / mass out	g/100 g C	%	mass in / mass out
1	541-05-9	Cyclotrisiloxane, hexamethyl-	222.5	134							5	90	10	5	90	10
2	556-67-2	Cyclotetrasiloxane, octamethyl-	296.6	175							20	98	50	20	98	50
3	USI000-06	tetramethylcyclotrisiloxane	194.0	135							5	90	10	5	90	10
4	3622-84-2	Benzenesulfonamide, N-butyl-	213.3	314							40	98	50	40	98	50
5	5145-07-1	2(3H)-Furanone, dihydro-3,5-dimethyl-	114.1	206							10	95	20	10	95	20
6	108-47-4	Pyridine, 2,4-dimethyl-	107.2	159							10	95	20	10	95	20
7	109-99-9	Furan, tetrahydro-	72.1	66	0.29856	0.35648	-0.0155	0.844	(0.156)	-18.42	1	50	2	0.5	20	1.25
8	110-00-9	Furan	68.1	31.4	0.04084	0.40613	-0.0162	0.415	(0.085)	-20.35	0.5	20	1.25	0	0	1
9	110-86-1	Pyridine	79.1	115.2							2	80	5	2	80	5
10	1708-29-8	Furan, 2,5-dihydro-	70.1	67	0.3399	0.40041	-0.02451	0.822	(0.178)	-21.62	1	50	2	0.5	20	1.25
11	24405-16-	2H-Pyran-2-one, tetrahydro-5,6-dimethyl-, trans-	128.2	180							10	95	20	10	95	20
12	289-95-2	Pyrimidine	80.1	123							2	80	5	2	80	5
13	290-37-9	Pyrazine	80.1	115							2	80	5	2	80	5
14	534-22-5	Furan, 2-methyl-	82.1	63							1	50	2	1	50	2
15	930-22-3	Oxirane, ethenyl-	70.1	67							1	50	2	1	50	2
16	96-48-0	2(3H)-Furanone, dihydro- (gamma butyrolactone)	86.1	205	1.29434	0.29719	-0.04658	8.924	(1.076)	-12.05	10	95	20	5	90	10
17	3457-90-7	1,3-Propanediol, dinitrate	166.1	100							2	80	5	2	80	5
18	3457-91-8	1,4-Butanediol, dinitrate	180.1	130							5	90	10	5	90	10
19	544-16-1	Nitrous acid, butyl ester	103.1	78							1	50	2	1	50	2
20	624-91-9	Nitrous acid, methyl ester	61.0	64.6							1	50	2	1	50	2
21	625-58-1	Nitric acid, ethyl ester	91.1	88							1	50	2	1	50	2
22	627-05-4	Butane, 1-nitro-	103.1	153							10	95	20	10	95	20
23	627-13-4	Nitric acid, propyl ester	105.1	110							2	80	5	2	80	5
24	62-75-9M	Methanamine, N-methyl-N-nitroso- and others	74.1	153							10	95	20	10	95	20
25	928-45-0	Nitric acid, butyl ester	119.1	136							2	80	5	2	80	5
26	123-75-1	Pyrrolidine	71.1	87	0.60693	0.36363	-0.03004	1.634	0.634	38.80	1	50	2	1	50	2
27	22431-09-(	Methanamine, N-(1-methylbutylidene)-	99.2	130							2	80	5	2	80	5
28	616-45-5	2-Pyrrolidinone	85.1	245							10	95	20	10	95	20
29	75-50-3	Methanamine, N,N-dimethyl-	59.1	2.9	-0.09422	0.32583	-0.00337	0.377	0.377	100.00	0	0	1	0	0	1
30	107-12-0	Propanenitrile	55.1	97	0.05925	0.51747	-0.03781	0.319	(0.681)	-213.35	1	50	2	0	0	1
31	109-74-0	Butanenitrile	69.1	118	0.64311	0.38787	-0.03822	1.648	(0.352)	-21.34	2	80	5	1	50	2
32	110-59-8	Pentanenitrile	83.1	139							2	80	5	2	80	5
33	124-12-9	Octanenitrile	125.2	199							10	95	20	10	95	20
34	2243-27-8	Nonanenitrile	139.2	224							10	95	20	10	95	20
35	628-73-9	Hexanenitrile	97.2	162							10	95	20	10	95	20
36	629-08-3	Heptanenitrile	111.2	180							10	95	20	10	95	20
37	75-05-8	Acetonitrile	41.1	81	-0.79666	0.63512	-0.02598	0.035	(0.965)	-2769.19	1	50	2	0	0	1
38	109-21-7	Butanoic acid, butyl ester	144.2	166							10	95	20	10	95	20
39	110-27-0	Tetradecanoic acid, 1-methylethyl ester	270.5	300							40	98	50	40	98	50
40	123-25-1	Butanedioic acid, diethyl ester	174.2	217							40	98	50	40	98	50
41	123-86-4	Acetic acid, butyl ester	116.2	126							2	80	5	2	80	5
42	126-73-8	Phosphoric acid tributyl ester	266.3	289							40	98	50	40	98	50
43	141-78-6	Acetic acid ethyl ester	88.1	77.1	0.63612	0.34441	-0.02691	1.840	0.840	45.65	1	50	2	1	50	2
44	1838-59-1	Formic acid, 2-propenyl ester	86.1	83							1	50	2	1	50	2
45	590-01-2	Propanoic acid, butyl ester	130.2	145							2	80	5	2	80	5
46	591-87-7	Acetic acid, 2-propenyl ester	100.1	103							2	80	5	2	80	5
47	592-84-7	Formic acid, butyl ester	102.1	107							2	80	5	2	80	5
48	84-66-2	1,2-Benzenedicarboxylic acid, diethyl ester	222.2	298							40	98	50	40	98	50
49	1002-84-2	Pentadecanoic acid	242.4	339							40	98	50	40	98	50

no of compound	CAS	Compound Name (COPC)	MW	Boiling pt.	carbon loading estimate constants			assumed outlet equilibrium of isotherm PPMV (y)	difference with BP and MW estimation	% error with Yaws prediction	estimated by BP and MW as per A. Shepherd (Shepherd 2001)			estimated by BP and MW with conservativatism for mixing and values no higher than predicted by Yaws (Yaws 1995)		
								0.100			Estimated Carbon Capacity	Predicted RE	DF	Estimated Carbon Capacity	Predicted RE	DF
					A	B	C	g ads/100 g carbon			g/100 g C	%	mass in / mass out	g/100 g C	%	mass in / mass out
50	107-92-6	Butanoic acid	88.1	163.5	1.22589	0.26481	-0.03737	8.389	(1.611)	-19.20	10	95	20	5	90	10
51	2091-29-4	9-Hexadecenoic acid	254.4	350							40	98	50	40	98	50
52	544-63-8	Tetradecanoic acid	228.4	326							40	98	50	40	98	50
53	57-10-3	Hexadecanoic acid	256.4	399							40	98	50	40	98	50
54	64-19-7	Acetic acid	60.1	118	-0.05553	0.6841	-0.06071	0.158	(1.842)	-1162.90	2	80	5	0	0	1
55	105-42-0	2-Hexanone, 4-methyl-	114.2	140							2	80	5	2	80	5
56	106-35-4	3-Heptanone	114.2	147							2	80	5	2	80	5
57	106-68-3	3-Octanone	128.2	166							10	95	20	10	95	20
58	107-87-9	2-Pentanone	86.1	102							2	80	5	2	80	5
59	108-10-1	2-Pentanone, 4-methyl- (MIBK)	100.2	117.4							2	80	5	2	80	5
60	110-43-0	2-Heptanone	114.2	150							2	80	5	2	80	5
61	111-13-7	2-Octanone	128.2	173							10	95	20	10	95	20
62	112-12-9	2-Undecanone	170.3	229							40	98	50	40	98	50
63	123-19-3	4-Heptanone	114.2	144							2	80	5	2	80	5
64	1534-26-5	3-Tridecanone	198.4	263							40	98	50	40	98	50
65	1534-27-6	3-Dodecanone	184.3	250							40	98	50	40	98	50
66	15932-80-(	Cyclohexanone, 5-methyl-2-(1-methylethylidene)-	152.2	224							40	98	50	40	98	50
67	22026-12-(	6-Tridecanone	198.4	263							40	98	50	40	98	50
68	2216-87-7	3-Undecanone	170.3	227							40	98	50	40	98	50
69	50639-02-(	5-Undecanone, 2-methyl-	184.3	210							40	98	50	40	98	50
70	563-80-4	2-Butanone, 3-methyl-	86.1	94							1	50	2	1	50	2
71	589-38-8	3-Hexanone	100.2	123							2	80	5	2	80	5
72	589-63-9	4-Octanone	128.2	166							10	95	20	10	95	20
73	591-78-6	2-Hexanone	100.2	127							2	80	5	2	80	5
74	593-08-8	2-Tridecanone	198.4	255							40	98	50	40	98	50
75	629-23-2	3-Tetradecanone	212.4	263							40	98	50	40	98	50
76	67-64-1	2-Propanone	58.1	56	-0.14546	0.47497	-0.02286	0.227	(0.773)	-339.84	1	50	2	0	0	1
77	763-93-9	3-Hexen-2-one	98.1	140							2	80	5	2	80	5
78	78-93-3	2-Butanone	72.1	80	0.46525	0.37688	-0.02801	1.149	0.149	12.98	1	50	2	1	50	2
79	78-94-4	3-Buten-2-one	70.1	82							1	50	2	1	50	2
80	821-55-6	2-Nonanone	142.2	195							10	95	20	10	95	20
81	89-82-7	Cyclohexanone, 5-methyl-2-(1-methylethylidene)	152.2	224							40	98	50	40	98	50
82	925-78-0	3-Nonanone	142.2	188							10	95	20	10	95	20
83	928-68-7	2-Heptanone, 6-methyl-	128.2	165							10	95	20	10	95	20
84	98-86-2	Ethanone, 1-phenyl-	120.2	201.7							10	95	20	10	95	20
85	110-62-3	Pentanal	86.1	103							2	80	5	2	80	5
86	111-71-7	Heptanal	114.2	153							10	95	20	10	95	20
87	123-38-6	Propanal	58.1	49	0.05519	0.49738	-0.04331	0.327	(0.173)	-52.92	0.5	20	1.25	0	0	1
88	123-72-8	Butanal	72.1	76	0.45056	0.37372	-0.02689	1.122	0.122	10.86	1	50	2	1	50	2
89	124-13-0	Octanal	128.2	171							10	95	20	10	95	20
90	124-19-6	Nonanal	142.2	93							1	50	2	1	50	2
91	19269-28-(	Hexanal, 3-methyl-	114.2	143							2	80	5	2	80	5
92	66-25-1	Hexanal	100.2	131							2	80	5	2	80	5
93	75-07-0	Acetaldehyde	44.1	20.1	-1.17047	0.62766	-0.02475	0.015	0.015	100.00	0	0	1	0	0	1
94	104-76-7	1-Hexanol, 2-ethyl-	130.2	183							10	95	20	10	95	20
95	111-70-6	1-Heptanol	116.2	176							10	95	20	10	95	20
96	112-92-5	1-Octadecanol	270.5	336							40	98	50	40	98	50
97	14898-79-(	2-Butanol	74.1	100	0.76814	0.34611	-0.03478	2.439	1.439	59.00	1	50	2	1	50	2
98	2136-70-1	Ethanol, 2-(tetradecyloxy)-	258.4	253							40	98	50	40	98	50

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								0.100			Estimated Carbon Capacity	Predicted RE	DF	Estimated Carbon Capacity	Predicted RE	DF
					A	B	C	g ads/100 g carbon			g/100 g C	%	mass in / mass out	g/100 g C	%	mass in / mass out
99	36653-82-4	1-Hexadecanol	242.4	344							40	98	50	40	98	50
100	51411-24-0	6,10-Dodecadien-1-ol, 3,7,11-trimethyl-	224.4	216							40	98	50	40	98	50
101	57-55-6	1,2-Propanediol	76.1	187.6							10	95	20	10	95	20
102	598-32-3	3-Buten-2-ol	72.1	96							1	50	2	1	50	2
103	6032-29-7	2-Pentanol	88.2	118							2	80	5	2	80	5
104	627-27-0	3-Buten-1-ol	72.1	113							2	80	5	2	80	5
105	64-17-5	Ethanol	46.1	78.3	-0.51153	0.67525	-0.04473	0.059	(0.941)	-1604.16	1	50	2	0	0	1
106	67-56-1	Methanol	32.0	64.6	-1.96739	0.82107	-0.01393	0.002	(0.998)	-63343.92	1	50	2	0	0	1
107	67-63-0	2-Propanol	60.1	82.4	0.27183	0.46419	-0.03682	0.590	(0.410)	-69.50	1	50	2	0.5	20	1.25
108	71-23-8	1-Propanol	60.1	97.2	0.38644	0.48033	-0.04505	0.726	(0.274)	-37.70	1	50	2	0.5	20	1.25
109	75-65-0	2-Propanol, 2-methyl-	74.1	82.2							1	50	2	1	50	2
110	75-84-3	1-Propanol, 2,2-dimethyl-	88.2	113							2	80	5	2	80	5
111	75-85-4	2-Butanol, 2-methyl-	88.2	102							2	80	5	2	80	5
112	78-92-2	2-Butanol	74.1	99.5	0.76814	0.34611	-0.03478	2.439	1.439	59.00	1	50	2	1	50	2
113	87-68-3	1,3-Butadiene, 1,1,2,3,4,4-hexachloro-	260.8	210							40	98	50	40	98	50
114	96-41-3	Cyclopentanol	86.1	139							2	80	5	2	80	5
115	1184-60-7	1-Propene, 2-fluoro-	60.1	-24							0	0	1	0	0	1
116	127-18-4	Ethene, tetrachloro-	165.8	121.1	1.40596	0.20802	-0.02097	15.030	10.030	66.73	5	90	10	5	90	10
117	156-59-2	Ethene, 1,2-dichloro-, (Z)-	96.9	60	0.47567	0.39061	-0.02554	1.147	0.147	12.81	1	50	2	1	50	2
118	1717-00-6	Ethane, 1,1-dichloro-1-fluoro- (freon 14b)	117.0	32							0.5	20	1.25	0.5	20	1.25
119	56-23-5	Methane, tetrachloro-	153.8	76.7	1.07481	0.28186	-0.02273	5.891	3.891	66.05	2	80	5	2	80	5
120	74-87-3	Methane, chloro- (R-40)	50.5	-24.2	-1.91871	0.62053	-0.00549	0.003	0.003	100.00	0	0	1	0	0	1
121	75-02-5	Ethene, fluoro-	46.0	-72							0	0	1	0	0	1
122	75-09-2	Methane, dichloro-	84.9	39.8	-0.07043	0.4921	-0.02276	0.260	(0.240)	-92.42	0.5	20	1.25	0	0	1
123	75-45-6	Methane, chlorodifluoro- (R-22)	86.5	-40.8							0	0	1	0	0	1
124	75-68-3	Ethane, 1-chloro-1,1-difluoro- (R-142)	100.5	-10							0	0	1	0	0	1
125	75-69-4	Methane, trichlorofluoro- (R-11)	137.4	23.7	0.17307	0.40715	-0.01915	0.558	0.558	100.00	0	0	1	0	0	1
126	6031-02-3	Benzene, (1-methylpentyl)-	162.3	208							40	98	50	40	98	50
127	100-41-4	Benzene, ethyl-	106.2	136.2							2	80	5	2	80	5
128	100-42-5	Benzene, ethenyl-	104.2	145.2							2	80	5	2	80	5
129	106-42-3	Benzene, 1,4-dimethyl-	106.2	138							2	80	5	2	80	5
130	108-38-3	Benzene, 1,3-dimethyl-	106.2	139.1							2	80	5	2	80	5
131	108-88-3	Benzene, methyl-	92.1	110.6							2	80	5	2	80	5
132	3290-53-7	Benzene, (2-methyl-2-propenyl)-	132.2	183							10	95	20	10	95	20
133	538-68-1	Benzene, pentyl-	148.3	205							10	95	20	10	95	20
134	637-50-3	Benzene, 1-propenyl-	118.2	175.5							10	95	20	10	95	20
135	643-58-3	1,1`-Biphenyl, 2-methyl-	168.2	255							40	98	50	40	98	50
136	71-43-2	Benzene	78.1	80.1							1	50	2	1	50	2
137	92-52-4	1,1`-Biphenyl	154.2	255							40	98	50	40	98	50
138	95-47-6	Benzene, 1,2-dimethyl-	106.2	144							2	80	5	2	80	5
139	74-99-7	1-Propyne	40.1	-23	-2.52865	1.74715	-0.21635	0.000	0.000	100.00	0	0	1	0	0	1
140	20184-91-1	4-Nonyne	124.2	154							10	95	20	10	95	20
141	61142-40-1	4-Undecene, 4-methyl-	168.3	193							20	98	50	20	98	50
142	629-73-2	1-Hexadecene	224.4	274							40	98	50	40	98	50
143	74630-39-0	1-Undecene, 4-methyl-	168.3	193							20	98	50	20	98	50
144	74630-48-7	3-Undecene, 2-methyl-, (Z)-	168.3	193							20	98	50	20	98	50
145	764-96-5	5-Undecene, (Z)-	154.3	192.3							20	98	50	20	98	50
146	821-74-9	4,5-Nonadiene	124.2	142.5							2	80	5	2	80	5
147	1008-80-6	Naphthalene, decahydro-2,3-dimethyl-	166.3	187							20	98	50	20	98	50

no of compound	CAS	Compound Name (COPC)	MW	Boiling pt.	carbon loading estimate constants			assumed outlet equilibrium of isotherm PPMV (y)	difference with BP and MW estimation	% error with Yaws prediction	estimated by BP and MW as per A. Shepherd (Shepherd 2001)			estimated by BP and MW with conservativatism for mixing and values no higher than predicted by Yaws (Yaws 1995)		
					A	B	C	0.100 g ads/100 g carbon			Estimated Carbon Capacity g/100 g C	Predicted RE %	DF mass in / mass out	Estimated Carbon Capacity g/100 g C	Predicted RE %	DF mass in / mass out
148	108-87-2	Cyclohexane, methyl-	98.2	101							2	80	5	2	80	5
149	110-82-7	Cyclohexane	84.2	80.7							1	50	2	1	50	2
150	1472-09-9	Cyclopropane, octyl-	154.3	150.8							20	98	50	20	98	50
151	1618-22-0	Naphthalene, decahydro-2,6-dimethyl-	166.3	187							20	98	50	20	98	50
152	1630-94-0	Cyclopropane, 1,1-dimethyl-	70.1	21							0	0	1	0	0	1
153	1678-93-9	Cyclohexane, butyl-	140.3	181							10	95	20	10	95	20
154	2415-72-7	Cyclopropane, propyl-	84.2	69							1	50	2	1	50	2
155	287-92-3	Cyclopentane	70.1	49.3							0.5	20	1.25	0.5	20	1.25
156	2883-05-8	Octane, 2-cyclohexyl-	196.4	181							20	98	50	20	98	50
157	294-62-2	Cyclododecane	168.3	239							40	98	50	40	98	50
158	2958-76-1	Naphthalene, decahydro-2-methyl-	152.3	201							40	98	50	40	98	50
159	3073-66-3	Cyclohexane, 1,1,3-trimethyl-	126.2	136.6							2	80	5	2	80	5
160	32281-85-9	Cyclopentane, 1,3-dimethyl-2-(1-methylethyl)-	140.3	92							1	50	2	1	50	2
161	3604-14-6	Naphthalene, decahydro-1,2-dimethyl-	166.3	187							20	98	50	20	98	50
162	41977-33-7	Cyclopropane, 1-pentyl-2-propyl-	154.3	151							20	98	50	20	98	50
163	4292-92-6	Cyclohexane, pentyl-	154.3	203.7							40	98	50	40	98	50
164	4806-61-5	Cyclobutane, ethyl-	84.2	71							1	50	2	1	50	2
165	493-02-7	Naphthalene, decahydro-, trans-	138.3	187.3							10	95	20	10	95	20
166	54676-39-0	Cyclohexane, 2-butyl-1,1,3-trimethyl-	182.4	203.7							40	98	50	40	98	50
167	55937-92-3	Bicyclo[4.1.0]heptane, 2-methyl-7-pentyl-	180.3	203.7							40	98	50	40	98	50
168	594-11-6	Cyclopropane, methyl-	56.1	0.7							0	0	1	0	0	1
169	598-61-8	Cyclobutane, methyl-	70.1	36.3							0.5	20	1.25	0.5	20	1.25
170	61142-20-9	Cyclohexane, (4-methylpentyl)-	168.3	203.7							40	98	50	40	98	50
171	7058-01-7	Cyclohexane, (1-methylpropyl)-	140.3	179.3							10	95	20	10	95	20
172	7094-26-0	Cyclohexane, 1,1,2-trimethyl-	126.2	145.2							2	80	5	2	80	5
173	822-50-4	Cyclopentane, 1,2-dimethyl-, trans-	98.2	92							1	50	2	1	50	2
174	1002-43-3	Undecane, 3-methyl-	170.3	195							20	98	50	20	98	50
175	106-97-8	Butane	58.1	-0.45	0.03071	0.34304	-0.01596	0.470	0.470	100.00	0	0	1	0	0	1
176	107-83-5	Pentane, 2-methyl-	86.2	62							1	50	2	1	50	2
177	108-08-7	Pentane, 2,4-dimethyl-	100.2	81							1	50	2	1	50	2
178	109-66-0	Pentane	72.2	36.1							0.5	20	1.25	0.5	20	1.25
179	110-54-3	Hexane	86.2	69							1	50	2	1	50	2
180	111-65-9	Octane	114.2	126							2	80	5	2	80	5
181	111-84-2	Nonane	128.3	150.8							10	95	20	10	95	20
182	1120-21-4	Undecane	156.3	195.6							20	98	50	20	98	50
183	112-40-3	Dodecane	170.3	216.3							40	98	50	40	98	50
184	124-18-5	Decane	142.3	174.1							10	95	20	10	95	20
185	13151-34-3	Decane, 3-methyl-	156.3	190							20	98	50	20	98	50
186	13151-35-4	Decane, 5-methyl-	156.3	190							20	98	50	20	98	50
187	13286-73-3	Tridecane, 3-ethyl-	212.4	252							40	98	50	40	98	50
188	13287-21-3	Tridecane, 6-methyl-	198.4	235							40	98	50	40	98	50
189	142-82-5	Heptane	100.2	98.4							1	50	2	1	50	2
190	14720-74-2	Heptane, 2,2,4-trimethyl-	142.3	148							2	80	5	2	80	5
191	1560-96-9	Tridecane, 2-methyl-	198.4	248							40	98	50	40	98	50
192	1632-70-8	Undecane, 5-methyl-	170.3	195							20	98	50	20	98	50
193	17301-23-4	Undecane, 2,6-dimethyl-	184.4	195							20	98	50	20	98	50
194	17301-25-6	Undecane, 2,8-dimethyl-	184.4	195							20	98	50	20	98	50
195	17301-27-8	Undecane, 2,10-dimethyl-	184.4	195							20	98	50	20	98	50
196	17301-29-0	Undecane, 3,7-dimethyl-	184.4	195							20	98	50	20	98	50

no of compound	CAS	Compound Name (COPC)	MW	Boiling pt.	carbon loading estimate constants			assumed outlet equilibrium of isotherm PPMV (y)	difference with BP and MW estimation	% error with Yaws prediction	estimated by BP and MW as per A. Shepherd (Shepherd 2001)			estimated by BP and MW with conservativatism for mixing and values no higher than predicted by Yaws (Yaws 1995)		
					A	B	C	0.100 g ads/100 g carbon			Estimated Carbon Capacity g/100 g C	Predicted RE %	DF mass in / mass out	Estimated Carbon Capacity g/100 g C	Predicted RE %	DF mass in / mass out
197	17301-30-3	Undecane, 3,8-dimethyl-	184.4	195							20	98	50	20	98	50
198	17301-32-8	Undecane, 4,7-dimethyl-	184.4	195							20	98	50	20	98	50
199	17301-94-9	Nonane, 4-methyl-	142.3	165.7							10	95	20	10	95	20
200	17302-28-2	Nonane, 2,6-dimethyl-	156.3	165							20	98	50	20	98	50
201	17302-32-6	Nonane, 3,7-dimethyl-	156.3	165							20	98	50	20	98	50
202	17312-50-4	Decane, 2,5-dimethyl-	170.3	195							20	98	50	20	98	50
203	17312-57-	Dodecane, 3-methyl-	184.4	216							40	98	50	40	98	50
204	17312-60-0	Undecane, 6-ethyl-	184.4	216							40	98	50	40	98	50
205	17312-73-	Undecane, 5,5-dimethyl-	184.4	216							40	98	50	40	98	50
206	17312-76-4	Undecane, 6,6-dimethyl-	184.4	216							40	98	50	40	98	50
207	17312-77-5	Undecane, 2,3-dimethyl-	184.4	216							40	98	50	40	98	50
208	17312-80-0	Undecane, 2,4-dimethyl-	184.4	216							40	98	50	40	98	50
209	17312-82-2	Undecane, 4,6-dimethyl-	184.4	216							40	98	50	40	98	50
210	17453-94-0	Undecane, 5-ethyl-	184.4	216							40	98	50	40	98	50
211	20278-85-7	Heptane, 2,3,5-trimethyl-	142.3	160.7							10	95	20	10	95	20
212	2213-23-2	Heptane, 2,4-dimethyl-	128.3	133							2	80	5	2	80	5
213	2216-33-3	Octane, 3-methyl-	128.3	144							2	80	5	2	80	5
214	2216-34-4	Octane, 4-methyl-	128.3	142							2	80	5	2	80	5
215	25117-24-2	Tetradecane, 4-methyl-	212.4	253.7							40	98	50	40	98	50
216	25117-31-	Tridecane, 5-methyl-	198.4	235							40	98	50	40	98	50
217	26730-12-	Tridecane, 4-methyl-	198.4	235							40	98	50	40	98	50
218	26730-14-3	Tridecane, 7-methyl-	198.4	235							40	98	50	40	98	50
219	2847-72-5	Decane, 4-methyl-	156.3	187							20	98	50	20	98	50
220	2980-69-0	Undecane, 4-methyl-	170.3	210							40	98	50	40	98	50
221	31295-56-4	Dodecane, 2,6,11-trimethyl-	212.4	252							40	98	50	40	98	50
222	3891-98-3	Dodecane, 2,6,10-trimethyl-	212.4	252							40	98	50	40	98	50
223	4032-93-3	Heptane, 2,3,6-trimethyl-	142.3	156							10	95	20	10	95	20
224	52896-90-9	Heptane, 3-ethyl-5-methyl-	142.3	158.2							10	95	20	10	95	20
225	544-76-3	Hexadecane	226.4	287							40	98	50	40	98	50
226	55030-62-	Tridecane, 4,8-dimethyl-	212.4	253.7							40	98	50	40	98	50
227	55045-07-3	Dodecane, 2-methyl-8-propyl-	226.4	253.7							40	98	50	40	98	50
228	55045-11-9	Tridecane, 5-propyl-	226.4	253.7							40	98	50	40	98	50
229	562-49-2	Pentane, 3,3-dimethyl-	100.2	90							1	50	2	1	50	2
230	56292-65-0	Dodecane, 2,5-dimethyl-	198.4	235							40	98	50	40	98	50
231	565-59-3	Pentane, 2,3-dimethyl-	100.2	90							1	50	2	1	50	2
232	589-34-4	Hexane, 3-methyl-	100.2	92							1	50	2	1	50	2
233	589-43-5	Hexane, 2,4-dimethyl-	114.2	109							2	80	5	2	80	5
234	589-53-7	Heptane, 4-methyl-	114.2	118							2	80	5	2	80	5
235	589-81-1	Heptane, 3-methyl-	114.2	119							2	80	5	2	80	5
236	591-76-4	Hexane, 2-methyl-	100.2	90							1	50	2	1	50	2
237	592-27-8	Heptane, 2-methyl-	114.2	118							2	80	5	2	80	5
238	61141-72-4	Dodecane, 4,6-dimethyl-	198.4	235							40	98	50	40	98	50
239	6117-97-1	Dodecane, 4-methyl-	184.4	216							40	98	50	40	98	50
240	617-78-7	3-Ethylpentane	100.2	93							1	50	2	1	50	2
241	62016-30-2	Octane, 2,3,3-trimethyl-	156.3	174							20	98	50	20	98	50
242	62016-34-6	Octane, 2,3,7-trimethyl-	156.3	174							20	98	50	20	98	50
243	62108-21-8	Decane, 6-ethyl-2-methyl-	184.4	216							40	98	50	40	98	50
244	62108-25-2	Decane, 2,6,7-trimethyl-	184.4	216							40	98	50	40	98	50
245	62108-27-4	Decane, 2,4,6-trimethyl-	184.4	216							40	98	50	40	98	50

no of compound	CAS	Compound Name (COPC)	MW	Boiling pt.	carbon loading estimate constants			assumed outlet equilibrium of isotherm PPMV (y)	difference with BP and MW estimation	% error with Yaws prediction	estimated by BP and MW as per A. Shepherd (Shepherd 2001)			estimated by BP and MW with conservativatism for mixing and values no higher than predicted by Yaws (Yaws 1995)		
								0.100			Estimated Carbon Capacity	Predicted RE	DF	Estimated Carbon Capacity	Predicted RE	DF
					A	B	C	g ads/100 g carbon			g/100 g C	%	mass in / mass out	g/100 g C	%	mass in / mass out
246	62238-13-9	Decane, 2,3,7-trimethyl-	184.4	216							40	98	50	40	98	50
247	629-50-5	Tridecane	184.4	235.4							40	98	50	40	98	50
248	629-59-4	Tetradecane	198.4	253.7							40	98	50	40	98	50
249	629-62-9	Pentadecane	212.4	270.6							40	98	50	40	98	50
250	629-78-7	Heptadecane	240.5	301.8							40	98	50	40	98	50
251	74-98-6	Propane	44.1	-42	-0.7946	0.49029	-0.02398	0.049	0.049	100.00	0	0	1	0	0	1
252	75-28-5	Propane, 2-methyl-	58.1	-11.7	-0.01676	0.33495	-0.01274	0.432	0.432	100.00	0	0	1	0	0	1
253	78-78-4	Butane, 2-methyl-	72.2	30							0.5	20	1.25	0.5	20	1.25
254	96-14-0	Pentane, 3-methyl-	86.2	64							1	50	2	1	50	2
255	565-75-3	Pentane, trimethyl-, isomer	114.3	113.5							2	80	5	2	80	5

Attachment 4 Tables of DF Analysis Results

Table 4-1 COPCs
Table 4-2 Compounds detected >0.1 ppmv

Table 4-1 COPCs

no of compound	CAS #	Compound	Oxidizer DF massflow in / massflow out	Adsorption DF massflow in / massflow out	reduced Adsorption DF massflow in / massflow out	Combined DF massflow in / massflow out
1	100-00-5	p-Nitrochlorobenzene	10000	50	5	50000
2	100-21-0	p-Phthalic acid	20	50	50	1000
3	100-25-4	1,4-Dinitrobenzene	10000	50	5	50000
4	100-41-4	Ethyl benzene	10000	5	1	10000
5	100-42-5	Styrene	10000	5	1	10000
6	10061-01-5	cis-1,3-Dichloropropene	100	5	1	100
7	10061-02-6	trans-1,3-Dichloropropene	50	5	1	50
8	101-55-3	4-Bromophenylphenyl ether	3.33	50	50	167
9	101-84-8	Diphenyl ether	50	50	5	250
10	106-35-4	3-Heptanone	10000	5	1	10000
11	106-42-3	p-Xylene (Dimethyl benzene)	1000	5	1	1000
12	106-46-7	1,4-Dichlorobenzene	50	20	2	100
13	106-88-7	1,2-Epoxybutane	10000	1.25	1	10000
14	106-93-4	Ethylene dibromide (Dibromoethane)	1	10	10	10
15	106-97-8	Butane (R-600)	10000	1	1	10000
16	106-99-0	1,3-Butadiene	10000	1	1	10000
17	107-02-8	Acrolein	10000	1	1	10000
18	107-05-1	3-Chloropropene (Allyl chloride)	10000	1.25	1	10000
19	107-06-2	1,2-Dichloroethane (Ethylene chloride) (freon 150)	10000	2	1	10000
20	107-12-0	Propionitrile	10000	1	1	10000
21	107-13-1	Acrylonitrile	10000	1	1	10000
22	107-18-6	2-Propene-1-ol	10000	1.25	1	10000
23	107-31-3	Formic acid, methyl ester	10000	1	1	10000
24	107-66-4	Dibutylphosphate	10000	5	1	10000
25	107-87-9	2-Pentanone	10000	5	1	10000
26	108-03-2	1-Nitropropane	10000	5	1	10000
27	108-05-4	Vinyl acetate	10000	2	1	10000
28	108-10-1	Hexone (4-Methyl-2-pentanone or MIBK)	10000	5	1	10000
29	108-20-3	Bis(isopropyl)ether	10000	2	1	10000
30	108-38-3	m-Xylene (Dimethyl benzene)	1000	5	1	1000
31	108-39-4	m-Cresol	1000	20	2	2000
32	108-87-2	Methylcyclohexane	10000	5	1	10000
33	108-88-3	Toluene	10000	5	1	10000
34	108-90-7	Chlorobenzene	20	5	5	100
35	108-93-0	Cyclohexanol	10000	20	2	20000
36	108-94-1	Cyclohexanone	10000	20	2	20000
37	108-95-2	Phenol	10	20	20	200
38	109-66-0	n-Pentane	10000	1.25	1	10000
39	109-99-9	Tetrahydrofuran	10000	1.25	1	10000
40	110-12-3	5-Methyl-2-hexanone	10000	5	1	10000
41	110-43-0	2-Heptanone	10000	5	1	10000
42	110-54-3	n-Hexane	10000	2	1	10000

Table 4-1 COPCs

no of compound	CAS #	Compound	Oxidizer DF massflow in / massflow out	Adsorption DF massflow in / massflow out	reduced Adsorption DF massflow in / massflow out	Combined DF massflow in / massflow out
43	110-62-3	n-Valeraldehyde	10000	5	1	10000
44	110-82-7	Cyclohexane	10000	2	1	10000
45	110-83-8	Cyclohexene	10000	2	1	10000
46	110-86-1	Pyridine	10000	5	1	10000
47	111-65-9	n-Octane	10000	5	1	10000
48	111-76-2	Ethylene glycol monobutyl ether	10000	20	2	20000
49	111-84-2	n-Nonane	10000	20	2	20000
50	117-81-7	Bis(2-ethylhexyl)phthalate (DEHP)	10000	50	5	50000
51	117-84-0	n-Dioctyl phthalate	10000	50	5	50000
52	118-74-1	Hexachlorobenzene	3.33	50	50	167
53	120-12-7	Anthracene	1000	50	5	5000
54	120-82-1	1,2,4-Trichlorobenzene	100	50	5	500
55	120-83-2	2,4-Dichlorophenol	3.33	50	50	167
56	121-44-8	Triethylamine	10000	2	1	10000
57	121-69-7	Dimethylaniline	10000	20	2	20000
58	122-39-4	N,N-Diphenylamine	50	50	5	250
59	123-19-3	4-Heptanone	10000	5	1	10000
60	123-38-6	n-Propionaldehyde	10000	1	1	10000
61	123-51-3	3-Methyl-1-butanol	10000	5	1	10000
62	123-86-4	Acetic acid n-butyl ester	10000	5	1	10000
63	123-91-1	1,4-Dioxane	10000	2	1	10000
64	126-73-8	Tributyl phosphate	10000	50	5	50000
65	126-98-7	2-Methyl-2-propenenitrile (Methacrylonitrile)	10000	2	1	10000
66	127-18-4	Perchloroethylene (tetrachloroethylene)	1	10	10	10
67	127-19-5	N,N-Dimethylacetamide	10000	10	1	10000
68	128-37-0	2,6-Bis(tert-butyl)-4-methylphenol	10000	50	5	50000
69	129-00-0	Pyrene	3.33	50	50	167
70	1321-64-8	Pentachloronaphthalene	3.33	50	50	167
71	1321-65-9	Trichloronaphthalene	3.33	50	50	167
72	132-64-9	Dibenzofuran	3.33	50	50	167
73	1335-87-1	Hexachloronaphthalene	3.33	50	50	167
74	1335-88-2	Tetrachloronaphthalene	3.33	50	50	167
75	1336-36-3	Polychlorinated biphenyls (PCBs)	3.33	50	50	167
76	141-78-6	Acetic acid ethyl ester (Ethyl acetate)	10000	2	1	10000
77	141-79-7	4-Methyl-3-penten-2-one	10000	5	1	10000
78	142-82-5	n-Heptane	10000	2	1	10000
79	144-62-7	Oxalic acid	10	20	20	200
80	156-60-5	trans-1,2-Dichloroethylene	10000	1.25	1	10000
81	1582-09-8	Trifluralin	10000	10	1	10000
82	1634-04-4	Methyl tert-butyl ether	10000	2	1	10000
83	1836-75-5	Nitrofen	3.33	50	50	167
84	189-55-9	Dibenzo[a,i]pyrene	3.33	50	50	167

Table 4-1 COPCs

no of compound	CAS #	Compound	Oxidizer DF massflow in / massflow out	Adsorption DF massflow in / massflow out	reduced Adsorption DF massflow in / massflow out	Combined DF massflow in / massflow out
85	189-64-0	Dibenzo[a,h]pyrene	3.33	50	50	167
86	191-24-2	Benzo(g,h,i)perylene	3.33	50	50	167
87	191-30-0	Benzo[a,i]pyrene	3.33	50	50	167
88	192-65-4	Dibenzo[a,e]pyrene	3.33	50	50	167
89	193-39-5	Indeno(1,2,3-cd)pyrene	3.33	50	50	167
90	205-82-3	Benzo(j)fluoranthene	3.33	50	50	167
91	205-99-2	Benzo(b)fluoranthene	3.33	50	50	167
92	206-44-0	Fluoranthene	3.33	50	50	167
93	207-08-9	Benzo(k)fluoranthene	3.33	50	50	167
94	208-96-8	Acenaphthylene	3.33	50	50	167
95	218-01-9	Chrysene	3.33	50	50	167
96	2234-13-1	Octachloronaphthalene	3.33	50	50	167
97	224-42-0	Dibenz[a,j]acridine	3.33	50	50	167
98	226-36-8	Dibenz[a,h]acridine	3.33	50	50	167
99	2385-85-5	Mirex	3.33	50	50	167
100	25551-13-7	Trimethyl benzene	1000	20	2	2000
101	26140-60-3	Terphenyls	3.33	50	50	167
102	27154-33-2	Trichlorofluoroethane	1	10	10	10
103	287-92-3	Cyclopentane	10000	1.25	1	10000
104	309-00-2	Aldrin	3.33	10	10	33
105	319-84-6	Hexachlorocyclohexane (Lindane) Alpha BHC	3.33	50	50	167
106	319-85-7	Hexachlorocyclohexane (Lindane) Beta BHC	3.33	50	50	167
107	319-86-8	Delta-BHC	3.33	50	50	167
108	3697-24-3	5-Methylchrysene	3.33	50	50	167
109	3825-26-1	Ammonium perfluorooctanoate	3.33	50	50	167
110	4170-30-3	2-Butenaldehyde (2-Butenal)	10000	2	1	10000
111	465-73-6	Isodrin	3.33	50	50	167
112	50-00-0	Formaldehyde	10000	1	1	10000
113	50-29-3	4,4-DDT	3.33	50	50	167
114	50-32-8	Benzo(a)pyrene	3.33	50	50	167
115	53-70-3	Dibenzo(a,h)anthracene	3.33	50	50	167
116	540-59-0	1,2-Dichloroethylene	10000	1.25	1	10000
117	540-84-1	2,2,4-Trimethylpentane	10000	2	1	10000
118	541-73-1	1,3-Dichlorobenzene	50	20	2	100
119	56-23-5	Carbon tetrachloride (R-10)	1	5	5	5
120	563-80-4	3-Methyl-2-butanone	10000	2	1	10000
121	56-49-5	3-Methylcholanthrene	3.33	50	50	167
122	56-55-3	Benzo(a)anthracene	3.33	50	50	167
123	57-14-7	1,1-Dimethylhydrazine	10000	2	1	10000
124	58-89-9	gamma-BHC (Lindane)	3.33	50	50	167
125	58-90-2	2,3,4,6-Tetrachlorophenol	3.33	10	10	33
126	591-78-6	2-Hexanone	1000	5	1	1000

