FACT SHEET FOR STATE WASTE DISCHARGE PERMIT NO. ST 4500

ISSUED TO UNITED STATES DEPARTMENT OF ENERGY

RICHLAND OPERATIONS OFFICE

RICHLAND, WASHINGTON

BY WASHINGTON STATE DEPARTMENT OF ECOLOGY

KENNEWICK, WASHINGTON

SUMMARY

The Washington State Department of Ecology (Ecology) is proposing to renew a State Waste Discharge Permit, which will continue to allow discharge of treated wastewater via infiltration through soils to the groundwaters of the state. The Applicant is the U.S. Department of Energy, Richland Operations Office (Permittee). The facility is called the 200 Area Effluent Treatment Facility (ETF). ETF is located in the 200 East Area of the Hanford Site, and ETF discharges to an infiltration gallery known as the State Approved Land Disposal Site (SALDS) that is located north of the 200 West Area.

The influent to ETF consists of individual waste streams from many Hanford facilities. Major sources include process condensate from the 242-A Evaporator, and groundwater from the UP-1 pump and treat operation. Most streams to be treated at ETF are initially stored at the Liquid Effluent Retention Basins (LERF). ETF has a robust treatment train that can remove all contaminates in the influent wastewaters, except for tritium.

Water in close proximity to the discharge is found as groundwater at a depth of about 220 feet below the surface. The disposal site was selected to avoid potential mobilization of contaminants from historical disposal practices and to give a long travel time to the Columbia River. Computer modeling of groundwater flow provides an estimated travel time of over 100 years for the effluent to reach the Columbia River. The most recent models indicate that tritium in groundwater from the SALDS will not exceed groundwater standards (GWS) further than 0.75 mile from the SALDS. This travel time is important, since the effluent does contain tritium, which needs time to decay before it reaches the river.

The draft permit complies with the regulatory requirements of Chapter 173-200 WAC - Water Quality Standards for Ground Waters of the State of Washington. This regulation is premised on the fact that all contaminants should be regulated to protect all existing and future beneficial uses of the groundwater. Since the use of drinking water is the most restrictive and protective, this regulation and the draft permit protects the groundwater for drinking water purposes. The draft permit establishes enforcement limits for nonradioactive contaminants or maximum allowable concentration levels, in the effluent and/or groundwater that are essentially drinking water standards. Hence, the permit requires that the effluent essentially meets drinking water standards for nonradioactive contaminants before discharge to the disposal site.

In the case of this permit, the Permittee shall be self-regulating for radioactive contaminants under the provisions of the Atomic Energy Act. The Permittee plans to meet the intent of 40 CFR Part 141, "National Primary Drinking Water Regulations," in regards to radioactive contaminants; and plans to take investigative and mitigative steps if drinking water standards are exceeded. Ecology is requiring and the permittee has agreed to provide monitoring and reporting of radionuclide concentrations in the effluent.

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INTRODUCTION

This fact sheet is a companion document to the draft State Waste Discharge Permit No. ST 4500. The Department of Ecology (Ecology) is proposing to renew this permit, which will allow continued discharge of wastewater to waters of the State of Washington. This fact sheet explains the nature of the proposed discharge, Ecology's decisions on limiting the pollutants in the wastewater, and the regulatory and technical bases for those decisions.

Washington State law (RCW 90.48.080 and 90.48.162) requires that a permit be issued before discharge of wastewater to waters of the state is allowed. Regulations adopted by the state include procedures for issuing permits (Chapter 173-216 WAC), and water quality criteria for groundwaters (Chapter 173-200 WAC). They also establish requirements which are to be included in the permit.

This fact sheet and draft permit are available for review by interested persons as described in Appendix A--Public Involvement Information.

The fact sheet and draft permit have been reviewed by the Permittee. Errors and omissions identified in these reviews have been corrected.

GENERAL INFORMATION	
Applicant	United States Department of Energy, Richland Operations Office
Facility Name and Address	200 Area Effluent Treatment Facility (ETF) 200 East Area on the Hanford Site P.O. Box 550, S7-41 Richland, WA 99352-1000
Type of Facility	Treatment facility for nuclear/mixed wastewaters.
Type of Treatment:	Filtration, Ultraviolet Oxidation, pH adjustment, Reverse Osmosis, and Ion Exchange.
Discharge Location	Waterbody: Discharge will through infiltration reach groundwater. Groundwater is at a depth of about 220 feet below the disposal facility. The disposal facility is approximately thirteen miles from the Columbia River. The disposal facility is an infiltration gallery designated as the State Approved Land Disposal Site (SALDS) and is located at: Latitude: 46° 34’ 21” N Longitude: 119° 38’ 0” W

GENERAL INFORMATION	
Contact at Facility	Gregory L. Sinton Waste Management Division Telephone #: (509) 373-7939
Responsible Official	Rudolph F. Guercia Acting Division Director, Waste Management Division U.S.D.O.E./Richland Operations Office P.O. Box 550, HO-12 Richland, WA 99352-0550 Telephone #: (509) 376-5494 FAX #: (509) 372-1926

BACKGROUND INFORMATION

DESCRIPTION OF THE FACILITY

The U.S. Department of Energy, Richland Operation Office's (Permittee) 200 Area Effluent Treatment Facility (ETF) is located near the 200 East Area of the Hanford Reservation, near Richland, Washington. The effluent infiltration gallery also known as the State Approved Land Disposal Site (SALDS), is located north of the 200 West Area of Hanford. The ETF and SALDS are have been operational since December 1995.

HISTORY

As a requirement for obtaining the original State Waste Discharge Permit, the Permittee had to apply all known, available, and reasonable methods (AKART) of prevention, control, and treatment prior to its discharge to the environment. This program of effluent treatment and facility construction and operation was incorporated as a portion of Milestone 17 in the 1989 Hanford Federal Facility Agreement and Consent Order (Tri-Party Agreement) between the Permittee, the U.S. Environmental Protection Agency, and Ecology. The Tri-Party Agreement further requires that the Best Available Technology (BAT) that is economically achievable be applied to the effluent. An extensive engineering report describes all of the treatment technologies applied at ETF to treat the effluent. Compliance inspections conducted by Ecology officials documented the implementation of the required improvements by the Permittee.

INDUSTRIAL PROCESSES

The Hanford Site has been used by the U.S. government to produce the materials needed for atomic bombs. The production of these materials produced various by-products that have become contaminates in the environment. The mission of the Hanford Site has now shifted from nuclear production to environmental cleanup. ETF is a key facility in the Permittee's efforts to handle various liquid wastes on the Hanford Site.

Since World War II, radioactive and dangerous wastes have been stored at the Hanford Site in large underground storage tanks (up to 75 feet in diameter). There are 149 single-walled tanks called

Single-Shell Tanks or SSTs. There are currently 28 double-walled tanks called Double-Shell Tanks or DSTs. The waste stored in these tanks can exist in any or all of three forms. These forms are:

1. A liquid layer composed mostly of water contaminated with low levels of organic and inorganic materials. In a few tanks, a separate organic layer also exists.

2. A slurry layer which is a fairly concentrated water, organic and inorganic mix producing a gelatin-like material.

3. A sludge layer which is mostly crystallized inorganic and organic material. In a few tanks, which have been allowed to dry out, all that is left is a hard, dry material called "salt cake."

Approximately 54 million gallons of radioactive and hazardous waste are stored in the SSTs and DSTs. The SSTs have outlived their design life and some have begun to leak. As part of its cleanup activities, the Permittee is using the 242-A Evaporator to concentrate liquid waste in the double-shell tanks and reduce the volume of waste in the tanks. The evaporator process produces a dilute, liquid waste known as process condensate (PC). The PC is sent to the Liquid Effluent Retention Facility (LERF) basins where it is stored temporarily prior to treatment in the 200 Area ETF. The LERF consists of three covered and lined surface impoundments just east of the 200 East Area. This PC was the first source of influent to be treated by the ETF and then discharged to the ground.

Until 1988, the 242-A evaporator PC was discharged directly to the soil. This practice was stopped under a plan submitted to Congress in an effort to reduce or eliminate the discharge of contaminated, untreated, wastewater (effluent) to the ground at Hanford. The Permittee's plan became part of the 1989 Hanford Federal Facilities Agreement and Consent Order, which is known as the Tri-Party Agreement (TPA) between the USDOE, the U.S. Environmental Protection Agency, and the State of Washington Department of Ecology (Ecology). The TPA is an agreement to ensure that environmental impacts associated with past and present practice activities at the Hanford Site are thoroughly investigated and that appropriate response actions are taken as necessary to protect the public health, welfare, and the environment. Further, the ETF is specifically required by the U.S. DOE and Ecology Consent Order No. DE 91NM-177 of December 23, 1991. This Consent Order, which controls liquid discharges to the ground, has been incorporated into the TPA as Milestone M-17-00 et seq. The program established by this milestone reduces or eliminates sources of contamination and provides effluent treatment prior to discharge.

The only constituent which is not removed by the ETF is tritium, a heavy form of hydrogen. Tritium is a radioactive species which has a short life span (12.3 year half life) compared to many other more well-known radioactive compounds such as uranium and plutonium. Tritium, however, because it is similar in form to hydrogen, replaces hydrogen in some water molecules. In addition, because of its similarity to hydrogen, it is very difficult and expensive to separate tritium from the more common hydrogen atoms.

Evaporator PC has had concentrations of tritium in the order of 4 million picocuries per liter. A picocurie is one trillionth of a curie. Other wastewaters that ETF has or will treat have a range of

tritium concentrations. Some wastewaters have little to no tritium, while wastewaters such as N-basin water are close to 40 million picocuries per liter of tritium.

