Fact Sheet for State Waste Discharge Permit ST0004502

200 Area Treated Effluent Disposal Facility (TEDF)

October 18, 2011

Purpose of this Fact Sheet

This fact sheet explains and documents the decisions the Department of Ecology (Ecology) made in drafting the proposed State Waste Discharge permit for the 200 Area Treated Effluent Disposal Facility (TEDF) that will allow discharge of wastewater into two adjacent five acre infiltration ponds near the 200 Area of the United States Department of Energy Hanford Site.

State law requires any industrial facility to obtain a permit before discharging waste or chemicals to waters of the state, which includes groundwater.

Ecology makes the draft permit and fact sheet available for public review and comment at least thirty (30) days before issuing the final permit. Copies of the fact sheet and draft permit for the 200 Area TEDF, State Waste Discharge permit ST0004502, are available for public review and comment from October 31, 2011 until the close of business November 30, 2011. For more details on preparing and filing comments about these documents, please see **Appendix A - Public Involvement Information**.

The United States Department of Energy, Richland Operations Office (US DOE-RL) reviewed the draft permit and fact sheet for factual accuracy. Ecology corrected any errors or omissions about the facility's location, history, product type or production rate, discharges or receiving water prior to publishing this draft fact sheet for public notice.

After the public comment period closes, Ecology will summarize substantive comments and our responses to them. Ecology will include our summary and responses to comments to this fact sheet as **Appendix E - Response to Comments**, and publish it when we issue the final State Waste Discharge permit. Ecology will not revise the rest of the fact sheet, but the full document including all appendices will become part of the legal history contained in the facility's permit file.

Summary

Ecology proposes to renew a State Waste Discharge Permit, which will continue to allow discharge of wastewater via infiltration through soils to the groundwater of the state. The Applicant is the United States Department of Energy, Richland Operations Office (USDOE-RL). The disposal facility is called the 200 Area Treated Effluent Disposal Facility. The TEDF is a piped collection system that does not have any treatment or retention capacity. Strict controls at the generating facilities are essential to operate in compliance with the Permit. Requirements and responsibilities for operation of TEDF generators discharging liquid effluents to TEDF are controlled by interface control procedure documents. The facility is located in and near the 200 East and West Areas and consists of an eleven (11)-mile-long pipeline, three lift stations, a sample station (Building 6653), and two adjacent five-acre infiltration ponds. Water in close proximity to the ponds is found as groundwater at a depth of about 100 to 120 feet below the surface. The disposal site was selected to avoid potential mobilization of contaminants from historical disposal practices or potential impacts to historical, archaeological, and

cultural resources. Recent computer modeling of groundwater flow provides an estimated travel time of approximately 10 to 300 years for the effluent to reach the Columbia River.

The public had the opportunity to review the original permitting of the disposal facility's effluent under the Washington State Environmental Policy Act (SEPA) in November 1993. An Environmental Checklist was completed at that time. Ecology made a determination of Nonsignificance under SEPA after receiving no comments during the public comment period.

The effluent consists of individual waste streams from several Hanford facilities. All of these individual waste streams are generated from uses that do not involve direct contact of the water with industrial processes. These uses are primarily those associated with ventilation, heating, and cooling systems for the buildings; steam condensate from heating potable (drinkable) water; condensate of pressurized potable water; rainwater; and untreated Columbia River water. USDOE-RL operates an extensive program of source controls (pollution prevention) to eliminate or reduce approximately 85% of prior contaminant loadings. It has also constructed effluent treatment systems at some of the facilities that discharge to the 200 Area TEDF.

The draft permit complies with the regulatory requirements of Chapter 173-200 of the Washington Administrative Code (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 meet drinking water standards for nonradioactive contaminants before discharge to the infiltration ponds.

This proposed permit does not cover any radioactivity or radionuclide parameters which are considered to be a source, a byproduct, or special nuclear materials that are controlled by the Department of Energy (DOE) under the Atomic Energy Act (AEA) in accordance with provisions of DOE Order 458.1, “Radiation Protection of the Public and the Environment.” DOE-RL will regulate and monitor the release of radionuclides to the environment pursuant to the AEA. DOE-RL 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 mitigating steps if the discharge exceeds drinking water standards. The facility monitors and reports radionuclide concentrations in the effluent to Ecology. Therefore, gross alpha, gross beta, and tritium are not assigned enforcement limits but are monitored and reported for informational purposes.

Proposed changes to this draft permit include:

- Raising the monthly average effluent limit for Total Dissolved Solids from 250 mg/l to 500 mg/l,
- Adding a major waste stream contributor from the Hanford Balance of Facilities/Waste Treatment Plant, and

- Moving the point of compliance for lead and cadmium from the groundwater to the effluent.
- Discontinuing monitoring of the groundwater wells.

Contents

I. Introduction

The legislature defined Ecology's authority and obligations for the wastewater discharge permit program in the Water Pollution Control law, chapter 90.48 RCW (Revised Code of Washington).

Ecology adopted rules describing how it exercises its authority:

- State waste discharge program (chapter 173-216 WAC)
- Water quality standards for groundwaters of the state of Washington (chapter 173-200 WAC)
- Submission of plans and reports for construction of wastewater facilities (chapter 173-240 WAC).

These rules require any industrial facility owner/operator to obtain a State Waste Discharge permit before discharging wastewater to state waters. They also help define the basis for limits on each discharge and for performance requirements imposed by the permit.

Under the State Waste Discharge permit program and in response to a complete and accepted permit application, Ecology must prepare a draft permit and accompanying fact sheet, and make it available for public review before final issuance. Ecology must also publish an announcement (public notice) telling people where they can read the draft permit, and where to send their comments, during a period of thirty days. (See **Appendix A-Public Involvement Information** for more detail about the public notice and comment procedures). After the public comment period ends, Ecology may make changes to the draft State Waste Discharge permit in response to comment(s). Ecology will summarize the responses to comments and any changes to the permit in **Appendix E**.

II. Background Information

Table 1 General Facility Information

Facility Information	
Applicant	United States Department of Energy, Richland Operations Office
Facility Name and Address	200 Area Treated Effluent Disposal Facility 200 East Area on the Hanford Site P.O. Box 550 Richland, Washington 99352
Contact at Facility	Name: Mark W. Bowman Telephone #: (509) 376-7395

Facility Information	
Responsible Official	Name: Matthew S. McCormick Title: Manager, U.S. Department of Energy/Richland Operations Office Address: P.O. Box 550 Richland, Washington 99352 Telephone #: (509) 376-7395 FAX # (509) 376-4789
Industry Type	Clean-up Site
Type of Treatment	System collects, conveys, and disposes of treated effluent from various facilities in the 200 Areas of the Hanford Site.
SIC Codes	4959
NAIC Codes	562910
Facility Location	200 Area of the Hanford Site
Legal Description of Application Area	Section, township, range S5, T12N, R27E

Permit Status	
Renewal Date of Previous Permit	05/18/2000
Application for Permit Renewal Submittal Date	10/08/2003
Date of Ecology Acceptance of Application	12/16/2003

Inspection Status	
Date of Last Sampling Inspection	N/A
Date of Last Non-sampling Inspection Date	06/15/2011