Table 4-1 COPCs

no of compound	CAS #	Compound	Oxidizer DF massflow in / massflow out	Adsorption DF massflow in / massflow out	reduced Adsorption DF massflow in / massflow out	Combined DF massflow in / massflow out
127	59-50-7	4-Chloro-3-methylphenol	3.33	20	20	67
128	59-89-2	N-Nitrosomorpholine	10000	20	2	20000
129	602-87-9	5-Nitroacenaphthene	3.33	50	50	167
130	60-29-7	Ethyl ether	10000	1.25	1	10000
131	603-34-9	Triphenylamine	3.33	50	50	167
132	60-34-4	Methylhydrazine	10000	1	1	10000
133	60-35-5	Acetamide	10000	20	2	20000
134	60-57-1	Dieldrin	3.33	50	50	167
135	621-64-7	Di-n-Propylnitrosamine	10000	20	2	20000
136	624-83-9	Methyl isocyanate	1000	1	1	1000
137	627-13-4	Nitric acid, propyl ester	10000	5	1	10000
138	62-75-9	N-Nitroso-N,N-dimethylamine	10000	20	2	20000
139	630-20-6	1,1,1,2-Tetrachloroethane	1	10	10	10
140	64-17-5	Ethyl alcohol	10000	1	1	10000
141	64-18-6	Formic acid	10000	1	1	10000
142	64-19-7	Acetic acid	10000	1	1	10000
143	67-56-1	Methyl alcohol (Methanol)	10000	1	1	10000
144	67-63-0	2-Propyl alcohol (Isopropanol)	10000	1.25	1	10000
145	67-64-1	2-Propanone (Acetone)	10000	1	1	10000
146	67-66-3	Chloroform (R-20)	1	2	2	2
147	67-72-1	Hexachloroethane	1	50	50	50
148	684-16-2	Hexafluoroacetone	1	1	1	1
149	71-23-8	n-Propyl alcohol	10000	1.25	1	10000
150	71-36-3	n-Butyl alcohol	10000	5	1	10000
151	71-43-2	Benzene	100	2	1	100
152	71-55-6	Methyl chloroform (1,1,1-Trichloroethane)	1000	2	1	1000
153	72-20-8	Endrin	3.33	50	50	167
154	72-43-5	Methoxychlor	3.33	50	50	167
155	72-54-8	4,4-DDD	3.33	50	50	167
156	72-55-9	4,4-DDE	3.33	50	50	167
157	74-83-9	Bromomethane (Methyl bromide) (halon 1001)	1000	1	1	1000
158	74-87-3	Chloromethane (Methyl chloride) (R-40)	20	1	1	20
159	74-97-5	Bromochloromethane (halon 1011)	1	2	2	2
160	74-99-7	Methylacetylene	10000	1	1	10000
161	75-00-3	Chloroethane	1000	1	1	1000
162	75-01-4	Vinyl chloride (1-Chloroethene)	10000	1	1	10000
163	75-05-8	Acetonitrile	1000	1	1	1000
164	75-07-0	Acetaldehyde	10000	1	1	10000
165	75-09-2	Dichloromethane (Methylene chloride) (R-30)	50	1	1	50
166	75-12-7	Formamide	10000	1	1	10000

Table 4-1 COPCs

no of compound	CAS #	Compound	Oxidizer DF massflow in / massflow out	Adsorption DF massflow in / massflow out	reduced Adsorption DF massflow in / massflow out	Combined DF massflow in / massflow out
167	75-15-0	Carbon disulfide	10000	1.25	1	10000
168	75-21-8	Ethylene oxide (Oxirane)	10000	1	1	10000
169	75-27-4	Bromodichloromethane	1	5	5	5
170	75-34-3	1,1-Dichloroethane	10000	2	1	10000
171	75-35-4	1,1-Dichloroethene (Vinylidene chloride)	10000	1.25	1	10000
172	75-43-4	Dichlorofluoromethane (R-21)	1000	1	1	1000
173	75-45-6	Chlorodifluoromethane (R-22)	50	1	1	50
174	75-50-3	Trimethylamine	10000	1	1	10000
175	75-52-5	Nitromethane	10000	1	1	10000
176	75-55-8	2-Methylaziridine	10000	1	1	10000
177	75-61-6	Difluorodibromomethane (freon 12B2-halon 1202)	1	1	1	1
178	75-63-8	Trifluorobromomethane (R-13B1)	1	1	1	1
179	75-65-0	2-Methyl-2-propanol	10000	2	1	10000
180	75-69-4	Trichlorofluoromethane (R-11)	1	1	1	1
181	75-71-8	Dichlorodifluoromethane (R-12)	1	1	1	1
182	75-99-0	2,2-Dichloropropionic acid	100	20	2	200
183	76-03-9	Trichloroacetic acid	1	50	50	50
184	76-11-9	1,1,1,2-Tetrachloro-2,2-difluoroethane (R-112a)	20	5	5	100
185	76-12-0	1,1,2,2-Tetrachloro-1,2-difluoroethane (R-112)	20	5	5	100
186	76-13-1	1,2,2-Trichloro-1,1,2-trifluoroethane (Freon 113)	20	2	2	40
187	76-14-2	1,2-Dichloro-1,1,2,2-tetrafluoroethane (R-114)	1	1	1	1
188	76-15-3	Chloropentafluoroethane (R-115)	1	1	1	1
189	76-44-8	Heptachlor	3.33	10	10	33
190	78-83-1	2-Methylpropyl alcohol (Isobutyl alcohol)	10000	5	1	10000
191	78-87-5	1,2-Dichloropropane	1000	2	1	1000
192	78-92-2	1-Methylpropyl alcohol (2-Butanol)	10000	2	1	10000
193	78-93-3	Methyl ethyl ketone (MEK, 2-Butanone)	1000	2	1	1000
194	79-00-5	1,1,2-Trichloroethane	10000	5	1	10000
195	79-01-6	Trichloroethylene	10000	2	1	10000
196	79-09-4	Propionic acid	10000	2	1	10000
197	79-10-7	2-Propenoic acid	10000	2	1	10000
198	79-20-9	Methyl acetate	10000	1	1	10000
199	79-34-5	1,1,2,2-Tetrachloroethane	1	10	10	10
200	8001-35-2	Toxaphene	3.33	50	50	167
201	82-68-8	Pentachloronitrobenzene (PCBN)	3.33	50	50	167
202	83-32-9	Acenaphthene	3.33	50	50	167
203	84-66-2	Diethyl phthalate	10000	50	5	50000
204	84-74-2	Dibutyl phthalate	10000	50	5	50000

Table 4-1 COPCs

no of compound	CAS #	Compound	Oxidizer DF massflow in / massflow out	Adsorption DF massflow in / massflow out	reduced Adsorption DF massflow in / massflow out	Combined DF massflow in / massflow out
205	85-01-8	Phenanthrene	3.33	50	50	167
206	85-68-7	Butylbenzyl phthalate	10000	50	5	50000
207	86-73-7	Fluorene	3.33	50	50	167
208	87-68-3	Hexachlorobutadiene	50	50	5	250
209	87-86-5	Pentachlorophenol	3.33	50	50	167
210	88-06-2	2,4,6-Trichlorophenol	3.33	50	50	167
211	88-72-2	2-Nitrotoluene	10000	20	2	20000
212	88-75-5	2-Nitrophenol	3.33	20	20	67
213	88-85-7	2-sec-Butyl-4,6-dinitrophenol (Dinoseb)	3.33	50	50	167
214	88-89-1	Picric acid	10000	50	5	50000
215	91-20-3	Naphthalene	100	20	2	200
216	91-22-5	Quinoline	10000	20	2	20000
217	91-58-7	2-Chloronapthalene	3.33	50	50	167
218	92-52-4	1,1`-Biphenyl	1000	50	5	5000
219	92-93-3	4-Nitrobiphenyl	3.33	50	50	167
220	93-72-1	Silvex (2,4,5-TP)	3.33	50	50	167
221	93-76-5	2,4,5-T	3.33	50	50	167
222	94-75-7	2,4-D and esters (160C typed)	3.33	50	50	167
223	95-13-6	Indene	1000	20	2	2000
224	95-47-6	o-Xylene	10000	5	1	10000
225	95-48-7	o-Cresol (2-Methylphenol)	1000	20	2	2000
226	95-49-8	2-Chlorotoluene	10000	20	2	20000
227	95-50-1	o-Dichlorobenzene (1,2-Dichlorobenzene)	50	20	2	100
228	95-57-8	2-Chlorophenol	10000	20	2	20000
229	95-95-4	2,4,5-Trichlorophenol	3.33	50	50	167
230	96-18-4	1,2,3-Trichloropropane	10000	20	2	20000
231	96-22-0	3-Pentanone	10000	5	1	10000
232	96-69-5	Bis(3-tert-butyl-4-hydroxy-6-methyl-phenyl)sulfide	3.33	50	50	167
233	98-51-1	p-tert-Butyltoluene	10000	20	2	20000
234	98-82-8	Cumene	10000	20	2	20000
235	98-83-9	alpha-Methylstyrene	100	20	2	200
236	98-86-2	Acetophenone	100	20	2	200
237	98-95-3	Nitrobenzene	10000	20	2	20000

Table 4-2 Compounds detected >0.1 ppmv

no of compound	CAS #	Compound	Oxidizer DF	Adsorption DF	reduced Adsorption DF	Combined DF
			massflow in / massflow out	massflow in / massflow out	massflow in / massflow out	massflow in / massflow out
1	541-05-9	Cyclotrisiloxane, hexamethyl-	10000	10	1	10000
2	556-67-2	Cyclotetrasiloxane, octamethyl-	10000	50	5	50000
3	USI000-06	tetramethylcyclotrisiloxane	10000	10	1	10000
4	3622-84-2	Benzenesulfonamide, N-butyl-	5	50	50	250
5	5145-07-1	2(3H)-Furanone, dihydro-3,5-dimethyl-	10000	20	2	20000
6	108-47-4	Pyridine, 2,4-dimethyl-	10000	20	2	20000
7	109-99-9	Furan, tetrahydro-	10000	1.25	1	10000
8	110-00-9	Furan	10000	1	1	10000
9	110-86-1	Pyridine	10000	5	1	10000
10	1708-29-8	Furan, 2,5-dihydro-	10000	1.25	1	10000
11	24405-16-1	2H-Pyran-2-one, tetrahydro-5,6-dimethyl-, trans-	10000	20	2	20000
12	289-95-2	Pyrimidine	10000	5	1	10000
13	290-37-9	Pyrazine	10000	5	1	10000
14	534-22-5	Furan, 2-methyl-	10000	2	1	10000
15	930-22-3	Oxirane, ethenyl-	10000	2	1	10000
16	96-48-0	2(3H)-Furanone, dihydro- (gamma butyrolactone)	10000	10	1	10000
17	3457-90-7	1,3-Propanediol, dinitrate	10000	5	1	10000
18	3457-91-8	1,4-Butanediol, dinitrate	10000	10	1	10000
19	544-16-1	Nitrous acid, butyl ester	10000	2	1	10000
20	624-91-9	Nitrous acid, methyl ester	10000	2	1	10000
21	625-58-1	Nitric acid, ethyl ester	10000	2	1	10000
22	627-05-4	Butane, 1-nitro-	10000	20	2	20000
23	627-13-4	Nitric acid, propyl ester	10000	5	1	10000
24	62-75-9M	Methanamine, N-methyl-N-nitroso- and others	10000	20	2	20000
25	928-45-0	Nitric acid, butyl ester	10000	5	1	10000
26	123-75-1	Pyrrolidine	10000	2	1	10000
27	22431-09-0	Methanamine, N-(1-methylbutylidene)-	10000	5	1	10000
28	616-45-5	2-Pyrrolidinone	10000	20	2	20000
29	75-50-3	Methanamine, N,N-dimethyl-	10000	1	1	10000
30	107-12-0	Propanenitrile	10000	1	1	10000
31	109-74-0	Butanenitrile	10000	2	1	10000
32	110-59-8	Pentanenitrile	10000	5	1	10000
33	124-12-9	Octanenitrile	10000	20	2	20000
34	2243-27-8	Nonanenitrile	10000	20	2	20000
35	628-73-9	Hexanenitrile	10000	20	2	20000
36	629-08-3	Heptanenitrile	10000	20	2	20000
37	75-05-8	Acetonitrile	1000	1	1	1000
38	109-21-7	Butanoic acid, butyl ester	10000	20	2	20000
39	110-27-0	Tetradecanoic acid, 1-methylethyl ester	10000	50	5	50000
40	123-25-1	Butanedioic acid, diethyl ester	10000	50	5	50000

Table 4-2 Compounds detected >0.1 ppmv

no of compound	CAS #	Compound	Oxidizer DF massflow in / massflow out	Adsorption DF massflow in / massflow out	reduced Adsorption DF massflow in / massflow out	Combined DF massflow in / massflow out
41	123-86-4	Acetic acid, butyl ester	10000	5	1	10000
42	126-73-8	Phosphoric acid tributyl ester	10000	50	5	50000
43	141-78-6	Acetic acid ethyl ester	10000	2	1	10000
44	1838-59-1	Formic acid, 2-propenyl ester	10000	2	1	10000
45	590-01-2	Propanoic acid, butyl ester	10000	5	1	10000
46	591-87-7	Acetic acid, 2-propenyl ester	10000	5	1	10000
47	592-84-7	Formic acid, butyl ester	10000	5	1	10000
48	84-66-2	1,2-Benzenedicarboxylic acid, diethyl ester	1000	50	5	5000
49	1002-84-2	Pentadecanoic acid	10000	50	5	50000
50	107-92-6	Butanoic acid	10000	10	1	10000
51	2091-29-4	9-Hexadecenoic acid	10000	50	5	50000
52	544-63-8	Tetradecanoic acid	10000	50	5	50000
53	57-10-3	Hexadecanoic acid	10000	50	5	50000
54	64-19-7	Acetic acid	10000	1	1	10000
55	105-42-0	2-Hexanone, 4-methyl-	10000	5	1	10000
56	106-35-4	3-Heptanone	10000	5	1	10000
57	106-68-3	3-Octanone	1000	20	2	2000
58	107-87-9	2-Pentanone	10000	5	1	10000
59	108-10-1	2-Pentanone, 4-methyl- (MIBK)	10000	5	1	10000
60	110-43-0	2-Heptanone	1000	5	1	1000
61	111-13-7	2-Octanone	1000	20	2	2000
62	112-12-9	2-Undecanone	10000	50	5	50000
63	123-19-3	4-Heptanone	1000	5	1	1000
64	1534-26-5	3-Tridecanone	10000	50	5	50000
65	1534-27-6	3-Dodecanone	10000	50	5	50000
66	15932-80-6	Cyclohexanone, 5-methyl-2-(1-methylethylidene)-	10000	50	5	50000
67	22026-12-6	6-Tridecanone	10000	50	5	50000
68	2216-87-7	3-Undecanone	10000	50	5	50000
69	50639-02-6	5-Undecanone, 2-methyl-	10000	50	5	50000
70	563-80-4	2-Butanone, 3-methyl-	10000	2	1	10000
71	589-38-8	3-Hexanone	1000	5	1	1000
72	589-63-9	4-Octanone	1000	20	2	2000
73	591-78-6	2-Hexanone	1000	5	1	1000
74	593-08-8	2-Tridecanone	10000	50	5	50000
75	629-23-2	3-Tetradecanone	10000	50	5	50000
76	67-64-1	2-Propanone	10000	1	1	10000
77	763-93-9	3-Hexen-2-one	1000	5	1	1000
78	78-93-3	2-Butanone	1000	2	1	1000
79	78-94-4	3-Buten-2-one	1000	2	1	1000
80	821-55-6	2-Nonanone	10000	20	2	20000
81	89-82-7	Cyclohexanone, 5-methyl-2-(1-methylethylidene)	10000	50	5	50000

Table 4-2 Compounds detected >0.1 ppmv

no of compound	CAS #	Compound	Oxidizer DF massflow in / massflow out	Adsorption DF massflow in / massflow out	reduced Adsorption DF massflow in / massflow out	Combined DF massflow in / massflow out
82	925-78-0	3-Nonanone	10000	20	2	20000
83	928-68-7	2-Heptanone, 6-methyl-	1000	20	2	2000
84	98-86-2	Ethanone, 1-phenyl-	100	20	2	200
85	110-62-3	Pentanal	10000	5	1	10000
86	111-71-7	Heptanal	10000	20	2	20000
87	123-38-6	Propanal	10000	1	1	10000
88	123-72-8	Butanal	10000	2	1	10000
89	124-13-0	Octanal	10000	20	2	20000
90	124-19-6	Nonanal	10000	2	1	10000
91	19269-28-4	Hexanal, 3-methyl-	10000	5	1	10000
92	66-25-1	Hexanal	10000	5	1	10000
93	75-07-0	Acetaldehyde	10000	1	1	10000
94	104-76-7	1-Hexanol, 2-ethyl-	10000	20	2	20000
95	111-70-6	1-Heptanol	10000	20	2	20000
96	112-92-5	1-Octadecanol	10000	50	5	50000
97	14898-79-4	2-Butanol	10000	2	1	10000
98	2136-70-1	Ethanol, 2-(tetradecyloxy)-	10000	50	5	50000
99	36653-82-4	1-Hexadecanol	10000	50	5	50000
100	51411-24-6	6,10-Dodecadien-1-ol, 3,7,11-trimethyl-	10000	50	5	50000
101	57-55-6	1,2-Propanediol	10000	20	2	20000
102	598-32-3	3-Buten-2-ol	10000	2	1	10000
103	6032-29-7	2-Pentanol	10000	5	1	10000
104	627-27-0	3-Buten-1-ol	10000	5	1	10000
105	64-17-5	Ethanol	10000	1	1	10000
106	67-56-1	Methanol	10000	1	1	10000
107	67-63-0	2-Propanol	10000	1.25	1	10000
108	71-23-8	1-Propanol	10000	1.25	1	10000
109	75-65-0	2-Propanol, 2-methyl-	10000	2	1	10000
110	75-84-3	1-Propanol, 2,2-dimethyl-	10000	5	1	10000
111	75-85-4	2-Butanol, 2-methyl-	10000	5	1	10000
112	78-92-2	2-Butanol	10000	2	1	10000
113	87-68-3	1,3-Butadiene, 1,1,2,3,4,4-hexachloro-	50	50	5	250
114	96-41-3	Cyclopentanol	10000	5	1	10000
115	1184-60-7	1-Propene, 2-fluoro-	100	1	1	100
116	127-18-4	Ethene, tetrachloro-	1	10	10	10
117	156-59-2	Ethene, 1,2-dichloro-, (Z)-	10000	2	1	10000
118	1717-00-6	Ethane, 1,1-dichloro-1-fluoro- (freon 14b)	1000	1.25	1	1000
119	56-23-5	Methane, tetrachloro-	1	5	5	5
120	74-87-3	Methane, chloro- (R-40)	20	1	1	20
121	75-02-5	Ethene, fluoro-	10000	1	1	10000
122	75-09-2	Methane, dichloro-	20	1	1	20
123	75-45-6	Methane, chlorodifluoro- (R-22)	50	1	1	50

Table 4-2 Compounds detected >0.1 ppmv

no of compound	CAS #	Compound	Oxidizer DF massflow in / massflow out	Adsorption DF massflow in / massflow out	reduced Adsorption DF massflow in / massflow out	Combined DF massflow in / massflow out
124	75-68-3	Ethane, 1-chloro-1,1-difluoro- (R-142)	50	1	1	50
125	75-69-4	Methane, trichlorofluoro- (R-11)	1	1	1	1
126	6031-02-3	Benzene, (1-methylpentyl)-	10000	50	5	50000
127	100-41-4	Benzene, ethyl-	10000	5	1	10000
128	100-42-5	Benzene, ethenyl-	10000	5	1	10000
129	106-42-3	Benzene, 1,4-dimethyl-	1000	5	1	1000
130	108-38-3	Benzene, 1,3-dimethyl-	1000	5	1	1000
131	108-88-3	Benzene, methyl-	10000	5	1	10000
132	3290-53-7	Benzene, (2-methyl-2-propenyl)-	10000	20	2	20000
133	538-68-1	Benzene, pentyl-	10000	20	2	20000
134	637-50-3	Benzene, 1-propenyl-	10000	20	2	20000
135	643-58-3	1,1`-Biphenyl, 2-methyl-	10000	50	5	50000
136	71-43-2	Benzene	1000	2	1	1000
137	92-52-4	1,1`-Biphenyl	1000	50	5	5000
138	95-47-6	Benzene, 1,2-dimethyl-	10000	5	1	10000
139	74-99-7	1-Propyne	10000	1	1	10000
140	20184-91-2	4-Nonyne	10000	20	2	20000
141	61142-40-3	4-Undecene, 4-methyl-	10000	50	5	50000
142	629-73-2	1-Hexadecene	10000	50	5	50000
143	74630-39-0	1-Undecene, 4-methyl-	10000	50	5	50000
144	74630-48-1	3-Undecene, 2-methyl-, (Z)-	10000	50	5	50000
145	764-96-5	5-Undecene, (Z)-	10000	50	5	50000
146	821-74-9	4,5-Nonadiene	1000	5	1	1000
147	1008-80-6	Naphthalene, decahydro-2,3-dimethyl-	10000	50	5	50000
148	108-87-2	Cyclohexane, methyl-	10000	5	1	10000
149	110-82-7	Cyclohexane	10000	2	1	10000
150	1472-09-9	Cyclopropane, octyl-	10000	50	5	50000
151	1618-22-0	Naphthalene, decahydro-2,6-dimethyl-	10000	50	5	50000
152	1630-94-0	Cyclopropane, 1,1-dimethyl-	10000	1	1	10000
153	1678-93-9	Cyclohexane, butyl-	10000	20	2	20000
154	2415-72-7	Cyclopropane, propyl-	10000	2	1	10000
155	287-92-3	Cyclopentane	10000	1.25	1	10000
156	2883-05-8	Octane, 2-cyclohexyl-	10000	50	5	50000
157	294-62-2	Cyclododecane	10000	50	5	50000
158	2958-76-1	Naphthalene, decahydro-2-methyl-	10000	50	5	50000
159	3073-66-3	Cyclohexane, 1,1,3-trimethyl-	10000	5	1	10000
160	32281-85-9	Cyclopentane, 1,3-dimethyl-2-(1-methylethyl)-	10000	2	1	10000
161	3604-14-6	Naphthalene, decahydro-1,2-dimethyl-	10000	50	5	50000
162	41977-33-7	Cyclopropane, 1-pentyl-2-propyl-	10000	50	5	50000
163	4292-92-6	Cyclohexane, pentyl-	10000	50	5	50000
164	4806-61-5	Cyclobutane, ethyl-	10000	2	1	10000
165	493-02-7	Naphthalene, decahydro-, trans-	10000	20	2	20000

Table 4-2 Compounds detected >0.1 ppmv

no of compound	CAS #	Compound	Oxidizer DF massflow in / massflow out	Adsorption DF massflow in / massflow out	reduced Adsorption DF massflow in / massflow out	Combined DF massflow in / massflow out
166	54676-39-0	Cyclohexane, 2-butyl-1,1,3-trimethyl-	10000	50	5	50000
167	55937-92-3	Bicyclo[4.1.0]heptane, 2-methyl-7-pentyl-	10000	50	5	50000
168	594-11-6	Cyclopropane, methyl-	10000	1	1	10000
169	598-61-8	Cyclobutane, methyl-	10000	1.25	1	10000
170	61142-20-9	Cyclohexane, (4-methylpentyl)-	10000	50	5	50000
171	7058-01-7	Cyclohexane, (1-methylpropyl)-	10000	20	2	20000
172	7094-26-0	Cyclohexane, 1,1,2-trimethyl-	10000	5	1	10000
173	822-50-4	Cyclopentane, 1,2-dimethyl-, trans-	10000	2	1	10000
174	1002-43-3	Undecane, 3-methyl-	10000	50	5	50000
175	106-97-8	Butane	10000	1	1	10000
176	107-83-5	Pentane, 2-methyl-	10000	2	1	10000
177	108-08-7	Pentane, 2,4-dimethyl-	10000	2	1	10000
178	109-66-0	Pentane	10000	1.25	1	10000
179	110-54-3	Hexane	10000	2	1	10000
180	111-65-9	Octane	10000	5	1	10000
181	111-84-2	Nonane	10000	20	2	20000
182	1120-21-4	Undecane	10000	50	5	50000
183	112-40-3	Dodecane	10000	50	5	50000
184	124-18-5	Decane	10000	20	2	20000
185	13151-34-3	Decane, 3-methyl-	10000	50	5	50000
186	13151-35-4	Decane, 5-methyl-	10000	50	5	50000
187	13286-73-2	Tridecane, 3-ethyl-	10000	50	5	50000
188	13287-21-3	Tridecane, 6-methyl-	10000	50	5	50000
189	142-82-5	Heptane	10000	2	1	10000
190	14720-74-2	Heptane, 2,2,4-trimethyl-	10000	5	1	10000
191	1560-96-9	Tridecane, 2-methyl-	10000	50	5	50000
192	1632-70-8	Undecane, 5-methyl-	10000	50	5	50000
193	17301-23-4	Undecane, 2,6-dimethyl-	10000	50	5	50000
194	17301-25-6	Undecane, 2,8-dimethyl-	10000	50	5	50000
195	17301-27-8	Undecane, 2,10-dimethyl-	10000	50	5	50000
196	17301-29-0	Undecane, 3,7-dimethyl-	10000	50	5	50000
197	17301-30-3	Undecane, 3,8-dimethyl-	10000	50	5	50000
198	17301-32-5	Undecane, 4,7-dimethyl-	10000	50	5	50000
199	17301-94-9	Nonane, 4-methyl-	10000	20	2	20000
200	17302-28-2	Nonane, 2,6-dimethyl-	10000	50	5	50000
201	17302-32-8	Nonane, 3,7-dimethyl-	10000	50	5	50000
202	17312-50-4	Decane, 2,5-dimethyl-	10000	50	5	50000
203	17312-57-1	Dodecane, 3-methyl-	10000	50	5	50000
204	17312-60-6	Undecane, 6-ethyl-	10000	50	5	50000
205	17312-73-1	Undecane, 5,5-dimethyl-	10000	50	5	50000
206	17312-76-4	Undecane, 6,6-dimethyl-	10000	50	5	50000
207	17312-77-5	Undecane, 2,3-dimethyl-	10000	50	5	50000

Table 4-2 Compounds detected >0.1 ppmv

no of compound	CAS #	Compound	Oxidizer DF massflow in / massflow out	Adsorption DF massflow in / massflow out	reduced Adsorption DF massflow in / massflow out	Combined DF massflow in / massflow out
208	17312-80-0	Undecane, 2,4-dimethyl-	10000	50	5	50000
209	17312-82-2	Undecane, 4,6-dimethyl-	10000	50	5	50000
210	17453-94-0	Undecane, 5-ethyl-	10000	50	5	50000
211	20278-85-7	Heptane, 2,3,5-trimethyl-	10000	20	2	20000
212	2213-23-2	Heptane, 2,4-dimethyl-	10000	5	1	10000
213	2216-33-3	Octane, 3-methyl-	10000	5	1	10000
214	2216-34-4	Octane, 4-methyl-	10000	5	1	10000
215	25117-24-2	Tetradecane, 4-methyl-	10000	50	5	50000
216	25117-31-1	Tridecane, 5-methyl-	10000	50	5	50000
217	26730-12-1	Tridecane, 4-methyl-	10000	50	5	50000
218	26730-14-3	Tridecane, 7-methyl-	10000	50	5	50000
219	2847-72-5	Decane, 4-methyl-	10000	50	5	50000
220	2980-69-0	Undecane, 4-methyl-	10000	50	5	50000
221	31295-56-4	Dodecane, 2,6,11-trimethyl-	10000	50	5	50000
222	3891-98-3	Dodecane, 2,6,10-trimethyl-	10000	50	5	50000
223	4032-93-3	Heptane, 2,3,6-trimethyl-	10000	20	2	20000
224	52896-90-9	Heptane, 3-ethyl-5-methyl-	10000	20	2	20000
225	544-76-3	Hexadecane	10000	50	5	50000
226	55030-62-1	Tridecane, 4,8-dimethyl-	10000	50	5	50000
227	55045-07-3	Dodecane, 2-methyl-8-propyl-	10000	50	5	50000
228	55045-11-9	Tridecane, 5-propyl-	10000	50	5	50000
229	562-49-2	Pentane, 3,3-dimethyl-	10000	2	1	10000
230	56292-65-0	Dodecane, 2,5-dimethyl-	10000	50	5	50000
231	565-59-3	Pentane, 2,3-dimethyl-	10000	2	1	10000
232	589-34-4	Hexane, 3-methyl-	10000	2	1	10000
233	589-43-5	Hexane, 2,4-dimethyl-	10000	5	1	10000
234	589-53-7	Heptane, 4-methyl-	10000	5	1	10000
235	589-81-1	Heptane, 3-methyl-	10000	5	1	10000
236	591-76-4	Hexane, 2-methyl-	10000	2	1	10000
237	592-27-8	Heptane, 2-methyl-	10000	5	1	10000
238	61141-72-8	Dodecane, 4,6-dimethyl-	10000	50	5	50000
239	6117-97-1	Dodecane, 4-methyl-	10000	50	5	50000
240	617-78-7	3-Ethylpentane	10000	2	1	10000
241	62016-30-2	Octane, 2,3,3-trimethyl-	10000	50	5	50000
242	62016-34-6	Octane, 2,3,7-trimethyl-	10000	50	5	50000
243	62108-21-8	Decane, 6-ethyl-2-methyl-	10000	50	5	50000
244	62108-25-2	Decane, 2,6,7-trimethyl-	10000	50	5	50000
245	62108-27-4	Decane, 2,4,6-trimethyl-	10000	50	5	50000
246	62238-13-5	Decane, 2,3,7-trimethyl-	10000	50	5	50000
247	629-50-5	Tridecane	10000	50	5	50000
248	629-59-4	Tetradecane	10000	50	5	50000
249	629-62-9	Pentadecane	10000	50	5	50000
250	629-78-7	Heptadecane	10000	50	5	50000

Table 4-2 Compounds detected >0.1 ppmv

no of compound	CAS #	Compound	Oxidizer DF	Adsorption DF	reduced Adsorption DF	Combined DF
			massflow in / massflow out	massflow in / massflow out	massflow in / massflow out	massflow in / massflow out
251	74-98-6	Propane	10000	1	1	10000
252	75-28-5	Propane, 2-methyl-	10000	1	1	10000
253	78-78-4	Butane, 2-methyl-	10000	1.25	1	10000
254	96-14-0	Pentane, 3-methyl-	10000	2	1	10000
255	565-75-3	Pentane, trimethyl-, isomer	10000	5	1	10000

Attachment 5 Thermal Stability Ranking Study

Figure 9 of Technical Article *Development of a Thermal Stability Based Ranking of Hazardous Organic Compound Incinerability* (Dellinger 2000)

Table IV. ΔT_{99} as a Function of Waste Feed Concentration (Radical Concentration) for Five Model Compounds*

A/A_0	R/R_0	$CHCl_3$	CH_2Cl_2	$C_6H_5CH_3$	CH_3Cl	C_6H_6
1.1	1.02	<~1	<~1	<~1	<~1	~5
1.3	1.06	<~1	<~1	<~1	~2	~14
1.5	1.10	<~1	<~1	~1	~3	~22
2.0	1.20	<~1	<~1	~1	~6	~46
3.0	1.40	<~1	<~1	~3	~12	~88

*In this analysis, we have assumed that the additional radical concentration (R/R_0) abstracts a H atom from the model compound at the same rate as a Cl atom. The relationship between waste feed concentration (A/A_0) and radical concentration was determined from a series of equilibrium calculations for nominal incinerability mixtures at 1000 °C.

sumption above 750 °C while H metathesis by OCl and C_2Cl_3 are significant destruction pathways at lower temperatures (*15*).

Effect of Varying Waste Feed Rate and Radical Chains. On the basis of the known complexity of hydrocarbon and chlorinated hydrocarbon reaction systems (*47, 14–17*) it may seem fortuitous that such a simple kinetic model can predict the thermal decomposition behavior of such a wide range of species. We acknowledge the need for detailed chemical kinetic mechanisms to predict the thermal decomposition behavior of a given species over wide ranges of experimental conditions. However, the goal of this kinetic analysis was simply the prediction of T_{99}s for one experimental condition.

Using eq 1, we have iteratively calculated the effect of increases in the waste feed concentration on T_{99} for the five model compounds. As shown in Table IV, results indicate that acceptably small decreases in T_{99} (<20 °C) were observed for all compounds for a factor of 2 increase in waste feed rate and acceptably small decreases were observed for all compounds except benzene for a factor of 3 increase in waste feed concentration (~40% increase in radical concentration). For chloroform and dichloromethane, the insensitivity of T_{99} on waste feed concentration is consistent with mechanisms dominated by molecular elimination reactions. The variance in T_{99} for the other compounds is due to the relative contributions of bimolecular radical attack versus unimolecular reaction.

In principle, radical chain reactions can increase the effect of varying radical concentration. Significant chain lengths ($\lambda > 2$) are not expected under incineration conditions due to termination by the formation of stable H_2 and HCl molecules. Polymerization reactions may have longer chain lengths but these reactions are not likely to contribute to POHC destruction in the H- and Cl-rich environment of an incinerator. Both pseudoequilibrium and kinetic calculations indicate that other readily formed polyatomic radicals (e.g., CH_3, CCl_3) that can participate in short chains are in concentrations lower by a factor of 10–100 than H and Cl. Thus, chain lengths for these species would have to be on the order of 10–100 before they would contribute to POHC destruction, which is highly unlikely. Our calculations indicate that chains of $\lambda \leq 2$ produce shifts in T_{99} of equal or lesser magnitude than the effect of changing the radical concentration of up to a factor of 2.

The above analysis indicates that exceptional compounds that are resistant to unimolecular reaction and exhibit large shifts in T_{99} with small increases in radical concentration do exist (e.g., C_6H_6). However, since the stability of all compounds undergoing bimolecular decomposition will shift in the same direction as the radical concentration is varied, changes in their *relative* T_{99} values

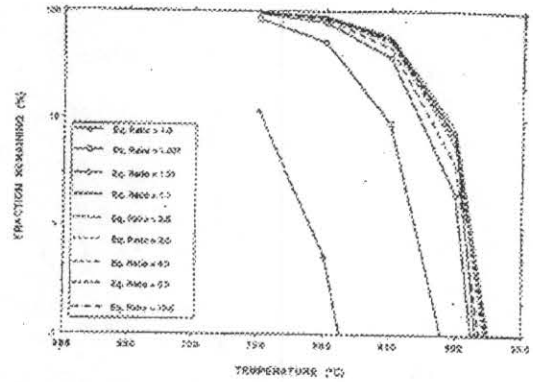

Figure 9. Sensitivity of toluene thermal decomposition behavior as a function of waste/oxygen equivalence ratio. Mixture elemental composition, C_2H_5Cl; t_r = 2.0 s.

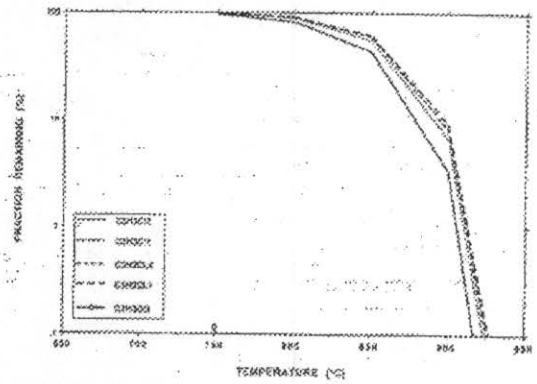

Figure 10. Sensitivity of toluene thermal decomposition behavior as a function of organic mixture Cl atom population. Φ = 3.0; t_r = 2.0 s.

will be suppressed. Since compounds at the top of the ranking decompose predominantly via bimolecular reactions, changes in their relative incinerability are expected to be minimal. Only as we descend through the ranking to where different compounds decompose by bimolecular versus unimolecular pathways will the ranking be expected to exhibit some variance. However, in this regime unimolecular decomposition reactions are available for compounds dominated by bimolecular pathways at nominal conditions. Thus, changes in T_{99} are again expected to be minimal.

Effect of Varying Equivalence Ratio and Waste Feed Composition. Toluene was selected as the model compound for further analysis, as this compound decomposes by numerous bimolecular reactions that are sensitive to changes in reaction atmosphere. We have analyzed the effect of reaction atmosphere by varying the fuel/oxygen stoichiometry ($0.05 < \Phi < 10.0$) for nominal values of mixture elemental composition and by varying mixture elemental composition ($0.33 < H/Cl < 30.0$) for nominal values of fuel/oxygen stoichiometry. Figure 9 presents the results of the sensitivity analysis for variation of waste/oxygen equivalence ratio while Figure 10 presents the results in relation to a variation of Cl and H atom populations, respectively.

Inspection of Figure 9 indicates that for waste/oxygen equivalence ratios ranging from 2.0 to 5.0, there is no significant difference (±10 °C) in T_{99}. As one decreases this parameter to 10.0, a small decrease in T_{99} was ob-

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Attachment 6 VOC Properties and Adsorption Potential

Technology Paper *Activated Carbon Adsorption for Treatment of VOC Emissions* (Shepherd 2001)

ACTIVATED CARBON ADSORPTION FOR TREATMENT OF VOC EMISSIONS

Presented at the 13th Annual EnviroExpo, Boston Massachusetts—May 2001

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A review of the characteristics of activated carbon and its applicability to emission control of VOC's. Design and costs of carbon systems are also discussed.

INTRODUCTION

The principal use of vapor phase activated carbon in the environmental field is for the removal of volatile organic compounds such as hydrocarbons, solvents, toxic gases and organic based odors. In addition, chemically impregnated activated carbons can be used to control certain inorganic pollutants such as hydrogen sulfide, mercury, or radon.

When properly applied, the adsorption process will remove pollutants for which it is designed, to virtually non-detectable levels. In fact one of the first large- scale uses of activated carbon was in military gas masks where complete contaminant removal is essential. Carbon adsorption is equally effective on single component emissions as well as complex mixtures of pollutants.

In the industrial area, the most common applications of activated carbon are for process off-gases, tank vent emissions, work area air purification, and odor control, either within the plant or related to plant exhausts. Additionally, activated carbon is used in the hazardous waste remediation area to treat off-gases from air strippers and from soil vapor extraction remediation projects.

EVALUATION OF ALTERNATIVE TREATMENT PROCESSES	LOW VOC LEVELS	HIGH VOC LEVELS	CONTINUOS LOADS	INTERMITTENT LOADS	HALOGENATED ORGANICS	TEMP>150F	TEMP<150F	HIGH FLOWS	LOW FLOWS	HIGH HUMIDITY	INORGANIC PARTICLES
ACTIVATED CARBON	•		•	•	•		•	•	•		
THERMAL OXIDATION		•	•			•			•	•	
SCRUBBERS	•	•	•			•	•	•	•		
PARTICULATE FILTERS			•	•			•			•	•
CATALYTIC OXIDATION		•	•			•			•	•	

TABLE I

APPLICATION CONSIDERATIONS

One of the major issues that must first be addressed when evaluating a specific environmental VOC problem is what treatment technology to consider. For a given situation there are likely a number of treatment alternatives that appear to have some utility.

The first step in this evaluation is to effectively characterize the application. You will need to know at least the following information:

Flow Rate - Continuos vs intermittent
Contaminants Present - individual contaminants, concentration and variability
Temperature - Average and maximum
Falamibility - Upper and lower explosive limits

Once you have characterized your problem, each technology can be considered for its ability to deal with the conditions identified. As an example, *Table I* lists some of the more common technologies used to control industrial vapor phase pollutants, and the conditions under which they might be most favorably applied. I can't stress enough the importance of this review, as this is where most technical solutions fail. If you solve the wrong problem or pick a technical solution that does not respond to all the variables of your application, poor performance will likely result.

