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Environmental Releases for Calendar Year 1998

Prepared for the U.S. Department of Energy

FLUOR DANIEL HANFORD, INC.
Richland, Washington

Hanford Management and Integration Contractor for the
U.S. Department of Energy under Contract DE-AC06-96RL13200

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EXECUTIVE SUMMARY

This report fulfills the annual reporting requirements of U.S. Department of Energy (DOE) Order 5400.1, *General Environmental Protection Program*. It presents summaries of air emissions and liquid effluents released to the environment as well as nonroutine releases during calendar-year 1998 from facilities and activities managed by Fluor Daniel Hanford, Inc. (FDH), and Bechtel Hanford, Inc. (BHI). Besides the summaries, the report also has extensive data on those releases and the radioactive and hazardous substances they contained. These data were obtained from direct sampling and analysis and from estimations deriving from approved release factors.

This report further serves as a supplemental resource to the *Hanford Site Environmental Report* (HSER; PNNL-12088) , which gives a yearly accounting of the major activities and environmental status of the Hanford Site. The HSER documents the Hanford Site's state of compliance with applicable environmental regulations as well as describing the impacts of activities on the Site to the surrounding populace and environment.

Comprehensive data summaries of air emissions and liquid effluents released during 1998 are displayed in Tables ES-1 through ES-5, which represent the following:

- **Table ES-1.** Radionuclide air emissions (detailed data are in Section 2.0)
- **Table ES-2.** Radioactive liquid effluents discharged to the soil (detailed data are in Section 3.0)
- **Table ES-3.** Radionuclides discharged to the Columbia River (detailed data are in Section 3.0)
- **Table ES-4.** Nonradioactive air emissions (detailed data are in Section 2.0)
- **Table ES-5.** Total volumes and flow rates of radioactive liquid effluents discharged to soil in the 600 Area (detailed data are in Section 3.0).

Table ES-1. Radionuclide Air Emissions from FDH- and BHI-Managed Facilities during 1998.

Radionuclide	Release (Ci)[a]
^{3}H (HT)[b]	ND
^{3}H (HTO)[b]	4.9 E+00
^{60}Co	ND
^{90}Sr	3.7 E–04
^{106}Ru	ND
^{113}Sn	ND
^{125}Sb	4.8 E–07
^{129}I	3.1 E–04
^{134}Cs	ND
^{137}Cs	2.3 E–04
^{152}Eu	ND
^{154}Eu	ND
^{155}Eu	ND
^{238}Pu	3.9 E–06
$^{239,240}Pu$	2.1 E–04
^{241}Pu	8.2 E–05
^{241}Am	3.3 E–05

[a] 1 curie = 3.7 E+10 becquerels; ND = not detected (that is, either the radionuclide was not detected in any sample during the year or the average of all the measurements for that given radionuclide or type of radioactivity made during the year was below background levels; takes into account that sampling and analyzing for this radionuclide in some areas is not required because of its minor significance [<10%] to the overall dose potential).

[b] HTO = tritiated water; HT = tritium gas.

Table ES-2. Radioactive Liquid Effluents Discharged to State-Approved Land Disposal Site from FDH- and BHI-Managed Facilities during 1998.

Radionuclide	Release (Ci)[a]
^{3}H	3.2 E+01
^{14}C	ND
^{90}Sr	5.9 E–05
^{99}Tc	2.8 E–05
^{106}Ru	ND
^{125}Sb	ND
^{129}I	ND
^{134}Cs	ND
^{137}Cs	ND
^{226}Ra	6.7 E–07
^{237}Np	1.0 E–05
^{238}Pu	1.3 E–05
$^{239,240}Pu$	1.2 E–05
^{241}Am	1.6 E–05
^{244}Cm	7.4 E–07

[a] 1 curie = 3.7 E+10 becquerels; ND = not detected (that is, either the radionuclide was not detected in any sample during the year or the average of all the measurements for that given radionuclide or type of radioactivity made during the year was below background levels).

Table ES-3. Radionuclides in Liquid Effluents Discharged to the Columbia River from FDH- and BHI-Managed Facilities during 1998.

Radionuclide	Release (Ci)[a]
^{3}H	1.3 E–01
^{60}Co	ND
^{90}Sr	1.3 E–01
^{106}Ru	ND
^{125}Sb	ND
^{134}Cs	ND
^{137}Cs	ND
^{154}Eu	ND
^{155}Eu	ND
^{238}Pu	ND
$^{239,240}Pu$	ND
^{241}Am	5.9 E–07

[a] 1 curie = 3.7 E+10 becquerels; ND = not detected (that is, either the radionuclide was not detected in any sample during the year or the average of all the measurements for that given radionuclide or type of radioactivity made during the year was below background levels).

Table ES-4. Nonradioactive Constituents in Air Emissions from FDH- and BHI-Managed Facilities during 1998.

Constituent	Quantities (kg)
Particles (PM_{10} and $PM_{2.5}$[a])	4.39 E+03
Sulfur oxides (SO_x)	4.45 E+04
Nitrogen oxides (NO_x)	5.13 E+04
Carbon monoxide (CO)	1.33 E+04
Lead	6.65 E+00
Volatile organic compounds	1.92 E+03
Ammonia	6.71 E+03
Beryllium	1.36 E–01
Cadmium	6.83 E+00
Carbon tetrachloride	8.00 E+00
Chromium	4.15 E+00
Cobalt	3.92 E+00
Copper	9.00 E+00
Formaldehyde	1.31 E+01
Selenium	1.23 E+00

[a] PM_{10} and $PM_{2.5}$ refer to particle diameters, which are, respectively, 10μm and 2.5 μm; PM = particulate matter.

Table ES-5. Total Volumes and Flow Rates of Radioactive Liquid Effluents Discharged to State-Approved Land Disposal Site from FDH-Managed Facilities during 1997 and 1998.[a]

Stream code[b]	EDP code[c]	Effluent source	Disposal site	Volume (gal [L][d])		Average flow rate (gpm [Lpm])	
				1997	1998	1997	1998
ETF	H129	200 Area Effluent Treatment Facility	616-A Crib	1.5 E+07 (5.5 E+07)	2.8 E+07 (1.1 E+08)	29 (110)	53 (200)

[a] These discharges do not include discharges to the 200 East Area Treated Effluent Disposal Facility (TEDF) because they meet drinking water standards. BHI currently does not manage any facilities that discharge radioactive liquid effluents to the 616-A Crib in the 600 Area.

[b] Stream code represents the specific liquid effluent source, which in this case is the 200 Area Effluent Treatment Facility (ETF).

[c] EDP code = electronic data processing code.

[d] 1 gal = 3.785 L

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GLOSSARY

BHI	Bechtel Hanford, Incorporated
CERCLA	*Comprehensive Environmental Response, Compensation, and Liability Act of 1980*
CFR	Code of Federal Regulations
DCG	derived concentration guide
DOE	U.S. Department of Energy
DOE-RL	U.S. Department of Energy, Richland Operations Office
DOH	State of Washington Department of Health
Ecology	State of Washington Department of Ecology
EDE	effective dose equivalent
EDP Code	electronic data processing code
EP	external publication
EPA	U.S. Environmental Protection Agency
ERDF	Environmental Restoration Disposal Facility
ESPC	energy savings performance contract
FDH	Fluor Daniel Hanford, Incorporated
FFTF	Fast Flux Test Facility
HEPA	high-efficiency particulate air (filter)
HT	tritium gas
HTO	tritiated water
LWDF	Liquid Waste Disposal Facility
MASF	Maintenance and Storage Facility
MEI	maximally exposed individual
mrem	millirem (unit of dose)
ND	not detected
NPDES	National Pollutant Discharge Elimination System
PHMC	Project Hanford Management Contract
PFP	Plutonium Finishing Plant
PSD	Prevention of Significant Deterioration
PNNL	Pacific Northwest National Laboratory
POTW	publicly owned treatment works
ppm	parts per million
PUREX	plutonium-uranium extraction
RCRA	*Resource Conservation and Recovery Act of 1976*
REDOX	Reduction-Oxidation
RQ	reportable quantity
SALDS	State-Approved Land Disposal Site
TEDF	Treated Effluent Disposal Facility
TRIGA	Test Reactor and Isotope Production, General Atomics
TRU	transuranic
TRUSAF	224-T Transuranic Waste Storage and Assay Facility
UO_3	uranium trioxide

GLOSSARY (cont)

WAC	Washington Administrative Code
WESF	Waste Encapsulation Storage Facility
WMH	Waste Management Federal Services of Hanford, Incorporated
WPPSS	Washington Public Power Supply System
WSCF	Waste Sampling and Characterization Facility

ENVIRONMENTAL RELEASES FOR CALENDAR YEAR 1998

1.0 INTRODUCTION

Fluor Daniel Hanford, Incorporated (FDH), and Bechtel Hanford, Incorporated (BHI), are responsible for monitoring radioactive and nonradioactive material in liquid effluents and in air emissions released into the environment from U.S. Department of Energy (DOE) facilities and activities they manage on the Hanford Site. This report documents releases during 1998, thereby fulfilling the annual reporting requirements of DOE Order 5400.1. Release data are presented in both summary and detailed forms.

The report also supplements information in the *Hanford Site Environmental Report for Calendar Year 1998* (HSER; PNNL-12088) published by Battelle's Pacific Northwest National Laboratory (PNNL). The HSER gives a public accounting of activities on the Hanford Site that affect the environment, as well as summarizing the degree of Site compliance with environmental regulations.

1.1 TYPES AND LOCATIONS OF RELEASES

Radioactive liquid effluents and air emissions were released in 1998 from FHD- and BHI-managed facilities in the 100, 200, 300, 400, and 600 Areas. Radioactive liquid effluents were discharged to the soil in the 600 Area and to the Columbia River along the 100-N and 100-K Areas.

Major potential sources of nonradioactive air emissions of industrial origin are (1) fossil-fuel combustion emissions from the operation of powerhouses, package boilers, and portable generators; (2) emissions of nitrogen oxides, ammonia, and volatile organic compounds from the 242-A Evaporator, the 200 Area Effluent Treatment Facility (ETF), and tanks containing radioactive liquid waste; and (3) carbon tetrachloride emissions from the CCl_4 Vapor Extraction Project. Most of these sources are located in the 200 and 300 Areas. In March 1997, the Department of Energy issued an Energy Savings Performance Contract (ESPC) to replace the Hanford Site's coal and oil fired boilers with smaller, cleaner-operating, and more energy-efficient diesel- and natural-gas-fired boilers. In December 1997, operation of the 284-E and 284-W powerhouses ceased and 14 new diesel-fired package boilers came on line in the 200 Areas. In March 1998, operation of the 300 Area powerhouse ceased.