Figure 1 Facility Location Map

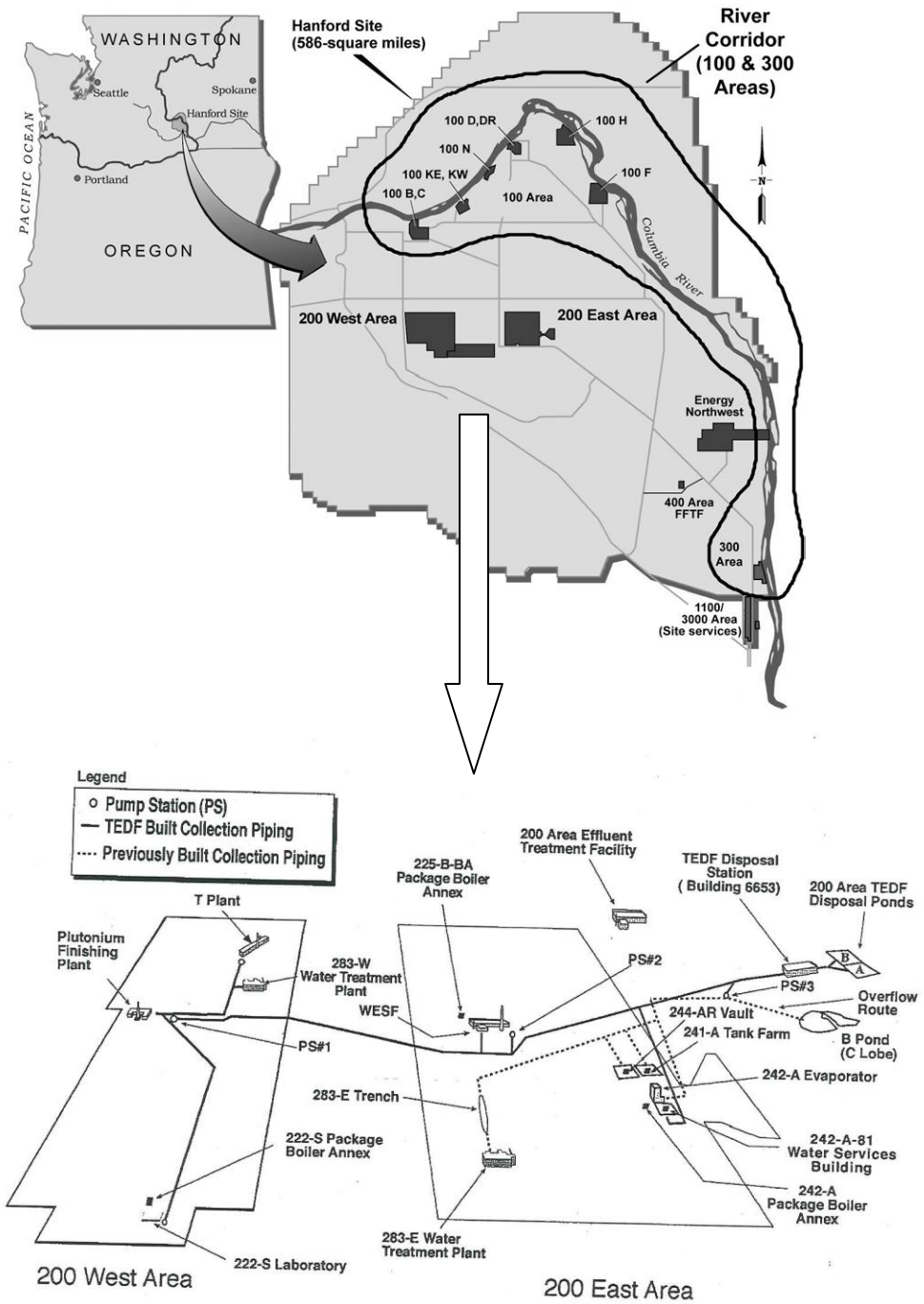

Figure 2 Facility Photos

A Pond
200 Area Treated Effluent Disposal Facility

B Pond
200 Area Treated Effluent Disposal Facility

A. Facility Description

History

As a requirement for obtaining the original State Waste Discharge Permit, the DOE-RL had to eliminate or reduce the contaminant loading in the effluent by applying all known, available, and reasonable methods (AKART) of prevention, control, and treatment prior to its discharge to the environment. In addition, the facility applied AKART to reduce the volume of the effluent. DOE-RL also incorporated this program of pollution prevention, effluent treatment prior to discharge into the 200 Area TEDF system, and facility construction and operation as a portion of Milestone 17 in the 1989 Hanford Federal Facility Agreement and Consent Order (Tri-Party Agreement) between the Department of Energy, 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 (WHC-SD-W049H-ER-003, Volumes 1 and 2 as listed in the References) describes all of the source controls, technology improvements, operational changes, and treatment technologies applied at all of the original facilities discharging to the 200 Area TEDF to clean up the effluent and reduce its volume. Compliance inspections conducted by Ecology officials documented the implementation of the required improvements by the facility.

Because of this multi-year effort, the facility reduced the toxic mass of contaminants in the effluent from the original facilities by approximately 85%. It projected a total cost of pollution prevention and disposal of $20 million. When the TEDF became operational in 1995, the original contributing effluent streams no longer discharged to their prior disposal sites. The TEDF project combined the individual effluent streams from several Hanford facilities, which then discharged to the disposal facility. The facilities originally included were Plutonium Finishing Plant, T Plant, 222-S Laboratory, 284-W Power Plant, B Plant, 242-A-81 Water Services Building, and the PUREX facility. The original permit provided for the addition of a limited quantity of future potential effluent streams, provided they did not contain new contaminants and the discharge met all permit conditions.

During the early years of the operation, the facility added new streams including the W-252 streams in 1997. The W-252 streams included discharges from the 242-A Evaporator, the 241-A Tank Farm Complex, the 284-E Power Plant, the B Plant, and the 244-AR Vault. Controls on the W-252 streams are discussed in the engineering report, "Phase II Liquid Effluent Program (Project W-252) Wastewater Engineering Report and BAT/AKART Studies" (WHC-SD-W252-ER-001, Rev. 0) and in subsequent engineering change notices to the report.

The current lists of facilities, authorized by the existing permit to discharge to 200 Area TEDF, include the following:

- Plutonium Finishing Plant Wastewater
- T Plant Wastewater

- 222-S Laboratory Complex Wastewater
- Waste Encapsulation Storage Facility (WESF) Liquid Effluent and Cooling Water
- 242-A-81 Water Services Wastewater
- 242-A Evaporator Cooling Water
- 242-A Package Boiler Annex Wastewater
- 242-A Evaporator Steam Condensate
- 241-A Tank Farm Cooling Water
- miscellaneous streams covered by State Waste Discharge Permit ST 4511
- Package Boiler locations 283E and 283W
- Discharges from the Hanford Tank Waste Treatment and Immobilization Plant (WTP) located in the 200 East Area

The addition of wastewater from the WTP to 200 Area TEDF is a major new waste stream. Discharges from testing may start as soon as 2012. Startup from cooling towers and discharges from actual operations of the facility may begin in 2015. Discharges from the WTP include discharges from the:

- Pretreatment Facility
- Water Treatment Building, Analytical Laboratory
- High Level Waste and Low Level Waste Facilities
- Steam Plant Facility, Chiller/Compressor Plant
- Wet Chemical Storage Facility
- Maintenance Shop
- PTF Chiller Plant and Cooling Tower

DOE prepared and submitted a Best Available Technology/All Known and reasonable treatments (BAT/AKART) engineering study specific to the WTP to Ecology in October 2003 (24590-CM-HC4-KKYP-00001-01-02A) as part of the permit application for ST0004502 and to complement the 1992 engineering study (WHC-SD-W049H-ER-003) for the other 200 Area facilities. The WTP study recommended a source control that included the use of a reverse osmosis (RO) unit for production of demineralized water for steam production and other plant processes, as well as operation of the cooling towers at an average of five cycles of concentration. The WTP study concluded that the treatment facility will meet the effluent limits of the ST0004502 permit with the exception of total dissolved solids (TDS). The report recommended that Ecology increase the monthly average limit for TDS in the ST0004502 permit from 250 mg/l to 500 mg/l. Ecology reviewed the WTP study and made a determination to increase the monthly average limit for TDS in the permit to 500 mg/l, which is the maximum allowable limit under WAC 173-

200 (Water Quality Standards for Groundwater). Ecology also determined a need to evaluate performance on discharges generated by WTP during this permit cycle. The variability study described in Special Condition S9 serves this purpose. Ecology will evaluate performance of the system at the next permit issuance and determine performance-based permit limits.

The WTP BAT/AKART Addendum #1 (04-RCA-0017) identified three changes to the original study; it:

1. Added biocides and added a process to treat the increased concentrations of total trihalomethanes (THMs), which would exceed the ST0004502 effluent limit.
2. Changed the source water from raw water to potable water as the primary source for WTP. Potable water would eliminate the need for on-site treatment of corrosion products in raw water piping.
3. Identified the WTP start date for full operation.

WTP BAT/AKART Addendum #2 (04-AMCP-0184) described the selection of air stripping as the technology for removing THMs. It also provided revised source water composition and the non-radioactive liquid waste (NLD) effluent flow rates and composition.

WTP BAT/AKART Addendum #3 (11-EMD-0040) submitted in December 2010, provided updated WTP design information affecting the WTP NLD to the TEDF which included expansion of the WTP Water Treatment Facility and planned construction of a new Chiller Plan/Cooling Tower supporting the Pretreatment Facility. DOE-RL estimated a total flow rate of the NLD effluent discharged from WTP to TEDF of a maximum of 396 gpm. It expects that the composition of the effluent will meet the permit effluent limits of ST0004502.

Because this is a significant new waste stream from a newly constructed facility, Ecology included a study of effluent variability in the proposed permit to evaluate the listed constituents in the effluent. Part VI, section G of this fact sheet discusses the TEDF Variability Study required under Special Condition S9.

Industrial Process(s)

The facility generates most of the effluent streams from uses that do not involve direct contact of the water with industrial processes. No manufacturing processes or products are associated with the individual effluent streams. Uses that generate the effluent are primarily those associated with the following:

- Ventilation, heating, and cooling systems for the buildings
- Steam condensate from heating potable (drinkable) water
- Condensate of pressurized softened or deionized potable water
- Rainwater from parking lots and exterior paved areas
- Potable (treated) water
- Untreated Columbia River water
- Boiler blowdown
- Floor drains with limited and strictly controlled usage

- Hydrotest, maintenance, construction, cooling water, condensate, and stormwater discharges that are covered by Hanford State Waste Discharge Permit ST0004511
- Reverse Osmosis brine
- Air Stripping

III. SOURCES OF EFFLUENT

A. Uses Generating Effluent

The following table summarizes the major sources of effluent generated at the facilities permitted to discharge to the 200 Area TEDF.