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HOW IT WORKS

In the adsorption process, molecules of a contaminated gas are attracted to and accumulate on the surface of the activated carbon. Carbon is a commonly used adsorbent due to its very large surface area. It can be made from a variety of base materials including coal, wood and coconut shells, and is manufactured or activated in a high temperature controlled oxidation process. A pound of highly activated carbon has a surface area approaching 140 acres.

CROSS SECTION OF CARBON

This *Figure I* presents an artist's rendition of the cross section of an activated carbon particle. Note that almost all of the surface area available for adsorption is associated with its internal pore structure. Also note the relative change in pore diameters, going from very large at the granule surface boundary, to much smaller within the particle interior. Balancing of the large and small pore volumes during the activation process is what makes individual activated carbons perform differently. Molecules of a contaminant tend to adsorb most strongly in areas where the pore diameter of the adsorbent is close to the molecular diameter of the compound.

While most organic compounds will adsorb on activated carbon to some degree, the adsorption process is most effective on higher molecular weight and high boiling point compounds.

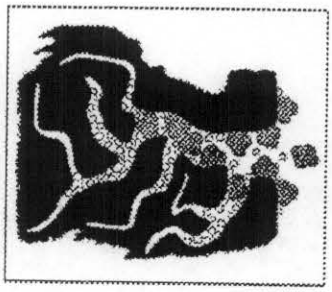

FIGURE I

LIST OF ORGANIC COMPOUNDS

RELATIVE ADSORPTION RATE

		MOLECULAR WEIGHT	BOILING POINT	CARBON CAPACITY %
STRONGER	NITROBENZENE	123	211 C	51
	TETRACHLOROETHANE	168	147 C	40
	TETRACHLOROETHYLENE	165	121 C	35
	STYRENE	104	145 C	25
	XYLENE	106	138 C	21
	NAPATHYLENE	128	217 C	20
	TOLUNE	92	111 C	20
	BENZENE	78	80 C	12
	MTBE	88	55 C	12
	HEXANE	86	68 C	7
	ETHLY ACRILATE	100	57 C	5
	DIDHLOROETHANE	99	99 C	7
	METHYL ETHYLKETONE	72	80 C	4
	METHYLENE CHLORIDE	84	40 C	2
	ACRILONITRILE	53	74 C	2
	ACETONE	58	56 C	0.8
	VINYLCHLORIDE	62	neg 14 C	0.7
	CHLOROETHANE	64	12 C	0.5
	BROMOTRI FLOROMETHANE	149	neg 58 C	0.13
WEAKER	METHANE	16	neg 161 C	0.0003

TABLE II

Compounds having a molecular weight over 50 and a boiling point greater than 50 degrees centigrade are good candidates for adsorption. *TABLE II* presents a representative list of organic compounds and their relative adsorption strength. Organic contaminants are often classified as weakly, moderately, or strongly adsorbed. You will note that a compound such as nitrobenzene having a molecular weight of 123 and a boiling point of 211 C is characterized as a very strong adsorber. On the other hand a compound such as methane which has a molecular weight of 16 and a boiling point of -161 C is a very weakly adsorbed compound. In fact, at this capacity, for all practical purposes, methane removal with activated carbon would not be cost effective.

ABSORPTION CAPACITY

Physical adsorption is dependant on the characteristics of the contaminant to be adsorbed, the temperature of the gas stream to be processed, and the concentration of the contaminant in the gas stream. The adsorption capacity for a particular contaminant represents the amount of the contaminant that can be adsorbed on a unit weight of activated carbon consumed at the conditions present in the application. Typical adsorption capacities for moderately adsorbed compounds range from 5 to 30 percent of the weight of the carbon.

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TRICHLOROETHYLENE ISOTHERM

The adsorption isotherm plot shows the influence of concentration on adsorption capacity. *Figure II* presents an adsorption isotherm used to predict adsorption capacity for trichloroethylene. Note how the adsorption capacity varies from 20 to 65 percent over the concentration range of 10 to 10000 ppm in the gas stream.

A series of isotherms at differing temperatures shows the influence of temperature on adsorption capacity. In Figure III you can see the effect of temperature on the same trichloroethylene compound. At 100ppm the capacity of activated carbon for trichloroethylene varies from 17 to 40 percent as the temperature changes from 140 to 32 degrees F.

Fortunately, most carbon suppliers have developed isotherms for a range of environmental contaminants. At Carbtrol we have built a computerized database of adsorption isotherms so that we can easily model most environmental applications. By supplying to us the gas flow rate, the contaminant concentration and the temperature of the gas stream, a carbon usage prediction can be made.

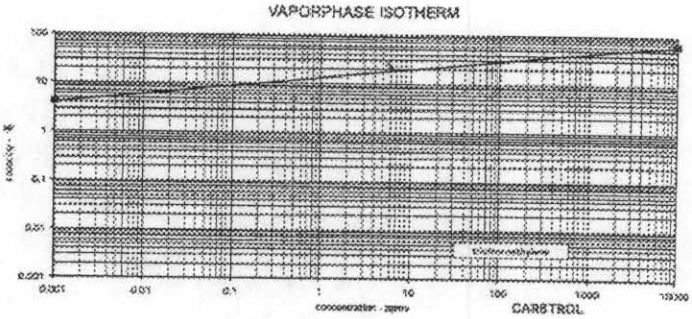


FIGURE II

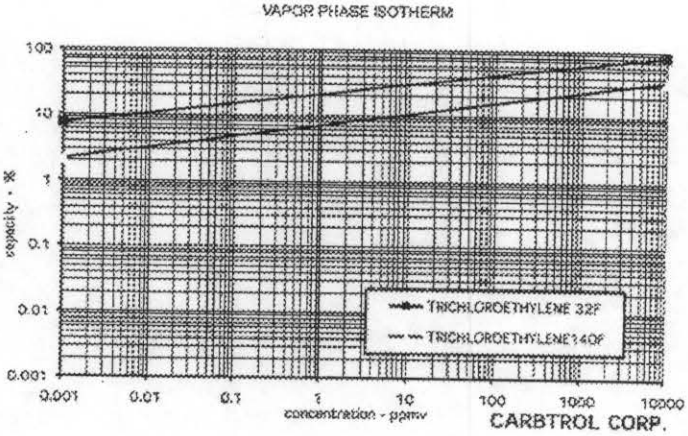
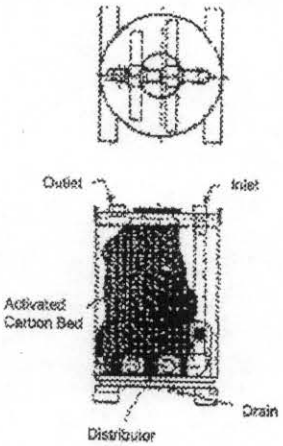


FIGURE III

DESIGN CONSIDERATIONS



CARBTROL G-4 ADSORBER

FIGURE IV

Activated carbons used in the air pollution control field are normally supplied in a granular form with a particle size ranging from 1 to 5 millimeters. In the granular form activated carbon can easily be packed into a containment device through which a contaminated gas stream can be processed for purification.

Figure IV shows the cross section of a typical fixed bed vapor phase adsorber. An adsorption system in its simplest form is made of a containment device (drum or vessel), distribution and collection devices to effect proper circulation of the gas stream through the activated carbon bed, and a means for moving the gas stream through the bed (such as a fan, a blower, or pressurized gas displacement). Packed activated carbon beds can be conveniently config-

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ured into small transportable drums or tanks, or into large fixed contacting devices depending on the application.

Adsorber sizing for a particular application is governed primarily by bed surface loading rate. With a standard 4-foot carbon bed depth, a maximum gas-loading rate of 100 cfm per square foot of bed surface should be maintained. This insures adequate gas contact and sufficient time to reach adsorption equilibrium. Higher gas flows are handled by increasing the carbon bed surface (larger adsorbers) or adding multiple beds in parallel.

One of the chief advantages of granular activated carbon adsorption is its simplicity of application. Pre-engineered fixed bed adsorbers can be purchased and installed on most existing exhaust systems with a minimum of capital expenditure. Transportable adsorbers from 100 to 5000 pounds are readily available as standard supply from several manufactures. Air flows for these stock units go up to as much as 5000 CFM. Larger systems up to 20,000 CFM or higher are available on a custom basis. Once installed these systems operate for the most part unattended until the carbon becomes spent and requires replacement. The frequency of replacement will vary for each application but may range from weekly to annually.

Another significant advantage of an adsorption process is that it provides on line reserve capacity on a passive basis. The system is, in effect, available on a continuos basis to handle varying loads but only consumes carbon when contaminants are present in the exhaust stream. Other processes may have significant fuel or chemical operating costs even when no contaminants are being treated.

REACTIVATION

Once the activated carbon has become spent it must be removed from service and replaced with fresh carbon in order to maintain the effectiveness of treatment. The spent carbon can be disposed of and replaced with virgin carbon, or the spent carbon can be returned to the supplier for reactivation and reuse. Reactivation restores most of the original carbon adsorption capacity and avoids expensive disposal costs. Most carbon adsorption applications rely on offsite reactivation to support their activated carbon supply.

The spent carbon can be vacuumed from fixed adsorption vessels and shipped to the reactivation center in bulk, or returned to the reactivation facility in a transportable adsorber that serves both as an adsorption vessel and a UN shipping container.

CAPITAL AND OPERATING COSTS

Adsorption system capital and operating costs can vary widely but depend primarily on the gas volume to be treated and the amount of carbon consumed.

A simple 100 cubic foot per minute adsorption system consisting of two 200 pound canisters and a blower would require about 20 sq ft of area and cost about 2-$3,000. When spent these smaller adsorption units can often be exchanged for new units with the original supplier.

Larger custom carbon adsorption systems can cost from several thousand, up to several hundred thousand dollars, and are usually supported with off site reactivation services.

A 5000 cfm system with two adsorbers and an exhaust blower would have a capital cost in the 30-$40,000 range and if skid mounted would take up an area of about 100sq ft.

The Custom reactivation service to support this system usually costs about $2.00 per pound of carbon processed including transportation.

ACTIVATED CARBON QUALITY

You should be aware that there is a significant difference in adsorption capacity among the various commercial activated carbon products available. When procuring activated carbons it is important to recognize that the value of the activated carbon product that you are purchasing is related to its adsorption capacity, and not its weight or volume.

The carbon manufacturing industry, in conjunction with ASTM, has developed several standard tests that enable comparison of the relative adsorption capacities of various activated carbons. These tests can be used to assess the quality of a virgin or reactivated carbon product and to predict its cost effectiveness.

The industry standard quality tests for VAPOR PHASE activated carbons is the CARBON TETRACHLORIDE ADSORPTION CAPACITY, or ASTM D3467. Typical vapor phase virgin activated carbons have CARBON TETRACHLORIDE ADSORPTION CAPACITIES ranging from 45 to 70 percent by weight.

When procuring either virgin or reactivated carbon products, make sure the appropriate adsorption number is specified. Then compare the alternative product specifications to insure you are getting the best activated carbon value.

SUMMARY

In summary, activated carbon has been shown to be applicable for treatment of a wide variety of environmental contaminants. It is a proven technology that is simple to install and easy to operate and maintain. Capital costs are among the least expensive for most alternative treatment technologies. Operating costs are primarily related to the amount of activated carbon consumed in the adsorption process.

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Attachment 7 Prediction of VOC Adsorption Capacity

Technical Article *Determining VOC Adsorption Capacity* (Yaws 1995)

Determining VOC Adsorption Capacity

Capacity data for the adsorption of VOCs on activated carbon is needed when meeting stricter air regs.

by Carl L. Yaws, Li Bu and Sachin Nijhawan

Physical and thermodynamic property data for organic compounds are especially helpful to engineers and scientists in industry. In particular, capacity data for adsorption of volatile organic compounds (VOCs) on activated carbon is becoming increasingly important in engineering and environmental studies because of more stringent air emissions regulations.

Results are presented for adsorption capacity as a function of the VOC concentration in the gas. The results can be used in engineering and environmental studies. Capacity data resulting from the correlation are useful in the engineering design of carbon adsorption systems to remove trace pollutants from gases. For pollution control to very low emission levels, such systems could include carbon adsorption followed by conventional steam regeneration with solvent recovery, or carbon adsorption followed by thermal or catalytic oxidation.

Adsorption capacity correlation

The correlation for adsorption on activated carbon is based on a logarithmic series expansion of concentration in the gas:

$$\log_{10}Q = A + B\log_{10}y + C[\log_{10}y]^2$$

where Q = adsorption capacity at equilibrium, g of compound/100 g of carbon

y = concentration in gas at 25°C and 1 atm, parts per million by volume, ppmv

A, B and C = correlation constants

The correlation constants (A, B and C) in Table 1 were determined from regression of the available data for adsorption on activated carbon. The tabulation is arranged by carbon number (C1, C2, C3...) so data can be quickly located using the chemical formula.

Estimation equation

In preparing the correlation, a literature search was conducted to identify sources for a database of adsorption capacity values at different concentrations (partial pressures). The database also served to check the accuracy of the correlation.

Adsorption capacity for the remaining compounds was then estimated. The following equation (developed by Calgon) was used to estimate the equilibrium adsorption capacity of activated carbon as a fifth order polynomial function of its adsorption potential:

$$\log_{10}Q = A + B\mu + C\mu^2 + D\mu^3 + E\mu^4 + F\mu^5$$

where Q = adsorption capacity at equilibrium, cm_3 of liquid compound/100 g of carbon

μ = adsorption potential of compound, $T/(V_l\Gamma_l)\log(P_l^{sat}/p_l)$

T = temperature, K

V_l = liquid molar volume of compound, cm^3/g-mol

Γ_l = relative polarizability, $[(n^2-1)(n^2+3)]/[(n^2-1)(n^2+1)]_{n=589nm}$

n = refractive index

P_l^{sat} = vapor pressure of compound, atm

p_l = partial pressure of compound, atm

A = 1.71

B = -1.46E-02

C = 1.65E-03

D = -4.11E-04

E = 3.14E-05

F = -6.75E-07

Examples

The correlation may be used to determine adsorption capacity of activated carbon for pollutants.

For example, the air from a paint-spraying operation contains 10 ppmv of n-butanol ($C_4H_{10}O$). The goal is to estimate the adsorption capacity of activated carbon for removing the pollutant at 25° C and 1 atm.

Substitution of the correlation constants from the table and concentration into the correlation equation yields

$$\log_{10}Q = 0.89881 + 0.32534\log_{10}(10) - 0.03648[\log_{10}(10)]^2 = 1.18767$$

Q = 15.41 g of n-butanol/100 g of carbon

In another case the air from an industrial operation contains 100 ppmv of methyl ethyl ketone (C_4H_8O). The adsorption capacity of activated carbon for removing the pollutant at 25° C and 1 atm must be estimated.

Substitution of the correlation constants from the table and concentration into the correlation equation yields

$$\log_{10}Q = 0.46525 + 0.37688\log_{10}(100) - 0.02803[\log_{10}(100)]^2 = 1.10697$$

Q = 12.79 g of methyl ethyl ketone/100 g of carbon

Operation and design

In actual operation under plant conditions, the capacity of an adsorption bed will seldom achieve equilibrium. Air

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Table 1. Adsorption on Activated Carbon

No.	Formula	Name	$\log_{10} Q = A + B \log_{10} C + C \log_{10}^2 C$			Q: g of compound/100 g of carbon; C: ppmv; gas at 25 °C and 1 atm				
			A	B	C	Min	Max	Q @ 10 ppmv	Q @ 100 ppmv	Q @ 1000 ppmv
1	CBr_3	Bromotrichloromethane	0.139842	0.23228	-0.02384	10	10000	47.69	55.55	79.10
2	CBr_4	Bromotrifluoromethane	-1.46147	0.58161	-0.01044	10	10000	0.13	0.46	1.56
3	CBr_2F_2	Dibromodifluoromethane	0.82076	0.50701	-0.01384	10	10000	23.90	23.96	41.42
4	$CBrF_3$	Tribromofluoromethane	-1.43748	0.55503	-0.00456	10	10000	0.13	0.45	1.54
5	CCl_2F_2	Dichlorodifluoromethane	-0.07150	0.40145	-0.01404	10	10000	2.06	4.71	10.10
6	CCl_2O	Phosgene	-0.64402	0.50429	-0.02950	10	10000	0.65	2.78	7.93
7	$CClF_3$	Trichlorofluoromethane	-0.17907	0.40715	-0.01915	10	10000	3.64	8.14	16.68
8	CCl_3NO_2	Chloropicrin	-1.26745	0.20841	-0.01298	10	10000	29.04	42.93	59.61
9	CCl_4	Carbon Tetrachloride	-0.07481	0.38186	-0.02029	10	10000	21.57	35.29	57.98
10	CH_3Br	Bromomethane	-2.23184	-0.12048	-0.02246	10	7238	81.07	109.89	134.33
11	$CHCl_3$	Chloroform	-0.67102	0.36148	-0.02258	10	10000	40.22	60.07	85.45
12	CHN	Hydrogen Cyanide	-4.39245	1.06948	-0.00740	10	10000	4.95-04	3.25-03	6.41-02
13	CH_2BrCl	Bromochloromethane	0.61396	0.41551	-0.02531	10	10000	10.05	21.87	42.35
14	CH_2BrF	Bromofluoromethane	-0.45483	0.36332	-0.01606	10	10000	6.34	13.10	25.13
15	CH_2Br_2	Dibromomethane	1.06376	0.37211	-0.03238	10	10000	26.32	49.94	85.04
16	CH_2Cl_2	Dichloromethane	-0.88241	0.49210	-0.01269	10	10000	2.37	6.65	15.29
17	CH_3I	Iodomethane	1.34752	0.19984	-0.01247	10	1563	118.66	147.70	169.67
18	CH_2O	Formaldehyde	-2.48524	0.68121	-0.00975	10	10000	1.65-02	7.65-02	0.36
19	CH_2O_2	Formic Acid	-1.77231	1.04503	-0.06134	10	10000	0.14	1.44	8.63
20	CH_3Br	Methyl Bromide	-1.23835	0.78564	-0.05321	10	10000	0.31	3.29	4.19
21	CH_3Cl	Methyl Chloride	-4.83873	0.82853	-0.08449	10	10000	5.05-03	0.39	0.78
22	CH_3Cl_3Si	Methyl Trichlorosilane	0.07158	0.24275	-0.01911	10	10000	23.03	23.27	42.46
23	CH_3I	Methyl Iodide	0.73997	0.32985	-0.01330	10	10000	11.39	22.11	40.72
24	CH_3NO	Formamide	1.30985	0.25374	—	10	80	36.52	—	—
25	CH_3NO_2	Nitromethane	-0.12547	0.70607	-0.05111	10	10000	2.12	7.37	21.36
26	CH_4	Methane	-4.31008	0.77883	-0.00629	10	10000	2.95-04	1.75-03	9.35-03
27	CH_4Cl_2Si	Methyl Dichlorosilane	0.73271	0.29305	-0.01822	10	10000	10.17	17.62	36.04
28	CH_4O	Methanol	-1.36739	0.82107	-0.05389	10	10000	6.95-02	0.42	2.35
29	CH_4S	Methyl Mercaptan	-1.12288	0.60973	-0.02094	10	10000	0.29	1.01	3.21
30	CH_5N	Methylamine	-1.93548	0.64738	-0.01057	10	10000	3.08-02	0.21	0.83
31	CN_2O_2	Tetranitromethane	1.49047	0.18181	-0.01894	10	10000	43.01	60.02	73.35
32	CO	Carbon Monoxide	-5.18782	0.90121	-0.01338	10	10000	3.05-05	3.65-04	2.35-03
33	COS	Carbonyl Sulfide	-1.42882	0.51061	-0.00028	10	10000	0.10	0.39	1.17
34	CO_2	Carbon Dioxide	-0.55724	0.46780	-0.00303	10	10000	4.60-03	2.76-03	2.31-02
35	CS_2	Carbon Disulfide	0.318899	0.47083	-0.01481	10	10000	9.85	14.94	19.32
36	$C_2Br_2F_4$	1,2-Dibromotetrafluoroethane	0.90388	0.25693	-0.00974	10	10000	14.16	22.92	38.84
37	C_2ClF_5	Chloropentafluoroethane	0.08264	0.34756	-0.01343	10	10000	2.61	7.36	10.10
38	$C_2Cl_3F_3$	1,1,2-Trichlorotrifluoroethane	-1.17268	0.12676	-0.01231	10	10000	28.08	39.59	52.79
39	C_2Cl_4	Tetrachloroethylene	-0.40986	0.26903	-0.00097	10	10000	38.17	54.72	69.39
40	$C_2Cl_4F_2$	1,1,2,2-Tetrachlorodifluoroethane	1.33307	0.17625	-0.01465	10	10000	34.25	46.45	58.88
41	$C_2HBrClF_3$	Halothane	0.92405	0.31204	-0.02094	10	10000	16.45	29.38	47.84
42	C_2HCl_3	Trichloroethylene	1.04851	0.29929	-0.02319	10	10000	19.66	33.20	49.38
43	C_2H_3ClO	Dichloroacetyl Chloride	1.13647	0.26219	-0.00596	10	10000	28.76	45.39	61.37
44	C_2H_3ClO	Monochloroacetaldehyde	1.13362	0.26923	-0.02513	10	10000	26.19	40.98	57.09
45	C_2HCl_5	Pentachloroethane	1.64586	0.13515	-0.01372	10	4829	38.22	71.30	81.22
46	$C_2HCl_3O_2$	Trichloroacetic Acid	-0.12577	0.91973	-0.03445	10	10000	2.73	8.39	22.15
47	C_2H_2	Acetylene	-2.34177	0.82454	-0.03360	10	10000	3.52-02	0.19	0.84
48	$C_2H_2Br_4$	1,1,2,2-Tetrabromoethane	—	—	—	—	—	146.03	—	—
49	$C_2H_2Cl_2$	1,1-Dichloroethylene	0.48740	0.33282	-0.01623	10	10000	6.37	13.25	21.87
50	$C_2H_2Cl_2$	cis-1,2-Dichloroethylene	0.47567	0.36061	-0.03534	10	10000	6.90	13.28	26.16
51	$C_2H_2Cl_2$	trans-1,2-Dichloroethylene	0.46867	0.35781	-0.03534	10	10000	6.93	14.28	26.16
52	$C_2H_2Cl_2O_2$	Dichloroacetic Acid	1.05737	0.05830	—	10	235	61.47	76.23	—
53	$C_2H_2Cl_4$	1,1,1,2-Tetrachloroethane	1.44097	0.19166	-0.01399	10	10000	40.99	55.52	68.61
54	$C_2H_2Cl_4$	1,1,2,2-Tetrachloroethane	1.52322	0.17848	-0.02019	10	6073	48.03	63.01	75.13
55	C_2H_3Cl	Vinyl Chloride	-0.98889	0.56564	-0.04320	10	10000	0.43	3.48	4.16
56	C_2H_3ClO	Acetyl Chloride	0.03627	0.45326	-0.02073	10	10000	2.96	7.30	16.35
57	$C_2H_3ClO_2$	Methyl Chloroformate	0.41186	0.42776	-0.02775	10	10000	6.49	14.33	27.88
58	$C_2H_3Cl_3$	1,1,1-Trichloroethane	0.97331	0.28737	-0.02277	10	10000	17.29	28.64	42.70
59	$C_2H_3Cl_3$	1,1,2-Trichloroethane	1.17153	0.27281	-0.02245	10	10000	26.43	41.46	57.31
60	C_2H_3N	Acetonitrile	-0.79866	0.63312	-0.02598	10	10000	0.65	3.34	7.50
61	C_2H_3NO	Methyl Isocyanate	-1.32579	0.85881	-0.06875	10	10000	0.52	2.32	7.62
62	C_2H_4	Ethylene	-2.27102	0.61731	-0.01467	10	10000	2.18-02	8.08-02	0.28
63	$C_2H_4Br_2$	1,1-Dibromoethane	1.37260	0.25671	-0.02516	10	10000	40.19	61.01	87.48
64	$C_2H_4Br_2$	1,2-Dibromoethane	1.44231	0.23590	-0.02669	10	10000	46.84	70.09	92.77
65	$C_2H_4Cl_2$	1,1-Dichloroethane	0.54485	0.36091	-0.02192	10	10000	7.85	15.10	26.93
66	$C_2H_4Cl_2$	1,2-Dichloroethane	0.55143	0.37077	-0.02161	10	10000	7.99	16.16	29.29
67	$C_2H_4Cl_2O$	Bischloromethylether	0.95599	0.33784	-0.03200	10	10000	18.27	31.89	48.04
68	$C_2H_4O_2$	1,2-Dihydroxyethane	-3.97902	2.57852	-0.31617	10	10000	0.02	0.62	5.58
69	$C_2H_4O_3$	Acetaldehyde	-0.27857	0.60756	-0.02425	10	10000	0.27	0.97	3.09
70	C_2H_4O	Ethylene Oxide	-2.42379	0.94378	-0.04032	10	10000	0.03	0.20	1.14
71	$C_2H_4O_2$	Acetic Acid	-0.05535	0.58446	-0.06027	10	10000	3.70	11.74	28.21
72	$C_2H_4O_2$	Methyl Formate	-0.93586	0.51693	-0.01847	10	10000	0.40	3.46	4.88
73	C_2H_4S	Thiacyclopropane	0.03238	0.45520	-0.02154	10	10000	2.66	7.03	15.64
74	C_2H_5Br	Bromoethane	0.31783	0.43549	-0.03072	10	10000	5.26	11.64	23.27
75	C_2H_5Cl	Ethyl Chloride	-0.50628	0.50364	-0.02129	10	10000	0.54	2.58	6.40
76	C_2H_5ClO	2-Chloroethanol	0.74164	0.46953	-0.03138	10	9446	14.43	28.78	48.46
77	C_2H_5I	Ethyl Iodide	-1.00356	0.32123	-0.02405	10	10000	19.99	35.47	56.33
78	C_2H_5N	Ethylenimine	-1.16913	0.91238	-0.07400	10	10000	0.47	2.28	7.68
79	C_2H_5NO	N-Methylformamide	1.25333	0.21723	—	10	333	28.22	46.54	—
80	$C_2H_5NO_2$	Nitroethane	0.64966	0.49706	-0.04612	10	10000	7.96	18.17	33.56
81	C_2H_6	Ethane	-2.83393	0.66107	-0.01935	10	10000	1.85-02	7.65-02	0.29
82	C_2H_6O	Ethanol	-0.26133	0.67536	-0.04495	10	10000	1.32	4.57	12.93
83	C_2H_6OS	Dimethyl Sulfoxide	1.24042	0.31302	-0.04768	10	802	32.03	47.40	—

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Table 1. Adsorption on Activated Carbon

No.	Formula	Name	A	B	C	Min	Max	Q @ 10 ppmv	Q @ 100 ppmv	Q @ 1000 ppmv
			Log Q = A + B Log y + C (Log y)²					(Q = g of compound/100 g of carbon; y = ppmv in gas at 25 C and 1 atm)		
84	$C_2H_6O_2$	Ethylene Glycol	1.40474	0.18738	-0.02662	10	125	36.77	47.09	—
85	$C_2H_6O_4S$	Dimethyl Sulfate	1.34612	0.21539	-0.02336	10	890	34.53	48.23	—
86	C_2H_6S	Dimethyl Sulfide	0.48472	0.37358	-0.02770	10	10000	6.77	13.32	22.71
87	C_2H_6S	Ethyl Mercaptan	0.00252	0.40506	-0.01802	10	10000	2.47	5.54	11.44
88	$C_2H_6S_2$	Dimethyl Disulfide	0.78878	0.35924	-0.02953	10	10000	12.28	22.87	37.23
89	C_2H_7N	Dimethylamine	-1.22492	0.63962	-0.03266	10	10000	0.24	0.84	2.57
90	C_2H_7NO	Monoethanolamine	1.21569	0.21994	—	10	485	27.27	45.24	—
91	$C_2H_8N_2$	Ethylenediamine	0.56304	0.46307	-0.04789	10	10000	9.38	12.94	33.36
92	C_3H_3Cl	Propargyl Chloride	0.27135	0.40480	-0.02135	10	10000	4.52	9.90	19.56
93	C_3H_3N	Acrylonitrile	0.07669	0.49986	-0.03500	10	10000	3.48	8.64	18.25
94	C_3H_3NO	Oxazole	0.63350	0.30620	-0.02150	10	10000	8.25	14.19	21.91
95	C_3H_4	Methylacetylene	[illegible]	[illegible]	[illegible]	10	10000	[illegible]	1.26	5.83
96	$C_3H_4Cl_2$	2,3-Dichloropropene	0.93417	0.30034	-0.02614	10	10000	16.92	28.20	41.68
97	C_3H_4O	Acrolein	-0.29632	0.49437	-0.02471	10	10000	1.48	3.92	9.21
98	C_3H_4O	Propargyl Alcohol	0.22971	0.37711	-0.05441	10	10000	3.65	14.67	29.81
99	$C_3H_4O_2$	Acrylic Acid	0.75549	0.47108	-0.05615	10	5221	14.81	29.72	46.06
100	$C_3H_4O_3$	Pyruvic Acid	1.07410	0.41416	-0.05768	10	1629	26.95	46.95	62.72
101	C_3H_5Br	3-Bromo-1-Propene	0.84875	0.32392	-0.02398	10	10000	14.06	25.12	40.19
102	C_3H_5Cl	3-Chloropropene	0.32792	0.36553	-0.01853	10	10000	4.73	9.66	18.10
103	C_3H_5ClO	alpha-Epichlorohydrin	0.83203	0.38983	-0.03932	10	10000	15.22	28.47	44.42
104	$C_3H_5ClO_2$	Methyl Chloroacetate	1.07657	0.32514	-0.03617	10	9959	23.20	38.21	53.27
105	$C_3H_5ClO_2$	Ethyl Chloroformate	0.94907	0.32529	-0.03309	10	10000	17.43	28.62	43.33
106	$C_3H_5Cl_3$	1,2,3-Trichloropropane	1.37241	0.19136	-0.02165	10	4843	42.87	56.04	66.32
107	C_3H_5I	3-Iodo-1-Propene	1.33638	0.24222	-0.02373	10	10000	35.96	53.70	72.21
108	C_3H_5N	Propionitrile	[illegible]	[illegible]	[illegible]	10	10000	3.46	8.77	18.68
109	C_3H_5NO	Hydracrylonitrile	1.50494	0.11032	—	10	105	41.72	53.79	—
110	C_3H_5NO	Lactonitrile	1.44356	0.22589	—	10	157	37.02	49.58	—
111	C_3H_6	Propylene	-0.93674	0.57775	-0.03833	10	10000	0.40	1.16	2.82
112	$C_3H_6Cl_2$	1,1-Dichloropropane	0.95379	0.28791	-0.02487	10	10000	16.48	26.92	39.24
113	$C_3H_6Cl_2$	1,2-Dichloropropane	0.98873	0.28700	-0.03573	10	10000	17.78	28.83	41.53
114	$C_3H_6Cl_2$	1,3-Dichloropropane	1.10340	0.27837	-0.02824	10	10000	22.57	35.23	48.35
115	$C_3H_6Cl_2$	2,2-Dichloropropane	0.85314	0.29433	-0.02253	10	10000	13.33	22.47	34.13
116	[illegible]	Acetone	[illegible]	[illegible]	[illegible]	10	10000	2.03	5.16	11.95
117	C_3H_6O	Allyl Alcohol	0.32390	0.49358	-0.04370	10	10000	5.94	13.69	25.80
118	[illegible]	n-Propionaldehyde	[illegible]	[illegible]	[illegible]	10	10000	3.23	7.53	14.37
119	C_3H_6O	1,2-Propylene Oxide	-0.42829	0.53458	-0.02757	10	10000	1.21	3.46	8.70
120	C_3H_6O	1,3-Propylene Oxide	-0.50821	0.51872	-0.03296	10	10000	0.96	2.70	7.00
121	$C_3H_6O_2$	Ethyl Formate	0.12618	0.42260	-0.02090	10	10000	2.37	7.72	16.06
122	$C_3H_6O_2$	Methyl Acetate	0.13314	0.42849	-0.02188	10	10000	3.42	7.99	16.66
123	$C_3H_6O_2$	Propionic Acid	0.77846	0.44570	-0.05209	10	4672	14.86	28.94	44.34
124	$C_3H_6O_2S$	3-Mercaptopropionic Acid	1.68823	0.05916	—	10	66	55.90	—	—
125	$C_3H_6O_3$	Lactic Acid	1.60732	0.09225	—	10	107	50.06	63.30	—
126	$C_3H_6O_3$	Methoxyacetic Acid	1.61885	0.08873	—	10	77	51.00	—	—
127	C_3H_6S	Thiacyclobutane	0.67420	0.37228	-0.03151	10	10000	10.35	19.62	32.16
128	C_3H_7Br	1-Bromopropane	0.83601	0.32409	-0.02407	10	10000	13.68	24.43	39.04
129	C_3H_7Br	2-Bromopropane	0.81157	0.31043	-0.02155	10	10000	12.60	22.16	35.37
130	C_3H_7Cl	Isopropyl Chloride	0.33428	0.34279	-0.01661	10	10000	4.42	8.78	16.15
131	C_3H_7Cl	n-Propyl Chloride	0.40353	0.34678	-0.01951	10	10000	5.36	10.41	18.53
132	C_3H_7I	Isopropyl Iodide	1.28496	0.24152	-0.02122	10	10000	30.54	46.01	62.85
133	C_3H_7I	n-Propyl Iodide	1.30623	0.24227	-0.02250	10	10000	33.57	50.31	67.28
134	C_3H_7N	Allylamine	0.16250	0.39815	-0.03105	10	10000	3.46	7.49	14.71
135	C_3H_7N	Propyleneimine	0.06918	0.43329	-0.02393	10	10000	3.03	7.05	14.75
136	C_3H_7NO	N,N-Dimethylformamide	0.90253	0.37875	-0.04523	10	5220	17.22	30.14	42.83
137	$C_3H_7NO_2$	1-Nitropropane	0.91323	0.34648	-0.03730	10	10000	16.69	28.64	41.40
138	$C_3H_7NO_2$	2-Nitropropane	0.83248	0.35732	-0.03608	10	10000	14.25	25.28	37.99
139	[illegible]	Propane	[illegible]	[illegible]	[illegible]	10	10000	0.47	1.23	2.89
140	[illegible]	Isopropanol	[illegible]	[illegible]	[illegible]	10	10000	3.00	11.30	21.53
141	[illegible]	n-Propanol	[illegible]	[illegible]	[illegible]	10	10000	6.82	14.69	26.42
142	$C_3H_8O_2$	2-Methoxyethanol	0.74339	0.41792	-0.04336	10	10000	13.06	24.99	38.81
143	$C_3H_8O_2$	Methylal	0.19079	0.38167	-0.01775	10	10000	3.58	7.64	15.00
144	$C_3H_8O_2$	1,2-Propylene Glycol	1.48275	0.11594	—	10	170	39.69	51.84	—
145	$C_3H_8O_2$	1,3-Propylene Glycol	1.58563	0.08395	—	10	58	46.73	—	—
146	C_3H_8S	n-Propylmercaptan	0.39031	0.31407	-0.02190	10	10000	7.63	13.52	21.63
147	C_3H_8S	Isopropyl Mercaptan	0.35779	0.31539	-0.02051	10	10000	7.12	12.78	20.86
148	C_3H_8S	Ethyl-Methyl-Sulfide	0.62830	0.31889	-0.02320	10	10000	8.39	14.90	23.78
149	C_3H_9N	n-Propylamine	0.05768	0.34918	-0.01241	10	10000	2.48	5.09	9.85
150	C_3H_9N	Isopropylamine	0.07464	0.37106	-0.01568	10	10000	2.69	5.68	11.14
151	C_3H_9N	Trimethylamine	[illegible]	[illegible]	[illegible]	10	10000	1.69	3.50	7.13
152	C_3H_9NO	1-Amino-2-Propanol	1.25496	0.27456	-0.04254	10	817	30.69	43.04	—
153	C_3H_9NO	3-Amino-1-Propanol	1.53733	0.08156	—	10	101	41.58	50.17	—
154	C_3H_9NO	Methylethanolamine	1.14745	0.30208	-0.04243	10	1422	25.53	38.18	46.97
155	$C_3H_9O_3P$	Trimethyl-Phosphite	1.00568	0.21001	-0.01402	10	10000	15.91	23.42	32.32
156	$C_3H_9O_4P$	Trimethyl Phosphate	1.48463	0.16933	-0.02290	10	3196	40.76	53.91	61.17
157	$C_3H_{10}N_2$	1,2-Propanediamine	0.90237	0.31904	-0.03400	10	10000	13.40	25.38	35.77
158	[illegible]	Furan	[illegible]	[illegible]	[illegible]	10	10000	2.70	6.14	12.99
159	$C_4H_4O_2$	Diketene	0.87430	0.37094	-0.03862	10	10000	16.06	28.69	42.71
160	C_4H_4S	Thiophene	0.80753	0.32166	-0.02554	10	10000	12.67	22.32	34.17
161	C_4H_5Cl	Chloroprene	0.72957	0.29786	-0.02111	10	10000	10.19	17.41	27.13
162	C_4H_5N	trans-Crotonitrile	0.70791	0.37264	-0.03756	10	10000	11.05	20.11	30.79
163	C_4H_5N	cis-Crotonitrile	0.58137	0.39427	-0.03590	10	10000	8.70	16.94	27.61
164	C_4H_5N	Methacrylonitrile	0.46655	0.38890	-0.03042	10	10000	6.86	13.26	22.68
165	C_4H_5N	Pyrrole	0.83125	0.38413	-0.04217	10	10000	14.90	26.97	40.19
166	C_4H_5N	Vinylacetonitrile	0.61844	0.40844	-0.04032	10	10000	9.70	18.80	30.26
167	$C_4H_5NO_2$	Methyl Cyanoacetate	1.56587	0.05143	—	10	180	45.43	56.07	—
168	C_4H_6	1,3-Butadiene	-0.03359	0.34764	-0.01297	10	10000	2.00	4.07	7.83
169	C_4H_6	Dimethylacetylene	-0.06673	0.35387	-0.01524	10	10000	2.05	4.37	8.50
170	C_4H_6	Ethylacetylene	-0.02918	0.33636	-0.01036	10	10000	1.98	3.98	7.67
171	$C_4H_6Cl_2$	1,3-Dichloro-trans-2-Butene	1.30208	0.15939	-0.02031	10	10000	30.24	41.42	51.53
172	$C_4H_6Cl_2$	1,4-Dichloro-cis-2-Butene	1.40115	0.17626	-0.02041	10	5363	36.27	47.54	56.73

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Table 1. Adsorption on Activated Carbon

