Department of Energy
Richland Operations Office
P.O. Box 550
Richland, Washington 99352

11-AMCP-0250

SEP 29 2011

Mr. D. A. Faulk, Program Manager
Office of Environmental Cleanup
Hanford Project Office
U.S. Environmental Protection Agency
309 Bradley Boulevard, Suite 115
Richland, Washington 99352

Dear Mr. Faulk:

WASTE SITE RECLASSIFICATION FORM (CONTROL NUMBER 2011-081), AND RESPONSE ACTION REPORT FOR THE 200-MG-1 OPERABLE UNIT WASTE SITE 216-S-19, DOE/RL-2011-91, REVISION 0

This letter transmits signed copies of the Waste Site Reclassification Form (Control Number 2011-081), and the approved Response Action Report for the 200-MG-1 Operable Unit Waste Site 216-S-19, DOE/RL-2011-91, Revision 0.

If you have any questions, please contact me, or your staff may contact, Al Farabee, of my staff, on (509) 376-8089.

Sincerely,

Jonathan A. Dowell, Assistant Manager
for the Central Plateau

AMCP:PGE

Attachments

cc: See Page 2

cc w/attachs:
G. Bohnee, NPT
L. Buck, Wanapum
L. C. Buelow, EPA
S. Harris, CTUIR
J. A. Hedges, Ecology
R. Jim, YN
S. L. Leckband, HAB
N. M. Menard, Ecology
K. Niles, ODOE
D. Rowland, YN (4) plus 2 CDs
Administrative Record
Environmental Portal

cc w/o attachs:
D. G. Black, CHPRC
R. L. Cathel, CHPRC
R. E. Piippo, MSA
J. G. Vance, MSA
C. B. Walker, CHPRC

WASTE SITE RECLASSIFICATION FORM

Date Submitted: 09/21/2011 Originator: N. Chandran Phone: 373-4716	Operable Unit(s): 200-MG-1 Waste Site Code: 216-S-19 Type of Reclassification Action: Closed Out ☐ Interim Closed Out ☒ No Action ☐ RCRA Postclosure ☐ Rejected ☐ Consolidated ☐	Control Number: 2011-081

This form documents agreement among parties listed authorizing classification of the subject unit as Closed Out, Interim Closed Out, No Action, RCRA Postclosure, Rejected, or Consolidated. This form also authorizes backfill of the waste management unit, if appropriate, for Closed Out and Interim Closed out units. Final removal from the NPL of No Action and Closed Out waste management units will occur at a future date.

Description of current waste site condition:
(Summarize status of investigation/remediation of the waste sites.)

The 216-S-19 waste site, also known as the 216-S-19 Pond, 222-S Lab Swamp, 216-SL-1, and the REDOX Lab Swamp, is located just south of the 200 West area perimeter fence and roughly 2.4 km (1.5 mi) north of the Rattlesnake Barricade. This site was used as a discharge pond for the 222-S control laboratory, 216-S waste storage facility, 222-SA analytical chemical standards laboratory, and 291-S exhaust fan control house and stack via the 207-SL retention basin and the 200-W-147-PL-A pipeline from February 1952 until October 1984. The pond received both radioactive and hazardous effluent wastes throughout its lifetime. The selected alternative authorized by DOE/RL-2009-86, *Action Memorandum for Non-Time-Critical Removal Action for 37 Waste Sites in the 200-MG-1 Operable Unit* (Action Memorandum) was confirmatory sampling/no further action (CS/NFA). Initial sampling indicated contaminants of potential concern (COPCs) in excess of the established removal action levels (RALs) for the waste site, resulting in the implementation of removal, treatment, and disposal (RTD) activities, in accordance with DOE/RL-2009-53, *Removal Action Work Plan for 48 Waste Sites in the 200-MG-1 Operable Unit* (RAWP). Following RTD, verification sampling was performed in accordance with DOE/RL-2009-60, *Sampling and Analysis Plan for Selected 200-MG-1 Operable Unit Waste Sites*, which demonstrated the 216-S-19 waste site had achieved compliance with the established cleanup standards and met corresponding removal action objectives (RAOs).

The results show that residual soil concentrations of COPCs meet the cleanup standards set forth in the SAP (DOE/RL-2009-60), which supports a reclassification of this site to interim closed out. The current site conditions achieve the cleanup standards and the corresponding RAOs established in the RAWP (DOE/RL-2009-53). The results of waste site sampling are used to make reclassification decisions for the 216-S-19 waste site in accordance with the TPA-MP-14 (DOE-RL 2007) process. Finalization of a backfill concurrence form provided to the agency(ies) constitutes concurrence that the waste site has achieved the established RAOs and thus backfill and/or contouring may occur at the 216-S-19 waste site with minimal risk. A Backfill Concurrence Form has been approved by the regulatory agency(ies), and backfill at the 216-S-19 waste site has been completed.

Basis for reclassification:
(For interim closeout, reference supporting documentation, as listed in Table 3.)

The current site conditions meet established cleanup standards and the corresponding RAOs specified in the Action Memorandum. The results show that the residual soil concentrations support reasonably anticipated future land uses recognized in DOE/RL-2008-44, *Engineering Evaluation/Cost Analysis for the 200-MG-1 Operable Unit Waste Sites*, and the Action Memorandum (DOE/RL-2009-86). The results also demonstrate that residual concentrations of COPCs in soil support unrestricted future use of shallow zone soil (i.e., surface to 4.6 m [15 ft] below ground surface) and that COPC concentrations remaining in the soil are protective of groundwater and the Columbia River. There is no deep zone for the 216-S-19 waste site therefore no institutional controls are required. The basis for reclassification to interim closed out is described in detail in DOE/RL-2011-91, *Response Action Report for 200-MG-1 Operable Unit Waste Site 216-S-19*, U.S. Department of Energy, Richland Operation Office, Richland, Washington.

Waste Site Controls:
Engineered Controls: Yes ☐ No ☒ Institutional Controls: Yes ☐ No ☒ O&M requirements: Yes ☐ No ☒
If any of the Waste Site Controls are checked Yes specify control requirements including reference to the Record of Decision, TSD Closure Letter, or other relevant documents.

O. A. Farabee DOE Federal Project Director (printed)	Signature	9/21/11 Date
D.F. Einan for L. Buelow EPA Project Manager (printed)	Signature	9/21/11 Date

DOE/RL-2011-91
Revision 0

Response Action Report for 200-MG-1 Operable Unit Waste Site 216-S-19

Prepared for the U.S. Department of Energy
Assistant Secretary for Environmental Management

U.S. DEPARTMENT OF ENERGY
Richland Operations Office

P.O. Box 550
Richland, Washington 99352

DOE/RL-2011-91
Revision 0

Response Action Report for 200-MG-1 Operable Unit Waste Site 216-S-19

Date Published
September 2011

Prepared for the U.S. Department of Energy
Assistant Secretary for Environmental Management

U.S. DEPARTMENT OF ENERGY

Richland Operations Office

P.O. Box 550
Richland, Washington 99352

J. D. Randal 09/21/2011
Release Approval Date

Approved for Public Release;
Further Dissemination Unlimited

Approval Page

Title: *Response Action Report for 200-MG-1 Operable Unit Waste Site 216-S-19*

O. A. Farabee
U.S. Department of Energy, Richland Operations Office

Signature

Date 9/21/11

Executive Summary

This response action report documents the successful completion of the removal action conducted at the 216-S-19 waste site, also known as the 216-S-19 Pond, 222-S Lab Swamp, 216-SL-1, and the REDOX Lab Swamp. The alternative proposed in DOE/RL-2008-44, *Engineering Evaluation/Cost Analysis for the 200-MG-1 Operable Unit Waste Sites* (EE/CA)[1] and selected in DOE/RL-2009-86, *Action Memorandum for Non-Time-Critical Removal Action for 37 Waste Sites in 200-MG-1 Operable Unit*[2] (Action Memorandum) was confirmatory sampling/no further action (CS/NFA).

The 216-S-19 waste site was investigated from November 2009 to August 2011 through field observations and sampling to determine the nature and extent of contaminants of potential concern (COPCs) present in the waste site soils as part of the selected removal action alternative of CS/NFA prescribed in the Action Memorandum (DOE/RL-2009-86). This investigation was performed in accordance with DOE/RL-2009-60, *Sampling and Analysis Plan for Selected 200-MG-1 Operable Unit Waste Sites*[3] (SAP) and DOE/RL-2009-53, *Removal Action Work Plan for 48 Waste Sites in the 200-MG-1 Operable Unit*[4] (RAWP). Through the investigation summarized in this report, it was found that analytical results from confirmatory sampling demonstrated that soil conditions at the waste site did not meet removal action levels. Therefore, in accordance with the methodology prescribed in the Action Memorandum (DOE/RL-2009-86), the alternative was changed to removal, treatment, and disposal (RTD). Verification sampling conducted after RTD activities confirmed that the waste site achieved cleanup standards and, therefore, met the established removal action objectives without further removal action.

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[1] DOE/RL-2008-44, 2009, *Engineering Evaluation/Cost Analysis for the 200-MG-1 Operable Unit Waste Sites*, Rev. 0, U.S. Department of Energy, Richland Operations Office, Richland, Washington. Available at: http://www2.hanford.gov/arpir/?content=findpage&AKey=0096350.

[2] DOE/RL-2009-86, 2010, *Action Memorandum for Non-Time-Critical Removal Action for 37 Waste Sites in the 200-MG-1 Operable Unit*, Rev. 0, U.S. Department of Energy, Richland Operations Office, Richland, Washington. Available at: http://www2.hanford.gov/arpir/?content=findpage&AKey=0084449

[3] DOE/RL-2009-60, 2011, *Sampling and Analysis Plan for Selected 200-MG-1 Operable Unit Waste Sites*, Rev. 1, U.S. Department of Energy, Richland Operations Office, Richland, Washington. Available at: http://www5.hanford.gov/pdw/fsd/AR/FSD0001/FSD0064/0084054/11-AMCP-0080_-_Letter_[1102030315]_-_1.pdf.

[4] DOE/RL-2009-53, 2010, *Removal Action Work Plan for 48 Waste Sites in the 200-MG-1 Operable Unit*, Rev. 1, U.S. Department of Energy, Richland Operations Office, Richland, Washington. Available at: http://www2.hanford.gov/arpir/?content=findpage&AKey=1010180132.

The results show that the residual soil concentrations of COPCs support reasonably anticipated future land use described in the EE/CA (DOE/RL-2008-44) and Action Memorandum (DOE/RL-2009-86). These results also support reclassification to "interim closed out" status in accordance with the process described in RL-TPA-90-0001, *Tri-Party Agreement Handbook Management Procedures*, Guideline Number TPA-MP-14, "Maintenance of the Waste Information Data System (WIDS)."[5] No institutional controls are required because there is no deep vadose zone contamination associated with the 216-S-19 waste site.

This waste site and the data obtained from the subject sampling evolutions will be included in the risk assessment and the remedial investigation/feasibility study for final remedial decisions for the Outer Area.

[5] RL-TPA-90-0001, 2007, *Tri-Party Agreement Handbook Management Procedures*, Guideline Number TPA-MP-14, "Maintenance of the Waste Information Data System (WIDS)," Rev. 1, U.S. Department of Energy, Richland Operations Office, Richland, Washington. Available at: http://www.hanford.gov/hanford/files/TPA-MP14.pdf.

Contents

Appendix

Figures

Tables

Terms

bgs	below ground surface
CERCLA	*Comprehensive Environmental Response, Compensation, and Liability Act of 1980*
COPC	contaminant of potential concern
CS/NFA	confirmatory sampling/no further action
DOE	U.S. Department of Energy
DQA	data quality assessment
Ecology	Washington State Department of Ecology
EE/CA	*Engineering Evaluation/Cost Analysis for the 200-MG-1 Operable Unit Waste Sites*
EPA	U.S. Environmental Protection Agency
FS	focused sample
HEIS	Hanford Environmental Information System
N/A	not available
NPL	National Priorities List
O&M	operations and maintenance
OU	operable unit
QA	quality assurance
QC	quality control
RAL	removal action level
RAO	removal action objective
RAWP	*Removal Action Work Plan for 48 Waste Sites in the 200-MG-1 Operable Unit*
RCRA	*Resource Conservation and Recovery Act of 1976*
RDL	required detection limit
RESRAD	RESidual RADioactivity (dose model)
RI/FS	remedial investigation/feasibility study
ROD	record of decision
RTD	removal, treatment, and disposal

RV	random verification
SAP	*Sampling and Analysis Plan for Selected 200-MG-1 Operable Unit Waste Sites*
SARA	*Superfund Amendments and Reauthorization Act of 1986*
TPH	total petroleum hydrocarbon
Tri-Party Agreement	*Hanford Federal Facility Agreement and Consent Order*
UCL	upper confidence limit
WIDS	Waste Information Data System

1 Introduction

This report documents the successful completion of a non-time-critical removal action conducted at the 216-S-19 waste site. The removal action alternative of confirmatory sampling/no further action (CS/NFA) was selected for this waste site, as proposed in DOE/RL-2008-44, *Engineering Evaluation/Cost Analysis for the 200-MG-1 Operable Unit Waste Sites* (EE/CA) and authorized by DOE/RL-2009-86, *Action Memorandum for Non-Time-Critical Removal Action for 37 Waste Sites in the 200-MG-1 Operable Unit* (Action Memorandum). Sampling results from the initial sampling evolution demonstrated that the waste site did not achieve compliance with the removal action levels (RALs). Using the methodology prescribed in the Action Memorandum (DOE/RL-2009-86) and based on the analytical results, the alternative was changed to removal, treatment, and disposal (RTD). This report provides the basis for the successful completion of the RTD action performed at the 216-S-19 waste site. This documentation has been prepared based on U.S. Environmental Protection Agency (EPA) guidance provided in EPA 540-R-98-016, *Close Out Procedures for National Priorities List Sites*.

This report provides a summary of the actions taken and resulting data to support a determination that, through performance of the RTD alternative, conditions remaining at the 216-S-19 waste site have achieved the established cleanup standards and have met the removal action objectives (RAOs) provided in the Action Memorandum (DOE/RL-2009-86). The documentation process is consistent with the U.S. Department of Energy (DOE) *Comprehensive Environmental Response, Compensation, and Liability Act of 1980* (CERCLA) Remedial Action Site Closure Guidance (DOE, 2010).

Statutory authority for the action taken is in accordance with CERCLA (as amended by the *Superfund Amendments and Reauthorization Act of 1986* [SARA]), Executive Order 12580, *Superfund Implementation,* the *Hanford Federal Facility Agreement and Consent Order* (Ecology et al., 1989), also known as the Tri-Party Agreement, and 40 CFR 300, "National Oil and Hazardous Substances Pollution Contingency Plan."

In August 2011, the non-time-critical removal action for the 216-S-19 waste site was completed in accordance with DOE/RL-2009-53, *Removal Action Work Plan for 48 Waste Sites in the 200-MG-1 Operable Unit* (RAWP). This report provides the following information relative to the completion of the subject removal action:

- Background, historical information, regulatory enforcement history, and environmental setting pertinent to this removal action
- Descriptions of the selected alternative, RAOs, and exposure and land use assumptions provided in the related regulatory documents
- A summary of the completed actions, the resulting data collected in support of completion of that removal action, a comparison of that data against objectives, and demonstration that RAOs have been met.

1.1 Site Description

General information on the Hanford Site and the 200-MG-1 Operable Unit (OU), described in the following subsections, provides a background and development of the removal action for the 216-S-19 waste site.

1.1.1 Hanford General Site Information

The Hanford Site, which is part of the DOE nuclear weapons complex, occupies approximately 1,517 km^2 (586 mi^2) along the Columbia River in Benton County, northwest of the City of Richland in the Lower Columbia Basin in southeastern Washington State (Figure 1-1). From the early 1940s to approximately 1989, the Hanford Site mission included building the world's first large-scale plutonium production facility and, until the 1980s, the site was used to produce plutonium for nuclear weapons. Other activities included nuclear research, development, and nuclear materials production. These activities created a wide variety of chemical and radioactive wastes that were released into the environment. The Hanford Site mission is now focused on the cleanup of those wastes and ultimate closure of the Hanford Site.

1.1.2 200-MG-1 Operable Unit

The Washington State Department of Ecology (Ecology), DOE, and EPA created the 200-MG-1 OU through the Tri-Party Agreement Milestone M-015-06-02 and Tri-Party Agreement Change Request C-06-02 (Ecology et al., 1989). The 200-MG-1 OU is made up of waste sites in the 200 East and 200 West Areas, and the 600 Area of the Hanford Site. The 600 Area encompasses those areas south of the Columbia River that are not part of another designated area (i.e., 300 Area, 200 East Area, and 100-K) and are not specifically identified (Figure 1-1). The 200-MG-1 OU waste sites consist of French drains, trenches, cribs, ditches, and retention basins with shallow contamination (generally less than 4.6 m [15 ft] deep), and where chemical and radioactive contaminants were released during material transfers (i.e. unplanned release sites). Additionally, some 200-MG-1 OU sites were produced by airborne dissemination of radioactive particles, or biodegradation and dispersion of plant or animal matter. For those sites containing radionuclides, the radionuclide inventory for this conceptual model group does not include transuranic isotopes greater than or equal to 100 nCi/g.

All of the waste sites contained in the 200-MG-1 OU are located within the Central Plateau, as described in the EE/CA (DOE/RL-2008-44) and Action Memorandum (DOE/RL-2009-86). The 216-S-19 waste site, also known as the 216-S-19 Pond, the 222-S Lab Swamp, 216-SL-1, and the REDOX Lab Swamp, is located just south of the 200 West Area perimeter fence and roughly 2.4 km (1.5 mi) north of the Rattlesnake Barricade (Figure 1-2).