Table 2 Major Sources Discharging to the 200 Area TEDF

Facility	Uses Generating Effluent
Plutonium finishing plant	Ventilation heating/cooling, steam condensate, cooling water, compressed air production, process water, rainwater, and potable water overflow, and miscellaneous water from deactivation, dismantling, and maintenance activities.
222-S Laboratory complex	Steam condensate and potable water
T Plant	Steam condensate, cooling water, heating coil water, and floor drains located in non-contaminated areas
242-A Evaporator	Cooling water and steam condensate
242-A-81 Water services building	Untreated Columbia river water, and strainer backwash
Waste Encapsulation Storage Facility (WESF)	Cooling water, rainwater collected from outdoor storm drains from non-radiation areas, raw water, and potable water
Package boilers (242-A Annex, 283E, and 283W)	Boiler blowdown, steam condensate, cooling water, and water softener regenerate flows
241-A Tank Farm Cooling Water	Cooling Water
Streams permitted by ST-4511	Miscellaneous waste streams (hydrotest, maintenance, construction, cooling water, etc.)
Waste Treatment Plant	Cooling/chilled water, steam condensate, boiler blowdown, reverse osmosis brine, air stripping, compressors, heating, ventilation, air conditioning, pretreatment, non-dangerous, non-radioactive water from sumps.

Wastewater Treatment Processes

The 200 Area TEDF is a pipeline with three pump stations that conveys effluent from several generating facilities to disposal/infiltration ponds, and does not provide any treatment. The effluent will discharge into A Pond or B Pond that the facility plans to rotate on a monthly basis. Ecology reviewed and approved engineering specifications and plans before construction. A summary of the major activities conducted at some of the generating facilities is included below. However, note that the effluent discharged under this draft permit is generated from the limited activities listed in the preceding table. Hence, it is not subject to contamination from all activities at these facilities.

- Plutonium Finishing Plant Effluent
  The Plutonium Finishing Plant (PFP) wastewater stream consists of potentially contaminated wastewater and uncontaminated wastewater. The uncontaminated discharges include ventilation heating/cooling, steam condensate, potable water, and storm water runoff. The potentially contaminated wastewater includes noncontact process cooling water, miscellaneous wastewater from deactivation, dismantling and maintenance activities, steam condensate, and air conditioning condensate.

  BAT/AKART for the effluent from the Plutonium Finishing Plant is implemented in the form of source controls and/or treatment. The facility has either eliminated contaminated wastewater sources or replaced them with closed loop cooling systems. Remaining wastewater sources that may potentially be contaminated are sent to the 243-Z Low Level Waste Treatment Facility. At 243-Z wastewater is filtered to remove suspended solids, activated carbon is used to trap organics, bone char is used to absorb transuranic (chemical elements with atomic numbers greater than 92) particles, and ion exchange resin is used to capture ionic salts. This treated water is released into the collection system for PFP's uncontaminated discharges. Monitoring and effluent water sampling is conducted at the point of PFP's discharge into the Treated Effluent Disposal Facility collection system.

- 222-S Laboratory Effluent

  The 222-S Laboratory's primary function is to provide chemical and radiological analyses of samples associated with ongoing Hanford Site operations and research programs. Source controls were implemented as BAT/AKART for the 222-S Laboratory's effluent. Improvements included adding corrosion inhibitors to the steam supply to reduce metal concentrations; piping and equipment changes to reduce the potential for contamination; adding new retention tanks; eliminating steam cell heaters to avoid condensate generation; and replacing heating, ventilation, and air conditioning air washers with electric chillers to eliminate blowdown effluent. The laboratory sends spent reagents to both onsite and offsite

Transfer, Storage, and Disposal Facilities and does not discharge them to 200 Area TEDF.

- T Plant Effluent

  The T Plant provides decontamination services, waste verification, and other waste handling activities for the Hanford Site. Source controls with retention/diversion capabilities were implemented as BAT/AKART for the T Plant's effluent. DOE-RL replaced water-cooled air compressors with air-cooled units. It replaced the water-cooled pressurized water reactor chiller with an air-cooled, refrigerant cooling system. Stored chemicals were removed and sumps and drains were sealed. The associated laboratory is no longer active and is not a source of wastewater.

- WESF

  Currently, the Waste Encapsulation Storage Facility (WESF) ensures safe storage and management of radiological and chemical waste inventories. WESF also stores chemicals and discharges cooling water, rainwater, raw water, and potable water to 200 Area TEDF.

- 242-A-81 Water Services Building Effluent

  The 242-A-81 Water Services Building houses equipment that strains coarse, suspended solids from untreated Columbia River water. Periodic flushing (backwashing) of the filtering media is required to cleanse the material, and results in an effluent. Ecology determined that prior pollution prevention controls were adequate at the 242-A-81 Water Services Building.

- 242-A Evaporator

  The Evaporator is used to reduce the volume of waste stored in underground tanks on Hanford. The Evaporator discharges a large volume of non-contact cooling water to 200 Area TEDF when the facility is supporting tank farm operations. Typically these evaporator campaigns will operate a few weeks per year.

- 241-A Tank Farm Cooling Water

  DOE-RL has reduced the 241-A Tank Farm Cooling Water System from eight sources to one. The remaining source is made up of four 702-AZ Cooling Towers. Each cooling tower is part of a tertiary cooling system for a ventilation system used for cooling hazardous and radioactive wastes stored in underground storage tanks. Heat is removed via heat exchanger from a closed loop chilled water system, which in turn removes heat from tank vapor via a shell and tube heat exchanger. Due to the systems arrangement, it is unlikely that radioactive or hazardous material would contaminate this stream.

- Tank Waste Treatment and Immobilization Plant (WTP)

  Construction of the WTP initiated in 2001 and full operation for dangerous waste/mixed waste treatment is scheduled to begin in 2019. The WTP mission is

to vitrify tank waste stored in the 200 Area tanks. WTP generates a non-radioactive liquid waste (NLD) effluent stream which discharges to the 200 Area TEDF. Cooling tower blowdown and reverse osmosis brine are the primary WTP wastewater contributions to TEDF. Other minor sources include non-dangerous, non-radioactive wastewater from sumps, steam condensate, and boiler blowdown. Source controls and end-of-pipe treatment are BAT/AKART for the WTP effluent. DOE plans to install an end-of-pipe treatment system consisting of air-stripping to remove Trihalomethanes, primarily chloroform. These Trihalomethanes are a by-product of treating source water with chlorine.

Collection System Status

The 11 mile-long pipeline, constructed to collect and convey the effluent to the disposal ponds was tested for integrity prior to use. Older, pre-existing ancillary pipelines at individual facilities have been cleaned or replaced if determined to be a potential source of contamination from deposition of contaminants that were the result of past practices. The collection system also includes three pump stations. Pump Station #1 is located in the 200 West Area near the Plutonium Finishing Plant. Pump Station #2 is located in the 200 East Area near B Plant. Pump Station #3 is in the 200 East Area near the TEDF Sample Station, and serves the 242-A Evaporator. Inputs to the system are limited in nature, documented, and strictly controlled. All access points to the system are strictly controlled and operated by trained personnel.

Land Treatment and Distribution System (Infiltration Basin)

The 200 Area TEDF is a collection system and two infiltration/disposal basins of approximately five acres in size. The infiltration/ disposal basins are called A Pond and B Pond. The infiltration systems are capable of handling the planned design flows. These basins are 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. Public access is restricted and the large area provides a buffer for the smaller areas currently used for storage of nuclear materials, waste storage, and waste disposal. DOE actively uses or has disturbed about 6% of the total land area.

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 1). 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 3000 waste management units and four groundwater contamination plumes that have been grouped into 44 operable units. The 200 Area TEDF is located near the center of the Hanford Site, approximately two miles east of the eastern boundary of the 200 East Area. DOE chose this site because area soils were essentially uncontaminated. Modeling indicates that additional infiltration would not mobilize contaminants or contribute to contamination plume migration originating from other locations.

B. Description of the Groundwater

The 200 Area TEDF is underlain by geologically young sediments that, in turn, are underlain by bedrock. The bedrock is Columbia River Basalt, at a depth of about 250 feet below the surface. The bedrock slopes gently (approximately one-half of a degree) toward the south-southwest. The sediments that lie immediately above the basalt are called the Ringold Formation. The Hanford Formation lies above the Ringold Formation. Alluvium and dune sand cover part of the surface of the site.

The upper part of the Hanford Formation consists of highly permeable, unconsolidated gravel. The lower part of the formation consists of silt and sandy gravel. The thickness of the formation varies from approximately 80 feet north, to about 120 feet south of the site. The hydraulic conductivity (permeability) of this formation is very high.