			Log Q = A + B Log y + C Log y²			Q = g of compound/100 g of carbon; y = ppmv in gas at 25 C and 1 atm				
No.	Formula	Name	A	B	C	Min	Max	Q @ 10 ppmv	Q @ 100 ppmv	Q @ 1000 ppmv
173	$C_4H_6Cl_2$	1,4-Dichloro-trans-2-Butene	1.040924	0.18120	-0.02179	10	4503	27.02	46.34	57.09
174	$C_4H_6Cl_2$	3,4-Dichloro-1-Butene	1.23394	0.21475	-0.02135	10	10000	26.75	37.85	48.54
175	C_4H_6O	trans-Crotonaldehyde	0.68353	0.35560	-0.03400	10	10000	10.35	19.00	29.81
176	$C_4H_6O_2$	2,5-Dihydrofuran	[illegible]	[illegible]	[illegible]	10	10000	3.20	11.03	20.02
177	C_4H_6O	Methacrolein	0.45461	0.37859	-0.02474	10	10000	6.03	11.99	21.01
178	$C_4H_6O_2$	gamma-Butyrolactone	[illegible]	[illegible]	[illegible]	10	591	35.07	50.39	—
179	$C_4H_6O_2$	Cis-Crotonic Acid	1.30871	0.25908	-0.01752	10	775	33.21	45.28	—
180	$C_4H_6O_2$	Methacrylic Acid	1.23099	0.27648	-0.03903	10	1292	29.45	42.44	51.19
181	$C_4H_6O_2$	Methyl Acrylate	0.45888	0.32104	-0.02001	10	10000	3.75	10.49	17.45
182	$C_4H_6O_2$	Vinyl Acetate	0.61067	0.34787	-0.02585	10	10000	8.56	16.95	26.36
183	$C_4H_6O_3$	Acetic Anhydride	1.07388	0.31683	-0.01375	10	7174	22.03	33.69	48.37
184	C_4H_7N	n-Butyronitrile	[illegible]	[illegible]	[illegible]	10	10000	8.83	18.45	29.02
185	C_4H_7N	Isobutyronitrile	0.56697	0.36807	-0.03537	10	10000	8.11	15.32	25.90
186	C_4H_7NO	3-Methoxypropionitrile	1.13283	0.28534	-0.03732	10	2398	24.04	35.93	44.96
187	C_4H_8	1-Butene	0.07313	0.32701	-0.01452	10	10000	2.43	4.87	8.38
188	$C_4H_8Br_2$	1,2-Dibromobutane	1.69234	0.17766	-0.01467	10	4094	63.63	77.23	87.72
189	$C_4H_8Br_2$	2,3-Dibromobutane	1.68176	0.12916	-0.01462	10	4934	66.52	75.93	86.13
190	$C_4H_8Cl_2$	1,4-Dichlorobutane	1.38278	0.17796	-0.02030	10	5427	34.73	45.45	54.20
191	C_4H_8O	n-Butyraldehyde	[illegible]	[illegible]	[illegible]	10	10000	6.37	12.31	21.36
192	C_4H_8O	Isobutyraldehyde	0.39515	0.36715	-0.02179	10	10000	5.45	10.77	19.08
193	C_4H_8O	1,2-Epoxybutane	0.36719	0.37654	-0.02360	10	10000	5.35	10.61	19.25
194	C_4H_8O	Methyl Ethyl Ketone	[illegible]	[illegible]	[illegible]	10	10000	6.52	12.79	22.07
195	C_4H_8O	Ethyl Vinyl Ether	0.33331	0.33471	-0.01711	10	10000	4.47	8.59	15.29
196	C_4H_8O	Tetrahydrofuran	[illegible]	[illegible]	[illegible]	10	10000	4.36	8.70	16.93
197	$C_4H_8O_2$	Isobutyric Acid	1.14021	0.25064	-0.03833	10	2338	24.66	36.89	46.27
198	$C_4H_8O_2$	n-Butyric Acid	[illegible]	[illegible]	[illegible]	10	1244	28.40	40.37	48.30
199	$C_4H_8O_2$	1,4-Dioxane	0.66751	0.35706	-0.03034	10	10000	8.99	16.65	30.27
200	$C_4H_8O_2$	Ethyl Acetate	[illegible]	[illegible]	[illegible]	10	10000	8.59	16.49	26.74
201	$C_4H_8O_2$	Methyl Propionate	0.64473	0.34862	-0.02757	10	10000	8.20	16.96	27.52
202	$C_4H_8O_2$	n-Propyl Formate	0.65855	0.34346	-0.02530	10	10000	9.43	17.59	27.62
203	$C_4H_8O_2S$	Sulfolane	1.77762	0.00018	0.00005	10	10000	60.10	60.28	63.48
204	C_4H_8S	Tetrahydrothiophene	0.93777	0.33197	-0.02872	10	10000	17.62	27.37	38.44
205	C_4H_9Br	1-Bromobutane	1.16698	0.24283	-0.02270	10	10000	24.44	36.62	48.44
206	C_4H_9Br	2-Bromobutane	1.13872	0.24481	-0.02203	10	10000	22.99	34.69	47.30
207	C_4H_9Cl	n-Butyl Chloride	0.80024	0.29114	-0.02370	10	10000	11.69	19.40	29.87
208	C_4H_9Cl	sec-Butyl Chloride	0.75046	0.29132	-0.02212	10	10000	10.46	17.58	26.53
209	C_4H_9Cl	tert-Butyl Chloride	0.68573	0.28579	-0.01944	10	10000	8.97	15.12	23.92
210	C_4H_9N	Pyrrolidine	[illegible]	[illegible]	[illegible]	10	10000	6.72	18.37	28.76
211	C_4H_9NO	N,N-Dimethylacetamide	1.20026	0.25114	-0.03263	10	2611	26.23	37.34	45.74
212	C_4H_9NO	Morpholine	1.00573	0.30572	-0.03294	10	10000	19.03	30.65	42.41
213	C_4H_{10}	n-Butane	[illegible]	[illegible]	[illegible]	10	10000	2.28	4.50	8.25
214	C_4H_{10}	Isobutane	[illegible]	[illegible]	[illegible]	10	10000	2.02	4.09	7.47
215	$C_4H_{10}O$	n-Butanol	0.99861	0.32534	-0.03648	10	9276	15.41	25.33	35.20
216	$C_4H_{10}O$	sec-Butanol	[illegible]	[illegible]	[illegible]	10	10000	12.01	20.93	31.15
217	$C_4H_{10}O$	Diethyl Ether	0.32377	0.35042	-0.01216	10	10000	4.74	7.35	11.09
218	$C_4H_{10}O$	Methyl-Propyl-Ether	0.36764	0.32893	-0.01787	10	10000	4.77	9.00	13.52
219	$C_4H_{10}O$	Methyl Isopropyl Ether	0.36373	0.33940	-0.01647	10	10000	4.64	8.64	14.92
220	$C_4H_{10}O_2$	Isobutanol	0.84338	0.33335	-0.03559	10	10000	3.94	23.39	33.30
221	$C_4H_{10}O_2$	1,3-Butanediol	—	—	—	—	—	48.89	—	—
222	$C_4H_{10}O_2$	1,4-Butanediol	—	—	—	—	—	51.19	—	—
223	$C_4H_{10}O_2$	2,3-Butanediol	1.50442	0.09239	—	10	239	39.70	49.11	—
224	$C_4H_{10}O_2$	t-Butyl Hydroperoxide	1.08563	0.25496	-0.03035	10	7898	20.90	31.20	40.45
225	$C_4H_{10}O_2$	1,2-Dimethoxyethane	0.74981	0.33330	-0.02616	10	10000	10.89	18.70	28.46
226	$C_4H_{10}O_2$	2-Ethoxyethanol	1.07971	0.27797	-0.03199	10	6983	21.14	32.14	42.16
227	$C_4H_{10}O_4S$	Diethyl Sulfate	1.64792	0.05935	—	10	278	50.82	58.08	—
228	$C_4H_{10}S$	n-Butyl Mercaptan	0.98089	0.24388	-0.02251	10	10000	15.93	23.91	32.35
229	$C_4H_{10}S$	Isobutyl Mercaptan	0.93709	0.24802	-0.02179	10	10000	14.57	22.18	30.35
230	$C_4H_{10}S$	sec-Butyl Mercaptan	0.92387	0.24856	-0.02146	10	10000	14.12	21.39	29.88
231	$C_4H_{10}S$	tert-Butyl Mercaptan	0.84180	0.24917	-0.01939	10	10000	11.85	18.41	26.15
232	$C_4H_{10}S_2$	Diethyl Sulfide	0.85983	0.23457	-0.02185	10	10000	15.23	22.98	31.35
233	$C_4H_{10}S_2$	Isopropyl-Methyl-Sulfide	0.92769	0.24689	-0.02133	10	10000	14.23	21.69	29.95
234	$C_4H_{10}S_2$	Methyl-Propyl-Sulfide	0.97217	0.24453	-0.02229	10	10000	15.65	23.55	32.00
235	$C_4H_{10}S_2$	Diethyl Disulfide	1.42394	0.12564	-0.01373	10	5627	34.56	41.91	47.79
236	$C_4H_{11}N$	n-Butylamine	0.64570	0.31857	-0.02370	10	10000	8.88	15.14	23.45
237	$C_4H_{11}N$	Isobutylamine	0.60137	0.31338	-0.02369	10	10000	7.82	13.72	21.59
238	$C_4H_{11}N$	sec-Butylamine	0.57706	0.31234	-0.02250	10	10000	7.36	12.95	20.32
239	$C_4H_{11}N$	tert-Butylamine	0.50039	0.30334	-0.01857	10	10000	6.09	10.74	17.17
240	$C_4H_{11}N$	Diethylamine	0.54770	0.30799	-0.02107	10	10000	6.83	12.01	19.14
241	$C_4H_{11}NO$	Dimethylethanolamine	1.16381	0.23249	-0.02857	10	4163	24.42	34.24	42.69
242	$C_4H_{12}Si$	Tetramethylsilane	0.70867	0.23089	-0.01505	10	10000	8.42	12.69	18.45
243	$C_4H_{13}N_3$	Diethylene Triamine	1.54270	0.06479	—	10	308	40.50	47.02	—

stripper bed capacity is said to be 30 percent to 40 percent of equilibrium for plant operating conditions. The EPA Design Manual suggests a working factor of 3 for design of adsorption beds. The total carbon requirements for an adsorption system are obtained by determining carbon required from equilibrium capacity and then multiplying by the working factor.

Factors affecting adsorption bed capacity include loss due to adsorption zone, loss due to heat wave (adsorption is an exothermic process); loss due to moisture in entering gas and loss due to residual moisture on the carbon.

Carl L. Yaws is a professor of chemical engineering at Lamar University, Beaumont, Texas, and Li Hu and Sachin Nijhawan are graduate students at Lamar University. A computer program with data for all compounds is available for a fee from Yaws at 409-880-8787.

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Attachment 2

Estimated Organic Emissions from Process Cells (24590-WTP-HAC-50-00001, Rev C)

Attachment 2
Estimated Organic Emissions from Process Cells (24590-WTP-HAC-50-00001, Rev C)

Orientation

This report documents the methods, calculations, and results associated with organic emission from process cells.

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DATE

Calculation Cover Sheet

RIVER PROTECTION PROJECT-WASTE TREATMENT PLANT	JOB NO.: 24590
CALC NO. 24590-WTP-HAC-50-00001	GROUP E&NS
SUBJECT Estimated Organic Emissions from Process Cells	

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Originator – John Sipkowski
Reviewer – Lee Bostic
Approver – Phil Peistrup

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B	Preliminary Calculation. Table 1 from Version A deleted. The summary was revised accordingly.	47	47	J. Sipkowski	L. Bostic	P. Peistrup	10/3/02 7-15-03
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RECORD OF REVISIONS

BY: John Sipkowski

DATE: July 9, 2003

SUBJECT: Estimated Organic Emissions from Process Cells

Contents

Sheet 1. Contents and Acronyms

Sheet 2. Discussion

Sheet 8. References

Sheet 10. Appendix A. Excel Worksheets: Table 1 through Table 9

Acronyms

EPA	US Environmental Protection Agency
HEPA	high efficiency particulate air (filter)
HLW	high-level waste
LAW	low-activity waste
PICs	products of incomplete combustion
SOCMI	synthetic organic chemical manufacturing industry
WAC	Washington Administrative Code
WTP	Hanford Tank Waste Treatment and Immobilization Plant

BY: John Sipkowski
DATE: July 9, 2003

SUBJECT: Estimated Organic Emissions from Process Cells

Summary

This calculation estimates the potential emission of organic compounds from ancillary equipment located within the Hanford Tank Treatment and Immobilization Plant (WTP) process cells. First, the release of organic compounds from ancillary equipment into the process cells was estimated. The release amount was then apportioned to each individual organic compound. Only a portion of the released organic material will result in uncontrolled emission. Particulate and particle-bound organics will be abated by the HEPA filters in the process cell offgas treatment system. The vapor phase will not be abated by the HEPA filters and will comprise the potential organic emissions from the process cells.

1 Introduction

This calculation estimates the potential emission of organic compounds from the WTP process cells as a result of treating the Hanford tank waste. The process cells will be operated under negative pressure with respect to atmospheric pressure, and the air from the process cells will be released to the atmosphere through a stack or flue. According to the Washington Administrative Code (WAC), WAC 173-400-030(32), fugitive emissions "means emissions which do not pass and which could not reasonably pass through a stack, chimney, vent, or other functionally equivalent opening." Consequently, the Washington State Department of Ecology (Ecology) has agreed (CCN 023430) that fugitive emissions are not applicable to the WTP. However, Ecology requested that the WTP estimate the potential emission of organic compounds that are not abated by the WTP offgas treatment systems.

In response to that request, this calculation estimates the potential unabated emission of organic compounds from the WTP process cells. This estimate is based upon Environmental Protection Agency (EPA) guidance documents. The emission estimate was made using the following process:

- Estimate the annual release of organic material into the process cells from ancillary equipment for the pretreatment plant, the low-activity waste (LAW) vitrification plant, and the high-level waste (HLW) vitrification plant
- Determine the weight fraction of individual organic compounds in the streams being evaluated
- Apportion the annual release of organic material to the individual organic compounds
- Apply ventilation abatement to the applicable organic compounds

This process resulted in an estimate of the potential emission of each organic compound from the pretreatment plant, the LAW plant, and the HLW plant process cells given in Appendix A, Tables 7, 8, and 9, respectively.

The scope of this calculation is limited to providing an estimate of potential organic compound emission from process cells to support the WTP risk assessment process.

2 Release Calculation Methodology

Building ventilation and process offgases will be treated by abatement systems that employ best available control technology for criteria pollutants, radionuclides, and toxic air pollutants prior to discharge into the atmosphere through a stack or flue. Organic compounds may be released into the process cells from ancillary equipment. Process cell ventilation will be treated by high efficiency particulate air (HEPA)

filters that will abate particulate or particle bound organic compounds. Vapor phase organic compounds will not be abated by the HEPA filters and are considered in this calculation to be process cell organic emissions.

The following sections present the formula for estimating the release of organic compounds from ancillary equipment within process cells and describes adjustments to the formula based upon the design and operation of the WTP.

2.1 Release Calculation Formula

The estimated release of organic material from ancillary equipment was calculated using the EPA guidance document, *Protocol for Equipment Leak Emission Estimates* (EPA 1995). This guidance provides several different methods to determine releases. The guidance recommends using the method that best matches the type of process being evaluated and the data available on that process. Since the WTP is not in operation, actual release measurements are not available, thus average release factors, given in the guidance, were used for the calculation. The formula for estimating releases using the average release factors is:

$$E_{HO} = N \cdot R_{avg} \cdot WF_s \cdot H$$

Where:

E_{HO} = estimated annual release of organic compounds, kg/year
N = ancillary equipment count by equipment type
R_{avg} = average release factor by equipment type, kg/hour
H = hours of operation, hours/year
WF_S = weight fraction of organic material by waste stream

An explanation of each formula value is discussed in the following sections, and the calculations are presented in Appendix A, Table 1.

2.2 Count of Ancillary Equipment by Equipment Type

The EPA guidance (EPA 1995) determined that the following ancillary equipment types are sources of potential release:

- Valves
- Pump seals
- Compressor seals
- Pressure relief valves
- Connectors
- Agitator seals
- Open-ended lines
- Sampling connections

The potential to emit for each of these ancillary equipment types are discussed below as they pertain to the design and operation of the WTP.

Valves

Valves that contact the waste were included in the release estimate.

Pumps

Reverse flow diverter pumps were not considered in this calculation since these offgases will be captured in process vessel ductwork, treated by the offgas treatment train, and released from the plant stack. The resultant estimated emissions are already included in the *Integrated Emissions Baseline Report for the Hanford Tank Waste Treatment and Immobilization Plant (*Emission Baseline Report) (24590-WTP-RPT-PO-03-008).

The WTP will also use conventional, centrifugal pumps. Centrifugal pumps that contact the waste will be equipped with double mechanical seals with an inert barrier fluid at greater pressure than the waste. It is assumed that there is no potential for releases from these pumps.

Compressors

The design of the WTP does not include compressors that contact the waste.

Pressure relief valves

Pressure relief valves on the process vessels and tanks were not considered sources of release in this calculation since all of the process vessels and tanks that manage the Hanford tank waste will operate under one to two inches of water gauge vacuum. The EPA guidance (EPA 1995) considers equipment under vacuum to be zero release.

Connections

Welded connections are considered to be zero release in the EPA guidance (EPA 1995). Other types of connectors such as gasketed flanged connections that contact the waste were included in this release estimate.

Agitator seals

Most of the process vessels that are agitated will use pulse jet mixers located within the vessels being agitated. Emissions from pulse jet mixers were not considered in this calculation since these offgases will be captured in the process vessel ductwork, treated by the offgas treatment train, and released from the plant stacks. The resultant estimated emissions are already included in the Emission Baseline Report (24590-WTP-RPT-PO-03-008).

Certain vessels will employ mechanical agitators that do employ a seal. These seals will be in the vapor space of the vessel, and the vessels will be under one to two inches of water gauge vacuum. The EPA guidance (EPA 1995) considers equipment under vacuum to be zero release.

Open-ended lines

The design of the WTP does not include open-ended lines.

Sampling systems

Sampling systems in the WTP will be closed-loop and are considered in the EPA guidance (EPA 1995) to be zero emission.

Thus, this calculation includes release calculations for valves and gasketed flanged type connectors that will contact the Hanford tank waste.

The ancillary equipment count by equipment type, N, is given in Appendix A, Table 1. The count of connectors that contact the Hanford tank waste was provided by Melter Systems (CCN 068046, CCN 068047) and the Pretreatment Jumper Group (CCN 068045). The count of valves was taken from the Plant Item List (PIL-4.08.06).

2.3 Average Release Factors

The EPA developed the average release factors through extensive measurements of actual processes in operation. This calculation used average release factors developed for the synthetic organic chemical manufacturing industry (SOCMI) since the processes proposed for the WTP are similar to the processes used in SOCMI.

The SOCMI average release factors for valves are based upon the type of service. The EPA guidance (EPA 1995) defines the types of service as:

- Gas/vapor – material in a gaseous state at operating conditions;
- Light liquid – material in a liquid state in which the sum of the concentrations of individual constituents with a vapor pressure over 0.3 kilopascals at 20° C is greater than or equal to twenty weight percent; or,
- Heavy liquid – not in gas/vapor service or light liquid service.

The release factor for heavy liquid service was used in this calculation since the *RPP-WTP Waste Feed Assessment* report (RPT-24590-EN00003) determined the total organic carbon content of the Hanford waste to be bounded at four weight percent.

The average release factor for connectors is the same regardless of the type of service. The average release factors, R_{avg}, applicable to the WTP are shown in Appendix A, Table 1.

2.4 Weight Fraction of Organic Material

The EPA guidance (EPA 1995) states that the weight fraction must be determined for each waste stream under evaluation. Four waste streams were evaluated for the calculation of ancillary equipment releases. These four waste streams are:

(1) The waste feed from receipt through the pretreatment evaporator process labeled the "pretreatment feed stream"
(2) The waste stream after the pretreatment evaporator labeled the "post-evaporator stream"
(3) The LAW concentrate through the LAW vitrification process labeled the "LAW stream"
(4) The HLW concentrate through the HLW vitrification process labeled the "HLW stream"

Section 3 addresses the determination of the weight fraction of the individual organic compounds in each of the four evaluated streams. The individual weight fractions were summed for each of the evaluated streams and entered onto Appendix A, Table 1 as the respective waste stream organic weight fraction, WF_S.

2.5 Hours of Operation

The calculation will use 8760 hours of operation which represents continuous operation for a year. The operating hours used is conservative since the average operational availability of the WTP is approximately 71% as determined in *LAW Vitrification Capacity and Availability Study* (24590-LAW-RPT-ENG-01-001). In addition, most of the transfer pipes will remain empty between transfers and will be flushed with water after transfer to prevent solids from settling in the line and to minimize corrosion.

2.6 Estimated Release of Organic Material

Appendix A, Table 1 gives the estimated release of organic material, E_{HO}, into the process cells of the pretreatment plant feed and post-evaporator streams, the LAW stream, and the HLW stream as a result of applying the average release calculation formula.

3 Weight Fraction of Individual Organic Compounds

The following sections discuss the determination of the weight fraction of each organic compound in each of the four evaluated streams.

3.1 Weight Fraction of Organic Compounds in the Pretreatment Feed Stream

The *RPP-WTP Waste Feed Assessment* (RPT-24590-EN00003) determined the upper bound concentration of individual organic compounds in the Hanford waste feed to the WTP. These concentrations are the starting point for the organic emissions calculations from the three production plants. The concentrations were given in milligrams per liter, mg/L. The formula given in the EPA guidance (1995) in section 2.1 to estimate the release of organic compounds requires the organic concentration to be expressed as a weight fraction. The milligrams per liter, mg/L, were converted to weight fractions, mg/kg, using the density, ρ, of the waste provided in the *RPP-WTP Waste Feed Assessment* (RPT-24590-EN00003). The values are given in Appendix A, Table 2. The individual weight fractions were summed in Appendix A, Table 2 to yield the waste stream organic weight fraction, WF_S, for the pretreatment feed stream and entered onto Appendix A, Table 1.

3.2 Weight Fraction of Organic Compounds in the Post-Evaporator, LAW, and HLW Streams

The Emission Baseline Report (24590-WTP-RPT-03-008) estimated the mass flow rate of fifty organic compounds in the waste using a computer model. The fifty organic compounds were selected as representative of the full spectrum of organic compounds in the waste. These fifty organic compounds were organized into thirty-five groups, termed Henry's Grouping, based upon the similarity of properties such as Henry's Law constant, molecular weight, vapor pressure, and solubility. The unmodeled organic compounds in the waste were assigned to one of the thirty-five groups based upon that compound's similar Henry's Grouping properties.

The model estimated the mass flow rate for each of the fifty organic compounds in the post-evaporator, the LAW, and the HLW streams shown in Appendix A, Tables 2, 3, and 4, respectively. Each unmodeled organic compound was then assigned, by stream, a mass flow rate associated with the appropriate Henry's Grouping. Some of the Henry's Groupings contain more than one modeled compound. In that case, the mass flow rates were averaged, and the average value was assigned to the unmodeled organic compounds in that Henry's Grouping. Appendix A, Table 6 shows the Henry's Grouping number and corresponding mass flow rate assigned to each organic compound, both modeled and unmodeled, in the post-evaporator stream; Appendix A, Table 8 shows the LAW stream; and Appendix A, Table 9 shows the HLW stream.

The formula given in the EPA guidance (1995) in section 2.1 to estimate the release of organic compounds requires the organic concentration to be expressed as a weight fraction. The mass flow rates were converted to weight fractions using the respective density for the three streams. The density used for this calculation is the density of the liquid phase of the waste stream being evaluated since the model apportioned the organic compounds to the liquid phase. A conversion factor was calculated to convert from mass flow rate to weight fraction according to the following formula:

$$\text{Conversion Factor} = Q_M \text{ g/s} \cdot 60 \text{ s/min} \cdot \text{min}/Q_V \cdot 35.315 \text{ ft}^3/1000\text{L} \cdot 1000 \text{ mg/g} \cdot 1/\rho \text{ kg/L}$$

Where:
Q_M = mass flow rate of the individual organic compound
Q_V = volumetric flow rate of the evaluated stream
ρ = density of the liquid phase of the evaluated stream

Appendix A, Table 6 shows the mass flow rate and conversion to a weight fraction for each of the organic compounds for the post-evaporator stream. The individual weight fractions were summed to yield the waste stream organic weight fraction, WF_S, for the post-evaporator stream. Appendix A, Table 8 presents the same information for the LAW stream, and Appendix A, Table 9 presents the same information for the HLW stream. The waste stream organic weight fractions, WF_S, for each of the evaluated streams was entered into Appendix A, Table 1.

4 Estimated Release of Organic Compounds

The *Human Health Risk Assessment Protocol* (EPA 1998) presents a method to speciate the release of organic compounds by multiplying the weight ratio of each individual organic compound by the total release from the waste streams being evaluated. This method was used to estimate the individual organic compound released into the WTP process cells for each of the evaluated streams.

The weight ratio for each organic compound for each stream was determined by dividing the individual organic compound weight fraction by the total weight fraction of all organic compounds in that stream.

The estimated release of each individual organic compound for each stream, R_{IO}, was then determined by multiplying the estimated release for the stream, ER_O, from Appendix A, Table 1 times the individual organic compound weight ratio, WR_i. These calculations were made for the pretreatment feed stream, the post-evaporator stream, the LAW stream, and the HLW stream. The resulting estimated releases into the process cells are given in Appendix A, Tables 5, 6, 8, and 9, respectively.

5 Estimated Emission of Organic Compounds

This section discusses the calculation of the estimated emission of organic compounds from the WTP process cells.

5.1 Unabated Organic Compound Emissions

Only a portion of the organic compound released into the process cells will result in unabated emissions. Organic compounds that are particle-bound or particulate will be abated by the high-efficiency particulate air (HEPA) filters. The Emission Baseline Report (24590-WTP-RPT-03-008) separated the organic compounds into particle-bound or particulate, and vapor phase. According to the Emission Baseline Report (24590-WTP-RPT-03-008), HEPA filters will abate the particle-bound or particulate organic compounds at a decontamination factor of two hundred thousand. Therefore, particle-bound or particulate organic compounds were not considered as uncontrolled emissions in this calculation.

Vapor phase organic compounds released into the process cells will not be captured by the HEPA filters and will represent potential unabated emissions. Appendix A, Table 5 gives the estimated organic vapor emission, R_{VO}, from the pretreatment feed stream by listing the release of each vapor phase organic compound as an emission and each particle-bound or particulate organic compound as zero emission. This process is repeated for the post-evaporator stream in Appendix A, Table 6. The feed stream and post-evaporator stream releases are summed in Appendix A, Table 7 to give the estimated emission of organic compounds from the pretreatment process cells. Appendix A, Table 8 gives the estimated emission of organic compounds from the LAW process cells, and Appendix A, Table 9 gives the estimated emission of organic compounds from the HLW process cells.

5.2 Potential Emissions Not Considered

The Emission Baseline Report (24590-WTP-RPT-03-008) proposed that the temperature and conditions in the melters and thermal oxidation units are sufficient to generate products of incomplete combustion (PICs) that would be introduced into the offgas streams. The melter offgas containing the PICs will be treated by a melter submerged bed scrubber, which will recycle scrubber liquor back into the pretreatment process. However, the Emission Baseline Report (24590-WTP-RPT-03-008) predicted that PICs recycled to the pretreatment plant will be at concentrations orders-of-magnitude less than the constituent organic compounds. Thus, PICs were not included as emissions in this calculation.

6 References

6.1 Codes and Standards

EPA 1995. *Protocol for Equipment Leak Emission Estimates*, EPA-453/R-95-017. November 1995. US Environmental Protection Agency, Research Triangle Park, North Carolina, USA.

EPA 1998. *Human Health Risk Assessment Protocol*, EPA530-D-98-001A. July 1998. US Environmental Protection Agency, Research Triangle Park, North Carolina, USA.

WAC 173-400. *General Regulations for Air Pollution Sources*, as amended. Washington Administrative Code.

6.2 Project Documents

24590-LAW-RPT-ENG-01-001, Rev. 0, *LAW Vitrification Capacity and Availability Study.*

CCN 023430, Meeting Minutes from 9/6/2001 and 9/7/2001 Meeting with the following purpose: "Discuss Proposed Final Resolution of Remaining Open Comments on the Risk Assessment Work Plan, Item 27.

CCN 068045, E-mail message from Ian Tanner to John Sipkowski, 28 May 2003, "Jumper Breakdown for Environmental Risk Assessment."

CCN 068046, E-mail message from Steven Cross to John Sipkowski, 28 May 2003, "Jumper Counts – Slurry Carrying Jumpers."

CCN 068047, E-mail message from Connie Feuz to John Sipkowski, 4 June 2003, "Connector Count."

PIL-4.08.06, Plant Item List, September, 2001.

24590-WTP-RPT-PO-03-008, Rev. 0, *Integrated Emissions Baseline Report for the Hanford Tank Waste Treatment and Immobilization Plant.*

RPT-24590-EN00003, Rev. 0, *RPP-WTP Waste Feed Assessment.*

Appendix A

Excel Worksheets:

Table 1. Estimate of the Release of Organic Compounds from Ancillary Equipment A-1

Table 2. Post-Evaporator Concentration and Henry's Law Grouping A-2

Table 3. LAW Stream Concentration and Henry's Law Grouping A-3

Table 4. HLW Stream Concentration and Henry's Law Grouping A-4

Table 5. Estimate of Organic Emissions from the Pretreatment Feed Stream A-5

Table 6. Estimate of Organic Emissions from the Post-Evaporator Stream A-9

Table 7. Estimate of Organic Emissions from Pretreatment Process Cells A-14

Table 8. Estimate of Organic Emissions from the LAW Process Cells A-20

Table 9. Estimate of Organic Emissions from the HLW Process Cells A-25

The *Protocol for Equipment Lead Emission Estimates* (EPA 1995) provides the following formula to calculate the estimated release of organic material from ancillary equipment.

$E_{HO} = N \times R_{avg} \times WF_S \times H$, where:

E_{HO} = estimated annual release, kg/year

N = ancillary equipment count by equipment type; equipment count was obtained form Melter Systems group, Area Plant Design, and the Plant Item List (PIL-4.08.06)

R_{avg} = average release factor by equipment type, (kg/hour); from *Protocol for Equipment Leak Emission Estimates* (EPA 1995)

WF_S = weight fraction of organic material = WFs from tables 5, 6, 8, and 9 for Pretreatment Feed Stream, Post-Evaporator Stream, LAW Stream, and HLW Stream respectively * 1/(1000*1000) to convert from mg/kg to kg/kg

$ER_O = E_{HO}$ kg/yr * 1000 gm/kg / (365 d/yr * 24 hr/d *60 min/hr * 60 s/min) where:

ER_O = waste stream organic release (gm/s) by equipment type

$ER_{O\text{-}PTF}$ = sum of Pretreatment Feed Stream estimated release = Sum ER_O by equipment type

$ER_{O\text{-}PE}$ = sum of Post-Evaporator Stream estimated release = Sum ER_O by equipment type

$ER_{O\text{-}LA}$ = sum of LAW Stream estimated release = Sum ER_O by equipment type

$ER_{O\text{-}HL}$ = sum of HLW Stream estimated release = Sum ER_O by equipment type

Table 1. Estimate of the Release of Organic Compounds from Ancillary Equipment. Calc. No. 24590-WTP-HAC-50-00001, Rev. C

Plant	Waste Stream	Equipment Type	Count N	R_{avg} (kg/hour)	Waste Stream Organic Weight Fraction WF_S	Operating Hours H hr/yr	Estimated Annual Release E_{HO} (kg/yr)	Estimated Release ER_O (gm/s)
Pretreatment	Pretreatment Feed Stream	Valves	15	0.00023	0.0083839	8760	0.2534	8.04E-06
		Connectors	170	0.00183	0.0083839	8760	22.8482	7.25E-04
	Pretreatment Feed Stream Total $ER_{O\text{-}PTF}$ =							**7.33E-04**
	Post-Evaporator Stream	Valves	355	0.00023	0.0014825	8760	1.0604	3.36E-05
		Connectors	978	0.00183	0.0014825	8760	23.2426	7.37E-04
	Post-Evaporator Stream Total $ER_{O\text{-}PE}$ =							**7.71E-04**
LAW	LAW Stream	Valves	32	0.00023	0.002454995	8760	0.1583	5.02E-06
		Connectors	44	0.00183	0.002454995	8760	1.7316	5.49E-05
	LAW Stream Total $ER_{O\text{-}LA}$ =							**5.99E-05**
HLW	HLW Stream	Valves	26	0.00023	0.0010959	8760	0.0574	1.82E-06
		Connectors	48	0.00183	0.0010959	8760	0.8432	2.67E-05
	HLW Stream Total $ER_{O\text{-}HL}$ =							**2.85E-05**

CF_{PE} = 60 sec/min x 1/ Q_V ft^3/min x 35.315 ft^3/1000 L x 1000 mg/L x ρ kg/L = Concentration mg/kg
CF_{PE} = Conversion Factor
Q_V = Volumetric Flow Rate from the Emission Baseline Report (24590-WTP-RPT-PO-03-008), Sheet FEP03 = 1.19E+00 ft^3/min
ρ = Density from the Emission Baseline Report (24590-WTP-RPT-PO-03-008), Sheet FEP03 = 1.50E+00 kg/L
Note: Un-rounded values for Q_V and ρ rom Sheet FET03 were used for the calculations.
CF_{PE} = 1190.702384

Q_M = Compound Mass Flow Rate from the Emission Baseline Report (24590-WTP-RPT-PO-03-008), Sheet FEP03
WF_i = Weight Fraction = Q_M * CF_{PE}
Average Weight Fraction WF_a = average WF_i for Henry's Law Group

Table 2. Post-Evaporator Concentration and Henry's Law Grouping. Calc. No. 24590-WTP-HAC-50-00001, Rev. C

Compound CAS#	Organic Compounds	Compound Mass Flow Rate Q_M g/s	Individual Organic Weight Fraction. WF_i mg/kg	Henry's Law Grouping HL	Henry's Law Group Average Organic Weight Fraction. WF_a mg/kg
100-21-0	p-Phthalic acid	4.82E-02	5.74E+01	1	5.74E+01
88-89-1	Picric acid	5.99E-02	7.13E+01	2	7.13E+01
144-62-7	Oxalic acid	4.83E-03	5.75E+00	3	5.75E+00
75-12-7	Formamide	4.80E-02	5.72E+01	4	5.72E+01
60-35-5	Acetamide	1.05E-02	1.24E+01	5	1.24E+01
87-86-5	Pentachlorophenol	4.63E-02	5.51E+01	6	5.51E+01
126-73-8	Tributyl phosphate	3.81E-02	4.54E+01	7	4.54E+01
108-95-2	Phenol	3.00E-02	3.57E+01	8	3.49E+01
84-66-2	Diethyl phthalate	2.24E-02	2.67E+01	8	3.49E+01
88-85-7	2-sec-Butyl-4,6-dinitrophenol (Dinoseb)	3.55E-02	4.23E+01	8	3.49E+01
62-75-9	N-Nitroso-N,N-dimethylamine	1.94E-02	2.31E+01	9	2.31E+01
122-39-4	N,N-Diphenylamine	1.33E-03	1.58E+00	10	8.11E-01
8001-35-2	Toxaphene	3.50E-05	4.17E-02	10	8.11E-01
4170-30-3	2-Butenaldehyde (2-Butenal)	4.69E-04	5.58E-01	11	1.90E+00
58-90-2	2,3,4,6-Tetrachlorophenol	2.34E-03	2.78E+00	11	1.90E+00
98-86-2	Acetophenone	1.98E-03	2.36E+00	11	1.90E+00
57-14-7	1,1-Dimethylhydrazine	1.63E-03	1.94E+00	12	1.94E+00
120-12-7	Anthracene	2.62E-04	3.12E-01	13	2.49E-01
75-05-8	Acetonitrile	1.56E-04	1.86E-01	13	2.49E-01
208-96-8	Acenaphthylene	8.79E-05	1.05E-01	14	1.05E-01
132-64-9	Dibenzofuran	2.88E-05	3.43E-02	15	3.43E-02
106-93-4	Ethylene dibromide (Dibromethane)	2.80E-06	3.33E-03	16	1.33E-03
76-44-8	Heptachlor	3.29E-07	3.92E-04	16	1.33E-03
91-20-3	Naphthalene	2.25E-07	2.68E-04	16	1.33E-03
120-82-1	1,2,4-Trichlorobenzene	1.08E-07	1.29E-04	17	1.29E-04
118-74-1	Hexachlorobenzene	6.76E-09	8.05E-06	18	8.05E-06
10061-01-5	cis-1,3-Dichloropropene	2.16E-08	2.57E-05	19	1.06E-05
108-88-3	Toluene	1.94E-09	2.31E-06	19	1.06E-05
71-43-2	Benzene	3.19E-09	3.80E-06	19	1.06E-05
79-01-6	Trichloroethylene	6.57E-10	7.82E-07	20	7.31E-07
87-68-3	Hexachlorobutadiene	5.70E-10	6.79E-07	20	7.31E-07
127-18-4	Perchloroethylene (tetrachloroethylene)	1.20E-10	1.43E-07	21	1.43E-07
56-23-5	Carbon tetrachloride	3.25E-11	3.86E-08	22	3.86E-08
106-99-0	1,3-Butadiene	1.78E-12	2.12E-09	23	2.12E-09
110-82-7	Cyclohexane	2.13E-13	2.53E-10	24	2.53E-10
108-87-2	Methylcyclohexane	9.07E-15	1.08E-11	25	1.08E-11
106-97-8	Butane	8.13E-16	9.68E-13	26	9.68E-13
110-54-3	n-Hexane	1.23E-16	1.47E-13	27	1.47E-13
111-84-2	n-Nonane	1.86E-17	2.22E-14	28	2.22E-14
76-15-3	Chloropentafluoroethane	4.19E-18	4.99E-15	29	4.99E-15
319-85-7	Hexachlorocyclohexane (Lindane) Beta BHC	1.16E-04	1.38E-01	30	3.21E-01
50-32-8	Benzo(a)pyrene	4.23E-04	5.04E-01	30	3.21E-01
84-74-2	Dibutyl phthalate	1.29E-02	1.53E+01	31	1.53E+01
218-01-9	Chrysene	4.88E-03	5.81E+00	32	3.47E+00
58-89-9	gamma-BHC (Lindane)	1.73E-05	2.06E-02	32	3.47E+00
603-34-9	Triphenylamine	3.84E-03	4.57E+00	32	3.47E+00
129-00-0	Pyrene	2.21E-03	2.63E+00	33	1.33E+00
60-57-1	Dieldrin	1.86E-05	2.21E-02	33	1.33E+00
309-00-2	Aldrin	7.54E-06	8.98E-03	34	8.98E-03
1336-36-3	Polychlorinated biphenyls (PCBs)	5.01E-05	5.97E-02	35	5.97E-02

CF_{LA} = 60 sec/min x 1/ Q_V ft^3/min x 35.315 ft^3/1000 L x 1000 mg/L x ρ kg/L = Concentration mg/kg
CF_{LA} = Conversion Factor
Q_V = Volumetric Flow Rate from the Emission Baseline Report (24590-WTP-RPT-PO-03-008), Sheet TCP03 = 4.24E-01 ft^3/min
ρ = Density from the Emission Baseline Report (24590-WTP-RPT-PO-03-008), Sheet TCP03 = 1.76E+00 kg/L
Note. Un-rounded values for Q_V and ρ rom Sheet TCP03 were used for the calculations.
CF_{LA} = 2835.87806

Q_M = Compound Mass Flow Rate from the Emission Baseline Report (24590-WTP-RPT-PO-03-008), Sheet FEP03
WF_i = Weight Fraction = Q_M * CF_{LA}
Average Weight Fraction WF_a = average WF_i for Henry's Law Group

Table 3. LAW Stream Concentration and Henry's Law Grouping. Calc. No. 24590-WTP-HAC-50-00001, Rev. C