Wastewater in the 300 Area is sent to the 300 Area Treated Effluent Disposal Facility (TEDF) for treatment before being discharged to the Columbia River via a permitted outfall. The 100-N Sewage Treatment Lagoon receives sanitary wastewater from 100-N facilities and from failed septic systems in the 100-K and 200 Areas, the wastewater from which is collected in and delivered by tanker trucks. Sanitary wastewater in the 100-DR and 100-K Areas is discharged into septic tanks or drain fields. In the 200 Areas, sanitary wastewater is discharged to several septic tanks or subsurface disposal systems located there. Historically, sanitary wastewater in the 300 Areas was discharged to a septic-tank trench system there, but is now, including all of 1998, routed

to the city of Richland's publicly owned treatment works (POTW). Sanitary wastewater in the 400 Area was previously discharged to a septic tank and surface discharge wetlands, but starting in April 1997 this wastewater was rerouted to the Washington Public Power Supply System (WPPSS) sewage treatment plant.

On March 29, 1996, the Solid Waste Landfill in the 200 Areas was closed. Leachate from this now-closed landfill is collected, transported, and treated at the 300 Area TEDF. Since December 29, 1995, nonradioactive, nonhazardous solid waste has been disposed of at the city of Richland landfill, adjacent to the southern edge of the Hanford Site boundary. Since February 1996, medical waste has been shipped to Waste Management of Kennewick for landfill disposal; asbestos has been shipped to Basin Disposal, Inc., in Pasco, and to the Environmental Restoration Disposal Facility (ERDF), on the Hanford Site, for landfill disposal. Since March 1996, nonregulated containerized waste has been shipped to Waste Management of Kennewick.

1.2 ENVIRONMENTAL RELEASE LIMITS AND GUIDELINES

This section presents environmental release standards for radiological constituents. Relevant standards for nonradioactive constituents also are included in this section. Guidelines are applicable for constituents when the constituents (1) affect the release and transport of radioactive constituents, (2) are necessary to meet any issued federal, state, or local permit, or (3) are necessary to meet any federal, state, or local regulations or guidelines prescribed by the U.S. Department of Energy, Richland Operations Office (DOE-RL).

1.2.1 Limits for Radioactive Releases

Quantities of radionuclides in air emissions and liquid effluents from Hanford Site facilities are governed by DOE Order 5400.5, *Radiation Protection of the Public and the Environment.* Quantities of radionuclides in air emissions are regulated by Title 40 of the Code of Federal Regulations (CFR) Part 61, Subpart H, and by the Washington Administrative Code (WAC) Chapter 246-247. The effective dose equivalent (EDE) received by any member of the offsite public from all effluents and emissions released during routine operations on the Hanford Site is not to exceed 100 mrem/yr (1 mSv/yr). For occasional exposure from noncontinuous releases, the EDE is not to exceed 500 mrem/yr (5 mSv/yr). From the air pathway only, the EDE to any member of the public is not to exceed 10 mrem/yr (0.1 mSv/yr). The derived concentration guide (DCG) values in DOE Order 5400.5 apply at the location of actual exposure to members of the public. DCG values are not limits, and are therefore used for comparison purposes only.

The 300 Area TEDF is also regulated by an aquatic-lands sewer outfall lease (Lease Number 20-012257) from the U.S. Department of Natural Resources. Limits for radioactive constituents include 15 pCi/L (5.5 E-04 Bq/m^3) alpha, 50 pCi/L (1.9 E+03 Bq/m^3) beta, and 20,000 pCi/L (7.4 E+05 Bq/m^3) tritium.

In each annual issuance of HSER, PNNL assesses the radiological impacts to the public that result from Hanford Site operations, in accordance with DOE Orders 5400.1, 5400.5, and 5480.1B. Effluent data in this report (that is, HNF-EP-0527-8) and in the *Radionuclide Air Emissions Report for the Hanford Site Calendar Year 1998* (DOE/RL-99-41) are used by PNNL to estimate offsite

radiological doses. These values and their related compliance determinations to federal and state dose standards are also published in HSER.

1.2.2 Limits for Nonradioactive Releases

These following regulations, as applicable, govern nonradioactive constituents in air emissions and liquid effluents: *Clean Water Act of 1977*, *Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) of 1980; Resource Conservation and Recovery Act (RCRA) of 1976; Safe Drinking Water Act of 1974; Toxic Substances Control Act of 1976;* and the State of Washington regulations WAC 173-216, 173-218, 173-272, 173-303, 173-400, and 173-460; and the Benton County Clean Air Authority *Regulation 1*.

Liquid effluent streams discharging to the Columbia River are regulated by the National Pollutant Discharge Elimination System. Limits for specific constituents are identified in the permits issued by the U.S. Environmental Protection Agency (EPA).

Liquid effluent discharges to the soil column are permitted by the State of Washington Departments of Ecology (Ecology) and Health (DOH), with the exception of storm-water discharges. Limits for specific constituents are specified for each of the discharge permits issued by Ecology and DOH. A state permit application for storm-water discharges to the soil column has been submitted; its issuance is expected in the early part of 1999.

2.0 AIR EMISSIONS

During 1998, radioactive and nonradioactive air emissions were released to the atmosphere from facilities and activities managed by FDH and BHI. Release data for each type of emission are discussed separately.

2.1 RADIONUCLIDE AIR EMISSIONS

Radionuclide air emissions from actively ventilated point sources (that is, emissions forcibly discharged, usually, through stacks or vents by the use of exhaust fans) having a potential to emit radioactive material to the atmosphere are routinely monitored. In the 200 Areas, stacks and vents are designated by a number that has a "291" or "296" prefix, depending on stack height; that is, 61-m- (200-ft-) tall stacks are designated by the"291" prefix and all other stacks and vents are designated by the "296" prefix. In the 100, 300, and 400 Areas, stacks and vents usually are identified by facility designations.

Radionuclide air emissions from sources other than actively ventilated point sources are monitored as diffuse and fugitive emissions. Passively vented point sources are exceptions to these types of sources; examples of them include the retired HEPA filters at B Plant (stack 296-B-2) and single-shell tank vents. Diffuse and fugitive emissions are monitored collectively by the Near-Facility Monitoring Program and the Environmental Surveillance Program. Monitoring data from these sources is not presented in this report but can be obtained from the *Radionuclide Air Emissions Report for the Hanford Site, Calendar Year 1998* (DOE/RL-99-41), the *Hanford Site Environmental Monitoring Report for Calendar Year 1998* (PNNL-12088), and the *Hanford Site Near-Facility Environmental Monitoring Data Report for Calendar Year 1998* (PNNL-12088, APP. 2).

2.1.1 Mitigation of Radionuclide Air Emissions

The following are examples of methods used to remove radionuclides from air emissions: (1) high-efficiency particulate air (HEPA) filters, (2) sand filters, (3) charcoal absorbers (for iodine removal), (4) water scrubbers, (5) deep-bed fiberglass filters, and (6) fiberglass prefilters. Generally at least one stage, but often several stages, of HEPA filtration is used as the final particulate removal method before air is discharged to the atmosphere. All in-place HEPA filters are required to have an efficiency of 99.95% in removing airborne particles with a median aerodynamic-equivalent diameter of 0.3 μm. This level of efficiency is assured by routine testing of the HEPA filters. These filtration systems have proven effective at mitigating Hanford Site radioactive emissions, as indicated by release data showing radionuclides in many cases at concentrations near or below the lowest limits of analytical detection.

2.1.2 Radionuclide Air Emissions Data

Release data on radionuclide air emissions from facilities, by operating area, are in Table 2-1. Tables 2-2 and 2-3 present data on radionuclide air emissions from individual stacks and vents. These data include radionuclides or types of radioactivity detected or sampled for as well as their average concentrations and total activities.

Emissions from actively ventilated point sources are documented in this report when the following criteria were met during 1998: (1) the point source requires continuous monitoring or periodic confirmatory measurements in accordance with 40 CFR 61, Subpart H, or with WAC 246-247, (2) the point source is registered with DOH, and (3) the point source normally has radionuclide emissions or potentially had radionuclide emissions. Point sources not included in this section did not meet those criteria or their air emissions were not forcibly discharged because, for example, these sources were passively ventilated, sealed off, or deactivated. Air emissions forcibly discharged by exhaust fans are sampled only if radioactive material had the potential to be released.

2.2 NONRADIOACTIVE AIR EMISSIONS

In 1998, nonradioactive air emissions were discharged from the following facilities: East Tank Farms, 242-A Evaporator, West Tank Farms, the CCl_4 Vapor Extraction Project in the 200 West Area, the 300 Area powerhouse, and the 300 Area natural-gas-fired package boiler. The 284-E Powerhouse was permanently shut down in December 1997. Data on emissions from these sources are shown in Table 2-4.

Powerhouse and package boiler emissions were estimated using information on the quantity and type of fuel consumed and applying formulas approved by the EPA (EPA 450/4-90-003). Table 2-5 contains a summary of the type and quantity of fuel consumed by the package boilers and the powerhouse.

Table 2-1. Radionuclide Air Emissions from FDH- and BHI-Managed Facilities during 1998.