The Ringold Formation at the disposal site consists of lenses (localized pockets) composed of partially consolidated sand and gravel, fine-grained sand, and silt and clay locally cemented by caliche. The Ringold Formation contacts the Hanford Formation at approximately 90 to 110 feet beneath the surface. The uppermost part of the Ringold Formation in this area consists of relatively impermeable silt and clay that varies from about 40 feet thick at the northwest corner to about 80 feet thick at the southeast corner of the site. These silts and clays are called the Lower Mud Sequence of the Ringold formation. The lower part of the Ringold Formation, below this Lower Mud Sequence, consists of a 75 to 120 (approximate) foot thick zone of gravel named Unit A. The natural confined aquifer (also called the uppermost aquifer) below the disposal site is found primarily in this gravel zone. The three groundwater monitoring wells, installed to monitor this disposal activity, penetrate to this aquifer. The facility encountered a minor amount of perched water above the Ringold lower mud unit when installing the wells. Recent discharges to the ground at the facility have likely increased the amount of perched water. The static water level in the uppermost aquifer currently varies from approximately 100 to 120 feet below the surface. Both the Lower Mud Sequence and Unit A slope gradually to the south-southeast.

Hydrologic and geochemical monitoring at the site has demonstrated that the Lower Mud Sequence of the Ringold Formation acts as an effective retardant to movement

of overlying water (originating from the disposal ponds) down to the uppermost groundwater aquifer in the Unit A gravels. This phenomenon occurs because the mud unit is highly impermeable, and does not conduct water well. Hence, the presence of the mud sequence will naturally prevent water from moving directly downward below the Hanford formation. The mud also acts to confine the groundwater in the Unit A gravels beneath the site such that it has a positive upward pressure gradient. This positive pressure also impedes the entry of the treated effluent into the aquifer in the immediate vicinity of the disposal facility.

Groundwater flows down-gradient at a flow rate of less than one foot per day in the uppermost aquifer. Recent hydrologic tests and head measurements indicate that the groundwater flow may be less than 0.02 feet per day. Groundwater currently flows radially outward from the 216-B-3 Pond complex (located west-northwest of 200 Area TEDF). The hydraulic gradient is currently about 0.002 foot per foot.

The Lower Mud Sequence of the Ringold formation is absent beneath portions of the main, A, and B lobes of the 216-B-3 Pond complex. Consequently, effluent previously discharged to these ponds migrated directly downward into the uppermost aquifer of the Ringold Unit A gravel. The additional volume and down-gradient movement of these B pond discharges contributes to the upward pressure gradient currently observed in the upper-most aquifer beneath 200 Area TEDF. Since effluent discharges to the main pond, and A and B lobes of the 216-B-3 Pond complex has ceased, the magnitude of the hydraulic head in the aquifer beneath 200 Area TEDF is gradually decreasing.

DOE discharged effluent to the 3C expansion pond of the 216-B-3 Pond complex prior to discharge to 200 Area TEDF, which began in 1997. The proposed permit still allows for emergency overflows to this pond. At this location, the Lower Mud Sequence is known to be present. Consequently, the water infiltrating downward from this pond likely did not directly enter the upper most aquifer. Instead, the water may flow laterally down-gradient along the top of the Lower Mud Sequence until it reaches an area where the mud does not exist, or is offset by a fault.

The May Junction Fault is found approximately one mile east, and down-gradient from 200 Area TEDF. It trends north-south. The fault may hydraulically connect the confined aquifer in the Unit A gravel of the Ringold formation with water perched in the Hanford formation at the top of the Lower Mud Sequence. Recent research makes it appear likely that the May Junction Fault is an impediment to eastward movement of groundwater in the Ringold (confined) aquifer.

East of the May Junction Fault to the Columbia River, the upper most aquifer is found in the Hanford formation gravels, with the possible exception of the area east-northeast of Gable Mountain. Geologic processes in this area have resulted in the upper most aquifer likely occurring in Unit A of the Ringold Formation.

The disposal facility is located approximately six miles west of the Columbia River. Prior to discharge, computer modeling of groundwater flow provided an estimated travel time of approximately 10 to 20 years for effluent discharged at 200 Area TEDF

to reach the Columbia River. Other more recent modeling estimate travel times approaching 120 to 300 years for effluent to reach the Columbia River.

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% of all precipitation. Days with greater than 0.51 inch of precipitation occur less than 1% 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 200 Area TEDF Site.

The Hanford Site has been botanically characterized as shrub-steppe. The major plant community in the vicinity of the 200 Area TEDF is Sagebrush/Cheatgrass or Sandberg Bluegrass and Greasewood/Cheatgrass-Saltgrass. DOE selected the disposal site to avoid impact on historical, archaeological, and cultural resources.

C. Wastewater Characterization

DOE-RL reported the concentration of pollutants in the discharge in the permit application and in discharge monitoring reports. The tabulated data represents the quality of the wastewater discharged from July 2006–March 2011. The wastewater prior to infiltration is characterized as shown in Table 3:

Table 3 Wastewater Characterization

Parameter	Units	Average Value	Maximum Value
Total Dissolved Solids	µg/l	101,000	347,000
Arsenic (total)	µg/l	0.654	3.1
Cadmium (total)	µg/l	0.054	0.136
Chromium (total)	µg/l	0.571	1.17
Lead (total)	µg/l	0.319	2.96
Mercury (total)	µg/l	0.052	0.090
Chloride	mg/l	3.78	17.0
Nitrate (as N)	µg/l	162	861
Iron (total)	µg/l	92	414

Parameter	Units	Average Value	Maximum Value
Manganese (total)	µg/l	4,720	5,720
Gross Alpha	pCi/l	1.6	14
Gross Beta	pCi/l	3.4	27
Tritium	pCi/l	230	550
Oil and Grease	mg/l	5.1	7.2
Copper	µg/l	6.18	28.7
Selenium	µg/l	0.617	8.09
Uranium	µg/l	0.386	1.3
Bromide	µg/l	NQ	NQ
Fluoride	µg/l	36	100
Nitrite as N	µg/l	11	19
Phosphate as P	µg/l	334	15,100
Sulfate	µg/l	17,700	28,800
Aluminum	µg/l	667	5,690
Antimony	µg/l	31.6	39.4
Barium	µg/l	29.2	38
Beryllium	µg/l	<0.5	<0.5
Calcium	µg/l	22,400	26,400
Cobalt	µg/l	1.6	2.3
Manganese	µg/l	8.3	51
Nickel	µg/l	2.8	6.7
Potassium	µg/l	1,680	6,370
Silicon	µg/l	2,270	3,160

Parameter	Units	Average Value	Maximum Value
Silver	µg/l	3.9	6.8
Sodium	µg/l	3,970	8,190
Thallium	µg/l	36.0	71.2
Titanium	µg/l	4.2	10.2
Vanadium	µg/l	6.6	14
Zinc	µg/l	31.2	190
1,1,1-Trichloroethane	µg/l	<2.0	<2.0
1,1-Dichloroethane	µg/l	<2.0	<2.0
Benzene	µg/l	<2.0	<2.0
Bromodichloromethane	µg/l	NQ	NQ
Bromoform	µg/l	<2.0	<2.0
Carbon Tetrachloride	µg/l	<2.0	<2.0
Chlorobenzene	µg/l	<2.0	<2.0
Chloroform	µg/l	2.2	7.8
Dibromochloromethane	µg/l	<2.0	<2.0
Methylene Chloride	µg/l	1.7	13
Toluene	µg/l	<2.0	<2.0
Total Trihalomethanes	µg/l	2.2	7.8
Trichloroethene	µg/l	NQ	NQ
1,2,4-Trichlorobenzene	µg/l	<0.6	<0.6
1,4-Dichlorobenzene	µg/l	<17.6	<17.6
2,4-Dinitrotoluene	µg/l	<0.4	<0.4
2-Chlorophenol	µg/l	<2.0	<2.0

Parameter	Units	Average Value	Maximum Value
4-Chloro-3-methylphenol	µg/l	NQ	NQ
4-Nitrophenol	µg/l	<1.0	<1.0
Acenaphthene	µg/l	<0.4	<0.4
Bis(2-ethylhexyl) phthalate	µg/l	0.92	2.47
n-Nitrosodi-n-dipropylamine	µg/l	NQ	NQ
Pentachlorophenol	µg/l	<1.0	<1.0
Phenol	µg/l	<4.0	<4.0
Pyrene	µg/l	<0.6	<0.6
Conductivity	µmho/cm	177	437

Parameter	Units	Minimum Value	Maximum Value
pH	standard units	6.08	8.99

NQ means Not Quantifiable

DOE-RL reported the concentration of pollutants in the groundwater in the permit application and in discharge monitoring reports. The tabulated data, as shown in Table 3, represents the quality of the groundwater in the monitoring wells from July 2006–March 2011. Well numbers 699-40-36 and 699-41-35 are downgradient wells. Well number 699-42-37 is the upgradient well.