Compound CAS#	Organic Compounds	Compound Mass Flow Rate Q_m g/s	Individual Organic Weight Fraction. WF_i mg/kg	Henry's Law Grouping HL	Henry's Law Group Average Organic Weight Fraction. WF_a mg/kg
100-21-0	p-Phthalic acid	2.73E-02	77.48	1	7.75E+01
88-89-1	Picric acid	3.64E-01	1032.27	2	1.03E+03
144-62-7	Oxalic acid	2.73E-03	7.73	3	7.73E+00
75-12-7	Formamide	2.72E-02	77.05	4	7.71E+01
60-35-5	Acetamide	5.81E-03	16.47	5	1.65E+01
87-86-5	Pentachlorophenol	2.50E-02	70.99	6	7.10E+01
126-73-8	Tributyl phosphate	1.67E-02	47.44	7	4.74E+01
108-95-2	Phenol	1.04E-02	29.37	8	3.48E+01
84-66-2	Diethyl phthalate	5.83E-03	16.54	8	3.48E+01
88-85-7	2-sec-Butyl-4,6-dinitrophenol (Dinoseb)	2.06E-02	58.53	8	3.48E+01
62-75-9	N-Nitroso-N,N-dimethylamine	2.42E-03	6.86	9	6.86E+00
122-39-4	N,N-Diphenylamine	9.65E-05	0.27	10	1.38E-01
8001-35-2	Toxaphene	9.31E-07	0.00	10	1.38E-01
4170-30-3	2-Butenaldehyde (2-Butenal)	1.28E-05	0.04	11	1.24E-01
58-90-2	2,3,4,6-Tetrachlorophenol	6.86E-05	0.19	11	1.24E-01
98-86-2	Acetophenone	4.94E-05	0.14	11	1.24E-01
57-14-7	1,1-Dimethylhydrazine	3.45E-05	0.10	12	9.79E-02
120-12-7	Anthracene	9.40E-07	0.00	13	2.71E-03
75-05-8	Acetonitrile	9.73E-07	0.00	13	2.71E-03
208-96-8	A	1.13E-07	0.00	14	3.20E-04
132-64-9	Dibenzofuran	5.68E-09	0.00	15	1.61E-05
106-93-4	Ethylene dibromide (Dibromethane)	1.12E-11	0.00	16	1.06E-08
76-44-8	Heptachlor	0.00E+00	0.00	16	1.06E-08
91-20-3	Naphthalene	0.00E+00	0.00	16	1.06E-08
120-82-1	1,2,4-Trichlorobenzene	0.00E+00	0.00	17	0.00E+00
118-74-1	Hexachlorobenzene	0.00E+00	0.00	18	0.00E+00
10061-01-5	cis-1,3-Dichloropropene	0.00E+00	0.00	19	0.00E+00
108-88-3	Toluene	0.00E+00	0.00	19	0.00E+00
71-43-2	Benzene	0.00E+00	0.00	19	0.00E+00
79-01-6	Trichloroethylene	0.00E+00	0.00	20	0.00E+00
87-68-3	Hexachlorobutadiene	0.00E+00	0.00	20	0.00E+00
127-18-4	Perchloroethylene (tetrachloroethylene)	0.00E+00	0.00	21	0.00E+00
56-23-5	Carbon tetrachloride	0.00E+00	0.00	22	0.00E+00
106-99-0	1,3-Butadiene	0.00E+00	0.00	23	0.00E+00
110-82-7	Cyclohexane	0.00E+00	0.00	24	0.00E+00
108-87-2	Methylcyclohexane	0.00E+00	0.00	25	0.00E+00
106-97-8	Butane	0.00E+00	0.00	26	0.00E+00
110-54-3	n-Hexane	0.00E+00	0.00	27	0.00E+00
111-84-2	n-Nonane	0.00E+00	0.00	28	0.00E+00
76-15-3	Chloropentafluoroethane	0.00E+00	0.00	29	0.00E+00
319-85-7	Hexachlorocyclohexane (Lindane) Beta BHC	3.42E-05	0.10	30	2.39E-01
50-32-8	Benzo(a)pyrene	1.34E-04	0.38	30	2.39E-01
84-74-2	Dibutyl phthalate	2.02E-03	5.73	31	5.73E+00
218-01-9	Chrysene	2.64E-04	0.75	32	4.21E-01
58-89-9	gamma-BHC (Lindane)	5.41E-07	0.00	32	4.21E-01
603-34-9	Triphenylamine	1.81E-04	0.51	32	4.21E-01
129-00-0	Pyrene	4.99E-05	0.14	33	7.11E-02
60-57-1	Dieldrin	2.65E-07	0 00	33	7.11E-02
309-00-2	Aldrin	1 30E-08	0.00	34	3.67E-05
1336-36-3	Polychlorinated biphenyls (PCBs)	6.02E-11	0.00	35	1.71E-07

CF_{HL} = 60 sec/min x 1/ Q_V ft^3/min x 35.315 ft^3/1000 L x 1000 mg/L x 1 ρ kg/L = Concentration mg/kg
CF_{HL} = Conversion Factor
Q_V = Volumetric Flow Rate from the Emission Baseline Report (24590-WTP-RPT-PO-03-008), Sheet HLP09 = 7.65E-01 ft^3/min
ρ = Density from the Emission Baseline Report (24590-WTP-RPT-PO-03-008), Sheet HLP09 = 1.04E+00 kg/L
Note Un-rounded values for QV and ρ from Sheet HLP09 were used for the calculations.
CF_{HL} = 2652.33539

Q_M = Compound Mass Flow Rate from the Emission Baseline Report (24590-WTP-RPT-PO-03-008), Sheet FEP03
WF_i = Weight Fraction = Q_M * CF_{HL}
Average Weight Fraction WF_a = average WF_i for Henry's Law Group

Table 4. HLW Stream Concentration and Henry's Law Grouping. Calc. No. 24590-WTP-HAC-50-00001, Rev. C

Compound CAS#	Organic Compounds	Compound Mass Flow Rate Q_m g/s	Individual Organic Weight Fraction. WF_i mg/kg	Henry's Law Grouping HL	Henry's Law Group Average Organic Weight Fraction. WF_a mg/kg
100-21-0	p-Phthalic acid	7.49E-03	19.87	1	1.99E+01
88-89-1	Picric acid	9.30E-03	24.68	2	2.47E+01
144-62-7	Oxalic acid	7.51E-04	1.99	3	1.99E+00
75-12-7	Formamide	7.48E-03	19.85	4	1.98E+01
60-35-5	Acetamide	1.66E-03	4.40	5	4.40E+00
87-86-5	Pentachlorophenol	7.54E-03	20.00	6	2.00E+01
126-73-8	Tributyl phosphate	7.59E-03	20.14	7	2.01E+01
108-95-2	Phenol	7.39E-03	19.59	8	2.21E+01
84-66-2	Diethyl phthalate	6.97E-03	18.48	8	2.21E+01
88-85-7	2-sec-Butyl-4,6-dinitrophenol (Dinoseb)	1.07E-02	28.29	8	2.21E+01
62-75-9	N-Nitroso-N,N-dimethylamine	1.09E-02	28.81	9	2.88E+01
122-39-4	N,N-Diphenylamine	1.14E-03	3.02	10	1.57E+00
8001-35-2	Toxaphene	4.52E-05	0.12	10	1.57E+00
4170-30-3	2-Butenaldehyde (2-Butenal)	8.77E-04	2.33	11	7.83E+00
58-90-2	2,3,4,6-Tetrachlorophenol	4.09E-03	10.85	11	7.83E+00
98-86-2	Acetophenone	3.89E-03	10.32	11	7.83E+00
57-14-7	1,1-Dimethylhydrazine	3.65E-03	9.67	12	9.67E+00
120-12-7	Anthracene	1.23E-03	3.28	13	2.48E+00
75-05-8	Acetonitrile	6.35E-04	1.69	13	2.48E+00
208-96-8	Acenaphthylene	3.94E-04	1.05	14	1.05E+00
132-64-9	Dibenzofuran	9.06E-05	0.24	15	2.40E-01
106-93-4	Ethylene dibromide (Dibromethane)	2.33E-06	0.01	16	3.04E-03
76-44-8	Heptachlor	7.72E-07	0.00	16	3.04E-03
91-20-3	Naphthalene	3.32E-07	0.00	16	3.04E-03
120-82-1	1,2,4-Trichlorobenzene	2.66E-08	0.00	17	7.06E-05
118-74-1	Hexachlorobenzene	1.22E-09	0.00	18	3.23E-06
10061-01-5	cis-1,3-Dichloropropene	1.66E-09	0.00	19	1.55E-06
108-88-3	Toluene	2.73E-11	0.00	19	1.55E-06
71-43-2	Benzene	6.36E-11	0.00	19	1.55E-06
79-01-6	Trichloroethylene	4.37E-12	0.00	20	1.03E-08
87-68-3	Hexachlorobutadiene	3.44E-12	0.00	20	1.03E-08
127-18-4	Perchloroethylene (tetrachloroethylene)	2.48E-13	0.00	21	6.57E-10
56-23-5	Carbon tetrachloride	2.75E-14	0.00	22	7.29E-11
106-99-0	1,3-Butadiene	2.11E-16	0.00	23	5.60E-13
110-82-7	Cyclohexane	1.24E-24	0.00	24	3.30E-21
108-87-2	Methylcyclohexane	0.00E+00	0.00	25	0.00E+00
106-97-8	Butane	0.00E+00	0.00	26	0.00E+00
110-54-3	n-Hexane	0.00E+00	0.00	27	0.00E+00
111-84-2	n-Nonane	0.00E+00	0.00	28	0.00E+00
76-15-3	Chloropentafluoroethane	0 00E+00	0.00	29	0.00E+00
319-85-7	Hexachlorocyclohexane (Lindane) Beta BHC	3 15E-05	0.08	30	1.97E-01
50-32-8	Benzo(a)pyrene	1.17E-04	0.31	30	1.97E-01
84-74-2	Dibutyl phthalate	7.33E-03	19.45	31	1.94E+01
218-01-9	Chrysene	5.79E-03	15.36	32	9.24E+00
58-89-9	gamma-BHC (Lindane)	1.99E-05	0.05	32	9.24E+00
603-34-9	Triphenylamine	4.65E-03	12.32	32	9.24E+00
129-00-0	Pyrene	4.82E-03	12.79	33	6.44E+00
60-57-1	Dieldrin	3.51E-05	0.09	33	6.44E+00
309-00-2	Aldrin	3.35E-05	0.09	34	8.88E-02
1336-36-3	Polychlorinated biphenyls (PCBs)	7.98E-05	0.21	35	2.12E-01

C_O = organic concentration; values are from the RPP-WTP Waste Feed Assessment (RPT-24590-EN00003)
ρ = density; values are from RPP-WTP Waste Feed Assessment (RPT-24590-EN00003)
$WF_i = C_O / \rho$
WF_i = the weight fraction of the individual organic compound
WF_S = Sum WF_i
WR_i = the ratio of the individual organic compound weight fraction to the sum of the individual weight fraction = WFi / WF_S
WR_S = Sum WR_i
$R_{IO} = WR_i * ER_{O\text{-}PTF}$; $ER_{O\text{-}PTF}$ is from Table 1
R_{VO} = vapor emissions; R_{VO} is "0" if the compound is a particle or is particle-bound
P = particle; cell has an "X" if the compound is a particle or is particle-bound

Table 5. Estimate of Organic Emissions from the Pretreatment Feed Stream. Calc. No. 24590-WTP-HAC-50-00001, Rev. C

CAS#	Organic Compounds	Organic Conc. C_O mg/L	Density ρ kg/L	Individual Organic Weight Fraction. WF_i mg/kg	Individual Organic Weight Ratio WR_i unitless	Individual Organic Release R_{IO} gm/s	Individual Organic Vapor Emission R_{VO} gm/s	Particle P
100-00-5	p-Nitrochlorobenzene	84.8	1.35	62.8	7.49E-03	5.49E-06	5.49E-06	
100-21-0	p-Phthalic acid	84.8	1.35	62.8	7.49E-03	5.49E-06	5.49E-06	
100-25-4	1,4-Dinitrobenzene	84.8	1.35	62.8	7.49E-03	5.49E-06	0.00E+00	X
100-41-4	Ethyl benzene	18.7	1.35	13.9	1.65E-03	1.21E-06	1.21E-06	
100-42-5	Styrene	18.7	1.35	13.9	1.65E-03	1.21E-06	1.21E-06	
10061-01-5	cis-1,3-Dichloropropene	18.7	1.35	13.9	1.65E-03	1.21E-06	1.21E-06	
10061-02-6	trans-1,3-Dichloropropene	18.7	1.35	13.9	1.65E-03	1.21E-06	1.21E-06	
101-55-3	4-Bromophenylphenyl ether	84.8	1.35	62.8	7.49E-03	5.49E-06	5.49E-06	
101-84-8	Diphenyl ether	18.7	1.35	13.9	1.65E-03	1.21E-06	1.21E-06	
106-35-4	3-Heptanone	18.7	1.35	13.9	1.65E-03	1.21E-06	1.21E-06	
106-42-3	p-Xylene (Dimethyl benzene)	18.7	1.35	13.9	1.65E-03	1.21E-06	1.21E-06	
106-46-7	1,4-Dichlorobenzene	18.7	1.35	13.9	1.65E-03	1.21E-06	1.21E-06	
106-88-7	1,2-Epoxybutane	18.7	1.35	13.9	1.65E-03	1.21E-06	1.21E-06	
106-93-4	Ethylene dibromide (Dibromethane)	84.8	1.35	62.8	7.49E-03	5.49E-06	5.49E-06	
106-97-8	Butane	18.7	1.35	13.9	1.65E-03	1.21E-06	1.21E-06	
106-99-0	1,3-Butadiene	18.7	1.35	13.9	1.65E-03	1.21E-06	1.21E-06	
107-02-8	Acrolein	18.7	1.35	13.9	1.65E-03	1.21E-06	1.21E-06	
107-05-1	3-Chloropropene (Allyl chloride)	18.7	1.35	13.9	1.65E-03	1.21E-06	1.21E-06	
107-06-2	1,2-Dichloroethane (Ethylene chloride)	18.7	1.35	13.9	1.65E-03	1.21E-06	1.21E-06	
107-12-0	Propionitrile	18.7	1.35	13.9	1.65E-03	1.21E-06	1.21E-06	
107-13-1	Acrylonitrile	18.7	1.35	13.9	1.65E-03	1.21E-06	1.21E-06	
107-18-6	2-Propene-1-ol	84.8	1.35	62.8	7.49E-03	5.49E-06	5.49E-06	
107-31-3	Formic acid, methyl ester	84.8	1.35	62.8	7.49E-03	5.49E-06	5.49E-06	
107-66-4	Dibutylphosphate	84.8	1.35	62.8	7.49E-03	5.49E-06	0.00E+00	X
107-87-9	2-Pentanone	18.7	1.35	13.9	1.65E-03	1.21E-06	1.21E-06	
108-03-2	1-Nitropropane	84.8	1.35	62.8	7.49E-03	5.49E-06	5.49E-06	
108-05-4	Vinyl acetate	84.8	1.35	62.8	7.49E-03	5.49E-06	5.49E-06	
108-10-1	Hexone (4-Methyl-2-pentanone or MIBK)	18.7	1.35	13.9	1.65E-03	1.21E-06	1.21E-06	
108-20-3	Bis(isopropyl)ether	18.7	1.35	13.9	1.65E-03	1.21E-06	1.21E-06	
108-38-3	m-Xylene (Dimethyl benzene)	18.7	1.35	13.9	1.65E-03	1.21E-06	1.21E-06	
108-39-4	m-Cresol	18.7	1.35	13.9	1.65E-03	1.21E-06	1.21E-06	
108-87-2	Methylcyclohexane	18.7	1.35	13.9	1.65E-03	1.21E-06	1.21E-06	
108-88-3	Toluene	18.7	1.35	13.9	1.65E-03	1.21E-06	1.21E-06	
108-90-7	Chlorobenzene	18.7	1.35	13.9	1.65E-03	1.21E-06	1.21E-06	
108-93-0	Cyclohexanol	18.7	1.35	13.9	1.65E-03	1.21E-06	1.21E-06	
108-94-1	Cyclohexanone	18.7	1.35	13.9	1.65E-03	1.21E-06	1.21E-06	
108-95-2	Phenol	84.8	1.35	62.8	7.49E-03	5.49E-06	5.49E-06	
109-66-0	n-Pentane	18.7	1.35	13.9	1.65E-03	1.21E-06	1.21E-06	
109-99-9	Tetrahydrofuran	39.6	1.35	29.3	3.50E-03	2.57E-06	2.57E-06	
110-12-3	5-Methyl-2-hexanone	18.7	1.35	13.9	1.65E-03	1.21E-06	1.21E-06	
110-43-0	2-Heptanone	18.7	1.35	13.9	1.65E-03	1.21E-06	1.21E-06	
110-54-3	n-Hexane	18.7	1.35	13.9	1.65E-03	1.21E-06	1.21E-06	
110-62-3	n-Valeraldehyde	84.8	1.35	62.8	7.49E-03	5.49E-06	5.49E-06	
110-82-7	Cyclohexane	18.7	1.35	13.9	1.65E-03	1.21E-06	1.21E-06	
110-83-8	Cyclohexene	18.7	1.35	13.9	1.65E-03	1.21E-06	1.21E-06	
110-86-1	Pyridine	84.8	1.35	62.8	7.49E-03	5.49E-06	5.49E-06	
111-65-9	n-Octane	18.7	1.35	13.9	1.65E-03	1.21E-06	1.21E-06	
111-76-2	Ethylene glycol monobutyl ether	84.8	1.35	62.8	7.49E-03	5.49E-06	5.49E-06	
111-84-2	n-Nonane	18.7	1.35	13.9	1.65E-03	1.21E-06	1.21E-06	
117-81-7	Bis(2-ethylhexyl)phthalate (DEHP)	84.8	1.35	62.8	7.49E-03	5.49E-06	0.00E+00	X
117-84-0	n-Dioctyl phthalate	84.8	1.35	62.8	7.49E-03	5.49E-06	0.00E+00	X
118-74-1	Hexachlorobenzene	1.8	1.35	1.3	1.60E-04	1.20E-07	1.20E-07	

Table 5. Estimate of Organic Emissions from the Pretreatment Feed Stream. Calc. No. 24590-WTP-HAC-50-00001, Rev. C

CAS#	Organic Compounds	Organic Conc. C_O mg/L	Density ρ kg/L	Individual Organic Weight Fraction. WF_i mg/kg	Individual Organic Weight Ratio WR_i unitless	Individual Organic Release R_{IO} gm/s	Individual Organic Vapor Emission R_{VO} gm/s	Particle P
120-12-7	Anthracene	84.8	1.35	62.8	7.49E-03	5.49E-06	5.49E-06	
120-82-1	1,2,4-Trichlorobenzene	18.7	1.35	13.9	1.65E-03	1.21E-06	1.21E-06	
120-83-2	2,4-Dichlorophenol	84.8	1 35	62.8	7.49E-03	5.49E-06	5.49E-06	
121-44-8	Triethylamine	18.7	1.35	13.9	1.65E-03	1.21E-06	1.21E-06	
121-69-7	Dimethylaniline	18.7	1.35	13.9	1.65E-03	1.21E-06	1.21E-06	
122-39-4	N,N-Diphenylamine	18.7	1.35	13.9	1.65E-03	1.21E-06	1.21E-06	
123-19-3	4-Heptanone	18.7	1.35	13.9	1.65E-03	1.21E-06	1.21E-06	
123-38-6	n-Propionaldehyde	18.7	1.35	13.9	1.65E-03	1.21E-06	1.21E-06	
123-51-3	3-Methyl-1-butanol	18.7	1.35	13.9	1.65E-03	1.21E-06	1.21E-06	
123-86-4	Acetic acid n-butyl ester	84.8	1.35	62.8	7.49E-03	5.49E-06	5.49E-06	
123-91-1	1,4-Dioxane	50.9	1.35	37.7	4.50E-03	3.30E-06	3.30E-06	
126-73-8	Tributyl phosphate	84.8	1.35	62.8	7.49E-03	5.49E-06	5.49E-06	
126-98-7	2-Methyl-2-propenenitrile (Methacrylonitrile)	18.7	1.35	13.9	1.65E-03	1.21E-06	1.21E-06	
127-18-4	Perchloroethylene (tetrachloroethylene)	18.7	1.35	13.9	1.65E-03	1.21E-06	1.21E-06	
127-19-5	N,N-Dimethylacetamide	18.7	1.35	13.9	1.65E-03	1.21E-06	1.21E-06	
128-37-0	2,6-Bis(tert-butyl)-4-methylphenol	84.8	1.35	62.8	7.49E-03	5.49E-06	5.49E-06	
129-00-0	Pyrene	84.8	1.35	62.8	7.49E-03	5.49E-06	0.00E+00	X
1321-64-8	Pentachloronaphthalene	84.8	1.35	62.8	7.49E-03	5.49E-06	0.00E+00	X
1321-65-9	Trichloronaphthalene	84.8	1.35	62.8	7.49E-03	5.49E-06	5.49E-06	
132-64-9	Dibenzofuran	84.8	1.35	62.8	7.49E-03	5.49E-06	5.49E-06	
1335-87-1	Hexachloronaphthalene	84.8	1.35	62.8	7.49E-03	5.49E-06	0.00E+00	X
1335-88-2	Tetrachloronaphthalene	84.8	1.35	62.8	7.49E-03	5.49E-06	0.00E+00	X
1336-36-3	Polychlorinated biphenyls (PCBs)	29.4	1.35	21.8	2.60E-03	1.91E-06	0.00E+00	X
141-78-6	Acetic acid ethyl ester (Ethyl acetate)	84.8	1.35	62.8	7.49E-03	5.49E-06	5.49E-06	
141-79-7	4-Methyl-3-penten-2-one	84.8	1.35	62.8	7.49E-03	5.49E-06	5.49E-06	
142-82-5	n-Heptane	18.7	1.35	13.9	1.65E-03	1.21E-06	1.21E-06	
144-62-7	Oxalic acid	8.5	1.35	6.3	7.50E-04	5.50E-07	5.50E-07	
156-60-5	trans-1,2-Dichloroethylene	18.7	1.35	13.9	1.65E-03	1.21E-06	1.21E-06	
1582-09-8	Trifluralin	84.8	1.35	62.8	7.49E-03	5.49E-06	0.00E+00	X
1634-04-4	Methyl tert-butyl ether	18.7	1.35	13.9	1.65E-03	1.21E-06	1.21E-06	
1836-75-5	Nitrofen	84.8	1.35	62.8	7.49E-03	5.49E-06	0.00E+00	X
189-55-9	Dibenzo[a,i]pyrene	84.8	1.35	62.8	7.49E-03	5.49E-06	0.00E+00	X
189-64-0	Dibenzo[a,h]pyrene	84.8	1.35	62.8	7.49E-03	5.49E-06	0.00E+00	X
191-24-2	Benzo(g,h,i)perylene	84.8	1.35	62.8	7.49E-03	5.49E-06	0.00E+00	X
191-30-0	Benzo[a,i]pyrene	84.8	1.35	62.8	7.49E-03	5.49E-06	0.00E+00	X
192-65-4	Dibenzo[a,e]pyrene	84.8	1.35	62.8	7.49E-03	5.49E-06	0.00E+00	X
193-39-5	Indeno(1,2,3-cd)pyrene	84.8	1.35	62.8	7.49E-03	5.49E-06	0.00E+00	X
205-82-3	Benzo(j)fluoranthene	84.8	1.35	62.8	7.49E-03	5.49E-06	0.00E+00	X
205-99-2	Benzo(b)fluoranthene	84.8	1.35	62.8	7.49E-03	5.49E-06	0.00E+00	X
206-44-0	Fluoranthene	84.8	1.35	62.8	7.49E-03	5.49E-06	0.00E+00	X
207-08-9	Benzo(k)fluoranthene	84.8	1.35	62.8	7.49E-03	5.49E-06	0.00E+00	X
208-96-8	Acenaphthylene	84.8	1.35	62.8	7.49E-03	5.49E-06	5.49E-06	
218-01-9	Chrysene	84.8	1.35	62.8	7.49E-03	5.49E-06	0.00E+00	X
2234-13-1	Octachloronaphthalene	84.8	1.35	62.8	7.49E-03	5.49E-06	0.00E+00	X
224-42-0	Dibenz[a,j]acridine	84.8	1.35	62.8	7.49E-03	5.49E-06	0.00E+00	X
226-36-8	Dibenz[a,h]acridine	84.8	1.35	62.8	7.49E-03	5.49E-06	0.00E+00	X
2385-85-5	Mirex	84.8	1.35	62.8	7.49E-03	5.49E-06	5.49E-06	
25551-13-7	Trimethyl benzene	18.7	1.35	13.9	1.65E-03	1.21E-06	1.21E-06	
26140-60-3	Terphenyls	84.8	1.35	62.8	7.49E-03	5.49E-06	0.00E+00	X
27154-33-2	Trichlorofluoroethane	18.7	1.35	13.9	1.65E-03	1.21E-06	1.21E-06	
287-92-3	Cyclopentane	18.7	1.35	13.9	1.65E-03	1.21E-06	1.21E-06	
309-00-2	Aldrin	1	1.35	0.7	9.00E-05	7.00E-08	0.00E+00	X
319-84-6	Hexachlorocyclohexane (Lindane) Alpha BHC	0.3	1.35	0.2	3.00E-05	2.00E-08	2.00E-08	
319-85-7	Hexachlorocyclohexane (Lindane) Beta BHC	0.3	1.35	0.2	3.00E-05	2.00E-08	0.00E+00	X
319-86-8	Delta-BHC	0.3	1.35	0.2	3.00E-05	2.00E-08	0.00E+00	X
3697-24-3	5-Methylchrysene	84.8	1.35	62.8	7.49E-03	5.49E-06	0.00E+00	X
3825-26-1	Ammonium perfluorooctanoate	84.8	1.35	62.8	7.49E-03	5.49E-06	0.00E+00	X
4170-30-3	2-Butenaldehyde (2-Butenal)	18.7	1.35	13.9	1.65E-03	1.21E-06	1.21E-06	
465-73-6	Isodrin	0.6	1.35	0.4	5.00E-05	4.00E-08	4.00E-08	
50-00-0	Formaldehyde	18.7	1.35	13.9	1.65E-03	1.21E-06	1.21E-06	
50-29-3	4,4-DDT	0.6	1.35	0.4	5.00E-05	4.00E-08	0.00E+00	X
50-32-8	Benzo(a)pyrene	1.1	1.35	0.8	1.00E-04	7.00E-08	0.00E+00	X
53-70-3	Dibenzo(a,h)anthracene	0.1	1.35	0.1	1.00E-05	1.00E-08	0.00E+00	X
540-59-0	1,2-Dichloroethylene	18.7	1.35	13.9	1.65E-03	1.21E-06	1.21E-06	

Table 5. Estimate of Organic Emissions from the Pretreatment Feed Stream. Calc. No. 24590-WTP-HAC-50-00001, Rev. C

CAS#	Organic Compounds	Organic Conc. C_O mg/L	Density ρ kg/L	Individual Organic Weight Fraction. WF_i mg/kg	Individual Organic Weight Ratio WR_i unitless	Individual Organic Release R_{IO} gm/s	Individual Organic Vapor Emission R_{VO} gm/s	Particle P
540-84-1	2,2,4-Trimethylpentane	18.7	1.35	13.9	1.65E-03	1.21E-06	1.21E-06	
541-73-1	1,3-Dichlorobenzene	18.7	1.35	13.9	1.65E-03	1.21E-06	1.21E-06	
56-23-5	Carbon tetrachloride	18.7	1.35	13.9	1.65E-03	1.21E-06	1.21E-06	
563-80-4	3-Methyl-2-butanone	18.7	1.35	13.9	1.65E-03	1.21E-06	1.21E-06	
56-49-5	3-Methylcholanthrene	84.8	1.35	62.8	7.49E-03	5.49E-06	0.00E+00	X
56-55-3	Benzo(a)anthracene	84.8	1.35	62.8	7.49E-03	5.49E-06	0.00E+00	X
57-14-7	1,1-Dimethylhydrazine	84.8	1.35	62.8	7.49E-03	5.49E-06	5.49E-06	
58-89-9	gamma-BHC (Lindane)	0.3	1.35	0.2	3.00E-05	2.00E-08	0.00E+00	X
58-90-2	2,3,4,6-Tetrachlorophenol	84.8	1.35	62.8	7.49E-03	5.49E-06	5.49E-06	
591-78-6	2-Hexanone	18.7	1.35	13.9	1.65E-03	1.21E-06	1.21E-06	
59-50-7	4-Chloro-3-methylphenol	84.8	1.35	62.8	7.49E-03	5.49E-06	0.00E+00	X
59-89-2	N-Nitrosomorpholine	84.8	1.35	62.8	7.49E-03	5.49E-06	5.49E-06	
602-87-9	5-Nitroacenaphthene	84.8	1.35	62.8	7.49E-03	5.49E-06	0.00E+00	X
60-29-7	Ethyl ether	84.8	1.35	62.8	7.49E-03	5.49E-06	5.49E-06	
603-34-9	Triphenylamine	84.8	1.35	62.8	7.49E-03	5.49E-06	5.49E-06	
60-34-4	Methylhydrazine	18.7	1.35	13.9	1.65E-03	1.21E-06	1.21E-06	
60-35-5	Acetamide	18.7	1.35	13.9	1.65E-03	1.21E-06	1.21E-06	
60-57-1	Dieldrin	0.6	1.35	0.4	5.00E-05	4.00E-08	0.00E+00	X
621-64-7	Di-n-Propylnitrosamine	84.8	1.35	62.8	7.49E-03	5.49E-06	5.49E-06	
624-83-9	Methyl isocyanate	18.7	1.35	13.9	1.65E-03	1.21E-06	1.21E-06	
627-13-4	Nitric acid, propyl ester	84.8	1.35	62.8	7.49E-03	5.49E-06	5.49E-06	
62-75-9	N-Nitroso-N,N-dimethylamine	158.4	1.35	117.3	1.40E-02	1.03E-05	1.03E-05	
630-20-6	1,1,1,2-Tetrachloroethane	18.7	1.35	13.9	1.65E-03	1.21E-06	1.21E-06	
64-17-5	Ethyl alcohol	18.7	1.35	13.9	1.65E-03	1.21E-06	1.21E-06	
64-18-6	Formic acid	84.8	1.35	62.8	7.49E-03	5.49E-06	5.49E-06	
64-19-7	Acetic acid	84.8	1.35	62.8	7.49E-03	5.49E-06	5.49E-06	
67-56-1	Methyl alcohol (Methanol)	18.7	1.35	13.9	1.65E-03	1.21E-06	1.21E-06	
67-63-0	2-Propyl alcohol (Isopropanol)	18.7	1.35	13.9	1.65E-03	1.21E-06	1.21E-06	
67-64-1	2-Propanone (Acetone)	101.8	1.35	75.4	8.99E-03	6.59E-06	6.59E-06	
67-66-3	Chloroform	18.7	1.35	13.9	1.65E-03	1.21E-06	1.21E-06	
67-72-1	Hexachloroethane	84.8	1.35	62.8	7.49E-03	5.49E-06	5.49E-06	
684-16-2	Hexafluoroacetone	18.7	1.35	13.9	1.65E-03	1.21E-06	1.21E-06	
71-23-8	n-Propyl alcohol	18.7	1.35	13.9	1.65E-03	1.21E-06	1.21E-06	
71-36-3	n-Butyl alcohol	18.7	1.35	13.9	1.65E-03	1.21E-06	1.21E-06	
71-43-2	Benzene	18.7	1.35	13.9	1.65E-03	1.21E-06	1.21E-06	
71-55-6	Methyl chloroform (1,1,1-Trichloroethane)	18.7	1.35	13.9	1.65E-03	1.21E-06	1.21E-06	
72-20-8	Endrin	0.6	1.35	0.4	5.00E-05	4.00E-08	0.00E+00	X
72-43-5	Methoxychlor	2.8	1.35	2.1	2.50E-04	1.80E-07	0.00E+00	X
72-54-8	4,4-DDD	0.6	1.35	0.4	5.00E-05	4.00E-08	0.00E+00	X
72-55-9	4,4-DDE	0.6	1.35	0.4	5.00E-05	4.00E-08	0.00E+00	X
74-83-9	Bromomethane (Methyl bromide)	18.7	1.35	13.9	1.65E-03	1.21E-06	1.21E-06	
74-87-3	Chloromethane (Methyl chloride)	18.7	1.35	13.9	1.65E-03	1.21E-06	1.21E-06	
74-97-5	Bromochloromethane	18.7	1.35	13.9	1.65E-03	1.21E-06	1.21E-06	
74-99-7	Methylacetylene	84.8	1.35	62.8	7.49E-03	5.49E-06	5.49E-06	
75-00-3	Chloroethane	18.7	1.35	13.9	1.65E-03	1.21E-06	1.21E-06	
75-01-4	Vinyl chloride (1-Chloroethene)	84.8	1.35	62.8	7.49E-03	5.49E-06	5.49E-06	
75-05-8	Acetonitrile	26.6	1.35	19.7	2.35E-03	1.72E-06	1.72E-06	
75-07-0	Acetaldehyde	84.8	1.35	62.8	7.49E-03	5.49E-06	5.49E-06	
75-09-2	Dichloromethane (Methylene chloride)	18.7	1.35	13.9	1.65E-03	1.21E-06	1.21E-06	
75-12-7	Formamide	84.8	1.35	62.8	7.49E-03	5.49E-06	5.49E-06	
75-15-0	Carbon disulfide	18.7	1.35	13.9	1.65E-03	1.21E-06	1.21E-06	
75-21-8	Ethylene oxide (Oxirane)	18.7	1.35	13.9	1.65E-03	1.21E-06	1.21E-06	
75-27-4	Bromodichloromethane	18.7	1.35	13.9	1.65E-03	1.21E-06	1.21E-06	
75-34-3	1,1-Dichloroethane	18.7	1.35	13.9	1.65E-03	1.21E-06	1.21E-06	
75-35-4	1,1-Dichloroethene (Vinylidene chloride)	18.7	1.35	13.9	1.65E-03	1.21E-06	1.21E-06	
75-43-4	Dichlorofluoromethane	18.7	1.35	13.9	1.65E-03	1.21E-06	1.21E-06	
75-45-6	Chlorodifluoromethane	18.7	1.35	13.9	1.65E-03	1.21E-06	1.21E-06	
75-50-3	Trimethylamine	18.7	1.35	13.9	1.65E-03	1.21E-06	1.21E-06	
75-52-5	Nitromethane	84.8	1.35	62.8	7.49E-03	5.49E-06	5.49E-06	
75-55-8	2-Methylaziridine	84.8	1.35	62.8	7.49E-03	5.49E-06	5.49E-06	
75-61-6	Difluorodibromomethane	18.7	1.35	13.9	1.65E-03	1.21E-06	1.21E-06	
75-63-8	Trifluorobromomethane	18.7	1.35	13.9	1.65E-03	1.21E-06	1.21E-06	
75-65-0	2-Methyl-2-propanol	18.7	1.35	13.9	1.65E-03	1.21E-06	1.21E-06	
75-69-4	Trichlorofluoromethane	18.7	1.35	13.9	1.65E-03	1.21E-06	1.21E-06	

Table 5. Estimate of Organic Emissions from the Pretreatment Feed Stream. Calc. No. 24590-WTP-HAC-50-00001, Rev. C

CAS#	Organic Compounds	Organic Conc. C_O mg/L	Density ρ kg/L	Individual Organic Weight Fraction. WF_i mg/kg	Individual Organic Weight Ratio WR_i unitless	Individual Organic Release R_{IO} gm/s	Individual Organic Vapor Emission R_{VO} gm/s	Particle P
75-71-8	Dichlorodifluoromethane	18.7	1.35	13.9	1.65E-03	1.21E-06	1.21E-06	
75-99-0	2,2-Dichloropropionic acid	84.8	1.35	62.8	7.49E-03	5.49E-06	5.49E-06	
76-03-9	Trichloroacetic acid	18.7	1.35	13.9	1.65E-03	1.21E-06	1.21E-06	
76-11-9	1,1,1,2-Tetrachloro-2,2-difluoroethane	84.8	1.35	62.8	7.49E-03	5.49E-06	5.49E-06	
76-12-0	1,1,2,2-Tetrachloro-1,2-difluoroethane	84.8	1.35	62.8	7.49E-03	5.49E-06	5.49E-06	
76-13-1	1,2,2-Trichloro-1,1,2-trifluoroethane (Freon 113)	18.7	1.35	13.9	1.65E-03	1.21E-06	1.21E-06	
76-14-2	1,2-Dichloro-1,1,2,2-tetrafluoroethane	18.7	1.35	13.9	1.65E-03	1.21E-06	1.21E-06	
76-15-3	Chloropentafluoroethane	18.7	1.35	13.9	1.65E-03	1.21E-06	1.21E-06	
76-44-8	Heptachlor	1.8	1.35	1.3	1.60E-04	1.20E-07	1.20E-07	
78-83-1	2-Methylpropyl alcohol (Isobutyl alcohol)	84.8	1.35	62.8	7.49E-03	5.49E-06	5.49E-06	
78-87-5	1,2-Dichloropropane	18.7	1.35	13.9	1.65E-03	1.21E-06	1.21E-06	
78-92-2	1-Methylpropyl alcohol (2-Butanol)	18.7	1.35	13.9	1.65E-03	1.21E-06	1.21E-06	
78-93-3	Methyl ethyl ketone (MEK, 2-Butanone)	18.7	1.35	13.9	1.65E-03	1.21E-06	1.21E-06	
79-00-5	1,1,2-Trichloroethane	18.7	1.35	13.9	1.65E-03	1.21E-06	1.21E-06	
79-01-6	Trichloroethylene	18.7	1.35	13.9	1.65E-03	1.21E-06	1.21E-06	
79-09-4	Propionic acid	84.8	1.35	62.8	7.49E-03	5.49E-06	5.49E-06	
79-10-7	2-Propenoic acid	84.8	1.35	62.8	7.49E-03	5.49E-06	5.49E-06	
79-20-9	Methyl acetate	84.8	1.35	62.8	7.49E-03	5.49E-06	5.49E-06	
79-34-5	1,1,2,2-Tetrachloroethane	18.7	1.35	13.9	1.65E-03	1.21E-06	1.21E-06	
8001-35-2	Toxaphene	0.7	1.35	0.5	6.00E-05	4.00E-08	0.00E+00	X
82-68-8	Pentachloronitrobenzene (PCBN)	84.8	1.35	62.8	7.49E-03	5.49E-06	5.49E-06	
83-32-9	Acenaphthene	84.8	1.35	62.8	7.49E-03	5.49E-06	5.49E-06	
84-66-2	Diethyl phthalate	84.8	1.35	62.8	7.49E-03	5.49E-06	5.49E-06	
84-74-2	Dibutyl phthalate	84.8	1.35	62.8	7.49E-03	5.49E-06	0.00E+00	X
85-01-8	Phenanthrene	84.8	1.35	62.8	7.49E-03	5.49E-06	5.49E-06	
85-68-7	Butylbenzyl phthalate	84.8	1.35	62.8	7.49E-03	5.49E-06	0.00E+00	X
86-73-7	Fluorene	84.8	1.35	62.8	7.49E-03	5.49E-06	0.00E+00	X
87-68-3	Hexachlorobutadiene	18.7	1.35	13.9	1.65E-03	1.21E-06	1.21E-06	
87-86-5	Pentachlorophenol	84.8	1.35	62.8	7.49E-03	5.49E-06	5.49E-06	
88-06-2	2,4,6-Trichlorophenol	84.8	1.35	62.8	7.49E-03	5.49E-06	5.49E-06	
88-72-2	2-Nitrotoluene	18.7	1.35	13.9	1.65E-03	1.21E-06	1.21E-06	
88-75-5	2-Nitrophenol	84.8	1.35	62.8	7.49E-03	5.49E-06	5.49E-06	
88-85-7	2-sec-Butyl-4,6-dinitrophenol (Dinoseb)	84.8	1.35	62.8	7.49E-03	5.49E-06	0.00E+00	X
88-89-1	Picric acid	84.8	1.35	62.8	7.49E-03	5.49E-06	0.00E+00	X
91-20-3	Naphthalene	2.8	1.35	2.1	2.50E-04	1.80E-07	1.80E-07	
91-22-5	Quinoline	84.8	1.35	62.8	7.49E-03	5.49E-06	5.49E-06	
91-58-7	2-Chloronapthalene	84.8	1.35	62.8	7.49E-03	5.49E-06	5.49E-06	
92-52-4	1,1`-Biphenyl	84.8	1.35	62.8	7.49E-03	5.49E-06	5.49E-06	
92-93-3	4-Nitrobiphenyl	84.8	1.35	62.8	7.49E-03	5.49E-06	0.00E+00	X
93-72-1	Silvex (2,4,5-TP)	84.8	1.35	62.8	7.49E-03	5.49E-06	0.00E+00	X
93-76-5	2,4,5-T	84.8	1.35	62.8	7.49E-03	5.49E-06	0.00E+00	X
94-75-7	2,4-D and esters (160C typed)	84.8	1.35	62.8	7.49E-03	5.49E-06	5.49E-06	
95-13-6	Indene	84.8	1.35	62.8	7.49E-03	5.49E-06	5.49E-06	
95-47-6	o-Xylene	18.7	1.35	13.9	1.65E-03	1.21E-06	1.21E-06	
95-48-7	o-Cresol (2-Methylphenol)	18.7	1.35	13.9	1.65E-03	1.21E-06	1.21E-06	
95-49-8	2-Chlorotoluene	84.8	1.35	62.8	7.49E-03	5.49E-06	5.49E-06	
95-50-1	o-Dichlorobenzene (1,2-Dichlorobenzene)	18.7	1.35	13.9	1.65E-03	1.21E-06	1.21E-06	
95-57-8	2-Chlorophenol	84.8	1.35	62.8	7.49E-03	5.49E-06	5.49E-06	
95-95-4	2,4,5-Trichlorophenol	84.8	1.35	62.8	7.49E-03	5.49E-06	5.49E-06	
96-22-0	3-Pentanone	18.7	1.35	13.9	1.65E-03	1.21E-06	1.21E-06	
96-69-5	Bis(3-tert-butyl-4-hydroxy-6-methyl-phenyl)sulfide	84.8	1.35	62.8	7.49E-03	5.49E-06	0.00E+00	X
98-51-1	p-tert-Butyltoluene	84.8	1.35	62.8	7.49E-03	5.49E-06	5.49E-06	
98-82-8	Cumene	84.8	1.35	62.8	7.49E-03	5.49E-06	5.49E-06	
98-83-9	alpha-Methylstyrene	18.7	1.35	13.9	1.65E-03	1.21E-06	1.21E-06	
98-86-2	Acetophenone	84.8	1 35	62.8	7.49E-03	5.49E-06	5.49E-06	
98-95-3	Nitrobenzene	84.8	1.35	62.8	7.49E-03	5.49E-06	5.49E-06	
			Weight Fraction Sum = WF_S =	8383.9				
			Weight Ratio Sum = WR_S =		1.0			
			Pretreatment Feed Stream Sum = $ER_{O\text{-}PTF}$ =			7.33E-04		
			Pretreatment Feed Stream Vapor Organic Release Sum = R_{VOS} =				5.11E-04	

