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Revision 0

100-D/H Area Interim Remedial Action Report

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

Approved for Public Release;
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D. G. Singleton
CH2M HILL Plateau Remediation Company

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Terms

ACM	asbestos-containing material
BCM	bank cubic meter
BCY	bank cubic yard
bgs	below ground surface
CA	contaminated area
CERCLA	*Comprehensive Environmental Response, Compensation, and Liability Act of 1980*
COC	contaminant of concern
COPC	contaminant of potential concern
cpm	counts per minute
CWC	Central Waste Complex
D&D	decontamination and decommissioning
DDD	dichorodiphenyldichloroethane
DDE	dichlorodiphenyldichloroethylene
DDT	dichlorodiphenyltrichloroethane
DOE	U.S. Department of Energy
dpm	disintegrations per minute
Ecology	Washington State Department of Ecology
EPA	U.S. Environmental Protection Agency
ERDF	Environmental Restoration Disposal Facility
FSB	fuel storage basin
GEA	gamma energy analysis
GPERS	Global Positioning Environmental Radiological Survey
GPR	ground-penetrating radar
HEPA	high-efficiency particulate air
ICP	inductively coupled plasma
ISS	interim safe storage
LSFF	Large Sodium Fire Facility
MTCA	Model Toxic Control Act

NaK	sodium-potassium alloy
NPL	National Priorities List
OHWM	ordinary high-water mark
OU	operable unit
PAH	polycyclic aromatic hydrocarbon
PCB	polychlorinated biphenyl
PFE	plenum filling experiment
QA	quality assurance
QC	quality control
RAG	remedial action goal
RAO	remedial action objective
RCP	reinforced concrete pipe
RCRA	*Resource Conservation and Recovery Act of 1976*
RDR/RAWP	remedial design report/remedial action work plan
RESRAD	RESidual RADioactivity
RMA	radioactive material area
ROD	record of decision
RSVP	remaining sites verification package
RTD	remove, treat, and dispose
SCA	soil contamination area
SNF	spent nuclear fuel
SPA	staging pile area
SSNF	suspect spent nuclear fuel
SVOC	semivolatile organic compound
TPH	total petroleum hydrocarbons
Tri-Parties	U.S. Department of Energy, Richland Operations Office, U.S. Environmental Protection Agency, and Washington State Department of Ecology
Tri-Party Agreement	*Hanford Federal Facility Agreement and Consent Order*
UPR	unplanned release
UST	underground storage tank

VCP	vitrified clay pipe
VOC	volatile organic compound
VSR	vertical safety rod
WAC	*Washington Administrative Code*
XRF	x-ray fluorescence

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1 Introduction

The Hanford Site is a 1,517-km^2 (586-mi^2) federal facility located in southeastern Washington State along the Columbia River (Figure 1-1). From 1943 to 1990, the primary mission of the Hanford Site was the production of nuclear materials for national defense. In 1989, the 100 Area was one of four areas at the Hanford Site placed on the National Priorities List (NPL) under the authority of the *Comprehensive Environmental Response, Compensation, and Liability Act of 1980* (CERCLA), as amended by the *Superfund Amendments and Reauthorization Action of 1986*. In 1990, the mission of the Hanford Site changed from producing nuclear materials to cleaning up residual radioactive and hazardous wastes.

The River Corridor is a subregion of the Hanford Site that encompasses approximately 570 km^2 (220 mi^2) (Figure 1-1). The Columbia River borders the River Corridor toward the north and east. The remaining areas of the River Corridor border the Central Plateau, Hanford Reach National Monument, and City of Richland. In 2007, the River Corridor was divided into six geographic areas, commonly referred to as decision areas, to organize the remedial investigation/feasibility study process for the River Corridor and support development of six final action records of decision (RODs). These decision areas encompass both the 100 Area and 300 Area NPL sites and include source and groundwater operable units (OUs). The six decision areas (100-BC, 100-K, 100-N, 100-D/H, 100-F/IU-2/IU-6, and 300), along with subareas referred to as segments, are shown in Figure 1-2. The 100-D/H Area and associated waste sites within the 100-DR-1, 100-DR-2, 100-HR-1, and 100-HR-2 source OUs are the focus of this report. Waste sites in the 100-D/H Area that are not assigned to one of the source OUs (hereafter referred to as unassigned waste sites) are also included in this report.

1.1 Purpose and Scope

Interim remedial actions in the 100-D/H Area have been implemented to mitigate potential impacts from hazardous chemical and radioactive releases to the soil column as required by interim action RODs. This report documents the completion of interim remedial actions and has been prepared in accordance with U.S. Environmental Protection Agency (EPA) guidance in OSWER Directive 9320.2-22, *Close Out Procedures for National Priorities List Sites*. This report provides a summary of the background and history of the Hanford Site (inclusive of the 100-D/H Area), construction information, and performance data.

In July 2018, final cleanup remedies were selected for these waste sites as documented in EPA et al., 2018, *Record of Decision Hanford 100 Area Superfund Site 100-DR-1, 100-DR-2, 100-HR-1, 100-HR-2, 100-HR-3 Operable Units*.

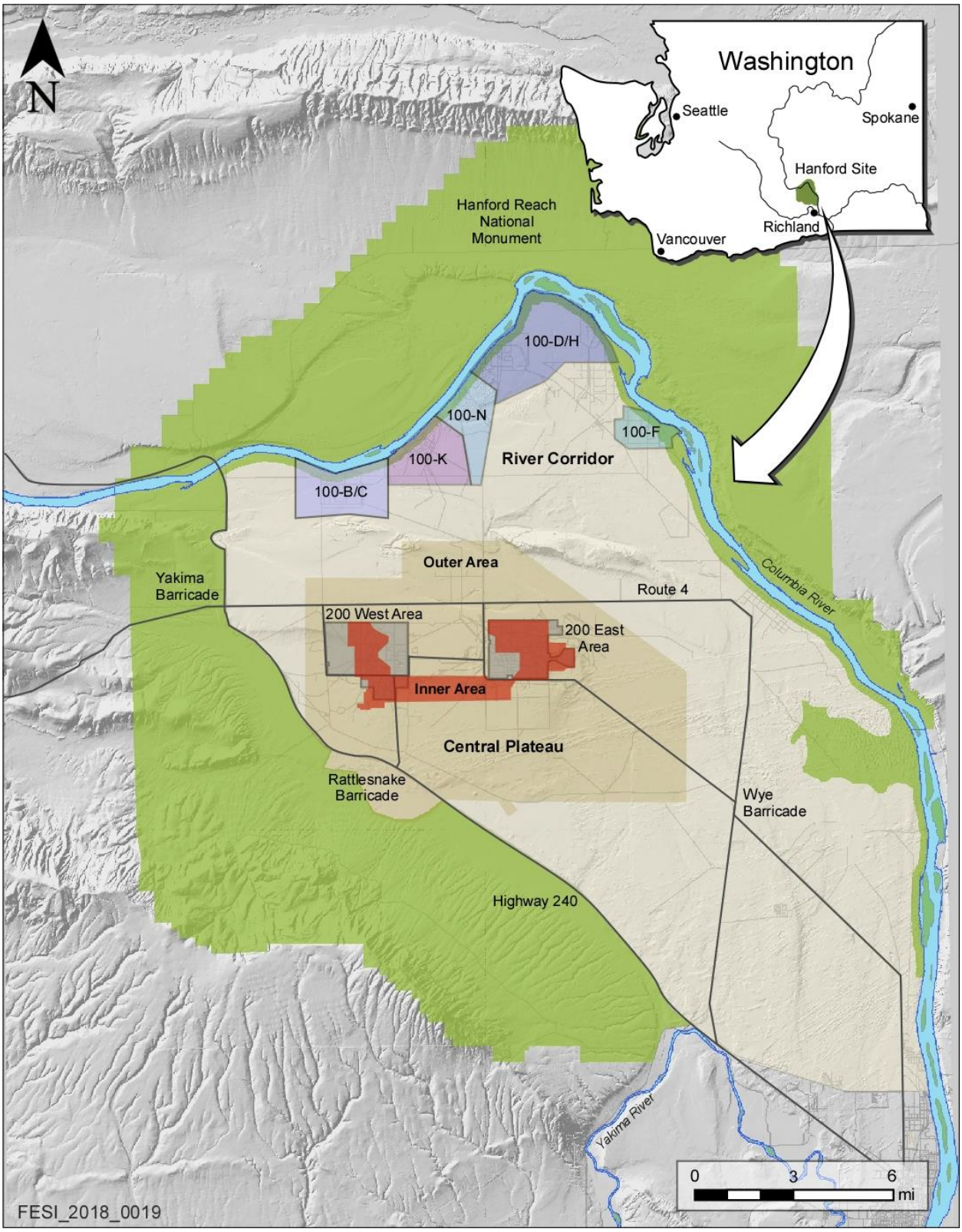

Figure 1-1. Hanford Site Location Map

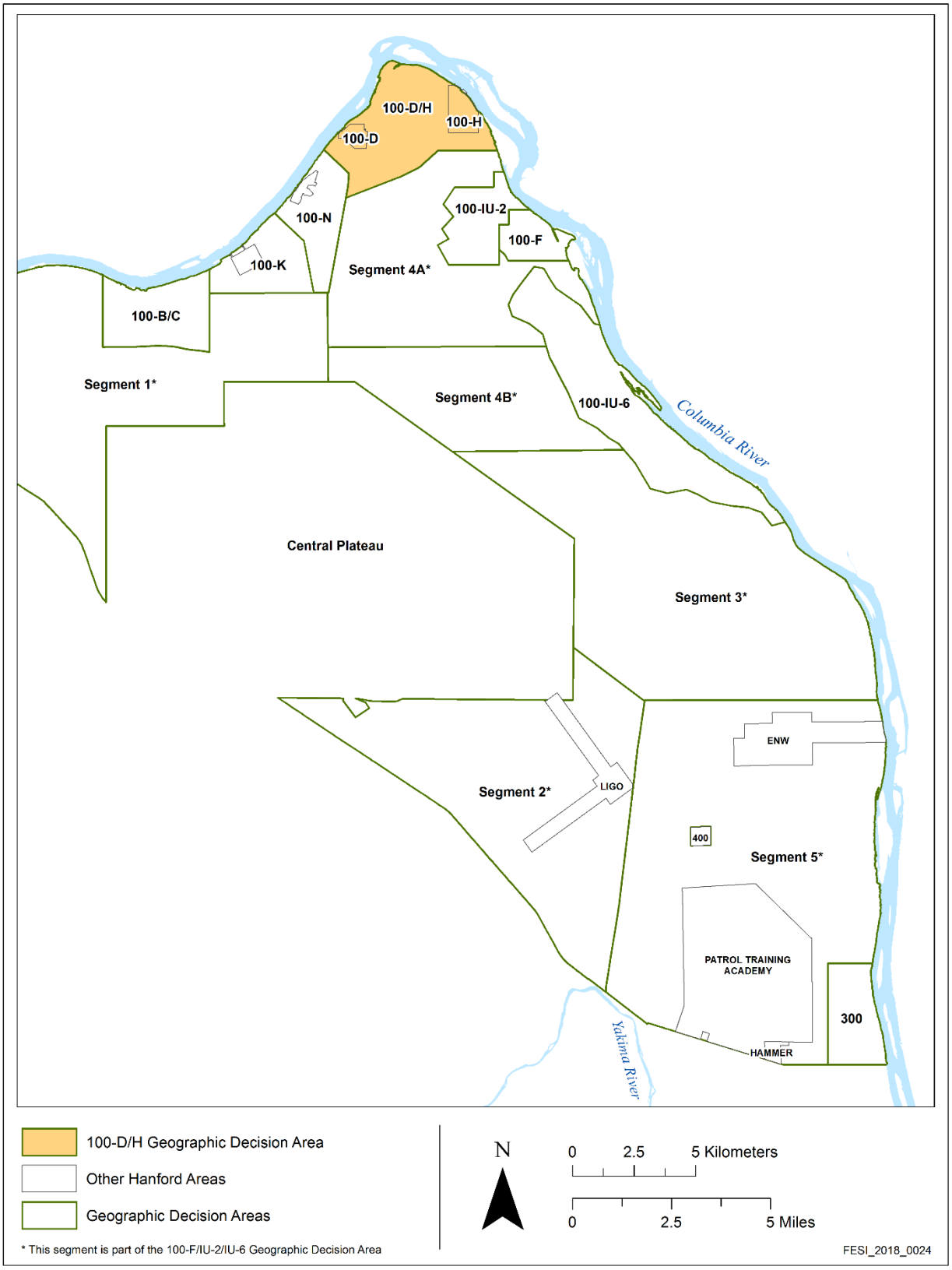

Figure 1-2. Decision Area and Segment Location Map

Information provided herein presents input for future decision-making and evaluation of technology. This report addresses the 100-D/H Area waste sites identified in the following interim action decision documents, where remedial action objectives (RAOs) and remedial action goals (RAGs) have been achieved:

- EPA/ROD/R10-95/126, *Interim Remedial Action Record of Decision for the 100-BC-1, 100-DR-1, and 100-HR-1 Operable Units, Hanford Site, Benton County, Washington*
- EPA/541/R-97/044, *Amended Record of Decision for the 100-BC-1, 100-DR-1, and 100-HR-1 Operable Units Interim Remedial Actions, Hanford Site, Benton County, Washington*
- EPA/ROD/R10-99/039, *Interim Action Record of Decision for the 100-BC-1, 100-BC-2, 100-DR-1, 100-DR-2, 100-FR-1, 100-FR-2, 100-HR-1, 100-HR-2, 100-KR-1, 100-KR-2, 100-IU-2, 100-IU-6, and 200-CW-3 Operable Units, Hanford Site, Benton County, Washington (100 Area Remaining Sites)* (hereinafter referred to as 100 Area Remaining Sites ROD)
- EPA/ROD/R10-00/121, *Interim Remedial Action Record of Decision for the 100-BC-1, 100-BC-2, 100-DR-1, 100-DR-2, 100-FR-2, 100-HR-2, and 100-KR-2 Operable Units, Hanford Site (100 Area Burial Grounds), Benton County, Washington* (hereinafter referred to as 100 Area Burial Grounds ROD)
- EPA et al., 2004, *Explanation of Significant Differences for the 100 Area Remaining Sites Interim Remedial Action Record of Decision*
- EPA et al., 2009, *Explanation of Significant Differences for the 100 Area Remaining Sites Interim Remedial Action Record of Decision: Hanford Site Benton County, Washington*

Sites included in this report have also been evaluated according to RL-TPA-90-0001, *Tri-Party Agreement Handbook Management Procedures*, Guideline Number TPA-MP-14, "Maintenance of the Waste Information Data System."