Radionuclide	Release, Ci[a]					
	100 Area	200 East Area	200 West Area	300 Area	400 Area	Total
^{3}H (as HT)	NM	NM	NM	ND	ND	ND
^{3}H (as HTO)	NM	NM	NM	7.3 E–01	4.2 E+00	4.9 E+00
^{60}Co	ND	ND	ND	ND	NM	ND
^{90}Sr	1.7 E–05[b]	1.2 E–04[b]	2.3 E–04[b]	8.7 E–07[b]	NM	3.7 E–04[b]
^{106}Ru	ND	ND	NM	NM	NM	ND
^{113}Sn	ND	ND	NM	NM	NM	ND
^{125}Sb	ND	4.8 E–07	NM	NM	NM	4.8 E–07
^{129}I	NM	3.1 E–04	NM	4.6 E–08	NM	3.1 E–04
^{134}Cs	ND	ND	ND	NM	NM	ND
^{137}Cs	3.0 E–05	1.9 E–04	3.2 E–09	5.7 E–07	5.5 E–06[c]	2.3 E–04[c]
^{152}Eu	ND	ND	ND	NM	NM	ND
^{154}Eu	ND	ND	ND	NM	NM	ND
^{155}Eu	ND	ND	ND	NM	NM	ND
U[d]	NM	NM	NM	ND[d]	NM	ND
^{238}Pu	5.2 E–07	7.9 E–10	3.4 E–06	1.7 E–09	NM	3.9 E–06
$^{239,240}Pu$	3.4 E–06[e]	1.1 E–06[e]	2.0 E–04[e]	1.4 E–08[e]	5.0 E–07[e]	2.1 E–04[e]
^{241}Pu	3.8 E–05	2.9 E–08	4.4 E–05	NM	NM	8.2 E–05
^{241}Am	2.0 E–06	5.0 E–07	3.0 E–05	1.9 E–08	NM	3.3 E–05
^{243}Am	NM	NM	NM	NM	NM	NM

[a] Ci = curie; 1 Ci = 3.7 E+10 becquerels (Bq); ND = not detected (that is, either the radionuclide was not detected in any sample during the year or the average of all the measurements for that given radionuclide or type of radioactivity made during the year was below background levels); NM = not measured, because this nuclide does not present a significant estimated contribution (that is, >10%) to the offsite dose potential.

[b] This value includes total beta release data. Total beta results assumed to be ^{90}Sr for dose calculations.

[c] This value includes total beta release data. Total beta results assumed to be ^{137}Cs for dose calculations from FFTF emissions.

[d] Determined from total alpha measurements. Assumed to be depleted uranium consisting of 63.478 Ci% ^{238}U, 0.821 Ci% ^{235}U, and 35.701 Ci% ^{234}U, which are based on 99.797 Wt% ^{238}U, 0.200 Wt% ^{235}U, and 0.003 Wt% ^{234}U.

[e] This value includes total alpha release data. Total alpha results assumed to be $^{239,240}Pu$ for dose calculations.

Table 2-2. Radionuclide Air Emissions from Major Point Sources at FDH- and BHI-Managed Facilities during 1998.

(major point sources have the potential of >0.1 mrem/yr EDE to nearest offsite resident)[a] (4 sheets)

Source[b] (Facility; Contractor; EDP code)	Discharge height (ft [m])	Emission control[c] (stages)	Total flow (ft^3 [m^3])	Radionuclide or type of radioactivity[d]	Average concentration ($\mu Ci/mL$)[e]	Annual emissions (Ci)[e]
200 East Area Point Sources						
291-A-1 (PUREX; FDH; A552, A511, A007)	200 (61)	HEPA (3)	4.1 E+09 (1.2 E+08)	^{90}Sr ^{106}Ru ^{113}Sn ^{125}Sb ^{129}I ^{134}Cs ^{137}Cs ^{238}Pu $^{239,240}Pu$ ^{241}Pu ^{241}Am	2.6 E–15 ND ND ND 2.1 E–12 ND 8.6 E–15 3.5 E–18 4.9 E–16 1.3 E–16 1.9 E–15	5.8 E–07 ND ND ND 2.8 E–04 ND 1.9 E–06 7.9 E–10 1.1 E–07 2.9 E–08 4.2E–07
291-B-1 (B Plant; FDH; B691) Note: Deactivated and closed on August 31, 1998.	200 (61)	HEPA (2)	1.4 E+10 (4.0 E+08)	^{90}Sr ^{134}Cs ^{137}Cs ^{238}Pu $^{239,240}Pu$ ^{241}Am	1.2 E–14 ND 2.7 E–13 ND 1.5 E–15 1.3 E–16	6.1 E–06 ND 1.4 E–04 ND 7.8 E–07 6.8 E–08
296-B-1 (B Plant; FDH; B001)	90 (27.4)	HEPA (2)	3.3 E+09 (9.4 E+07)	^{90}Sr ^{125}Sb $^{239,240}Pu$ ^{241}Am	2.5 E–15 1.1 E–15 1.3 E–17 9.5 E–17	1.9 E–07 1.0 E–07 1.3 E–09 9.0 E–09
296-B-10 (WESF; FDH; B748)	75 (22.9)	HEPA (2)	1.1 E+10 (3.0 E+08)	^{90}Sr ^{125}Sb ^{134}Cs ^{137}Cs total α	3.0 E–13 9.8 E–16 ND 1.1 E–13 1.2 E–15	1.1 E–04 3.8 E–07 ND 4.3 E–05 4.6 E–07
296-A-12 (East Tank Farms; FDH; E058)	150 (45.7)	HEPA (2)	0	did not operate		
296-A-17 *backup: 296-P-26* (East Tank Farms; FDH; E059, E026, E027, and *E039, E040, E041*)	50 (15.2)	HEPA (2)	3.6 E+08 (1.0 E+07)	^{90}Sr ^{106}Ru ^{113}Sn ^{125}Sb ^{129}I ^{134}Cs ^{137}Cs ^{238}Pu $^{239,240}Pu$ ^{241}Am	6.3 E–15 ND ND ND 2.5 E–12 ND 7.5 E–14 ND 1.7 E–17 9.0 E–17	9.1 E–08 ND ND ND 2.9 E–05 ND 1.1 E–06 ND 2.4 E–10 1.3 E–09

Table 2-2. Radionuclide Air Emissions from Major Point Sources at FDH- and BHI-Managed Facilities during 1998.

(major point sources have the potential of >0.1 mrem/yr EDE to nearest offsite resident)[a] (4 sheets)

Source[b] (Facility; Contractor; EDP code)	Discharge height (ft [m])	Emission control[c] (stages)	Total flow (ft^3 [m^3])	Radionuclide or type of radioactivity[d]	Average concentration ($\mu Ci/mL$)[e]	Annual emissions (Ci)[e]
296-A-25 (East Tank Farms; FDH; E080)	9.8 (3.0)	HEPA (2)	6.3 E+07 (1.8 E+06)	***^{90}Sr***	1.6 E–15	3.5 E–09
				^{134}Cs	ND	ND
				^{137}Cs	9.2 E–13	2.0 E–06
				^{238}Pu	ND	ND
				$^{239,240}Pu$	1.6 E–17	3.6 E–11
				^{241}Am	5.4 E–17	1.2 E–10
296-A-42 (East Tank Farms; FDH; E147, E152)	55 (16.8)	HEPA (2)	2.9 E+08 (8.2 E+06)	***^{90}Sr***	ND	ND
				^{137}Cs	ND	ND
				$^{239,240}Pu$	ND	ND
				total β	2.5 E–15	2.8 E–08
296-B-28 (West Tank Farms; FDH; E886)	11 (3.4)	HEPA (2)	8.4 E+07 (2.4 E+06)	^{90}Sr	ND	ND
				^{134}Cs	ND	ND
				^{137}Cs	7.0 E–16	2.3 E–09
				^{238}Pu	ND	ND
				$^{239,240}Pu$	1.7 E–17	5.8 E–11
				^{241}Am	9.4 E–17	3.1 E–10
296-C-5 (East Tank Farms; FDH; E069)	48 (14.6)	HEPA (2)	1.9 E+09 (5.3 E+07)	***^{90}Sr***	1.6 E–15	1.0 E–07
				^{137}Cs	3.3 E–15	2.1 E–07
				^{238}Pu	ND	ND
				$^{239,240}Pu$	5.3 E–18	3.4 E–10
				^{241}Am	4.3 E–17	2.7 E–09
296-C-6 (East Tank Farms; FDH; E083, E084)	18.7 (5.7)	HEPA (2)	2.8 E+07 (7.9 E+05)	^{90}Sr	ND	ND
				^{137}Cs	6.9 E–16	7.5 E–10
				$^{239,240}Pu$	ND	ND
				^{241}Am	6.6 E–17	7.1 E–11
296-P-16 (East Tank Farms; FDH; E068)	15 (4.6)	HEPA (2)	1.4 E+09 (3.9 E+07)	***^{90}Sr***	3.1 E–15	1.6 E–07
				^{134}Cs	ND	ND
				^{137}Cs	1.0 E–14	5.1 E–07
				^{238}Pu	ND	ND
				$^{239,240}Pu$	8.9 E–17	4.4 E–09
				^{241}Am	7.3 E–17	3.6 E–09
296-P-32 (East Tank Farms; FDH; E401)	15 (4.6)	HEPA (2)	1.1 E+05 (3.0 E+03)	***^{90}Sr***	1.7 E–13	5.2 E–10
				^{241}Am	2.6 E–14	8.0 E–11
				total β	1.1 E–12	4.6 E–09
296-P-33 (East Tank Farms; FDH; E307)	15 (4.6)	HEPA (2)	1.0 E+06 (3.0 E+04)	***^{90}Sr***	7.9 E–15	3.2 E–10
				^{137}Cs	ND	ND
				$^{239,240}Pu$	ND	ND

Table 2-2. Radionuclide Air Emissions from Major Point Sources at FDH- and BHI-Managed Facilities during 1998.