HL = Henry's Law Groupings; values for HL are from the Emission Baseline Report (23590-WTP-RPT-PO-03-008)
WF_i = the weight fraction of the individual organic compound; values are assigned from Table 2 based on HL
WF_S = Sum WF_i
WR_i = the ratio of the individual organic compound weight fraction to the sum of the individual weight fraction = WFi / WF_S
WR_S = Sum WR_i
R_{IO} = WR_i * ER_{O-PE}; ER_{O-PE} is from Table 1
R_{VO} = vapor emissions; R_{VO} is "0" if the compound is a particle or is particle-bound
R_{VOS} = Sum R_{VOi}
P = particle; cell has an "X" if the compound is a particle or is particle-bound

Table 6. Estimate of Organic Emissions from the Post-Evaporator Stream. Calc. No. 24590-WTP-HAC-50-00001, Rev. C

CAS#	Organic Compound	Henry's Law Grouping HL	Individual Organic Weight Fraction. WF_i mg/kg	Individual Organic Weight Ratio WR_i unitless	Individual Organic Release R_{IO} gm/s	Individual Organic Vapor Emission R_{VO} gm/s	Particle P
100-00-5	p-Nitrochlorobenzene	10	8.11E-01	5.47E-04	4.00E-07	4.00E-07	
100-21-0	p-Phthalic acid	1	5.74E+01	3.87E-02	2.98E-05	2.98E-05	
100-25-4	1,4-Dinitrobenzene	6	5.51E+01	3.72E-02	2.86E-05	0.00E+00	X
100-41-4	Ethyl benzene	20	7.31E-07	0.00E+00	0.00E+00	0.00E+00	
100-42-5	Styrene	19	1.06E-05	0.00E+00	0.00E+00	0.00E+00	
10061-01-5	cis-1,3-Dichloropropene	19	2.57E-05	0.00E+00	0.00E+00	0.00E+00	
10061-02-6	trans-1,3-Dichloropropene	17	1.29E-04	1.00E-07	0.00E+00	0.00E+00	
101-55-3	4-Bromophenylphenyl ether	14	1.05E-01	7.06E-05	5.44E-08	5.44E-08	
101-84-8	Diphenyl ether	16	1.33E-03	9.00E-07	1.00E-09	1.00E-09	
106-35-4	3-Heptanone	14	1.05E-01	7.06E-05	5.44E-08	5.44E-08	
106-42-3	p-Xylene (Dimethyl benzene)	19	1.06E-05	0.00E+00	0.00E+00	0.00E+00	
106-46-7	1,4-Dichlorobenzene	18	8.05E-06	0.00E+00	0.00E+00	0.00E+00	
106-88-7	1,2-Epoxybutane	15	3.43E-02	2.31E-05	1.78E-08	1.78E-08	
106-93-4	Ethylene dibromide (Dibromethane)	16	3.33E-03	2.20E-06	2.00E-09	2.00E-09	
106-97-8	Butane	26	9.68E-13	0.00E+00	0.00E+00	0.00E+00	
106-99-0	1,3-Butadiene	23	2.12E-09	0.00E+00	0.00E+00	0.00E+00	
107-02-8	Acrolein	14	1.05E-01	7.06E-05	5.44E-08	5.44E-08	
107-05-1	3-Chloropropene (Allyl chloride)	20	7.31E-07	0.00E+00	0.00E+00	0.00E+00	
107-06-2	1,2-Dichloroethane (Ethylene chloride)	17	1.29E-04	1.00E-07	0.00E+00	0.00E+00	
107-12-0	Propionitrile	13	2.49E-01	1.68E-04	1.29E-07	1.29E-07	
107-13-1	Acrylonitrile	14	1.05E-01	7.06E-05	5.44E-08	5.44E-08	
107-18-6	2-Propene-1-ol	10	8.11E-01	5.47E-04	4.21E-07	4.21E-07	
107-31-3	Formic acid, methyl ester	15	3.43E-02	2.31E-05	1.78E-08	1.78E-08	
107-66-4	Dibutylphosphate	5	1.24E+01	8.39E-03	6.47E-06	0.00E+00	X
107-87-9	2-Pentanone	14	1.05E-01	7.06E-05	5.44E-08	5.44E-08	
108-03-2	1-Nitropropane	14	1.05E-01	7.06E-05	5.44E-08	5.44E-08	
108-05-4	Vinyl acetate	16	1.33E-03	9.00E-07	1.00E-09	1.00E-09	
108-10-1	Hexone (4-Methyl-2-pentanone or MIBK)	14	1.05E-01	7.06E-05	5.44E-08	5.44E-08	
108-20-3	Bis(isopropyl)ether	18	8.05E-06	0.00E+00	0.00E+00	0.00E+00	
108-38-3	m-Xylene (Dimethyl benzene)	19	1.06E-05	0.00E+00	0.00E+00	0.00E+00	
108-39-4	m-Cresol	9	2.31E+01	1.56E-02	1.20E-05	1.20E-05	
108-87-2	Methylcyclohexane	25	1.08E-11	0.00E+00	0.00E+00	0.00E+00	
108-88-3	Toluene	19	2.31E-06	0.00E+00	0.00E+00	0.00E+00	
108-90-7	Chlorobenzene	19	1.06E-05	0.00E+00	0.00E+00	0.00E+00	
108-93-0	Cyclohexanol	10	8.11E-01	5.47E-04	4.21E-07	4.21E-07	
108-94-1	Cyclohexanone	11	1.90E+00	1.28E-03	9.87E-07	9.87E-07	
108-95-2	Phenol	8	3.57E+01	2.41E-02	1.86E-05	1.86E-05	
109-66-0	n-Pentane	26	9.68E-13	0.00E+00	0.00E+00	0.00E+00	
109-99-9	Tetrahydrofuran	13	2.49E-01	1.68E-04	1.29E-07	1.29E-07	
110-12-3	5-Methyl-2-hexanone	15	3.43E-02	2.31E-05	1.78E-08	1.78E-08	
110-43-0	2-Heptanone	15	3.43E-02	2.31E-05	1.78E-08	1.78E-08	
110-54-3	n-Hexane	27	1.47E-13	0.00E+00	0.00E+00	0.00E+00	
110-62-3	n-Valeraldehyde	15	3.43E-02	2.31E-05	1.78E-08	1.78E-08	
110-82-7	Cyclohexane	24	2.53E-10	0.00E+00	0.00E+00	0.00E+00	
110-83-8	Cyclohexene	22	3.86E-08	0.00E+00	0.00E+00	0.00E+00	

Table 6. Estimate of Organic Emissions from the Post-Evaporator Stream. Calc. No. 24590-WTP-HAC-50-00001, Rev. C

CAS#	Organic Compound	Henry's Law Grouping HL	Individual Organic Weight Fraction. WF_i mg/kg	Individual Organic Weight Ratio WR_i unitless	Individual Organic Release R_{IO} gm/s	Individual Organic Vapor Emission R_{VO} gm/s	Particle P
110-86-1	Pyridine	11	1.90E+00	1.28E-03	9.87E-07	9.87E-07	
111-65-9	n-Octane	28	2.22E-14	0.00E+00	0.00E+00	0.00E+00	
111-76-2	Ethylene glycol monobutyl ether	9	2.31E+01	1.56E-02	1.20E-05	1.20E-05	
111-84-2	n-Nonane	28	2.22E-14	0.00E+00	0.00E+00	0.00E+00	
117-81-7	Bis(2-ethylhexyl)phthalate (DEHP)	30	3.21E-01	2.17E-04	1.67E-07	0.00E+00	X
117-84-0	n-Dioctyl phthalate	32	3.47E+00	2.34E-03	1.80E-06	0.00E+00	X
118-74-1	Hexachlorobenzene	18	8.05E-06	0.00E+00	0.00E+00	0.00E+00	
120-12-7	Anthracene	13	3.12E-01	2.11E-04	1.62E-07	1.62E-07	
120-82-1	1,2,4-Trichlorobenzene	17	1.29E-04	1.00E-07	0.00E+00	0.00E+00	
120-83-2	2,4-Dichlorophenol	10	8.11E-01	5.47E-04	4.21E-07	4.21E-07	
121-44-8	Triethylamine	15	3.43E-02	2.31E-05	1.78E-08	1.78E-08	
121-69-7	Dimethylaniline	13	2.49E-01	1.68E-04	1.29E-07	1.29E-07	
122-39-4	N,N-Diphenylamine	10	1.58E+00	1.07E-03	8.21E-07	8.21E-07	
123-19-3	4-Heptanone	13	2.49E-01	1.68E-04	1.29E-07	1.29E-07	
123-38-6	n-Propionaldehyde	14	1.05E-01	7.06E-05	5.44E-08	5.44E-08	
123-51-3	3-Methyl-1-butanol	12	1.94E+00	1.31E-03	1.01E-06	1.01E-06	
123-86-4	Acetic acid n-butyl ester	16	1.33E-03	9.00E-07	1.00E-09	1.00E-09	
123-91-1	1,4-Dioxane	10	8.11E-01	5.47E-04	4.21E-07	4.21E-07	
126-73-8	Tributyl phosphate	7	4.54E+01	3.06E-02	2.36E-05	2.36E-05	
126-98-7	2-Methyl-2-propenenitrile (Methacrylonitrile)	16	1.33E-03	9.00E-07	1.00E-09	1.00E-09	
127-18-4	Perchloroethylene (tetrachloroethylene)	21	1.43E-07	0.00E+00	0.00E+00	0.00E+00	
127-19-5	N,N-Dimethylacetamide	5	1.24E+01	8.39E-03	6.47E-06	6.47E-06	
128-37-0	2,6-Bis(tert-butyl)-4-methylphenol	32	3.47E+00	2.34E-03	1.80E-06	1.80E-06	
129-00-0	Pyrene	33	2.63E+00	1.78E-03	1.37E-06	0.00E+00	X
1321-64-8	Pentachloronaphthalene	14	1.05E-01	7.06E-05	5.44E-08	0.00E+00	X
1321-65-9	Trichloronaphthalene	15	3.43E-02	2.31E-05	1.78E-08	1.78E-08	
132-64-9	Dibenzofuran	15	3.43E-02	2.31E-05	1.78E-08	1.78E-08	
1335-87-1	Hexachloronaphthalene	14	1.05E-01	7.06E-05	5.44E-08	0.00E+00	X
1335-88-2	Tetrachloronaphthalene	15	3.43E-02	2.31E-05	1.78E-08	0.00E+00	X
1336-36-3	Polychlorinated biphenyls (PCBs)	35	5.97E-02	4.03E-05	3.11E-08	0.00E+00	X
141-78-6	Acetic acid ethyl ester (Ethyl acetate)	14	1.05E-01	7.06E-05	5.44E-08	5.44E-08	
141-79-7	4-Methyl-3-penten-2-one	13	2.49E-01	1.68E-04	1.29E-07	1.29E-07	
142-82-5	n-Heptane	27	1.47E-13	0.00E+00	0.00E+00	0.00E+00	
144-62-7	Oxalic acid	3	5.75E+00	3.88E-03	2.99E-06	2.99E-06	
156-60-5	trans-1,2-Dichloroethylene	20	7.31E-07	0.00E+00	0.00E+00	0.00E+00	
1582-09-8	Trifluralin	14	1.05E-01	7.06E-05	5.44E-08	0.00E+00	X
1634-04-4	Methyl tert-butyl ether	16	1.33E-03	9.00E-07	1.00E-09	1.00E-09	
1836-75-5	Nitrofen	30	3.21E-01	2.17E-04	1.67E-07	0.00E+00	X
189-55-9	Dibenzo[a,i]pyrene	5	1.24E+01	8.39E-03	6.47E-06	0.00E+00	X
189-64-0	Dibenzo[a,h]pyrene	5	1.24E+01	8.39E-03	6.47E-06	0.00E+00	X
191-24-2	Benzo(g,h,i)perylene	30	3.21E-01	2.17E-04	1.67E-07	0.00E+00	X
191-30-0	Benzo[a,i]pyrene	5	1.24E+01	8.39E-03	6.47E-06	0.00E+00	X
192-65-4	Dibenzo[a,e]pyrene	5	1.24E+01	8.39E-03	6.47E-06	0.00E+00	X
193-39-5	Indeno(1,2,3-cd)pyrene	30	3.21E-01	2.17E-04	1.67E-07	0.00E+00	X
205-82-3	Benzo(j)fluoranthene	7	4.54E+01	3.06E-02	2.36E-05	0.00E+00	X
205-99-2	Benzo(b)fluoranthene	30	3.21E-01	2.17E-04	1.67E-07	0.00E+00	X
206-44-0	Fluoranthene	33	1.33E+00	8.96E-04	6.90E-07	0.00E+00	X
207-08-9	Benzo(k)fluoranthene	30	3.21E-01	2.17E-04	1.67E-07	0.00E+00	X
208-96-8	Acenaphthylene	14	1.05E-01	7.06E-05	5.44E-08	5.44E-08	
218-01-9	Chrysene	32	5.81E+00	3.92E-03	3.02E-06	0.00E+00	X
2234-13-1	Octachloronaphthalene	14	1.05E-01	7.06E-05	5.44E-08	0.00E+00	X
224-42-0	Dibenz[a,j]acridine	4	5.72E+01	3.86E-02	2.97E-05	0.00E+00	X
226-36-8	Dibenz[a,h]acridine	4	5.72E+01	3.86E-02	2.97E-05	0.00E+00	X
2385-85-5	Mirex	17	1.29E-04	1.00E-07	0.00E+00	0.00E+00	
25551-13-7	Trimethyl benzene	19	1.06E-05	0.00E+00	0.00E+00	0.00E+00	
26140-60-3	Terphenyls	34	8.98E-03	6.10E-06	4.70E-09	0.00E+00	X
27154-33-2	Trichlorofluoroethane	23	2.12E-09	0.00E+00	0.00E+00	0.00E+00	

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CAS#	Organic Compound	Henry's Law Grouping HL	Individual Organic Weight Fraction. WF_i mg/kg	Individual Organic Weight Ratio WR_i unitless	Individual Organic Release R_{IO} gm/s	Individual Organic Vapor Emission R_{VO} gm/s	Particle P
287-92-3	Cyclopentane	24	2.53E-10	0.00E+00	0.00E+00	0.00E+00	
309-00-2	Aldrin	34	8.98E-03	6.10E-06	4.70E-09	0.00E+00	X
319-84-6	Hexachlorocyclohexane (Lindane) Alpha BHC	33	1.33E+00	8.96E-04	6.90E-07	6.90E-07	
319-85-7	Hexachlorocyclohexane (Lindane) Beta BHC	30	1.38E-01	9.34E-05	7.20E-08	0.00E+00	X
319-86-8	Delta-BHC	30	3.21E-01	2.17E-04	1.67E-07	0.00E+00	X
3697-24-3	5-Methylchrysene	32	3.47E+00	2.34E-03	1.80E-06	0.00E+00	X
3825-26-1	Ammonium perfluorooctanoate	14	1.05E-01	7.06E-05	5.44E-08	0.00E+00	X
4170-30-3	2-Butenaldehyde (2-Butenal)	11	5.58E-01	3.77E-04	2.90E-07	2.90E-07	
465-73-6	Isodrin	35	5.97E-02	4.03E-05	3.11E-08	3.11E-08	
50-00-0	Formaldehyde	8	3.49E+01	2.35E-02	1.81E-05	1.81E-05	
50-29-3	4,4-DDT	33	1.33E+00	8.96E-04	6.90E-07	0.00E+00	X
50-32-8	Benzo(a)pyrene	30	5.04E-01	3.40E-04	2.62E-07	0.00E+00	X
53-70-3	Dibenzo(a,h)anthracene	7	4.54E+01	3.06E-02	2.36E-05	0.00E+00	X
540-59-0	1,2-Dichloroethylene	19	1.06E-05	0.00E+00	0.00E+00	0.00E+00	
540-84-1	2,2,4-Trimethylpentane	28	2.22E-14	0.00E+00	0.00E+00	0.00E+00	
541-73-1	1,3-Dichlorobenzene	19	1.06E-05	0.00E+00	0.00E+00	0.00E+00	
56-23-5	Carbon tetrachloride	22	3.86E-08	0.00E+00	0.00E+00	0.00E+00	
563-80-4	3-Methyl-2-butanone	14	1.05E-01	7.06E-05	5.44E-08	5.44E-08	
56-49-5	3-Methylcholanthrene	28	2.22E-14	0.00E+00	0.00E+00	0.00E+00	X
56-55-3	Benzo(a)anthracene	33	1.33E+00	8.96E-04	6.90E-07	0.00E+00	X
57-14-7	1,1-Dimethylhydrazine	12	1.94E+00	1.31E-03	1.01E-06	1.01E-06	
58-89-9	gamma-BHC (Lindane)	32	2.06E-02	1.39E-05	1.07E-08	0.00E+00	X
58-90-2	2,3,4,6-Tetrachlorophenol	11	2.78E+00	1.88E-03	1.45E-06	1.45E-06	
591-78-6	2-Hexanone	14	1.05E-01	7.06E-05	5.44E-08	5.44E-08	
59-50-7	4-Chloro-3-methylphenol	32	3.47E+00	2.34E-03	1.80E-06	0.00E+00	X
59-89-2	N-Nitrosomorpholine	6	5.51E+01	3.72E-02	2.86E-05	2.86E-05	
602-87-9	5-Nitroacenaphthene	9	2.31E+01	1.56E-02	1.20E-05	0.00E+00	X
60-29-7	Ethyl ether	17	1.29E-04	1.00E-07	0.00E+00	0.00E+00	
603-34-9	Triphenylamine	32	4.57E+00	3.08E-03	2.37E-06	2.37E-06	
60-34-4	Methylhydrazine	10	8.11E-01	5.47E-04	4.21E-07	4.21E-07	
60-35-5	Acetamide	5	1.24E+01	8.39E-03	6.47E-06	6.47E-06	
60-57-1	Dieldrin	33	2.21E-02	1.49E-05	1.15E-08	0.00E+00	X
621-64-7	Di-n-Propylnitrosamine	10	8.11E-01	5.47E-04	4.21E-07	4.21E-07	
624-83-9	Methyl isocyanate	17	1.29E-04	1.00E-07	0.00E+00	0.00E+00	
627-13-4	Nitric acid, propyl ester	17	1.29E-04	1.00E-07	0.00E+00	0.00E+00	
62-75-9	N-Nitroso-N,N-dimethylamine	9	2.31E+01	1.56E-02	1.20E-05	1.20E-05	
630-20-6	1,1,1,2-Tetrachloroethane	18	8.05E-06	0.00E+00	0.00E+00	0.00E+00	
64-17-5	Ethyl alcohol	10	8.11E-01	5.47E-04	4.21E-07	4.21E-07	
64-18-6	Formic acid	7	4.54E+01	3.06E-02	2.36E-05	2.36E-05	
64-19-7	Acetic acid	6	5.51E+01	3.72E-02	2.86E-05	2.86E-05	
67-56-1	Methyl alcohol (Methanol)	10	8.11E-01	5.47E-04	4.21E-07	4.21E-07	
67-63-0	2-Propyl alcohol (Isopropanol)	11	1.90E+00	1.28E-03	9.90E-07	9.90E-07	
67-64-1	2-Propanone (Acetone)	13	2.49E-01	1.68E-04	1.29E-07	1.29E-07	
67-66-3	Chloroform	19	1.06E-05	0.00E+00	0.00E+00	0.00E+00	
67-72-1	Hexachloroethane	19	1.06E-05	0.00E+00	0.00E+00	0.00E+00	
684-16-2	Hexafluoroacetone	19	1.06E-05	0.00E+00	0.00E+00	0.00E+00	
71-23-8	n-Propyl alcohol	11	1.90E+00	1.28E-03	9.87E-07	9.87E-07	
71-36-3	n-Butyl alcohol	11	1.90E+00	1.28E-03	9.87E-07	9.87E-07	
71-43-2	Benzene	19	3.80E-06	0.00E+00	0.00E+00	0.00E+00	
71-55-6	Methyl chloroform (1,1,1-Trichloroethane)	21	1.43E-07	0.00E+00	0.00E+00	0.00E+00	
72-20-8	Endrin	32	3.47E+00	2.34E-03	1.80E-06	0.00E+00	X
72-43-5	Methoxychlor	7	4.54E+01	3.06E-02	2.36E-05	0.00E+00	X
72-54-8	4,4-DDD	32	3.47E+00	2.34E-03	1.80E-06	0.00E+00	X
72-55-9	4,4-DDE	34	8.98E-03	6.10E-06	5.00E-09	0.00E+00	X
74-83-9	Bromomethane (Methyl bromide)	19	1.06E-05	0.00E+00	0.00E+00	0.00E+00	
74-87-3	Chloromethane (Methyl chloride)	20	7.31E-07	0.00E+00	0.00E+00	0.00E+00	
74-97-5	Bromochloromethane	17	1.29E-04	1.00E-07	0.00E+00	0.00E+00	

Table 6. Estimate of Organic Emissions from the Post-Evaporator Stream. Calc. No. 24590-WTP-HAC-50-00001, Rev. C

CAS#	Organic Compound	Henry's Law Grouping HL	Individual Organic Weight Fraction. WF_i mg/kg	Individual Organic Weight Ratio WR_i unitless	Individual Organic Release R_{IO} gm/s	Individual Organic Vapor Emission R_{VO} gm/s	Particle P
74-99-7	Methylacetylene	20	7.31E-07	0.00E+00	0.00E+00	0.00E+00	
75-00-3	Chloroethane	20	7.31E-07	0.00E+00	0.00E+00	0.00E+00	
75-01-4	Vinyl chloride (1-Chloroethene)	22	3.86E-08	0.00E+00	0.00E+00	0.00E+00	
75-05-8	Acetonitrile	13	1.86E-01	1.25E-04	9.65E-08	9.65E-08	
75-07-0	Acetaldehyde	13	2.49E-01	1.68E-04	1.29E-07	1.29E-07	
75-09-2	Dichloromethane (Methylene chloride)	19	1.06E-05	0.00E+00	0.00E+00	0.00E+00	
75-12-7	Formamide	4	5.72E+01	3.86E-02	2.97E-05	2.97E-05	
75-15-0	Carbon disulfide	20	7.31E-07	0.00E+00	0.00E+00	0.00E+00	
75-21-8	Ethylene oxide (Oxirane)	15	3.43E-02	2.31E-05	1.78E-08	1.78E-08	
75-27-4	Bromodichloromethane	18	8.05E-06	0.00E+00	0.00E+00	0.00E+00	
75-34-3	1,1-Dichloroethane	19	1.06E-05	0.00E+00	0.00E+00	0.00E+00	
75-35-4	1,1-Dichloroethene (Vinylidene chloride)	22	3.86E-08	0.00E+00	0.00E+00	0.00E+00	
75-43-4	Dichlorofluoromethane	20	7.31E-07	0.00E+00	0.00E+00	0.00E+00	
75-45-6	Chlorodifluoromethane	22	3.86E-08	0.00E+00	0.00E+00	0.00E+00	
75-50-3	Trimethylamine	14	1.05E-01	7.06E-05	5.44E-08	5.44E-08	
75-52-5	Nitromethane	13	2.49E-01	1.68E-04	1.29E-07	1.29E-07	
75-55-8	2-Methylaziridine	11	1.90E+00	1.28E-03	9.87E-07	9.87E-07	
75-61-6	Difluorodibromomethane	22	3.86E-08	0.00E+00	0.00E+00	0.00E+00	
75-63-8	Trifluorobromomethane	25	1.08E-11	0.00E+00	0.00E+00	0.00E+00	
75-65-0	2-Methyl-2-propanol	11	1.90E+00	1.28E-03	9.87E-07	9.87E-07	
75-69-4	Trichlorofluoromethane	23	0.00E+00	0.00E+00	0.00E+00	0.00E+00	
75-71-8	Dichlorodifluoromethane	25	1.08E-11	0.00E+00	0.00E+00	0.00E+00	
75-99-0	2,2-Dichloropropionic acid	6	5.51E+01	3.72E-02	2.86E-05	2.86E-05	
76-03-9	Trichloroacetic acid	5	1.24E+01	8.39E-03	6.47E-06	6.47E-06	
76-11-9	1,1,1,2-Tetrachloro-2,2-difluoroethane	24	2.53E-10	0.00E+00	0.00E+00	0.00E+00	
76-12-0	1,1,2,2-Tetrachloro-1,2-difluoroethane	23	2.12E-09	0.00E+00	0.00E+00	0.00E+00	
76-13-1	1,2,2-Trichloro-1,1,2-trifluoroethane (Freon 113)	25	1.08E-11	0.00E+00	0.00E+00	0.00E+00	
76-14-2	1,2-Dichloro-1,1,2,2-tetrafluoroethane	28	2.22E-14	0.00E+00	0.00E+00	0.00E+00	
76-15-3	Chloropentafluoroethane	29	4.99E-15	0.00E+00	0.00E+00	0.00E+00	
76-44-8	Heptachlor	16	3.92E-04	3.00E-07	0.00E+00	0.00E+00	
78-83-1	2-Methylpropyl alcohol (Isobutyl alcohol)	11	1.90E+00	1.28E-03	9.87E-07	9.87E-07	
78-87-5	1,2-Dichloropropane	19	1.06E-05	0.00E+00	0.00E+00	0.00E+00	
78-92-2	1-Methylpropyl alcohol (2-Butanol)	11	1.90E+00	1.28E-03	9.87E-07	9.87E-07	
78-93-3	Methyl ethyl ketone (MEK, 2-Butanone)	13	2.49E-01	1.68E-04	1.29E-07	1.29E-07	
79-00-5	1,1,2-Trichloroethane	17	1.29E-04	1.00E-07	0.00E+00	0.00E+00	
79-01-6	Trichloroethylene	20	7.82E-07	0.00E+00	0.00E+00	0.00E+00	
79-09-4	Propionic acid	8	3.49E+01	2.35E-02	1.81E-05	1.81E-05	
79-10-7	2-Propenoic acid	8	3.49E+01	2.35E-02	1.81E-05	1.81E-05	
79-20-9	Methyl acetate	14	1.05E-01	7.06E-05	5.44E-08	5.44E-08	
79-34-5	1,1,2,2-Tetrachloroethane	16	1.33E-03	9.00E-07	1.00E-09	1.00E-09	
8001-35-2	Toxaphene	10	4.17E-02	2.81E-05	2.17E-08	0.00E+00	X
82-68-8	Pentachloronitrobenzene (PCBN)	13	2.49E-01	1.68E-04	1.29E-07	1.29E-07	
83-32-9	Acenaphthene	15	3.43E-02	2.31E-05	1.78E-08	1.78E-08	
84-66-2	Diethyl phthalate	8	2.67E+01	1.80E-02	1.39E-05	1.39E-05	
84-74-2	Dibutyl phthalate	31	1.53E+01	1.03E-02	7.96E-06	0.00E+00	X
85-01-8	Phenanthrene	13	2.49E-01	1.68E-04	1.29E-07	1.29E-07	
85-68-7	Butylbenzyl phthalate	31	1.53E+01	1.03E-02	7.96E-06	0.00E+00	X
86-73-7	Fluorene	14	1.05E-01	7.06E-05	5.44E-08	0.00E+00	X
87-68-3	Hexachlorobutadiene	20	6.79E-07	0.00E+00	0.00E+00	0.00E+00	
87-86-5	Pentachlorophenol	6	5.51E+01	3.72E-02	2.86E-05	2.86E-05	
88-06-2	2,4,6-Trichlorophenol	10	8.11E-01	5.47E-04	4.21E-07	4.21E-07	
88-72-2	2-Nitrotoluene	12	1.94E+00	1.31E-03	1.01E-06	1.01E-06	
88-75-5	2-Nitrophenol	12	1.94E+00	1.31E-03	1.01E-06	1.01E-06	
88-85-7	2-sec-Butyl-4,6-dinitrophenol (Dinoseb)	8	4.23E+01	2.85E-02	2.20E-05	0.00E+00	X
88-89-1	Picric acid	2	7.13E+01	4.81E-02	3.71E-05	0.00E+00	X
91-20-3	Naphthalene	16	2.68E-04	2.00E-07	0.00E+00	0.00E+00	
91-22-5	Quinoline	9	2.31E+01	1.56E-02	1.20E-05	1.20E-05	

Table 6. Estimate of Organic Emissions from the Post-Evaporator Stream. Calc. No. 24590-WTP-HAC-50-00001, Rev. C

CAS#	Organic Compound	Henry's Law Grouping HL	Individual Organic Weight Fraction. WF_i mg/kg	Individual Organic Weight Ratio WR_i unitless	Individual Organic Release R_{IO} gm/s	Individual Organic Vapor Emission R_{VO} gm/s	Particle P
91-58-7	2-Chloronapthalene	16	1.33E-03	9.00E-07	1.00E-09	1.00E-09	
92-52-4	1,1`-Biphenyl	16	1.33E-03	9.00E-07	1.00E-09	1.00E-09	
92-93-3	4-Nitrobiphenyl	10	8.11E-01	5.47E-04	4.21E-07	0.00E+00	X
93-72-1	Silvex (2,4,5-TP)	5	1.24E+01	8.39E-03	6.47E-06	0.00E+00	X
93-76-5	2,4,5-T	5	1.24E+01	8.39E-03	6.47E-06	0.00E+00	X
94-75-7	2,4-D and esters (160C typed)	6	5.51E+01	3.72E-02	2.86E-05	2.86E-05	
95-13-6	Indene	18	8.05E-06	0.00E+00	0.00E+00	0.00E+00	
95-47-6	o-Xylene	19	1.06E-05	0.00E+00	0.00E+00	0.00E+00	
95-48-7	o-Cresol (2-Methylphenol)	9	2.31E+01	1.56E-02	1.20E-05	1.20E-05	
95-49-8	2-Chlorotoluene	19	1.06E-05	0.00E+00	0.00E+00	0.00E+00	
95-50-1	o-Dichlorobenzene (1,2-Dichlorobenzene)	18	8.05E-06	0.00E+00	0.00E+00	0.00E+00	
95-57-8	2-Chlorophenol	11	1.90E+00	1.28E-03	9.87E-07	9.87E-07	
95-95-4	2,4,5-Trichlorophenol	9	2.31E+01	1.56E-02	1.20E-05	1.20E-05	
96-22-0	3-Pentanone	14	1.05E-01	7.06E-05	5.44E-08	5.44E-08	
96-69-5	Bis(3-tert-butyl-4-hydroxy-6-methyl-phenyl)sulfide	19	1.06E-05	0.00E+00	0.00E+00	0.00E+00	X
98-51-1	p-tert-Butyltoluene	21	1.43E-07	0.00E+00	0.00E+00	0.00E+00	
98-82-8	Cumene	20	7.31E-07	0.00E+00	0.00E+00	0.00E+00	
98-83-9	alpha-Methylstyrene	19	1.06E-05	0.00E+00	0.00E+00	0.00E+00	
98-86-2	Acetophenone	11	2.36E+00	1.59E-03	1.22E-06	1.22E-06	
98-95-3	Nitrobenzene	12	1.94E+00	1.31E-03	1.01E-06	1.01E-06	
	Weight Fraction Sum = WF_S =		1482.5				
	Weight Ratio Sum = WR_S =			1.0			
	Post-Evaporator Stream Sum = $ER_{O\text{-}PE}$ =				7.70E-04		
	Post-Evaporator Stream Vapor Organic Release Sum = R_{VOS} =					4.61E-04	

Total Pretreatment emissions = the sum of Pretreatment Feed Stream and Post-Evaporator Stream Emissions

$R_{VO} = R_{VO\text{-}PTF} + R_{VO\text{-}PE}$

Table 7. Estimate of Organic Emissions from Pretreatment Process Cells. Calc. No. 24590-WTP-HAC-50-00001, Rev. C

CAS#	Organic Compound	Pretreatment Feed Stream Individual Organic Vapor Emission $R_{VO\text{-}PTF}$ gm/s	Post-Evaporator Individual Organic Vapor Emission $R_{VO\text{-}PE}$ gm/s	Total Pretreatment Organic Emission R_{VO} gm/s
100-00-5	p-Nitrochlorobenzene	5.49E-06	4.00E-07	5.89E-06
100-21-0	p-Phthalic acid	5.49E-06	2.98E-05	3.53E-05
100-25-4	1,4-Dinitrobenzene	0.00E+00	0.00E+00	0.00E+00
100-41-4	Ethyl benzene	1.21E-06	0.00E+00	1.21E-06
100-42-5	Styrene	1.21E-06	0.00E+00	1.21E-06
10061-01-5	cis-1,3-Dichloropropene	1.21E-06	0.00E+00	1.21E-06
10061-02-6	trans-1,3-Dichloropropene	1.21E-06	0.00E+00	1.21E-06
101-55-3	4-Bromophenylphenyl ether	5.49E-06	5.44E-08	5.54E-06
101-84-8	Diphenyl ether	1.21E-06	1.00E-09	1.21E-06
106-35-4	3-Heptanone	1.21E-06	5.44E-08	1.26E-06
106-42-3	p-Xylene (Dimethyl benzene)	1.21E-06	0.00E+00	1.21E-06
106-46-7	1,4-Dichlorobenzene	1.21E-06	0.00E+00	1.21E-06
106-88-7	1,2-Epoxybutane	1.21E-06	1.78E-08	1.23E-06
106-93-4	Ethylene dibromide (Dibromethane)	5.49E-06	2.00E-09	5.49E-06
106-97-8	Butane	1.21E-06	0.00E+00	1.21E-06
106-99-0	1,3-Butadiene	1.21E-06	0.00E+00	1.21E-06
107-02-8	Acrolein	1.21E-06	5.44E-08	1.26E-06
107-05-1	3-Chloropropene (Allyl chloride)	1.21E-06	0.00E+00	1.21E-06
107-06-2	1,2-Dichloroethane (Ethylene chloride)	1.21E-06	0.00E+00	1.21E-06
107-12-0	Propionitrile	1.21E-06	1.29E-07	1.34E-06
107-13-1	Acrylonitrile	1.21E-06	5.44E-08	1.26E-06
107-18-6	2-Propene-1-ol	5.49E-06	4.21E-07	5.91E-06
107-31-3	Formic acid, methyl ester	5.49E-06	1.78E-08	5.51E-06
107-66-4	Dibutylphosphate	0.00E+00	0.00E+00	0.00E+00
107-87-9	2-Pentanone	1.21E-06	5.44E-08	1.26E-06
108-03-2	1-Nitropropane	5.49E-06	5.44E-08	5.54E-06
108-05-4	Vinyl acetate	5.49E-06	1.00E-09	5.49E-06
108-10-1	Hexone (4-Methyl-2-pentanone or MIBK)	1.21E-06	5.44E-08	1.26E-06
108-20-3	Bis(isopropyl)ether	1.21E-06	0.00E+00	1.21E-06
108-38-3	m-Xylene (Dimethyl benzene)	1.21E-06	0.00E+00	1.21E-06
108-39-4	m-Cresol	1.21E-06	1.20E-05	1.32E-05
108-87-2	Methylcyclohexane	1.21E-06	0.00E+00	1.21E-06
108-88-3	Toluene	1.21E-06	0.00E+00	1.21E-06
108-90-7	Chlorobenzene	1.21E-06	0.00E+00	1.21E-06
108-93-0	Cyclohexanol	1.21E-06	4.21E-07	1.63E-06
108-94-1	Cyclohexanone	1.21E-06	9.87E-07	2.20E-06
108-95-2	Phenol	5.49E-06	1.86E-05	2.41E-05
109-66-0	n-Pentane	1.21E-06	0.00E+00	1.21E-06
109-99-9	Tetrahydrofuran	2.57E-06	1.29E-07	2.70E-06

Table 7. Estimate of Organic Emissions from Pretreatment Process Cells. Calc. No. 24590-WTP-HAC-50-00001, Rev. C

CAS#	Organic Compound	Pretreatment Feed Stream Individual Organic Vapor Emission $R_{VO\text{-}PTF}$ gm/s	Post-Evaporator Individual Organic Vapor Emission $R_{VO\text{-}PE}$ gm/s	Total Pretreatment Organic Emission R_{VO} gm/s
110-12-3	5-Methyl-2-hexanone	1.21E-06	1.78E-08	1.23E-06
110-43-0	2-Heptanone	1.21E-06	1.78E-08	1.23E-06
110-54-3	n-Hexane	1.21E-06	0.00E+00	1.21E-06
110-62-3	n-Valeraldehyde	5.49E-06	1.78E-08	5.51E-06
110-82-7	Cyclohexane	1.21E-06	0.00E+00	1.21E-06
110-83-8	Cyclohexene	1.21E-06	0.00E+00	1.21E-06
110-86-1	Pyridine	5.49E-06	9.87E-07	6.48E-06
111-65-9	n-Octane	1.21E-06	0.00E+00	1.21E-06
111-76-2	Ethylene glycol monobutyl ether	5.49E-06	1.20E-05	1.75E-05
111-84-2	n-Nonane	1.21E-06	0.00E+00	1.21E-06
117-81-7	Bis(2-ethylhexyl)phthalate (DEHP)	0.00E+00	0.00E+00	0.00E+00
117-84-0	n-Dioctyl phthalate	0.00E+00	0.00E+00	0.00E+00
118-74-1	Hexachlorobenzene	1.20E-07	0.00E+00	1.20E-07
120-12-7	Anthracene	5.49E-06	1.62E-07	5.65E-06
120-82-1	1,2,4-Trichlorobenzene	1.21E-06	0.00E+00	1.21E-06
120-83-2	2,4-Dichlorophenol	5.49E-06	4.21E-07	5.91E-06
121-44-8	Triethylamine	1.21E-06	1.78E-08	1.23E-06
121-69-7	Dimethylaniline	1.21E-06	1.29E-07	1.34E-06
122-39-4	N,N-Diphenylamine	1.21E-06	8.21E-07	2.03E-06
123-19-3	4-Heptanone	1.21E-06	1.29E-07	1.34E-06
123-38-6	n-Propionaldehyde	1.21E-06	5.44E-08	1.26E-06
123-51-3	3-Methyl-1-butanol	1.21E-06	1.01E-06	2.22E-06
123-86-4	Acetic acid n-butyl ester	5.49E-06	1.00E-09	5.49E-06
123-91-1	1,4-Dioxane	3.30E-06	4.21E-07	3.72E-06
126-73-8	Tributyl phosphate	5.49E-06	2.36E-05	2.91E-05
126-98-7	2-Methyl-2-propenenitrile (Methacrylonitrile)	1.21E-06	1.00E-09	1.21E-06
127-18-4	Perchloroethylene (tetrachloroethylene)	1.21E-06	0.00E+00	1.21E-06
127-19-5	N,N-Dimethylacetamide	1.21E-06	6.47E-06	7.68E-06
128-37-0	2,6-Bis(tert-butyl)-4-methylphenol	5.49E-06	1.80E-06	7.29E-06
129-00-0	Pyrene	0.00E+00	0.00E+00	0.00E+00
1321-64-8	Pentachloronaphthalene	0.00E+00	0.00E+00	0.00E+00
1321-65-9	Trichloronaphthalene	5.49E-06	1.78E-08	5.51E-06
132-64-9	Dibenzofuran	5.49E-06	1.78E-08	5.51E-06
1335-87-1	Hexachloronaphthalene	0.00E+00	0.00E+00	0.00E+00
1335-88-2	Tetrachloronaphthalene	0.00E+00	0.00E+00	0.00E+00
1336-36-3	Polychlorinated biphenyls (PCBs)	0.00E+00	0.00E+00	0.00E+00
141-78-6	Acetic acid ethyl ester (Ethyl acetate)	5.49E-06	5.44E-08	5.54E-06
141-79-7	4-Methyl-3-penten-2-one	5.49E-06	1.29E-07	5.62E-06
142-82-5	n-Heptane	1.21E-06	0.00E+00	1.21E-06
144-62-7	Oxalic acid	5.50E-07	2.99E-06	3.54E-06
156-60-5	trans-1,2-Dichloroethylene	1.21E-06	0.00E+00	1.21E-06
1582-09-8	Trifluralin	0.00E+00	0.00E+00	0.00E+00
1634-04-4	Methyl tert-butyl ether	1.21E-06	1.00E-09	1.21E-06