The Remaining Sites explanation of significant differences (ESD) (EPA et al., 2009) authorized that newly discovered waste sites in operable units (OUs) included in the 100 Area Remaining Sites ROD (EPA/ROD/R10-99/039) that met the ROD requirements for plug-in or candidate sites should proceed in accordance with the provisions stated in the ESD (EPA et al., 2009) without publication of an additional ESD. Plug-in sites qualified for cleanup action by remove, treat, and dispose (RTD) because remedial action was needed, while candidate sites required additional characterization to determine if remedial action was necessary. Additions of plug-in and candidate sites were documented in the Hanford Site Administrative Record and published in annual fact sheets issued by the U.S. Department of Energy, Richland Operations Office (DOE-RL) that identified the plug-in and candidate waste sites. These waste sites were also incorporated into the final remedy decisions documented in EPA et al. (2018).

1.2 Hanford Site

In early 1943, the U.S. Army Corps of Engineers selected the Hanford Site as the location for production reactors and chemical separation facilities for the production and purification of plutonium for use in nuclear weapons as part of the Manhattan Project, as described in ERDA-1538, *Final Environmental Statement Waste Management Operations: Hanford Reservation, Richland, Washington*. Production reactors were constructed in the 100 Area of the Hanford Site along the Columbia River. Separation and purification plants were constructed on the Central Plateau within the 200 Areas of the Hanford Site.

The 100 Area is located along the southern banks of the Columbia River in the northeastern part of the Hanford Site and encompasses an area of approximately 68 km2 (26 mi^2). The 100-D/H Area is two of six reactor areas in the 100 Area and encompasses approximately 20 km^2 (7.8 mi^2) area along the southern shore of the Columbia River. The 100-D/H Area contains three retired nuclear production reactors, including the 105-D, 105-DR, and 105-H Reactors. The area between the 100-D and 100-H Areas is undeveloped and referred to as the Horn. The 105-D, 105-DR, and 105-H Reactors' primary mission was plutonium production. These water-cooled nuclear reactors, associated structures, and processes that generated solid and liquid wastes were the primary sources of contamination. Solid waste was placed in unlined burial grounds. Liquid contaminants were released to the environment via retention basins, trenches, cribs, ditches, and through outfall piping to the Columbia River. The waste sites within the 100-D Reactor Area are included in the 100-DR-1 and 100-DR-2 OUs and the waste sites within the 100-H Reactor Area are included in the 100-HR-1 and 100-HR-2 OUs.

Releases and contamination from Hanford Site operations in the 100-D/H Area are addressed in five OUs. The 100-D/H Area consists of the 100-DR-1, 100-DR-2, 100-HR-1, and 100-HR-2 source OUs that included solid waste burial grounds, effluent disposal sites, and the associated vadose zone. The 100-HR-3 OU includes the groundwater beneath the source OUs.

1.2.1 100-D/H Area Source Operable Units

The 100-D/H Area is the northernmost of the six River Corridor areas. The 100-D/H Area includes three deactivated nuclear reactors and support facilities that operated to produce plutonium from 1944 to 1967. The 105-D and 105-DR Reactors are within the 100-D Area and the 105-H Reactor is within the 100-H Area. The area between the 100-D and 100-H Areas is undeveloped and is referred to as "the Horn." The 100-D/DR Area contains two reactors: the 105D Reactor within the 100-DR-1 OU and the 105-DR Reactor within the 100-DR-2 OU. The 105D Reactor operated from 1944 to 1967, and the 105-DR Reactor operated from 1950 to 1964. The 100-D Area includes former radioactive liquid waste disposal sites and buried debris resulting from demolition of some reactor support facilities. The 100-H Area (100-HR-1 and 100-HR-2 OUs) contains the 105-H Reactor that operated from 1949 to 1965. In general, the 100-H Area contains waste units associated with the original plant facilities constructed to support 105-H Reactor operation.

1.2.2 100-HR-3 Groundwater Operable Unit

Groundwater in the 100-HR-3 OU flows generally to the east-northeast, from 100-D across the Horn, toward 100-H. Flow in 100-H is to the east and northeast, generally toward the river. In the southern and central portions of 100-D, groundwater flows to the northwest, toward the Columbia River. Horizontal hydraulic gradients are generally lower during high river stage compared to low river stage.

Pump and treat (P&T) system operation has changed historical groundwater flow direction and velocity in the 100-HR-3 OU. These changes are expressed as depressions and mounds in the water table, often localized, affecting the local flow direction and gradient. The flow directions and gradients during low and high river stage have a greater effect on contaminant transport than transitional river stages. The effect of the P&T system is noticeable where groundwater depressions are present around some DX P&T system extraction wells.

In addition to changes due to remedial actions, daily and seasonal fluctuations in the river stage affect groundwater flow. Longer term changes in the river stage produce more extensive and longer changes in water levels, hydraulic gradient, and flow directions in the unconfined aquifer. The high and low river stages, which typically last a few months, affect the groundwater flow near the river and extend some distance inland, depending mostly on geology.

During high river stage periods, the local groundwater gradient is reduced near the river; the vicinity very near the river may exhibit a flow direction reversal, with river water intruding slowly into the aquifer (i.e., seasonal bank storage). The increased elevation of the boundary condition causes the groundwater inland of the river to back up during high river stage, creating the seasonal rise in groundwater elevation typically observed inland of the river. As the river stage declines, the boundary condition adjusts, the groundwater gradient steepens toward the river, and groundwater velocity increases. This condition continues until the groundwater head again equilibrates with the low river stage condition. Seasonal groundwater elevation transients are observed up to several kilometers inland from the river as the water table and river stage equilibrate, although the magnitude of the increase decreases with distance from the river. Changes in gradients and velocity as the river stage fluctuates result in lower contaminant concentrations during high river stage and higher contaminant concentrations during low river stage.

1.3 Environmental Setting

The Hanford Site is located within the semiarid Pasco Basin in the northern portion of the Columbia Plateau. Average annual precipitation on the Hanford Site is 16 cm (6 in.). Recharge in the 300 Area for disturbed conditions is estimated to range from 1.5 to 52 mm/yr (0.06 to 2.05 in.) (PNNL-14702, *Vadose Zone Hydrogeology Data Package for Hanford Assessments*) depending on soil type and vegetation.

The 100 Area is located in the northern portion of the Hanford Site, adjacent to the Columbia River. The geologic structure beneath the 100 Area is similar to much of the rest of the Hanford Site, which consists of three distinct levels of soil formations. The deepest level is a thick series of basalt flows that have been warped and folded, resulting in protrusions that crop out as rock ridges in some locations. The top of the basalt in the 100 Area ranges in elevation from 46 m (150 ft) near the 100-H Area to 64 m (210 ft) below sea level near the 100-B/C Area. Layers of silt, gravel, and sand known as the Ringold Formation form the middle level. The Ringold Formation shows a marked west-to-east variation in the 100 Area. The main channel of the ancestral Columbia River flowed along Umtanum Ridge and through the 100-B/C and 100-K Areas, before turning south to flow along Gable Mountain and/or through the Gable Mountain-Gable Butte gap, leaving relatively thin deposits of sand and gravel in the 100-B/C and 100-K Areas. The uppermost level is known as the Hanford formation and consists of gravel and sands deposited by catastrophic floods during glacial retreat. In the 100 Area, the Hanford formation consists primarily of Pasco Gravels facies, with local occurrences of the sand-dominated or slackwater facies. The predominant soil types in this area are Burbank loamy sand (34%), Ephrata sandy loam (23%), Ephrata stony loam (23%), and Quincy sand (17%). Other soil types include Pasco silt loam, Kiona silt loam, and river wash.

Groundwater beneath the Hanford Site is found in both an upper unconfined aquifer system and in deeper, basalt-confined aquifers. Portions of the upper, suprabasalt aquifer system are locally confined, but because the entire suprabasalt aquifer system is interconnected on a site-wide scale, it is referred to as the Hanford unconfined aquifer system. The deeper, basalt-confined aquifer system is important because there is a potential for significant groundwater movement, and consequently contamination movement, between the two systems. Groundwater in the 100-D/DR Area flows in a north/northwest direction toward the Columbia River. The depth to groundwater ranges from 22.67 m (74.4 ft) south of D Reactor in well 199-D2-5 to 17.0 m (55.8 ft) near the Columbia River in well 199-D8-53.

Groundwater in the 100-H Area generally flows in a northeasterly direction toward the Columbia River.

2 100-D/H Area Background

In anticipation of CERCLA NPL listing of the Hanford Site in 1989, the EPA, Washington State Department of Ecology (Ecology), and the U.S. Department of Energy (DOE) entered into the *Hanford Federal Facility Agreement and Consent Order* (Tri-Party Agreement) (Ecology et al., 1989). The Tri-Party Agreement is a legally binding agreement among the EPA, DOE, and Ecology (Tri-Parties) for the purposes of achieving compliance with the remedial action provisions of CERCLA and with treatment, storage, and disposal unit regulation and corrective action provisions of the *Resource Conservation and Recovery Act of 1976* (RCRA).

2.1 Integration with CERCLA Cleanup Actions

Cleanup actions in the River Corridor were performed in accordance with several interim action RODs that provided a regulatory framework, established cleanup objectives, and identified selected remedies. New waste sites identified and accepted in the Waste Information Data System (WIDS) by DOE-RL, EPA, and Ecology (Tri-Parties) were added to the 100 Area Remaining Sites ROD (EPA/ROD/R10-99/039) as plug in or candidate sites per the conditions of the RODs or ESD (EPA et al., 2009) by meeting the criteria to require remedial action or by requiring additional characterization.

2.2 Remedial Action Decisions

To expedite the decision-making process to allow cleanup to begin as soon as possible, in 1991 the Tri-Parties adopted a “bias-for-action” approach for the remediation of the Hanford Site called the *Hanford Past-Practice Strategy* (DOE/RL-91-40), which streamlined the remedial investigation/feasibility study process for contaminated waste sites to allow remediation to begin earlier than is typically allowed under the traditional CERCLA process. The decision documents authorizing remediation for waste sites in the 100-D/H Area include the following:

- Interim action ROD amendment EPA/541/R-97/044 increases the scope of EPA/ROD/R10-95/126 by adding waste sites that received similar waste discharges. This amendment also eliminated soil washing as a possible treatment step for 100 Area liquid effluent disposal sites and provides guidance for revegetation in accordance with DOE/RL-96-19, Mitigation Action Plan for Liquid Waste Sites in the 100-BC-1, 100-DR-1, and 100-HR-1 Operable Units.

- The 100 Area Remaining Sites ROD (EPA/ROD/R10-99/039) directs remedial action for waste sites that have been termed “100 Area Remaining Sites for Remove, Treat, and Dispose” because of indicated adverse impacts to human health and the environment. In addition, this ROD identifies “Candidate 100 Area Remaining Sites for Plug in of Remove, Treat and Dispose” because information was insufficient to determine if remedial action is needed and directs remedial action at proximity, analogous, and discovery waste sites that can be shown to plug in to the “Remove, Treat, and Dispose” remedy.

- The 100 Area Burial Grounds ROD (EPA/ROD/R10-00/121) defines remedial action for areas used for near-surface disposal of solid wastes containing hazardous substances. The selected remedy includes removing contaminated soils, structures, and debris with disposal at the Environmental Restoration Disposal Facility (ERDF).

- Following the issuance of the Remaining Sites ROD in 1999, ongoing remedial activities in the 100 Area in EPA et al., 2004 identified 28 additional waste sites, 4 sites were assigned to the 100-DR-1 OU, 1 site to the 100-DR-2 OU, and 2 sites to the 100-HR-1 OU. These sites were added using the “plug-in” approach to the 100 Area RTD remedy.