Table 4 Recent Groundwater Characteristics

Parameter	Units	Minimum Value			Maximum Value		
		699-40-36	699-41-35	699-42-37	699-40-36	699-41-35	699-42-37
Total Dissolved Solids	mg/L	129	174	203	426	347	292
Arsenic (total)	µg/l	3.18	3.68	4.10	4.91	5.50	6.07

Parameter	Units	Minimum Value			Maximum Value		
		699-40-36	699-41-35	699-42-37	699-40-36	699-41-35	699-42-37
Cadmium (total)	µg/l	NQ	NQ	NQ	NQ	NQ	NQ
Chromium (total)	µg/l	1.12	3.44	3.63	8.15	7.41	29.9
Lead (total)	µg/l	NQ	NQ	NQ	0.695	0.190	0.660
Mercury (total)	µg/l	NQ	NQ	NQ	0.0676	0.057	0.086
Chloride	mg/L	3.68	3.45	4.03	4.61	8.24	9.54
Nitrate (as N)	mg/L	NQ	0.164	0.198	0.044	1.580	1.580
Iron (total)	µg/l	NQ	NQ	51.5	136	176	955
Manganese (total)	µg/l	4.5	NQ	NQ	13.0	10	18
Gross Alpha	pCi/l	NQ	NQ	NQ	4.6	7.8	6.2
Gross Beta	pCi/l	6.6	6.5	NQ	12	11	10
Tritium	pCi/l	NQ	NQ	NQ	NQ	NQ	10.4
pH	SU	7.9	7.82	7.59	8.36	8.23	9.21

D. Summary of Compliance with Previous Permit Issued on May 18, 2000

The 200 Area TEDF has complied with the effluent limits and permit conditions throughout the duration of the permit issued on May 18, 2000. Ecology assessed compliance based on its review of the facility's discharge monitoring reports (DMRs) and on recent inspections.

The table below summarizes compliance with report submittal requirements over the permit term.

Table 5 Permit Submittals

Submittal Name	Due Date	Date Submitted	Date Reviewed or Approved
Application for Permit Renewal	10/01/2004	10/08/2003	12/16/2003
O&M Manual Review Letter	Annually	*08/10/2010	08/16/2010
Noncompliance Notification Report	As required	*02/11/2011	02/15/2011
Overflow Sample Analysis Report	As required	*02/11/2011	02/15/2011
*Most Recent Submittal			

E. State Environmental Policy Act (SEPA) Compliance

As the lead agency, Ecology performed a threshold determination of the impacts on the environment that could result from reissuing the TEDF wastewater discharge permit. Had Ecology reissued the TEDF permit to impose conditions that are within Federal effluent limits and State rules upon existing discharges only, then the action would have been exempt from SEPA under the State law (RCW 43.21C.0383). The draft permit makes a change that alone would make the action exempt; however, it also includes other changes that Ecology determined required a review for a significant environmental impact.

The draft permit adds a new major waste stream composed of non-radioactive liquid waste effluent from various facilities within the Hanford Waste Treatment and Immobilization Facility (WTP). Discharges will come from the facilities that appear in the list in the History section of the Fact Sheet. The WTP treatment facility is able to treat the effluent to meet the limits in the existing permit, with the exception of the existing monthly average effluent limit for Total Dissolved Solids (TDS) (250 mg/l). To ensure that the WTP effluent will meet the State's quality standards for groundwater, the draft permit raises the monthly average limit from 250 milligrams per liter (mg/l) to 500 mg/l. This limit is the maximum allowable limit under WAC 173-200 (Quality Standards for Groundwater). In addition, Ecology added a permit condition that requires the USDOE to perform an Effluent Variability Study and report the results. If the results of that study indicate that the TEDF can achieve a lower TDS limit, Ecology may require performance-based limits during the next permit cycle or may modify the permit during the current permit cycle.

Ecology also changed the points of compliance for lead and cadmium from the groundwater wells to the effluent. New points of compliance are necessary because the monitoring wells that the USDOE used for monitoring lead and cadmium concentrations in the groundwater from the TEDF are completed in the confined aquifer that is isolated from the TEDF discharges. As the wells are not effective for

monitoring TEDF discharges, the USDOE will now meet the Federal effluent limits and State rules when the effluent enters the infiltration basins. The wells are not monitoring the correct aquifer, so there is no need to sample the groundwater.

After reviewing the changes to the TEDF permit and the impacts on the environment, Ecology determined that the impacts are not significant. Ecology prepared a Determination of Significance that documents the results of the review.

IV. Proposed Permit Limits

State regulations require that Ecology base limits in a State Waste Discharge permit on the:

- Technology and treatment methods available to treat specific pollutants (technology-based). Dischargers must treat wastewater using all known, available, reasonable methods of prevention, control, and treatment (AKART). Ecology has developed guidance describing technology-based (AKART) criteria for industrial/commercial systems that discharge to ground (Ecology, 1993; 2004).

- Operations and best management practices necessary to meet applicable water quality standards to preserve or protect existing and future beneficial uses of the ground waters.

- Groundwater quality standards (Ecology, 1996).

- Applicable requirements of other local, state, and federal laws.

Ecology applies the most stringent of technology and water quality-based limits to each parameter of concern and further describes the proposed limits below.

The limits in this permit reflect information received in the permit application and from supporting reports and studies (engineering, hydrogeology, and monitoring). Ecology evaluated the permit application and determined the limits needed to comply with the rules adopted by the State of Washington. Ecology does not develop effluent limits for all reported pollutants. Some pollutants are not treatable at the concentrations reported, are not controllable at the source, and are not listed in regulation.

Ecology does not usually develop permit limits for pollutants not reported in the permit application but may be present in the discharge. The permit does not authorize the discharge of the non-reported pollutants. During the five-year permit term, the facility's effluent discharge conditions may change from those conditions reported in the permit application. The facility must notify Ecology if significant changes occur in any constituent. Until Ecology modifies the permit to reflect additional discharges of pollutants, a permitted facility could be violating its permit.

A. Design Criteria

Under WAC 173-216-110 (4), flows and waste loadings must not exceed approved design criteria. Ecology approved the design criteria for this facility's collection system and infiltration basins based on the *200 Area Treated Effluent Disposal Facility Wastewater Engineering Report* dated February 1992 and the updated information from the WTP engineering study prepared by US DOE-RL. Table 6 includes design criteria from the referenced reports.

Table 6 Design Criteria for the Infiltration Basins

Parameter	Design Quantity
Monthly Average Flow (Maximum Month)	5.5 MGD
Average Yearly Flow	1.7 MGD

B. Technology-based Effluent Limits

Waste discharge permits issued by Ecology specify conditions require the facility to use all known available and reasonable methods of prevention, control and treatment (AKART) before discharging to waters of the state (RCW 90.48).

Ecology approved the engineering report titled *200 Area Treated Effluent Disposal Facility Wastewater Engineering Report*, dated February 1992 and prepared by the US DOE-RL in addition to the WTP *BAT/AKART Report*, (October 2003). Ecology determined that the facility meets the minimum requirements demonstrating compliance with the AKART standard if the U.S. Department of Energy operates the treatment and disposal system as described in the approved engineering report and any subsequent Ecology approved reports.

See **Appendix D** for the Enforcement Limit Derivation Summary which discusses the rationale for technology-based and groundwater quality-based limits.

US DOE-RL must meet the permit limits in the table below to satisfy the requirement for AKART.

Table 7 Technology-Based Effluent Limits

Effluent Limits		
Parameter	**Average Monthly**	**Maximum Daily**
Total Trihalomethanes	20 µg/l	---
Methylene Chloride	5 µg/l	---
Cadmium (total)	5 µg/l	---
Chromium (total)	20 µg/l	---
Lead (total)	10 µg/l	---
Chloride	58,000 µg/l	116,000 µg/l
Nitrate (as N)	620 µg/l	1,240 µg/l

C. Groundwater Quality-based Effluent Limits

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 violation of the groundwater quality standards. The goal of the groundwater quality standards is to maintain the highest quality of the State's groundwaters and to protect existing and future beneficial uses of the groundwater through the reduction or elimination of the discharge of contaminants to groundwater [WAC 173-200-010(4)]. Ecology achieves this goal by:

- Applying all known available and reasonable methods of prevention, control and treatment (AKART) to any discharge.
- Applying the antidegradation policy of the groundwater standards.

Establishing numeric and narrative criteria for the protection of human health and the environment in the groundwater quality standards.

Antidegradation Policy

The State of Washington's Ground Water Quality Standards (GWQS) require preservation of existing and future beneficial uses of groundwater through the antidegradation policy, which includes the two concepts of antidegradation and non-degradation. Antidegradation is not the same as non-degradation (see below).