(major point sources have the potential of >0.1 mrem/yr EDE to nearest offsite resident)[a] (4 sheets)

Source[b] (Facility; Contractor; EDP code)	Discharge height (ft [m])	Emission control[c] (stages)	Total flow (ft^3 [m^3])	Radionuclide or type of radioactivity[d]	Average concentration ($\mu Ci/mL$)[e]	Annual emissions (Ci)[e]
296-P-34 (East Tank Farms; FDH; E308)	15(4.6)	HEPA (2)	1.1 E+07 (3.1 E+05)	***^{90}Sr***	ND	ND
				^{137}Cs	ND	ND
				$^{239,240}Pu$	3.5 E–17	1.5 E–11
				^{241}Am	2.1 E–16	8.7 E–11
				total β	2.6 E–15	1.1 E–09
200 West Area Point Sources						
296-S-22 (West Tank Farms; FDH; W880)	12 (3.7)	HEPA (2)	6.9 E+07 (2.0 E+06)	***^{90}Sr***	1.5 E–16	4.2 E–10
				^{134}Cs	ND	ND
				^{137}Cs	2.5 E–16	6.9 E–10
				^{238}Pu	6.8 E–18	1.9 E–11
				$^{239,240}Pu$	1.1 E–17	3.1 E–11
				^{241}Am	8.0 E–17	2.2 E–10
296-T-18 (West Tank Farms; FDH; W882)	12 (3.7)	HEPA (2)	1.2 E+08 (3.5 E+06)	^{90}Sr	1.6 E–16	7.7 E–10
				^{134}Cs	ND	ND
				^{137}Cs	5.1 E–16	2.5 E–09
				^{238}Pu	ND	ND
				$^{239,240}Pu$	5.5 E–17	2.7 E–10
				^{241}Am	5.7 E–17	2.8 E–10
296-W-4 (WRAP; FDH; W123)	47 (14.2)	HEPA (2)	7.9 E+09 (2.2 E+08)	***^{90}Sr***	1.8 E–16	5.5 E–08
				^{137}Cs	ND	ND
				$^{239,240}Pu$	1.1 E–17	3.3 E–09
				^{241}Am	3.1 E–17	9.5 E–09
291-Z-1 (PFP; FDH; Z810)	200 (61)	HEPA (1-3)	1.5 E+11 (4.3 E+09)	^{238}Pu	6.7 E–16	3.4 E–06
				$^{239,240}Pu$	3.2 E–14	1.6 E–04
				^{241}Pu	8.8 E–15	7.2 E–07
				^{241}Am	6.0 E–15	4.7 E–05
300 Area Point Sources						
EP-324-01-S (324 Bldg.; FDH; F025, F028)	157 (48)	HEPA	3.5 E+10 (1.0 E+09)	^{3}H (as HTO)[f]	2.2 E–10	2.5 E–01
				^{90}Sr	2.3 E–17	2.7 E–08
				^{137}Cs	ND	ND
				^{238}Pu	ND	ND
				$^{239,240}Pu$	ND	ND
				^{241}Am	1.1 E–17	1.3 E–08
EP-327-01-S (327 Bldg.;FDH; F026, F604, F029)	46 (14)	HEPA	2.6 E+10 (7.3 E+08)	^{3}H (as HTO)[f]	5.7 E–10	4.8 E–01
				^{90}Sr	2.9 E–16	2.5 E–07
				^{137}Cs	6.5 E–16	5.6 E–07
				^{238}Pu	2.0 E–18	1.7 E–09
				$^{239,240}Pu$	1.5 E–17	1.3 E–08
				^{241}Am	5.8 E–18	5.0 E–09

Table 2-2. Radionuclide Air Emissions from Major Point Sources at FDH- and BHI-Managed Facilities during 1998.

(major point sources have the potential of >0.1 mrem/yr EDE to nearest offsite resident)[a] (4 sheets)

Source[b] (Facility; Contractor; EDP code)	Discharge height (ft [m])	Emission control[c] (stages)	Total flow (ft^3 [m^3])	Radionuclide or type of radioactivity[d]	Average concentration (μCi/mL)[e]	Annual emissions (Ci)[e]
340-NT-EX (340 Waste Handling; FDH; F002, F007, F602)	18 (5.5)	HEPA (2)	9.7 E+08 (2.7 E+07)	^{129}I	1.5 E–15	4.6 E–08
				^{137}Cs	2.2 E–16	6.8 E–09
				^{238}Pu	ND	ND
				$^{239,240}Pu$	1.7 E–17	5.3 E–10
				^{241}Am	1.1 E–17	1.1 E–09

[a] Nearest offsite receptors who differed from MEI were used to determine state of compliance of each point source with 40 CFR 61, *National Emission Standards for Hazardous Air Pollutants,* Subpart H; EDE = effective dose equivalent.

[b] EDP code = the electronic data processing code, which identifies the sampler; FDH = Fluor Daniel Hanford, Inc.; BHI = Bechtel Hanford, Inc.

[c] Efficiencies are ≥99.95% for HEPA; ≥95% for charcoal; ≥99.8% for sand filter; 0% for no emission control; HEPA = high-efficiency particulate air filter.

[d] Radionuclides distinguished by both italic and bold typeface are required by 40 CFR 61, Subpart H, to be sampled and analyzed.

[e] Ci = curie; 1 Ci = 3.7+10 becquerels (Bq); μCi/mL = 3.7 E+10 Bq/m^3; ND = not detected (that is, either the radionuclide was not detected in any sample during the year or the average of all the measurements for that given radionuclide or type of radioactivity made during the year was below background levels).

[f] HTO is tritium as condensable water vapor; HT is tritium as incondensable gas.

Table 2-3. Radionuclide Air Emissions
from Minor Point Sources at FDH- and BHI-Managed Facilities during 1998.
(minor point sources have the potential of <0.1 mrem/yr EDE to nearest offsite resident)[a] (5 sheets)

Source[b] (Facility; Contractor; EDP code)	Discharge height (ft [m]))	Emission control[c]	Total flow (ft^3 [m^3])	Radionuclide of type of radioactivity	Average concentration ($\mu Ci/mL$)[d]	Annual emissions (Ci)[d]
100 Area						
116-N (100-N Area; BHI; Y211,Y212,Y213)	201 (61.3)	HEPA, charcoal	1.7 E+10 (4.9 E+08)	^{90}Sr ^{137}Cs ^{238}Pu $^{239,240}Pu$ ^{241}Am	1.8 E–15 2.2 E–16 1.1 E–17 3.5 E–17 1.7 E–16	1.2 E–06 1.5 E–07 7.6 E–09 2.4 E–08 1.2 E–07
107-N (100-N Area; BHI; Y265, Y266)	39 (12)	HEPA	2.1 E+09 (6.0 E+07)	total α total β	ND 3.4 E–16	ND 2.8 E–08
RCF-1-EX (100N Area; BHI; Y215)	9.8 (3)	HEPA	3.6 E+07 (1.0 E+05)	total α total β	7.8 E–17 1.4 E–15	1.0 E–10 2.0 E–09
105-KE Basin (100-K Area; FDH; Y245-Y248)	42 (12.8)	none	2.4 E+10 (6.7 E+08)	^{90}Sr ^{137}Cs ^{238}Pu $^{239,240}Pu$ ^{241}Pu ^{241}Am	1.9 E–14 3.5 E–14 6.9 E–16 4.2 E–15 5.1 E–14 2.6 E–15	1.4 E–05 2.6 E–05 5.1 E–07 3.1 E–06 3.8 E–05 1.9 E–06
105-KW Basin (100-K Area; FDH; Y234 - Y236)	42 (12.8)	none	1.1 E+10 (3.0 E+08)	^{90}Sr ^{137}Cs ^{238}Pu $^{239,240}Pu$ ^{241}Pu ^{241}Am	1.3 E–15 1.2 E–14 1.9 E–18 7.1 E–17 1.0 E–15 1.3 E–16	4.2 E–07 3.9 E–06 6.1 E–10 2.3 E–08 3.4 E–07 4.1 E–08
1706-KER (100-K Area; FDH; Y244)	3 (0.9)	HEPA	0	did not operate		
1706-KE (100-K Area; FDH;Y243)	25 (7.6)	HEPA	2.1 E+09 (5.8 E+07)	total α total β	2.4 E–15 9.7 E–15	1.9 E–07 7.8 E–07
200 East Area						
296-A-13 (East Tank Farms; FDH; E052)	125 (38.1)	HEPA	0	did not operate		
296-A-18 (East Tank Farms; FDH; E060)	15 (4.6)	HEPA	0	did not operate		
296-A-19 (East Tank Farms; FDH; E061)	15 (4.6)	HEPA	2.4 E+08 (6.8 E+06)	total α total β	2.8 E–16 1.6 E–15	2.6 E–09 1.4 E–08
296-A-20 (East Tank Farms; FDH; E197)	24 (7.3)	HEPA	0	did not operate		

Table 2-3. Radionuclide Air Emissions
from Minor Point Sources at FDH- and BHI-Managed Facilities during 1998.
(minor point sources have the potential of <0.1 mrem/yr EDE to nearest offsite resident)[a] (5 sheets)

Source[b] (Facility; Contractor; EDP code)	Discharge height (ft [m]))	Emission control[c]	Total flow (ft^3 [m^3])	Radionuclide of type of radioactivity	Average concentration ($\mu Ci/mL$)[d]	Annual emissions (Ci)[d]
296-A-26 (East Tank Farms; FDH; E297)	31 (9.4)	HEPA	8.4 E+08 (2.4 E+07)	total α total β	ND 5.9 E–16	ND 1.9 E–08
296-A-27 (East Tank Farms; FDH; E270, E933, E934)	12 (3.7)	HEPA	5.0 E+08 (1.4 E+07)	total α total β	8.3 E–17 4.8 E–15	2.3 E–09 1.3 E–07
296-A-28 (East Tank Farms; FDH; E272)	12 (3.7)	HEPA	1.8 E+09 (5.1 E+07)	total α total β	3.3 E–16 2.6 E–15	3.6 E–08 1.7 E–07
296-A-29 (East Tank Farms; FDH; E901)	12 (3.7)	HEPA	3.8 E+08 (1.1 E+07)	total α total β	ND 1.8 E–15	ND 3.7 E–08
296-A-30 (East Tank Farms; FDH; E903)	12 (3.7)	HEPA	2.4 E+09 (6.8 E+07)	total α total β	3.4 E–16 2.3 E–15	4.2 E–08 2.8 E–07
296-A-40 (East Tank Farms; FDH; E013, E028, E029)	13.4 (4.1)	HEPA	4.7 E+08 (1.3 E+07)	^{90}Sr ^{129}I ^{137}Cs ^{238}Pu $^{239,240}Pu$ ^{241}Am	ND 1.0 E–13 1.7 E–16 ND 1.6 E–17 5.5 E–17	ND 1.5 E–06 2.8 E–09 ND 2.6 E–10 9.0 E–10
296-A-41 (East Tank Farms; FDH; E015)	29 (8.9)	HEPA	4.4 E+09 (1.1 E+08)	total α total β	ND 6.1 E–16	ND 9.6 E–08
296-A-43 (East Tank Farms; FDH; E148)	55 (16.8)	HEPA	3.8 E+08 (1.1 E+07)	total α total β	ND 3.8 E–16	ND 5.6 E–09
296-P-17 (East Tank Farms; FDH; E120)	15 (4.6)	HEPA	0	closed and deregistered		
296-P-31 (East Tank Farms; FDH; E209)	33 (10)	HEPA	5.1 E+08 (1.4 E+07)	total α total β	5.0 E–16 1.0 E–15	7.9 E–09 1.6 E–08
296-A-21 (242A Evaporator; FDH; E645)	22 (6.7)	HEPA	6.1 E+09 (1.7 E+08)	total α total β	ND 8.7 E–16	ND 1.9 E–07
296-A-22 (242-A Evaporator; FDH; E013, E028, E029)	61 (18.6)	HEPA	2.3 E+08 (6.6 E+06)	^{90}Sr ^{137}Cs ^{238}Pu $^{239,240}Pu$ ^{241}Am	3.3 E–16 7.8 E–17 ND 2.2 E–17 1.2 E–16	2.7 E–09 6.5 E–10 ND 1.9 E–10 9.8 E–10