- EPA et al., 2009 added 99 waste sites that were "plugged in" and remediated in accordance with the Remaining Sites ROD or that had been remediated in accordance with the plug-in approach without prior issuance of an ESD. Also, this ESD added 87 newly discovered waste sites that were candidates for remediation, 29 of which were assigned to the 100-DR-1 OU, 1 to the 100-DR-2 OU, and 17 to the 100-HR-1 OU.
- EPA et al., 2001, *100 Area "Plug-In" and Candidate Waste Sites for Fiscal Year 2010*, authorized that additions of plug-in and candidate sites would be documented in the Administrative Record and a fact sheet would be published by the DOE annually identifying the plug-in and candidate sites that were added. This fact sheet added 43 waste sites, 1 that was assigned to the 100-DR-1 OU and 1 that was assigned to the 100-HR-2 OU. In addition, the fact sheet listed 20 candidate sites that required further evaluation: 3 in the 100-DR-1 OU, 1 in the 100-DR-2 OU, and 2 in the 100-HR-1 OU.
- EPA et al., 2013, *100 Area "Plug-In" and Candidate Waste Sites for Calendar Year 2012*, fact sheet added two waste sites in the 100-IU-2 and 100-IU-6 OUs that were remediated in accordance with the Remaining Sites ROD or were remediated in accordance with the plug-in approach without prior issuance of an ESD. In addition, the fact sheet listed nine candidate sites that required further evaluation, one of which was assigned to the 100-DR-1 OU, one to the 100-HR-1 OU, and five to the 100-HR-2 OU.

The decision documents described above also directed remedial action at waste sites within other River Corridor areas. However, this remedial action report only documents remedial action completed at waste sites in the 100-D/H OUs.

Sites in the 100-D/H Area have a WIDS site classification/reclassification status of "Accepted," "Not Accepted," "No Action," "Interim Closed Out," and "Rejected." The following is a listing of the definitions of these terms from RL-TPA-90-0001:

- Accepted: A classification status indicating an assessment has been made that a WIDS site is a waste management unit.
- Interim Closed Out: A historical reclassification status indicating, due to actions taken, a waste management unit meets cleanup standards specified in an interim action ROD or action memorandum, but for which a final action ROD has not been issued. Use of Interim Closed Out in this report as documented on pre-2011 waste site reclassification forms essentially means "Interim," a reclassification category indicating that the reclassification is based upon cleanup standards specified in an interim decision document (e.g., an interim ROD). A site with an interim reclassification will need a final reclassification to be fully dispositioned.
- No Action: A reclassification status indicating a waste site does not require any further remedial action under RCRA Corrective Action, CERCLA, or other cleanup standards based on an assessment of quantitative data collected for the waste site.
- Not Accepted: A classification status indicating an assessment has been made that a WIDS site is not a waste management unit.
- Rejected: A reclassification status indicating a waste site does not require remediation under RCRA Corrective Action, CERCLA, or other cleanup standards based on qualitative information such as a review of historical records, photographs, drawings, walkdowns, ground-penetrating radar scans, and shallow test pits. Such investigations do not include quantitative measurements.

Regulator approval of site status is documented on a waste site reclassification form, which is accompanied by a regulator-reviewed site specific informal report discussing the reasons and justification for reclassification. Site classification and reclassification status are documented in WIDS and serve as formal notification to the public of site status.

A total of 313 waste sites (including subsites) are identified within the scope of this report (Tables 2-1 through 2-5). The locations and classification/reclassification status of all 100-D/H Area sites are shown in Figures 2-1 through 2-5.

Table 2-1. 100-DR-1 Operable Unit Sites

Waste Information Data System Site Code/Name	Waste Site Status
100-D-1, Contaminated Drain, Contaminated Storm Drain	Interim Closed Out
100-D-2, Solid Waste Site, Lead Sheeting	Interim Closed Out
100-D-3, Solid Waste Burial Ground, Silica Gel	Interim No Action
100-D-4, Sludge Trench #5, 107-DR Sludge Trench #5, 107-D-5, 107-D5	Interim Closed Out
100-D-5, Waste Site Near 103-D, Undocumented Solid Waste Site, Undocumented Solid Waste Site Near 103-D	Interim Closed Out
100-D-6, Buried VSR Thimble, Minor Construction Burial Ground #1, Burial Ground 4D, 118-D-4D	Interim Closed Out
100-D-7, Undocumented Solid Waste Site	Interim Closed Out
100-D-8, 105-DR Process Sewer Outfall Site, Undocumented Liquid Waste Site, 1907-DR	Interim Closed Out
100-D-9, 184-DA Boiler Oil Tank	Interim Closed Out
100-D-18, Sludge Trench #4, 107-D Sludge Trench #4, 107-D-4, 107-D4	Interim Closed Out
100-D-19, Sludge Trench #6, 107-D Sludge Trench #6	Interim Closed Out
100-D-20, Sludge Trench #3, 107-D Sludge Trench #3, 107-D-3, 107-D3	Interim Closed Out
100-D-21, Sludge Trench #2, 107-DR Sludge Trench #2, 107-D-2, 107-D2	Interim Closed Out
100-D-22, Sludge Trench #1, 107-DR Sludge Trench #1, 107-D-1, 107-D1	Interim Closed Out
100-D-24, 119-D Sample Building Drywell	Interim No Action
100-D-25, Unplanned Release: 107-DR Basin Leaks	Interim Closed Out
100-D-29, Effluent Line Leak #2	Interim Closed Out
100-D-30, 185-D Sodium Dichromate Trench, 190-D Complex, Unplanned Release	Interim Closed Out
100-D-31:1, 1607-D2 Septic Sewer Pipelines	Interim Closed Out
100-D-31:2, 1700-D Series Buildings Septic Sewer Pipelines	Interim Closed Out
100-D-31:3, 105-D Sewer Pipelines	Interim Closed Out
100-D-31:4, 190-D Sewer Pipelines	Interim Closed Out
100-D-31:5, 188-D Ash Disposal Pipeline	Interim Closed Out
100-D-31:6, 184-D Powerhouse Sewer Pipelines	Interim Closed Out
100-D-31:7, 116-D-5 and D-Pond Sewer Pipeline	Interim Closed Out
100-D-31:8, 183-D and 186-D Northern Sewer Pipelines	Interim Closed Out
100-D-31:9, 183-D and 186-D Process Sewer Pipelines	Interim Closed Out
100-D-31:10, 182-D North Septic Sewer Pipeline	Interim Closed Out

Table 2-1. 100-DR-1 Operable Unit Sites

Waste Information Data System Site Code/Name	Waste Site Status
100-D-31:11, 182-D and 183-D Sewer Pipelines	Interim Closed Out
100-D-31:12, 183-D West Process Sewer Pipelines	Interim Closed Out
100-D-32, Minor Construction Burial Ground #6	Interim Closed Out
100-D-42, Buried VSR Thimble Site	Interim Closed Out
100-D-45, Buried VSR Thimble Site, Burial Ground 4B, 118-D-4B	Interim Closed Out
100-D-48:1, North Pipelines from 116-D-7 to the Outfalls	Interim Closed Out
100-D-48:2, West Pipelines from D Avenue to 116-D-7	Interim Closed Out
100-D-48:3, Effluent Pipelines from D Avenue to 105D Reactor	Interim Closed Out
100-D-48:4, Small Cooling Water Effluent Pipelines at 105D Reactor	Interim Closed Out
100-D-49:1, North Pipelines from 116-DR-9 to the Outfalls	Interim Closed Out
100-D-49:2, East Pipelines from D Avenue to 116-DR-9	Interim Closed Out
100-D-49:3, Effluent Pipelines from D Avenue to ~60 Meters from the 105-DR Reactor	Interim Closed Out
100-D-49:4, 100-DR Effluent Pipelines Within About 60 Meters of the Reactor	Interim Closed Out
100-D-50:1, Emergency Discharge Pipeline	Interim Closed Out
100-D-50:2, Reactor Cooling Water Pipelines from 190-DR Pumphouse	Accepted
100-D-50:3, Reactor Cooling Water Pipelines from 190-D High Bay	Rejected
100-D-50:4, Gas Recirculation Pipelines	Interim Closed Out
100-D-50:5, 183-DR Sedimentation Basin Drain Pipelines	Interim No Action
100-D-50:6, 183-DR Clearwell Drain Pipelines	Interim Closed Out
100-D-50:7, 183-DR Head House Floor Drain and Catch Basins Pipelines	Interim Closed Out
100-D-50:8, 117-DR Condensate Drain Pipelines	Interim Closed Out
100-D-50:9, 1607-DR3 Sanitary Sewer Pipelines	Interim Closed Out
100-D-50:10, Construction Camp Potable Water Supply Pipelines	Interim No Action
100-D-52, 105-D Downcomer Insulation Space Dry Well	Interim Closed Out
100-D-56:1, North Portion of 100-D-56	Interim Closed Out
100-D-56:2, South Portion of 100-D-56	Interim Closed Out
100-D-60, 100D/DR River Effluent Pipelines, 100D River Lines	Accepted
100-D-61, Utility Pole and Fixture Debris Piles	Interim Closed Out
100-D-63, 100-D/DR Service Water Pipelines, 100-D/DR Clean Water Pipelines	Interim No Action
100-D-65, 1904D Spillway, 116-D-5 Outfall Spillway, 100-D-60:1 Flumes	Interim Closed Out
100-D-66, 1904-DR Spillway, 116-DR-5 Outfall, 100-D-60:1 Flume	Interim Closed Out
100-D-67, D Island Contamination, D Island	Interim No Action
100-D-69, Sodium Dichromate Found Near Pacific Avenue and Paddock Street	Interim Closed Out
100-D-70, 184-DA Steam Generating Plant Dry Well	Interim No Action
100-D-71, Vertical Safety Rod Tower Components	Interim Closed Out

Table 2-1. 100-DR-1 Operable Unit Sites

Waste Information Data System Site Code/Name	Waste Site Status
100-D-72, 183-D Acid Facility	Interim Closed Out
100-D-73, 108-D Chemical Pump House Sodium Dichromate System	Interim Closed Out
100-D-74, 105-DR Dry Well	Interim No Action
100-D-75:1, 151-D Primary Electrical Substation	Interim Closed Out
100-D-75:2, 152-E1-D Secondary Electrical Substation, Substation C4-S1	Interim No Action
100-D-75:3, 152-C1-D Secondary Electrical Substation	Interim No Action
100-D-76, Former 116-D-3	Interim Closed Out
100-D-78, 100D Yellow Stained Soils	Interim Closed Out
100-D-80:1, Tar Stained Soil & Miscellaneous Debris (Areas 1, 2 and 3)	Interim No Action
100-D-80:2, Valve Box with Possible Asbestos Insulation (Area 4)	Interim Closed Out
100-D-81, 100D Burn Areas and Other Stained Areas	Interim Closed Out
100-D-82, 100D Garnet Sand Sites	Interim No Action
100-D-83:1, 183-DR Acid Addition Pipelines	Interim Closed Out
100-D-83:2, 183-DR Filter Backwash Connection	Interim Closed Out
100-D-83:3, 108-D Acid Addition Facility Pipelines	Interim Closed Out
100-D-83:4, Additional Treated Water Pipelines	Interim No Action
100-D-83:5, 186-D Acid Neutralizing System Pipelines and Reactor Cooling Water Pipelines to 105-D	Interim Closed Out
100-D-84:1, Sanitary Sewer Pipelines - Areas 1 and 2	Interim No Action
100-D-84:2, Sanitary Sewer Pipelines - Areas 3 and 4	Interim Closed Out
100-D-85:1, Additional 107-DR Effluent Pipeline	Interim No Action
100-D-85:2, Additional 105-DR Reactor Effluent Pipelines	Interim Closed Out
100-D-86:1, 105-D Gas Recirculation Pipelines	Interim Closed Out
100-D-86:2, Additional Process Sewer Pipelines	Interim No Action
100-D-86:3, 105-DR Fan Room Sewer Pipelines	Interim Closed Out
100-D-87, Spill Near Railroad Car Spot	Interim No Action
100-D-88, Miscellaneous Pipelines	Interim No Action
100-D-90, Two Transformers	Interim No Action
100-D-96:1, 100-D/DR Additional French Drains Group 1	Interim No Action
100-D-96:2, 100-D/DR Additional French Drains Group 2	Interim Closed Out
100-D-97, 184-DA Fuel Tank	Interim Closed Out
100-D-98:2, 152D and 153D Substations - Inactive	Interim No Action
100-D-98:3, 153-D-5 Distribution Substation	Interim Closed Out
100-D-99, Two Suspect Features identified by Ground Penetrating Radar	Interim Closed Out
100-D-101, 108-D Acid Pit and Sump, 108-D Car Spot, 108-D Sodium Silicate Sump, 108-D Storage Tanks, Miscellaneous Structures	Interim No Action
100-D-102, Suspect Effluent Leak Adjacent to 107-DR Basin	Interim No Action