1.2 Regulatory and Enforcement History

CERCLA was enacted to enable the federal government to conduct cleanup of hazardous substances released into the environment. In 1986, CERCLA was amended by SARA, which included Section 120 (42 USC 9620, "Federal Facilities"), developed specifically for federal facility cleanup. Presidential Executive Order 12580, *Superfund Implementation*, delegated to DOE the primary authority to conduct removal and remedial actions under authority of CERCLA Section 104, "Response Authorities." In 1987, the federal government determined that waste that included a mixture of radioactive and hazardous chemical components was subject to regulation under the *Resource Conservation and Recovery Act of 1976* (RCRA) and its Washington State counterpart. In 1989, DOE, EPA, and Ecology signed the Tri-Party Agreement (Ecology et al., 1989). The Tri-Party Agreement implemented DOE's exercise of CERCLA remedial action authority under EPA oversight, in accordance with CERCLA Section 120, and also included an Ecology Consent Order containing a schedule for bringing all current Hanford Site hazardous waste operations into compliance with RCRA under the new mixed waste requirements. DOE's authority to conduct removal actions under CERCLA Section 104 is independent of the Tri-Party Agreement, but is exercised cooperatively with the respective oversight authorities of EPA and Ecology.

As discussed in Chapter 1, statutory authority for this removal action is taken in accordance with CERCLA. Further governing requirements for compliance with CERCLA and the (RCRA) activities at the Hanford Site are in accordance with the Tri-Party Agreement (Ecology et al., 1989). The Hanford Site was proposed for inclusion in 53 FR 23988, "National Priorities List for Uncontrolled Hazardous Waste Sites – Update 7," hereafter referred to as the National Priorities List (NPL), and was placed on the NPL on November 3, 1989 (54 FR 41015, "National Priorities List for Uncontrolled Hazardous Waste Sites – Final Rule 10/04/89") by the EPA. The EPA placed the four aggregate areas (i.e. the 100, 200, 300, and 1100 Areas) on the NPL. The 200 Area NPL site consists of the 200 West and 200 East Areas, which contain waste management facilities and inactive irradiated fuel reprocessing facilities. The site also includes the 200 North Area, formerly used for interim storage and staging of irradiated fuel, and the waste sites assigned to the 200-MG-1 OU.

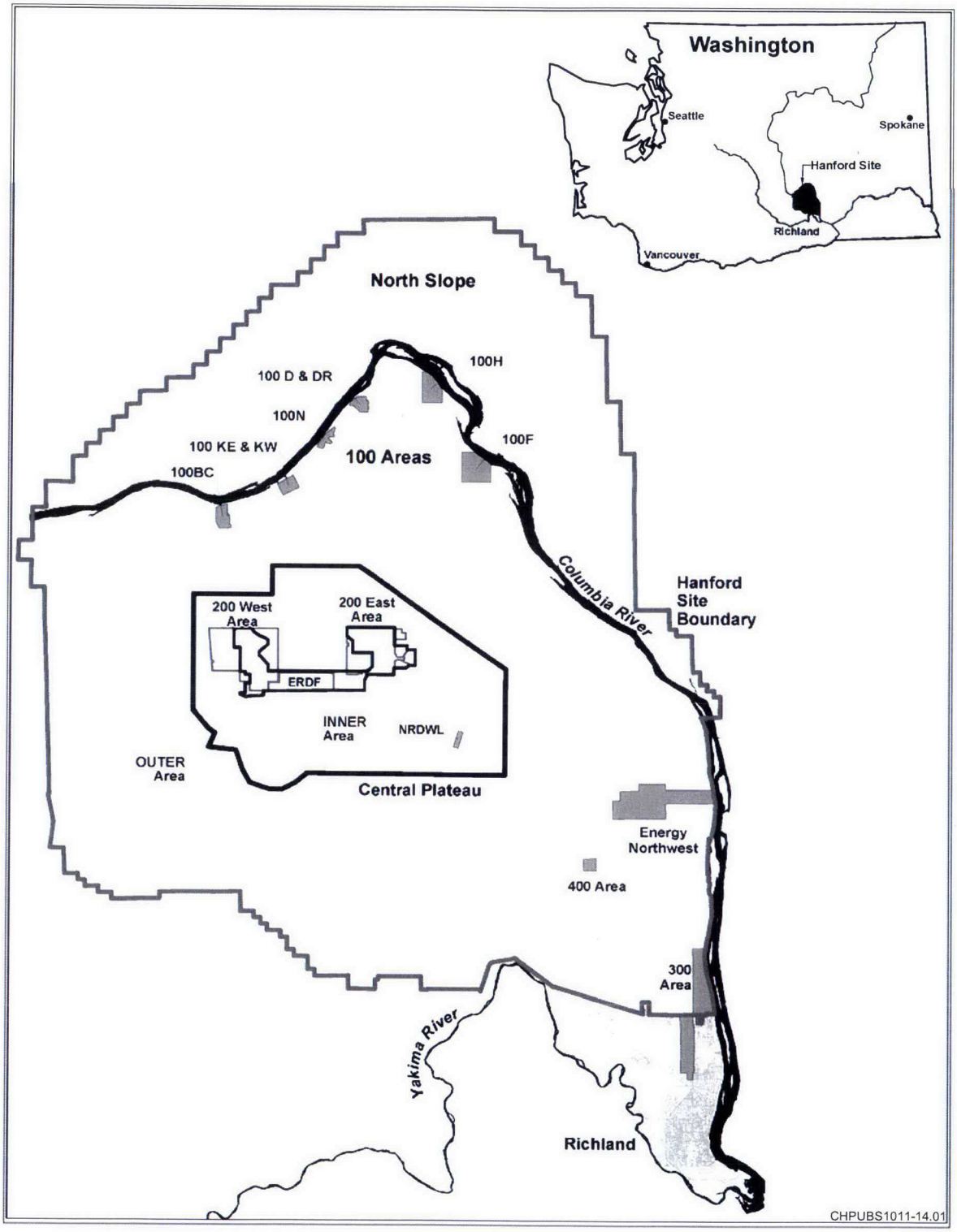

Figure 1-1. Location of the Hanford Site in Washington State

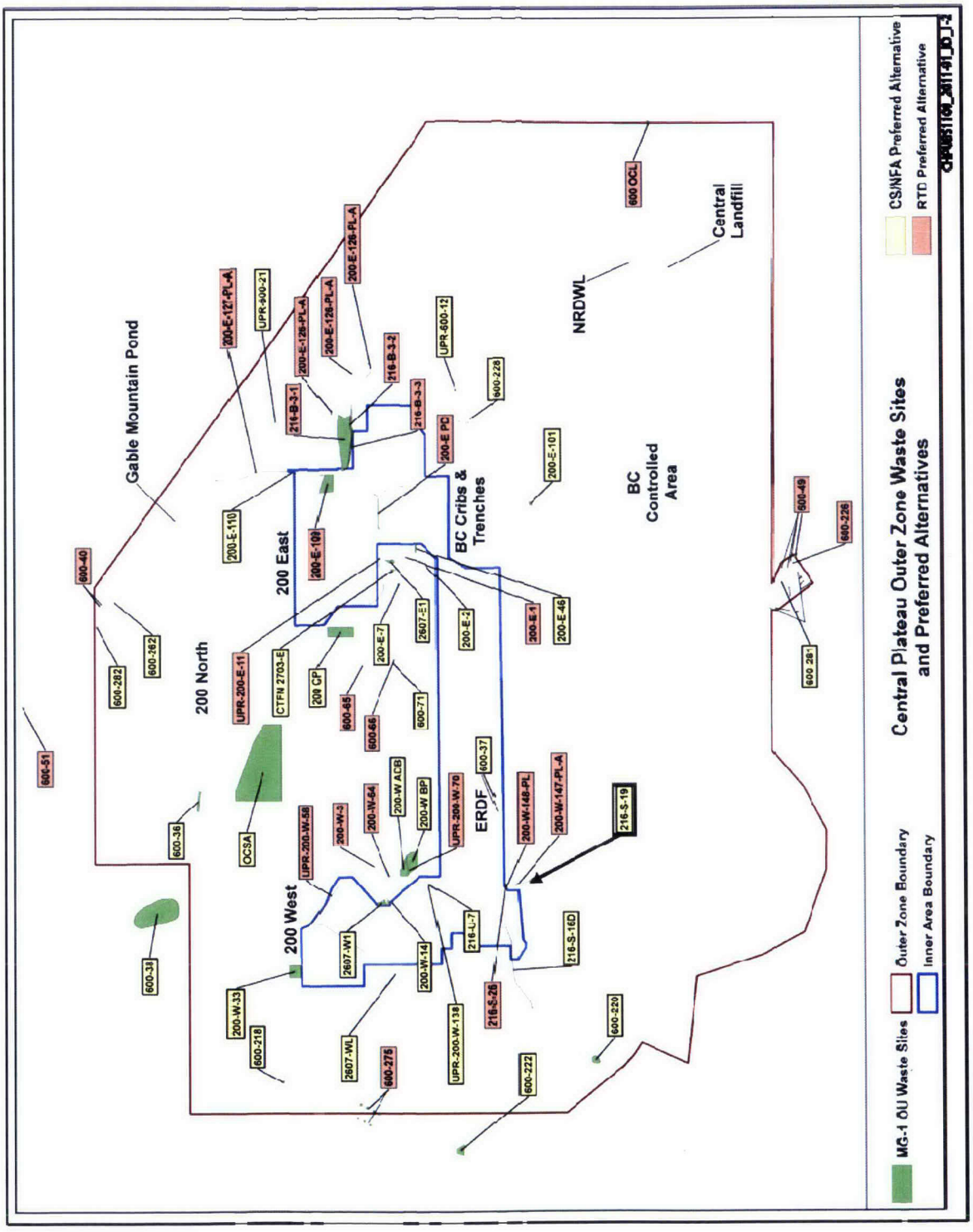

Figure 1-2. 200-MG-1 Operable Unit and the 216-S-19 Waste Site

1.3 Environmental Setting

The Hanford Site is located within the semiarid Pasco Basin in the northern portion of the Columbia Plateau. Normal annual precipitation is 17.7 cm (7 in.). According to PNL-10285, *Estimated Recharge Rates at the Hanford Site*, 2.6 to 17.3 mm (0.1 to 0.7 in.) per year of recharge is estimated in the 100 Area. Bedrock beneath the site is basalt of the Columbia River Basalt Group.

The Ringold Formation and the Hanford formation cover the basalt throughout the Central Plateau. Poorly consolidated, river-deposited, well-drained sands, gravels, cobbles, and boulders dominate these units. The Ringold Formation is an interstratified sequence of unconsolidated clay, silt, sand, and gravel-to-cobble sediment deposited by the ancestral Columbia River. The Hanford formation consists of uncemented gravels, sands, and silts deposited by Pleistocene cataclysmic floodwaters. Groundwater from the Hanford Site discharges to the Columbia River, which is the dominant surface water body of the Hanford Site. The direction of groundwater flow beneath the Central Plateau is toward the east-northeast. The uses of the Columbia River include production of hydroelectric power, irrigation, drinking water, recreation, and natural resources.

The average depth from ground surface to groundwater beneath the 200 Area ranges from 50 m (164 ft) to greater than 100 m (328 ft). Additional details on the geology and hydrogeology underlying the 200 Area and the 200-MG-1 OU are not provided in the base response action documents because the 200-MG-1 OU was created for shallow zone (less than 4.6 m [15 ft] in depth) waste sites, which are assumed not to be a threat to groundwater quality. This assumption is based on historical and process knowledge regarding volumes of liquids discharged, lack of mobility of contaminants, and shallow depth of the discharge(s).

The nearest natural surface water body to the 216-S-19 waste site is the Columbia River, located approximately 12.5 km (7.8 mi) north. The potential for natural groundwater recharge within the 200 Area is limited to precipitation infiltration. Estimates of recharge from precipitation at the Hanford Site range from 0 to 10 cm (0 to 4 in.) per year.

2 Waste Site Background

This chapter provides a description of the 216-S-19 waste site and information on process and background, describes the selected alternative, and delineates the RAOs and cleanup standards applicable to this removal action as prescribed in the Action Memorandum (DOE/RL-2009-86).

2.1 Waste Site 216-S-19

The 216-S-19 waste site, also known as the 216-S-19 Pond, the 222-S Lab Swamp, 216-SL-1, and the REDOX Lab Swamp, is located just south of the 200 West Area perimeter fence and roughly 2.4 km (1.5 mi) north of the Rattlesnake Barricade (Figure 2-1). This site was used as a discharge pond for the 222-S control laboratory, 216-S waste storage facility, 222-SA analytical chemical standards laboratory, and 291-S exhaust fan control house and stack via the 207-SL retention basin and the 200-W-147-PL-A pipeline from February 1952 until October 1984. The pond received both radioactive and hazardous effluent wastes throughout its lifetime.

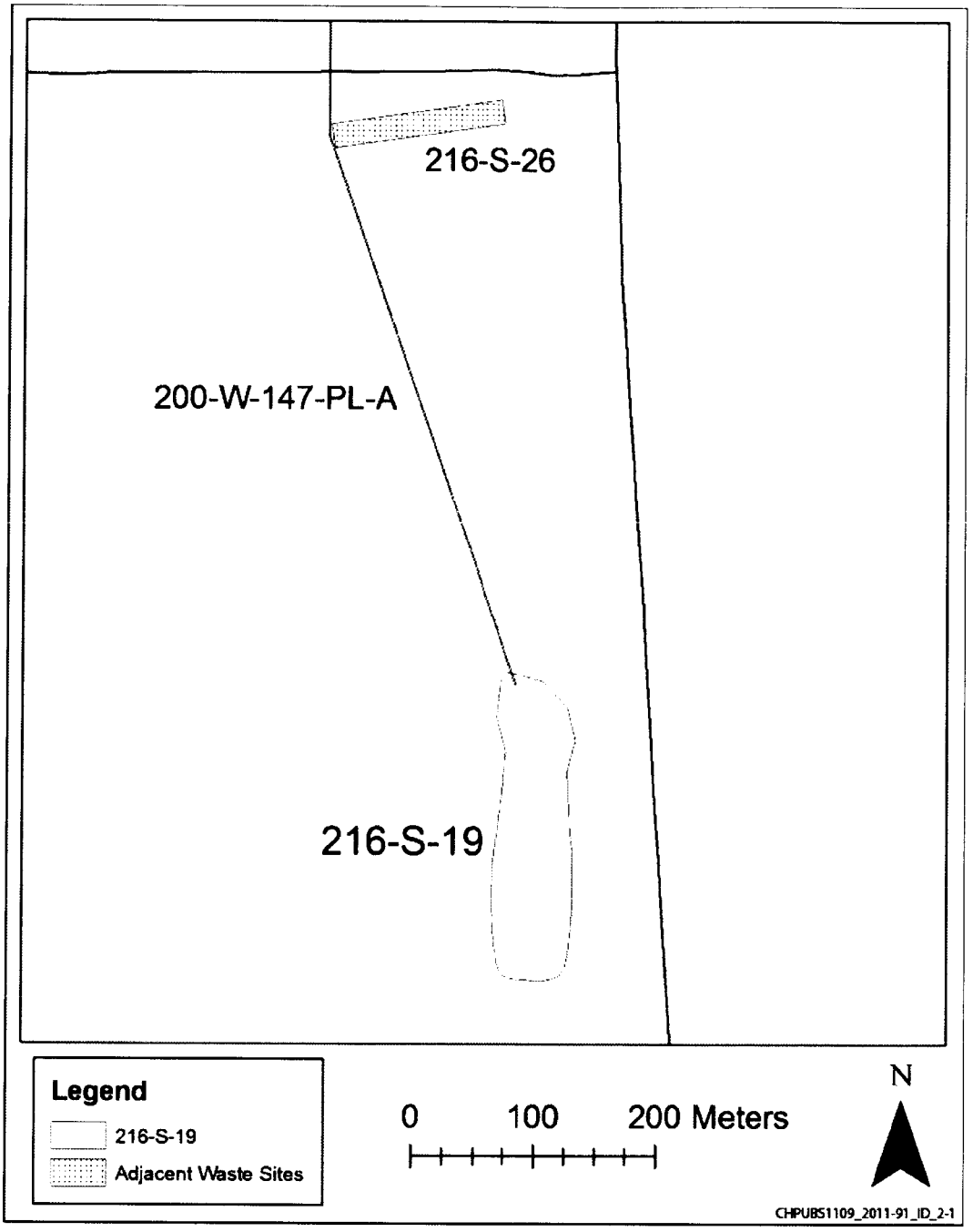

Figure 2-1. Boundary and Operational Areas of the 216-S-19 Waste Site

The 216-S-19 waste site is described in the Waste Information Data System (WIDS) as a discharge pond for the 222-S laboratory complex and was marked as an underground radioactive material area. The 216-S-19 pond was a natural depression approximately 14,164 m^2 (152,460 ft^2) in area. The release mechanism for this waste site is planned and sustained release of contaminated effluent. The current form of all waste materials is solid.

2.2 Description of the Selected Alternative

As stated in the EE/CA (DOE/RL-2008-44) and Action Memorandum (DOE/RL-2009-86), the selected alternative for the subject waste site was CS/NFA. This alternative was selected because, due to historical activity and process knowledge, contaminants of potential concern (COPCs) were not expected to exceed the RALs. Initial sampling and analysis did not confirm that concentrations of COPCs in soil were less than or equal to the RALs without the need for further action. As a result, in accordance with the Action Memorandum (DOE/RL-2009-86), the alternative was changed to RTD. Activities involved in the RTD action set forth in the RAWP (DOE/RL-2009-53) and DOE/RL-2009-60, *Sampling and Analysis Plan for Selected 200-MG-1 Operable Unit Waste Sites* (SAP) include soil excavation and verification sampling to demonstrate that concentrations of COPCs in soil are less than or equal to established RALs, and that no additional removal action is required. The general removal action sampling design criteria are provided in this section followed by a summary of waste site history, specific sampling design and methodology, and analytical results for the 216-S-19 waste site.