Antidegradation

Antidegradation applies to calculation of permit limits in groundwater when background (see below) contaminant concentrations are less than criteria in the

GWQS. Ecology has discretion to allow the concentration of contaminants at the point of compliance to exceed background concentrations but not exceed criteria in the GWQS. Ecology grants discretion through an approved AKART engineering analysis of treatment alternatives. If the preferred treatment alternative predicts that discharges to groundwater will result in contaminant concentrations that fall between background concentrations and the criteria, then the preferred treatment alternative should protect beneficial uses and meet the antidegradation policy. In this case, the predicted concentrations become the permit limits. If the preferred alternative will meet background contaminant concentrations, background concentrations become the permit limits. Permit limits must protect groundwater quality by preventing degradation beyond the GWQS criteria. If discharges will result in exceedance of the criteria, facilities must apply additional treatment before Ecology can permit the discharge.

Non-degradation

Non-degradation applies to permit limits in groundwater when background contaminant concentrations exceed criteria in the GWQS. Non-degradation means that discharges to groundwater must not further degrade existing water quality. In this case, Ecology considers the background concentrations as the water quality criteria and imposes the criteria as permit limits. To meet the antidegradation policy, the facility must prepare an AKART engineering analysis that demonstrates that discharges to groundwater will not result in increasing background concentrations. Ecology must review and approve the AKART engineering analysis.

Additional information on antidegradation and non-degradation may be obtained by referring to the *Implementation Guidance for the Ground Water Quality Standards (Implementation Guidance)*, Ecology Publication #96-02 (available at http://www.ecy.wa.gov/biblio/9602.html).

Background Water Quality

Background water quality is determined by a statistical calculation of contaminant concentrations without the impacts of the proposed activity. The calculation requires an adequate amount of groundwater quality data and determining the mean and standard deviation of the data, as described in the *Implementation Guidance*. Following the procedure in the *Implementation Guidance,* Ecology then defines background water quality for most contaminants as the 95% upper tolerance limit. This means that Ecology is 95% confident that 95%of future measurements will be less than the upper tolerance limit. There are a few exceptions to the use of the upper tolerance limit. For pH, Ecology will calculate both an upper and a lower tolerance limit resulting in an upper and lower bound to the background water quality. If dissolved oxygen is of interest, Ecology will calculate a lower tolerance limit without an upper tolerance limit.

Applicable groundwater criteria as defined in chapter 173-200 WAC and in RCW 90.48.520 for this discharge include those in Table 8:

Table 8 Ground Water Quality Criteria

Parameter	Units	Ground Water Criteria	Background Value of Wells Before Discharge		
			699-42-37	699-41-35	699-40-36
Total Dissolved Solids	mg/L	500	332	246	266
Chloride	mg/L	250	8.5	3.8	3.7
Sulfate	mg/L	250	31.8	10.8	28.1
Nitrate (as nitrogen)	mg/L	10	8.1	1.2	1.1
pH Minimum/Maximum	standard units	6.5 to 8.5	7.31-8.59	6.9-8.94	7.26-8.46
Manganese	mg/L	0.05	0.4	0.3	0.3
Total Iron	mg/L	0.3	17.0	0.9	5.2
Total Lead	mg/L	0.05	NQ	NQ	NQ
Total Mercury	mg/L	0.002	NQ	NQ	NQ
Total Chromium	mg/L	0.05	0.17	0.78	0.78
Total Cadmium	mg/L	0.01	NQ	NQ	NQ
Total Arsenic	µg/L	0.05	0.007	0.006	0.002
Tritium	pCi/l	20,000	ND	ND	ND
Gross Alpha	pCi/l	15	13.3	24.0	18.3
Gross Beta	pCi/l	50	12.8	20.0	17.5
Bis (2-ethylhexyl) phthalate	µg/L	6.0	NQ	NQ	NQ
Carbon Tetrachloride	µg/L	0.3	NQ	NQ	NQ
Chloroform	µg/L	7.0	ND	ND	ND
Methylene chloride	µg/L	5.0	NQ	NQ	NQ

NQ means Not Quantifiable. ND means No Data.

Ecology has reviewed existing records for the facility's land treatment site and there is sufficient data to determine the background groundwater quality as defined in Chapter 173-200 WAC and described in the Implementation Guidance for the Ground Water Quality Standards; Ecology, Revised October 2005.

Ecology established groundwater enforcement limits to protect the quality of the groundwater based on the background values in groundwater. The proposed groundwater enforcement limits establish the quality of the wastewater that USDOE-RL may discharge to the infiltration ponds.

Table 9 includes the groundwater quality-based enforcement limits for the discharge.

Table 9 Groundwater Quality-Based Effluent Limits

Parameter	Effluent Enforcement Limits
Bis (2-ethylhexyl) phthalate	10 µg/l
Carbon Tetrachloride	5 µg/l
Chloroform	7 µg/l
Arsenic (total)	15 µg/l
Iron (total)	300 µg/l
Manganese (total)	50 µg/l
Mercury (total)	2 µg/l
Total Dissolved Solids	500 mg/l

D. Comparison of Effluent Limits with the Previous Permit Issued on May 18, 2000

As shown in Table 10, one limit and two points of compliance have been changed in this draft permit. Ecology increased the Total Dissolved Solids (TDS) monthly average effluent limit from 250 mg/l to 500 mg/l, and eliminated the TDS daily maximum limit. US DOE-RL engineering studies (WTP BAT/AKART Engineering Studies, including WTP BAT/AKART Addenda 1, 2 and 3*)* show that new waste streams from the Tank Waste Treatment and Immobilization Plant (WTP) will increase the amount of TDS in the effluent. The engineering studies predicted applying BAT/AKART to the new waste streams would still produce a monthly average higher than the previous limit of 250 mg/l. Ecology therefore increased the TDS limit to the Groundwater Quality Criteria limit of 500 mg/l. If the results of a permit-required Effluent Variability Study show the facility can achieve a lower TDS

limit, Ecology may require performance-based limits during the next permit cycle or may modify the permit during this cycle.

Ecology moved the points of compliance for lead and cadmium from the groundwater monitoring wells to the effluent. These new points of compliance were established because the monitoring wells are installed in a confined aquifer and are isolated from the TEDF discharges, making them ineffective at monitoring the discharges from TEDF. Therefore, groundwater monitoring at these wells has been discontinued in this draft permit. However, the wells will continue to be monitored as part of the 200-PO-1 Operable Unit and site wide surveillance monitoring plan on an annual basis.

Table 10 Comparison of Previous and Proposed Limits

Parameter	Basis of Limit	Existing Limits	Proposed Limits
Effluent Limits			
Bis (2-ethylhexyl) phthalate	Water Quality Based	10 µg/l AM	10 µg/l AM
Total trihalomethanes	Technology	20 µg/l AM	20 µg/l AM
Carbon tetrachloride	Water Quality Based	5 µg/l AM	5 µg/l AM
Chloroform	Water Quality	7 µg/l AM	7 µg/l AM
Methylene chloride	Technology	5 µg/l AM	5 µg/l AM
Arsenic (total)	Water Quality Based	15 µg/l AM	15 µg/l AM
Chromium (total)	Technology	20 µg/l AM	20 µg/l AM
Cadmium (total)	Technology	NA	5 µg/l AM
Iron (total)	Water Quality Based	300 µg/l AM	300 µg/l AM
Lead (total)	Technology	NA	10 µg/l AM
Manganese (total)	Water Quality Based	50 µg/l AM	50 µg/l AM
Mercury (total)	Water Quality Based	2 µg/l AM	2 µg/l AM

Parameter	Basis of Limit	Existing Limits	Proposed Limits
Chloride	Technology	58,000 µg/l AM 116,000 µg/l DM	58,000 µg/l AM 116,000 µg/l DM
Nitrate (as N)	Technology	620 µg/l AM 1,240 µg/l DM	620 µg/l AM 1,240 µg/l DM
Total Dissolved Solids	Water Quality Based	250,000 µg/l AM 500,000 µg/l DM	500,000 µg/l AM
Flow	Technology	5.5 MGD AM 1.7 MGD AY	5.5 MGD AM 1.7 MGD AY
Groundwater Limits			
Cadmium (total)	Technology	5 µg/l	NA
Lead (total)	Technology	10 µg/l	NA
pH	Water Quality Based	6.5-8.5 standard units	NA
AM means an average monthly limit, DM means a daily maximum limit, and AY means average yearly.			

V. Monitoring Requirements

Ecology requires monitoring, recording, and reporting (WAC 173-216-110) to verify that the treatment process functions correctly, the discharge meets groundwater criteria and that the discharge complies with the permit's effluent limits.

A. Wastewater Monitoring

Ecology details the proposed monitoring schedule under Permit Special Condition S2. Specified monitoring frequencies take into account the quantity and variability of the discharge, the treatment method, past compliance, significance of pollutants, and cost of monitoring. The effluent is monitored at Sampling Station 6653. A composite sampler and continuous meters for pH, conductivity, and flow are at this location. The composite sampler is used to collect 24 hour composite samples of the discharge.