Table 2-1. 100-DR-1 Operable Unit Sites

Waste Information Data System Site Code/Name	Waste Site Status
100-D-104, Unplanned release near 185-D Sodium Dichromate Storage Tank and Acid Neutralization French Drain	Interim Closed Out
100-D-105, D/DR-Area Pipelines Discovered During Remediation	Interim No Action
100-D-107, Soil beneath the 1713-DA Essential Materials Warehouse	Interim No Action
116-D-1A, 105-D Storage Basin Trench #1	Interim Closed Out
116-D-1B, 116D1B, 105-D Storage Basin Trench #2	Interim Closed Out
116-D-2, 105-D Pluto Crib, 116-D-2A	Interim Closed Out
116-D-3, 116D3, 108-D Crib #1	Interim No Action
116-D-4, 108-D Crib #2	Interim Closed Out
116-D-5, 1904-D Outfall Structure	Interim Closed Out
116-D-6, 116D6, 105-D Cushion Corridor French Drain	Interim Closed Out
116-D-7, 107-D Retention Basin, 107-D	Interim Closed Out
116-D-9, 116D9, 117-D Crib, 117-D Seal Pit Crib	Interim Closed Out
116-D-10, 105-D Fuel Storage Basin Cleanout Percolation Pit, 105-D Fuel Storage Discharge Ponds, 105-D Ponds	Interim Closed Out
116-DR-1&2, 107-DR Liquid Waste Disposal Trench #1, 107-DR Liquid Waste Disposal Trench #2, 116-DR-1, 116-DR-2	Interim Closed Out
116-DR-5, 1904-DR Outfall Structure, 1904-DR	Interim Closed Out
116-DR-9, 107-DR Retention Basin, 107-DR	Interim Closed Out
120-D-2, 186-D Waste Acid Reservoir	Interim Closed Out
126-D-2, 126D2, 184-D Coal Pit	Interim Closed Out
128-D-2, 128-D-2 Burn Pit	Interim Closed Out
130-D-1, 130D1, 1716-D Gasoline and Oil Storage Tanks, 1706-D Gasoline Storage Tank	Interim Closed Out
132-D-1, 115-D/DR Gas Recirculating Facility	Interim Closed Out
132-D-2, 117-D Filter Building	Interim Closed Out
132-D-3, 132D3, 1608-D Waste Water Pumping Station, 1608-D Effluent Pumping Station	Interim Closed Out
1607-D2:1, Original 1607-D2 Tile Field, Eastern 1607-D2 Tile Field	Interim Closed Out
1607-D2:2, Replacement 1607-D2 Tile Field, Northern Tile Field	Interim Closed Out
1607-D2:3, Septic Pipelines	Interim Closed Out
1607-D2:4, 1607-D2 Septic Tank	Interim Closed Out
1607-D2:5, Inlet Pipe to Replacement System Tile Field	Interim Closed Out
1607-D4, 1607-D4 Septic Tank and Drain Field, 124-D-4, 1607-D4 Sanitary Sewer System, 1607-D4 Septic Tank	Interim Closed Out
1607-D5, 1607-D5 Septic Tank and Associated Drain Field, 124-D-5, 1607-D5 Sanitary Sewer System, 1607-D5 Septic Tank	Interim Closed Out
628-3, 628-3 Burn Pit	Interim Closed Out
UPR-100-D-1, Oil Soaked Soil	Interim No Action

Table 2-1. 100-DR-1 Operable Unit Sites

Waste Information Data System Site Code/Name	Waste Site Status
UPR-100-D-2, Effluent Line Leak #1	Interim Closed Out
UPR-100-D-3, Effluent Line Leak #3	Interim Closed Out
UPR-100-D-4, Unplanned Release: 107-D Basin Leaks	Interim Closed Out
UPR-100-D-5, Effluent Line Leak #4	Interim No Action

Table 2-2. 100-DR-2 Operable Unit Sites

Waste Information Data System Site Code/Name	Waste Site Status
100-D-12, Sodium Dichromate/Acid Railcar and Truck Unloading Station and Associated French Drain, Undocumented Liquid Waste Site	Interim Closed Out
100-D-13, Unnumbered Septic System A, Septic Tank D-13, 100 DR Area Sewage Disposal Unit, 124-DR-3, 1607-DR3	Interim Closed Out
100-D-14, Unnumbered Septic Tank #2, Unnumbered Septic System	Interim Closed Out
100-D-15, Debris North of 100-D Area Perimeter Road and Debris South of 100-D Perimeter Road - within 100-D-55 , Gravel Pit #2, Pit 21	Interim Closed Out
100-D-23, 119-DR Sample Building Drywell	Interim Closed Out
100-D-28:1, Replacement Septic System	Interim Closed Out
100-D-43, Buried VSR Thimble Site, Burial Ground 4C, 118-D-4C	Interim Closed Out
100-D-46, Burial Ground 4A, 118-D-4A	Interim Closed Out
100-D-47, Construction C.G. 558-Rod Burial, Burial Ground 4E, 118-D-4E	Interim Closed Out
100-D-53, 117-DR Filter Building, 117-DR HEPA Filter Building	Interim Closed Out
100-D-54, Drywell Near Fire Facility Gravel Scrubber	Interim Closed Out
100-D-62, 183-DR Headhouse Septic Tank	Interim Closed Out
100-D-77, 183-DR Acid Facility, 183-DR Head House, 183-DR Flocculation, 183-DR Sedimentation Basins, and 183-DR Filter Plant	Interim Closed Out
100-D-94, Dichromate Contaminated Pit Associated with 187-DR	Interim No Action
100-D-100, Stained Soil Near 183-DR Railroad Tracks	Interim Closed Out
100-D-103, Suspected Trench and French Drain from 116-D-8 Cask Pad	Interim No Action
100-D-106, 1607-D1 Influent Pipelines	Interim Closed Out
100-D-108, 182-D Remaining Pipeline Stubs	Accepted
100-D-109, 183-D Remaining Pipeline Stubs	Accepted
116-D-8, 100-D Cask Storage Pad	Interim Closed Out
116-DR-10, 105-DR Fuel Storage Basin Cleanout Percolation Pit, 105-DR Fuel Storage Discharge Pond, 105-DR Pond	Interim Closed Out
116-DR-3, 105-DR Storage Basin Trench	Interim No Action
116-DR-4, 105-DR Pluto Crib	Interim Closed Out
116-DR-6, 1608-DR Liquid Disposal Trench, Wash Pad Liquid Waste Site 3C	Interim Closed Out
116-DR-7, 105-DR Inkwell Crib, 105-DR DR Ink Facility Tank	Interim Closed Out

Table 2-2. 100-DR-2 Operable Unit Sites

Waste Information Data System Site Code/Name	Waste Site Status
116-DR-8, 117-DR Crib, 117-DR Seal Pit Crib (CERCLA)	Interim Closed Out
118-D-1, 100-D Burial Ground No. 1	Interim Closed Out
118-D-2:1, 100-D Burial Ground No. 2 Trenches and Disposal Pits	Interim Closed Out
118-D-2:2, Anomaly Characterization Area	Interim Closed Out
118-D-3:1, 100-D Burial Ground No. 3 and Process Cells	Interim Closed Out
118-D-3:2, Fuel and Anomaly Characterization Areas	Interim Closed Out
118-D-4, 118-D4, Construction Burial Ground, Burial Ground 4F, 118-D-4F	Interim Closed Out
118-D-5, 118-D5, Ball 3X Burial Ground, Burial Ground 4G, 118-D-4G, Minor Construction Burial Ground Number 3	Interim Closed Out
118-DR-1, 105-DR Gas Loop Burial Ground	Interim Closed Out
126-DR-1, 190-DR Clearwell Tank Pit	Interim Closed Out
128-D-1, 100 D/DR Burning Pit	Interim No Action
132-DR-1, 132DR1, 1608-DR Waste Water Pumping Station, 1608-DR Effluent Pumping Station	Interim Closed Out
1607-D1, 1607-D1 Septic Tank and Associated Drain Field, 124-D-1, 1607-D1 Sanitary Sewer System, 1607-D1 Septic Tank	Interim Closed Out
600-30, 100-DR Construction Lay-down Area	Interim Closed Out

Table 2-3. 100-HR-1 Operable Unit Area Sites

Waste Information Data System Site Code/Name	Waste Site Status
100-H-1, 105-H Rod Cave	Interim Closed Out
100-H-3, 1716-H Garage Fuel Tanks Site	Interim Closed Out
100-H-4, 1717-H Hot Shop, French Drain, and Contaminated Storage Unit	Interim Closed Out
100-H-5, 107-H Retention Basin Sludge Burial Site, 107-H Buried Sludge Site, Sludge Disposal Trench, 107-H Grave	Interim Closed Out
100-H-7, French Drain A	Interim No Action
100-H-8, French Drain B	Interim No Action
100-H-9, French Drain C	Interim Closed Out
100-H-10, French Drain D	Interim Closed Out
100-H-11, Expansion Box French Drain E	Interim Closed Out
100-H-12, Expansion Box French Drain F and Shielding Lead	Interim Closed Out
100-H-13, French Drain G	Interim Closed Out
100-H-14, Surface Contamination Zone H	Interim Closed Out
100-H-17, 116-H-2 Trench Overflow	Interim Closed Out
100-H-21, 100-H Reactor Cooling Water Effluent Underground Pipelines	Interim Closed Out
100-H-22, Soil Contaminated by Effluent Line Leakage	Interim Closed Out
100-H-24, 151-H Electrical Facilities, 100-H-24 Substation, 151-H Substation	Interim Closed Out

Table 2-3. 100-HR-1 Operable Unit Area Sites

Waste Information Data System Site Code/Name	Waste Site Status
100-H-28:1, 184-H Power House Ash Sluicing Line	Interim No Action
100-H-28:2, South Process Sewers	Interim Closed Out
100-H-28:3, North Process Sewers	Interim Closed Out
100-H-28:4, 1607-H1 Sanitary Sewer Pipelines	Interim Closed Out
100-H-28:5, 1607-H2 Sanitary Sewer Pipelines	Interim Closed Out
100-H-28:6, 182-H Reservoir Sump Drains	Interim No Action
100-H-28:7, Process Water Pipelines	Interim No Action
100-H-28:8, 190-H Process Water Pipelines	Interim No Action
100-H-30, 110-H Sanitary Sewer Trench	Interim Closed Out
100-H-31, Polychlorinated Biphenyl in Soil On North Side of 105-H Reactor Building	Interim Closed Out
100-H-33, 183-H Solar Evaporation Basins Radionuclide Components	Interim No Action
100-H-34, 100H River Effluent Pipelines, 100H River Lines	Accepted
100-H-35, 100-H Service Water Pipelines, 100-H Clean Water Pipelines	Interim No Action
100-H-36, 1904-H Spillway, 116-H-5 Spillway, 100-H-34:1 Flume (Spillway) for the 116-H-5 Outfall Structure	Accepted
100-H-38, Trenches and Pit Southwest of 105-H	Interim No Action
100-H-40, 100-H Disposal Pit	Interim No Action
100-H-41, 100-H Contaminated Area	Interim Closed Out
100-H-42, 1906-H Drainage Lift Station	Interim Closed Out
100-H-43, 1716-H Maintenance Garage, Repair Shop	Interim Closed Out
100-H-44, 183-H Neutralization Pit	Interim Closed Out
100-H-45, 1717-H UST, Underground Propane Tank	Interim No Action
100-H-46, 190-H Potential Contaminated Soil	Interim Closed Out
100-H-48, 184-HA Underground Fuel Oil Tanks Associated Piping	Interim Closed Out
100-H-49:1, 184-H Boiler House and 1717-H Hot Shop French Drains	Interim Closed Out
100-H-49:2, 119-H, 181-H, and 183-H French Drains	Interim No Action
100-H-49:3, 183-H and 1717-H French Drains	Rejected
100-H-50, Steam Condensate French Drains	Interim No Action
100-H-51:1, 1703-H Sanitary Sewer Segment	Interim Closed Out
100-H-51:2, 117-H Seal Pit Crib Feedline	Interim Closed Out
100-H-51:3, 184-H Brine Discharge Line	Interim Closed Out
100-H-51:4, 100-H Main Gate Storm Drain	Interim No Action
100-H-51:5, Discovery Pipeline at 128-H-1	Interim No Action
100-H-51:6, Carbon Steel Pipe	Interim Closed Out
100-H-52, 184-HA Drain Field and Associated Piping	Interim Closed Out
100-H-53, Carbon Steel Pipe	Interim No Action

Table 2-3. 100-HR-1 Operable Unit Area Sites

Waste Information Data System Site Code/Name	Waste Site Status
100-H-54, GPERS 100-H Shoreline Survey UPR	Interim No Action
100-H-56, H-Area Miscellaneous Pipelines	Interim No Action
100-H-57, Water Tower Foundations at 100-H	Interim No Action
100-H-59:1, 100-H Area Railroad Track Soil Contamination Area	Interim Closed Out
100-H-59:2, Debris Piles near 100-H Area Railroad Track	Interim Closed Out
116-H-1, 107-H Liquid Waste Disposal Trench	Interim Closed Out
116-H-2, 1608-H Liquid Waste Disposal Trench, 1608-H Crib & Trench	Interim Closed Out
116-H-3, 105-H Dummy Decontamination French Drain, Perf Decontamination Drain	Interim Closed Out
116-H-4, 105-H Pluto Crib	Interim No Action
116-H-5, 116-H-5 Outfall Structure, 1904-H Outfall Structure	Interim Closed Out
116-H-7, 107-H Retention Basin, 107-H	Interim Closed Out
116-H-9, 117-H Crib, 117-H Seal Pit Crib	Interim Closed Out
126-H-2, 183-H Clearwells/Disposal Pit	Interim Closed Out
132-H-1, 116-H Reactor Exhaust Stack Burial Site	Interim Closed Out
132-H-3, 1608-H Waste Water Pumping Station Site, 116-H-8, 1608-H Effluent Pumping Station Site	Interim Closed Out
1607-H2, 1607-H2 Septic Tank and Associated Drain Field, Septic System, 1607-H2 Sanitary Sewer System, 124-H-2, 1607-H2 Septic Tank	Interim Closed Out
1607-H3, 1607-H3 Septic Tank and Associated Drain Field, 124-H-3, 1607-H3 Sanitary Sewer System, 1607-H3 Septic Tank	Interim Closed Out
1607-H4, 1607-H4 Septic Tank and Associated Drain Field, 1607-H4 Sanitary Sewer System, 124-H-4, 1607-H4 Septic Tank; Septic System	Interim Closed Out