Table 2-3. Radionuclide Air Emissions
from Minor Point Sources at FDH- and BHI-Managed Facilities during 1998.
(minor point sources have the potential of <0.1 mrem/yr EDE to nearest offsite resident)[a] (5 sheets)

Source[b] (Facility; Contractor; EDP code)	Discharge height (ft [m]))	Emission control[c]	Total flow (ft^3 [m^3])	Radionuclide of type of radioactivity	Average concentration ($\mu Ci/mL$)[d]	Annual emissions (Ci)[d]
296-E-1 (ETF; FDH; E036)	51 (15.5)	HEPA	3.1 E+10 (8.7 E+08)	total α total β	1.1 E–16 5.0 E–16	1.3 E–07 6.0 E–07
200 West Area						
296-P-22 (West Tank Farms; FDH; W191)	15 (4.6)	HEPA	4.6 E+08 (1.3 E+07)	total α total β	ND 2.4 E–15	ND 4.0 E–08
296-P-23 *backup 296-P-28* (West Tank Farms; FDH; W190, *W195*)	15 (4.6)	HEPA	4.7 E+08 (1.3 E+07)	total α total β	2.0 E–16 8.2 E–14	7.9 E–09 2.5 E–06
296-S-15 (West Tank Farms; FDH; W111)	15 (4.6)	HEPA	1.6 E+09 (4.5 E+07)	total α total β	7.6 E–17 6.1 E–15	4.1 E–09 3.3 E–07
296-S-18 (West Tank Farms; FDH; W096)	22 (6.7)	HEPA	1.6 E+09 (4.4 E+07)	total α total β	ND 1.8 E–15	ND 1.1 E–07
296-T-17 (West Tank Farms; FDH; W117)	33 (10.1)	HEPA	6.2 E+08 (1.7 E+07)	total α total β	ND ND	ND ND
291-S-1 (S Plant; BHI; S006)	200 (61)	sand filter	1.1 E+10 (3.1 E+08)	total α total β	1.1 E–15 1.4 E–14	4.7 E–07 6.0 E–06
296-S-2 (S Plant; BHI; S032)	68 (20.7)	HEPA	3.8 E+08 (1.1 E+07)	total α total β	ND 2.8 E–15	ND 4.2 E–08
296-S-7W *backup 296-S-7E* (S Plant; BHI; S015, *S016*)	25 (7.6)	HEPA	4.4 E+09 (1.2 E+08)	total α total β	1.4 E–14 4.6 E–15	2.0 E–06 6.7 E–07
296-S-16 (222-S; FDH; S264)	9.8 (3)	HEPA	7.1 E+07 (2.0 E+06)	total α total β	4.3 E–15 1.1 E–14	1.2 E–08 3.1 E–08
296-S-21 (222-S; FDH; S289)	38 (11.6)	HEPA	3.9 E+10 (1.1 E+09)	total α total β	ND 1.3 E–15	ND 2.0 E–06
291-T-1 (T Plant; FDH; T785)	200 (61)	HEPA	1.7 E+10 (4.8 E+08)	total α total β	6.2 E–14 2.1 E–13	3.7 E–05 1.3 E–04
296-T-7 (T Plant; FDH; T154)	28 (8.5)	HEPA	2.5 E+09 (7.1 E+07)	total α total β	8.9 E–17 2.5 E–16	8.9 E–09 2.5 E–08
296-T-13 (T Plant; FDH; T786)	68 (20.7)	HEPA	0	did not operate		
296-T-11 (224-T; FDH; T783)	25 (7.6)	HEPA	0	did not operate		

Table 2-3. Radionuclide Air Emissions
from Minor Point Sources at FDH- and BHI-Managed Facilities during 1998.
(minor point sources have the potential of <0.1 mrem/yr EDE to nearest offsite resident)[a] (5 sheets)

Source[b] (Facility; Contractor; EDP code)	Discharge height (ft [m]))	Emission control[c]	Total flow (ft^3 [m^3])	Radionuclide of type of radioactivity	Average concentration ($\mu Ci/mL$)[d]	Annual emissions (Ci)[d]
296-T-12 (224-T; FDH; T784)	25 (7.6)	HEPA	8.6 E+09 (2.4 E+08)	total α total β	3.8 E–15 5.7 E–15	1.2 E–06 1.8 E–06
291-U-1 (U Plant; BHI; U771)	200 (61)	sand filter	1.5 E+10 (4.2 E+08)	total α total β	6.2 E–16 1.3 E–13	3.6 E–07 7.2 E–05
696-W-1 (WSCF; FDH; W010)	25 (7.6)	HEPA	2.6 E+10 (7.2 E+08)	total α total β	ND 1.2 E–16	ND 1.2 E–07
696-W-2 (WSCF; FDH; W011)	32 (9.8)	HEPA	5.3 E+08 (1.5 E+07)	total α total β	ND ND	ND ND
296-W-3 (West Tank Farms; FDH; W003)	25 (7.6)	HEPA	0	did not operate		
296-Z-3 (PFP; FDH; Z813)	25 (7.6)	HEPA	4.6 E+08 (1.3 E+07)	^{238}Pu $^{239,240}Pu$ ^{241}Pu ^{241}Am total β	1.3 E–15 1.3 E–15 1.8 E–15 6.0 E–16 2.6 E–15	2.3 E–08 2.3 E–08 3.2 E–08 1.1 E–08 3.7 E–08
296-Z-5 (PFP; FDH; Z913)	8.5	HEPA	5.4 E+09 (1.5 E+08)	total α total β	ND 5.7 E–16	ND 1.2 E–07
296-Z-6 (PFP; FDH; Z802)	15 (4.5)	HEPA	3.9 E+09 (1.1 E+08)	total α total β	ND 1.7 E–16	ND 2.6 E–08
296-Z-14 (PFP; FDH; Z814)	20 (6.1)	HEPA	7.0 E+08 (2.0 E+07)	total α total β	6.0 E–16 2.8 E–15	1.6 E–08 7.5 E–08
296-Z-15 (PFP; FDH; Z915)	42 (12.8)	HEPA	8.4 E+08 (2.4 E+07)	total α total β	ND 2.3 E–16	ND 7.5 E–09
300 Area						
EP-327-02-V (327 Bldg.; FDH; F027)	29.5 (9)	HEPA	4.0 E+08 (1.1 E+07)	^{60}Co ^{90}Sr ^{137}Cs $^{239,240}Pu$ total α total β	ND 1.3 E–16 2.5 E–16 ND 9.9 E–17 1.1 E–15	ND 2.0 E–09 4.0 E–09 ND 1.5 E–09 1.6 E–08
340-B BLDG (340 Bldg.; FDH; F008)	38 (11.6)	HEPA	1.1 E+08 (3.1 E+06)	total α total β	ND 2.5E–15	ND 1.1 E–08
340-DECON (340 Bldg.; FDH; F009)	9.8 (3)	HEPA	3.9 E+09 (1.1 E+08)	total α total β	ND 4.0 E–15	ND 5.8 E–07

Table 2-3. Radionuclide Air Emissions
from Minor Point Sources at FDH- and BHI-Managed Facilities during 1998.
(minor point sources have the potential of <0.1 mrem/yr EDE to nearest offsite resident)[a] (5 sheets)

Source[b] (Facility; Contractor; EDP code)	Discharge height (ft [m]))	Emission control[c]	Total flow (ft^3 [m^3])	Radionuclide of type of radioactivity	Average concentration (μCi/mL)[d]	Annual emissions (Ci)[d]
400 Area						
FFTF-CB-EX (FFTF; FDH; F011, F024)	47 (14.3)	none	1.1 E+10 (3.1 E+08)	^{3}H (as HTO) total α total β	1.2 E–08 ND 2.1 E–15	4.2 E+00 ND 8.8 E–07
FFTF-HT-TR (FFTF; FDH; F013)	29 (8.8)	none	2.7 E+09 (7.8 E+07)	total α total β	2.5 E–17 1.5 E–15	2.7 E–09 1.6 E–07
FFTF-RE-SB (FFTF; FDH; F012)	20 (6.1)	none	6.8 E+09 (1.9 E+08)	total α total β	1.9 E–15 1.1 E–14	4.9 E–07 2.9 E–06
437-MN&ST (MASF; FDH; F014)	30 (9.1)	HEPA	7.6 E+09 (2.1 E+08)	total α total β	ND 2.7 E–15	ND 8.8 E–07
437-1-61 (MASF; FDH; F019)	38.4 (11.7)	HEPA	7.0 E+09 (2.0 E+08)	total α total β	ND 2.4 E–15	ND 6.5 E–07

[a] EDE = effective dose equivalent

[b] EDP code = the electronic data processing code, which identifies the sampler; FDH = Fluor Daniel Hanford, Inc.; BHI = Bechtel Hanford, Inc.

[c] Efficiencies are $\geq$99.95% for HEPA; $\geq$95% for charcoal; $\geq$99.8% for sand filter; 0% for no emission control; HEPA = high-efficiency particulate air filter.

[d] Ci = curie; 1 Ci = 3.7 E+10 becquerels (Bq); 1 μCi/mL = 3.7 E+10 Bq/mL; ND = none detected (that is, either the radionuclide was not detected in any sample during the year or the average of all the measurements for that given radionuclide or type of radioactivity made during the year was below background levels).