The following key features relevant to the 216-S-19 waste site were considered during development of the sample design:

- Direct visual inspection of the site surface was performed, using available site information as a guide for visual cues such as staining, discoloration, absence of vegetation, presence of debris and other anomalies.
- Radiological field screening was performed at the surface of the waste site to provide an indication of the presence of radiological COPCs.
- A combination of focused and random sampling was performed per the methodology prescribed in the SAP (DOE/RL-2009-60). The use of focused samples (FSs) based on process knowledge and visual indicators was considered appropriate for the initial sampling evolution. Random sampling in the impacted area was considered appropriate for the verification sampling evolution.

Based on these key design features, soil samples were collected from the 216-S-19 waste site and analyzed for COPC concentrations. Evaluation of the initial sampling analytical results demonstrated that, for specific areas, concentrations of COPCs exceeded the RALs, resulting in the implementation of the RTD alternative. Under this alternative, soils were removed from the impacted areas, and a verification sampling evolution was conducted, the results of which confirmed that remaining in situ soils met cleanup standards for COPCs applicable to the impacted area. Table 5-2 provides the maximum concentrations for each COPC from the verification sampling analytical data. Tables A-1 through A-4 provide detailed summaries of all analytical data results for sampling conducted at the 216-S-19 waste site (Appendix A).

Personnel with current training and qualifications performed field radiological surveying during the sampling evolutions. Survey methods and practices were performed in accordance with established contractor methods and protocols. Of the radiological surveys performed during samples activities, one survey indicated radiological readings greater than the measured background, and an additional contingency sample was collected. Analytical results from the sample collected were less than established RALs. Survey results indicated no radiological contamination.

2.2.1 Removal Action Objectives

The removal action alternatives for the 200-MG-1 OU waste sites were evaluated based on their overall ability to protect human health and the environment and their effectiveness in maintaining both short-term

and long-term protection. The selected alternative must meet the following RAOs established in the Action Memorandum (DOE/RL-2009-86):

- **RAO 1**–Prevent unacceptable risk to human health and ecological receptors from exposure to soils and/or debris contaminated with nonradiological constituents to 4.6 m (15 ft) below ground surface (bgs) at concentrations above the appropriate RALs.
- **RAO 2**–Prevent unacceptable risk to human health and ecological receptors from exposure to soils and/or debris contaminated with radiological constituents to 4.6 m (15 ft) bgs at concentrations above the appropriate RALs.
- **RAO 3**–Control the sources of groundwater contamination to minimize impacts to groundwater resources, protect the Columbia River from adverse impacts, and reduce the degree of groundwater cleanup that may be required under future action.
- **RAO 4**–Prevent adverse impacts to cultural resources and threatened or endangered species, and minimize wildlife habitat disruption.

The RALs for the waste sites identified in the Action Memorandum (DOE/RL-2009-86) are based on the RAOs noted above. These RALs are based on attainment of acceptable levels of human health, ecological risk, and protection of groundwater but are not less than background levels or detection limits for waste sites. Attainment of RALs is intended to meet the first three RAOs and is expected to satisfy the remedial action objectives established in the final record of decision (ROD). The fourth RAO is met through cultural and ecological reviews performed before starting removal action activities. The RALs applicable to the 216-S-19 waste site are listed in Tables 2-1 and 2-2. The attainment of RALs and RAOs is provided in Chapter 5 of this report.

Table 2-1. Radiological Removal Action Levels

Contaminant of Potential Concern	Background Concentration[a] (pCi/g)	Direct Exposure[b] (pCi/g)	Groundwater Protection[c] (pCi/g)	Required Detection Limit (pCi/g)	Removal Action Levels (pCi/g)
Americium-241	N/A	31.1	N/A[d]	1.0	31.1
Cesium-137	1.1	6.2	1,465	0.1	6.2
Cobalt-60[g]	0.008	1.4	N/A[d]	0.05	1.4
Europium-152	N/A	3.3	N/A[d]	0.1	3.3
Europium-154	0.033	3.0	N/A[d]	0.1	3.0
Europium-155	0.054	125	N/A[d]	0.1	125
Plutonium-238	0.004	38.8	N/A[d]	1.0	38.8
Plutonium-239/240	0.025	33.9	N/A[d]	1.0	33.9
Strontium-90	0.18	4.5	27.6	1.0	4.5
Technetium-99[f]	N/A	5.8	0.46	15.0	15.0
Tritium[f]	N/A	459	12.6	30.0	30.0
Uranium-233/234	1.1	1.1[e]	1.1[e]	1.0	1.1
Uranium-235	0.11	0.61	0.5[e]	0.5	0.5
Uranium-238	1.1	1.1[e]	1.1[e]	1.0	1.1

a. Hanford Site background values for radiological constituents are provided in DOE/RL-96-12, *Hanford Site Background; Part 2, Soil Background for Radionuclides*, Table 5-1.

b. Radionuclide concentrations for beta/gamma in water correspond to a 4 mrem/yr dose from EPA/540-R-00-007, *Soil Screening Guidance for Radionuclides: User's Guide*. Calculations are based on either RESRAD (ANL, 2009, RESRAD Version 6.5) or WDOH/320-015, *Hanford Guidance for Radiological Cleanup*.

c. Soil concentration for groundwater protection were calculated using RESRAD with the maximum contaminant levels calculated from NBS Handbook 69, *Maximum Permissible Body Burdens and Maximum Permissible Concentrations of Radionuclides in Air or Water for Occupational Exposure*; maximum permissible concentrations cited in EPA/540-R-00-007; or 40 CFR 141.66, "National Primary Drinking Water Regulations," "Maximum Contaminant Levels for Radionuclides."

d. RESRAD predicts that constituents will not reach groundwater within 1,000 years, based on 100 Area generic site model using soil column layers and depths.

e. Where removal action levels (RALs) are less than background or required detection limits (RDLs), RALs default to background or RDLs (whichever is larger).

f. Technitium-99 and tritium (H_3) are applicable only to 216-S-19 and 216-S-26 only.

g. Cobalt-60 is specific to the processes associated with sites that received specific 222-S Laboratory effluent streams such as 216-S-19 and 216-S-26.

N/A = not available

RESRAD = RESidual RADioactivity (dose model)

Table 2-2. Nonradiological Removal Action Levels

Contaminant of Potential Concern	Background Concentration[a] (mg/kg)	Direct Exposure[b] (mg/kg)	Groundwater Protection[c] (mg/kg)	Required Detection Limit (mg/kg)	Removal Action Levels (mg/kg)	Ecological Risk Screening Values (mg/kg)
Antimony	5	32	5.4	0.6	5.4	5
Arsenic	6.5	6.5[d]	6.5[d]	1.0	6.5[d]	7
Barium	132	16,000	1,650	2	1,650	102
Beryllium	1.51	160	63.2	0.5	63.2	10
Boron	N/A	16,000	210	2	210	0.5
Cadmium	0.81	80	0.81[d]	0.5	0.81[d]	4
Chromium (Total)	18.5	120,000	2,000	1	2,000	42
Chromium (VI)	N/A	240	--[e]	0.5	--[e]	N/A
Cobalt	15.7	24	15.7[d]	2	15.7[d]	20
Copper	22.0	3,200	284	1	284	50
Lead	10.2	250	3,000	5.0	250	50
Lithium	33.5	160	192	2.5	160	35
Manganese	512	3,760	512[d]	5	512[d]	1,100
Mercury	0.33	24	2.09	0.2	2.09	0.1
Nickel	19.1	1,600	130	4	130	30
Selenium	0.78	400	5.2	1	5.2	0.3
Silver	0.73	400	13.6	0.2	13.6	2
Strontium	N/A	48,000	2,920	1	2,920	N/A
Thallium	N/A	5.6	1.59	1	1.59	1
Tin	N/A	48,000	48,000	10	48,000	50
Uranium (Soluble Salts)	3.21	240	3.21[d]	1	3.21[d]	5
Vanadium	85.1	560	2,240	2.5	560	2
Zinc	67.8	24,000	5,970	1	5,970	86
Aroclor 1016	N/A	0.5	0.094	0.017	0.094	0.65
Aroclor 1221	N/A	0.5	0.017[d]	0.017	0.017[d]	0.65
Aroclor 1232	N/A	0.5	0.017[d]	0.017	0.017[d]	0.65
Aroclor 1242	N/A	0.5	0.039	0.017	0.039	0.65
Aroclor 1248	N/A	0.5	0.039	0.017	0.039	0.65

Table 2-2. Nonradiological Removal Action Levels

Contaminant of Potential Concern	Background Concentration[a] (mg/kg)	Direct Exposure[b] (mg/kg)	Groundwater Protection[c] (mg/kg)	Required Detection Limit (mg/kg)	Removal Action Levels (mg/kg)	Ecological Risk Screening Values (mg/kg)
Aroclor 1254	N/A	0.5	0.066	0.017	0.066	0.65
Aroclor 1260	N/A	0.5	0.72	0.017	0.5	0.65
Acenaphthene	N/A	4,800	98	0.33	98	20
Acenaphthylene	N/A	4,800	98	0.33	98	N/A
Anthracene	N/A	24,000	2,270	0.33	2,270	N/A
Benzo[*a*]anthracene	N/A	1.37	0.86	0.33	0.86	N/A
Benzo[*a*]pyrene	N/A	0.137	0.233[f]	0.33	0.33[d]	12
Benzo[*b*]fluoranthene	N/A	1.37	2.95	0.33	1.37	N/A
Benzo[*g,h,i*]perylene	N/A	2,400	25,700	0.33	2,400	N/A
Benzo[*k*]fluoranthene	N/A	1.37	2.95[f]	0.33	1.37	N/A
Chrysene	N/A	13.7	9.56	0.33	9.56	N/A
Dibenz[*a,h*]anthracene	N/A	1.37	4.29	0.33	1.37	N/A
Fluoranthene	N/A	3,200	631	0.33	631	N/A
Fluorene	N/A	3,200	101	0.33	101	30
Indeno[*1,2,3-cd*]pyrene	N/A	1.37	8.33	0.33	1.37	N/A
Naphthalene	N/A	1,600	4.46	0.33	4.46	N/A
Phenanthrene	N/A	24,000	1,140	0.33	1,140	N/A
Pyrene	N/A	2,400	655	0.33	655	N/A
Carbon Tetrachloride[g]	N/A	7.69	0.0031	0.005	0.005	N/A
Xylene[h]	N/A	16,000	14.6	0.01	14.6	N/A
Nitrate (as Nitrogen)	11.8	128,000	40	0.75	40	N/A
TPH–Diesel	N/A	2,000	2,000	5	2,000	200
TPH–Kerosene	N/A	2,000	2,000	5	2,000	200
Fluoride[i]	N/A	4,800	16	5	16	N/A
Asbestos	N/A	N/A[j]	N/A[j]	N/A[j]	1 %[j]	N/A

Table 2-2. Nonradiological Removal Action Levels

Contaminant of Potential Concern	Background Concentration[a] (mg/kg)	Direct Exposure[b] (mg/kg)	Groundwater Protection[c] (mg/kg)	Required Detection Limit (mg/kg)	Removal Action Levels (mg/kg)	Ecological Risk Screening Values (mg/kg)

a. If Hanford Site-specific background data are not available, values are then taken from Ecology Publication No. 94-115, *Natural Background Soil Metals Concentrations in Washington State*. Hanford Site background values are available from nonradiological background data in DOE/RL-92-24, *Hanford Site Soil Background: Part 1, Soil Background for Nonradioactive Analytes*, Table D9-2.

b. Direct-contact values were calculated based on WAC 173-340-740, "Unrestricted Land Use Soil Cleanup Standards;" using Method B methodology and assumptions.

c. The groundwater protection values were obtained using equations provided in WAC 173-340-747(4), "Model Toxics Control Act—Cleanup," "Deriving Soil Concentrations for Groundwater Protection," with the physical parameters obtained from http://www.ecy.wa.gov/.

d. Where cleanup levels are less than background or RDLs, cleanup levels default to background or RDLs in accordance with WAC 173-340-700(6)(d), "Model Toxics Control Act—Cleanup," "Overview of Cleanup Standards," and WAC 173-340-707(2), "Model Toxics Control Act—Cleanup," "Analytical Considerations," respectively.

e. Based on process knowledge, chromium (VI) is not expected to be present at 200-MG-1 OU waste sites. The following values are given to help guide cleanup:

- 0.2 mg/kg—calculated value using $K_d = 0$, based on PNNL-13895, *Hanford Contamination Distribution Coefficient Database and Users Guide*, and WAC 173-340-747, "Deriving Soil Concentrations for Groundwater Protection," Equation 747-1.
- 2.1 mg/kg—based on DOE/RL-96-17, *Remedial Design Report/Remedial Action Work Plan for the 100 Area.*
- 18.4 mg/kg—based on Ecology, 2007, Cleanup Levels and Risk Calculations (CLARC) database.

f. The soil concentration for protection of groundwater values for benzo[*a*]pyrene and benzo[*k*]fluoranthene were incorrectly reported in DOE/RL-2009-48, *Action Memorandum for Non-Time-Critical Removal Action for 11 Waste Sites in 200-MG-1 Operable Unit*, and have been corrected.

g. Carbon tetrachloride is applicable to the 11 waste sites authorized by DOE/RL-2009-48.

h. Xylene is applicable only to the 200-W-3, 216-S-19, and 216-S-26 waste sites.

i. Fluoride is added as a contaminant of potential concern for select sites, such as 216-S-19 and 216-S-26, based on process history.

j. The RAL for asbestos in soil is one percent by weight (measured using polarized light microscopy). EPA has used this value for determining if response actions for asbestos should be undertaken (Cook, 2004, "Clarifying Cleanup Goals and Identification of New Assessment Tools for Evaluating Asbestos at Superfund Cleanups,"). Further evaluation of removal actions for asbestos will be conducted, as needed, on a site-specific basis in the Outer Area remedial investigation/feasibility study.

TPH = total petroleum hydrocarbon

Ecological screening values, which are based on WAC 173-340-900, "Model Toxics Control Act—Cleanup," "Tables," Table 749-3, are used for screening purposes only and are not considered cleanup levels for this CERCLA removal action (described more fully in Chapter 5 of the Action Memorandum [DOE/RL-2009-86]). If analytical results exceed the ecological screening values, the results will be further evaluated during the final ecological risk assessment in accordance with the remedial investigation/feasibility study (RI/FS) for the Central Plateau in order to make the final cleanup decisions.

2.2.2 Exposure and Land Use Assumptions

The 216-S-19 waste site is located within the Central Plateau, as discussed in more detail in the EE/CA (DOE/RL-2008-44) and Action Memorandum (DOE/RL-2009-86) for the 200-MG-1 OU. Land use for

the Central Plateau is designated for reasonably anticipated future uses recognized in the EE/CA (DOE/RL-2008-44) and Action Memorandum (DOE/RL-2009-86) (for the purposes of this interim action, RAOs were selected that would support unrestricted land use).

2.2.3 Design Summary

The CS/NFA action alternative was the selected alternative for the 216-S-19 waste site. Sampling and analysis indicated that contaminant concentrations in the waste site soils were greater than the RALs. Based on those analytical results, and per the methodology prescribed in the Action Memorandum (DOE/RL-2009-86), the alternative progressed to RTD. Following removal of the impacted soil, verification sampling was conducted to confirm that remaining in-situ soil was less than or equal to the RALs. The sampling objectives for the 216-S-19 waste site included visual inspection and collection of discrete soil samples from the waste site as described in Section 3.1 of this report.

Key features of the site-specific sampling design for the 216-S-19 waste site included the following:

- Direct visual inspection of the site surface was performed, using available site information as a guide for visual cues such as staining, discoloration, absence of vegetation, presence of debris and other anomalies.
- Radiological field screening was performed at the surface of the waste site to provide an indication of the presence of radiological COPCs.
- A combination of focused and random sampling was performed per the methodology prescribed in the SAP (DOE/RL-2009-60). The use of FSs based on process knowledge and visual indicators was considered appropriate for the initial sampling evolution. Random sampling in the impacted areas was considered appropriate for the verification sampling evolution.

2.3 Decision Document Amendments, Significant Differences, or Waivers

No amendments to the EE/CA (DOE/RL-2008-44) or Action Memorandum (DOE/RL-2009-86), or technical impracticability waivers were associated with this removal action. A Tri-Party Agreement change (TPA-CN-350, *Tri-Party Agreement Change Notice Form: DOE/RL-2009-86 Action Memorandum for Non-Time-Critical Removal Action for 37 Waste Sites in the 200-MG-1 Operable Unit, Rev. 0*) has been approved for the Action Memorandum (DOE/RL-2009-86) to add sites to the scope of the removal action; however, the change had no effect on the previously authorized action or on cleanup levels for this waste site.

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3 Response Activity Summary

As stated in the EE/CA (DOE/RL-2008-44) and Action Memorandum (DOE/RL-2009-86), the selected alternative for the 216-S-19 waste site was CS/NFA. The results of the confirmatory sampling indicated COPC concentrations greater than the RALs in one of the samples collected. Per the provisions of the Action Memorandum (DOE/RL-2009-86), the removal action activities progressed to implementation of the RTD alternative for the waste site. Upon completion of RTD activities, verification sampling was conducted to demonstrate that contaminant concentrations remaining in soil at the 216-S-19 waste site met cleanup standards, thus demonstrating that the RAOs were met.