Table 2-4. 100-HR-2 Operable Unit Sites

Waste Information Data System Site Code/Name	Waste Site Status
100-H-2, Buried Thimble Site	Interim Closed Out
100-H-37, 100-H Mud Dauber Contamination Area	Interim Closed Out
100-H-58, Mud Dauber Nests On Active Powerlines in H Area	Accepted
118-H-1:1, 100-H Burial Ground Trenches and Sorting Cells	Interim Closed Out
118-H-1:2, Anomaly Staging Area and Fuel Bunker	Interim Closed Out
118-H-2, H-1 Loop Burial Ground, 100-H Burial Ground No. 2, P-13 Test Loop	Interim Closed Out
118-H-3, Construction Burial Ground	Interim Closed Out
118-H-4, Ball 3X Burial Ground	Interim Closed Out
118-H-5, 105-H Thimble Pit	Interim Closed Out
128-H-1, 100-H Burning Pit, 100-H Burning Pit No. 1	Interim Closed Out
128-H-2, 100-H Burning Ground #2	Interim No Action
128-H-3, 100-H Burning Ground #3	Interim No Action

Table 2-4. 100-HR-2 Operable Unit Sites

Waste Information Data System Site Code/Name	Waste Site Status
132-H-2, 117-H Filter Building Site	Interim Closed Out
1607-H1, 1607-H1 Septic Tank and Associated Drain Field, 124-H-1, 1607-H1 Sanitary Sewer System, 1607-H1 Septic Tank	Interim Closed Out
600-151, Dumping Areas 50 yards and 200 yards Downstream of River Mile 14, Military installation NW of 100H Area	Interim Closed Out
600-152, Military Septic Tanks	Interim Closed Out
600-380, Segment 4 Unknown Cylinder	Interim Closed Out
600-381, Segment 4 Underground Structure with Wooden Air Vents Feature	Interim No Action
600-382, Segment 4 Oil Stain and Filter Area #3	Interim Closed Out
600-382:1, Segment 4 Oil Stain and Filter Area #3a	Interim Closed Out
600-382:2, Segment 4 Oil Stain and Filter Area #3b	Interim Closed Out
600-382:3, Segment 4 Oil Stain and Filter Area #3c	Interim Closed Out
600-382:4, Segment 4 Oil Stain and Filter Area #3d	Interim Closed Out
600-382:5, Segment 4 Oil Stain and Filter Area #3e	Interim Closed Out
600-383, Segment 4 Battery Remnant Area #2	Interim Closed Out
600-383:1, Segment 4 Battery Remnant Area #2a	Interim Closed Out
600-383:2, Segment 4 Battery Remnant Area #2b	Interim Closed Out
600-383:3, Segment 4 Battery Remnant Area #2c	Interim Closed Out
600-383:4, Segment 4 Battery Remnant Area #2d	Interim Closed Out
600-383:5, Segment 4 Battery Remnant Area #2e	Interim Closed Out
600-383:6, Segment 4 Battery Remnant Area #2f	Interim Closed Out
600-383:7, Segment 4 Battery Remnant Area #2g	Interim Closed Out
600-383:8, Segment 4 Battery Remnant Area #2h	Interim Closed Out
600-383:9, Segment 4 Battery Remnant Area #2i	Interim Closed Out
600-383:10, Segment 4 Battery Remnant Area #2j	Interim Closed Out
600-384, Segment 4 Stained Soil Area #3	Interim Closed Out
600-384:1, Segment 4 Stained Soil Area #3a	Interim Closed Out
600-384:2, Segment 4 Stained Soil Area #3b	Interim Closed Out
600-384:3, Segment 4 Stained Soil Area #3c	Interim Closed Out
600-384:4, Segment 4 Stained Soil Area #3d	Interim Closed Out
600-384:5, Segment 4 Stained Soil Area #3e	Interim Closed Out
600-385, Segment 4 Transite, Concrete, and Metal Debris Area	Interim Closed Out

Table 2-5.Unassigned Sites

Waste Information Data System Site Code/Name	Waste Site Status
100-D-10, Storm Drain Outfall, Undocumented Liquid Waste Site	Not Accepted
100-D-33, Minor Construction Burial Ground #4 East Trench	Rejected
100-D-35, Minor Construction Burial Ground #4 West Trench	Rejected
100-D-40, Minor Construction Burial Ground #5 Hole	Rejected
100-D-41, Minor Construction Burial Ground #5 Trench,	Rejected
100-D-58, 100-DR Area On-site Sewage System for MO-980 & 4-Closet Restroom Facility	Closed Out
100-D-59, French Drain at the 183-D Acid Transfer Station	Rejected
100-D-64, 119-DR Sample Building, 105-DR Reactor Exhaust Stack Sampling Building	Interim Closed Out
100-D-68, 190-DR Process Water Pump House	Interim No Action
100-D-79, Posted Soil Contamination Areas (SCAs)	Rejected
100-D-92, Potential UST Near Dichromate Station	Rejected
100-D-93, Potential UST Near Dichromate Station	Rejected
100-D-95, 100-D/DR Unnumbered Septic Tanks and Tile Field	Rejected
118-D-6:2, 105-D Reactor Ancillary Support Areas, Below-Grade Structures and Underlying Soils	Interim Closed Out
118-D-6:3, 105-D Reactor Fuel Storage Basin and Underlying Soils	Interim Closed Out
118-D-6:4, 105-D Fuel Storage Basin Side Slope Soils	Interim Closed Out
118-DR-2:2, 105-DR Reactor Below-Grade Structures and Soil	Interim Closed Out
120-D-1, 100-D Ponds	Closed Out
132-D-4, 132D4, 105-D Reactor Exhaust Stack, 116-D Reactor Exhaust Stack	Interim Closed Out
132-DR-2, 132DR2, 116-DR Reactor Exhaust Stack	Interim Closed Out
100-H-39, 100-H Possible Thimble Pit	Rejected
100-H-47, 1717-H Geophysical Anomaly, Possible UST	Rejected
100-H-55, 100-H Cast Iron Pipe (H-038)	Rejected
116-H-6, 183-H Solar Evaporation Basins	Closed Out
118-H-6:2, 105-H Reactor Ancillary Support Areas, Below-Grade Structures and Underlying Soils	Interim Closed Out
118-H-6:3, 105-H Reactor Fuel Storage Basin and Underlying Soils	Interim Closed Out
118-H-6:4, 105-H Fuel Storage Basin Shallow Zone Side Slope Soils	Interim Closed Out
118-H-6:5, 105-H Decontamination Pads	Interim Closed Out
118-H-6:6, 118-H-6:6 Deep Zone Side Slope Soils	Interim Closed Out