Table 2-4. Nonradioactive Air Emissions from FDH- and BHI-Managed Facilities during 1998.
(2 sheets)

Source (contractor[a])	Constituent	Annual emissions (kg)[b]
300 Area Powerhouse (FDH)	**Criteria Air Pollutants**	
	Particulate matter	3.3 E+03
	Nitrogen oxides (NO_x)	1.2 E+04
	Sulfur oxides (SO_x)	4.2 E+04
	Carbon monoxide (CO)	1.1 E+03
	Lead	6.3E+00
	Volatile organic compounds	5.9 E+01
	Toxic Air Pollutants	
	Beryllium	1.4 E–01
	Cadmium	6.8 E+00
	Chromium	4.2 E+00
	Cobalt	3.9 E+00
	Copper	9.0 E+00
	Formaldehyde	1.3 E+01
	Selenium	1.2 E+00
ESPC Distillate-Oil-Fired Boilers[c] (FDH)	**Criteria Air Pollutants**	
	Particulate matter	6.3 E+02
	Nitrogen oxides (NO_x)	6.4 E+03
	Sulfur oxides (SO_x)	2.1 E+03
	Carbon monoxide (CO)	3.0 E+03
	Lead	3.7 E–01
	Volatile organic compounds	5.4 E+02
ESPC Natural-Gas-Fired Boilers (FDH)	**Criteria Air Pollutants**	
	Particulate matter	4.9 E+02
	Nitrogen oxides (NO_x)	2.0 E+03
	Sulfur oxides (SO_x)	2.5 E+01
	Carbon monoxide (CO)	9.2 E+03
	Lead	0
	Volatile organic compounds	5.3 E+02
East Tank Farms Exhausters (FDH)	Nitrogen oxides (NO_x)	1.5 E+04
	Volatile organic compounds	6.1 E+02
	Ammonia	3.6 E+03
West Tank Farms Exhausters (FDH)	Nitrogen oxides (NO_x)	1.6 E+04
	Volatile organic compounds	1.7 E+02
	Ammonia	3.1 E+03
242-A Evaporator FDH)	Volatile organic compounds	3.6 E–02
	Ammonia	0
200 Area ETF (FDH)	Volatile organic compounds	3.6 E+00
	Ammonia	0

Table 2-4. Nonradioactive Air Emissions from FDH- and BHI-Managed Facilities during 1998.
(2 sheets)

Source (contractor[a])	Constituent	Annual emissions (kg)[b]
200 West Area CCl_4 Vapor Extraction Project (BHI)	Carbon tetrachloride	8.0 E+00

[a] FDH = Fluor Daniel Hanford, Inc.; BHI = Bechtel Hanford, Inc.

[b] Emissions calculated using emission factors (EPA 450/4-90-003) and values on fuel consumed.

[c] ESPC = Energy Savings Performance Contract.

Table 2-5. Fuel Consumed by FDH- and BHI-Managed Boilers during 1998

Source	Fuel consumed		
	Grade 2 oil (gal [L])	Grade 6 oil (gal [L])	Natural gas (gal [L])
300 Area Powerhouse		1.08 E+06 [4.07 E+06]	
ESPC oil-fired boilers	3.07 E+06 [1.16 E+07]		
ESCP natural-gas-fired boilers			2.80 E+04 [1.06 E+05]

[a] ESPC = Energy Savings Performance Contract.

3.0 LIQUID EFFLUENTS

The majority of radioactive and nonradioactive liquid effluents released to the environment during 1998 from facilities and activities managed by FDH and BHI were discharged in accordance with state and federal discharge permits. Data on these liquid effluents are in this section.

To briefly recount pertinent near history, by the end of June 1995 several liquid effluent streams were either discontinued or rerouted to the 200 Area TEDF, eliminating them as individual discharges to the ground. The streams rerouted include the Plutonium Finishing Plant wastewater, 222-S Laboratory steam condensate, T Plant wastewater, 284-W Power Plant wastewater, PUREX Plant wastewater, B Plant wastewater, and 242-A-81 wastewater streams. Since any of these streams still active no longer discharge directly to the environment, reporting on them is not required.

On August 8, 1997, the remaining liquid effluent streams discharging to the 216-B-3 Pond (C Lobe) were permanently rerouted to the 200 Area TEDF, eliminating them too as individual discharges to ground. The streams rerouted include the 242-A Evaporator cooling water, 242-A Evaporator steam condensate, 241-A Tank Farm cooling water, 244-AR Vault cooling water, 284-E Power Plant wastewater, and B Plant cooling water streams. Reporting on these streams is not required, either.

3.1 NPDES PERMITTED DISCHARGES TO COLUMBIA RIVER

Liquid effluents discharged to the Columbia River from the 100-N, 100-K, and 300 Areas are regulated by parameters respectively defined in the NPDES permits WA-000374-3, WA-002591-7, and WA-R-10-000F for the Hanford Site. Table 3-1 lists the NPDES permitted discharge points.

Summaries of discharge monitoring reports (DMRs) in 1998 are in Table 3-2. DMRs are used to demonstrate the state of compliance with the NPDES permits.

The quantities of radionuclides discharged in liquid effluents to the Columbia River during 1998 are summarized in Table ES-2 of the Executive Summary. Table 3-3 has release data on specific radionuclides and total activity discharged by individual liquid effluent streams.

Four discharge points (005, 006, 007, and 009) identified in permit WA-000374-3 had no discharges in 1998, having been previously shut down permanently. Monitoring of the remaining discharge point in this permit, the 1301-N Springs, remained a requirement in 1998 because of natural groundwater migrating through to the Columbia River.

The next three subsections discuss the NPDES permitted discharge streams that were active during 1998.

3.1.1 1908-K Outfall

The 1908-K Outfall (discharge number 004) discharges potentially hazardous chemical and radioactive substances to the Columbia River. The outfall is routinely monitored for flow, temperature, pH, total suspended solids, and chlorine. It is also routinely monitored for the following radionuclides and types of radioactivity: ^{3}H, ^{90}Sr, ^{238}Pu, $^{239,240}Pu$, ^{241}Am, gamma-emitting radionuclides, total alpha, and total beta.

3.1.2 N Springs

The N Springs (discharge "number" 1301-N Springs) discharges radionuclides and potentially hazardous chemical substances to the Columbia River. It is routinely monitored for pH, oil and grease, chromium, iron, nitrogen, ^{3}H, and ^{90}Sr.

3.1.3 300 Area Treated Effluent Disposal Facility

300 Area Treated Effluent Disposal Facility (TEDF; discharge number 001) discharges treated wastewater to the Columbia River. It is regulated under NPDES permit WA-002591-7. This outfall is routinely monitored for numerous constituents, listed in Table 3-2.

All nonradioactive liquid effluents from the 300 Area are discharged to the 300 Area TEDF for treatment prior to discharge. The 300 Area TEDF discharged 7.8 E+07 gal (3.0 E+08 L) of nonhazardous, nonradioactive liquid wastes to the Columbia River during 1998. Historically, radioactive liquid effluents from the 300 Area were transported to the Tank Farms in the 200 East Area by way of the 340 Facility in the 300 Area, but this facility was closed in September 1997.

3.2 STATE PERMITTED DISCHARGES TO THE SOIL

All liquid effluent streams discharging to the soil column on the Hanford Site are governed by State Waste Discharge Permits. The Site has made significant efforts to bring these streams into compliance with current regulations. Liquid effluent streams for which the state has issued waste discharge permits are listed in Table 3-1 and described in the succeeding subsections.

3.2.1 200 Area Treated Effluent Disposal Facility

The 200 Area TEDF discharges treated wastewater to ground via infiltration. This TEDF consists of a piping network that conveys wastewater from numerous facilities on the Hanford Site to two 5-acre disposal basins. Its discharges are regulated in accordance with State Waste Discharge Permit ST 4502 and is routinely monitored for a multitude of constituents, listed in Table 3-4, though its discharges meet the drinking water standards promulgated by the state.

3.2.2 200 Area Effluent Treatment Facility

The 200 Area Effluent Treatment Facility (ETF) discharges treated wastewater. It is regulated in accordance with State Waste Discharge Permit ST 4500, and is routinely monitored for numerous chemical and radioactive constituents, listed in Tables 3-3 and 3-4.

3.2.3 400 Area Secondary Cooling Water

The 400 Area Secondary Cooling Water Stream discharges cooling water from the secondary cooling loop of the FFTF reactor. This stream is regulated in accordance with State Waste Discharge Permit ST 4501, and meets drinking water standards. It is routinely monitored for flow, pH, nitrate, nitrite, arsenic, cadmium, chloride, cobalt, cyanide, lead, manganese, phosphorus, total dissolved solids, total organic halides, total beta activity, and tritium.

3.2.4 183-N Backwash Discharge Pond

Wastewater discharged to the 183-N Backwash Discharge Pond originates from 183-N Water Treatment Facility activities. These discharges are regulated in accordance with State Waste Discharge Permit ST 4503. The 183-N Water Treatment Facility converts raw water from the Columbia River into potable water for use at 100-N Area. Three untreated wastewater streams are discharged to the 183-N Backwash Discharge Pond. They contain wastewater from the following sources: annual draining and washing of the coagulator basins; a potable-water sample tap having a continuous flow; a drain in an area used to dry potable-water containers; and backwashing of the multimedia gravity filters. The discharge site is routinely monitored for flow rate, pH, sulfate, trihalomethanes, and residual chlorine.

3.2.5 100-N Sewage Treatment Lagoon

The 100-N Sewage Treatment Lagoon treats sewage from the 100-N, 100-K, and 200 Areas. Domestic wastewater from the 100-N Sewage Treatment Lagoon is discharged to the soil in accordance with State Waste Discharge Permit ST 4507. Discharging leachate, from residual solids, and of radioactive waste is not permitted for this discharge site. It is routinely monitored for influent flow, effluent flow, pH, biochemical oxygen demand, total suspended solids, and total dissolved solids.

3.2.6 Hydrotest, Maintenance, and Construction Discharges

Wastewater discharges to soil as a result of hydrotests, maintenance, and construction activities are conducted in accordance with State Waste Discharge Permit ST 4508. These discharges occur at numerous locations throughout the Hanford Site and require compliance with an Ecology-approved Pollution Prevention and Best Management Practices Plan (DOE/RL-97-67, Rev. 3).

3.2.7 Cooling Water and Steam Condensate Discharges

Cooling water and steam condensate discharges are controlled in accordance with State Waste Discharge Permit ST 4509. These discharges occur at numerous locations throughout the Hanford Site and must comply with an Ecology-approved Pollution Prevention and Best Management Practices Plan (DOE/RL-97-67, Rev. 3).