The chosen alternative for handling tritium in the ETF effluent is to discharge this water to the subsurface and allow tritium to decay into non-radioactive helium before it reaches the Columbia River. Although the preferred alternative would be to separate tritium and handle it appropriately, the large expense involved currently makes this an unrealistic option. Therefore, discharge to the subsurface is the only cost effective method to handle tritium found in the process condensate and other feeds to ETF.

An effort is being made by the Permittee to evaluate new tritium separation/removal technologies. If new technologies are developed which enable the separation of tritium from hydrogen in a cost effective manner, they will be evaluated and potentially implemented on the Hanford Site.

The remaining contaminants in the PC and other feeds to ETF (mostly organic and inorganic species) will either be destroyed or be separated out for proper handling in the ETF. Treated effluent discharged to the soil from the ETF will meet all applicable state and federal limits. Tritium will be the only exception.

The ETF was originally permitted to receive influent from one source, the 242-A Evaporator. The Evaporator is a wastewater volume reduction/waste concentration facility which processes liquid mixed waste (mixed waste is both toxic/hazardous from a chemical standpoint and radioactive) originating from a battery of underground tanks. These tanks contain mixed waste from various waste sources, including the following:

- S Plant laboratory and decontamination wastes
- T Plant spent decontamination solutions
- 300 Area laboratory wastes
- 300 Area fuels fabrication
- 400 Area laboratory waste
- 100-N dilute phosphate decontamination waste and 100 Area spent fuel storage basin sulfate waste from ion exchange regeneration and sand filter backwashing
- Single-shell tank salt well pumping waste
- Plant process and miscellaneous waste, including cell drainage and vessel cleanout waste
- PUREX Plant

Condensate from the 242-A Evaporator was the only influent stream allowed at first. Additional influent streams have been permitted, if acceptance criteria were met. These new streams include: 200-UP-1 Groundwater, Quanterra Wastewater, Waste Sampling and Characterization Facility Wastewater, Plutonium Uranium Extraction Facility Basin Wastewater, Solid Waste Landfill Leachate, Environmental Restoration Disposal Facility Leachate, West Area Tank Farm's 242-S-302-C Wastewater, 100-N Reactor Wastewater, Well Purgewater, T-Plant Tank 241-TX-302C Wastewater, Well Drilling Decontamination Wastewater, 107-N/1314-N/1310-N Wastewater, 105-N Lift Station Wastewater, 100 HR-3 & KR-4 Field Test Wastewater, 105-C Lift Station Wastewater, FFTF Rinse Wastewater, 100-D Area Wastewater, Railcar Cleanout Contaminated

Stormwater, K Area Well Test Water, 327 Building Sanitary Water Overflow, and Grout Testing Project Wastewater.

TREATMENT PROCESSES

The ETF has been constructed pursuant to the TPA and specifically it is required via Ecology Consent Order No. DE-91NM-177 of December 23, 1991. The ETF has been in operation since late 1995. The ETF is a multi-stage liquid treatment train consisting of the following elements:

- Surge tank (pH adjustment)
- Coarse filtration
- Ultraviolet/Oxidation (UV/OX) system
- pH adjustment
- Hydrogen peroxide decomposer
- Fine filter
- Degasification
- Reverse Osmosis (RO) system
- Polisher Ion Exchange columns
- pH adjustment
- Verification tanks
- Cooling tower unit and blowdown

Influent to the ETF arrives in the surge tank via one 3 inch diameter and one 4 inch diameter underground pipelines totaling approximately 1,500 feet in length. One pipe originates from the LERF, the other pipe tees off of the line from the 242-A Evaporator to the LERF. Influent also can go directly from a truck unloading station to the surge tank. Most all of the influent is stored in LERF prior to transfer to ETF.

After treatment, ETF effluent accumulates prior to discharge in any one of three 650,000 gallon verification tanks. If verification tank contents are shown via sampling and analysis to be out of compliance with this permit's effluent limitations then the contents of that tank will be re-routed through the ETF for further treatment.

The effluent pipeline to the SALDS is a subsurface 8 inch diameter PVC pipe which is approximately six miles long. This line includes vacuum relief and sectioning valves.

The SALDS effluent infiltration gallery is a 116 foot by 200 foot rectangular drainfield with 4 inch diameter porous pipe laterals coming off an 8 inch diameter header at 6 foot intervals. The drainfield pipes are 6 inches below the surface of a 6 foot deep gravel basin. The gravel basin is covered by a layer of native soil at least 12 inches deep.

SITE DESCRIPTION

The ETF is located on the Hanford Site, east of the 200 East Area. The Hanford Site is located within the semiarid Pasco Basin of the Columbia Plateau in south-central Washington State. The Hanford Site occupies an area of about 560 square miles northwest of the confluence of the Snake and Yakima rivers with the Columbia River. It comprises an area of about 30 miles north to south, and 24 miles east to west. This land has restricted public access and provides a buffer for the smaller areas currently used for storage of nuclear materials, waste storage, and waste disposal. Only about 6% of the land area has been disturbed and is actively used.

The Columbia River flows through the northern part of the Hanford Site. It then turns south and forms part of the Site's eastern boundary (see Figure on Page 9). The Yakima River runs along part of the southern boundary and joins the Columbia River below the City of Richland. Richland borders the Hanford Site on the southeast. Rattlesnake Mountain, the Yakima Ridge, and Umtanum Ridge form the southwestern and western boundaries of the Hanford Site. The Saddle Mountains form the northern boundary. Two small east-west ridges, Gable Butte and Gable Mountain, rise above the plateau of the central part of the Hanford Site. Adjoining lands to the west, north, and east are principally range and agricultural lands. The cities of Richland, Kennewick, and Pasco constitute the nearest population centers and are located southeast of the Hanford Site.

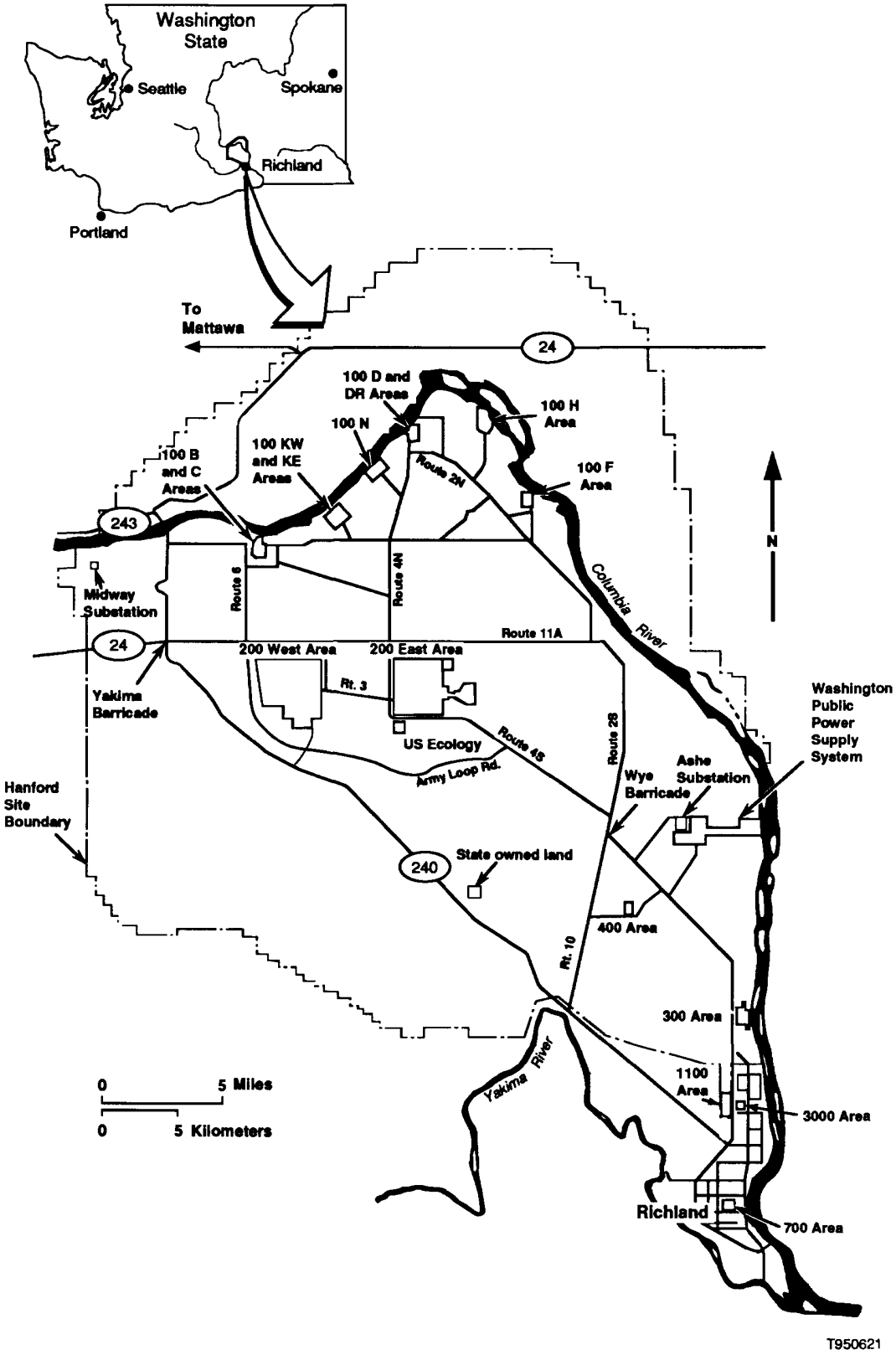
The Hanford Site encompasses more than 1500 waste management units and four groundwater contamination plumes that have been grouped into 78 operable units. The ETF is located near the center of the Hanford Site, approximately on the northeastern corner of the 200 East Area.