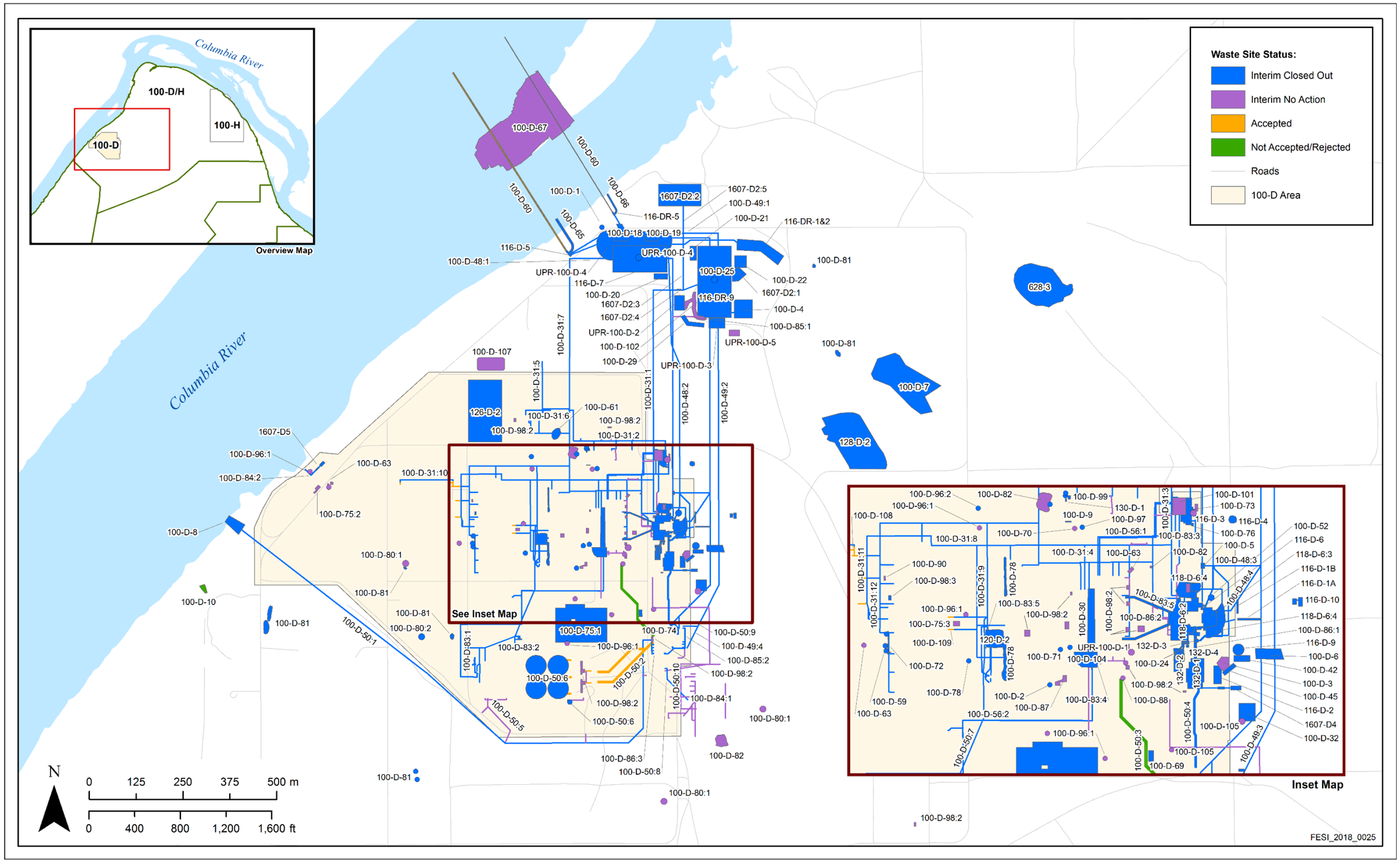

Figure 2-1. 100-DR-1 Operable Unit Waste Site Location Map

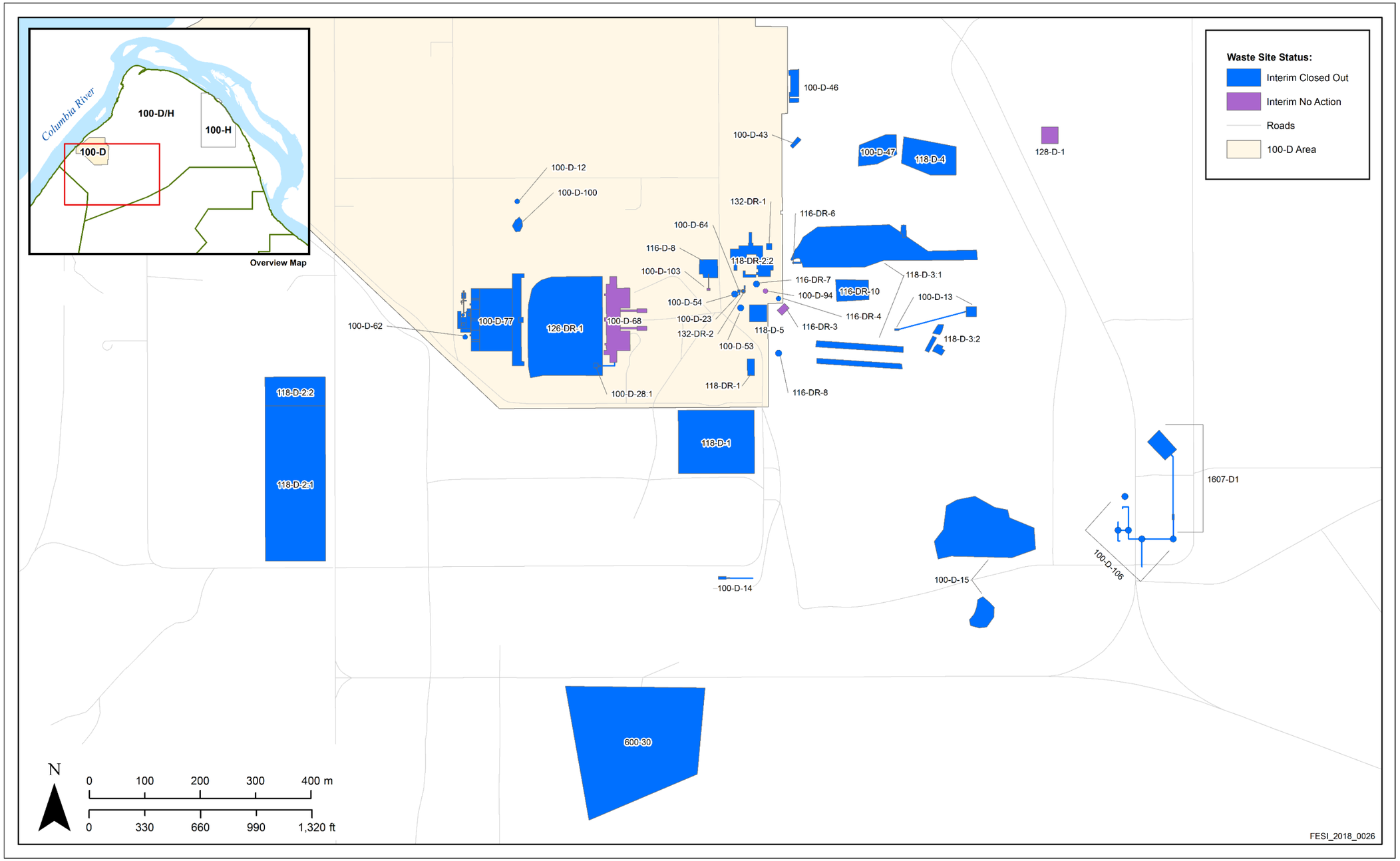

Figure 2-2. 100-DR-2 Operable Unit Waste Site Location Map

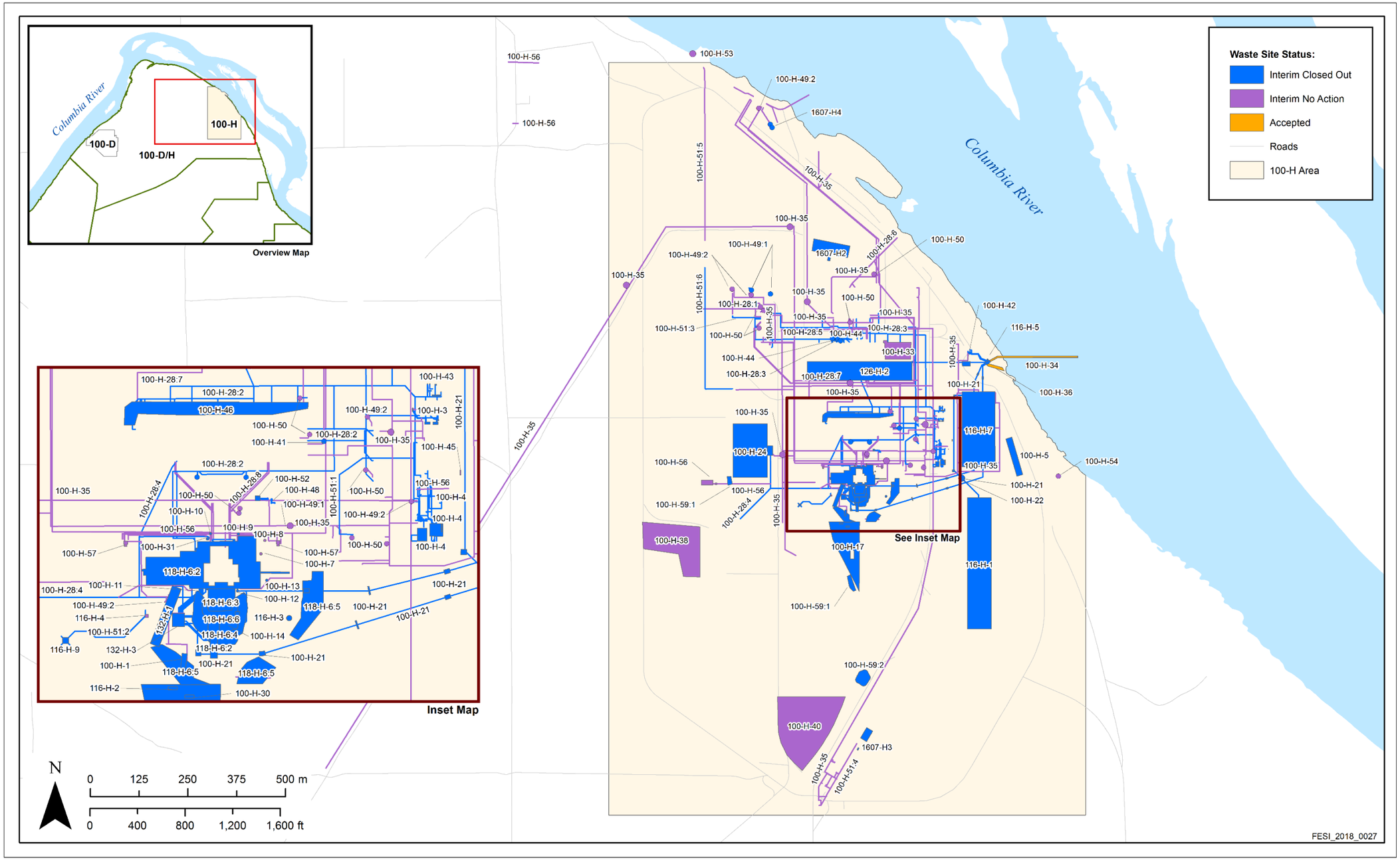

Figure 2-3. 100-HR-1 Operable Unit Waste Site Location Map

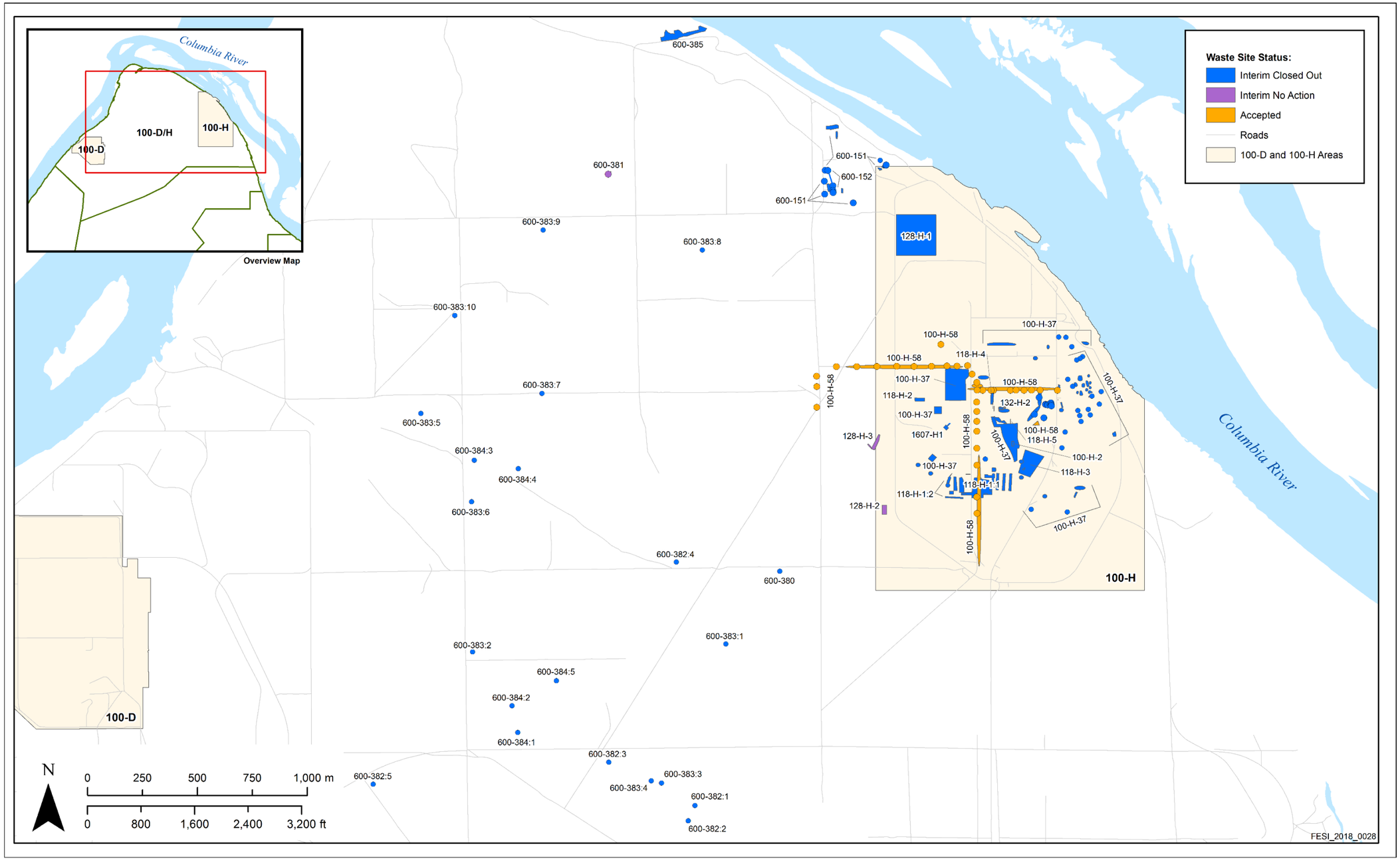

Figure 2-4. 100-HR-2 Operable Unit Waste Site Location Map

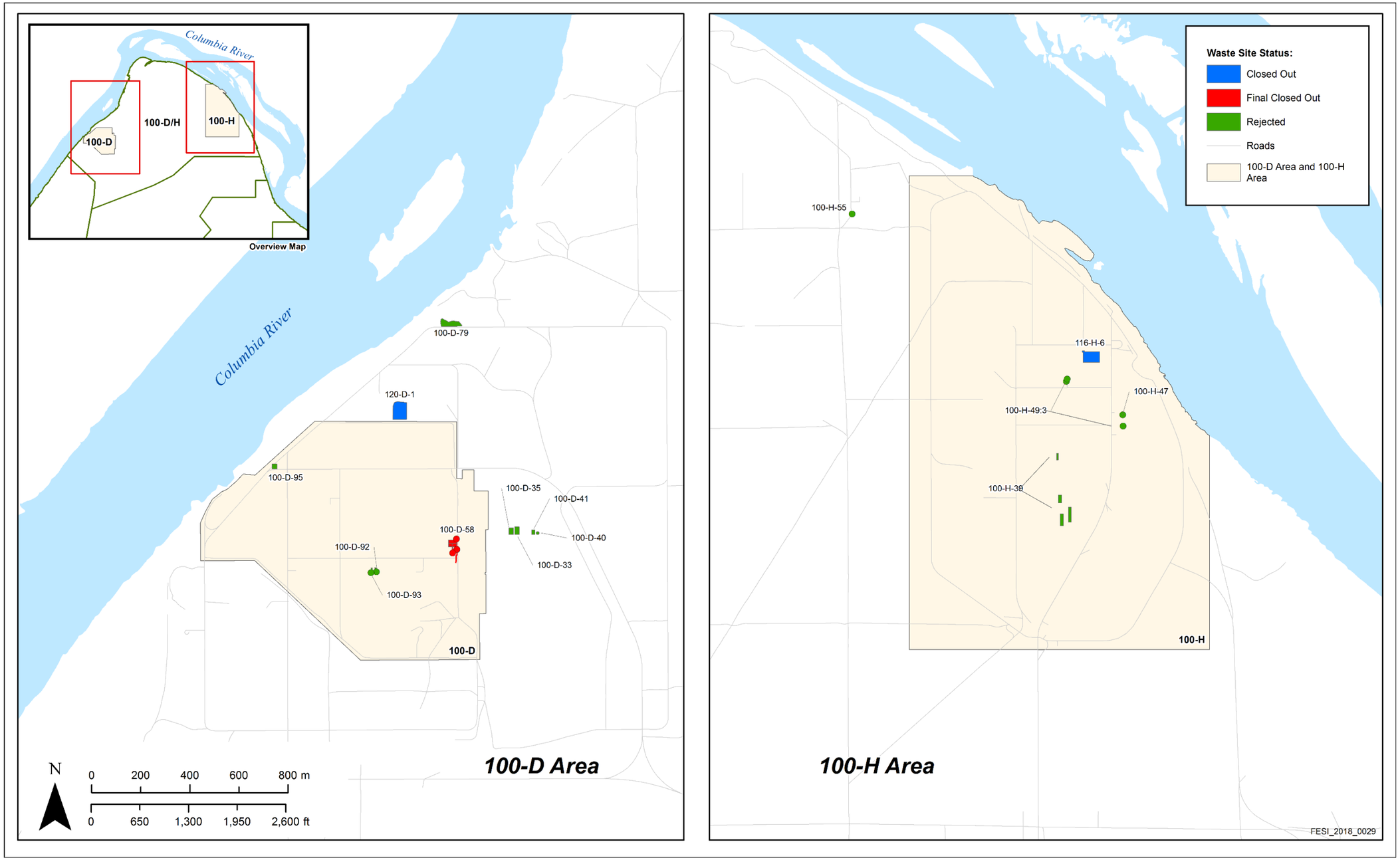

Figure 2-5. Unassigned Waste Site Location Map

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2.3 Exposure and Land-Use Assumptions

The reasonably anticipated future land use is important in CERCLA remedial actions in determining the appropriate extent of remediation. Future land use affects the types and frequency of exposures to residual contamination for both human and ecological receptors, thereby influencing the amount of cleanup needed. Decisions on future land use at the Hanford Site had not been made at the time most of the interim action RODs were issued. Interim action cleanup levels for the 100-D/H Area waste sites were based on unrestricted use defined by a rural residential farmer exposure scenario that is protective of multiple future land uses (e.g., residential, conservation/preservation, recreation, industrial).