3.1 Summary of Activities

The removal action at the 216-S-19 waste site was conducted from November 2010 through August 2011 and included the collection of focused and random samples from locations within the waste site, as specified in Section 2.2, and per the methodologies prescribed in the SAP (DOE/RL-2009-60). The following key activities were pertinent to the removal action at the 216-S-19 waste site:

- Collection of focused and random soil samples during initial sampling (Figure 3-1) based on historical and process knowledge of the waste site as an effluent discharge pond, and visual indicators
- Excavation of soil from the waste site, under the RTD alternative, based on analytical results of initial sampling in excess of the RALs. The extent of excavation was further refined utilizing in process sampling to eventually encompass the entire floor of the pond
- Collection of random samples from the area of excavation for verification purposes, laboratory analysis of soil samples for COPCs, and evaluation of analytical results to demonstrate achievement of cleanup standards

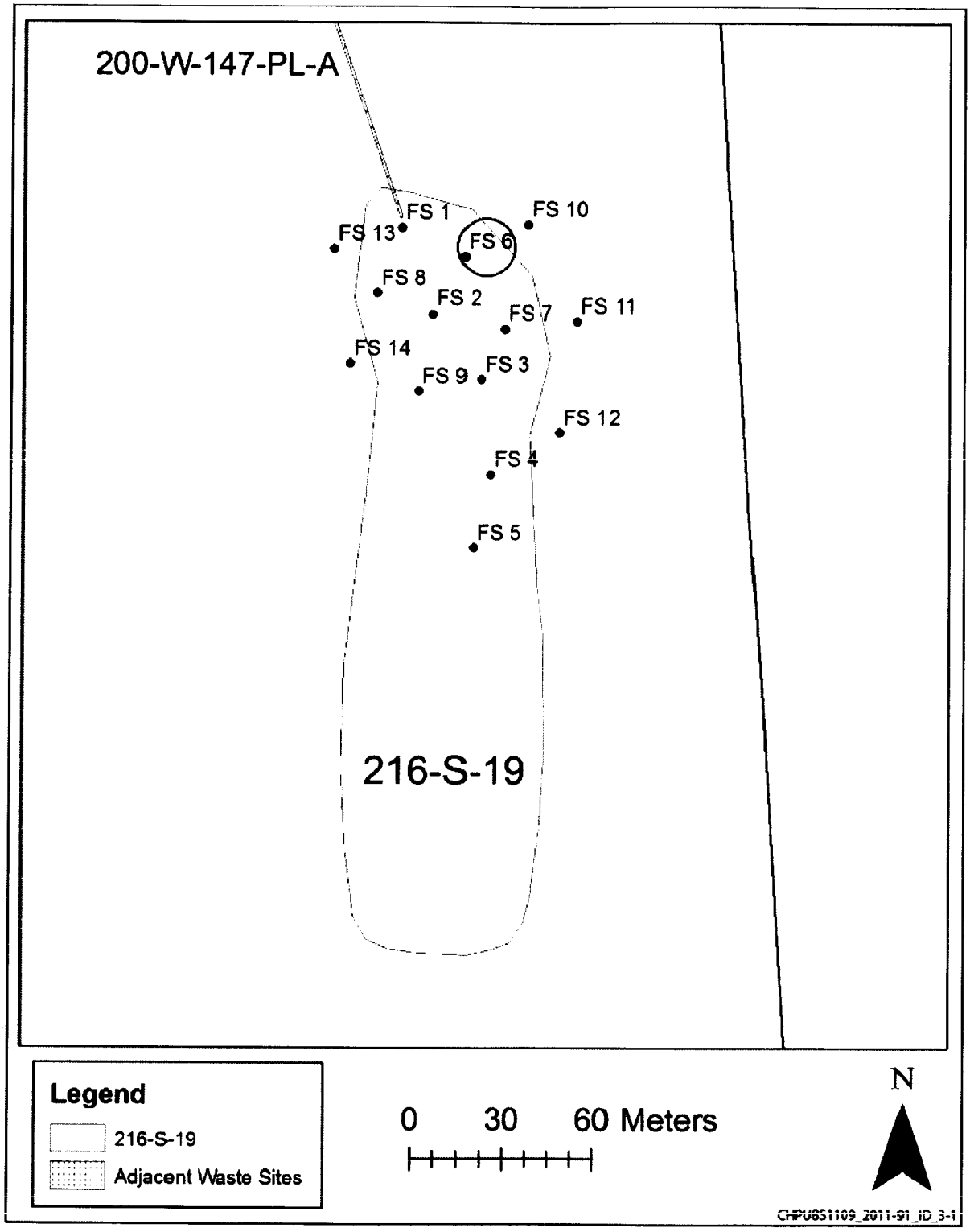

Figure 3-1.Initial Sample Locations at the 216-S-19 Waste Site

3.1.1 Waste Site 216-S-19 Confirmatory Sampling

A site evaluation was performed in August 2010, prior to performance of the initial sampling evolution. This evaluation served to support job planning as well as completion of the visual inspection component of the sampling activities described in the SAP (DOE/RL-2009-60). Observations made during site evaluation included an area of low-lying land to the south of the pond that was incorporated into the confirmatory sample design. Based on historical information and observations made during visual inspection, 14 FSs were identified for sampling at the 216-S-19 waste site, as shown in Figure 3-1. The samples placed outside the pond boundaries were established to determine the lateral extent of the waste site.

For radiological field screening at the 216-S-19 waste site, surveys were performed in accordance with established contractor methods and protocols by personnel with current training and qualifications. Soil contamination area radiological postings were present at the time of surveying. Of the radiological surveys performed during samples activities, one survey indicated radiological readings greater than the measured background, and an additional contingency sample was collected. Analytical results from the sample collected were less than established RALs. Survey results indicated no radiological contamination.

Initial soil sampling was conducted from November 2010 through March 2011 at the 14 FS locations established during site evaluation. The FS locations were selected based on historical flow path information and site investigation. At each sample location surface (defined as 0 to 0.3 m [0 to 1 ft] below ground surface [bgs]) and depth (up to 4.6 m [15 ft] bgs) samples were included in the sample design. Depth samples were screened for radiological contamination at 0.61 m (2 ft) increments. Samples were collected at the area of highest radiological contamination, if detected during incremental radiological screening.

The samples were analyzed for the full suite of COPCs (radiological, metals, polynuclear aromatic hydrocarbons, volatile organic analytes, anions, and total petroleum hydrocarbons) in accordance with the SAP (DOE/RL-2009-60). Analytical results from the initial sampling evolution indicated COPC concentrations of uranium (soluble salts), U-233/234, and U-238 in excess of the RALs at FS location 6 (Table 3-1).

Arsenic and manganese were not considered COPCs for the 216-S-19 waste site based on process knowledge and historical information; however, maximum concentrations of arsenic and manganese reported were 9.35 mg/kg and 537 mg/kg, respectively. These values are consistent with recorded background values for arsenic and manganese at the Hanford Site, and do not indicate a source of contamination.

Table 3-1. Contaminants of Potential Concern Concentrations Exceeding Removal Action Levels

Contaminant of Potential Concern	Removal Action Level	Initial Sampling Results HEIS B28BL0 FS 6
Uranium (Soluble Salts)	3.21 mg/kg	**3.42 mg/kg**
U-233/234	1.1 pCi/g	**1.4 pCi/g**
U-238	1.1 pCi/g	**1.4 pCi/g**

Note: Values listed in bold denote concentrations of contaminants of potential concern in excess of the removal action levels.

FS = focused sample

HEIS = Hanford Environmental Information System

3.1.2 Waste Site Excavation

The results of initial sampling indicated concentrations of uranium (soluble salts), U-233/234, and U-238 in excess of their respective RALs at the 216-S-19 waste site, thus initiating RTD. Removal of impacted soils at the 216-S-19 waste site was completed in August 2011. The area surrounding FS 6 was excavated to a depth of approximately 0.31 to 0.61 m (1 to 2 ft) below the floor of the pond in an attempt to spot clean the area of contamination; however, the area of excavation was ultimately expanded laterally to encompass the entire floor of the pond based on the results of in process sampling. The vertical extent of excavation was further refined by in process sampling conducted during RTD activities to depths ranging from approximately 3 to 4 m (10 to 13 ft) below original grade.

3.1.3 Waste Site 216-S-19 Verification Sampling

Based on analytical results from initial and in process sampling at the 216-S-19 waste site, the RTD alternative was implemented. The lateral and vertical extents of excavation were expanded utilizing in process sampling collected during RTD activities. Upon completion of RTD activities, a verification sampling design was developed for the waste site utilizing Visual Sample Plan software to place samples randomly within the excavated area (Figure 3-2) In accordance with guidance from Section 3.2.5.2 of the SAP (DOE/RL-2009-60), and based on the area of excavation of 2,125 m^2 (22,878 ft^2) encompassing the floor of the pond, a multi-agency radiological site survey and investigation manual sample design was implemented, resulting in a total of 20 random verification (RV) samples.

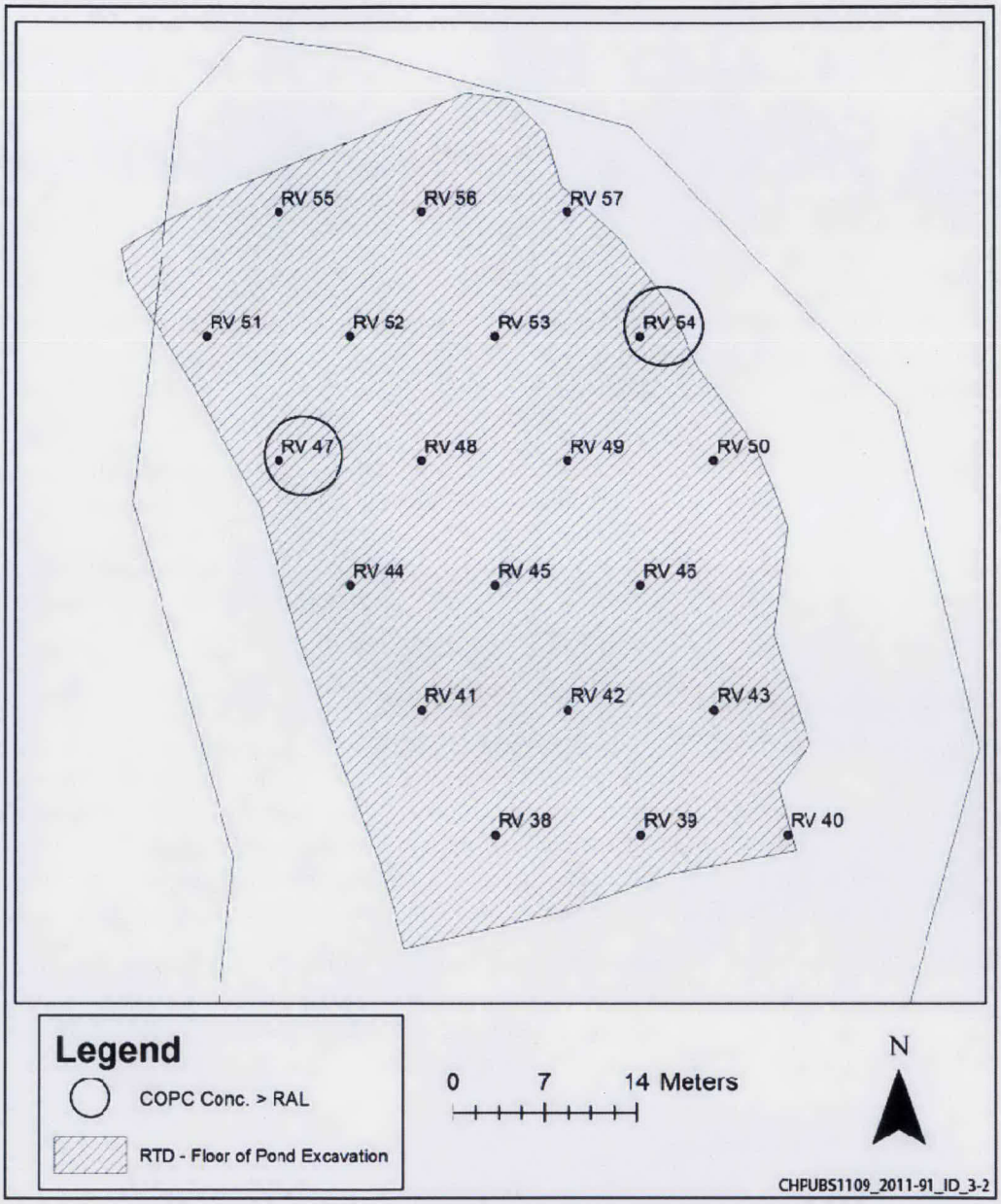

Figure 3-2. Verification Sampling Locations at 216-S-19 Waste Site

The samples collected were analyzed for uranium (soluble salts), U-233/234, and U-238. Analytical results indicated concentrations of uranium (soluble salts), U-233/234, and U-238 were greater than RALs for sample locations RV 47 and RV 54 (Table 3-2).

Table 3-2. Verification Sample Results versus Removal Action Levels

Contaminant of Potential Concern	Removal Action Levels	HEIS B2H072 B2H0B2 RV 47	HEIS B2H080 B2H0C0 RV 54	95 % Upper Confidence Limit Mean
Uranium (Soluble Salts)	3.21 mg/kg	**4.06 mg/kg**	**3.55 mg/kg**	1.48 mg/kg
U-233/234	1.1 pCi/g	**1.7 pCi/g**	**1.2 pCi/g**	0.55 pCi/g
U-238	1.1 pCi/g	**1.6 pCi/g**	**1.2 pCi/g**	0.55 pCi/g

Note: Values listed in bold denote concentrations of contaminants of potential concern in excess of the removal action levels.

HEIS = Hanford Environmental Information System

RV = random verification

In accordance with Section 3.2.5.1 of the SAP (DOE/RL-2009-60), comparison of the calculated 95 percent upper confidence limit (UCL) site mean value with the respective RAL demonstrates compliance with cleanup criteria. The resulting 95 percent UCL site mean values, indicated in Table 3-2, were less than the established RALs; therefore demonstrating that the site meets the cleanup standards set forth in the SAP (DOE/RL-2009-60). Table A-5 presents the calculations supporting the UCL mean values listed in Table 3-2.

3.1.4 Backfill and Revegetation

As described in Sections 2.1 and 5.5.1 of the RAWP (DOE/RL-2009-53), backfill and/or contouring may take place at the 216-S-19 waste site upon concurrence by the signing parties that the RAOs have been attained. Finalization of a backfill concurrence form provided to the agency(ies) provided concurrence that the waste site had achieved the established RAOs; therefore, backfill and/or contouring proceeded at the 216-S-19 waste site. The backfill concurrence form was approved by the regulatory agency(ies) on August 31, 2011. Backfill of the 216-S-19 waste site was completed on September 12, 2011.

In accordance with the ecological compliance review conducted for the 216-S-19 waste site, this area does not meet the requirements of a Level III or Level IV designation as described in DOE/RL-96-32, *Hanford Site Biological Resources Management Plan*; therefore, revegetation at the 216-S-19 waste site is not required. DOE may elect to revegetate the 216-S-19 waste site at a future date for aesthetic purposes.

3.1.5 Statement of Protectiveness

In accordance with the SAP (DOE/RL-2009-60), soil at the 216-S-19 waste site has been sampled, analyzed, and evaluated. The results obtained through implementation of the RTD alternative demonstrate that contaminant concentrations in the soil at the 216-S-19 waste site meet the cleanup standards set forth in the SAP (DOE/RL-2009-60) (discussed in further detail in Chapter 5). These results also indicate that residual concentrations will support reasonably anticipated future land use recognized in the EE/CA (DOE/RL-2008-44) and Action Memorandum (DOE/RL-2009-86), and demonstrate that residual concentrations of COPCs in soil throughout the site are unlikely to affect groundwater or the Columbia River. As summarized in Chapter 5, a review of the sampling results showed that the removal action at the 216-S-19 waste site has demonstrated achievement of the RAOs established in the Action Memorandum (DOE/RL-2009-86) and identified in the RAWP (DOE/RL-2009-53).

4 Chronology of Events

Table 4-1 presents a chronology of major events associated with sampling the subject waste site. The chronology includes approval of the regulatory documents that form the basis of the removal action and key fieldwork activities associated with the removal action.

Table 4-1. Response Action Chronology

Date	Event
June 5, 2009	DOE/RL-2008-44, *Engineering Evaluation/Cost Analysis for the 200-MG-1 Operable Unit Waste Sites*, approved
April 15, 2010	DOE/RL-2009-86, Revision 0, *Action Memorandum for Non-Time-Critical Removal Action for 37 Waste Sites in the 200-MG-1* Operable Unit, approved
April 21, 2010	Draft of DOE/RL-2009-53, Revision 1, *Removal Action Work Plan for 48 Waste Sites in the 200-MG-1 Operable Unit*, completed and routed for approval
May 20, 2010	Draft of DOE/RL-2009-60, Revision 1, *Sampling and Analysis Plan for Selected 200-MG-1 Operable Unit Waste Sites*, completed and routed for approval
August 2010	Site evaluation of the 216-S-19 waste site completed
October 7, 2010	DOE/RL-2009-53, Revision 1, approved
November 17, 2010	Initial surface sampling of the 216-S-19 waste site conducted
December 13, 2011	Laboratory analytical data evaluation completed for initial surface sampling
January 10, 2011	DOE/RL-2009-60, Revision 1, approved
March 9, 2011	Initial depth sampling of the 216-S-19 waste site conducted
March 21, 2011	RTD of the 216-S-19 waste site commenced
April 11, 2011	Laboratory analytical data evaluation completed for initial depth sampling
June 14, 2011	In process sampling of the 216-S-19 waste site commenced
August 15, 2011	In process sampling of the 216-S-19 waste site completed
August 17, 2011	Verification sampling of the 216-S-19 waste site completed
August 23, 2011	RTD of the 216-S-19 waste site completed
August 31, 2011	Laboratory analytical data evaluation completed for verification sampling
August 31, 2011	Backfill Concurrence Form approved
September 12, 2011	Backfill of the 216-S-19 waste site completed

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5 Performance Standards and Construction Quality Control

This chapter addresses the process for demonstrating achievement of performance standards, which includes attaining RALs and RAOs and maintaining the required quality control (QC) during removal activities.