The SALDS is located about six miles from the ETF, just north of the 200 West Area. The site was chosen due to the fact that the travel time to the river from the site would allow tritium to decay to acceptable levels. The area soils were essentially uncontaminated; and modeling indicated that additional infiltration would not mobilize contaminants or contribute to contamination plume migration originating from other locations.

GROUNDWATER AND GEOLOGY OF THE SITE

The effluent infiltration gallery, also known as the State Approved Land Disposal Site (SALDS), which is located just north of the 200 West Area is underlain by sediments that are geologically young. The sediments are composed of the Ringold Formation, the "Plio-Pleistocene unit" and early "Palouse" soil, and the overlying (much younger) Hanford formation. A thin, discontinuous veneer of dune sand overlies the Hanford formation at the surface of the SALDS. Basalt bedrock of the Columbia River Basalt Group underlies the sediments. The Plio-Pleistocene, the Ringold Formation, and the underlying basalt slope gently to the south beneath the SALDS.

The Hanford formation is approximately 7 m (23 feet) thick and is mostly highly permeable gravel with a sandy matrix between gravel clasts. Minor amounts of silt also occur throughout. The Hanford formation thickens southward in the vicinity of the SALDS.


Washington State
Seattle
Spokane
Richland
Portland
To Mattawa
24
100 D and DR Areas
100 H Area
100 N
100 KW and KE Areas
100 B and C Areas
Route 2N
100 F Area
243
N
Midway Substation
Route 6
Route 4N
Columbia River
Route 11A
24
200 West Area
200 East Area
Rt. 3
Yakima Barricade
US Ecology
Route 4S
Route 2S
Army Loop Rd.
Wye Barricade
Ashe Substation
Washington Public Power Supply System
Hanford Site Boundary
240
State owned land
400 Area
Rt. 10
300 Area
Yakima River
1100 Area
3000 Area
0 5 Miles
0 5 Kilometers
Richland
700 Area
T950621

The strata known as the plio-pleistocene unit and the early "Palouse" soil collectively consist of calcium-carbonate-cemented silt, sand, and gravel, and silt and sand without calcium carbonate cement. Calcium carbonate lenses (local pockets), formed within an ancient soil, also occur within these units. The thickness of these combined units beneath the facility is approximately 13 m (42 feet).

Beneath the SALDS, the Ringold Formation consists of three primary sedimentary units that total approximately 119 m (390 feet) in thickness. From bottom to top, these are: 1) the Ringold unit A. consisting mostly of a mixture of sand and gravel, 18 m (60 feet) thick; 2) the Ringold unit E. consisting of gravel mixed with both sand and silt (much finer than sand) and interbedded with sand layers, 95 m (312 feet) thick; and 3) an "upper Ringold" unit that is dominantly sand, 5.5 m (18 feet) thick. Ringold units A and E are similar in many respects and therefore often cannot confidently be distinguished from borehole information.

A north-south trending subsurface channel that is relatively permeable to groundwater flow is interpreted to be present in the vicinity of SALDS, although the exact location and boundaries of the channel are not well known.

Three groundwater monitoring wells have been installed along the northeastern and southern edges of the facility. The two wells northeast of the facility are downgradient wells: one of these wells monitors groundwater at the water table; the other well monitors groundwater deeper in the aquifer. The well at the southern end of the facility was originally intended as an upgradient well that monitors the aquifer at the water table. The plume from the discharge has reached this well, making all three near field wells downgradient wells. The uppermost aquifer occurs within the Ringold units A and E beneath the facility.

The water table was in April 1999 at a depth of 68.272 m (224 feet) below land surface, as measured in the groundwater monitoring well 699-48-77A. The hydraulic gradient beneath the facility is about 0.004 ft/ft. Groundwater flows in a north-northeasterly direction at a low velocity. Results of numerical modeling of groundwater flow suggest travel times of at least 105 years from the facility to the Columbia River.

Groundwater samples were taken before the start of discharge, over a period of eight quarters from the groundwater sampling point well 699-48-77A, beginning in June 1992. Groundwater level measurements have been made quarterly in this well since June 1992.

The average annual precipitation at the Hanford Site is 6.3 inches. Minor local variations occur. Most of the precipitation occurs during the winter, with nearly half of the annual amount occurring from November through February. Snowfall accounts for about 38 percent of all precipitation. Days with greater than 0.51 inch of precipitation occur less than 1 percent of the year. These semiarid conditions mitigate the development of groundwater contamination plumes.

Projections are that the probable maximum flood on the Columbia River would not encroach within three miles of the SALDS.

The Hanford Site has been botanically characterized as a shrub-steppe. The major plant community in the vicinity of the SALDS is Sagebrush/Cheatgrass or Sandberg Bluegrass and Greasewood/Cheatgrass-Saltgrass.

The SALDS was selected to avoid impact on historical, archaeological, and cultural resources.

PERMIT STATUS

The previous permit for this facility was issued on June 30, 1995.

An application for permit renewal was submitted to Ecology on December 30, 1999 and accepted by Ecology in January 2000.

SUMMARY OF COMPLIANCE WITH THE PREVIOUS PERMIT

During the history of the previous permit, the Permittee has remained in compliance based on Discharge Monitoring Reports (DMRs) and other reports submitted to Ecology and inspections conducted by Ecology. The only exceptions have been a few early high groundwater levels of sulfate. The sulfate levels were not due to the discharge of sulfate, but rather by the clean effluent dissolving sulfate that exists in the vadose zone. The sulfate levels peaked for about a year, always below groundwater standards, and have since returned to background levels.

The Permittee has also recently reported that from April 1996 until November 2, 1999, their lab failed to digest samples as required by EPA method 200.8 for metals, therefore making much of their metals data of questionable quality. Metals affected include arsenic, cadmium, chromium, lead, mercury, and uranium, in both effluent and groundwater samples.

The Permittee has recently done reanalysis of preserved samples by method 200.8. Forty-nine samples of effluent and groundwater were re-analyzed using mixed-acid digestion, as is called for by method 200.8. It has been reported that the reanalysis indicate the effect from not digesting when determining total metals in ETF effluent and groundwater was not significant to metals data previously reported. Data from the reanalysis mostly did not exceed or approach permit limits or early warning values. Two retest samples from groundwater wells did exceed the groundwater standard for chromium.

WASTEWATER CHARACTERIZATION

The concentration of pollutants in the discharge was reported in the permit reapplication and in discharge monitoring reports. The proposed wastewater discharge prior to infiltration is characterized for the following parameters:

WASTEWATER CHARACTERIZATION

Parameter	Average Concentration	Parameter	Average Concentration
1,1,1-Trichloroethane	0.60	Cerium/Praseodymium-144	96.93
1,1,2-Trichloroethane	0.60	Cerium-144	48.43
1,1-Dichloroethane	0.30	Cesium-134	7.45
1,1-Dichloroethene	0.40	Cesium-137	7.50
1,2-Dichloroethene (total)	1.20	Curium-242	0.10
1,2-Dichloroethane	0.50	Curium-244	0.15
1,4-Dichlorobenzene	3.10	Iodine-129	3.87
1-Butanol	150.00	Chloride	19.25
2-Butanone (Methyl ethyl ketone)	3.12	Neptunium-237	0.09
2-Hexanone	1.10	Plutonium-238	0.16
2-Pentanone	2.30	Plutonium-239/240	0.12
4-Methyl-2-pentanone (Hexone)	0.90	Technetium-99	2.84
Acetone	14.26	Tritium	208,746
Benzene	0.50	Carbon-14	3.49
Bromodichloromethane	0.40	Americium-241	0.16
Carbon Disulfide	0.60	Silicon	50.65
Carbon Tetrachloride	0.60	Ammonia (as N)	5.45
Chlorobenzene	0.40	Nitrogen total (TKN)	172.25
Chloroform	0.40	Total Suspended Solids	250.00
Methylene Chloride	0.88	Chromium	0.62
Propionitrile	3.00	Cobalt	8.01
Tetrachloroethylene	0.50	Cobalt-60	7.10
Tetrahydrofuran	4.60	Europium-152	22.79
Toluene	0.70	Europium-154	19.71
Trichloroethene	0.50	Europium-155	24.03
Vinyl Chloride	0.60	Fluoride	10.25

WASTEWATER CHARACTERIZATION Cont.

Parameter	Average Concentration	Parameter	Average Concentration
Xylene (total)	1.20	Specific Conductivity	19.30
1,2,4-Trichlorobenzene	5.40	Copper	1.75
2,4-Dinitrotoluene	1.60	Cyanide	5.00
2-Butoxyethanol	1.20	Gross Alpha	0.85
2-Chlorophenol	0.90	Gross Beta	1.14
2-Methylphenol	1.60	Iron	13.92
3-Methylphenol	2.10	Lead	0.25
4-Chloro-3-Methylphenol	0.70	Magnesium	67.16
4-Nitrophenol	1.10	Manganese	5.41
Acenaphthene	3.50	Beryllium	4.47
Acetophenone	1.20	Pyrene	0.50
Benzyl Alcohol	0.90	Total Cresol	3.60
Di-n-octyl phthalate	1.80	Tributyl Phosphate	0.70
Hexachloroethane	6.30	Total Organic Carbon	315.00
Naphthalene	4.20	Aluminum	57.68
Dimethylnitrosamine	0.80	Antimony	6.16
n-Nitrosodi-n-propylamine	1.40	Antimony-125	20.91
Pentachlorophenol	2.60	Arsenic	1.10
Phenol	2.05	Barium	7.08
Mercury	0.22	Bromide	70.50
Nickel	12.53	Sodium	34.06
Niobium-94	7.29	Sulfate	200.25
Nitrate(as N)	24.75	Thallium	85.08
Nitrite(as N)	34.25	Tin-113	16.12
Cadmium	0.19	Titanium	4.57
Calcium	23.31	Total Dissolved Solids	1800.00
Strontium-90	2.13	Uranium (Total)	0.13
Phosphate	66.00	Vanadium	14.41

WASTEWATER CHARACTERIZATION Cont.