VI. Other Permit Conditions

A. Reporting and Recordkeeping

Ecology based Special Condition S3 on its authority to specify any appropriate reporting and recordkeeping requirements to prevent and control waste discharges (WAC 173-216-110).

B. Operations and Maintenance

Ecology requires dischargers to take all reasonable steps to properly operate and maintain their wastewater treatment system in accordance with state regulations (WAC 173-240-080 and WAC 173-216-110). The facility has prepared and must submit an annual update of an operation and maintenance (O&M) manual for the wastewater facility. If the O&M Manual has been reviewed and no changes have been made, the facility must submit an annual letter to Ecology stating the document has been reviewed.

Implementation of the procedures in the operation and maintenance manual ensures the facility's compliance with the terms and limits in the permit and ensures the facility provides AKART to the waste stream.

C. Solid Waste Control Plan

The 200 Area TEDF could cause pollution of the waters of the state through inappropriate disposal of solid waste. This proposed permit requires that the Permittee maintain a solid waste plan designed to prevent solid waste from causing pollution of the waters of the state (RCW 90.48.080).

D. Non routine and Unanticipated Discharges

Occasionally, this facility may generate wastewater that was not characterized in the permit application because it is not a routine discharge and was not anticipated at the time of application. These wastes typically consist of waters used to pressure-test storage tanks or fire water systems or of leaks from drinking water systems.

The permit authorizes non-routine and unanticipated discharges under certain conditions. The facility must characterize these waste waters for pollutants and examine the opportunities for reuse. Depending on the nature and extent of pollutants in this wastewater and on any opportunities for reuse, Ecology may:

- Authorize the facility to discharge the wastewater.
- Require the facility to treat the wastewater.
- Require the facility to reuse the wastewater.

E. Spill Plan

This facility stores a quantity of chemicals on-site that have the potential to cause water pollution if accidentally released. Ecology can require a facility to develop best management plans to prevent this accidental release [Section 402(a)(1) of the Federal Water Pollution Control Act (FWPCA) and RCW 90.48.080].

The 200 Area TEDF 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 Ecology.

F. Best Management Practices

Best management practices (BMPs) are the actions identified to manage and prevent contamination of stormwater and groundwater. BMPs include 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 also include treatment systems, operating procedures, and practices used to control plant site runoff, spillage or leaks, sludge or waste disposal, and drainage from raw material storage.

G. Effluent Variability Study

The Hanford Tank Waste Treatment and Immobilization Plant (WTP) generates non-radioactive liquid waste streams that discharge to 200 Area TEDF. An engineering study has determined several of these waste streams cannot be fully characterized prior to their initial discharge to the 200 Area TEDF. Therefore, Special Permit Condition S9 requires DOE-RL to conduct a study in at least two seasonal phases (winter and summer) during initial testing and the first year of WTP operational discharges to TEDF for each Significant New Source. A Significant New Source is a new discharge to TEDF, which may not be fully characterized through sample analysis or process knowledge and may have a measurable impact on the 200 Area TEDF effluent. The 200 Area TEDF will determine which new streams are significant. The facility will contact Ecology when it identifies a significant new source discharge. If the facility is not certain if a new discharge is considered a Significant New Source, it must contact Ecology for a determination.

Specific objectives of the statistical evaluation include:

- Determining the overall variability of permitted constituents,
- Evaluating comparability of grab and composite samples, and
- Determining if concentrations of permitted constituents vary with season.

Results of the statistical evaluation will be used by Ecology to verify and/or to modify permit limits of the listed constituents in the effluent if needed. If conditions warrant, Ecology will issue an administrative order or permit modification to the Permittee to modify monitoring or other permit requirements. The results could also be used by

the Permittee to support a request for reduction in monitoring requirements where the requirements appear to be unnecessarily redundant or too extensive.

Effluent Variability Studies will consist of the following minimum requirements; the facility must:

- Collect weekly flow-composited samples for metals, anions, Total Dissolved Solids, and semi-volatile organics (if the collection of flow-composited samples isn't possible, it may collect grab samples).
- Collect five random grab samples per month and analyze for volatile organics and oil and grease.
- Continuously monitor pH, conductivity, and flow.
- Provide statistical evaluators such as the mean concentration, upper 95% confidence level, standard deviation, and coefficient of variation (or their equivalent).

DOE-RL must conduct these studies over the course of one calendar year and submit monitoring results for any significant new source discharge quarterly with Discharge Monitoring Reports. It must provide a final summary report with the results of the evaluation and any relevant or new information or recommendations to Ecology within one year of completion of the study. Ecology will use the report information and results to verify and/or modify the highest allowable concentrations for the discharge limits of the listed constituents in the effluent. Ecology may develop performance-based permit limits using the results of these studies.

The facility may apply to Ecology for a permit modification if the results of this study provide new information, which they were not aware of when submitting the original application.

New waste streams from the WTP will originate at the following facilities:

- Pretreatment Facility
- Low Activity Waste Facility
- Analytical Laboratory
- High Level Waste Facility
- Water Treatment Building, Steam Plant Facility
- Chiller/Compressor Plant
- Wet Chemical Storage Facility
- Maintenance Shop
- Pretreatment Chiller Plant and Cooling Tower
- A Cooling Tower Facility

Discharges from all of these facilities will flow into the Non-Radioactive Liquid Waste (NLD) Tank prior to discharge to the 200 Area TEDF.

H. General Conditions

Ecology bases the standardized general conditions on state law and regulations. They are included in all individual industrial state waste discharge permits issued by Ecology.

VII. Permit Issuance Procedures

A. Permit Modifications

Ecology may modify this permit to impose numerical limits, if necessary, to comply with water quality standards for groundwaters, based on new information from sources such as inspections, effluent monitoring, outfall studies, and effluent mixing studies.

Ecology may also modify this permit to comply with new or amended state regulations.

B. Proposed Permit Issuance

This proposed permit meets all statutory requirements for Ecology to authorize a wastewater discharge. The permit includes limits and conditions to protect human health and aquatic life, and the beneficial uses of waters of the state of Washington. Ecology proposes to issue this permit for a term of five years.

VIII. References for Text and Appendices

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Appendix A--Public Involvement Information

Ecology proposes to reissue a permit to the 200 Area Treated Effluent Disposal Facility (TEDF). The permit includes wastewater discharge limits and other conditions. This fact sheet describes the facility and Ecology's reasons for requiring permit conditions.

Ecology will place a Public Notice of Draft on Sunday, October 30 in the Tri-City Herald to inform the public and to invite comment on the proposed draft State Waste Discharge permit and fact sheet.

The notice:

- Tells where copies of the draft Permit and Fact Sheet are available for public evaluation (a local public library, the closest Regional or Field Office, posted on our website).
- Offers to provide the documents in an alternate format to accommodate special needs.
- Urges people to submit their comments, in writing, before the end of the Comment Period.
- Tells how to request a public hearing of comments about the proposed state waste discharge permit.
- Explains the next step(s) in the permitting process.

Ecology has published a document entitled *Frequently Asked Questions about Effective Public Commenting*, which is available on our website at http://www.ecy.wa.gov/biblio/0307023.html.

Further information may be obtained from Ecology by telephone, 509-372-7917, or by writing to the address listed below.

Water Quality Permit Coordinator
Department of Ecology
3100 Port of Benton Blvd.
Richland, WA 99354

The primary author of this permit and fact sheet is Stacy Nichols.

Appendix B --Your Right to Appeal

You have a right to appeal this permit to the Pollution Control Hearing Board (PCHB) within 30 days of the date of receipt of the final permit. The appeal process is governed by chapter 43.21B RCW and chapter 371-08 WAC. "Date of receipt" is defined in RCW 43.21B.001(2) (see glossary).

To appeal you must do the following within 30 days of the date of receipt of this permit:

- File your appeal and a copy of this permit with the PCHB (see addresses below). Filing means actual receipt by the PCHB during regular business hours.
- Serve a copy of your appeal and this permit on Ecology in paper form - by mail or in person. (See addresses below.) E-mail is not accepted.

You must also comply with other applicable requirements in chapter 43.21B RCW and chapter 371-08 WAC.

ADDRESS AND LOCATION INFORMATION

Street Addresses	Mailing Addresses
Department of Ecology Attn: Appeals Processing Desk 300 Desmond Drive SE Lacey, WA 98503	**Department of Ecology** Attn: Appeals Processing Desk PO Box 47608 Olympia, WA 98504-7608
Pollution Control Hearings Board 1111 Israel RD SW STE 301 Tumwater, WA 98501	**Pollution Control Hearings Board** PO Box 40903 Olympia, WA 98504-0903

Appendix C--Glossary

AKART -- The acronym for "all known, available, and reasonable methods of prevention, control, and treatment." AKART is a technology-based approach to limit pollutants from wastewater discharges, which requires an engineering judgment and an economic judgment. AKART must be applied to all wastes and contaminants prior to entry into waters of the state in accordance with RCW 90.48.010 and 520, WAC 173-200-030(2)(c)(ii), and WAC 173-216-110(1)(a).