5.1 Attainment of Performance Standards

Initial, in process, and verification sampling and analysis confirm that the 216-S-19 waste site meets the RAOs identified in the Action Memorandum (DOE/RL-2009-86), and residual levels of COPCs remaining in the soil have met cleanup standards set forth in the SAP (DOE/RL-2009-60). As shown in Table 5-1, RAOs 1 and 2 are achieved by preventing unacceptable risk to human health and the environment through direct exposure to soils and debris by reducing the soil concentration of COPCs to less than or equal to the RALs. RAO 3 is achieved by preventing migration and/or leaching of radiological and nonradiological contamination to groundwater by reducing the soil concentration of COPCs to less than or equal to the RALs. RAO 4 is met through cultural and ecological evaluation, performed in December 2009 and January 2010, respectively, and by the implementation of considerations and recommendations during work activities. Demonstration that the soil concentration of COPCs is less than or equal to RALs (Tables 5-2 and 5-3) meets RAOs 1, 2, and 3.

Per the methodology prescribed in the RAWP (DOE/RL-2009-53) and SAP (DOE/RL-2009-60), initial sampling of the 216-S-19 waste site consisted of visual inspection, radiological survey, and soil sampling performed starting in November 2010. Resulting data from the sampling evolution indicating concentrations of COPCs greater than the RALs initiated the removal of impacted soils, performed from March 2011 to August 2011, followed by verification sampling performed in August 2011. The analytical results, provided in Tables 5-2 and 5-3 below, and Table A-1 through A-4 (Appendix A), demonstrate that the site cleanup standards set forth in the SAP (DOE/RL-2009-60) have been met, thus meeting RAOs 1, 2, and 3.

This waste site and the data obtained from the subject sampling evolutions will be included in the RI/FS for final remedial action of the Outer Area.

Table 5-1. Summary of Attainment of Cleanup Objectives

Removal Action Objective	Compliance Methods	Removal Action Objective Attained?
RAO 1: Prevent unacceptable risk to human health and ecological receptors from exposure to soils and/or debris contaminated with nonradiological constituents to 4.6 m (15 ft) bgs at concentrations above the appropriate RALs.	Achieved through verification soil sampling, performed upon completion of RTD activities, which demonstrated that all individual COPC concentrations are less than the RALs.	Yes
RAO 2: Prevent unacceptable risk to human health and ecological receptors from exposure to soils and/or debris contaminated with radiological constituents to 4.6 m (15 ft) bgs at concentrations above the appropriate RALs.	Achieved through the radiological survey of soils within the waste site, conducted during site evaluation and sampling evolutions, resulting in no detectable radiological contamination. Measured dose rate readings greater than background were confirmed to be less than RALs by analytical results from samples collected. Verification sampling analytical results demonstrate that COPC concentrations are less than the RALs.	Yes
RAO 3: Control the sources of groundwater contamination to minimize impacts to groundwater resources, protect the Columbia River from adverse impacts, and reduce the degree of groundwater cleanup that may be required under future actions.	Achieved through verification soil sampling, performed upon completion of RTD activities, which demonstrated that concentrations of COPCs in soil were less than established RALs.	Yes
RAO 4: Prevent adverse impacts to cultural resources and threatened or endangered species, and minimize wildlife habitat disruption.	Achieved through cultural and ecological evaluation and the implementation of considerations during removal activities to minimize wildlife habitat and cultural artifact disruption.	Yes

5.1.1 Performance Standard Documentation

This response action report addresses the individual 216-S-19 waste site and not an OU; therefore, this section is not applicable.

5.1.2 Response Action Objectives Verification

RAO performance standard attainment involves comparisons of soil analytical data to RALs. The RALs, identified in the Action Memorandum (DOE/RL-2009-86) and RAWP (DOE/RL-2009-53) are directly compared to the maximum results from the verification sampling analytical data (Tables 5-2 and 5-3). Appendix A provides a full set of analytical results from all samples collected.

5.1.3 Contaminant Identification

Tables 5-2 and 5-3 provide a direct comparison of verification sample analytical results for each radiological and nonradiological COPC, as determined from process knowledge and historical information, against the established RALs for the 216-S-19 waste site.

Table 5-2. Comparison of Verification Sample Results Against Removal Action Levels for Radiological Contaminants of Potential Concern

Contaminant of Potential Concern	Background Concentration[a] (pCi/g)	Removal Action Levels (pCi/g)	Maximum Concentration in Soil (pCi/g)	Does the Maximum Exceed Removal Action Levels?
Americium-241	N/A	31.1	0.47	No
Cesiom-137	1.1	6.2	0.87	No
Cobalt-60	0.008	0.05	U	No
Europium-152	N/A	3.3	U	No
Europium-154	0.033	3.0	U	No
Europium-155	0.054	125	U	No
Plutonium-238	0.004	38.8	0.042	No
Plutonium-239/240	0.025	33.9	0.38	No
Strontium-90	0.18	4.5	U	No
Technicium-99	N/A	15.0	1.4	No
Tritium	N/A	30.0	11	No
Uranium-233/234	1.1	1.1[b]	1.7	Yes[c]
Uranium-235	0.11	0.5	0.16	No
Uranium-238	1.1	1.1[b]	1.6	Yes[c]

a. Hanford Site background values for radiological constituents are provided in DOE/RL-96-12, *Hanford Site Background; Part 2, Soil Background for Radionuclides*, Table 5-1.

b. Where cleanup levels are less than background or required detection limits (RDLs), cleanup levels default to background or RDLs in accordance with WAC 173-340-700(6)(d), "Model Toxics Control Act—Cleanup," "Overview of Cleanup Standards," and WAC 173-340-707(2), "Model Toxics Control Act—Cleanup," "Analytical Considerations," respectively.

c. In accordance with Section 3.2.5.1 of DOE/RL-2009-60 *Sampling and Analysis Plan for Selected 200-MG-1 Operable Unit Waste Sites* (SAP), the resulting 95% upper confidence limit site mean values were less than the established RALs; therefore demonstrating that the site meets the cleanup standards set forth in the SAP (DOE/RL-2009-60).

N/A = not available

U = result is less than laboratory detection limit

Table 5-3. Comparison of Sample Results Against Removal Action Levels for Nonradiological Contaminants of Potential Concern

Contaminant of Potential Concern	Background Concentration[a] (mg/kg)	Removal Action Levels (mg/kg)	Maximum Concentration in Soil (mg/kg)	Does the Maximum Exceed Removal Action Levels?
Metals				
Antimony	5	5.4	U	No
Barium	132	1,650	131	No
Beryllium	1.51	63.2	0.56	No
Boron	N/A	210	44	No
Cadmium	0.81	0.81[b]	0.12	No
Chromium (Total)	18.5	2,000	36.4	No
Chromium (VI)[c]	N/A	2.1[c]	U	No
Cobalt	15.7	15.7[b]	12	No
Copper	22.0	284	16.8	No
Lead	10.2	250	6.7	No
Lithium	33.5	160	10	No
Mercury	0.33	2.09	0.082	No
Nickel	19.1	130	23.2	No
Selenium	0.78	5.2	2.13	No
Silver	0.73	13.6	0.115	No
Strontium	N/A	2,920	50.3	No
Thallium	0.1	1.59	0.14	No
Tin	N/A	48,000	0.556	No
Uranium (Soluble Salts)	3.21	3.21[b]	4.06	Yes[d]
Vanadium	85.1	560	90.5	No
Zinc	67.8	5,970	54.2	No
Polychlorinated Biphenyls				
Aroclor 1016	N/A	0.094	U	No
Aroclor 1221	N/A	0.017[b]	U	No
Aroclor 1232	N/A	0.017[b]	U	No
Aroclor 1242	N/A	0.039	U	No
Aroclor 1248	N/A	0.039	U	No

Table 5-3. Comparison of Sample Results Against Removal Action Levels for Nonradiological Contaminants of Potential Concern

Contaminant of Potential Concern	Background Concentration[a] (mg/kg)	Removal Action Levels (mg/kg)	Maximum Concentration in Soil (mg/kg)	Does the Maximum Exceed Removal Action Levels?
Aroclor 1254	N/A	0.066	U	No
Aroclor 1260	N/A	0.5	U	No
Polynuclear Aromatic Hydrocarbons				
Acenaphthene	N/A	98	U	No
Acenaphthylene	N/A	98	U	No
Anthracene	N/A	2,270	U	No
Benzo[*a*]anthracene	N/A	0.86	U	No
Benzo[*a*]pyrene	N/A	0.33[b]	U	No
Benzo[*b*]fluoranthene	N/A	1.37	U	No
Benzo[*g,h,i*]perylene	N/A	2,400	U	No
Benzo[*k*]fluoranthene	N/A	1.37	U	No
Chrysene	N/A	9.56	U	No
Dibenz[*a,h*]anthracene	N/A	1.37	U	No
Fluoranthene	N/A	631	U	No
Fluorene	N/A	101	U	No
Indeno[*1,2,3-cd*]pyrene	N/A	1.37	U	No
Naphthalene	N/A	4.46	U	No
Phenanthrene	N/A	1,140	U	No
Pyrene	N/A	655	U	No
Anion				
Fluoride	N/A	16	U	No
Nitrate (as Nitrogen)	11.8	40	34.8	No
Total Petroleum Hydrocarbon				
Diesel	N/A	2,000	U	No
Kerosene	N/A	2,000	U	No
Volatile Organic Analyte				
Carbon Tetrachloride	N/A	0.005	U	No
Xylene	N/A	14.6	U	No

Table 5-3. Comparison of Sample Results Against Removal Action Levels for Nonradiological Contaminants of Potential Concern

Contaminant of Potential Concern	Background Concentration[a] (mg/kg)	Removal Action Levels (mg/kg)	Maximum Concentration in Soil (mg/kg)	Does the Maximum Exceed Removal Action Levels?

a. If Hanford Site-specific background data are not available, values are then taken from Ecology Publication 94-115, *Natural Background Soil Metals Concentrations in Washington State*. Hanford Site background values are available from nonradiological background data in DOE/RL-92-24, *Hanford Site Soil Background: Part 1, Soil Background for Nonradioactive Analytes*, Table D9-2.

b. Where cleanup levels are less than background or required detection limits (RDLs), cleanup levels default to background or RDLs in accordance with WAC 173-340-700(6)(d), "Model Toxics Control Act—Cleanup," "Overview of Cleanup Standards," and WAC 173-340-707(2), "Model Toxics Control Act—Cleanup," "Analytical Considerations," respectively.

c. Based on process knowledge, chromium (VI) is not expected to be present at 200-MG-1 OU waste sites. The following values are given to help guide cleanup:

- 0.2 mg/kg is the calculated value using Kd=0, based on PNNL-13895, Hanford Contamination Distribution Coefficient Database and Users Guide, and WAC 173-340-747, "Model Toxics Control Act—Cleanup," "Deriving Soil Concentrations for Groundwater Protection," equation 747-1.
- 2.1 mg/kg is based on DOE/RL-96-17, Remedial Design Report/Remedial Action Work Plan for the 100 Area.
- 18.4 mg/kg is based on Ecology, 2007, Cleanup Levels and Risk Calculations database.

d. In accordance with Section 3.2.5.1 of the SAP (DOE/RL-2009-60), the resulting 95% UCL site mean values were less than the established RALs; therefore demonstrating that the site meets the cleanup standards set forth in the SAP (DOE/RL-2009-60).

N/A = not available

U = result is less than laboratory detection limit

5.2 Construction Quality Assurance/Quality Control

No construction related aspects were implemented as part of the selected remedy for the 216-S-19 waste site; therefore, this section is not applicable.

5.3 Cleanup Verification Quality Assurance/Quality Control

A data quality assessment (DQA) review was performed to compare the sampling approach and analytical data with the sampling and data requirements specified by the SAP (DOE/RL-2009-60). This review involves evaluation of the data to determine if they are of the right type, quality, and quantity to support the intended use. The assessment review completes the data life cycle (i.e., planning, implementation, and assessment) that was initiated by the data quality process.

Level C data validation as defined in the contractor's validation procedures, which are based on EPA functional guidelines (for example, Bleyler, 1988a, *Laboratory Data Validation Functional Guidelines for Evaluating Inorganics Analyses*; Bleyler, 1988b, *Laboratory Data Validation Functional Guidelines for Evaluating Organics Analyses*), was performed for the entire sampling and analysis data package for the samples collected for the 216-S-19 waste site. Level C validation is a review of the QC data and specifically requires verification of deliverables and requested versus reported analyses and qualification of the results based on analytical holding times, method blank results, matrix spike/matrix spike duplicate, surrogate recoveries, duplicates, and analytical method blanks.

Specific data quality objectives for the site are found in the SAP (DOE/RL-2009-60).

All of the sampling and analysis data generated from the sampling at the 216-S-19 waste site are tracked through the Hanford Environmental Information System (HEIS). All of the sampling and analysis data for the 216-S-19 waste site were found to be useable for decision making purposes as provided in the following summary:

HEIS Identification Numbers: B28BB9, B28BC0, B28BC1, B28BC2, B28BC5, B28BC6, B28BD8, B28BD9, B28BF0, B28BF1, B28BF2, B28BF3, B28BF6, B28BF9, B28BH2, BF8BH5, B28BJ1, B28BJ2, B28BJ3, B28BJ4, B28BJ7, B28BJ8, B28BL0, B28BL1, B28BL2, B28BL3, B28BL4, B28BL5, B28BL6, B28BM1, B28BM4, B28BM7, B28980, B28981, B28982, B28983, B28986, B28987, B28999, B289B0, B289B7, B289B8, B289B9, B289C0, B289C3, B289C6, B289C9, B289D2, B289W4, B289W5, B289W6, B289W7, B289X0, B289Y2, B289Y3, B289Y4, B289Y5, B289Y6, B28B00, B28B03, B28B06, B28B10, B28B31, B28B32, B28B33, B28B34, B28B37, B28B49, B28B50, B28B51, B28B52, B28B53, B28B57, B28B60, B28B63, B28B67, B289M7, B289M8, B289M9, B289N0, B289N3, B289P5, B289P6, B289P7, B289P8, B289P9, B289R3, B289R6, B289R9, B289T3, B2FHY2, B2FHY8, B2FNT5, B2FNT6, B2FNT8, B2FNV0, B2FNR1, B2FNR7, B2FNV5, B2FNV6, B2FNV8, B2FNW0, B2H063, B2H064, B2H065, B2H066, B2H067, B2H068, B2H069, B2H070, B2H071, B2H072, B2H073, B2H074, B2H075, B2H076, B2H077, B2H078, B2H079, B2H080, B2H081, B2H082, B2H083, B2H093, B2H094, B2H095, B2H096, B2H097, B2H098, B2H099, B2H0B0, B2H0B1, B2H0B2, B2H0B3, B2H0B4, B2H0B5, B2H0B6, B2H0B7, B2H0B8, B2H0B9, B280C0, B280C1, B280C2, and B280C3.

Blanks: Equipment blanks (B28B80, B28B81, B28B82, B28B83, B28B84, and B2H0F9) were received intact to the laboratory and holding times were acceptable.

Field Duplicates: The duplicate (B28B85, B28B86, B28B87, B28B88, and B28B89) results were acceptable.

Data Completeness: Analytical reports submitted for validation and verified for completeness based on the percentage of data determined to be valid (i.e., not rejected). The completion percentage was 100 percent. The data has been determined to be useable for decision-making purposes. The final results, the narrative supporting the sampling analysis activities and findings, and copies of chains of custody were transmitted in letter reports from the laboratory.

Field Screening: Relative to analytical data in sample media, physical data, and/or field screening results are of lesser importance in making inferences of risk. Because of the secondary importance of such data, no validation for physical property data and/or field screening results was performed. However, field quality assurance (QA) and QC were reviewed to ensure that the data are useable. Field instrumentation, calibration, and QA checks were performed in accordance with the following:

- Calibration of radiological field instruments (such as Geiger-Müeller and portable alpha meters) on the Hanford Site is performed under contract by Pacific Northwest National Laboratory, as specified in their program documentation.
- Daily calibration checks are performed and documented for each instrument used in support of waste site sampling and investigation. These checks are made on standard materials that are sufficiently like the matrix under consideration that direct comparison of data can be made. Daily calibration checks of radiological field instruments were performed by trained and qualified radiological control technicians in accordance with established program requirements.

The review and approval of completed field radiation surveys by the radiological controls organization represents the data validation and usability review for handheld field radiological measurements.

The DQA review for the 216-S-19 waste site found the analytical results to be accurate within the standard errors associated with the methods, including sampling and sample handling. The data are of the correct type, quality, and quantity to support the intended use. Detection limits, precision, accuracy, and sampling data group completeness were assessed to determine if any analytical results should be rejected because of QA/QC deficiencies. All analytical data were found acceptable for decision-making purposes. All of the sampling analytical data are stored in HEIS.

5.4 Regulatory Oversight

This document provides a summary of the removal action taken at the 216-S-19 waste site; it shows a comparison of the data collected to RALs authorized in approved regulatory documents and provides the basis to reclassify the waste site status (see Chapter 9). Though this report does not require approval by Ecology or EPA, concurrence of those agencies is necessary, under CERCLA Section 120 and the Tri-Party Agreement (Ecology et al., 1989), for determinations concerning follow-on remedial actions. This report is, therefore, provided to the agency (or agencies) for review, in accordance with the approval process for waste site reclassification, as supporting documentation. Upon approval of the waste site reclassification, a copy of this report will be maintained in the Administrative Record. No additional regulatory oversight was required for the sampling of the 216-S-19 waste site.

6 Final Inspection and Certifications

There were no final inspections or certifications required in the implementation of the selected alternative for the 216-S-19 waste site; therefore, this chapter is not applicable.