3.2.8 Storm-Water Discharges

Industrial storm-water discharges that are collected in engineered structures and then discharged to engineered structures will be regulated in accordance with a State Waste Discharge Permit to be issued in the early part of 1999. Storm-water discharges requiring permit coverage must comply with an Ecology-approved Pollution Prevention and Best Management Practices Plan (DOE/RL-97-67, Rev. 3).

3.3 SANITARY SEWAGE DISCHARGES TO THE SOIL

Various facilities discharged sanitary sewage during 1998. In the 100-N Area, sanitary wastewater was discharged to the 100-N Sewage Treatment Lagoon and five septic tanks. In the 100-DR and 100-K Areas, sanitary sewage was discharged to septic tanks and drain fields, with a portion of the sewage in the 100-K Areas collected in and delivered by tanker truck to the 100-N Sewage Treatment Lagoon. In the 200 Areas, sanitary wastewater was discharged to a system of septic tanks and drain fields. Sludge was pumped from septic tanks in the 200 Areas and taken to the 100-N Sewage Treatment Lagoon for disposal. In the 300 Area, sanitary sewage was discharged to the city of Richland's POTW. In the 400 Area, sanitary sewage was discharged to a septic tank and surface discharge wetlands until April 15, 1997, when these discharges were diverted to the WPPSS sewage treatment plant.

The estimated volume of sewage discharged in each operating area during 1998 is shown in Table 3-5. All sanitary sewer discharges are estimated by multiplying the total number of personnel stationed in each area by 15/gal/day-person (57 L/day-person) and by 250 business days in 1998.

Table 3-1. National Pollutant Discharge Elimination System (NPDES) and State Permitted Discharge Points in 1998.

Designation	Description
NPDES Discharge Points	
001	300 Area Treated Effluent Disposal Facility (TEDF)
003[a]	181-KE Inlet Screen Backwash
004	1908-K Outfall
005[a]	182-N Tank Farm Overflow (36-in. raw-water return)
006[a]	182-N Drain System (42-in. raw-water return)
007[a]	181-N Inlet Screen Backwash
009[a]	102-in. Outfall (raw-water return)
1301-N Springs	100-N Riverbank Springs
State Permitted Discharge Points	
ST 4502	200 Area Treated Effluent Disposal Facility (TEDF)
ST 4500	200 Area Effluent Treatment Facility (ETF)
ST 4501	400 Area Secondary Cooling Water
ST 4507	100-N Sewage Treatment Lagoon
ST 4503	183-N Backwash Discharge Pond
ST 4508	Hydrotest, Maintenance, and Construction Discharges
ST 4509	Cooling Water and Steam Condensate Discharges

[a] No releases occurred from this discharge point during 1998.

Table 3-2. Summary of National Pollutant Discharge System (NPDES) Constituents and Parameters in 1998.[a]

(2 sheets)

Sample parameter	1908-K Outfall (004)		N-Springs (1301-N Springs)		300 Area TEDF (001A)	
	Avg.	Max.	Avg.	Max.	Avg.	Max.
Flow rate (MGD)	0.45	4.29	*	*	0.235	0.401
Temperature (°F)	*	80.0	*	59.2	73.75	91.81
pH (minimum and maximum)	7.0	7.3	7.6	7.77	6.42	8.77
Total suspended solids (μg/L)	3.3	4.0	*	*	1,000	9,000
Oil and grease (mg/L)	*	*	1.61	2.95	*	*
Aluminum (μg/L)	*	*	*	*	21.64	41.9
Arsenic (μg/L)	*	*	*	*	<0.4	6.7
Beryllium (μg/L)	*	*	*	*	<0.2	<0.2
Cadmium (μg/L)	*	*	*	*	<0.2	<0.2
Chromium (mg/L)	*	*	0.0039	0.0043	*	*
Chlorine (mg/L)	0.02	0.02	*	*	*	*
Copper (μg/L)	*	*	*	*	2.66	9.5
Iron (μg/L)	*	*	0.32	0.5	15.13	128
Lead (μg/L)	*	*	*	*	<0.2	<0.2
Manganese (μg/L)	*	*	*	*	<0.2	<0.2
Mercury (μg/L)	*	*	*	*	<0.2	<0.2
Nickel (μg/L)	*	*	*	*	0.93	4.8
Radium (pCi/L)	*	*	*	*	<0.2	<0.2
Selenium (μg/L)	*	*	*	*	<3	<3
Silver (μg/L)	*	*	*	*	<0.3	<0.3
Zinc (μg/L)	*	*	*	*	2.12	8.5
Nitrogen (as ammonia) (μg/L)	*	*	<0.067	<0.10	<50	82.5
Bis (2-ethylhexyl) phthalate (μg/L)	*	*	*	*	<3	49
Chlorodiflouromethane (μg/L)	*	*	*	*	<5	<5
Chloroform (μg/L)	*	*	*	*	<5	12
Coliform (growth/100mL)	*	*	*	*	<3.7	<3.7
Cyanide (μg/L)	*	*	*	*	<5	<5
Dichlorobromomethane (μg/L)	*	*	*	*	<2.2	<2.2

Table 3-2. Summary of National Pollutant Discharge System (NPDES) Constituents and Parameters in 1998.[a]

(2 sheets)

Sample parameter	1908-K Outfall (004)		N-Springs (1301-N Springs)		300 Area TEDF (001A)	
	Avg.	Max.	Avg.	Max.	Avg.	Max.
1,1-Dichloroethane (μg/L)	*	*	*	*	<4.7	<4.7
Methylenechloride (μg/L)	*	*	*	*	<3	18
Nitrite (NO_2) (μg/L)	*	*	*	*	<50	87.6
Tetrachloroethylene (μg/L)	*	*	*	*	<5	<5
1,1,1-Trichloroethane (μg/L)	*	*	*	*	<5	<5
Trichloroethylene (μg/L)	*	*	*	*	<1.9	<1.9
Toluene (μg/L)	*	*	*	*	<6	<6

[a] MGD = million gallons per day; * = analysis not required.

Table 3-3 Radionuclides in Liquid Effluent Streams Discharged to the Environment from FDH- and BHI-Managed Facilities during 1998.

Liquid effluent stream[a] (contractor; stream code; EDP code)	Discharge location	Total flow (gal [L])	Radionuclide or type of radioactivity	Average concentration (μCi/mL)[b]	Annual release (Ci)[b]
100 Area Discharges to the Columbia River					
N-Springs (BHI; NA; Y101)	Columbia River	6.0 E+06 (2.3 E+07)	^{3}H	1.3 E–05	2.9 E–01
			^{90}Sr	1.3 E–05	2.9 E–01
NPDES Outfall 004, 100-K 1908-K Outfall (FDH; NA; Y130)	Columbia River	1.5 E+08 (5.7 E+08)	^{3}H	ND	ND
			^{60}Co	ND	ND
			^{90}Sr	4.2 E–10	2.4 E–04
			^{106}Ru	ND	ND
			^{125}Sb	ND	ND
			^{134}Cs	ND	ND
			^{137}Cs	ND	ND
			^{154}Eu	ND	ND
			^{155}Eu	ND	ND
			^{238}Pu	ND	ND
			$^{239,240}Pu$	2.2 E–12	1.3 E–06
			^{241}Am	4.4 E–10	1.7 E–05
			total α	1.8 E–10	1.0 E–04
			total β	1.0 E–09	5.9 E–04
200 Area Discharges to Ground					
200 Area Effluent Treatment Facility (FDH; ETF; H129)	616-A Crib (SALDS)	2.8 E+07 (1.1 E+08)	^{3}H	3.0 E–04	3.2 E+01
			^{90}Sr	5.2 E–10	5.9 E–05
			^{99}Tc	2.6 E–10	2.8 E–05
			^{226}Ra	6.3 E–12	6.7 E–07
			^{237}Np	9.3 E–11	1.0 E–05
			^{238}Pu	1.2 E–10	1.3 E–05
			$^{239,240}Pu$	1.1 E–10	1.2 E–05
			^{241}Am	1.5 E–10	1.6 E–05
			^{244}Cm	6.9 E–12	7.4 E–07
			total α	1.7 E–10	1.8 E–05
			total β	1.3 E–10	1.4 E–05

[a] FDH = Fluor Daniel Hanford, Inc.; BHI = Bechtel Hanford, Inc; EDP code = electronic data processing code, which identifies the sampler.

[b] Ci = curie; 1 Ci = 3.7 E+10 becquerels (BQ); 1 μCi/mL = 3.7 E+10 Bq/m^3; ND = none detected.

Table 3-4. Summary of Discharge Monitoring Reports for State Permitted Discharge Points in 1998[a]
(3 sheets)

Sample parameter	200 Area Effluent Treatment Facility (ST 4500)		400 Area Secondary Cooling Water (ST 4501)		200 Area TEDF (ST 4502)		183-N Backwash Discharge Pond (ST 4503)		100-N Sewage Treatment Lagoon (ST 4507)	
	Avg.	Max.	Avg.	Max.	Avg.	Max.	Avg.	Max.	Avg.	Max.
Effluent flow rate (gal/month)	2.6 E+06	3.8 E+06	*	*	*	*	*	*	*	*
Effluent flow rate (gal/day)	*	*	*	*	*	*	6,030	61,000	4,380	11,900
Effluent flow rate (gal/min)	*	*	35.8	105	375	2,294	*	*	*	*
Influent flow rate (gal/day)	*	*	*	*	*	*	*	*	5,170	6,600
pH (minimum and maximum)	*	*	8.40	8.71	7.56	8.72	7.21	7.35	7.9	8.3
Conductivity (μmhos/cm)	NQ	NQ	*	*	182	239	*	*	*	*
Total suspended solids (μg/L)	NQ	NQ	*	*	*	*	*	*	26,300	72,000
Total dissolved solids (μg/L)	NQ	NQ	450,000	827,000	84,754	*	*	*	274,000	318,000
Biochemical oxygen demand (mg/L)	*	*	*	*	*	*	*	*	18.7	37.0
Total organic carbon (μg/L)	NQ	NQ	*	*	*	*	*	*	*	*
Total organic halides (μg/L)	*	*	38.98	126	*	*	*	*	*	*
Total trihalomethanes (μCi/L)	*	*	*	*	NQ	NQ	*	*	*	*
Oil and grease (mg/L)	*	*	*	*	NQ	NQ	*	*	*	*
Arsenic (μg/L)	NQ	NQ	NQ	NQ	NQ	NQ	*	*	*	*
Beryllium (μg/L)	NQ	NQ	*	*	*	*	*	*	*	*
Cadmium (μg/L)	NQ	NQ	NQ	NQ	NQ	NQ	*	*	*	*
Chlorine (mg/L)	*	*	*	*	*	*	0.25	0.70	*	*
Chromium (mg/L)	NQ	NQ	*	*	NQ	NQ	*	*	*	*
Cobalt (μg/L)	*	*	*	*	*	*	*	*	*	*
Copper (μg/L)	NQ	NQ	*	*	*	*	*	*	*	*
Iron (μg/L)	*	*	*	*	113	*	*	*	*	*
Lead (μg/L)	NQ	NQ	NQ	NQ	NQ	NQ	*	*	*	*
Manganese (μg/L)	*	*	NQ	NQ	1.28	*	*	*	*	*