2.4 Remedial Action Requirements

Implementation of remedial actions at the 100-D/H Area waste sites was done in accordance with interim action RODs that required implementation of the selected cleanup remedy to address actual or threatened releases.

The major components of the selected remedy (i.e., RTD) include the following:

- Planning and implementation of the remedial action according to an approved remedial design report/remedial action work plan (RDR/RAWP) document
- Stockpiling uncontaminated overburden and use for backfilling excavations when feasible
- Removal of contaminated soil, structures, and associated debris
- Disposing of contaminated materials at the Hanford Site's ERDF, or other disposal facilities approved in advance by EPA
- Treatment, as necessary, to meet waste acceptance criteria at an acceptable disposal facility
- Recontouring and backfilling of excavated areas and restoring viable habitat by revegetating the impacted area
- Identifying institutional controls to prevent exposure to contamination by limiting land or resource uses if needed
- Demonstrating that residual contamination concentrations are protective of humans and the environment.

The RAOs were met by implementing the selected remedy with an "observational approach." The observational approach consisted of two main steps: compilation of available data and the "characterize-and-remediate-in-one-step" methodology. The first step relied on recorded information from historical process operations and information from investigations addressing the nature and extent of contamination. This initial step of characterization was a prerequisite task to field remediation and was used to develop an initial understanding of site conditions. The second methodology consisted of site excavation, field screening, and in-process sampling for contaminants at sites where remedial action and cleanup goals had been selected. Remediation proceeded until it was demonstrated through a combination of field screening, in-process sampling, and verification sampling that cleanup goals were achieved.

The RTD remedy for the waste sites in the 100-D/H Area involved removing clean and contaminated soils, debris, and anomalous waste present within waste site boundaries. The materials exposed during excavation were monitored for radiological and hazardous chemical constituents as defined, for example, in DOE/RL-96-22, *100 Area Remedial Action Sampling and Analysis Plan* (hereinafter referred to as the 100 Area SAP). During remediation of known dump sites or burial grounds, extra measures were taken

for materials to be sorted for waste disposition. During excavation, soils were monitored for both radiological and chemical constituents. Activities were guided during excavation using data obtained from in situ analytical systems or in-process sampling using quick-turnaround laboratory analyses working concurrently with excavation.

Upon completion of remediation at each waste site, verification sampling and analyses were performed to verify attainment of cleanup criteria for all contaminants of concern (COCs) and contaminants of potential concern (COPCs). Statistical and focused sampling approaches were used in accordance with the applicable sampling and analysis plan (SAP). If analytical results indicated that cleanup criteria have not been achieved, then excavation resumed with appropriate analyses as guidance. Remediation proceeded until it was demonstrated through a combination of field screening, in-process sampling, and verification sampling that cleanup goals were achieved.

Specific RAOs associated with the selected remedy and the method for achieving the objectives through remedial actions are discussed in DOE/RL-96-17, *Remedial Design Report/Remedial Action Work Plan for the 100 Area* (hereinafter referred to as the 100 Area RDR/RAWP), and summarized in Table 2-6.

Table 2-6. 100 Area Operable Unit Cleanup Objectives

Remedial Action Objective	Compliance Methods
Protect human and ecological receptors from exposure to contaminants in soils, structures, and debris by dermal exposure, inhalation, or ingestion of radionuclides, inorganics, or organics.	Achieved through excavation to State of Washington WAC 173-340, "Model Toxics Control Act—Cleanup," levels for organic and inorganic chemical constituents in soil to support unrestricted (residential) use. Achieved human health total radiological dose standards of less than 15 mrem/yr above background for radionuclides.
Control the sources of groundwater contamination to minimize the impacts to groundwater resources, protect the Columbia River from further adverse impacts, and reduce the degree of groundwater cleanup that may be required under future actions.	Protection such that contaminant levels in soil after remediation did not result in an adverse impact to groundwater that exceeded any nonzero maximum contaminant level goals under the *Safe Drinking Water Act of 1974* or Method B cleanup levels under WAC 173-340. Protection such that contaminant levels in the soil after remediation did not result in an impact to groundwater and the Columbia River that exceeded the ambient water quality criteria under the *Clean Water Act of 1977* (formerly the *Federal Water Pollution Control Act*) for protection of fish or Method B cleanup levels under WAC 173-340. Because there are no ambient water quality criteria for radionuclides, maximum contaminant levels from national primary drinking water standards were used. The protection of receptors (aquatic species, with emphasis on salmon) in surface waters was achieved by reducing or eliminating further contaminant loadings to groundwater such that receptors at the groundwater discharge in the Columbia River were not subjected to any additional adverse risks.
To the extent practicable, return soil concentrations to levels that allow for unlimited future use and exposure. Where it is not practicable to remediate to levels that will allow for unrestricted use in all areas, institutional controls and long-term monitoring will be required.	This remedial action objective was achieved by removing waste sites to the bottom of the engineered structure and providing institutional controls, as required. Institutional controls include prevention of uncontrolled drilling or excavation into the deep zone (i.e., below 4.6 m [15 ft), and prohibiting irrigation for 140 years.

References: *Federal Water Pollution Control Act*.

Safe Water Drinking Act of 1974.

WAC 173-340, "Model Toxics Control Act—Cleanup."

2.5 Remedial Design Summary

The general design and approach for remediation of the 100-D/H Area waste sites is documented in the 100 Area RDR/RAWP (DOE/RL-96-17). The RDR/RAWPs were prepared and maintained to implement the interim action RODs.

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3 Chronology of Events

This chapter provides the chronology of and documentation for the 100-DR-1, 100-DR-2, 100-HR-1, 100-HR-2 OUs, as well as unassigned sites (Table 3-1).

Table 3-1. 100-DR-1 OU, 100-DR-2 OU, 100-HR-1 OU, 100-HR-2 OU, and Unassigend Site Chronology and Supporting Documentation

Year	Event*
1993	58 FR 48509, "Record of Decision; Decommissioning of Eight Surplus Production Reactors at the Hanford Site, Richland, Washington."
1995	EPA/ROD/R10-95/126, *Interim Action Record of Decision for the 100-BC-1, 100-DR-1, and 100-HR-1 Operable Units, Hanford Site, Benton County, Washington*.
1996	DOE/RL-96-17, *Remedial Design Report/Remedial Action Work Plan for the 100 Area*, Rev. 0. DOE/RL-96-22, *100 Area Remedial Action Sampling and Analysis Plan*, Rev. 0.
1997	EPA/ROD/R10-96/151, *Record of Decision, 100-IU-1, 100-IU-3, 100-IU-4, 100-IU-5 Operable Units, Hanford Site, Benton County Washington*. EPA/541/R-97/044, *Amended Record of Decision for the 100-BC-1, 100-DR-1, and 100-HR-1 Operable Units Interim Remedial Actions, Hanford Site, Benton County, Washington*. Waste sites closed out: 116-H-6 May
1998	059689, *Action Memorandum: USDOE Hanford 100 Area National Priorities List, 105-F and 105-DR Reactor Buildings and Ancillary Facilities, Hanford Site, Benton County, Washington*. DOE/RL-96-17, *Remedial Design Report/Remedial Action Work Plan for the 100 Area*, Rev. 1. DOE/RL-96-22, *100 Area Remedial Action Sampling and Analysis Plan*, Rev. 1. RL-TPA-90-0001, *Tri-Party Agreement Handbook Management Procedures*, Rev. 0).
1999	EPA/ROD/R10-99/039, *Interim Action Record of Decision for the 100-BC-1, 100-BC-2, 100-DR-1, 100-DR-2, 100-FR-1, 100-FR-2, 100-HR-1, 100-HR-2, 100-KR-1, 100-KR-2, 100-IU-2, 100-IU-6, and 200-CW-3 Operable Units, Hanford Site, Benton County Washington (100 Area Remaining Sites)*. Waste sites closed out: 120-D-1 August Interim Closed Out: 100-D-4 March; 100-D-22 March 100-D-20 March; 1607-D2:1 March 100-D-21 March; 1607-D2:4 November
2000	EPA/ROD/R10-00/121, *Interim Action Record of Decision for the 100-BC-1, 100-BC-2, 100-DR-1, 100-DR-2,100-FR-2, 100-HR-2, and 100-KR-2 Operable Units, Hanford Site (100 Area Burial Grounds), Benton County, Washington*. DOE/RL-96-17, *Remedial Design Report/Remedial Action Work Plan for the 100 Area*, Rev. 2. DOE/RL-96-22, *100 Area Remedial Action Sampling and Analysis Plan*, Rev. 2. Interim Closed Out: 100-D-25 January; UPR-100-D-2 September 116-DR-9 January; UPR-100-D-3 September 116-D-7 August; 100-D-12 October 100-D-18 September; 116-D-2 October 100-D-48:2 September; 116-D-4 October 100-D-49:2 September; 116-DR-4 October 116-DR-1&2 September; 116-DR-6 October 116-DR-7 September; 100-D-52 November 1607-D2:3 September; 116-D-6 November 100-H-5 December

Table 3-1. 100-DR-1 OU, 100-DR-2 OU, 100-HR-1 OU, 100-HR-2 OU, and Unassigend Site Chronology and Supporting Documentation

Year	Event*
2001	Ecology, 2001, "Action Memorandum for the 105-D & 105-H Reactor Facilities and Ancillary Facilities." DOE/RL-2001-35, *100 Area Burial Grounds Remedial Action Sampling and Analysis Plan*. DOE/RL-96-17, *Remedial Design Report/Remedial Action Work Plan for the 100 Area*, Rev. 3. DOE/RL-96-22, *100 Area Remedial Action Sampling and Analysis Plan* Rev. 3. Interim Closed Out: 1607-H2 February; 100-H-21 March 1607-H4 February; 100-H-22 March 100-D-19 March; 100-H-30 March 100-D-46 March; 116-H-2 March 100-D-48:1 March; 100-D-5 April 100-D-49:1 March; 100-D-6 April 116-D-1A March; 100-D-48:3 April 116-D-1B March; 100-D-48:4 April 116-D-9 March; 100-D-49:3 April UPR-100-D-4 March; 116-H-1 April 100-H-1 March; 116-H-3 April 100-H-2 March; 100-H-24 May 100-H-17 March; 116-H-7 July
2002	DOE/RL-96-17, *Remedial Design Report/Remedial Action Work Plan for the 100 Area*, Rev. 4.
2003	No Action: 116-D-3 January
2004	EPA et al., 2004, *Explanation of Significant Differences for the 100 Area Remaining Sites Interim Remedial Action Record of Decision*. DOE/RL-96-17, *Remedial Design Report/Remedial Action Work Plan for the 100 Area*, Rev. 5. DOE/RL-96-22, *100 Area Remedial Action Sampling and Analysis Plan*, Rev. 4. Interim Closed Out: 100-D-49:4 January; 100-D-54 March 118-DR-2:2 January; 100-D-64 March 100-D-23 March; 132-DR-2 March 100-D-53 March No Action: 128-D-1 April
2005	Interim Closed Out: 118-D-6:2 July 118-D-6:3 July 132-D-4 July 132-DR-1 September No Action: UPR-100-D-1 April 100-D-50:10 June 100-D-68 July

Table 3-1. 100-DR-1 OU, 100-DR-2 OU, 100-HR-1 OU, 100-HR-2 OU, and Unassigend Site Chronology and Supporting Documentation