Parameter	Average Concentration	Parameter	Average Concentration
Potassium	1426.50	Zinc	11.38
Silver	8.69	Zinc-65	14.94
Radium-226	0.06		
Ruthenium-103	7.18		
Ruthenium-106	68.01		
Selenium	4.28		

Units are in µg/l, except for the radionuclides, which are in pCi/l

Average concentrations are over the last year.

SEPA COMPLIANCE

Construction and operation of the ETF at the Hanford Site was reviewed under the Washington State Environmental Policy Act (SEPA). An Environmental Checklist was completed by USDOE in February 1993. On October 6, 1993, a "Determination of Significance and Adoption of Existing Environmental Document" was made by Ecology's Nuclear Waste Program. The document adopted is an Environmental Assessment (EA) prepared by USDOE under the National Environmental Policy Act (NEPA) of the Hanford Environmental Compliance Project. The EA includes an analysis of the alternatives, the affected environment, and the environmental impacts of ETF. A supplemental addendum to the EA was prepared by Ecology and included, along with the EA, as part of the SEPA determination.

The SEPA determination was announced in the October 18, 1993, SEPA Register and in a public mailing. Comments were accepted until December 14, 1993. During the comment period three comments were received.

The Ecology supplemental addendum includes the following conclusions:

"From the information evaluated in this addendum, Ecology accepts USDOE's proposal to discharge the tritiated effluent from the Effluent Treatment Facility to the ground. Presently there are no reasonable treatment technologies to remove tritium from this effluent. In addition, Ecology finds the discharge option which USDOE has selected will adequately protect human health and the environment.

In accepting the ground discharge option, Ecology continues to maintain several controls over the discharge. Ecology will issue a wastewater discharge permit for the effluent. In that permit Ecology will consider the siting of the discharge and its impacts on already contaminated groundwater and soils, the relationship of this treatment system to other cleanup activities at Hanford, future consumption of Hanford groundwater, and discharge limits. Furthermore, Ecology will continue to encourage USDOE to develop tritium removal technology through the establishment of milestones within the Tri-Party Agreement."

PROPOSED PERMIT LIMITATIONS

State regulations require that limitations set forth in a waste discharge permit must be either technology- or water quality-based. Wastewater must be treated using all known, available, and reasonable treatment (AKART) and not pollute the waters of the State. The minimum requirements to demonstrate compliance with the AKART standard were determined in the engineering report "Project C-1-018H Waste Water Engineering Alternatives Report," August 1991, WHC-SD-C018-ER.

The permit also includes limitations on the quantity and quality of the wastewater discharged to the infiltration gallery that have been determined to protect the quality of the groundwater. The approved engineering report includes specific design criteria for this facility. Water quality-based limitations are based upon compliance with the Ground Water Quality Standards (Chapter 173-200 WAC).

The more stringent of the water quality-based or technology-based limits are applied to each of the parameters of concern. Each of these types of limits is described in more detail below.

TECHNOLOGY-BASED EFFLUENT AND GROUNDWATER LIMITATIONS

All waste discharge permits issued by Ecology must specify conditions requiring available and reasonable methods of prevention, control, and treatment of discharges to waters of the state (WAC 173-216-110). The following permit limitations are necessary to satisfy the requirement for AKART:

TECHNOLOGY-BASED EFFLUENT AND GROUNDWATER LIMITATIONS

Parameter	Effluent and Groundwater Limitations	
	Average Monthly [a]	Maximum Daily [b]
Acetone	--	160 µg/l
Acetophenone	10 µg/l	--
Benzene	--	5 µg/l
Carbon Tetrachloride	5 µg/l	10 µg/l
Chloroform	--	6.2 µg/l
N-Nitrosodimethylamine	20 µg/l	--
Tetrachloroethylene	5 µg/l	10 µg/l
Tetrahydrofuran	--	100 µg/l
Total Organic Carbon	1,100 µg/l	--
Arsenic (total)	15 µg/l	30 µg/l
Beryllium (total)	40 µg/l	--
Chromium (total)	20 µg/l	--
Copper (total)	--	70 µg/l
Ammonia (as N)	830 µg/l	--
Nitrate (as N)	100 µg/l	--
Nitrite (as N)	100 µg/l	--

Parameter	Effluent and Groundwater Limitations	
	Average Monthly [a]	Maximum Daily [b]
Sulfate	10,000 µg/l	--
Total suspended solids	4,000 µg/l	--
[a] The average monthly effluent limitation is defined as the highest allowable average of daily discharges over a calendar month, calculated as the sum of all daily discharges measured during a calendar month divided by the number of daily discharges measured during that month.		
[b] The maximum daily effluent limitation is defined as the highest allowable daily discharge. The daily discharge means the discharge of a pollutant measured during a calendar day. The daily discharge is the average measurement of the pollutant over the day.		
µg/l means micrograms per liter (parts per billion).		

The constituents with technology-based limits had their limits set at the lowest level achievable by the treatment system, based on AKART, or at the lowest level reliably measured in the laboratory, the Practical Quantification Limit (PQL). Effluent technology controls have and should continue to maintain the levels in the effluent below the limits in the permit.

GROUNDWATER QUALITY-BASED EFFLUENT AND GROUNDWATER LIMITATIONS

In order to protect existing water quality and preserve the designated beneficial uses of Washington's groundwaters, including the protection of human health, WAC 173-200-100 states that waste discharge permits shall be conditioned in such a manner as to authorize only activities that will not cause violations of the Ground Water Quality Standards. Drinking water is the beneficial use generally requiring the highest quality of groundwater. Providing protection to the level of drinking water standards will protect a great variety of existing and future beneficial uses.

Applicable groundwater criteria as defined in Chapter 173-200 WAC and in RCW 90.48.520 for this discharge include the following:

GROUNDWATER QUALITY CRITERIA

Parameter	Groundwater Quality Criteria
Benzene	1.0 µg/l
Carbon tetrachloride	0.3 µg/l
Chloroform	7.0 µg/l
N-Nitrosodimethylamine	0.002 µg/l
Methylene chloride	5 µg/l
Tetrachloroethylene	0.8 µg/l
Gross alpha	15 pCi/l
Gross beta	50 pCi/l
Strontium-90	8 pCi/l
Tritium	20,000 pCi/l
Arsenic (total)	0.05 µg/l
Cadmium (total)	10 µg/l

Parameter	Groundwater Quality Criteria
Chromium (total)	50 µg/l
Copper (total)	1000 µg/l
Lead (total)	50 µg/l
Mercury (total)	2 µg/l
Chloride	250,000 µg/l
Nitrate (as N)	10,000 µg/l
Sulfate	250,000 µg/l
Total dissolved solids	500,000 µg/l
pH	6.5-8.5

Ecology has reviewed existing records and was able to determine if background groundwater quality is higher or lower than the criteria given in Chapter 173-200 WAC. The only exceptions have been a few early high groundwater levels of sulfate. The sulfate levels were not due to the discharge of sulfate, but rather by the clean effluent-dissolving sulfate that exists in the vadose zone. The sulfate levels peaked for about a year, always below groundwater standards, and have since returned to background levels. The discharges authorized by this proposed permit are not expected to interfere with beneficial uses, except for the presence of tritium.

During the history of the previous permit, the Permittee has remained in compliance based on Discharge Monitoring Reports (DMRs) and other reports submitted to Ecology and inspections conducted by Ecology.

An evaluation of monitoring data from groundwater monitoring wells (pre ETF discharge) is presented in the following table. The wells are completed in, and sample, the upper most aquifer. The values found in the table represent conditions present in the upper most aquifer prior to discharge.

No organic or man-made contaminants are suspected of contaminating the existing ground-water prior to discharge (background). Based on evaluation of available data, the background groundwater concentration of chromium exceeds groundwater (drinking water) criteria. This exceedance is thought to be due to stainless steel screens in the new monitoring wells.

BACKGROUND GROUNDWATER CHARACTERISTICS AT SALDS

Parameter	Groundwater Background Before Discharge
Acetone	NQ
Acetophenone	NQ
Benzene	NQ
Carbon tetrachloride	NQ
Chloroform	NQ
N-Nitrosodimethylamine	--
Methylene chloride	--

Parameter	Groundwater Background Before Discharge
Tetrachloroethylene	NQ
Tetrahydrofuran	--
Total Organic Carbon	2,058 µg/l
1,1,2-Trichloroethane	NQ
Gross alpha	5.23 pCi/l
Gross beta	22.31 pCi/l
Strontium-90	--
Technetium-99	--
Tritium	1,287 pCi/l
Uranium (total)	--
Arsenic (total)	NQ
Beryllium (total)	NQ
Cadmium (total)	NQ
Chromium (total)	811 µg/l
Copper (total)	NQ
Lead (total)	NQ
Mercury (total)	NQ
Ammonia (as N)	--
Chloride	--
Nitrate (as N)	43,758 µg/l
Nitrite (as N)	NQ
Nitrogen (TKN)	--
Sulfate	28,863 µg/l
Total dissolved solids	210 µg/l
Total suspended solids	--
pH	6.9-8.5
Specific Conductivity	320 µmhos/cm
Temperature	--

More recent data about the groundwater quality was included in the permit reapplication. Effects of ETF discharge are shown in the recent results. For this latest data, arsenic, carbon tetrachloride, and tritium exceed groundwater criteria. The level of chromium in the groundwater has decreased since the start of discharge, to the point that it no longer exceeds groundwater criteria. The exceedance of arsenic is thought to be due to natural, not man-made causes. The tritium is a clear indicator of the presence of the effluent. Carbon tetrachloride is detected in only one of the wells, and it is not clear as to the source. One possible source of carbon tetrachloride could be from the 200 West Area disposal activities. One deep well at SALDS (699-48-77C) has produced detectable quantities. In SALDS shallower wells (77A and 77D), carbon tetrachloride has not been detected.