Table 7. Estimate of Organic Emissions from Pretreatment Process Cells. Calc. No. 24590-WTP-HAC-50-00001, Rev. C

CAS#	Organic Compound	Pretreatment Feed Stream Individual Organic Vapor Emission R_{VO-PTF} gm/s	Post-Evaporator Individual Organic Vapor Emission R_{VO-PE} gm/s	Total Pretreatment Organic Emission R_{VO} gm/s
1836-75-5	Nitrofen	0.00E+00	0.00E+00	0.00E+00
189-55-9	Dibenzo[a,i]pyrene	0.00E+00	0.00E+00	0.00E+00
189-64-0	Dibenzo[a,h]pyrene	0.00E+00	0.00E+00	0.00E+00
191-24-2	Benzo(g,h,i)perylene	0.00E+00	0.00E+00	0.00E+00
191-30-0	Benzo[a,i]pyrene	0.00E+00	0.00E+00	0.00E+00
192-65-4	Dibenzo[a,e]pyrene	0.00E+00	0.00E+00	0.00E+00
193-39-5	Indeno(1,2,3-cd)pyrene	0.00E+00	0.00E+00	0.00E+00
205-82-3	Benzo(j)fluoranthene	0.00E+00	0.00E+00	0.00E+00
205-99-2	Benzo(b)fluoranthene	0.00E+00	0.00E+00	0.00E+00
206-44-0	Fluoranthene	0.00E+00	0.00E+00	0.00E+00
207-08-9	Benzo(k)fluoranthene	0.00E+00	0.00E+00	0.00E+00
208-96-8	Acenaphthylene	5.49E-06	5.44E-08	5.54E-06
218-01-9	Chrysene	0.00E+00	0.00E+00	0.00E+00
2234-13-1	Octachloronaphthalene	0.00E+00	0.00E+00	0.00E+00
224-42-0	Dibenz[a,j]acridine	0.00E+00	0.00E+00	0.00E+00
226-36-8	Dibenz[a,h]acridine	0.00E+00	0.00E+00	0.00E+00
2385-85-5	Mirex	5.49E-06	0.00E+00	5.49E-06
25551-13-7	Trimethyl benzene	1.21E-06	0.00E+00	1.21E-06
26140-60-3	Terphenyls	0.00E+00	0.00E+00	0.00E+00
27154-33-2	Trichlorofluoroethane	1.21E-06	0.00E+00	1.21E-06
287-92-3	Cyclopentane	1.21E-06	0.00E+00	1.21E-06
309-00-2	Aldrin	0.00E+00	0.00E+00	0.00E+00
319-84-6	Hexachlorocyclohexane (Lindane) Alpha BHC	2.00E-08	6.90E-07	7.10E-07
319-85-7	Hexachlorocyclohexane (Lindane) Beta BHC	0.00E+00	0.00E+00	0.00E+00
319-86-8	Delta-BHC	0.00E+00	0.00E+00	0.00E+00
3697-24-3	5-Methylchrysene	0.00E+00	0.00E+00	0.00E+00
3825-26-1	Ammonium perfluorooctanoate	0.00E+00	0.00E+00	0.00E+00
4170-30-3	2-Butenaldehyde (2-Butenal)	1.21E-06	2.90E-07	1.50E-06
465-73-6	Isodrin	4.00E-08	3.11E-08	7.11E-08
50-00-0	Formaldehyde	1.21E-06	1.81E-05	1.93E-05
50-29-3	4,4-DDT	0.00E+00	0.00E+00	0.00E+00
50-32-8	Benzo(a)pyrene	0.00E+00	0.00E+00	0.00E+00
53-70-3	Dibenzo(a,h)anthracene	0.00E+00	0.00E+00	0.00E+00
540-59-0	1,2-Dichloroethylene	1.21E-06	0.00E+00	1.21E-06
540-84-1	2,2,4-Trimethylpentane	1.21E-06	0.00E+00	1.21E-06
541-73-1	1,3-Dichlorobenzene	1.21E-06	0.00E+00	1.21E-06
56-23-5	Carbon tetrachloride	1.21E-06	0.00E+00	1.21E-06
563-80-4	3-Methyl-2-butanone	1.21E-06	5.44E-08	1.26E-06
56-49-5	3-Methylcholanthrene	0.00E+00	0.00E+00	0.00E+00
56-55-3	Benzo(a)anthracene	0.00E+00	0.00E+00	0.00E+00
57-14-7	1,1-Dimethylhydrazine	5.49E-06	1.01E-06	6.50E-06
58-89-9	gamma-BHC (Lindane)	0.00E+00	0.00E+00	0.00E+00
58-90-2	2,3,4,6-Tetrachlorophenol	5.49E-06	1.45E-06	6.94E-06

Table 7. Estimate of Organic Emissions from Pretreatment Process Cells. Calc. No. 24590-WTP-HAC-50-00001, Rev. C

CAS#	Organic Compound	Pretreatment Feed Stream Individual Organic Vapor Emission $R_{VO\text{-}PTF}$ gm/s	Post-Evaporator Individual Organic Vapor Emission $R_{VO\text{-}PE}$ gm/s	Total Pretreatment Organic Emission R_{VO} gm/s
591-78-6	2-Hexanone	1.21E-06	5.44E-08	1.26E-06
59-50-7	4-Chloro-3-methylphenol	0.00E+00	0.00E+00	0.00E+00
59-89-2	N-Nitrosomorpholine	5.49E-06	2.86E-05	3.41E-05
602-87-9	5-Nitroacenaphthene	0.00E+00	0.00E+00	0.00E+00
60-29-7	Ethyl ether	5.49E-06	0.00E+00	5.49E-06
603-34-9	Triphenylamine	5.49E-06	2.37E-06	7.86E-06
60-34-4	Methylhydrazine	1.21E-06	4.21E-07	1.63E-06
60-35-5	Acetamide	1.21E-06	6.47E-06	7.68E-06
60-57-1	Dieldrin	0.00E+00	0.00E+00	0.00E+00
621-64-7	Di-n-Propylnitrosamine	5.49E-06	4.21E-07	5.91E-06
624-83-9	Methyl isocyanate	1.21E-06	0.00E+00	1.21E-06
627-13-4	Nitric acid, propyl ester	5.49E-06	0.00E+00	5.49E-06
62-75-9	N-Nitroso-N,N-dimethylamine	1.03E-05	1.20E-05	2.23E-05
630-20-6	1,1,1,2-Tetrachloroethane	1.21E-06	0.00E+00	1.21E-06
64-17-5	Ethyl alcohol	1.21E-06	4.21E-07	1.63E-06
64-18-6	Formic acid	5.49E-06	2.36E-05	2.91E-05
64-19-7	Acetic acid	5.49E-06	2.86E-05	3.41E-05
67-56-1	Methyl alcohol (Methanol)	1.21E-06	4.21E-07	1.63E-06
67-63-0	2-Propyl alcohol (Isopropanol)	1.21E-06	9.90E-07	2.20E-06
67-64-1	2-Propanone (Acetone)	6.59E-06	1.29E-07	6.72E-06
67-66-3	Chloroform	1.21E-06	0.00E+00	1.21E-06
67-72-1	Hexachloroethane	5.49E-06	0.00E+00	5.49E-06
684-16-2	Hexafluoroacetone	1.21E-06	0.00E+00	1.21E-06
71-23-8	n-Propyl alcohol	1.21E-06	9.87E-07	2.20E-06
71-36-3	n-Butyl alcohol	1.21E-06	9.87E-07	2.20E-06
71-43-2	Benzene	1.21E-06	0.00E+00	1.21E-06
71-55-6	Methyl chloroform (1,1,1-Trichloroethane)	1.21E-06	0.00E+00	1.21E-06
72-20-8	Endrin	0.00E+00	0.00E+00	0.00E+00
72-43-5	Methoxychlor	0.00E+00	0.00E+00	0.00E+00
72-54-8	4,4-DDD	0.00E+00	0.00E+00	0.00E+00
72-55-9	4,4-DDE	0.00E+00	0.00E+00	0.00E+00
74-83-9	Bromomethane (Methyl bromide)	1.21E-06	0.00E+00	1.21E-06
74-87-3	Chloromethane (Methyl chloride)	1.21E-06	0.00E+00	1.21E-06
74-97-5	Bromochloromethane	1.21E-06	0.00E+00	1.21E-06
74-99-7	Methylacetylene	5.49E-06	0.00E+00	5.49E-06
75-00-3	Chloroethane	1.21E-06	0.00E+00	1.21E-06
75-01-4	Vinyl chloride (1-Chloroethene)	5.49E-06	0.00E+00	5.49E-06
75-05-8	Acetonitrile	1.72E-06	9.65E-08	1.82E-06
75-07-0	Acetaldehyde	5.49E-06	1.29E-07	5.62E-06
75-09-2	Dichloromethane (Methylene chloride)	1.21E-06	0.00E+00	1.21E-06
75-12-7	Formamide	5.49E-06	2.97E-05	3.52E-05
75-15-0	Carbon disulfide	1.21E-06	0.00E+00	1.21E-06
75-21-8	Ethylene oxide (Oxirane)	1.21E-06	1.78E-08	1.23E-06

Table 7. Estimate of Organic Emissions from Pretreatment Process Cells. Calc. No. 24590-WTP-HAC-50-00001, Rev. C

CAS#	Organic Compound	Pretreatment Feed Stream Individual Organic Vapor Emission R_{VO-PTF} gm/s	Post-Evaporator Individual Organic Vapor Emission R_{VO-PE} gm/s	Total Pretreatment Organic Emission R_{VO} gm/s
75-27-4	Bromodichloromethane	1.21E-06	0.00E+00	1.21E-06
75-34-3	1,1-Dichloroethane	1.21E-06	0.00E+00	1.21E-06
75-35-4	1,1-Dichloroethene (Vinylidene chloride)	1.21E-06	0.00E+00	1.21E-06
75-43-4	Dichlorofluoromethane	1.21E-06	0.00E+00	1.21E-06
75-45-6	Chlorodifluoromethane	1.21E-06	0.00E+00	1.21E-06
75-50-3	Trimethylamine	1.21E-06	5.44E-08	1.26E-06
75-52-5	Nitromethane	5.49E-06	1.29E-07	5.62E-06
75-55-8	2-Methylaziridine	5.49E-06	9.87E-07	6.48E-06
75-61-6	Difluorodibromomethane	1.21E-06	0.00E+00	1.21E-06
75-63-8	Trifluorobromomethane	1.21E-06	0.00E+00	1.21E-06
75-65-0	2-Methyl-2-propanol	1.21E-06	9.87E-07	2.20E-06
75-69-4	Trichlorofluoromethane	1.21E-06	0.00E+00	1.21E-06
75-71-8	Dichlorodifluoromethane	1.21E-06	0.00E+00	1.21E-06
75-99-0	2,2-Dichloropropionic acid	5.49E-06	2.86E-05	3.41E-05
76-03-9	Trichloroacetic acid	1.21E-06	6.47E-06	7.68E-06
76-11-9	1,1,1,2-Tetrachloro-2,2-difluoroethane	5.49E-06	0.00E+00	5.49E-06
76-12-0	1,1,2,2-Tetrachloro-1,2-difluoroethane	5.49E-06	0.00E+00	5.49E-06
76-13-1	1,2,2-Trichloro-1,1,2-trifluoroethane (Freon 113)	1.21E-06	0.00E+00	1.21E-06
76-14-2	1,2-Dichloro-1,1,2,2-tetrafluoroethane	1.21E-06	0.00E+00	1.21E-06
76-15-3	Chloropentafluoroethane	1.21E-06	0.00E+00	1.21E-06
76-44-8	Heptachlor	1.20E-07	0.00E+00	1.20E-07
78-83-1	2-Methylpropyl alcohol (Isobutyl alcohol)	5.49E-06	9.87E-07	6.48E-06
78-87-5	1,2-Dichloropropane	1.21E-06	0.00E+00	1.21E-06
78-92-2	1-Methylpropyl alcohol (2-Butanol)	1.21E-06	9.87E-07	2.20E-06
78-93-3	Methyl ethyl ketone (MEK, 2-Butanone)	1.21E-06	1.29E-07	1.34E-06
79-00-5	1,1,2-Trichloroethane	1.21E-06	0.00E+00	1.21E-06
79-01-6	Trichloroethylene	1.21E-06	0.00E+00	1.21E-06
79-09-4	Propionic acid	5.49E-06	1.81E-05	2.36E-05
79-10-7	2-Propenoic acid	5.49E-06	1.81E-05	2.36E-05
79-20-9	Methyl acetate	5.49E-06	5.44E-08	5.54E-06
79-34-5	1,1,2,2-Tetrachloroethane	1.21E-06	1.00E-09	1.21E-06
8001-35-2	Toxaphene	0.00E+00	0.00E+00	0.00E+00
82-68-8	Pentachloronitrobenzene (PCBN)	5.49E-06	1.29E-07	5.62E-06
83-32-9	Acenaphthene	5.49E-06	1.78E-08	5.51E-06
84-66-2	Diethyl phthalate	5.49E-06	1.39E-05	1.94E-05
84-74-2	Dibutyl phthalate	0.00E+00	0.00E+00	0.00E+00
85-01-8	Phenanthrene	5.49E-06	1.29E-07	5.62E-06
85-68-7	Butylbenzyl phthalate	0.00E+00	0.00E+00	0.00E+00
86-73-7	Fluorene	0.00E+00	0.00E+00	0.00E+00
87-68-3	Hexachlorobutadiene	1.21E-06	0.00E+00	1.21E-06
87-86-5	Pentachlorophenol	5.49E-06	2.86E-05	3.41E-05
88-06-2	2,4,6-Trichlorophenol	5.49E-06	4.21E-07	5.91E-06
88-72-2	2-Nitrotoluene	1.21E-06	1.01E-06	2.22E-06

Table 7. Estimate of Organic Emissions from Pretreatment Process Cells. Calc. No. 24590-WTP-HAC-50-00001, Rev. C

CAS#	Organic Compound	Pretreatment Feed Stream Individual Organic Vapor Emission $R_{VO\text{-}PTF}$ gm/s	Post-Evaporator Individual Organic Vapor Emission $R_{VO\text{-}PE}$ gm/s	Total Pretreatment Organic Emission R_{VO} gm/s
88-75-5	2-Nitrophenol	5.49E-06	1.01E-06	6.50E-06
88-85-7	2-sec-Butyl-4,6-dinitrophenol (Dinoseb)	0.00E+00	0.00E+00	0.00E+00
88-89-1	Picric acid	0.00E+00	0.00E+00	0.00E+00
91-20-3	Naphthalene	1.80E-07	0.00E+00	1.80E-07
91-22-5	Quinoline	5.49E-06	1.20E-05	1.75E-05
91-58-7	2-Chloronapthalene	5.49E-06	1.00E-09	5.49E-06
92-52-4	1,1`-Biphenyl	5.49E-06	1.00E-09	5.49E-06
92-93-3	4-Nitrobiphenyl	0.00E+00	0.00E+00	0.00E+00
93-72-1	Silvex (2,4,5-TP)	0.00E+00	0.00E+00	0.00E+00
93-76-5	2,4,5-T	0.00E+00	0.00E+00	0.00E+00
94-75-7	2,4-D and esters (160C typed)	5.49E-06	2.86E-05	3.41E-05
95-13-6	Indene	5.49E-06	0.00E+00	5.49E-06
95-47-6	o-Xylene	1.21E-06	0.00E+00	1.21E-06
95-48-7	o-Cresol (2-Methylphenol)	1.21E-06	1.20E-05	1.32E-05
95-49-8	2-Chlorotoluene	5.49E-06	0.00E+00	5.49E-06
95-50-1	o-Dichlorobenzene (1,2-Dichlorobenzene)	1.21E-06	0.00E+00	1.21E-06
95-57-8	2-Chlorophenol	5.49E-06	9.87E-07	6.48E-06
95-95-4	2,4,5-Trichlorophenol	5.49E-06	1.20E-05	1.75E-05
96-22-0	3-Pentanone	1.21E-06	5.44E-08	1.26E-06
96-69-5	Bis(3-tert-butyl-4-hydroxy-6-methyl-phenyl)sulfide	0.00E+00	0.00E+00	0.00E+00
98-51-1	p-tert-Butyltoluene	5.49E-06	0.00E+00	5.49E-06
98-82-8	Cumene	5.49E-06	0.00E+00	5.49E-06
98-83-9	alpha-Methylstyrene	1.21E-06	0.00E+00	1.21E-06
98-86-2	Acetophenone	5.49E-06	1.22E-06	6.71E-06
98-95-3	Nitrobenzene	5.49E-06	1.01E-06	6.50E-06
	Sum of column = R_{VOS} =	5.11E-04	4.61E-04	9.72E-04

HL = Henry's Law Groupings; values for HL are from the Emission Baseline Report (23590-WTP-RPT-PO-03-008)
WF_i = the weight fraction of the individual organic compound; values are assigned from Table 3 based on HL
WF_S = Sum WF_i
WR_i = the ratio of the individual organic compound weight fraction to the sum of the individual weight fraction = WFi / WF_S
WR_S = Sum WR_i
R_{IO} = WR_i * ER_{O-LA}; ER_{O-LA} is from Table 1
R_{VO} = vapor emissions; R_{VO} is "0" if the compound is a particle or is particle-bound
R_{VOS} = Sum R_{VOi}
P = particle; cell has an "X" if the compound is a particle or is particle-bound

Table 8. Estimate of Organic Emissions from the LAW Process Cells. Calc. No. 24590-WTP-HAC-50-00001, Rev. C

CAS#	Organic Compound	Henry's Law Grouping HL	Individual Organic Weight Fraction. WF_i mg/kg	Individual Organic Weight Ratio WR_i unitless	Individual Organic Release R_{IO} gm/s	Individual Organic Vapor Emission R_{VO} gm/s	Particle P
100-00-5	p-Nitrochlorobenzene	10	1.38E-01	5.60E-05	3.35E-09	3.35E-09	
100-21-0	p-Phthalic acid	1	7.75E+01	3.16E-02	1.89E-06	1.89E-06	
100-25-4	1,4-Dinitrobenzene	6	7.10E+01	2.89E-02	1.73E-06	0.00E+00	X
100-41-4	Ethyl benzene	20	0.00E+00	0.00E+00	0.00E+00	0.00E+00	
100-42-5	Styrene	19	0.00E+00	0.00E+00	0.00E+00	0.00E+00	
10061-01-5	cis-1,3-Dichloropropene	19	0.00E+00	0.00E+00	0.00E+00	0.00E+00	
10061-02-6	trans-1,3-Dichloropropene	17	0.00E+00	0.00E+00	0.00E+00	0.00E+00	
101-55-3	4-Bromophenylphenyl ether	14	3.20E-04	0.00E+00	0.00E+00	0.00E+00	
101-84-8	Diphenyl ether	16	1.06E-08	0.00E+00	0.00E+00	0.00E+00	
106-35-4	3-Heptanone	14	3.20E-04	0.00E+00	0.00E+00	0.00E+00	
106-42-3	p-Xylene (Dimethyl benzene)	19	0.00E+00	0.00E+00	0.00E+00	0.00E+00	
106-46-7	1,4-Dichlorobenzene	18	0.00E+00	0.00E+00	0.00E+00	0.00E+00	
106-88-7	1,2-Epoxybutane	15	1.61E-05	0.00E+00	0.00E+00	0.00E+00	
106-93-4	Ethylene dibromide (Dibromethane)	16	3.17E-08	0.00E+00	0.00E+00	0.00E+00	
106-97-8	Butane	26	0.00E+00	0.00E+00	0.00E+00	0.00E+00	
106-99-0	1,3-Butadiene	23	0.00E+00	0.00E+00	0.00E+00	0.00E+00	
107-02-8	Acrolein	14	3.20E-04	0.00E+00	0.00E+00	0.00E+00	
107-05-1	3-Chloropropene (Allyl chloride)	20	0.00E+00	0.00E+00	0.00E+00	0.00E+00	
107-06-2	1,2-Dichloroethane (Ethylene chloride)	17	0.00E+00	0.00E+00	0.00E+00	0.00E+00	
107-12-0	Propionitrile	13	2.71E-03	1.00E-06	6.00E-11	6.00E-11	
107-13-1	Acrylonitrile	14	3.20E-04	0.00E+00	0.00E+00	0.00E+00	
107-18-6	2-Propene-1-ol	10	1.38E-01	5.60E-05	3.35E-09	3.35E-09	
107-31-3	Formic acid, methyl ester	15	1.61E-05	0.00E+00	0.00E+00	0.00E+00	
107-66-4	Dibutylphosphate	5	1.65E+01	6.71E-03	4.02E-07	0.00E+00	X
107-87-9	2-Pentanone	14	3.20E-04	0.00E+00	0.00E+00	0.00E+00	
108-03-2	1-Nitropropane	14	3.20E-04	0.00E+00	0.00E+00	0.00E+00	
108-05-4	Vinyl acetate	16	1.06E-08	0.00E+00	0.00E+00	0.00E+00	
108-10-1	Hexone (4-Methyl-2-pentanone or MIBK)	14	3.20E-04	0.00E+00	0.00E+00	0.00E+00	
108-20-3	Bis(isopropyl)ether	18	0.00E+00	0.00E+00	0.00E+00	0.00E+00	
108-38-3	m-Xylene (Dimethyl benzene)	19	0.00E+00	0.00E+00	0.00E+00	0.00E+00	
108-39-4	m-Cresol	9	6.86E+00	2.79E-03	1.67E-07	1.67E-07	
108-87-2	Methylcyclohexane	25	0.00E+00	0.00E+00	0.00E+00	0.00E+00	
108-88-3	Toluene	19	0.00E+00	0.00E+00	0.00E+00	0.00E+00	
108-90-7	Chlorobenzene	19	0.00E+00	0.00E+00	0.00E+00	0.00E+00	
108-93-0	Cyclohexanol	10	1.38E-01	5.60E-05	3.35E-09	3.35E-09	
108-94-1	Cyclohexanone	11	1.24E-01	5.00E-05	3.00E-09	3.00E-09	
108-95-2	Phenol	8	2.94E+01	1.20E-02	7.17E-07	7.17E-07	
109-66-0	n-Pentane	26	0.00E+00	0.00E+00	0.00E+00	0.00E+00	
109-99-9	Tetrahydrofuran	13	2.71E-03	1.00E-06	6.00E-11	6.00E-11	
110-12-3	5-Methyl-2-hexanone	15	1.61E-05	0.00E+00	0.00E+00	0.00E+00	
110-43-0	2-Heptanone	15	1.61E-05	0.00E+00	0.00E+00	0.00E+00	

Table 8. Estimate of Organic Emissions from the LAW Process Cells. Calc. No. 24590-WTP-HAC-50-00001, Rev. C

CAS#	Organic Compound	Henry's Law Grouping HL	Individual Organic Weight Fraction. WF_i mg/kg	Individual Organic Weight Ratio WR_i unitless	Individual Organic Release R_{IO} gm/s	Individual Organic Vapor Emission R_{VO} gm/s	Particle P
110-54-3	n-Hexane	27	0.00E+00	0.00E+00	0.00E+00	0.00E+00	
110-62-3	n-Valeraldehyde	15	1.61E-05	0.00E+00	0.00E+00	0.00E+00	
110-82-7	Cyclohexane	24	0.00E+00	0.00E+00	0.00E+00	0.00E+00	
110-83-8	Cyclohexene	22	0.00E+00	0.00E+00	0.00E+00	0.00E+00	
110-86-1	Pyridine	11	1.24E-01	5.00E-05	3.00E-09	3.00E-09	
111-65-9	n-Octane	28	0.00E+00	0.00E+00	0.00E+00	0.00E+00	
111-76-2	Ethylene glycol monobutyl ether	9	6.86E+00	2.79E-03	1.67E-07	1.67E-07	
111-84-2	n-Nonane	28	0.00E+00	0.00E+00	0.00E+00	0.00E+00	
117-81-7	Bis(2-ethylhexyl)phthalate (DEHP)	30	2.39E-01	9.70E-05	5.81E-09	0.00E+00	X
117-84-0	n-Dioctyl phthalate	32	4.21E-01	1.72E-04	1.03E-08	0.00E+00	X
118-74-1	Hexachlorobenzene	18	0.00E+00	0.00E+00	0.00E+00	0.00E+00	
120-12-7	Anthracene	13	2.67E-03	1.00E-06	6.00E-11	6.00E-11	
120-82-1	1,2,4-Trichlorobenzene	17	0.00E+00	0.00E+00	0.00E+00	0.00E+00	
120-83-2	2,4-Dichlorophenol	10	1.38E-01	5.60E-05	3.35E-09	3.35E-09	
121-44-8	Triethylamine	15	1.61E-05	0.00E+00	0.00E+00	0.00E+00	
121-69-7	Dimethylaniline	13	2.71E-03	1.00E-06	6.00E-11	6.00E-11	
122-39-4	N,N-Diphenylamine	10	2.74E-01	1.11E-04	6.65E-09	6.65E-09	
123-19-3	4-Heptanone	13	2.71E-03	1.00E-06	6.00E-11	6.00E-11	
123-38-6	n-Propionaldehyde	14	3.20E-04	0.00E+00	0.00E+00	0.00E+00	
123-51-3	3-Methyl-1-butanol	12	9.79E-02	4.00E-05	2.40E-09	2.40E-09	
123-86-4	Acetic acid n-butyl ester	16	1.06E-08	0.00E+00	0.00E+00	0.00E+00	
123-91-1	1,4-Dioxane	10	1.38E-01	5.60E-05	3.35E-09	3.35E-09	
126-73-8	Tributyl phosphate	7	4.74E+01	1.93E-02	1.16E-06	1.16E-06	
126-98-7	2-Methyl-2-propenenitrile (Methacrylonitrile)	16	1.06E-08	0.00E+00	0.00E+00	0.00E+00	
127-18-4	Perchloroethylene (tetrachloroethylene)	21	0.00E+00	0.00E+00	0.00E+00	0.00E+00	
127-19-5	N,N-Dimethylacetamide	5	1.65E+01	6.71E-03	4.02E-07	4.02E-07	
128-37-0	2,6-Bis(tert-butyl)-4-methylphenol	32	4.21E-01	1.72E-04	1.03E-08	1.03E-08	
129-00-0	Pyrene	33	1.41E-01	5.80E-05	3.47E-09	0.00E+00	X
1321-64-8	Pentachloronaphthalene	14	3.20E-04	0.00E+00	0.00E+00	0.00E+00	X
1321-65-9	Trichloronaphthalene	15	1.61E-05	0.00E+00	0.00E+00	0.00E+00	
132-64-9	Dibenzofuran	15	1.61E-05	0.00E+00	0.00E+00	0.00E+00	
1335-87-1	Hexachloronaphthalene	14	3.20E-04	0.00E+00	0.00E+00	0.00E+00	X
1335-88-2	Tetrachloronaphthalene	15	1.61E-05	0.00E+00	0.00E+00	0.00E+00	X
1336-36-3	Polychlorinated biphenyls (PCBs)	35	1.71E-07	0.00E+00	0.00E+00	0.00E+00	X
141-78-6	Acetic acid ethyl ester (Ethyl acetate)	14	3.20E-04	0.00E+00	0.00E+00	0.00E+00	
141-79-7	4-Methyl-3-penten-2-one	13	2.71E-03	1.00E-06	6.00E-11	6.00E-11	
142-82-5	n-Heptane	27	0.00E+00	0.00E+00	0.00E+00	0.00E+00	
144-62-7	Oxalic acid	3	7.73E+00	3.15E-03	1.89E-07	1.89E-07	
156-60-5	trans-1,2-Dichloroethylene	20	0.00E+00	0.00E+00	0.00E+00	0.00E+00	
1582-09-8	Trifluralin	14	3.20E-04	0.00E+00	0.00E+00	0.00E+00	X
1634-04-4	Methyl tert-butyl ether	16	1.06E-08	0.00E+00	0.00E+00	0.00E+00	
1836-75-5	Nitrofen	30	2.39E-01	9.70E-05	5.81E-09	0.00E+00	X
189-55-9	Dibenzo[a,i]pyrene	5	1.65E+01	6.71E-03	4.02E-07	0.00E+00	X
189-64-0	Dibenzo[a,h]pyrene	5	1.65E+01	6.71E-03	4.02E-07	0.00E+00	X
191-24-2	Benzo(g,h,i)perylene	30	2.39E-01	9.70E-05	5.81E-09	0.00E+00	X
191-30-0	Benzo[a,i]pyrene	5	1.65E+01	6.71E-03	4.02E-07	0.00E+00	X
192-65-4	Dibenzo[a,e]pyrene	5	1.65E+01	6.71E-03	4.02E-07	0.00E+00	X
193-39-5	Indeno(1,2,3-cd)pyrene	30	2.39E-01	9.70E-05	5.81E-09	0.00E+00	X
205-82-3	Benzo(j)fluoranthene	7	4.74E+01	1.93E-02	1.16E-06	0.00E+00	X
205-99-2	Benzo(b)fluoranthene	30	2.39E-01	9.70E-05	5.81E-09	0.00E+00	X
206-44-0	Fluoranthene	33	7.11E-02	2.90E-05	1.74E-09	0.00E+00	X
207-08-9	Benzo(k)fluoranthene	30	2.39E-01	9.70E-05	5.81E-09	0.00E+00	X
208-96-8	Acenaphthylene	14	3.20E-04	0.00E+00	0.00E+00	0.00E+00	

Table 8. Estimate of Organic Emissions from the LAW Process Cells. Calc. No. 24590-WTP-HAC-50-00001, Rev. C

CAS#	Organic Compound	Henry's Law Grouping HL	Individual Organic Weight Fraction. WF_i mg/kg	Individual Organic Weight Ratio WR_i unitless	Individual Organic Release R_{IO} gm/s	Individual Organic Vapor Emission R_{VO} gm/s	Particle P
218-01-9	Chrysene	32	7.49E-01	3.05E-04	1.83E-08	0.00E+00	X
2234-13-1	Octachloronaphthalene	14	3.20E-04	0.00E+00	0.00E+00	0.00E+00	X
224-42-0	Dibenz[a,j]acridine	4	7.71E+01	3.14E-02	1.88E-06	0.00E+00	X
226-36-8	Dibenz[a,h]acridine	4	7.71E+01	3.14E-02	1.88E-06	0.00E+00	X
2385-85-5	Mirex	17	0.00E+00	0.00E+00	0.00E+00	0.00E+00	
25551-13-7	Trimethyl benzene	19	0.00E+00	0.00E+00	0.00E+00	0.00E+00	
26140-60-3	Terphenyls	34	3.67E-05	0.00E+00	0.00E+00	0.00E+00	X
27154-33-2	Trichlorofluoroethane	23	0.00E+00	0.00E+00	0.00E+00	0.00E+00	
287-92-3	Cyclopentane	24	0.00E+00	0.00E+00	0.00E+00	0.00E+00	
309-00-2	Aldrin	34	3.67E-05	0.00E+00	0.00E+00	0.00E+00	X
319-84-6	Hexachlorocyclohexane (Lindane) Alpha BHC	33	7.11E-02	2.90E-05	1.74E-09	1.74E-09	
319-85-7	Hexachlorocyclohexane (Lindane) Beta BHC	30	9.70E-02	3.90E-05	2.34E-09	0.00E+00	X
319-86-8	Delta-BHC	30	2.39E-01	9.70E-05	5.81E-09	0.00E+00	X
3697-24-3	5-Methylchrysene	32	4.21E-01	1.72E-04	1.03E-08	0.00E+00	X
3825-26-1	Ammonium perfluorooctanoate	14	3.20E-04	0.00E+00	0.00E+00	0.00E+00	X
4170-30-3	2-Butenaldehyde (2-Butenal)	11	3.62E-02	1.50E-05	9.00E-10	9.00E-10	
465-73-6	Isodrin	35	1.71E-07	0.00E+00	0.00E+00	0.00E+00	
50-00-0	Formaldehyde	8	3.48E+01	1.42E-02	8.50E-07	8.50E-07	
50-29-3	4,4-DDT	33	7.11E-02	2.90E-05	1.74E-09	0.00E+00	X
50-32-8	Benzo(a)pyrene	30	3.81E-01	1.55E-04	9.28E-09	0.00E+00	X
53-70-3	Dibenzo(a,h)anthracene	7	4.74E+01	1.93E-02	1.16E-06	0.00E+00	X
540-59-0	1,2-Dichloroethylene	19	0.00E+00	0.00E+00	0.00E+00	0.00E+00	
540-84-1	2,2,4-Trimethylpentane	28	0.00E+00	0.00E+00	0.00E+00	0.00E+00	
541-73-1	1,3-Dichlorobenzene	19	0.00E+00	0.00E+00	0.00E+00	0.00E+00	
56-23-5	Carbon tetrachloride	22	0.00E+00	0.00E+00	0.00E+00	0.00E+00	
563-80-4	3-Methyl-2-butanone	14	3.20E-04	0.00E+00	0.00E+00	0.00E+00	
56-49-5	3-Methylcholanthrene	28	0.00E+00	0.00E+00	0.00E+00	0.00E+00	X
56-55-3	Benzo(a)anthracene	33	7.11E-02	2.90E-05	1.74E-09	0.00E+00	X
57-14-7	1,1-Dimethylhydrazine	12	9.79E-02	4.00E-05	2.40E-09	2.40E-09	
58-89-9	gamma-BHC (Lindane)	32	1.53E-03	1.00E-06	6.00E-11	0.00E+00	X
58-90-2	2,3,4,6-Tetrachlorophenol	11	1.95E-01	7.90E-05	4.73E-09	4.73E-09	
591-78-6	2-Hexanone	14	3.20E-04	0.00E+00	0.00E+00	0.00E+00	
59-50-7	4-Chloro-3-methylphenol	32	4.21E-01	1.72E-04	1.03E-08	0.00E+00	X
59-89-2	N-Nitrosomorpholine	6	7.10E+01	2.89E-02	1.73E-06	1.73E-06	
602-87-9	5-Nitroacenaphthene	9	6.86E+00	2.79E-03	1.67E-07	0.00E+00	X
60-29-7	Ethyl ether	17	0.00E+00	0.00E+00	0.00E+00	0.00E+00	
603-34-9	Triphenylamine	32	5.13E-01	2.09E-04	1.25E-08	1.25E-08	
60-34-4	Methylhydrazine	10	1.38E-01	5.60E-05	3.35E-09	3.35E-09	
60-35-5	Acetamide	5	1.65E+01	6.71E-03	4.02E-07	4.02E-07	
60-57-1	Dieldrin	33	7.51E-04	0.00E+00	0.00E+00	0.00E+00	X
621-64-7	Di-n-Propylnitrosamine	10	1.38E-01	5.60E-05	3.35E-09	3.35E-09	
624-83-9	Methyl isocyanate	17	0.00E+00	0.00E+00	0.00E+00	0.00E+00	
627-13-4	Nitric acid, propyl ester	17	0.00E+00	0.00E+00	0.00E+00	0.00E+00	
62-75-9	N-Nitroso-N,N-dimethylamine	9	6.86E+00	2.79E-03	1.67E-07	1.67E-07	
630-20-6	1,1,1,2-Tetrachloroethane	18	0.00E+00	0.00E+00	0.00E+00	0.00E+00	
64-17-5	Ethyl alcohol	10	1.38E-01	5.60E-05	3.35E-09	3.35E-09	
64-18-6	Formic acid	7	4.74E+01	1.93E-02	1.16E-06	1.16E-06	
64-19-7	Acetic acid	6	7.10E+01	2.89E-02	1.73E-06	1.73E-06	
67-56-1	Methyl alcohol (Methanol)	10	1.38E-01	5.60E-05	3.35E-09	3.35E-09	
67-63-0	2-Propyl alcohol (Isopropanol)	11	1.24E-01	5.00E-05	3.00E-09	3.00E-09	
67-64-1	2-Propanone (Acetone)	13	2.71E-03	1.00E-06	6.00E-11	6.00E-11	
67-66-3	Chloroform	19	0.00E+00	0.00E+00	0.00E+00	0.00E+00	
67-72-1	Hexachloroethane	19	0.00E+00	0.00E+00	0.00E+00	0.00E+00	

Table 8. Estimate of Organic Emissions from the LAW Process Cells. Calc. No. 24590-WTP-HAC-50-00001, Rev. C