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7 Operations and Maintenance Activities

This chapter discusses operations and maintenance (O&M) for the 216-S-19 waste site.

7.1 Remedy Related Operations and Maintenance or Monitoring

There are no O&M activities or monitoring requirements for the 216-S-19 waste site; therefore, this section is not applicable.

7.2 Institutional Controls

Based on the analyses performed and presented in this report, there are no waste site specific institutional controls required at the 216-S-19 waste site; therefore, this section is not applicable.

7.3 Five-Year Reviews

Five-year reviews are required by CERCLA for post-ROD remedial actions, but do not apply to the 216-S-19 waste site. This waste site and the data obtained from the subject sampling evolutions will be included in the risk assessment and RI/FS for final remedial action of the Outer Area.

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8 Summary of Project Costs

For the purposes of reporting costs of removal action for the 216-S-19 waste site, costs are prorated utilizing an activity/schedule-based methodology (Table 8-1). This method is not considered to be audit quality data. Actual costs for waste site cleanup will continue to be collected for each OU or closure area in accordance with the current cost tracking methodology. These costs will then be included, in accordance with CERCLA requirements, in the response action report for the final remedial action of the OU or closure area.

Table 8-1. Cost Summary

Cost Item	Actual Cost Fiscal Year 2009 ($$)	Actual Cost Fiscal Year 2010 ($)	Actual Cost Fiscal Year 2011 ($)	Actual Total Cost ($)
Removal Action Capital (Construction) Costs	0	0	0	0
Removal Action Operating Costs	126,863.08	2,459,572.44	305,663.00	2,892.098.52
Total Removal Action Cost	126,863.08	2,459.572.44	305,663.00	2,892,098.52
Projected Yearly Operations and Maintenance Cost	0	0	0	0

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9 Waste Site Reclassification

The waste site reclassification form for the 216-S-19 waste site is proposed and processed in accordance with the procedures and definitions described in RL-TPA-90-001, *Tri-Party Agreement Handbook Management Procedures,* Guideline Number TPA-MP-14, "Maintenance of the Waste Information Data System (WIDS)." Reclassification form 2011-081 for the 216-S-19 waste site proposes that the status of this waste site be changed to "interim closed out." Per TPA-MP-14, "interim closed out" status indicates that a site meets the cleanup standards specified in the approved 200-MG-1 Action Memorandum (DOE/RL-2009-86) (i.e., the interim response action decision document). This site will be evaluated under the cleanup standards established for the final ROD for this area.

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10 Observations and Lessons Learned

There were no observations or lessons learned applicable for inclusion in this report.

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Appendix A

Sampling Results for the 216-S-19 Waste Site

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A1 Introduction

This appendix contains laboratory analytical results, provided in Tables A-1 through A-4, from sampling conducted at the 216-S-19 waste site. The following information is provided in the table headings: Hanford Environmental Information System (HEIS) identification numbers, field sample identifier, and sample depth. Surface samples are collected from approximately 0 to 0.3 m (0 to 1 ft) below ground surface (bgs), and depths listed are bgs.

Tables A-1a and A1-b, provide analytical results for radiological contaminants from samples collected during the initial phase of sampling, respectively. Analytical results from one FS location did not meet the established removal action levels (RALs), therefore requiring removal, treatment, and disposal (RTD).

Tables A-2a, and A-2b provide analytical results for nonradiological contaminants from samples collected during the initial phase of sampling, respectively. Analytical results from one FS location did not meet the established RALs, therefore requiring RTD.

Table A-3 provides analytical results from in process samples collected during RTD activities. The analytical results from these in process samples were used to further refine the lateral and vertical extents of excavation during RTD activities.

Tables A-4a and A-4b include final verification sampling results for uranium (soluble salts), U-233/234, and U-238 from the 216-S-19 waste site. The results of verification sampling demonstrate achievement of cleanup standards at the 216-S-19 waste site.

Table A-5 provides a calculation of the 95 percent upper confidence limit site mean, which was calculated using the 216-S-19 waste site verification sampling results, and provides a comparison of the mean value against established RALs, to demonstrate achievement of the cleanup standards and corresponding removal action objectives.

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Table A-1a. Analytical Results for Initial Sampling for Radiological Contaminants

Contaminant	Removal Action Levels [a]	Required Detection Limit (pCi/g)	Maximum Reported Laboratory Method Detection Limit (pCi/g)	Background Activity [b] (pCi/g)	HEIS B28938 B28BB9 B28BJ1 B28980 FS 1a Surface	HEIS B28939 B28BC0 B28BJ2 B28981 FS 2a Surface	HEIS B28940 B28BC1 B28BJ3 B28982 FS 3a Surface	HEIS B28941 B28BC2 B28BJ4 B28983 FS 4a Surface	HEIS B28944 B28BC5 B28BJ7 B28986 FS 5a Surface	HEIS B28957 B28BD8 B28BL0 B28999 FS 6a Surface	HEIS B28958 B28BD9 B28BL1 B289B0 FS 7a Surface	HEIS B28959 B28BF0 B28BL2 B289B7 FS 8a Surface	HEIS B28960 B28BF1 B28BL3 B289B8 FS 9a Surface	HEIS B28962 B28BF3 B28BL5 B289C0 FS 10a Surface	HEIS B28965 B28BF6 B28BL8 B289C3 FS 11a Surface	HEIS B28968 B28BF9 B28BM1 B289C6 FS 12a Surface	HEIS B28971 B28BH2 B28BM4 B289C9 FS 13a Surface	HEIS B28974 B28BH5 B28BM7 B289D2 FS 14a Surface
	(pCi/g)	(pCi/g)	(pCi/g)	(pCi/g)	(pCi/g)	(pCi/g)	(pCi/g)	(pCi/g)	(pCi/g)	(pCi/g)	(pCi/g)	(pCi/g)	(pCi/g)	(pCi/g)	(pCi/g)	(pCi/g)	(pCi/g)	(pCi/g)
Americium-241	31.1	1.0	0.074	N/A	0.046	0.11	0.47	0.83	0.38	U	0.097	U	U	U	U	0.31	0.034	0.11
Cesium-137	6.2	0.1	0.053	1.1	U	U	0.87	0.56	U	U	0.2	U	U	0.037	0.061	0.6	U	0.36
Cobalt-60	1.4	0.05	0.053[c]	0.008	U	U	U	U	U	U	U	U	U	U	U	U	U	U
Europium-152	3.3	0.1	0.14[c]	N/A	U	U	U	U	U	U	U	U	U	U	U	U	U	U
Europium-154	3	0.1	0.15[c]	0.033	U	U	U	U	U	U	U	U	U	U	U	U	U	U
Europium-155	125	0.1	0.21[c]	0.054	U	U	U	U	U	U	U	U	U	U	U	U	U	U
Plutonium-238	38.8	1.0	0.056	0.004	U	U	0.026	0.031	U	U	U	U	U	U	U	U	U	U
Plutonium-239/240	33.9	1.0	0.019	0.025	0.013	0.022	0.038	0.071	0.015	U	0.039	U	U	U	U	0.22	0.076	0.0045
Strontium-90	4.5	1.0	0.41	0.18	1.8	U	U	U	U	U	U	U	U	U	U	U	U	U
Technetium-99	15	15	0.32	N/A	U	0.21	U	U	U	0.63	U	U	U	U	U	1.4	U	U
Tritium	30	30	3.01	N/A	U	U	U	U	U	U	U	U	U	U	U	U	U	U
Uranium-233/234	1.1	1.0	0.024	1.1	0.7	0.54	0.75	0.2	0.13	1.4	0.76	0.28	0.17	0.27	0.15	0.26	0.11	0.13
Uranium-235	0.5	0.5	0.024	0.11	0.03	0.044	0.05	0.025	U	0.13	0.044	0.03	U	U	0.018	0.025	0.017	0.017
Uranium-238	1.1	1.0	0.024	1.1	0.63	0.5	0.76	0.19	0.14	1.4	0.77	0.26	0.17	0.26	0.16	0.32	0.11	0.12

a. Removal action levels are from DOE/RL-2009-53, *Removal Action Work Plan for 48 Waste Sites in the 200-MG-1 Operable Unit* (RAWP).

b. Hanford Site background values for radiological background data are available from DOE/RL-96-12, *Hanford Site Background: Part 2, Soil Background for Radionuclides*, Table 5-1.

c. Maximum reported laboratory method detection limits were greater than the required detection limit per the RAWP; however, analytical results are less than the established removal action levels and meet the corresponding removal action objectives.

N/A = not available

U = result is less than laboratory method detection limit

Table A-1b. Analytical Results for Initial Depth Sampling for Radiological Contaminants

Contaminant	Removal Action Levels [a]	Required Detection Limit (pCi/g)	Maximum Reported Laboratory Method Detection Limit (pCi/g)	Background Activity[b] (pCi/g)	HEIS B289F0 B289W4 B28B31 B289M7 FS 1b 4.6 m (15 ft)	HEIS B289F1 B289W5 B28B32 B289M8 FS 2b 4.6 m (15 ft)	HEIS B289F2 B289W6 B28B33 B289M9 FS 3b 4.6 m (15 ft)	HEIS B289F3 B289W7 B28B34 B289N0 FS 4b 4.6 m (15 ft)	HEIS B289F6 B289X0 B28B37 B289N3 FS 5b 4.6 m (15 ft)	HEIS B289H8 B289Y2 B28B49 B289P5 FS 6b 4.6 m (15 ft)	HEIS B289H9 B289Y3 B28B50 B289P6 FS 7b 4.6 m (15 ft)	HEIS B289J0 B289Y4 B28B51 B289P7 FS 8b 4.6 m (15 ft)	HEIS B289J1 B289Y5 B28B52 B289P8 FS 9b 4.6 m (15 ft)	HEIS B289J2 B289Y6 B28B53 B289P9 FS 10b 4.6 m (15 ft)	HEIS B289J6 B28B00 B28B57 B289R3 FS 11b 4.6 m (15 ft)	HEIS B289J9 B28B03 B28B60 B289R6 FS 12b 4.6 m (15 ft)	HEIS B289K2 B29B06 B28B63 B289R9 FS 13b 4.6 m (15 ft)	HEIS B289K6 B28B10 B28B67 B289T3 FS 14b 4.6 m (15 ft)
	(pCi/g)	(pCi/g)	(pCi/g)	(pCi/g)	(pCi/g)	(pCi/g)	(pCi/g)	(pCi/g)	(pCi/g)	(pCi/g)	(pCi/g)	(pCi/g)	(pCi/g)	(pCi/g)	(pCi/g)	(pCi/g)	(pCi/g)	(pCi/g)
Americium-241	31.1	1.0	0.069	N/A	0.029	U	0.042	0.023	0.011	U	U	U	U	U	U	U	0.024	0.023
Cesium-137	6.2	0.1	0.31[c]	1.1	U	U	U	U	U	U	U	U	U	U	U	U	U	U
Cobalt-60	1.4	0.05	0.28[c]	0.008	U	U	U	U	U	U	U	U	U	U	U	U	U	U
Europium-152	3.3	0.1	0.75[c]	N/A	U	U	U	U	U	U	U	U	U	U	U	U	U	U
Europium-154	3	0.1	0.93[c]	0.033	U	U	U	U	U	U	U	U	U	U	U	U	U	U
Europium-155	125	0.1	0.75[c]	0.054	U	U	U	U	U	U	U	U	U	U	U	U	U	U
Plutonium-238	38.8	1.0	0.81	0.004	U	U	U	U	U	U	U	U	U	U	U	0.0067	U	U
Plutonium-239/240	33.9	1.0	0.026	0.025	0.014	U	U	U	0.012	U	U	U	U	U	0.014	0.01	U	0.011
Strontium-90	4.5	1.0	0.5	0.18	U	U	U	U	U	U	U	U	U	U	U	U	U	U
Technetium-99	15	15	0.34	N/A	U	U	U	U	U	U	U	U	U	U	U	U	U	U
Tritium	30	30	9.28	N/A	U	U	U	U	U	U	U	11	U	U	U	U	U	U
Uranium-233/234	1.1	1.0	0.028	1.1	0.16	0.28	0.21	0.17	0.23	0.18	0.12	0.18	0.22	0.17	0.17	0.25	0.2	0.26
Uranium-235	0.5	0.5	0.022	0.11	U	0.022	0.016	0.031	0.028	0.019	U	0.026	0.02	0.012	0.027	0.024	0.029	0.028
Uranium-238	1.1	1.0	0.015	1.1	0.15	0.33	0.22	0.17	0.24	0.16	0.16	0.24	0.22	0.18	0.17	0.27	0.22	0.19

a. Removal action levels are from DOE/RL-2009-53, *Removal Action Work Plan for 48 Waste Sites in the 200-MG-1 Operable Unit* (RAWP).

b. Hanford Site background values for radiological background data are available from DOE/RL-96-12, *Hanford Site Background: Part 2, Soil Background for Radionuclides*, Table 5-1.

c. Maximum reported laboratory method detection limits were greater than the required detection limit per the RAWP; however, analytical results are below the established removal action levels and meet the corresponding removal action objectives.

N/A = not available

U = result is less than laboratory method detection limit

Table A-2a. Analytical Results for Initial Surface Sampling for Nonradiological Contaminants

Contaminant	Removal Action Levels[a]	Required Detection Limit	Maximum Reported Laboratory Method Detection Limit	Background Concentration[b]	HEIS B28938 B28BB9 B28BJ1 B28980 FS 1a Surface	HEIS B28939 B28BC0 B28BJ2 B28981 FS 2a Surface	HEIS B28940 B28BC1 B28BJ3 B28982 FS 3a Surface	HEIS B28941 B28BC2 B28BJ4 B28983 FS 4a Surface	HEIS B28944 B28BC5 B28BJ7 B28986 FS 5a Surface	HEIS B28957 B28BD8 B28BL0 B28999 FS 6a Surface	HEIS B28958 B28BD9 B28BL1 B289B0 FS 7a Surface	HEIS B28959 B28BF0 B28BL2 B289B7 FS 8a Surface	HEIS B28960 B28BF1 B28BL3 B289B8 FS 9a Surface	HEIS B28962 B28BF3 B28BL5 B289C0 FS 10a Surface	HEIS B28965 B28BF6 B28BL8 B289C3 FS 11a Surface	HEIS B28968 B28BF9 B28BM1 B289C6 FS 12a Surface	HEIS B28971 B28BH2 B28BM4 B289C9 FS 13a Surface	HEIS B28974 B28BH5 B28BM7 B289D2 FS 14a Surface
Metals	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)
Antimony	5.4	0.6	0.32	5	U	U	U	U	U	U	U	U	U	U	U	U	U	U
Arsenic	6.5[c]	1	0.43	6.5	4.21	4.74	3.91	3.31	3.11	3.34	3.79	9.35	3.79	2.57	2.56	2.84	3.72	2.75
Barium	1,650	2	0.22	132	90.5	131	90.4	94.7	102	116	109	115	67.7	92.7	85.5	87.2	102	85.5
Beryllium	63.2	0.5	0.11	1.51	0.256	0.32	0.233	0.171	0.264	0.319	0.115	0.231	0.276	0.3	0.253	0.292	0.189	0.209
Boron	210	2	45[d]	N/A	U	U	U	U	U	U	U	U	U	U	U	U	U	U
Cadmium	0.81[c]	0.5	0.11	0.81	U	U	0.117	0.12	U	U	U	U	U	U	U	U	U	U
Chromium Total	2000	1	0.54	18.5	6.93	7.43	7.72	9.33	8.39	5.49	6.17	7.49	4.63	9.14	7.39	8.5	8.78	7.77
Chromium VI	2.1	0.5	0.11	N/A	U	U	U	U	U	U	U	U	U	U	U	U	U	U
Cobalt	15.7[c]	2	0.11	15.7	10.4	10.7	9.47	9.39	9.4	9.87	10.4	9.83	9.97	9.42	9.04	8.8	9.22	7.61
Copper	284	1	0.11	22	13.9	14.5	16.8	11.5	10.9	12.7	13.4	12.9	12	10.4	9.12	11.7	11.8	9.37
Lead	250	5	0.11	10.2	4.56	4.88	4.42	6.7	5.57	2.87	4.08	4.44	3.45	4.81	4.59	5.76	5	5.61
Lithium	160	2.5	0.44	33.5	5.26	6.33	4.66	5.71	5.79	3.97	4.19	4.05	3.59	5.36	5.1	5.78	5.75	6.11
Manganese	512[c]	5	0.11	512	427	537	392	430	430	435	490	463	375	432	412	416	416	373
Mercury	2.09	0.2	0.054	0.33	U	U	0.082	U	U	U	U	U	U	U	U	U	U	U
Nickel	130	4	0.22	19.1	10.9	9.85	9.2	9.69	9.32	10.3	9.56	9.51	7.19	9.49	8.76	8.31	9.45	8.59
Selenium	5.2	1	0.32	0.78	1.85	1.81	1.81	0.677	1.29	1.05	1.61	1.48	1.51	1.05	1.04	1.32	1.46	2.13
Silver	13.6	0.2	0.11	0.73	U	U	0.115	U	U	U	U	U	U	U	U	U	U	U
Strontium	2,920	1	0.11	NA	23.4	32.3	28.5	21.9	21.1	23.8	27.2	38.6	27.6	20.1	19.1	20.4	22.4	19.3
Thallium	1.59	1	0.11	0.1	U	U	U	0.11	0.1	U	U	U	U	U	U	U	U	U
Tin	48,000	10	0.11	N/A	0.437	0.425	0.413	0.428	0.448	0.446	0.427	0.357	0.398	0.424	0.427	0.481	0.412	0.344
Uranium	3.21[c]	1	0.11	3.21	1.66	1.73	2.13	0.599	0.873	3.42	2.59	0.575	1.08	0.411	0.459	0.88	1.94	0.409
Vanadium	560	2.5	0.22	85.1	80.4	71.7	71.1	68	66.2	77.4	83.2	69.7	87.4	71.5	70.6	60	63.5	57.2
Zinc	5970	1	0.86	67.8	54.2	51.1	49.4	53.5	50.8	47.2	53.6	46.2	50.6	50.3	49.3	49.3	48.5	44.9
Anions	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)
Fluoride	16	5	1.6	N/A	U	U	U	U	U	U	U	U	U	U	U	U	U	U
Nitrate-N	40	0.75	1.7[d]	11.8	3.61	28.68	34.77	16.89	2.94	2.48	3.97	5.08	1.90	6.07	2.08	29.58	2.02	25.06