RECENT GROUNDWATER CHARACTERISTICS

Parameter	Well 699-48-77A Recent Range of Measurements	Well 699-48-77C Recent Range of Measurements	Well 699-48-77D Recent Range of Measurements
Acetone	4.4-4.4 µg/l	4.4-4.4 µg/l	4.4-4.4 µg/l
Acetophenone	--	--	--
Benzene	0.5-0.5 µg/l	0.5-0.5 µg/l	0.5-0.5 µg/l
Carbon tetrachloride	0.6-0.6 µg/l	4-7 µg/l	0.6-0.6 µg/l
Chloroform	0.4-0.4 µg/l	0.4-0.9 µg/l	0.4-0.4 µg/l
N-Nitrosodimethylamine	--	--	--
Methylene chloride	0.4-0.4 µg/l	0.4-0.4 µg/l	0.4-0.4 µg/l
Tetrachloroethylene	0.5-0.5 µg/l	0.5-0.5 µg/l	0.5-0.5 µg/l
Tetrahydrofuran	4.6-4.6 µg/l	4.6-4.6 µg/l	4.6-4.6 µg/l
Total Organic Carbon	--	--	--
1,1,2-Trichloroethane	0.6-0.6 µg/l	0.6-0.6 µg/l	0.6-0.6 µg/l
Gross alpha	0.76-1.5 pCi/l	1.5-2.2 pCi/l	0.71-1.7 pCi/l
Gross beta	1.1-2.3 pCi/l	1.6-2.8 pCi/l	0.7-2.8 pCi/l
Strontium-90	0.99-1 pCi/l	0.99-1.6 pCi/l	1.03-5.5 pCi/l
Technetium-99	--	--	--
Tritium	15000-970000 pCi/l	261-35000 pCi/l	540000-1100000 pCi/l
Uranium (total)	0.72-0.85 µg/l	0.5-0.76 µg/l	1.1-1.35 µg/l
Arsenic (total)	4-5.02 µg/l	1.61-2.3 µg/l	2.84-3.45 µg/l
Beryllium (total)	4.4-4.4 µg/l	4.4-4.4 µg/l	4.4-4.4 µg/l
Cadmium (total)	0.2-0.34 µg/l	0.2-1.45 µg/l	0.2-1.49 µg/l
Chromium (total)	6.22-9.36 µg/l	9.65-11.5 µg/l	3.58-5.62 µg/l
Copper (total)	0.4-1.4 µg/l	0.34-1.6 µg/l	2.59-8.6 µg/l
Lead (total)	0.2-0.21 µg/l	0.2-0.22 µg/l	0.2-0.21 µg/l
Mercury (total)	0.2-0.21 µg/l	0.2-0.21 µg/l	0.2-0.21 µg/l
Ammonia (as N)	20-40 µg/l	30-40 µg/l	20-40 µg/l
Chloride	570-1500 µg/l	9530-15580 µg/l	1010-1830 µg/l
Nitrate (as N)	80-180 µg/l	2950-5300 µg/l	270-420 µg/l
Nitrite (as N)	10-40 µg/l	10-40 µg/l	10-40 µg/l
Nitrogen (TKN)	--	--	--
Sulfate	4710-8480 µg/l	27350-49460 µg/l	11210-23080 µg/l
Total dissolved solids	132000-157000 µg/l	213000-24000 µg/l	175000-188000 µg/l
Total suspended solids	--	--	--
pH	8.08-8.58	7.9-8.32	8.09-8.36
Specific Conductivity	190-219 µmhos/cm	316-391 µmhos/cm	258-286 µmhos/cm
Temperature	--	--	--
Water Table Level	450.8-453.7’	448.8-452.9’	449.3-451.1’
NQ means not quantifiable			

Pollutant concentrations in the discharge do not exceed groundwater quality criteria, except for tritium, with technology-based controls, which Ecology has determined to be AKART. Limits based on groundwater criteria are established and applied at the end of pipe and in the groundwater. The resultant effluent limits are as follows:

WATER QUALITY-BASED LIMITATIONS

Parameter	Effluent and Groundwater Limitations Average Monthly [a]
Chloride	250,000 µg/l
Cadmium	10 µg/l
Lead (total)	50 µg/l
Mercury (total)	2 µg/l
Sulfate	250,000 µg/l
Total dissolved solids	500,000 µg/l
pH	6.5-8.5
[a] The average monthly effluent limitation is defined as the highest allowable average of daily discharges over a calendar month, calculated as the sum of all daily discharges measured during a calendar month divided by the number of daily discharges measured during that month.	
pH is limited both in the groundwater. Groundwater limitations shall be met in groundwaters collected from the point of compliance monitoring wells numbers 699-48-77A, 699-48-77C, and 699-48-77D.	
µg/l means micrograms per liter (parts per billion).	

In the case of this permit, the Permittee shall be self-regulating for radioactive contaminants under the provisions of the Atomic Energy Act. The Permittee plans to meet the intent of 40 CFR Part 141, "National Primary Drinking Water Regulations," in regards to radioactive contaminants; and plans to take investigative and mitigative steps if drinking water standards are exceeded. Ecology is requiring and the permittee has agreed to provide monitoring and reporting of radionuclide concentrations in the effluent and groundwater.

EARLY WARNING VALUES

Early Warning Values provide early detection of increasing contaminant concentrations that could approach or exceed enforcement limits. Exceedance of an Early Warning Value requires that the Applicant file a report with Ecology. This section requires that the Permittee address the significance of the exceedance and propose needed mitigation measures. Ecology decides if corrective measures or additional investigations are warranted. Exceedance of an Early Warning Value does not constitute a legal violation on the part of the Permittee.

Early Warning Values were sought for all constituents of concern. However, since most of the enforcement limits equal the lowest level of precision that laboratories can reliably measure (the

PQL), it was not possible to establish even lower PQLs. In other cases, the background groundwater values were greater than the calculated Early Warning Values. Early Warning Values were established in the effluent for the following list of constituents. The rationale for each Early Warning Value is also listed.

EARLY WARNING VALUE DERIVATION SUMMARY

Constituent	Early Warning Value, µg/l	Rationale/Method of Derivation
Benzene	5	Set at PQL
Chloroform	5	Set at PQL
Tetrahydrofuran	100	Set at PQL
Cadmium (total)	7.5	75% of enforcement limit
Copper (total)	70	Set at PQL
Lead (total)	38	75% of enforcement limit
Mercury (total)	2	Set at PQL
Total Dissolved Solids	380,000	75% of enforcement limit

COMPARISON OF LIMITATIONS WITH THE EXISTING PERMIT ISSUED JUNE 30, 1995

The following table compares the limitations in the old permit with the limitations planned for the new permit.

COMPARISON OF PREVIOUS AND NEW LIMITS

Parameter	Existing Limits, µg/l, unless otherwise noted	Proposed Limits, µg/l, unless otherwise noted
Acetone	160 GW	160 GW
Acetophenone	10 EFF EW	10 EFF AM
Benzene	5 GW 5 EFF EW	5 GW 5 EFF EW
Carbon tetrachloride	5 EFF AM 10 EFF DM	5 EFF AM 10 EFF DM

Parameter	Existing Limits, µg/l, unless otherwise noted	Proposed Limits, µg/l, unless otherwise noted
Chloroform	6.2 GW 5 EFF EW	6.2 GW 5 EFF EW
N-Nitrosodimethylamine	20 EFF AM	20 EFF AM
Methylene chloride	Monitor Only	Monitor Only
Tetrachloroethylene	5 EFF AM 10 EFF DM	5 EFF AM 10 EFF DM
Tetrahydrofuran	100 EFF EW	100 EFF EW
Total Organic Carbon	1,100 EFF EW	1,100 EFF AM
1,1,2-Trichloroethane	5 EFF EW	Deleted
Gross alpha	Monitor Only	Monitor Only
Gross beta	Monitor Only	Monitor Only
Strontium-90	Monitor Only	Monitor Only
Technetium-99	None	Monitor Only
Tritium	Monitor Only	Monitor Only
Uranium (total)	None	Monitor Only
Arsenic (total)	15 EFF AM 30 EFF DM	15 EFF AM 30 EFF DM
Beryllium (total)	40 EFF EW	40 EFF AM
Cadmium (total)	10 GW 7.5 EFF EW	10 GW 7.5 EFF EW
Chromium (total)	20 EFF AM	20 EFF AM
Copper (total)	70 GW 70 EFF EW	70 GW 70 EFF EW
Lead (total)	50 GW 38 EFF EW	50 GW 38 EFF EW
Mercury (total)	2 GW 2 EFF EW	2 GW 2 EFF EW
Ammonia (as N)	830 EFF EW	830 EFF AM

Parameter	Existing Limits, µg/l, unless otherwise noted	Proposed Limits, µg/l, unless otherwise noted
Sulfate	10,000 EFF AM 250,000 GW	10,000 EFF AM 250,000 GW
Total dissolved solids	500,000 GW 380,000 EFF EW	500,000 GW 380,000 EFF EW
Total suspended solids	4,000 EFF EW	4,000 EFF AM
pH	6.5-8.5 GW	6.5-8.5 GW
Specific Conductivity	Monitor Only	Monitor Only
Temperature	Monitor Only	Monitor Only
Flow	None	.25 MGD EFF AM .67 MGD EFF DM
Water level	None	Monitor Only
EFF means a limit in the effluent, GW means a limit in the groundwater, AM means an average monthly limit, DM means a daily maximum limit, and EW means an early warning value.		