CAS#	Organic Compound	Henry's Law Grouping HL	Individual Organic Weight Fraction. WF_i mg/kg	Individual Organic Weight Ratio WR_i unitless	Individual Organic Release R_{IO} gm/s	Individual Organic Vapor Emission R_{VO} gm/s	Particle P
684-16-2	Hexafluoroacetone	19	0.00E+00	0.00E+00	0.00E+00	0.00E+00	
71-23-8	n-Propyl alcohol	11	1.24E-01	5.00E-05	3.00E-09	3.00E-09	
71-36-3	n-Butyl alcohol	11	1.24E-01	5.00E-05	3.00E-09	3.00E-09	
71-43-2	Benzene	19	0.00E+00	0.00E+00	0.00E+00	0.00E+00	
71-55-6	Methyl chloroform (1,1,1-Trichloroethane)	21	0.00E+00	0.00E+00	0.00E+00	0.00E+00	
72-20-8	Endrin	32	4.21E-01	1.72E-04	1.03E-08	0.00E+00	X
72-43-5	Methoxychlor	7	4.74E+01	1.93E-02	1.16E-06	0.00E+00	X
72-54-8	4,4-DDD	32	4.21E-01	1.72E-04	1.03E-08	0.00E+00	X
72-55-9	4,4-DDE	34	3.67E-05	0.00E+00	0.00E+00	0.00E+00	X
74-83-9	Bromomethane (Methyl bromide)	19	0.00E+00	0.00E+00	0.00E+00	0.00E+00	
74-87-3	Chloromethane (Methyl chloride)	20	0.00E+00	0.00E+00	0.00E+00	0.00E+00	
74-97-5	Bromochloromethane	17	0.00E+00	0.00E+00	0.00E+00	0.00E+00	
74-99-7	Methylacetylene	20	0.00E+00	0.00E+00	0.00E+00	0.00E+00	
75-00-3	Chloroethane	20	0.00E+00	0.00E+00	0.00E+00	0.00E+00	
75-01-4	Vinyl chloride (1-Chloroethene)	22	0.00E+00	0.00E+00	0.00E+00	0.00E+00	
75-05-8	Acetonitrile	13	2.76E-03	1.00E-06	6.00E-11	6.00E-11	
75-07-0	Acetaldehyde	13	2.71E-03	1.00E-06	6.00E-11	6.00E-11	
75-09-2	Dichloromethane (Methylene chloride)	19	0.00E+00	0.00E+00	0.00E+00	0.00E+00	
75-12-7	Formamide	4	7.71E+01	3.14E-02	1.88E-06	1.88E-06	
75-15-0	Carbon disulfide	20	0.00E+00	0.00E+00	0.00E+00	0.00E+00	
75-21-8	Ethylene oxide (Oxirane)	15	1.61E-05	0.00E+00	0.00E+00	0.00E+00	
75-27-4	Bromodichloromethane	18	0.00E+00	0.00E+00	0.00E+00	0.00E+00	
75-34-3	1,1-Dichloroethane	19	0.00E+00	0.00E+00	0.00E+00	0.00E+00	
75-35-4	1,1-Dichloroethene (Vinylidene chloride)	22	0.00E+00	0.00E+00	0.00E+00	0.00E+00	
75-43-4	Dichlorofluoromethane	20	0.00E+00	0.00E+00	0.00E+00	0.00E+00	
75-45-6	Chlorodifluoromethane	22	0.00E+00	0.00E+00	0.00E+00	0.00E+00	
75-50-3	Trimethylamine	14	3.20E-04	0.00E+00	0.00E+00	0.00E+00	
75-52-5	Nitromethane	13	2.71E-03	1.00E-06	6.00E-11	6.00E-11	
75-55-8	2-Methylaziridine	11	1.24E-01	5.00E-05	3.00E-09	3.00E-09	
75-61-6	Difluorodibromomethane	22	0.00E+00	0.00E+00	0.00E+00	0.00E+00	
75-63-8	Trifluorobromomethane	25	0.00E+00	0.00E+00	0.00E+00	0.00E+00	
75-65-0	2-Methyl-2-propanol	11	1.24E-01	5.00E-05	3.00E-09	3.00E-09	
75-69-4	Trichlorofluoromethane	23	0.00E+00	0.00E+00	0.00E+00	0.00E+00	
75-71-8	Dichlorodifluoromethane	25	0.00E+00	0.00E+00	0.00E+00	0.00E+00	
75-99-0	2,2-Dichloropropionic acid	6	7.10E+01	2.89E-02	1.73E-06	1.73E-06	
76-03-9	Trichloroacetic acid	5	1.65E+01	6.71E-03	4.02E-07	4.02E-07	
76-11-9	1,1,1,2-Tetrachloro-2,2-difluoroethane	24	0.00E+00	0.00E+00	0.00E+00	0.00E+00	
76-12-0	1,1,2,2-Tetrachloro-1,2-difluoroethane	23	0.00E+00	0.00E+00	0.00E+00	0.00E+00	
76-13-1	1,2,2-Trichloro-1,1,2-trifluoroethane (Freon 113)	25	0.00E+00	0.00E+00	0.00E+00	0.00E+00	
76-14-2	1,2-Dichloro-1,1,2,2-tetrafluoroethane	28	0.00E+00	0.00E+00	0.00E+00	0.00E+00	
76-15-3	Chloropentafluoroethane	29	0.00E+00	0.00E+00	0.00E+00	0.00E+00	
76-44-8	Heptachlor	16	0.00E+00	0.00E+00	0.00E+00	0.00E+00	
78-83-1	2-Methylpropyl alcohol (Isobutyl alcohol)	11	1.24E-01	5.00E-05	3.00E-09	3.00E-09	
78-87-5	1,2-Dichloropropane	19	0.00E+00	0.00E+00	0.00E+00	0.00E+00	
78-92-2	1-Methylpropyl alcohol (2-Butanol)	11	1.24E-01	5.00E-05	3.00E-09	3.00E-09	
78-93-3	Methyl ethyl ketone (MEK, 2-Butanone)	13	2.71E-03	1.00E-06	6.00E-11	6.00E-11	
79-00-5	1,1,2-Trichloroethane	17	0.00E+00	0.00E+00	0.00E+00	0.00E+00	
79-01-6	Trichloroethylene	20	0.00E+00	0.00E+00	0.00E+00	0.00E+00	
79-09-4	Propionic acid	8	3.48E+01	1.42E-02	8.50E-07	8.50E-07	
79-10-7	2-Propenoic acid	8	3.48E+01	1.42E-02	8.50E-07	8.50E-07	
79-20-9	Methyl acetate	14	3.20E-04	0.00E+00	0.00E+00	0.00E+00	
79-34-5	1,1,2,2-Tetrachloroethane	16	1.06E-08	0.00E+00	0.00E+00	0.00E+00	
8001-35-2	Toxaphene	10	2.64E-03	1.00E-06	6.00E-11	0.00E+00	X

Table 8. Estimate of Organic Emissions from the LAW Process Cells. Calc. No. 24590-WTP-HAC-50-00001, Rev. C

CAS#	Organic Compound	Henry's Law Grouping HL	Individual Organic Weight Fraction. WF_i mg/kg	Individual Organic Weight Ratio WR_i unitless	Individual Organic Release R_{IO} gm/s	Individual Organic Vapor Emission R_{VO} gm/s	Particle P
82-68-8	Pentachloronitrobenzene (PCBN)	13	2.71E-03	1.00E-06	6.00E-11	6.00E-11	
83-32-9	Acenaphthene	15	1.61E-05	0.00E+00	0.00E+00	0.00E+00	
84-66-2	Diethyl phthalate	8	1.65E+01	6.74E-03	4.04E-07	4.04E-07	
84-74-2	Dibutyl phthalate	31	5.73E+00	2.33E-03	1.40E-07	0.00E+00	X
85-01-8	Phenanthrene	13	2.71E-03	1.00E-06	6.00E-11	6.00E-11	
85-68-7	Butylbenzyl phthalate	31	5.73E+00	2.33E-03	1.40E-07	0.00E+00	X
86-73-7	Fluorene	14	3.20E-04	0.00E+00	0.00E+00	0.00E+00	X
87-68-3	Hexachlorobutadiene	20	0.00E+00	0.00E+00	0.00E+00	0.00E+00	
87-86-5	Pentachlorophenol	6	7.10E+01	2.89E-02	1.73E-06	1.73E-06	
88-06-2	2,4,6-Trichlorophenol	10	1.38E-01	5.60E-05	3.35E-09	3.35E-09	
88-72-2	2-Nitrotoluene	12	9.79E-02	4.00E-05	2.40E-09	2.40E-09	
88-75-5	2-Nitrophenol	12	9.79E-02	4.00E-05	2.40E-09	2.40E-09	
88-85-7	2-sec-Butyl-4,6-dinitrophenol (Dinoseb)	8	5.85E+01	2.38E-02	1.43E-06	0.00E+00	X
88-89-1	Picric acid	2	1.03E+03	4.20E-01	2.52E-05	0.00E+00	X
91-20-3	Naphthalene	16	0.00E+00	0.00E+00	0.00E+00	0.00E+00	
91-22-5	Quinoline	9	6.86E+00	2.79E-03	1.67E-07	1.67E-07	
91-58-7	2-Chloronapthalene	16	1.06E-08	0.00E+00	0.00E+00	0.00E+00	
92-52-4	1,1`-Biphenyl	16	1.06E-08	0.00E+00	0.00E+00	0.00E+00	
92-93-3	4-Nitrobiphenyl	10	1.38E-01	5.60E-05	3.35E-09	0.00E+00	X
93-72-1	Silvex (2,4,5-TP)	5	1.65E+01	6.71E-03	4.02E-07	0.00E+00	X
93-76-5	2,4,5-T	5	1.65E+01	6.71E-03	4.02E-07	0.00E+00	X
94-75-7	2,4-D and esters (160C typed)	6	7.10E+01	2.89E-02	1.73E-06	1.73E-06	
95-13-6	Indene	18	0.00E+00	0.00E+00	0.00E+00	0.00E+00	
95-47-6	o-Xylene	19	0.00E+00	0.00E+00	0.00E+00	0.00E+00	
95-48-7	o-Cresol (2-Methylphenol)	9	6.86E+00	2.79E-03	1.67E-07	1.67E-07	
95-49-8	2-Chlorotoluene	19	0.00E+00	0.00E+00	0.00E+00	0.00E+00	
95-50-1	o-Dichlorobenzene (1,2-Dichlorobenzene)	18	0.00E+00	0.00E+00	0.00E+00	0.00E+00	
95-57-8	2-Chlorophenol	11	1.24E-01	5.00E-05	3.00E-09	3.00E-09	
95-95-4	2,4,5-Trichlorophenol	9	6.86E+00	2.79E-03	1.67E-07	1.67E-07	
96-22-0	3-Pentanone	14	3.20E-04	0.00E+00	0.00E+00	0.00E+00	
96-69-5	Bis(3-tert-butyl-4-hydroxy-6-methyl-phenyl)sulfide	19	0.00E+00	0.00E+00	0.00E+00	0.00E+00	X
98-51-1	p-tert-Butyltoluene	21	0.00E+00	0.00E+00	0.00E+00	0.00E+00	
98-82-8	Cumene	20	0.00E+00	0.00E+00	0.00E+00	0.00E+00	
98-83-9	alpha-Methylstyrene	19	0.00E+00	0.00E+00	0.00E+00	0.00E+00	
98-86-2	Acetophenone	11	1.40E-01	5.70E-05	3.41E-09	3.41E-09	
98-95-3	Nitrobenzene	12	9.79E-02	4.00E-05	2.40E-09	2.40E-09	
		Weight Fraction Sum = WF_S =	2454.995				
		Weight Ratio Sum = WR_S =		1.00			
		LAW Stream Sum = $ER_{O\text{-}LA}$ =			5.99E-05		
		LAW Stream Vapor Organic Release Sum = R_{VOS} =				2.09E-05	

HL = Henry's Law Groupings; values for HL are from the Emission Baseline Report (23590-WTP-RPT-PO-03-008)
WF_i = the weight fraction of the individual organic compound; values are assigned from Table 4 based on HL
WF_S = Sum WF_i
WR_i = the ratio of the individual organic compound weight fraction to the sum of the individual weight fraction = WFi / WF_S
WR_S = Sum WR_i
$R_{IO} = WR_i * ER_{O\text{-}HL}$; $ER_{O\text{-}HL}$ is from Table 1
R_{VO} = vapor emissions; R_{VO} is "0" if the compound is a particle or is particle-bound
R_{VOS} = Sum R_{VOi}
P = particle; cell has an "X" if the compound is a particle or is particle-bound

Table 9. Estimate of Organic Emissions from the HLW Process Cells. Calc. No. 24590-WTP-HAC-50-00001, Rev. C

CAS#	Organic Compound	Henry's Law Grouping HL	Individual Organic Weight Fraction. WF_i mg/kg	Individual Organic Weight Ratio WR_i unitless	Individual Organic Release R_{IO} gm/s	Individual Organic Vapor Emission R_{VO} gm/s	Particle P
100-00-5	p-Nitrochlorobenzene	10	1.57E+00	1.40E-03	3.99E-08	3.99E-08	
100-21-0	p-Phthalic acid	1	1.99E+01	1.81E-02	5.16E-07	5.16E-07	
100-25-4	1,4-Dinitrobenzene	6	2.00E+01	1.83E-02	5.22E-07	0.00E+00	X
100-41-4	Ethyl benzene	20	1.03E-08	0.00E+00	0.00E+00	0.00E+00	
100-42-5	Styrene	19	1.55E-06	0.00E+00	0.00E+00	0.00E+00	
10061-01-5	cis-1,3-Dichloropropene	19	4.41E-06	0.00E+00	0.00E+00	0.00E+00	
10061-02-6	trans-1,3-Dichloropropene	17	7.06E-05	0.00E+00	0.00E+00	0.00E+00	
101-55-3	4-Bromophenylphenyl ether	14	1.05E+00	1.00E-03	2.85E-08	2.85E-08	
101-84-8	Diphenyl ether	16	3.04E-03	0.00E+00	0.00E+00	0.00E+00	
106-35-4	3-Heptanone	14	1.05E+00	1.00E-03	2.85E-08	2.85E-08	
106-42-3	p-Xylene (Dimethyl benzene)	19	1.55E-06	0.00E+00	0.00E+00	0.00E+00	
106-46-7	1,4-Dichlorobenzene	18	3.23E-06	0.00E+00	0.00E+00	0.00E+00	
106-88-7	1,2-Epoxybutane	15	2.40E-01	2.00E-04	5.70E-09	5.70E-09	
106-93-4	Ethylene dibromide (Dibromethane)	16	6.18E-03	0.00E+00	0.00E+00	0.00E+00	
106-97-8	Butane	26	0.00E+00	0.00E+00	0.00E+00	0.00E+00	
106-99-0	1,3-Butadiene	23	5.60E-13	0.00E+00	0.00E+00	0.00E+00	
107-02-8	Acrolein	14	1.05E+00	1.00E-03	2.85E-08	2.85E-08	
107-05-1	3-Chloropropene (Allyl chloride)	20	1.03E-08	0.00E+00	0.00E+00	0.00E+00	
107-06-2	1,2-Dichloroethane (Ethylene chloride)	17	7.06E-05	0.00E+00	0.00E+00	0.00E+00	
107-12-0	Propionitrile	13	2.48E+00	2.30E-03	6.56E-08	6.56E-08	
107-13-1	Acrylonitrile	14	1.05E+00	1.00E-03	2.85E-08	2.85E-08	
107-18-6	2-Propene-1-ol	10	1.57E+00	1.40E-03	3.99E-08	3.99E-08	
107-31-3	Formic acid, methyl ester	15	2.40E-01	2.00E-04	5.70E-09	5.70E-09	
107-66-4	Dibutylphosphate	5	4.40E+00	4.00E-03	1.14E-07	0.00E+00	X
107-87-9	2-Pentanone	14	1.05E+00	1.00E-03	2.85E-08	2.85E-08	
108-03-2	1-Nitropropane	14	1.05E+00	1.00E-03	2.85E-08	2.85E-08	
108-05-4	Vinyl acetate	16	3.04E-03	0.00E+00	0.00E+00	0.00E+00	
108-10-1	Hexone (4-Methyl-2-pentanone or MIBK)	14	1.05E+00	1.00E-03	2.85E-08	2.85E-08	
108-20-3	Bis(isopropyl)ether	18	3.23E-06	0.00E+00	0.00E+00	0.00E+00	
108-38-3	m-Xylene (Dimethyl benzene)	19	1.55E-06	0.00E+00	0.00E+00	0.00E+00	
108-39-4	m-Cresol	9	2.88E+01	2.63E-02	7.50E-07	7.50E-07	
108-87-2	Methylcyclohexane	25	0.00E+00	0.00E+00	0.00E+00	0.00E+00	
108-88-3	Toluene	19	7.25E-08	0.00E+00	0.00E+00	0.00E+00	
108-90-7	Chlorobenzene	19	1.55E-06	0.00E+00	0.00E+00	0.00E+00	
108-93-0	Cyclohexanol	10	1.57E+00	1.40E-03	3.99E-08	3.99E-08	
108-94-1	Cyclohexanone	11	7.83E+00	7.10E-03	2.02E-07	2.02E-07	
108-95-2	Phenol	8	1.96E+01	1.79E-02	5.11E-07	5.11E-07	
109-66-0	n-Pentane	26	0.00E+00	0.00E+00	0.00E+00	0.00E+00	
109-99-9	Tetrahydrofuran	13	2.48E+00	2.30E-03	6.56E-08	6.56E-08	
110-12-3	5-Methyl-2-hexanone	15	2.40E-01	2.00E-04	5.70E-09	5.70E-09	
110-43-0	2-Heptanone	15	2.40E-01	2.00E-04	5.70E-09	5.70E-09	

Table 9. Estimate of Organic Emissions from the HLW Process Cells. Calc. No. 24590-WTP-HAC-50-00001, Rev. C

CAS#	Organic Compound	Henry's Law Grouping HL	Individual Organic Weight Fraction. WF_i mg/kg	Individual Organic Weight Ratio WR_i unitless	Individual Organic Release R_{IO} gm/s	Individual Organic Vapor Emission R_{VO} gm/s	Particle P
110-54-3	n-Hexane	27	0.00E+00	0.00E+00	0.00E+00	0.00E+00	
110-62-3	n-Valeraldehyde	15	2.40E-01	2.00E-04	5.70E-09	5.70E-09	
110-82-7	Cyclohexane	24	3.30E-21	0.00E+00	0.00E+00	0.00E+00	
110-83-8	Cyclohexene	22	7.29E-11	0.00E+00	0.00E+00	0.00E+00	
110-86-1	Pyridine	11	7.83E+00	7.10E-03	2.02E-07	2.02E-07	
111-65-9	n-Octane	28	0.00E+00	0.00E+00	0.00E+00	0.00E+00	
111-76-2	Ethylene glycol monobutyl ether	9	2.88E+01	2.63E-02	7.50E-07	7.50E-07	
111-84-2	n-Nonane	28	0.00E+00	0.00E+00	0.00E+00	0.00E+00	
117-81-7	Bis(2-ethylhexyl)phthalate (DEHP)	30	1.97E-01	2.00E-04	5.70E-09	0.00E+00	X
117-84-0	n-Dioctyl phthalate	32	9.24E+00	8.40E-03	2.40E-07	0.00E+00	X
118-74-1	Hexachlorobenzene	18	3.23E-06	0.00E+00	0.00E+00	0.00E+00	
120-12-7	Anthracene	13	3.28E+00	3.00E-03	8.56E-08	8.56E-08	
120-82-1	1,2,4-Trichlorobenzene	17	7.06E-05	0.00E+00	0.00E+00	0.00E+00	
120-83-2	2,4-Dichlorophenol	10	1.57E+00	1.40E-03	3.99E-08	3.99E-08	
121-44-8	Triethylamine	15	2.40E-01	2.00E-04	5.70E-09	5.70E-09	
121-69-7	Dimethylaniline	13	2.48E+00	2.30E-03	6.56E-08	6.56E-08	
122-39-4	N,N-Diphenylamine	10	3.02E+00	2.80E-03	7.99E-08	7.99E-08	
123-19-3	4-Heptanone	13	2.48E+00	2.30E-03	6.56E-08	6.56E-08	
123-38-6	n-Propionaldehyde	14	1.05E+00	1.00E-03	2.85E-08	2.85E-08	
123-51-3	3-Methyl-1-butanol	12	9.67E+00	8.80E-03	2.51E-07	2.51E-07	
123-86-4	Acetic acid n-butyl ester	16	3.04E-03	0.00E+00	0.00E+00	0.00E+00	
123-91-1	1,4-Dioxane	10	1.57E+00	1.40E-03	3.99E-08	3.99E-08	
126-73-8	Tributyl phosphate	7	2.01E+01	1.84E-02	5.25E-07	5.25E-07	
126-98-7	2-Methyl-2-propenenitrile (Methacrylonitrile)	16	3.04E-03	0.00E+00	0.00E+00	0.00E+00	
127-18-4	Perchloroethylene (tetrachloroethylene)	21	6.57E-10	0.00E+00	0.00E+00	0.00E+00	
127-19-5	N,N-Dimethylacetamide	5	4.40E+00	4.00E-03	1.14E-07	1.14E-07	
128-37-0	2,6-Bis(tert-butyl)-4-methylphenol	32	9.24E+00	8.40E-03	2.40E-07	2.40E-07	
129-00-0	Pyrene	33	1.28E+01	1.17E-02	3.34E-07	0.00E+00	X
1321-64-8		14	1.05E+00	1.00E-03	2.85E-08	0.00E+00	X
1321-65-9	Trichloronaphthalene	15	2.40E-01	2.00E-04	5.70E-09	5.70E-09	
132-64-9	Dibenzofuran	15	2.40E-01	2.00E-04	5.70E-09	5.70E-09	
1335-87-1	Hexachloronaphthalene	14	1.05E+00	1.00E-03	2.85E-08	0.00E+00	X
1335-88-2	Tetrachloronaphthalene	15	2.40E-01	2.00E-04	5.70E-09	0.00E+00	X
1336-36-3	Polychlorinated biphenyls (PCBs)	35	2.12E-01	2.00E-04	5.70E-09	0.00E+00	X
141-78-6	Acetic acid ethyl ester (Ethyl acetate)	14	1.05E+00	1.00E-03	2.85E-08	2.85E-08	
141-79-7	4-Methyl-3-penten-2-one	13	2.48E+00	2.30E-03	6.56E-08	6.56E-08	
142-82-5	n-Heptane	27	0.00E+00	0.00E+00	0.00E+00	0.00E+00	
144-62-7	Oxalic acid	3	1.99E+00	1.80E-03	5.13E-08	5.13E-08	
156-60-5	trans-1,2-Dichloroethylene	20	1.03E-08	0.00E+00	0.00E+00	0.00E+00	
1582-09-8	Trifluralin	14	1.05E+00	1.00E-03	2.85E-08	0.00E+00	X
1634-04-4	Methyl tert-butyl ether	16	3.04E-03	0.00E+00	0.00E+00	0.00E+00	
1836-75-5	Nitrofen	30	1.97E-01	2.00E-04	5.70E-09	0.00E+00	X
189-55-9	Dibenzo[a,i]pyrene	5	4.40E+00	4.00E-03	1.14E-07	0.00E+00	X
189-64-0	Dibenzo[a,h]pyrene	5	4.40E+00	4.00E-03	1.14E-07	0.00E+00	X
191-24-2	Benzo(g,h,i)perylene	30	1.97E-01	2.00E-04	5.70E-09	0.00E+00	X
191-30-0	Benzo[a,i]pyrene	5	4.40E+00	4.00E-03	1.14E-07	0.00E+00	X
192-65-4	Dibenzo[a,e]pyrene	5	4.40E+00	4.00E-03	1.14E-07	0.00E+00	X
193-39-5	Indeno(1,2,3-cd)pyrene	30	1.97E-01	2.00E-04	5.70E-09	0.00E+00	X
205-82-3	Benzo(j)fluoranthene	7	2.01E+01	1.84E-02	5.25E-07	0.00E+00	X
205-99-2	Benzo(b)fluoranthene	30	1.97E-01	2.00E-04	5.70E-09	0.00E+00	X
206-44-0	Fluoranthene	33	6.44E+00	5.90E-03	1.68E-07	0.00E+00	X
207-08-9	Benzo(k)fluoranthene	30	1.97E-01	2.00E-04	5.70E-09	0.00E+00	X
208-96-8	Acenaphthylene	14	1.05E+00	1.00E-03	2.85E-08	2.85E-08	

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CAS#	Organic Compound	Henry's Law Grouping HL	Individual Organic Weight Fraction. WF_i mg/kg	Individual Organic Weight Ratio WR_i unitless	Individual Organic Release R_{IO} gm/s	Individual Organic Vapor Emission R_{VO} gm/s	Particle P
218-01-9	Chrysene	32	1.54E+01	1.40E-02	3.99E-07	0.00E+00	X
2234-13-1	Octachloronaphthalene	14	1.05E+00	1.00E-03	2.85E-08	0.00E+00	X
224-42-0	Dibenz[a,j]acridine	4	1.98E+01	1.81E-02	5.16E-07	0.00E+00	X
226-36-8	Dibenz[a,h]acridine	4	1.98E+01	1.81E-02	5.16E-07	0.00E+00	X
2385-85-5	Mirex	17	7.06E-05	0.00E+00	0.00E+00	0.00E+00	
25551-13-7	Trimethyl benzene	19	1.55E-06	0.00E+00	0.00E+00	0.00E+00	
26140-60-3	Terphenyls	34	8.88E-02	1.00E-04	2.85E-09	0.00E+00	X
27154-33-2	Trichlorofluoroethane	23	5.60E-13	0.00E+00	0.00E+00	0.00E+00	
287-92-3	Cyclopentane	24	3.30E-21	0.00E+00	0.00E+00	0.00E+00	
309-00-2	Aldrin	34	8.88E-02	1.00E-04	2.85E-09	0.00E+00	X
319-84-6	Hexachlorocyclohexane (Lindane) Alpha BHC	33	6.44E+00	5.90E-03	1.68E-07	1.68E-07	
319-85-7	Hexachlorocyclohexane (Lindane) Beta BHC	30	8.35E-02	1.00E-04	2.85E-09	0.00E+00	X
319-86-8	Delta-BHC	30	1.97E-01	2.00E-04	5.70E-09	0.00E+00	X
3697-24-3	5-Methylchrysene	32	9.24E+00	8.40E-03	2.40E-07	0.00E+00	X
3825-26-1	Ammonium perfluorooctanoate	14	1.05E+00	1.00E-03	2.85E-08	0.00E+00	X
4170-30-3	2-Butenaldehyde (2-Butenal or Crotonaldehyde)	11	2.33E+00	2.10E-03	5.99E-08	5.99E-08	
465-73-6	Isodrin	35	2.12E-01	2.00E-04	5.70E-09	5.70E-09	
50-00-0	Formaldehyde	8	2.21E+01	2.02E-02	5.76E-07	5.76E-07	
50-29-3	4,4-DDT	33	6.44E+00	5.90E-03	1.68E-07	0.00E+00	X
50-32-8	Benzo(a)pyrene	30	3.11E-01	3.00E-04	8.56E-09	0.00E+00	X
53-70-3	Dibenzo(a,h)anthracene	7	2.01E+01	1.84E-02	5.25E-07	0.00E+00	X
540-59-0	1,2-Dichloroethylene	19	1.55E-06	0.00E+00	0.00E+00	0.00E+00	
540-84-1	2,2,4-Trimethylpentane	28	0.00E+00	0.00E+00	0.00E+00	0.00E+00	
541-73-1	1,3-Dichlorobenzene	19	1.55E-06	0.00E+00	0.00E+00	0.00E+00	
56-23-5	Carbon tetrachloride	22	7.29E-11	0.00E+00	0.00E+00	0.00E+00	
563-80-4	3-Methyl-2-butanone	14	1.05E+00	1.00E-03	2.85E-08	2.85E-08	
56-49-5	3-Methylcholanthrene	28	0.00E+00	0.00E+00	0.00E+00	0.00E+00	X
56-55-3	Benzo(a)anthracene	33	6.44E+00	5.90E-03	1.68E-07	0.00E+00	X
57-14-7	1,1-Dimethylhydrazine	12	9.67E+00	8.80E-03	2.51E-07	2.51E-07	
58-89-9	gamma-BHC (Lindane)	32	5.28E-02	0.00E+00	0.00E+00	0.00E+00	X
58-90-2	2,3,4,6-Tetrachlorophenol	11	1.08E+01	9.90E-03	2.82E-07	2.82E-07	
591-78-6	2-Hexanone	14	1.05E+00	1.00E-03	2.85E-08	2.85E-08	
59-50-7	4-Chloro-3-methylphenol	32	9.24E+00	8.40E-03	2.40E-07	0.00E+00	X
59-89-2	N-Nitrosomorpholine	6	2.00E+01	1.83E-02	5.22E-07	5.22E-07	
602-87-9	5-Nitroacenaphthene	9	2.88E+01	2.63E-02	7.50E-07	0.00E+00	X
60-29-7	Ethyl ether	17	7.06E-05	0.00E+00	0.00E+00	0.00E+00	
603-34-9	Triphenylamine	32	1.23E+01	1.12E-02	3.19E-07	3.19E-07	
60-34-4	Methylhydrazine	10	1.57E+00	1.40E-03	3.99E-08	3.99E-08	
60-35-5	Acetamide	5	4.40E+00	4.00E-03	1.14E-07	1.14E-07	
60-57-1	Dieldrin	33	9.32E-02	1.00E-04	2.85E-09	0.00E+00	X
621-64-7	Di-n-Propylnitrosamine (N-Nitroso-di-n-propylamine)	10	1.57E+00	1.40E-03	3.99E-08	3.99E-08	
624-83-9	Methyl isocyanate	17	7.06E-05	0.00E+00	0.00E+00	0.00E+00	
627-13-4	Nitric acid, propyl ester	17	7.06E-05	0.00E+00	0.00E+00	0.00E+00	
62-75-9	N-Nitroso-N,N-dimethylamine (Dimethylnitrosamine)	9	2.88E+01	2.63E-02	7.50E-07	7.50E-07	
630-20-6	1,1,1,2-Tetrachloroethane	18	3.23E-06	0.00E+00	0.00E+00	0.00E+00	
64-17-5	Ethyl alcohol	10	1.57E+00	1.40E-03	3.99E-08	3.99E-08	
64-18-6	Formic acid	7	2.01E+01	1.84E-02	5.25E-07	5.25E-07	
64-19-7	Acetic acid	6	2.00E+01	1.83E-02	5.22E-07	5.22E-07	
67-56-1	Methyl alcohol (Methanol)	10	1.57E+00	1.40E-03	3.99E-08	3.99E-08	
67-63-0	2-Propyl alcohol (Isopropanol; Propan-2-01)	11	7.83E+00	7.10E-03	2.02E-07	2.02E-07	
67-64-1	2-Propanone (Acetone)	13	2.48E+00	2.30E-03	6.56E-08	6.56E-08	
67-66-3	Chloroform	19	1.55E-06	0.00E+00	0.00E+00	0.00E+00	
67-72-1	Hexachloroethane	19	1.55E-06	0.00E+00	0.00E+00	0.00E+00	

Table 9. Estimate of Organic Emissions from the HLW Process Cells. Calc. No. 24590-WTP-HAC-50-00001, Rev. C

CAS#	Organic Compound	Henry's Law Grouping HL	Individual Organic Weight Fraction. WF_i mg/kg	Individual Organic Weight Ratio WR_i unitless	Individual Organic Release R_{IO} gm/s	Individual Organic Vapor Emission R_{VO} gm/s	Particle P
684-16-2	Hexafluoroacetone	19	1.55E-06	0.00E+00	0.00E+00	0.00E+00	
71-23-8	n-Propyl alcohol	11	7.83E+00	7.10E-03	2.02E-07	2.02E-07	
71-36-3	n-Butyl alcohol	11	7.83E+00	7.10E-03	2.02E-07	2.02E-07	
71-43-2	Benzene	19	1.69E-07	0.00E+00	0.00E+00	0.00E+00	
71-55-6	Methyl chloroform (1,1,1-Trichloroethane)	21	6.57E-10	0.00E+00	0.00E+00	0.00E+00	
72-20-8	Endrin	32	9.24E+00	8.40E-03	2.40E-07	0.00E+00	X
72-43-5	Methoxychlor	7	2.01E+01	1.84E-02	5.25E-07	0.00E+00	X
72-54-8	4,4-DDD	32	9.24E+00	8.40E-03	2.40E-07	0.00E+00	X
72-55-9	4,4-DDE	34	8.88E-02	1.00E-04	2.85E-09	0.00E+00	X
74-83-9	Bromomethane (Methyl bromide)	19	1.55E-06	0.00E+00	0.00E+00	0.00E+00	
74-87-3	Chloromethane (Methyl chloride)	20	1.03E-08	0.00E+00	0.00E+00	0.00E+00	
74-97-5	Bromochloromethane	17	7.06E-05	0.00E+00	0.00E+00	0.00E+00	
74-99-7	Methylacetylene	20	1.03E-08	0.00E+00	0.00E+00	0.00E+00	
75-00-3	Chloroethane	20	1.03E-08	0.00E+00	0.00E+00	0.00E+00	
75-01-4	Vinyl chloride (1-Chloroethene)	22	7.29E-11	0.00E+00	0.00E+00	0.00E+00	
75-05-8	Acetonitrile	13	1.69E+00	1.50E-03	4.28E-08	4.28E-08	
75-07-0	Acetaldehyde	13	2.48E+00	2.30E-03	6.56E-08	6.56E-08	
75-09-2	Dichloromethane (Methylene chloride)	19	1.55E-06	0.00E+00	0.00E+00	0.00E+00	
75-12-7	Formamide	4	1.98E+01	1.81E-02	5.16E-07	5.16E-07	
75-15-0	Carbon disulfide	20	1.03E-08	0.00E+00	0.00E+00	0.00E+00	
75-21-8	Ethylene oxide (Oxirane)	15	2.40E-01	2.00E-04	5.70E-09	5.70E-09	
75-27-4	Bromodichloromethane	18	3.23E-06	0.00E+00	0.00E+00	0.00E+00	
75-34-3	1,1-Dichloroethane	19	1.55E-06	0.00E+00	0.00E+00	0.00E+00	
75-35-4	1,1-Dichloroethene (Vinylidene chloride)	22	7.29E-11	0.00E+00	0.00E+00	0.00E+00	
75-43-4	Dichlorofluoromethane	20	1.03E-08	0.00E+00	0.00E+00	0.00E+00	
75-45-6	Chlorodifluoromethane	22	7.29E-11	0.00E+00	0.00E+00	0.00E+00	
75-50-3	Trimethylamine	14	1.05E+00	1.00E-03	2.85E-08	2.85E-08	
75-52-5	Nitromethane	13	2.48E+00	2.30E-03	6.56E-08	6.56E-08	
75-55-8	2-Methylaziridine	11	7.83E+00	7.10E-03	2.02E-07	2.02E-07	
75-61-6	Difluorodibromomethane	22	7.29E-11	0.00E+00	0.00E+00	0.00E+00	
75-63-8	Trifluorobromomethane	25	0.00E+00	0.00E+00	0.00E+00	0.00E+00	
75-65-0	2-Methyl-2-propanol	11	7.83E+00	7.10E-03	2.02E-07	2.02E-07	
75-69-4	Trichlorofluoromethane	23	0.00E+00	0.00E+00	0.00E+00	0.00E+00	
75-71-8	Dichlorodifluoromethane	25	0.00E+00	0.00E+00	0.00E+00	0.00E+00	
75-99-0	2,2-Dichloropropionic acid	6	2.00E+01	1.83E-02	5.22E-07	5.22E-07	
76-03-9	Trichloroacetic acid	5	4.40E+00	4.00E-03	1.14E-07	1.14E-07	
76-11-9	1,1,1,2-Tetrachloro-2,2-difluoroethane	24	3.30E-21	0.00E+00	0.00E+00	0.00E+00	
76-12-0	1,1,2,2-Tetrachloro-1,2-difluoroethane	23	5.60E-13	0.00E+00	0.00E+00	0.00E+00	
76-13-1	1,2,2-Trichloro-1,1,2-trifluoroethane (Freon 113)	25	0.00E+00	0.00E+00	0.00E+00	0.00E+00	
76-14-2	1,2-Dichloro-1,1,2,2-tetrafluoroethane	28	0.00E+00	0.00E+00	0.00E+00	0.00E+00	
76-15-3	Chloropentafluoroethane	29	0.00E+00	0.00E+00	0.00E+00	0.00E+00	
76-44-8	Heptachlor	16	2.05E-03	0.00E+00	0.00E+00	0.00E+00	
78-83-1	2-Methylpropyl alcohol (Isobutyl alcohol)	11	7.83E+00	7.10E-03	2.02E-07	2.02E-07	
78-87-5	1,2-Dichloropropane	19	1.55E-06	0.00E+00	0.00E+00	0.00E+00	
78-92-2	1-Methylpropyl alcohol (2-Butanol)	11	7.83E+00	7.10E-03	2.02E-07	2.02E-07	
78-93-3	Methyl ethyl ketone (MEK, 2-Butanone)	13	2.48E+00	2.30E-03	6.56E-08	6.56E-08	
79-00-5	1,1,2-Trichloroethane	17	7.06E-05	0.00E+00	0.00E+00	0.00E+00	
79-01-6	Trichloroethylene	20	1.16E-08	0.00E+00	0.00E+00	0.00E+00	
79-09-4	Propionic acid	8	2.21E+01	2.02E-02	5.76E-07	5.76E-07	
79-10-7	2-Propenoic acid	8	2.21E+01	2.02E-02	5.76E-07	5.76E-07	
79-20-9	Methyl acetate	14	1.05E+00	1.00E-03	2.85E-08	2.85E-08	
79-34-5	1,1,2,2-Tetrachloroethane	16	3.04E-03	0.00E+00	0.00E+00	0.00E+00	
8001-35-2	Toxaphene	10	1.20E-01	1.00E-04	2.85E-09	0.00E+00	X

Table 9. Estimate of Organic Emissions from the HLW Process Cells. Calc. No. 24590-WTP-HAC-50-00001, Rev. C

CAS#	Organic Compound	Henry's Law Grouping HL	Individual Organic Weight Fraction. WF_i mg/kg	Individual Organic Weight Ratio WR_i unitless	Individual Organic Release R_{IO} gm/s	Individual Organic Vapor Emission R_{VO} gm/s	Particle P
82-68-8	Pentachloronitrobenzene (PCBN or quintobenzene)	13	2.48E+00	2.30E-03	6.56E-08	6.56E-08	
83-32-9	Acenaphthene	15	2.40E-01	2.00E-04	5.70E-09	5.70E-09	
84-66-2	Diethyl phthalate	8	1.85E+01	1.69E-02	4.82E-07	4.82E-07	
84-74-2	Dibutyl phthalate	31	1.94E+01	1.77E-02	5.05E-07	0.00E+00	X
85-01-8	Phenanthrene	13	2.48E+00	2.30E-03	6.56E-08	6.56E-08	
85-68-7	Butylbenzyl phthalate	31	1.94E+01	1.77E-02	5.05E-07	0.00E+00	X
86-73-7	Fluorene	14	1.05E+00	1.00E-03	2.85E-08	0.00E+00	X
87-68-3	Hexachlorobutadiene	20	9.11E-09	0.00E+00	0.00E+00	0.00E+00	
87-86-5	Pentachlorophenol	6	2.00E+01	1.83E-02	5.22E-07	5.22E-07	
88-06-2	2,4,6-Trichlorophenol	10	1.57E+00	1.40E-03	3.99E-08	3.99E-08	
88-72-2	2-Nitrotoluene	12	9.67E+00	8.80E-03	2.51E-07	2.51E-07	
88-75-5	2-Nitrophenol	12	9.67E+00	8.80E-03	2.51E-07	2.51E-07	
88-85-7	2-sec-Butyl-4,6-dinitrophenol (Dinoseb)	8	2.83E+01	2.58E-02	7.36E-07	0.00E+00	X
88-89-1	Picric acid	2	2.47E+01	2.25E-02	6.42E-07	0.00E+00	X
91-20-3	Naphthalene	16	8.81E-04	0.00E+00	0.00E+00	0.00E+00	
91-22-5	Quinoline	9	2.88E+01	2.63E-02	7.50E-07	7.50E-07	
91-58-7	2-Chloronapthalene	16	3.04E-03	0.00E+00	0.00E+00	0.00E+00	
92-52-4	1,1`-Biphenyl	16	3.04E-03	0.00E+00	0.00E+00	0.00E+00	
92-93-3	4-Nitrobiphenyl	10	1.57E+00	1.40E-03	3.99E-08	0.00E+00	X
93-72-1	Silvex (2,4,5-TP)	5	4.40E+00	4.00E-03	1.14E-07	0.00E+00	X
93-76-5	2,4,5-T	5	4.40E+00	4.00E-03	1.14E-07	0.00E+00	X
94-75-7	2,4-D and esters (160C typed)	6	2.00E+01	1.83E-02	5.22E-07	5.22E-07	
95-13-6	Indene	18	3.23E-06	0.00E+00	0.00E+00	0.00E+00	
95-47-6	o-Xylene	19	1.55E-06	0.00E+00	0.00E+00	0.00E+00	
95-48-7	o-Cresol (2-Methylphenol)	9	2.88E+01	2.63E-02	7.50E-07	7.50E-07	
95-49-8	2-Chlorotoluene	19	1.55E-06	0.00E+00	0.00E+00	0.00E+00	
95-50-1	o-Dichlorobenzene (1,2-Dichlorobenzene)	18	3.23E-06	0.00E+00	0.00E+00	0.00E+00	
95-57-8	2-Chlorophenol	11	7.83E+00	7.10E-03	2.02E-07	2.02E-07	
95-95-4	2,4,5-Trichlorophenol	9	2.88E+01	2.63E-02	7.50E-07	7.50E-07	
96-22-0	3-Pentanone	14	1.05E+00	1.00E-03	2.85E-08	2.85E-08	
96-69-5	Bis(3-tert-butyl-4-hydroxy-6-methyl-phenyl)sulfide	19	1.55E-06	0.00E+00	0.00E+00	0.00E+00	X
98-51-1	p-tert-Butyltoluene	21	6.57E-10	0.00E+00	0.00E+00	0.00E+00	
98-82-8	Cumene	20	1.03E-08	0.00E+00	0.00E+00	0.00E+00	
98-83-9	alpha-Methylstyrene	19	1.55E-06	0.00E+00	0.00E+00	0.00E+00	
98-86-2	Acetophenone	11	1.03E+01	9.40E-03	2.68E-07	2.68E-07	
98-95-3	Nitrobenzene	12	9.67E+00	8.80E-03	2.51E-07	2.51E-07	
	Weight Fraction Sum = WF_S =		1095.9				
	Weight Ratio Sum = WR_S =			1.00E+00			
	HLW Stream Sum = $ER_{O\text{-}HL}$ =				2.85E-05		
	LAW Stream Vapor Organic Release Sum = R_{VOS} =					1.87E-05	