Table A-2a. Analytical Results for Initial Surface Sampling for Nonradiological Contaminants

Contaminant	Removal Action Levels[a]	Required Detection Limit	Maximum Reported Laboratory Method Detection Limit	Background Concentration[b]	HEIS B28938 B28BB9 B28BJ1 B28980 FS 1a Surface	HEIS B28939 B28BC0 B28BJ2 B28981 FS 2a Surface	HEIS B28940 B28BC1 B28BJ3 B28982 FS 3a Surface	HEIS B28941 B28BC2 B28BJ4 B28983 FS 4a Surface	HEIS B28944 B28BC5 B28BJ7 B28986 FS 5a Surface	HEIS B28957 B28BD8 B28BL0 B28999 FS 6a Surface	HEIS B28958 B28BD9 B28BL1 B289B0 FS 7a Surface	HEIS B28959 B28BF0 B28BL2 B289B7 FS 8a Surface	HEIS B28960 B28BF1 B28BL3 B289B8 FS 9a Surface	HEIS B28962 B28BF3 B28BL5 B289C0 FS 10a Surface	HEIS B28965 B28BF6 B28BL8 B289C3 FS 11a Surface	HEIS B28968 B28BF9 B28BM1 B289C6 FS 12a Surface	HEIS B28971 B28BH2 B28BM4 B289C9 FS 13a Surface	HEIS B28974 B28BH5 B28BM7 B289D2 FS 14a Surface
Polynuclear Aromatic Hydrocarbons	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)
Acenaphthene	98	0.33	0.2	N/A	U	U	U	U	U	U	U	U	U	U	U	U	U	U
Acenaphthylene	98	0.33	0.2	N/A	U	U	U	U	U	U	U	U	U	U	U	U	U	U
Anthracene	2,270	0.33	0.2	N/A	U	U	U	U	U	U	U	U	U	U	U	U	U	U
Benzo[*a*]anthracene	0.86	0.33	0.2	N/A	U	U	U	U	U	U	U	U	U	U	U	U	U	U
Benzo[*a*]pyrene	0.33[c]	0.33	0.2	N/A	U	U	U	U	U	U	U	U	U	U	U	U	U	U
Benzo[*b*]fluoranthene	1.37	0.33	0.2	N/A	U	U	U	U	U	U	U	U	U	U	U	U	U	U
Benzo[*k*]fluoranthene	1.37	0.33	0.2	N/A	U	U	U	U	U	U	U	U	U	U	U	U	U	U
Benzo[*g,h,i*]perylene	2,400	0.33	0.2	N/A	U	U	U	U	U	U	U	U	U	U	U	U	U	U
Chrysene	9.56	0.33	0.2	N/A	U	U	U	U	U	U	U	U	U	U	U	U	U	U
Dibenzo[*a,h*]anthracene	1.37	0.33	0.2	N/A	U	U	U	U	U	U	U	U	U	U	U	U	U	U
Fluoranthene	631	0.33	0.2	N/A	U	U	U	U	U	U	U	U	U	U	U	U	U	U
Fluorene	101	0.33	0.2	N/A	U	U	U	U	U	U	U	U	U	U	U	U	U	U
Indeno[*1,2,3-cd*]pyrene	1.37	0.33	0.2	N/A	U	U	U	U	U	U	U	U	U	U	U	U	U	U
Naphthalene	4.46	0.33	0.2	N/A	U	U	U	U	U	U	U	U	U	U	U	U	U	U
Phenanthrene	1,140	0.33	0.2	N/A	U	U	U	U	U	U	U	U	U	U	U	U	U	U
Pyrene	655	0.5	0.2	N/A	U	U	U	U	U	U	U	U	U	U	U	U	U	U
Polychlorinated Biphenyls	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)
Aroclor 1016	0.094	0.017	0.004	N/A	U	U	U	U	U	U	U	U	U	U	U	U	U	U
Aroclor 1221	0.017[c]	0.017	0.009	N/A	U	U	U	U	U	U	U	U	U	U	U	U	U	U
Aroclor 1232	0.017[c]	0.017	0.004	N/A	U	U	U	U	U	U	U	U	U	U	U	U	U	U
Aroclor 1242	0.039	0.017	0.004	N/A	U	U	U	U	U	U	U	U	U	U	U	U	U	U
Aroclor 1248	0.039	0.017	0.004	N/A	U	U	U	U	U	U	U	U	U	U	U	U	U	U
Aroclor 1254	0.066	0.017	0.004	N/A	U	U	U	U	U	U	U	U	U	U	U	U	U	U
Aroclor 1260	0.5	0.017	0.004	N/A	U	U	U	U	U	U	U	U	U	U	U	U	U	U

Table A-2a. Analytical Results for Initial Surface Sampling for Nonradiological Contaminants

Contaminant	Removal Action Levels[a]	Required Detection Limit	Maximum Reported Laboratory Method Detection Limit	Background Concentration[b]	HEIS B28938 B28BB9 B28BJ1 B28980 FS 1a Surface	HEIS B28939 B28BC0 B28BJ2 B28981 FS 2a Surface	HEIS B28940 B28BC1 B28BJ3 B28982 FS 3a Surface	HEIS B28941 B28BC2 B28BJ4 B28983 FS 4a Surface	HEIS B28944 B28BC5 B28BJ7 B28986 FS 5a Surface	HEIS B28957 B28BD8 B28BL0 B28999 FS 6a Surface	HEIS B28958 B28BD9 B28BL1 B289B0 FS 7a Surface	HEIS B28959 B28BF0 B28BL2 B289B7 FS 8a Surface	HEIS B28960 B28BF1 B28BL3 B289B8 FS 9a Surface	HEIS B28962 B28BF3 B28BL5 B289C0 FS 10a Surface	HEIS B28965 B28BF6 B28BL8 B289C3 FS 11a Surface	HEIS B28968 B28BF9 B28BM1 B289C6 FS 12a Surface	HEIS B28971 B28BH2 B28BM4 B289C9 FS 13a Surface	HEIS B28974 B28BH5 B28BM7 B289D2 FS 14a Surface
Volatile Organic Analytes	**(mg/kg)**	**(mg/kg)**	**(mg/kg)**	**(mg/kg)**	**(mg/kg)**	**(mg/kg)**	**(mg/kg)**	**(mg/kg)**	**(mg/kg)**	**(mg/kg)**	**(mg/kg)**	**(mg/kg)**	**(mg/kg)**	**(mg/kg)**	**(mg/kg)**	**(mg/kg)**	**(mg/kg)**	**(mg/kg)**
Carbon Tetrachloride	0.005	0.005	0.001	N/A	U	U	U	U	U	U	U	U	U	U	U	U	U	U
Xylene	14.6	0.01	0.001	N/A	U	U	U	U	U	U	U	U	U	U	U	U	U	U
Total Petroleum Hydrocarbons	**(mg/kg)**	**(mg/kg)**	**(mg/kg)**	**(mg/kg)**	**(mg/kg)**	**(mg/kg)**	**(mg/kg)**	**(mg/kg)**	**(mg/kg)**	**(mg/kg)**	**(mg/kg)**	**(mg/kg)**	**(mg/kg)**	**(mg/kg)**	**(mg/kg)**	**(mg/kg)**	**(mg/kg)**	**(mg/kg)**
Diesel	2,000	5	4.0	N/A	U	U	U	U	U	U	U	U	U	U	U	U	U	U
Kerosene	2,000	5	4.0	N/A	U	U	U	U	U	U	U	U	U	U	U	U	U	U

a. Removal action levels are from DOE/RL-2009-53, *Removal Action Work Plan for 48 Waste Sites in the 200-MG-1 Operable Unit* (RAWP).

b. If Hanford Site-specific background data is not available, values are then taken from Ecology Publication 94-115, *Natural Background Soil Metals Concentrations in Washington State*. Hanford Site background values are available in nonradiological background data from DOE/RL-92-24, *Hanford Site Background: Part 1, Soil Background for Nonradioactive Analytes*, Table D39-2.

c. Where cleanup levels are less than background or required detection limits (RDLs), cleanup levels default to background or RDLs per Ecology Publication 94-06, *Model Toxics Control Act Cleanup Regulation Chapter 173-340 WAC*; WAC 173-340-700(6)(d), "Model Toxics Control Act—Cleanup," "Overview of Cleanup Standards;" and WAC 173-340-707(2), "Model Toxics Control Act—Cleanup," " Analytical Considerations," respectively.

d. Maximum reported laboratory method detection limits were greater than the RDL per the RAWP; however, analytical results are less than the established removal action levels and meet the corresponding removal action objectives.

N/A = not available

U = result is less than laboratory method detection limit.

Table A-2b. Analytical Results for Initial Depth Sampling for Nonradiological Contaminants

Contaminant	Removal Action Levels[a]	Required Detection Limit	Maximum Reported Laboratory Method Detection Limit	Background Concentration[b]	HEIS B289F0 B289W4 B28B31 B289M7 FS 1b 4.67m (15 ft)	HEIS B289F1 B289W5 B28B32 B289M8 FS 2b 4.67m (15 ft)	HEIS B289F2 B289W6 B28B33 B289M9 FS 3b 4.67m (15 ft)	HEIS B289F3 B289W7 B28B34 B289N0 FS 4b 4.67m (15 ft)	HEIS B289F6 B289X0 B28B37 B289N3 FS 5b 4.67m (15 ft)	HEIS B289H8 B289Y2 B28B49 B289P5 FS 6b 4.67m (15 ft)	HEIS B289H9 B289Y3 B28B50 B289P6 FS 7b 4.67m (15 ft)	HEIS B289J0 B289Y4 B28B51 B289P7 FS 8b 4.67m (15 ft)	HEIS B289J1 B289Y5 B28B52 B289P8 FS 9b 4.67m (15 ft)	HEIS B289J2 B289Y6 B28B53 B289P9 FS 10b 4.67m (15 ft)	HEIS B289J6 B28B00 B28B57 B289R3 FS 11b 4.67m (15 ft)	HEIS B289J9 B28B03 B28B60 B289R6 FS 12b 4.67m (15 ft)	HEIS B289K2 B29B06 B28B63 B289R9 FS 13b 4.67m (15 ft)	HEIS B289K6 B28B10 B28B67 B289T3 FS 14b 4.67m (15 ft)
Metals	**(mg/kg)**	**(mg/kg)**	**(mg/kg)**	**(mg/kg)**	**(mg/kg)**	**(mg/kg)**	**(mg/kg)**	**(mg/kg)**	**(mg/kg)**	**(mg/kg)**	**(mg/kg)**	**(mg/kg)**	**(mg/kg)**	**(mg/kg)**	**(mg/kg)**	**(mg/kg)**	**(mg/kg)**	**(mg/kg)**	**(mg/kg)**
Antimony	5.4	0.6	0.34	5	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U
Arsenic	6.5[c]	1	0.45	6.5	2.43	4.69	2.45	2.71	5.15	5.44	3.45	2.86	3.96	2.99	3.39	7.41	3.79	4.97	
Barium	1,650	2	0.22	132	84.4	110	86	88.7	131	109	89.9	82.2	97.9	98.7	100	125	112	98	
Beryllium	63.2	0.5	0.11	1.51	0.297	0.364	0.332	0.376	0.56	0.284	0.321	0.264	0.348	0.336	0.371	0.354	0.351	0.288	
Boron	210	2	47[d]	N/A	U	U	U	6.88	6.47	U	U	U	U	10	12.2	15.3	19.7	6.46	
Cadmium	0.81[c]	0.5	0.11	0.81	U	U	0.114	U	U	0.114	U	U	U	U	U	U	U	U	
Chromium Total	2000	1	0.56	18.5	24	33.2	13.3	21.3	36.4	17.4	18.1	28.9	13.9	26.8	19.5	15.2	15.6	21	
Chromium VI	2.1	0.5	0.79[d]	N/A	U	U	U	U	U	U	U	U	U	U	U	U	U	U	
Cobalt	15.7[c]	2	0.11	15.7	8.89	9.89	8.5	10.8	12	9.83	8.64	9.07	9.82	8.8	8.92	11.5	8.55	10.3	
Copper	284	1	0.11	22	12.7	14.2	12.4	13.7	14.4	13.1	13.2	12.5	14.3	12.2	13.4	16.1	12.5	13.4	
Lead	250	5	0.11	10.2	3.69	5.29	3.4	2.83	5.84	5.19	4.37	3.18	5.2	3.79	4.48	6.6	4.25	5.36	
Lithium	160	2.5	46[d]	33.5	8.87	7.87	7.14	5.32	8.28	10	6.03	6.24	8.63	5.57	4.8	6.41	7.19	7.97	
Manganese	512[c]	5	0.11	512	395	433	383	458	507	412	390	360	457	415	428	483	393	407	
Mercury	2.09	0.2	0.056	0.33	U	U	U	U	U	U	U	U	U	U	U	U	0.0528	U	
Nickel	130	4	0.22	19.1	16.8	22.2	12.6	17.4	23.2	14.5	14	19.2	12.7	17.7	15	13.6	13.8	16.5	
Selenium	5.2	1	0.34	0.78	1.13	1.2	1.13	1.94	1.6	1.76	1.38	1.39	1	1.23	1.09	1.51	1.25	1.98	
Silver	13.6	0.2	0.11	0.73	U	U	U	U	U	U	U	U	U	U	U	U	U	U	
Strontium	2,920	1	0.11	N/A	28.5	34.4	29.5	26	50.3	34.4	31.4	26.8	33.8	30.5	32.5	41	34.4	34.4	
Thallium	1.59	1	0.11	0.1	0.14	U	0.136	0.092	0.139	0.122	U	U	0.103	0.131	U	0.118	0.128	U	
Tin	48,000	10	0.11	N/A	0.491	0.465	0.431	0.528	0.556	0.483	0.443	0.403	0.46	0.436	0.446	0.528	0.456	0.481	
Uranium	3.21[c]	1	0.11	3.21	0.448	0.84	0.548	0.519	0.63	0.534	0.927	0.446	0.595	0.728	0.523	0.784	0.516	0.681	
Vanadium	560	2.5	0.22	85.1	63.1	59.2	67.9	84.3	71	60.1	60.5	70.5	70.7	64.2	65.8	73.2	59.6	66	
Zinc	5970	1	0.90	67.8	42.6	46.7	43.4	49.8	49.5	45.6	43.6	43.5	47.7	42.8	43.1	52.2	44.6	47	
Anions	**(mg/kg)**	**(mg/kg)**	**(mg/kg)**	**(mg/kg)**	**(mg/kg)**	**(mg/kg)**	**(mg/kg)**	**(mg/kg)**	**(mg/kg)**	**(mg/kg)**	**(mg/kg)**	**(mg/kg)**	**(mg/kg)**	**(mg/kg)**	**(mg/kg)**	**(mg/kg)**	**(mg/kg)**	**(mg/kg)**	
Fluoride	16	5	1.7	N/A	U	U	U	U	U	U	U	U	U	U	U	U	U	U	

Table A-2b. Analytical Results for Initial Depth Sampling for Nonradiological Contaminants