Most of the limits in the new permit match the limits in the old permit. Differences include changing early warning values to enforcement limits for acetophenone, ammonia, beryllium (total), chloride, nitrite (as N), total organic carbon, and total suspended solids. These limits were changed since there was no corresponding limit in the groundwater. Two other early warning values were dropped from the permit, for nitrogen (TKN), and 1,1,2 trichloroethane. A new flow limit was added to the permit. The flow is limited to prevent the capacity of the treatment system from being exceeded. Both the treatment system capacity and the capacity of the infiltration gallery were considered in assigning these flow limits. For nitrate (as N), the enforcement limit of 100 µg/l was left the same, but the higher limit (3,800 µg/l), for periods when 200-UP-1 groundwater was being treated, was removed.

MONITORING REQUIREMENTS

Monitoring, recording, and reporting are specified to verify that the system is functioning correctly, that groundwater criteria are not violated, and that effluent limitations are being achieved (WAC 173-216-110). The discharge is monitored both at the end of pipe (effluent) and in the groundwater at three monitoring wells.

WASTEWATER MONITORING

The monitoring schedule is detailed in the proposed permit under Condition S2. Specified monitoring frequencies take into account the quantity and variability of the discharge, the level

of treatment, past compliance, significance of pollutants, and cost of monitoring. The effluent is monitored at the verification tanks. A grab sample is taken from the verification tank recycle line after each tank has been filled. Verification tanks are not discharged to the SALDS until the results of the samples are reviewed.

GROUNDWATER MONITORING

The monitoring of ground water at the site is required in accordance with the Ground Water Quality Standards, Chapter 173-200 WAC. Ecology has determined that this discharge has a potential to pollute the groundwater. Therefore the Permittee is required to evaluate the impacts on ground water quality. Monitoring of the groundwater at the site boundaries and within the site is an integral component of such an evaluation. Groundwater monitoring is done at monitoring wells 699-48-77A (downgradient), 699-48-77C (downgradient), and 699-48-77D (downgradient). Well 699-48-77A was originally planned to be upgradient, but the discharged effluent reached this well first. Well 299-W8-1 was then used as an upgradient well, but it never represented the upgradient conditions very well. So now the only monitoring required is at the three downgradient wells, since the background conditions have been fairly well established. The three wells show the impact that the effluent is having on the groundwater that is directly under the disposal site.

COMPARISON OF MONITORING WITH THE EXISTING PERMIT ISSUED JUNE 30, 1995

The monitoring for this permit has been reduced from the monitoring required by the existing permit. The reductions in monitoring were based on the results of the last five years of monitoring. The reductions also took into account the potential environmental threat of each parameter and the likely sources of each parameter.

The following table compares the monitoring requirements in the old permit with the monitoring requirements planned for the new permit.

MONITORING REQUIREMENTS TO DEMONSTRATE PERMIT COMPLIANCE

Constituent or Characteristic	Existing Groundwater Sample Type and Analysis Frequency	Proposed Groundwater Sample Type and Analysis Frequency	Existing Effluent Sample Type and Analysis Frequency	Proposed Effluent Sample Type and Analysis Frequency
Acetone	Grab-quarterly	Grab-quarterly	Not required	Not required
Acetophenone	Not required	Not required	Grab-1/tank	Grab-1/tank
Benzene	Grab-quarterly	Grab-quarterly	Grab-1/tank	Grab-1/tank
Carbon tetrachloride	Not required	Not required	Grab-1/tank	Grab-1/tank
Chloroform	Grab-quarterly	Grab-quarterly	Grab-1/tank	Grab-1/tank
N-Nitrosodimethylamine	Not required	Not required	Grab-1/tank	Grab-1/tank
Methylene chloride	Not required	Not required	Grab-1/tank	Grab-1/tank
Tetrachloroethylene	Not required	Not required	Grab-1/tank	Grab-1/tank
Tetrahydrofuran	Grab-quarterly	Grab-quarterly	Grab-1/tank	Grab-1/tank

MONITORING REQUIREMENTS TO DEMONSTRATE PERMIT COMPLIANCE

Constituent or Characteristic	Existing Groundwater Sample Type and Analysis Frequency	Proposed Groundwater Sample Type and Analysis Frequency	Existing Effluent Sample Type and Analysis Frequency	Proposed Effluent Sample Type and Analysis Frequency
Total Organic Carbon	Not required	Not required	Grab-1/tank	Grab-1/tank
1,1,2-Trichloroethane	Not required	Not required	Grab-1/tank	Not required
Gross alpha	Grab-quarterly	Grab-quarterly	Grab-1/tank	Grab-1/tank
Gross beta	Grab-quarterly	Grab-quarterly	Grab-1/tank	Grab-1/tank
Strontium-90	Grab-quarterly	Grab-quarterly	Grab-1/tank	Grab-1/tank
Technetium-99	Not required	Not required	Not required	Grab-1/tank
Tritium	Grab-quarterly	Grab-quarterly	Grab-1/tank	Grab-1/tank
Uranium (total)	Not required	Not required	Not required	Grab-1/tank
Arsenic (total)	Not required	Not required	Grab-1/tank	Grab-1/tank
Beryllium (total)	Not required	Not required	Grab-1/tank	Grab-1/tank
Cadmium (total)	Grab-quarterly	Grab-quarterly	Grab-1/tank	Grab-1/tank
Chromium (total)	Not required	Not required	Grab-1/tank	Grab-1/tank
Copper (total)	Grab-quarterly	Grab-quarterly	Grab-1/tank	Grab-1/tank
Lead (total)	Grab-quarterly	Grab-quarterly	Grab-1/tank	Grab-1/tank
Mercury (total)	Grab-quarterly	Grab-quarterly	Grab-1/tank	Grab-1/tank
Ammonia (as N)	Grab-quarterly	Not required	Grab-1/tank	Grab-1/tank
Chloride	Not required	Not required	Grab-1/tank	Grab-1/tank
Nitrate (as N)	Not required	Not required	Grab-1/tank	Grab-1/tank
Nitrite (as N)	Not required	Not required	Grab-1/tank	Grab-1/tank
Nitrogen (TKN)	Not required	Not required	Grab-1/tank	Not required
Sulfate	Grab-quarterly	Grab-quarterly	Grab-1/tank	Grab-1/tank
Total dissolved solids	Grab-quarterly	Grab-quarterly	Grab-1/tank	Grab-1/tank
Total suspended solids	Not required	Not required	Grab-1/tank	Grab-1/tank
pH	Grab-quarterly	Grab-quarterly	Not required	Not required
Specific Conductivity	Not required	Grab-quarterly	Grab-1/tank	Grab-1/tank
Temperature	Not required	Grab-quarterly	Not required	Not required
Flow	Not required	Not required	Not required	Per tank
Water level	Not required	Quarterly	Not required	Not required
Quarterly is defined as the four quarters of the calendar year: January through March, April through June, July through September, and October through December. The frequency of "1/tank" means one (1) sample from each verification tank discharged.				

OTHER PERMIT CONDITIONS

REPORTING AND RECORDKEEPING

The conditions of S3 are based on the authority to specify any appropriate reporting and recordkeeping requirements to prevent and control waste discharges (WAC 273-216-110).

FACILITY LOADING

The flow criteria for this disposal facility are taken from the reapplication and past performance and are as follows:

Average monthly flow:	.25 mgd
Maximum daily flow:	.67 mgd

The permit requires the Permittee to maintain adequate capacity to handle the flows and waste loading to the disposal facility (WAC 173-216-110[4]). For significant changes in loadings to the disposal facility, the permit requires a new application and an engineering report (WAC 173-216-110[5]).

OPERATIONS AND MAINTENANCE

The proposed permit contains condition S.5. as authorized under Chapter 173-240-150 WAC and Chapter 173-216-110 WAC. It is included to ensure proper operation and regular maintenance of equipment, and to ensure that adequate safeguards are taken so that constructed facilities are used to their optimum potential in terms of pollutant capture and treatment.

SOLID WASTE PLAN

Ecology has determined that the Permittee has a potential to cause pollution of the waters of the state from solid waste. This proposed permit requires, under the authority of RCW 90.48.080, that the Permittee maintain a solid waste plan designed to prevent solid waste from causing pollution of the waters of the state.

NON-ROUTINE AND UNANTICIPATED DISCHARGES

Occasionally, this facility may generate wastewater, which is not characterized in their permit application because it is not a routine discharge, and was not anticipated at the time of application.. These are typically clean waste waters but may be contaminated with pollutants. The permit contains an authorization for non-routine and unanticipated discharges. The permit requires a characterization of these waste waters for pollutants and examination of the opportunities for reuse. Depending on the nature and extent of pollutants in this wastewater and opportunities for reuse, Ecology may authorize a direct discharge via the process wastewater outfall for clean water, require the wastewater to be placed through a wastewater treatment process, or require the water to be reused.

SPILL PLAN

Ecology has determined that the Permittee stores a quantity of chemicals that have the potential to cause water pollution if accidentally released. Ecology has the authority to require the Permittee to develop best management plans to prevent this accidental release under section 402(a)(1) of the Federal Water Pollution Control Act (FWPCA) and RCW 90.48.080.

The Permittee has developed a plan for preventing the accidental release of pollutants to state waters and for minimizing damages if such a spill occurs. The proposed permit requires the Permittee to keep the plan updated and submit major changes to the Ecology.

INFLUENT CRITERIA

The proposed permit contains condition S.9, which details the method to be used to screen new influents to be treated and discharged by ETF. The Permittee screens the new influents, and only needs to ask Ecology about new influents that are different from present influents. Ecology evaluates new influents that are different to determine if new monitoring or limits would be appropriate and to determine if ETF provides AKART for the streams.