Alternate point of compliance -- An alternative location in the groundwater from the point of compliance where compliance with the groundwater standards is measured. It may be established in the groundwater at locations some distance from the discharge source, up to, but not exceeding the property boundary and is determined on a site specific basis following an AKART analysis. An "early warning value" must be used when an alternate point is established. An alternate point of compliance must be determined and approved in accordance with WAC 173-200-060(2).

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

Annual average design flow (AADF) -- average of the daily flow volumes anticipated to occur over a calendar year.

Average monthly discharge limit -- The average of the measured values obtained over a calendar month's time.

Background water quality -- The concentrations of chemical, physical, biological or radiological constituents or other characteristics in or of groundwater at a particular point in time upgradient of an activity that has not been affected by that activity, [WAC 173-200-020(3)]. Background water quality for any parameter is statistically defined as the 95% upper tolerance interval with a 95% confidence based on at least eight hydraulically upgradient water quality samples. The eight samples are collected over a period of at least one year, with no more than one sample collected during any month in a single calendar year.

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 a treatment facility.

Clean water act (CWA) -- The federal Water Pollution Control Act enacted by Public Law 92-500, as amended by Public Laws 95-217, 95-576, 96-483, 97-117; USC 1251 et seq.

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 for the purpose of determining the compliance of a facility with the terms and conditions of its permit or with applicable statutes and regulations. In addition it includes 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% removal requirement. Ecology may conduct additional sampling.

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).

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.

Date of receipt -- This is defined in RCW 43.21B.001(2) as five (5) business days after the date of mailing; or the date of actual receipt, when the actual receipt date can be proven by a preponderance of the evidence. The recipient's sworn affidavit or declaration indicating the date of receipt, which is unchallenged by the agency, constitutes sufficient evidence of actual receipt. The date of actual receipt, however, may not exceed forty-five days from the date of mailing.

Detection limit -- See Method Detection Level.

Dilution factor (DF) -- A measure of the amount of mixing of effluent and receiving water that occurs at the boundary of the mixing zone. Expressed as the inverse of the percent effluent fraction, for example, a dilution factor of ten means the effluent comprises 10% by volume and the receiving water 90%.

Early warning value -- The concentration of a pollutant set in accordance with WAC 173-200-070 that is a percentage of an enforcement limit. It may be established in the effluent, groundwater, surface water, the vadose zone or within the treatment process. This value acts as a trigger to detect and respond to increasing contaminant concentrations prior to the degradation of a beneficial use.

Enforcement limit -- The concentration assigned to a contaminant in the ground water at the point of compliance for the purpose of regulation, [WAC 173-200-020(11)]. This limit assures that a ground water criterion will not be exceeded and that background water quality will be protected.

Engineering report -- A document that thoroughly examines the engineering and administrative aspects of a particular domestic or industrial wastewater facility. The report must 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 a period of time as is feasible.

Ground water -- Water in a saturated zone or stratum beneath the surface of land or below a surface water body.

Industrial user -- A discharger of wastewater to the sanitary sewer that is not sanitary wastewater or is not equivalent to sanitary wastewater in character.

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.

Maximum daily discharge limit -- 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.

Maximum day design flow (MDDF) -- The largest volume of flow anticipated to occur during a one-day period, expressed as a daily average.

Maximum month design flow (MMDF) -- The largest volume of flow anticipated to occur during a continuous 30-day period, expressed as a daily average.

Maximum week design flow (MWDF) -- The largest volume of flow anticipated to occur during a continuous seven (7)-day period, expressed as a daily average.

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

National pollutant discharge elimination system (NPDES) -- The NPDES (Section 402 of the Clean Water Act) is the federal wastewater permitting system for discharges to navigable waters of the United States. Many states, including the state of Washington, have been delegated the authority to issue these permits. NPDES permits issued by Washington State permit writers are joint NPDES/State permits issued under both state and federal laws.

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

Peak hour design flow (PHDF) -- The largest volume of flow anticipated to occur during a one-hour period, expressed as a daily or hourly average.

Peak instantaneous design flow (PIDF) -- The maximum anticipated instantaneous flow.

Point of compliance -- The location in the groundwater where the enforcement limit must not be exceeded and a facility must comply with the Ground Water Quality Standards. Ecology determines this limit on a site-specific basis. Ecology locates the point of compliance in the ground water as near and directly downgradient from the pollutant source as technically, hydrogeologically, and geographically feasible, unless it approves an alternative point of compliance.

Quantitation level (QL) -- Also known as Minimum Level of Quantitation (ML) – The lowest level at which the entire analytical system must give a recognizable signal and acceptable calibration point for the analyte. It is equivalent to the concentration of the lowest calibration standard, assuming that the lab has used all method-specified sample weights, volumes, and cleanup procedures. The QL is calculated by multiplying the MDL by 3.18 and rounding the result to the number nearest to (1, 2, or 5) x 10^n, where n is an integer. (64 FR 30417).
ALSO GIVEN AS:
The smallest detectable concentration of analyte greater than the Detection Limit (DL) where the accuracy (precision & bias) achieves the objectives of the intended purpose. (Report of the Federal Advisory Committee on Detection and Quantitation Approaches and Uses in Clean Water Act Programs Submitted to the U.S. Environmental Protection Agency December 2007).

Reasonable potential -- A reasonable potential to cause a water quality violation, or loss of sensitive and/or important habitat.

Responsible corporate officer -- A president, secretary, treasurer, or vice-president of the corporation in charge of a principal business function, or any other person who performs similar policy- or decision-making functions for the corporation, or the manager of one or more manufacturing, production, or operating facilities employing more than 250 persons or have gross annual sales or expenditures exceeding $25 million (in second quarter 1980 dollars), if authority to sign documents has been assigned or delegated to the manager in accordance with corporate procedures (40 CFR 122.22).

Solid waste -- All putrescible and non-putrescible solid and semi-solid wastes including, but not limited to, garbage, rubbish, ashes, industrial wastes, swill, sewage sludge, demolition and construction wastes, abandoned vehicles or parts thereof, contaminated soils and contaminated dredged material, and recyclable materials.

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 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.

Upset -- An exceptional incident in which there is unintentional and temporary noncompliance with technology-based permit effluent limits because of factors beyond the reasonable control of the Permittee. An upset does not include noncompliance to the extent caused by operational error, improperly designed treatment facilities, lack of preventative maintenance, or careless or improper operation.

Water quality-based effluent limit -- A limit imposed on the concentration of an effluent parameter to prevent the concentration of that parameter from exceeding its water quality criterion after discharge into receiving waters.

Appendix D--Technical Calculations

Enforcement Limit Derivation Summary

Constituent or Characteristic	Enforcement Limit	Point of Compliance	Type of Limit	Rationale/ Method of Derivation
Bis (2-ethylhexyl) phthalate	10 µg/l	Effluent	Water quality-based	Criteria too low to discern (reliably) in laboratory. Limit set at PQL
Total trihalomethanes	20 µg/l	Effluent	Technology-based	Criteria met. Limit set at PQL.
Carbon tetrachloride	5 µg/l	Effluent	Water quality-based	Criteria too low to discern (reliably) in laboratory. Limit set at PQL.
Chloroform	7 µg/l	Effluent	Water quality-based	Limit set at criteria.
Methylene chloride	5 µg/l	Effluent	Technology-based	Criteria met. Limit set at PQL, which also happens to be the criteria.
Arsenic	15 µg/l	Effluent	Water quality-based	Criteria too low to discern (reliably) in laboratory. Limit set at PQL.
Cadmium	5 µg/l	Groundwater	Technology-based	Criteria met. Limit set at PQL.
Chromium	20 µg/l	Effluent	Technology-based	Criteria met. Limit set at PQL. Background groundwater value may exceed criteria.
Iron	300 µg/l	Groundwater	Water quality-based	Criteria normally met. Background groundwater value may exceed criteria.

Constituent or Characteristic	Enforcement Limit	Point of Compliance	Type of Limit	Rationale/ Method of Derivation
Lead	10 µg/l	Groundwater	Technology-based	Criteria met. Limit set at PQL.
Manganese	50 µg/l	Effluent	Technology-based	Criteria met. Limit set at PQL.
Mercury	2 µg/l	Effluent	Technology-based	Criteria met. Limit set at PQL.
Chloride	58 mg/l	Effluent	Technology-based	Criteria met. Limit set at as low a level as source and technology controls can achieve.
Nitrate (as N)	620 µg/l	Effluent	Technology-based	Criteria met. Limit set at as low a level as source and technology controls can achieve.
Total dissolved solids	500 mg/l	Effluent	Water quality-based	Limit set at criteria.
pH, in pH units	6.5 to 8.5	Groundwater and Effluent	Water quality-based	Criteria met. Range provided due to natural variability in groundwater.

Appendix E--Response to Comments