Table 3-4. Summary of Discharge Monitoring Reports for State Permitted Discharge Points in 1998[a]
(3 sheets)

Sample parameter	200 Area Effluent Treatment Facility (ST 4500)		400 Area Secondary Cooling Water (ST 4501)		200 Area TEDF (ST 4502)		183-N Backwash Discharge Pond (ST 4503)		100-N Sewage Treatment Lagoon (ST 4507)	
	Avg.	Max.	Avg.	Max.	Avg.	Max.	Avg.	Max.	Avg.	Max.
Nitrogen (μg/L)	NQ	NQ	*	*	*	*	*	*	*	*
Acetophenone (μg/L)	NQ	NQ	*	*	*	*	*	*	*	*
Ammonia (μg/L)	<64	64	*	*	*	*	*	*	*	*
Benzene (μg/L)	NQ	NQ	*	*	*	*	*	*	*	*
Bis (2-ethylhexyl) phthalate (μg/L)	*	*	*	*	NQ	NQ	*	*	*	*
Carbon tetrachloride (μg/L)	NQ	NQ	*	*	NQ	NQ	*	*	*	*
Chloride (μg/L)	NQ	NQ	19,041	21,300	6,334	40,220	*	*	*	*
Chloroform (μg/L)	NQ	NQ	*	*	<2.5	4.0	*	*	*	*
Cyanide (μg/L)	*	*	NQ	NQ	NQ	NQ	*	*	*	*
Methylene chloride (μg/L)	NQ	NQ	*	*	NQ	NQ	*	*	*	*
Nitrate (NO_3) (μg/L)	NQ	NQ	2,262	4,750	162.6	415	*	*	*	*
Nitrite (NO_2) (μg/L)	NQ	NQ	NQ	NQ	*	*	*	*	*	*
N-Nitrosodiumethylamine (μg/L)	NQ	NQ	*	*	*	*	*	*	*	*
Phenol (μg/L)	*	*	*	*	NQ	NQ	*	*	*	*
Phosphorus (μg/L)	*	*	894	1,820	*	*	*	*	*	*
Sulfate (μg/L)	NQ	NQ	*	*	15,996	*	36,300	55,200	*	*
Tetrachloroethylene (μg/L)	NQ	NQ	*	*	*	*	*	*	*	*
1,1,1-Trichloroethane (μg/L)	*	*	*	*	NQ	NQ	*	*	*	*
1,1,2-Trichloroethane (μg/L)	NQ	NQ	*	*	*	*	*	*	*	*

Table 3-4. Summary of Discharge Monitoring Reports for State Permitted Discharge Points in 1998[a]
(3 sheets)

Sample parameter	200 Area Effluent Treatment Facility (ST 4500)		400 Area Secondary Cooling Water (ST 4501)		200 Area TEDF (ST 4502)		183-N Backwash Discharge Pond (ST 4503)		100-N Sewage Treatment Lagoon (ST 4507)	
	Avg.	Max.	Avg.	Max.	Avg.	Max.	Avg.	Max.	Avg.	Max.
Tetrahydrofuran (μg/L)	NQ	NQ	*	*	*	*	*	*	*	*
Trihalomethanes (mg/L)	*	*	*	*	NQ	NQ	25.1	58.0	*	*
WTPH-G (μg/L)	*	*	*	*	NQ	NQ	*	*	*	*
Total alpha (pCi/L)	NQ	NQ	*	*	0.23	*	*	*	*	*
Total beta (pCi/L)	NQ	NQ	16.8	25.6	NQ	*	*	*	*	*
^{226}Ra (pCi/L)	*	*	*	*	NQ	*	*	*	*	*
^{226}Ra and ^{228}Ra (pCi/L)	*	*	*	*	NQ	*	*	*	*	*
^{90}Sr (pCi/L)	NQ	NQ	*	*	*	*	*	*	*	*
^{99}Tc (pCi/L)	NQ	NQ	*	*	*	*	*	*	*	*
Tritium (^{3}H) (pCi/L)	*	*	9,526	16,500	*	*	*	*	*	*
Tritium (^{3}H) (Ci/month)	2.6	15.4	*	*	*	*	*	*	*	*
Total uranium	NQ	NQ	*	*	*	*	*	*	*	*

[a] * = analysis not required; NQ = nonquantifiable (that is, below practical quantification limits [PQL]).

Table 3-5. Sanitary Sewage
Discharged to the Soil during 1998

Area	Population	Discharge[a] (gal/yr [L/yr])
100-DR	30	1.1 E+05 (4.3 E+05)
100-K	320	1.2 E+06 (4.5 E+06)[b]
100-N	127	4.8 E+05 (1.8 E+06)[b]
200 East	2,150	8.1 E+06 (3.1 E+07)[b]
200 West	1,600	6.0 E+06 (2.3 E+07)[b]
300[c]	1,900	0
400[d]	400	1.5 E+06 (5.7 E+06)
600[d]	150	5.6 E+05 (2.1 E+06)

[a] Discharges estimated by multiplying the total number of persons assigned to each area on the basis of a person generating 15 gal/day (57 L/day) of sanitary sewage while working 250 days/yr.

[b] A portion of this discharge was transported via pipe or tanker truck to the 100-N Sewage Treatment Lagoon, where it was treated and released to the soil; data on 100-N Sewage Treatment Lagoon effluents is in Table 3-4. The remaining sanitary sewage is assumed to have been discharged to treatment systems, such as septic tanks and drain fields, in each respective area.

[c] Discharges from the 300 Area no longer go to a soil column; they have been rerouted to the city of Richland POTW.

[d] Discharges to ground in the 400 Area were discontinued on April 15, 1997, when they were rerouted to the WPPSS sanitary sewer system.

4.0 HAZARDOUS SUBSTANCE RELEASES

Hazardous substances released to the environment must be evaluated to determine if they are reportable to federal, state, or local regulatory agencies. Agency notification is required when a released amount exceeds reporting thresholds. Reportable releases of hazardous substances are classified as one of the following two types:

- Nonroutine releases
- Continuous, routine releases.

Each type of release is discussed in the following sections.

4.1 NONROUTINE RELEASES

During 1998, the following number of nonroutine releases occurred of a solid, semi-solid, liquid, or airborne substance involving radioactive, hazardous, or dangerous wastes, hazardous or extremely hazardous substances, polychlorinated biphenyls (PCBs), and oil and/or petroleum derivatives. None of these releases caused a measurable offsite impact.

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Seven releases were evaluated and determined to be reportable in accordance with regulatory notification requirements for FDH and its subcontractors. One hundred twenty-three other releases were evaluated and determined not to be nonreportable in accordance with regulatory notification requirements for FDH and it subcontractors.

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One release was evaluated and determined to be reportable in accordance with regulatory notification requirements for BHI and its subcontractors. Ninety-one other releases were evaluated and determined to be nonreportable in accordance with regulatory notification requirements for BHI and it subcontractors.

The eight total reportable releases between FDH and BHI are summarized in Table 4-1 on the following page.

4.2 ROUTINE CONTINUOUS RELEASES

Releases of hazardous substances that exceed CERCLA reportable quantities (RQ) need not be reported immediately to the National Response Center when both of the following conditions are met:

- An initial notification has been completed
- The routine releases are continuous and stable in quantity and rate.

For 1998, the initial notification requirement has been satisfied for hazardous substances that exceeded or have a potential to exceed an RQ. Historically at the Hanford Site, only the continuous, routine releases of ammonia, ammonium hydroxide, and carbon tetrachloride have posed operational difficulties of staying beneath RQs. During 1998, releases of ammonia, ammonium hydroxide, and carbon tetrachloride were below reportable quantities and were continuous and stable in quantity and rate.

Table 4-1. FDH and BHI Reportable Releases to the Environment during 1998.

Contractor	Date	Agency notified	Material released	Quantity	Description of release event
FDH	03/17/98	DOH	radioactive air	small amount	During a core-drilling operation at the 241-SX Tank 105, riser #14, in the 200 West Area, a drill string became pressurized, releasing the air through a drill-string connecting joint.
BHI	05/27/98	DOH	potentially radioactive water	2 gal	On the north side of the 105-C Building in the 100-C Area, a worker dumped 2 gal of water onto ground from barrel he had taken from a radioactively contaminated area.
FDH	07/07/98	Ecology	oil	0.10 kg	During removal of UST #2721 by the 2721-Z Building in the 200 West Area, oil discharged from past refilling was found.
FDH	07/22/98	Ecology and DOH	radioactive air	small amount	Radioactive air escaped from an over-pressurized 55-gal drum of bagged mixed waste at 241-AN Tank Farm in the 200 East Area.
FDH	09/15/98	DOH	radioactive air	small amount	While a rigid jumper with a flexible jumper at the ER-152 diversion box in the 200 East Area was being replaced, water rushed into the box, dislodging some fixative sprayed there.
FDH	11/11/98	Ecology and DOH	radioactive water	small amount	During cleaning of SX-A Vault pit at SX-Tank Farm in the 200 West Area, high-pressure water-line used forced air from nozzle, resulting in several workers being splashed with radioactive water from pit.
FDH	11/18/98	Ecology and DOH	volatile organic compounds	>50 ppm	At Tank C-106 in C-Tank Farm in the 200 East Area, a ventilation system monitor registered an exceedance of the VOC permit limit.
FDH	12/26/98	Ecology and DOH	radioactive water	2,304 kg	An estimated 76,800 kg of water was released inside 327 Building in the 300 Area when fire-suppressant line broke; 2,304 kg of this water leaked to outside soil.

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