TRITIUM TRACKING AND GROUNDWATER MONITORING PLAN

The proposed permit contains condition S.10, which requires a tritium tracking and groundwater monitoring plan. The Permittee has agreed to and shall monitor the tritium plume created by the ETF discharge, and update models used to predict travel time to the Columbia River. The Permittee has previously submitted results of a computer model that has predicted that the tritium-bearing effluent discharged to the ground at the infiltration gallery (SALDS) location will take 105 years to travel with the groundwater beneath the Hanford site and ultimately to discharge to the Columbia River. Also, recent models and discharge scenarios show that the tritium at or above DWS is predicted to remain within the 0.75-mile of the SALDS and will not reach the Columbia River in detectable quantities. The 105 year travel time is important since tritium, which has a half life of 12.3 years, would have 105 years, or more than 8 half lives, to undergo radioactive decay to become non-radioactive helium. If the tritium "plume" does take 105 years to reach the river, the concentration of tritium discharging to the river at that time would be well below the tritium drinking water standard (DWS) according to the model. The 105 year travel time would greatly reduce tritium river discharge concentrations due to subsurface dispersion as well as radioactive decay.

The Permittee shall use a system of monitoring wells to keep track of the tritium plume and to determine if the travel time of tritium in the subsurface agrees with the travel time predicted by the computer model. The new monitoring well data will be used to calibrate and verify the model. The Permittee will update the model and the travel time prediction as well as the predicted concentration of tritium which will enter the Columbia River as a result of this discharge based on new data gathered from the well system. If the recalibrated model shows a travel time which is less than the predicted 105 year travel time and which would result in tritium river discharge concentrations which exceed the tritium surface water standard, then contingency measures (see below) may be warranted.

As stated above, the computer model will be updated/recalibrated as more well data comes in. If the concentration of tritium predicted to be discharged via groundwater to the Columbia River as a result of this discharge will exceed the surface water standard for tritium, the Permittee will submit a list of possible remedial actions which could be used to abate a release of tritium to Columbia River via groundwater from this facility.

The Permittee is also required by the tri-party agreement milestone M-26-05 to report and keep a list of potential tritium treatment/removal technologies. The list must be updated biannually to include all known or developing tritium treatment technologies. These reports allow Ecology to determine if a technology appears or promises to be viable from technical and economic standpoints.

GENERAL CONDITIONS

General Conditions are based directly on state laws and regulations and have been standardized for all industrial waste discharge to groundwater permits issued by Ecology.

Condition G1 requires responsible officials or their designated representatives to sign submittals to Ecology. Condition G2 requires the Permittee to allow Ecology to access the system, production facility, and records related to the permit. Condition G3 specifies conditions for modifying, suspending, or terminating the permit. Condition G4 requires the Permittee to apply to Ecology prior to increasing or varying the discharge from the levels stated in the permit application. Condition G5 requires the Permittee to construct, modify, and operate the permitted facility in accordance with approved engineering documents. Condition G6 prohibits the Permittee from using the permit as a basis for violating any laws, statutes, or regulations. Conditions G7 and G8 relate to permit renewal and transfer. Condition G9 requires the payment of permit fees. Condition G10 and G11 describes the penalties for violating permit conditions.

RECOMMENDATION FOR PERMIT ISSUANCE

This proposed permit meets all statutory requirements for authorizing a wastewater discharge, including those limitations and conditions believed necessary to control toxics, and to protect human health and the beneficial uses of waters of the State of Washington. Ecology proposes that the permit be issued for five years.

REFERENCES FOR TEXT AND APPENDICES

Reapplication for State Waste Discharge Permit ST 4500 for the 200 Area Effluent Treatment Facility (ETF), December 1999, United Stated Department of Energy (USDOE), 00-OSS-088.

Implementation Guidance for the Ground Water Quality Standards, 1996, Washington State Department of Ecology, Ecology Publication # 96-02.

Quarterly Discharge Monitoring Reports for the 200 Area ETF, December 1995 through September 1999 reporting periods, USDOE.

Noncompliance Report Regarding the Sate Waste Discharge Permits ST 4500 and ST 4502, November 1999, USDOE, 00-OS0-70.

Permit Writers Manual, Washington State Department of Ecology, Procedures for Writing Effluent Discharge Permits, Water Quality Program, Publication Number 92-109.

Water Quality Standards for Ground Waters of the State of Washington, Chapter 173-200 WAC, 10/31/90.

State Waste Discharge Permit Program, Chapter 173-216 WAC, 9/22/93.

Washington State Law, RCW 90.48.

State Waste Discharge Permit ST 4500 and Fact Sheet, issued June 30 1995, Ecology.

Statistical Analysis of Ground-Water Monitoring Data at RCRA Facilities - Interim Final Guidance, 1989, Environmental Protection Agency (EPA), PB89-151047.

Technical Support Document for Water Quality-based Toxics Control, March 1991, EPA, Office of Water (EN-336), EPA/505/2-90-001, PB91-127415.

Hanford Federal Facility Agreement and Consent Order, 4th Amendment, January 1994, by Washington State Department of Ecology, U.S. Environmental Protection Agency, U.S. Department of Energy, No. 89-10 Rev. 3.

Consent Order No. DE-91NM-177 for the Permitting of Liquid Effluent Discharges under the Washington Administrative Code (WAC) 173-216, December 1991.

Project C-018H Waste Water Engineering Alternatives Report (WHC-SD-C018H-ER), August 1991, Westinghouse Hanford Company, Richland, Washington.

Project C-018H Waste Water Engineering Alternatives Report - Supplementary Information on Treated Effluent Disposal Site Engineered Structures (WHC-SD-C018H-ER-003), January 1993, Westinghouse Hanford Company, Richland, Washington.

200 Area Effluent Treatment Facility Delisting Petition (DOE/Rl-92-72), August 1993, Westinghouse Hanford Company, Richland, Washington.

Hanford Site National Environmental Policy Act (NEPA) Characterization, December 1991, Pacific Northwest Laboratory (PNL), PNL-6415, Rev. 4, UC-600.

State Waste Discharge Permit Application, 200 Area Treated Effluent Disposal Facility and the State Approved Land Disposal Site (Project C-018H), U.S. Department of Energy, Richland, Washington, DOE/RL-93-44, Revision 0.

Washington State Department of Ecology, Model Toxics Control Act, Cleanup Levels and Risk Calculation (CLARC II) Update, August 31, 1994, Publication No. 94-145.

Groundwater Monitoring Plan for the Proposed State-Approved Land Disposal Site (WHC-SD-C018H-PLN-004).

Estimation of Ground-Water Travel Time at the Hanford Site: Description, Past Work, and Future Needs, January, 1988, prepared by Pacific N.W. Laboratory for U.S. DOE under Contract DE-AC06-76RLO 1830, PNL 6328, DE 90 013208.

Travel Time Estimates for Alternative Tritium Crib Locations, Hanford Site, Washington, prepared by Golder Associates for Westinghouse Hanford Co., WHC-SD-EN-EE-002, Rev. 0, March 30, 1990.

Tritiated Wastewater Treatment and Disposal Evaluation for 1994, U.S. DOE, DOE/RL-94-77.

1999 Evaluation of Tritium Removal and Mitigation Technologies for wastewater Treatment, USDOE, DOE/RL-99-42, June 1999.

Final Groundwater Screening Evaluation/Monitoring plan—200 Area ETF (Project C-018H), USDOE, 96-EAP-008, March 1996.

Fiscal Year 1999 Results of Tritium Tracking and Groundwater Monitoring at the 200 Area SALDS, USDOE, 00-OSS-051, November 1999.

Detailed Report on the State Waste Discharge Permit ST 4500 Noncompliance: Use of Non-accredited Laboratory for Tritium Analysis, USDOE, 00-OSS-182, February 2000.

Determination of Significance and Adoption of Existing Environmental Document (SEPA Addendum), Washington State Department of Ecology, October 6, 1993.

RCRA Proposed Rule (Delisting), Docket Number F-95-HNEP-FFFF.

Letter from June M. Henning, U.S. DOE to Melodie Selby, Washington State Department of Ecology (94-LWB-077) of December 19, 1994, listing C018H Operations and Maintenance Manuals.

APPENDICES

APPENDIX A--PUBLIC INVOLVEMENT INFORMATION

Ecology has tentatively determined to renew the permit of the applicant listed on page 1 of this fact sheet. The permit contains conditions and effluent limitations, which are described in the rest of this fact sheet.

Public notice of application was published on January 18, 2000 and January 25, 2000 in Tri-City Herald to inform the public that an application had been submitted.

Further information may be obtained from Ecology by telephone, (509) 736-3045, or by writing to the address listed below.

Water Quality Permit Coordinator
Department of Ecology
Kennewick Office
1315 W. 4th Avenue
Kennewick, WA 99336-6018

This permit was written by Dave Dougherty.

APPENDIX B—GLOSSARY

Alluvium--Sedimentary material deposited by flowing water, as in a riverbed or delta.

Ambient Water Quality--The existing environmental condition of the water in a receiving water body.

Average Monthly Discharge Limitation--The average of the measured values obtained over a calendar month's time.

BAT or BAT/AKART--Best Available Technology/All Known, Available and Reasonable Treatment.

Best Management Practices (BMPs)--Schedules of activities, prohibitions of practices, maintenance procedures, and other physical, structural and/or managerial practices to prevent or reduce the pollution of waters of the State. BMPs include treatment systems, operating procedures, and practices to control: plant site runoff, spillage or leaks, sludge or waste disposal, or drainage from raw material storage. BMPs may be further categorized as operational, source control, erosion and sediment control, and treatment BMPs.