Contaminant	Removal Action Levels[a]	Required Detection Limit	Maximum Reported Laboratory Method Detection Limit	Background Concentration[b]	HEIS B289F0 B289W4 B28B31 B289M7 FS 1b 4.67m (15 ft)	HEIS B289F1 B289W5 B28B32 B289M8 FS 2b 4.67m (15 ft)	HEIS B289F2 B289W6 B28B33 B289M9 FS 3b 4.67m (15 ft)	HEIS B289F3 B289W7 B28B34 B289N0 FS 4b 4.67m (15 ft)	HEIS B289F6 B289X0 B28B37 B289N3 FS 5b 4.67m (15 ft)	HEIS B289H8 B289Y2 B28B49 B289P5 FS 6b 4.67m (15 ft)	HEIS B289H9 B289Y3 B28B50 B289P6 FS 7b 4.67m (15 ft)	HEIS B289J0 B289Y4 B28B51 B289P7 FS 8b 4.67m (15 ft)	HEIS B289J1 B289Y5 B28B52 B289P8 FS 9b 4.67m (15 ft)	HEIS B289J2 B289Y6 B28B53 B289P9 FS 10b 4.67m (15 ft)	HEIS B289J6 B28B00 B28B57 B289R3 FS 11b 4.67m (15 ft)	HEIS B289J9 B28B03 B28B60 B289R6 FS 12b 4.67m (15 ft)	HEIS B289K2 B29B06 B28B63 B289R9 FS 13b 4.67m (15 ft)	HEIS B289K6 B28B10 B28B67 B289T3 FS 14b 4.67m (15 ft)
Nitrate-N	40	0.75	1.7[d]	11.8	U	10.39	10.39	U	U	5.08	U	1.8	4.02	U	U	2.37	U	2.19
Polynuclear Aromatic Hydrocarbons	**(mg/kg)**	**(mg/kg)**	**(mg/kg)**	**(mg/kg)**	**(mg/kg)**	**(mg/kg)**	**(mg/kg)**	**(mg/kg)**	**(mg/kg)**	**(mg/kg)**	**(mg/kg)**	**(mg/kg)**	**(mg/kg)**	**(mg/kg)**	**(mg/kg)**	**(mg/kg)**	**(mg/kg)**	**(mg/kg)**
Acenaphthene	98	0.33	0.3	N/A	U	U	U	U	U	U	U	U	U	U	U	U	U	U
Acenaphthylene	98	0.33	0.3	N/A	U	U	U	U	U	U	U	U	U	U	U	U	U	U
Anthracene	2,270	0.33	0.3	N/A	U	U	U	U	U	U	U	U	U	U	U	U	U	U
Benzo[*a*]anthracene	0.86	0.33	0.3	N/A	U	U	U	U	U	U	U	U	U	U	U	U	U	U
Benzo[*a*]pyrene	0.33[c]	0.33	0.3	N/A	U	U	U	U	U	U	U	U	U	U	U	U	U	U
Benzo[*b*]fluoranthene	1.37	0.33	0.3	N/A	U	U	U	U	U	U	U	U	U	U	U	U	U	U
Benzo[*k*]fluoranthene	1.37	0.33	0.3	N/A	U	U	U	U	U	U	U	U	U	U	U	U	U	U
Benzo[*g,h,i*]perylene	2,400	0.33	0.3	N/A	U	U	U	U	U	U	U	U	U	U	U	U	U	U
Chrysene	9.56	0.33	0.3	N/A	U	U	U	U	U	U	U	U	U	U	U	U	U	U
Dibenzo[*a,h*]anthracene	1.37	0.33	0.3	N/A	U	U	U	U	U	U	U	U	U	U	U	U	U	U
Fluoranthene	631	0.33	0.3	N/A	U	U	U	U	U	U	U	U	U	U	U	U	U	U
Fluorene	101	0.33	0.3	N/A	U	U	U	U	U	U	U	U	U	U	U	U	U	U
Indeno[*1,2,3-cd*]pyrene	1.37	0.33	0.3	N/A	U	U	U	U	U	U	U	U	U	U	U	U	U	U
Naphthalene	4.46	0.33	0.3	N/A	U	U	U	U	U	U	U	U	U	U	U	U	U	U
Phenanthrene	1,140	0.33	0.3	N/A	U	U	U	U	U	U	U	U	U	U	U	U	U	U
Pyrene	655	0.5	0.3	N/A	U	U	U	U	U	U	U	U	U	U	U	U	U	U
Polychlorinated Biphenyls	**(mg/kg)**	**(mg/kg)**	**(mg/kg)**	**(mg/kg)**	**(mg/kg)**	**(mg/kg)**	**(mg/kg)**	**(mg/kg)**	**(mg/kg)**	**(mg/kg)**	**(mg/kg)**	**(mg/kg)**	**(mg/kg)**	**(mg/kg)**	**(mg/kg)**	**(mg/kg)**	**(mg/kg)**	**(mg/kg)**
Aroclor 1016	0.094	0.017	0.006	N/A	U	U	U	U	U	U	U	U	U	U	U	U	U	U
Aroclor 1221	0.017[c]	0.017	0.010	N/A	U	U	U	U	U	U	U	U	U	U	U	U	U	U
Aroclor 1232	0.017[c]	0.017	0.006	N/A	U	U	U	U	U	U	U	U	U	U	U	U	U	U
Aroclor 1242	0.039	0.017	0.006	N/A	U	U	U	U	U	U	U	U	U	U	U	U	U	U
Aroclor 1248	0.039	0.017	0.006	N/A	U	U	U	U	U	U	U	U	U	U	U	U	U	U
Aroclor 1254	0.066	0.017	0.006	N/A	U	U	U	U	U	U	U	U	U	U	U	U	U	U

Table A-2b. Analytical Results for Initial Depth Sampling for Nonradiological Contaminants

Contaminant	Removal Action Levels[a]	Required Detection Limit	Maximum Reported Laboratory Method Detection Limit	Background Concentration[b]	HEIS B289F0 B289W4 B28B31 B289M7 FS 1b 4.67m (15 ft)	HEIS B289F1 B289W5 B28B32 B289M8 FS 2b 4.67m (15 ft)	HEIS B289F2 B289W6 B28B33 B289M9 FS 3b 4.67m (15 ft)	HEIS B289F3 B289W7 B28B34 B289N0 FS 4b 4.67m (15 ft)	HEIS B289F6 B289X0 B28B37 B289N3 FS 5b 4.67m (15 ft)	HEIS B289H8 B289Y2 B28B49 B289P5 FS 6b 4.67m (15 ft)	HEIS B289H9 B289Y3 B28B50 B289P6 FS 7b 4.67m (15 ft)	HEIS B289J0 B289Y4 B28B51 B289P7 FS 8b 4.67m (15 ft)	HEIS B289J1 B289Y5 B28B52 B289P8 FS 9b 4.67m (15 ft)	HEIS B289J2 B289Y6 B28B53 B289P9 FS 10b 4.67m (15 ft)	HEIS B289J6 B28B00 B28B57 B289R3 FS 11b 4.67m (15 ft)	HEIS B289J9 B28B03 B28B60 B289R6 FS 12b 4.67m (15 ft)	HEIS B289K2 B29B06 B28B63 B289R9 FS 13b 4.67m (15 ft)	HEIS B289K6 B28B10 B28B67 B289T3 FS 14b 4.67m (15 ft)
Aroclor 1260	0.5	0.017	0.006	N/A	U	U	U	U	U	U	U	U	U	U	U	U	U	U
Volatile Organic Analytes	**(mg/kg)**	**(mg/kg)**	**(mg/kg)**	**(mg/kg)**	**(mg/kg)**	**(mg/kg)**	**(mg/kg)**	**(mg/kg)**	**(mg/kg)**	**(mg/kg)**	**(mg/kg)**	**(mg/kg)**	**(mg/kg)**	**(mg/kg)**	**(mg/kg)**	**(mg/kg)**	**(mg/kg)**	**(mg/kg)**
Carbon Tetrachloride	0.005	0.005	0.001	N/A	U	U	U	U	U	U	U	U	U	U	U	U	U	U
Xylene	14.6	0.01	0.001	N/A	U	U	U	U	U	U	U	U	U	U	U	U	U	U
Total Petroleum Hydrocarbons	**(mg/kg)**	**(mg/kg)**	**(mg/kg)**	**(mg/kg)**	**(mg/kg)**	**(mg/kg)**	**(mg/kg)**	**(mg/kg)**	**(mg/kg)**	**(mg/kg)**	**(mg/kg)**	**(mg/kg)**	**(mg/kg)**	**(mg/kg)**	**(mg/kg)**	**(mg/kg)**	**(mg/kg)**	**(mg/kg)**
Diesel	2,000	5	8.0[d]	N/A	U	U	U	U	U	U	U	U	U	U	U	U	U	U
Kerosene	2,000	5	8.0[d]	N/A	U	U	U	U	U	U	U	U	U	U	U	U	U	U

a. Removal action levels are from DOE/RL-2009-53, *Removal Action Work Plan for 48 Waste Sites in the 200-MG-1 Operable Unit* (RAWP).

b. If Hanford Site-specific background data is not available, values are then taken from Ecology Publication 94-115, *Natural Background Soil Metals Concentrations in Washington State*. Hanford Site background values are available in nonradiological background data from DOE/RL-92-24, *Hanford Site Background: Part 1, Soil Background for Nonradioactive Analytes*, Table D39-2.

c. Where cleanup levels are less than background or required detection limits (RDLs), cleanup levels default to background or RDLs per Ecology Publication 94-06, *Model Toxics Control Act Cleanup Regulation Chapter 173-340 WAC*; WAC 173-340-700(6)(d), "Model Toxics Control Act—Cleanup," "Overview of Cleanup Standards;" and WAC 173-340-707(2), "Model Toxics Control Act—Cleanup," "Analytical Considerations," respectively.

d. Maximum reported laboratory method detection limits were greater than the RDL per the RAWP; however, analytical results are below the established removal action levels and meet the corresponding removal action objectives.

N/A = not available

U = result is less than laboratory method detection limit.

Table A-3. Analytical Results for In Process Sampling for Nonradiological and Radiological Contaminants of Potential Concern

Contaminant of Potential Concern	Removal Action Levels[a]	Required Detection Limit	Maximum Reported Laboratory Method Detection Limit	Background Concentration[b,c]	HEIS B2FHY2 B2FNR1 RV 28 Surface	HEIS B2FHY8 B2FNR7 RV 33 Surface	HEIS B2FNT5 B2FNV5 CS1 Surface	HEIS B2FNT6 B2FNV6 CS2 Surface	HEIS B2FNT8 B2FNV8 CS4 Surface	HEIS B2FNV0 B2FNW0 CS6 Surface
Metals	**(mg/kg)**	**(mg/kg)**	**(mg/kg)**	**(mg/kg)**	**(mg/kg)**	**(mg/kg)**	**(mg/kg)**	**(mg/kg)**	**(mg/kg)**	**(mg/kg)**
Uranium	3.21[d]	1	0.1	3.21	0.521	0.839	0.522	0.74	1.12	0.597
Radiological	**(pCi/g)**	**(pCi/g)**	**(pCi/g)**	**(pCi/g)**	**(pCi/g)**	**(pCi/g)**	**(pCi/g)**	**(pCi/g)**	**(pCi/g)**	**(pCi/g)**
Uranium-233/234	1.1	1.0	0.025	1.1	0.19	0.2	0.21	0.32	0.46	0.26
Uranium-235	0.5	0.5	0.016	0.11	0.012	0.027	0.008	0.037	0.022	0.019
Uranium-238	1.1	1.0	0.022	1.1	0.22	0.22	0.21	0.3	0.5	0.28

a. Removal action levels are from DOE/RL-2009-53, *Removal Action Work Plan for 48 Waste Sites in the 200-MG-1 Operable Unit* (RAWP).

b. If Hanford Site-specific background data is not available, values are then taken from Ecology Publication 94-115, *Natural Background Soil Metals Concentrations in Washington State*. Hanford Site background values are available in nonradiological background data from DOE/RL-92-24, *Hanford Site Background: Part 1, Soil Background for Nonradioactive Analytes*, Table D39-2.

c. Hanford Site background values for radiological background data are available from DOE/RL-96-12, *Hanford Site Background: Part 2, Soil Background for Radionuclides*, Table 5-1.

d. Where cleanup levels are less than background or required detection limits (RDLs), cleanup levels default to background or RDLs per Ecology Publication 94-06, *Model Toxics Control Act Cleanup Regulation Chapter 173-340 WAC*; WAC 173-340-700(6)(d), "Model Toxics Control Act—Cleanup," "Overview of Cleanup Standards;" and WAC 173-340-707(2), "Model Toxics Control Act—Cleanup," "Analytical Considerations," respectively.

Table A-4a. Analytical Results for Verification Sampling for Nonradiological and Radiological Contaminants of Potential Concern

Contaminant of Potential Concern	Removal Action Levels[a]	Required Detection Limit	Maximum Reported Laboratory Method Detection Limit	Background Concentration[b,c]	HEIS B2H063 B2H093 RV 3 Surface	HEIS B2H064 B2H094 RV 39 Surface	HEIS B2H065 B2H095 RV 40 Surface	HEIS B2H066 B2H096 RV 41 Surface	HEIS B2H067 B2H097 RV 42 Surface	HEIS B2H068 B2H098 RV 43 Surface	HEIS B2H069 B2H099 RV 44 Surface	HEIS B2H070 B2H0B0 RV 45 Surface	HEIS B2H071 B2H0B1 RV 46 Surface	HEIS B2H072 B2H0B2 RV 47 Surface
Metals	**(mg/kg)**	**(mg/kg)**	**(mg/kg)**	**(mg/kg)**	**(mg/kg)**	**(mg/kg)**	**(mg/kg)**	**(mg/kg)**	**(mg/kg)**	**(mg/kg)**	**(mg/kg)**	**(mg/kg)**	**(mg/kg)**	**(mg/kg)**
Uranium	3.21[d]	1	0.11	3.21	0.521	0.839	0.522	0.74	1.12	0.597	0.596	0.731	1.44	4.06
Radiological	**(pCi/g)**	**(pCi/g)**	**(pCi/g)**	**(pCi/g)**	**(pCi/g)**	**(pCi/g)**	**(pCi/g)**	**(pCi/g)**	**(pCi/g)**	**(pCi/g)**	**(pCi/g)**	**(pCi/g)**	**(pCi/g)**	**(pCi/g)**
Uranium-233/234	1.1	1.0	0.028	1.1	0.19	0.2	0.21	0.32	0.46	0.26	0.25	0.35	0.38	1.7
Uranium-235	0.5	0.5	0.026	0.11	0.012	0.027	0.008	0.037	0.022	0.019	0.02	0.024	0.03	0.087
Uranium-238	1.1	1.0	0.022	1.1	0.22	0.22	0.21	0.3	0.5	0.28	0.28	0.33	0.45	1.6

a. Removal action levels are from DOE/RL-2009-53, *Removal Action Work Plan for 48 Waste Sites in the 200-MG-1 Operable Unit* (RAWP).

b. If Hanford Site-specific background data is not available, values are then taken from Ecology Publication 94-115, *Natural Background Soil Metals Concentrations in Washington State*. Hanford Site background values are available in nonradiological background data from DOE/RL-92-24, *Hanford Site Background: Part 1, Soil Background for Nonradioactive Analytes*, Table D39-2.

c. Hanford Site background values for radiological background data are available from DOE/RL-96-12, *Hanford Site Background: Part 2, Soil Background for Radionuclides*, Table 5-1.

d. Where cleanup levels are less than background or required detection limits (RDLs), cleanup levels default to background or RDLs per Ecology Publication 94-06, *Model Toxics Control Act Cleanup Regulation Chapter 173-340 WAC*; WAC 173-340-700(6)(d), "Model Toxics Control Act—Cleanup," "Overview of Cleanup Standards;" and WAC 173-340-707(2), "Model Toxics Control Act—Cleanup," "Analytical Considerations," respectively.

Table A-4b. Analytical Results for Verification Sampling for Nonradiological and Radiological Contaminants of Potential Concern

Contaminant of Potential Concern	Removal Action Levels[a]	Required Detection Limit	Maximum Reported Laboratory Method Detection Limit	Background Concentration[b,c]	HEIS B2H073 B2H0B3 RV 48 Surface	HEIS B2H074 B2H0B4 RV 49 Surface	HEIS B2H075 B2H0B5 RV 50 Surface	HEIS B2H077 B2H0B7 RV 51 Surface	HEIS B2H078 B2H0B8 RV 52 Surface	HEIS B2H079 B2H0B9 RV 53 Surface	HEIS B2H080 B2H0C0 RV 54 Surface	HEIS B2H081 B2H0C1 RV 55 Surface	HEIS B2H082 B2H0C2 RV 56 Surface	HEIS B2H083 B2H0C3 RV 57 Surface
Metals	**(mg/kg)**	**(mg/kg)**	**(mg/kg)**	**(mg/kg)**	**(mg/kg)**	**(mg/kg)**	**(mg/kg)**	**(mg/kg)**	**(mg/kg)**	**(mg/kg)**	**(mg/kg)**	**(mg/kg)**	**(mg/kg)**	**(mg/kg)**
Uranium	3.21[d]	1	0.11	3.21	0.641	0.779	0.72	0.606	1.21	1.08	3.55	0.802	0.553	0.755
Radiological	**(pCi/g)**	**(pCi/g)**	**(pCi/g)**	**(pCi/g)**	**(pCi/g)**	**(pCi/g)**	**(pCi/g)**	**(pCi/g)**	**(pCi/g)**	**(pCi/g)**	**(pCi/g)**	**(pCi/g)**	**(pCi/g)**	**(pCi/g)**
Uranium-233/234	1.1	1.0	0.028	1.1	0.25	0.23	0.25	0.24	0.41	0.37	1.2	0.19	0.17	0.27
Uranium-235	0.5	0.5	0.026	0.11	0.0073	0.012	0.018	0.015	0.029	0.031	0.1	0.0081	0.02	0.02
Uranium-238	1.1	1.0	0.022	1.1	0.27	0.29	0.31	0.22	0.43	0.44	1.2	0.21	0.19	0.29

a. Removal action levels are from DOE/RL-2009-53, *Removal Action Work Plan for 48 Waste Sites in the 200-MG-1 Operable Unit* (RAWP).

b. If Hanford Site-specific background data is not available, values are then taken from Ecology Publication 94-115, *Natural Background Soil Metals Concentrations in Washington State*. Hanford Site background values are available in nonradiological background data from DOE/RL-92-24, *Hanford Site Background: Part 1, Soil Background for Nonradioactive Analytes*, Table D39-2.

c. Hanford Site background values for radiological background data are available from DOE/RL-96-12, *Hanford Site Background: Part 2, Soil Background for Radionuclides*, Table 5-1.

d. Where cleanup levels are less than background or required detection limits (RDLs), cleanup levels default to background or RDLs per Ecology Publication 94-06, *Model Toxics Control Act Cleanup Regulation Chapter 173-340 WAC*; WAC 173-340-700(6)(d), "Model Toxics Control Act—Cleanup," "Overview of Cleanup Standards;" and WAC 173-340-707(2), "Model Toxics Control Act—Cleanup," "Analytical Considerations," respectively.

Table A-5. 216-S-19 Cleanup Criteria for Final Verification Sample Results

Contaminant of Potential Concern	Uranium (Soluble Salts)	U-233/234	U-238
Average	1.07 mg/kg	0.39 pCi/g	0.41 pCi/g
Count	21	21	21
Std Deviation	0.94 mg/kg	0.37 pCi/g	0.35 pCi/g
95% Confidence	0.40 mg/kg	0.16 pCi/g	0.15 pCi/g
95% Upper Confidence Limit Mean	**1.48 mg/kg**	**0.55 pCi/g**	**0.55 pCi/g**
Removal Action Level	**3.21 mg/kg**	**1.1 pCi/g**	**1.1 pCi/g**
Satisfy Cleanup Criteria	**Yes**	**Yes**	**Yes**

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