Bypass--The intentional diversion of waste streams from any portion of the collection or treatment facility.

Caliche--A hard soil layer cemented by calcium carbonate and found in deserts and other arid or semiarid regions.

Compliance Inspection - Without Sampling--A site visit for the purpose of determining the compliance of a facility with the terms and conditions of its permit or with applicable statutes and regulations.

Compliance Inspection - With Sampling---A site visit to accomplish the purpose of a Compliance Inspection - Without Sampling and as a minimum, sampling and analysis for all parameters with limits in the permit to ascertain compliance with those limits; and, for municipal facilities, sampling of influent to ascertain compliance with the 85 percent removal requirement. Additional sampling may be conducted.

Composite Sample--A mixture of grab samples collected at the same sampling point at different times, formed either by continuous sampling or by mixing discrete samples. May be "time-composite"(collected at constant time intervals) or "flow-proportional" (collected either as a constant sample volume at time intervals proportional to stream flow, or collected by increasing the volume of each aliquot as the flow increased while maintaining a constant time interval between the aliquots.

Confidence Interval--A statistical range with a specified probability (ex. 95%) that a given parameter lies within the range.

Construction Activity--Clearing, grading, excavation and any other activity which disturbs the surface of the land. Such activities may include road building, construction of residential houses, office buildings, or industrial buildings, and demolition activity.

Continuous Monitoring –Uninterrupted, unless otherwise noted in the permit.

Engineering Report--A document, signed by a professional licensed engineer, which thoroughly examines the engineering and administrative aspects of a particular domestic or industrial wastewater facility. The report shall contain the appropriate information required in WAC 173-240-060 or 173-240-130.

Grab Sample--A single sample or measurement taken at a specific time or over as short period of time as is feasible.

Gross Alpha--A measurement of radioactive decay of an atomic nucleus by emission of an alpha (positively charged) particle.

Gross Beta--A measurement of radioactive decay of a high-speed electron or positron.

Industrial Wastewater--Water or liquid-carried waste from industrial or commercial processes, as distinct from domestic wastewater. These wastes may result from any process or activity of industry, manufacture, trade or business, from the development of any natural resource, or from animal operations such as feed lots, poultry houses, or dairies. The term includes contaminated storm water and, also, leachate from solid waste facilities.

Lognormal--Of, pertaining to, or being a logarithmic function with a normal distribution; where a logarithmic function is an exponential one, and a normal distribution is represented by a bell-shaded curve that is symmetrical about the statistical mean.

Maximum Daily Discharge Limitation--The highest allowable daily discharge of a pollutant measured during a calendar day or any 24-hour period that reasonably represents the calendar day for purposes of sampling. The daily discharge is calculated as the average measurement of the pollutant over the day.

Method Detection Level (MDL)--The minimum concentration of a substance that can be measured and reported with 99% confidence that the analyte concentration is above zero and is determined from analysis of a sample in a given matrix containing the analyte.

pH--The pH of a liquid measures its acidity or alkalinity. A pH of 7 is defined as neutral, and large variations above or below this value are considered harmful to most aquatic life.

Practical Quantification Level (PQL)-- A calculated value normally about five times the MDL (method detection level). When a WAC 173-200 groundwater criterion is at a level less than the PQL, then an enforcement limit may be established at the PQL. Compliance cannot be determined at levels below the PQL, since by definition, this is the lowest level that an analytical laboratory can reliably detect. Compliance may not be definitively determined by using the PQL as a limit, but it will act as the first reliable and reproducible point which can be accurately measured.

State Waters--Lakes, rivers, ponds, streams, inland waters, underground waters, salt waters, and all other surface waters and watercourses within the jurisdiction of the state of Washington.

Stormwater--That portion of precipitation that does not naturally percolate into the ground or evaporate, but flows via overland flow, interflow, pipes, and other features of a storm water drainage system into a defined surface water body, or a constructed infiltration facility.

Technology-Based Effluent Limit--A permit limit that is based on the ability of a treatment method to reduce the pollutant.

Total Dissolved Solids--That portion of total solids in water or wastewater that passes through a specific filter.

Tritium--(T or ^{3}H) is a radioactive isotope of hydrogen which is a by-product of nuclear operations such as some of those carried out at Hanford

Water Quality-Based Effluent Limit--A limit on the concentration of an effluent parameter that is intended to prevent pollution of the receiving water.

Water Quality Standards (WQS)--Refers, for this permit, to Water Quality Standards for Groundwater as listed in Table 1 of Chapter 173-200 WAC.

APPENDIX C--TECHNICAL CALCULATIONS

The following table provides a summary of the required enforcement limit for each constituent of concern, sampling point, limit type (i.e., water quality or technology based), and a brief explanation of the selection rationale. The rationale explanation "criteria met" means that the groundwater (drinking water) criteria from Chapter 173-200-040 were not exceeded, hence concentrations do not exceed levels recommended for human consumption.

ENFORCEMENT LIMIT DERIVATION SUMMARY

Constituent or Characteristic	Enforcement Limit	Point of Compliance	Type of Limit	Rationale/ Method of Derivation
Acetone	160 µg/l	Groundwater	Technology-based	Limit set at lowest level achievable in effluent by source and technology controls.
Acetophenone	10 µg/l	Effluent	Technology-based	Limit set at lowest level achievable in effluent by source and technology controls. Limit set at PQL.
Benzene	5 µg/l	Groundwater	Technology-based	Criteria too low to discern (reliably) in laboratory. Limit set at PQL.
Carbon tetrachloride	5 µg/l	Effluent	Technology-based	Criteria too low to discern (reliably) in laboratory. Limit set at PQL.
Chloroform	6.2 µg/l	Groundwater	Technology-based	Criteria met. Limit set at lowest level achievable in effluent by source and technology controls.
N-Nitrosodi-methylamine	20 µg/l	Effluent	Technology-based	Limit set at lowest level achievable in effluent by source and technology controls.
Tetrachloro-ethylene	5 µg/l	Effluent	Technology-based	Criteria too low to discern (reliably) in laboratory. Limit set at PQL.
Tetrahydrofuran	100 µg/l	Groundwater	Technology-based	Limit set at PQL.

Constituent or Characteristic	Enforcement Limit	Point of Compliance	Type of Limit	Rationale/ Method of Derivation
Total Organic Carbon	1,100 µg/l	Effluent	Technology-based	Limit set at lowest level achievable in effluent by source and technology controls.
Arsenic (total)	15 µg/l	Effluent	Technology-based	Criteria too low to discern (reliably) in laboratory. Limit set at PQL.
Beryllium (total)	40 µg/l	Effluent	Technology-based	Limit set at PQL.
Cadmium (total)	10 µg/l	Groundwater	Water quality -based	Criteria met. Limit set at criteria.
Chromium (total)	20 µg/l	Effluent	Technology-based	Criteria met. Limit set at PQL..
Copper (total)	70 µg/l	Groundwater	Technology-based	Criteria met. Limit set at PQL.
Lead (total)	50 µg/l	Groundwater	Water quality-based	Criteria met. Limit set at criteria.
Mercury (total)	2 µg/l	Groundwater	Water quality-based	Criteria met. Limit set at criteria.
Ammonia (as N)	830 µg/l	Effluent	Technology-based	Limit set at lowest level achievable in effluent by source and technology controls.
Chloride	250,000 µg/l	Effluent	Water quality-based	Criteria met. Limit set at criteria.
Nitrate (as N)	100 µg/l	Effluent	Technology-based	Limit set at PQL.
Nitrite (as N)	100 µg/l	Effluent	Technology-based	Limit set at PQL.
Sulfate	10,000 µg/l and 250,000 µg/l	Effluent and Groundwater	Technology-based and Water quality-based	Limit set at PQL and at criteria.

Constituent or Characteristic	Enforcement Limit	Point of Compliance	Type of Limit	Rationale/ Method of Derivation
Total dissolved solids	500,000 µg/l	Groundwater	Water quality-based	Criteria met. .Limit set at criteria.
Total suspended solids	4,000 µg/l	Effluent	Technology-based	Limit set at PQL.
pH	6.5-8.5	Groundwater	Water quality-based	Criteria met. .Limit set at criteria.
Flow	.67 MGD and .25 MGD	Effluent	Technology-based	Limit based on plant design output.

TECHNICAL METHODOLOGY

The following equation was used to calculate the theoretical concentration at which a carcinogen would cause an increased risk of one additional cancer case in every one million persons exposed.

$$\text{Groundwater criteria, ppb} = \frac{\text{RISK x BW x LIFE x UCF}}{\text{CPF x DWIR x DUR}} = 0.08167/\text{CPF}$$

Where the terms are defined as follows:

RISK = human cancer risk level (1 in 1,000,000)
BW = body weight (70 kilograms)
LIFE = lifetime (70 years)
UCF = unit conversion factor (1,000 micrograms per milligram)
CPF = cancer potency factor from EPA's Integrated Risk Information System database.
DWIR = drinking water ingestion rate (2 liters per day)
DUR = duration of exposure (30 years)

Volatile carcinogens incorporate inhalation from showering as a potential exposure route by doubling the drinking water ingestion rate.

Carcinogens are potentially present in the effluent. The effects were assumed to be additive, and the following equation was used:

$$\text{Maximum Concentration, ppb} = 1/n\ 0.08167/\text{CPF}(1) + 1/n\ 0.08167/\text{CPF}(2) + \ldots 1/n\ 0.08167/\text{CPF}(n)$$

which estimates a total risk of 1 in 1,000,000.

This theoretical calculation resulted in a concentration which is much lower than reliably measurable by laboratories (the summed PQLs). Hence, this evaluation did not result in modification of enforcement limits. The limits for carcinogens are set at the PQL or at the groundwater quality standard.