Year	Event*
2006	Interim Closed Out: 1607-D4 February 132-D-2 May 132-D-3 May 100-H-9 June 100-H-10 June 100-H-11 June 100-H-12 June 100-H-13 June 100-H-14 June 100-H-31 June 118-H-6:2 June 118-H-6:3 June 118-H-6:6 June 100-D-9 August 132-H-2 August No Action: 100-D-24 September
2007	RL-TPA-90-0001, *Tri-Party Agreement Handbook Management Procedures*, Rev. 1. Interim Closed Out: 132-H-1 June No Action: 100-H-28:8 April 100-D-50:5 November
2008	Interim Closed Out: 100-D-2 March Rejected: 100-D-33 March 100-D-35 March 100-D-40 March 100-D-41 March
2009	EPA et al., 2009, *Explanation of Significant Differences for the 100 Area Remaining Sites Interim Remedial Action Record of Decision: Hanford Site Benton County, Washington*. DOE/RL-96-17, *Remedial Design Report/Remedial Action Work Plan for the 100 Area* Rev. 6. DOE/RL-96-22, *100 Area Remedial Action Sampling and Analysis Plan*, Rev. 5. Interim Closed Out: 126-DR-1 April 120-D-2 July 100-D-31:6 August 100-D-31:5 October 100-D-61 October 100-D-32 December No Action: 100-D-3 March 100-H-7 July 100-H-28:1 July 100-H-28:6 October 100-H-8 December
2010	Interim Closed Out: 100-D-47 January 118-H-5 January 118-D-5 February 100-D-29 March 600-152 April 100-D-42 May 100-D-43 May 100-D-45 May 118-DR-1 June 100-H-37 August 100-D-15 September 116-DR-8 September 1607-D2:2 September 100-D-31:1 October 100-D-31:2 October 100-D-31:7 October 118-D-4 October 126-D-2 October 116-H-9 October 118-H-6:4 November 118-H-2 November 116-D-10 December 116-DR-10 December 118-H-4 December No Action: 128-H-2 January 128-H-3 January 100-H-40 May 100-H-45 July UPR-100-D-5 October Rejected: 100-D-92 February 100-H-47 February 100-H-55 February 100-D-93 May 100-H-39 May 100-D-79 September 100-D-95 November

Table 3-1. 100-DR-1 OU, 100-DR-2 OU, 100-HR-1 OU, 100-HR-2 OU, and Unassigend Site Chronology and Supporting Documentation

Year	Event*
2011	EPA et al., 2011, *100 Area "Plug-In" and Candidate Waste Sites for Fiscal Year 2010*. TPA-MP-14, *Maintenance of the Waste Information Data System (WIDS)*, Rev. 2.
	Interim Closed Out: 100-D-1 January; 100-D-31:4 August; 100-D-31:9 October 116-DR-5 January; 116-D-5 August; 100-D-31:10 October 1607-H3 February; 116-D-8 August; 118-H-1:2 October 100-H-41 March; 130-D-1 August; 118-H-6:5 October 628-3 May; 600-30 August; 118-D-1 October 100-H-3 June; 128-D-2 September; 1607-D5 October 100-H-4 June; 1607-H1 September; 600-151 October 118-H-3 June; 100-D-7 October; 118-D-6:4 December 118-H-1:1 July; 100-D-28:1 October; 132-D-1 December 100-D-31:3 August; 100-D-31:8 October No Action: 100-D-82 January; 100-D-86:2 May; 100-D-70 July 100-D-85:1 January; 100-D-88 May; 100-D-83:4 July 100-D-87 January; 100-H-51:4 May; 100-D-84:1 July 100-D-90 January; 100-D-74 June; 100-D-75:3 August 100-D-80:1 March; 100-H-50 June; 100-H-49:2 October 100-D-94 March
2012	EPA et al., 2012, *100 Area "Plug-In" and Candidate Waste Sites for Calendar Year 2011*. Closed Out: 100-D-58 November Interim Closed Out: 100-D-56:2 January; 118-D-2:1 July; 118-D-3:2 August 100-D-56:1 April; 118-D-3:1 July; 100-D-13 September 116-H-5 May; 132-H-3 July; 118-D-2:2 September 128-H-1 May; 100-D-8 August; 100-D-14 October 1607-D1 May; 100-D-50:4 August; 126-H-2 October No Action: 100-H-35 February; 100-H-53 April 100-H-33 April; 100-D-102 September 100-H-51:5 April; 116-DR-3 September Rejected: 100-H-49:3 January 100-D-50:3 September

Table 3-1. 100-DR-1 OU, 100-DR-2 OU, 100-HR-1 OU, 100-HR-2 OU, and Unassigend Site Chronology and Supporting Documentation

Year	Event*
2013	EPA et al., 2013, *100 Area "Plug-In" and Candidate Waste Sites for Calendar Year 2012*.
	Interim Closed Out:
	100-D-50:8 January; 100-D-76 January; 100-D-71 September
	100-D-50:9 January; 100-D-50:1 March; 100-D-62 October
	100-D-65 January; 100-D-80:2 March; 100-D-77 October
	100-D-66 January; 100-D-50:6 June; 100-D-83:1 October
	100-D-73 January; 100-D-78 August
	No Action:
	100-D-96:1 January; 100-D-103 July
	100-D-98:2 January; 100-H-57 October
	100-H-28:7 February; 100-H-38 November
	100-D-63 April; 600-381 December
	100-D-101 June
	Rejected: 100-D-59 January
2014	Interim Closed Out:
	100-D-83:2 January; 100-D-50:7 May
	600-380 March; 100-D-83:5 June
	100-D-98:3 April; 600-383 July
	100-H-46 April; 600-382 August
	100-H-48 April; 600-384 August
	100-H-52 April; 100-D-84:2 December
	No Action:
	100-D-105 January; 100-D-107 April
	100-H-54 March; 100-H-56 August
	100-D-67 April; 100-D-75:2 September
2015	Interim Closed Out:
	100-D-83:3 January; 100-D-86:3 June; 100-D-104 June
	100-D-106 January; 100-D-69 April; 100-H-59:1 June
	1607-D2:5 January; 100-D-97 April; 100-H-28:3 July
	100-D-96:2 February; 100-D-99 April; 100-H-28:5 July
	100-D-81 March; 100-D-31:11 May; 100-H-44 July
	100-H-28:4 March; 100-D-31:12 May; 100-H-51:2 July
	100-H-43 March; 100-D-72 May; 100-D-100 August
	100-H-49:1 March; 100-D-30 June; 100-H-28:2 September
	100-H-51:1 March; 100-D-75:1 June; 100-H-42 September
	100-H-51:3 March; 100-D-85:2 June; 100-H-59:2 November
	100-H-51:6 March; 100-D-86:1 June
2016	Interim Closed Out:
	600-385 July
2017	No Action:
	116-H-4 February

*The full citations for the references included in this column are provided in Chapter 8 of this report.

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4 Remediation Activity Summary

Field operations supporting remedial actions in the 100-DR-1, 100-DR-2, 100-HR-1, and 100-HR-2 OUs began in 1984 and were completed in 2016. The work was performed under several contracts. The cleanup actions resulted in the disposal of 4,268,449 metric tons (4,705,171 U.S. tons) of contaminated soil and debris at ERDF. Summaries of the waste disposal activities for each waste site are presented by OU in Table 4-1 through Table 4-5. Table 4-6 identifies sites in the 100-D/H Area that were not accepted or were rejected as waste sites. Detailed information about each waste site and related remediation activities is presented in the following sections.

Table 4-1. 100-DR-1 Operable Unit ERDF Waste Disposal Summary

WIDS Site Code	Site Type	Mass Disposed at ERDF (metric tons)
100-D-1	Process Sewer	1,110 [a]
100-D-2	Foundation	216
100-D-4	Trench	1,678
100-D-5	Burial Ground	Included with 100-D-48:3
100-D-6	Burial Ground	Included with 100-D-48:3
100-D-7	Dumping Area	54,270 [a]
100-D-8	Outfall	120,120
100-D-9	Storage Tank	None
100-D-18	Trench	8,700
100-D-19	Trench	Included with 100-D-48:1
100-D-20	Trench	9,710
100-D-21	Trench	9,943
100-D-22	Trench	9,710
100-D-25	UPR	Included with 116-DR-9
100-D-29	UPR	4 [b]
100-D-30	UPR	122,810 [b]
100-D-31:1	Process Sewer	5,650 [a,c]
100-D-31:2	Process Sewer	Included with 100-D-31:1
100-D-31:3	Process Sewer	17,300 [a,c]
100-D-31:4	Process Sewer	22,240 [a,c]
100-D-31:5	Process Sewer	212 [a,c]
100-D-31:6	Process Sewer	835 [a,c]
100-D-31:7	Process Sewer	39,789 [a,c]
100-D-31:8	Process Sewer	12,900 [a,c]
100-D-31:9	Process Sewer	25,840 [a,c]
100-D-31:10	Process Sewer	470 [a,c]
100-D-31:11	Process Sewer	Included with 100-D-72
100-D-31:12	Process Sewer	Included with 100-D-72

Table 4-1. 100-DR-1 Operable Unit ERDF Waste Disposal Summary

WIDS Site Code	Site Type	Mass Disposed at ERDF (metric tons)
100-D-32	Burial Ground	1,350 [a]
100-D-42	Burial Ground	1,190 [a]
100-D-45	Burial Ground	5,860 [a]
100-D-48:1	Radioactive Process Sewer	107,266
100-D-48:2	Radioactive Process Sewer	57,106
100-D-48:3	Radioactive Process Sewer	55,561
100-D-48:4	Radioactive Process Sewer	Included with 100-D-48:3
100-D-49:1	Radioactive Process Sewer	Included with 100-D-48:1
100-D-49:2	Radioactive Process Sewer	Included with 100-D-48:2
100-D-49:3	Radioactive Process Sewer	Included with 100-D-48:3
100-D-49:4	Radioactive Process Sewer	Included with 118-DR-2:2
100-D-50:1	Process Sewer	3,040 [a]
100-D-50:4	Process Sewer	830 [a]
100-D-50:6	Process Sewer	112,850 [a]
100-D-50:7	Process Sewer	12,830 [a]
100-D-50:8	Process Sewer	1,620 [a]
100-D-50:9	Process Sewer	1,270 [a]
100-D-52	French Drain	199
100-D-56:1	Product Piping	4,240 [a]
100-D-56:2	Product Piping	9,230 [a]
100-D-61	Dumping Area	340 [a]
100-D-65	Outfall	1,810 [a]
100-D-66	Outfall	7,650 [a]
100-D-69	UPR	620 [a]
100-D-71	Laboratory	Included with 100-D-104
100-D-72	Process Unit/Plant	23,820 [a]
100-D-73	Process Unit/Plant	4,885 [a]
100-D-75:1	Electrical Substation	38,340 [a]
100-D-76	Crib	410 [a]
100-D-78	UPR	10,850 [a]
100-D-80:2	Dumping Area	3.4 [a]
100-D-81	UPR	3,897 [a]
100-D-83:1	Product Piping	Included with 100-D-77 (100-DR-2 OU)
100-D-83:2	Product Piping	Included with 100-D-100 (100-DR-2 OU)
100-D-83:3	Product Piping	340 [a]

Table 4-1. 100-DR-1 Operable Unit ERDF Waste Disposal Summary

WIDS Site Code	Site Type	Mass Disposed at ERDF (metric tons)
100-D-83:5	Product Piping	25,179 [a]
100-D-84:2	Sanitary Sewer	380 [a]
100-D-85:2	Radioactive Process Sewer	29,360 [a]
100-D-86:1	Process Sewer	7,200 [a]
100-D-86:3	Process Sewer	7,960 [a]
100-D-96:2	French Drain	340 [a]
100-D-97	Storage Tank	160 [a]
100-D-98:3	Electrical Substation	Included with demolition of 183D Building
100-D-99	Septic Tank	860 [a]
100-D-104	UPR	134,201 [b]
116-D-1A	Trench	10,987
116-D-1B	Trench	Included with 116-D-1A
116-D-2	Crib	623.2
116-D-4	Crib	Not reported
116-D-5	Outfall	5,120 [a]
116-D-6	French Drain	200
116-D-7	Retention Basin	177,724
116-D-9	Crib	7.3
116-D-10	Pond	6,080 [a]
116-DR-1&2	Trench	82,768
116-DR-5	Outfall	5,880 [a]
116-DR-9	Retention Basin	201,519
118-D-6:2	Reactor	21,613
118-D-6:3	Reactor	Included with 118-D-6:2
118-D-6:4	UPR	19,150 [d]
120-D-2	Surface Impoundment	7,769 [b]
126-D-2	Inert/Demolition Landfill	98,980 [a]
128-D-2	Burn Pit	89,030 [a]
130-D-1	Storage Tank	1,755 [a]
132-D-1	Process Unit/Plant	26,260 [a]
132-D-2	Process Unit/Plant	None
132-D-3	Pump Station	None
132-D-4	Stack	699 [b]
1607-D2:1	Septic Tank	10,040
1607-D2:2	Septic Tank	7,810 [a]

Table 4-1. 100-DR-1 Operable Unit ERDF Waste Disposal Summary

WIDS Site Code	Site Type	Mass Disposed at ERDF (metric tons)
1607-D2:3	Septic Tank	1,137 [b]
1607-D2:4	Septic Tank	2,041
1607-D2:5	Sanitary Sewer	765 [a]
1607-D4	Septic Tank	None
1607-D5	Septic Tank	1,125 [a]
628-3	Burn Pit	76,657 [b]
UPR-100-D-2	UPR	Included with 100-D-48:2
UPR-100-D-3	UPR	Included with 100-D-48:2
UPR-100-D-4	UPR	Included with 100-D-48:1
	Total for 100-DR-1 Sites	**1,992,294 metric tons**

a. Converted to metric tons from bank cubic meters or m^3 by multiplying with a factor of 2.25 for soil.

b. Value for the site as reported by ERDF.

c. Mass does not include lengths of piping also disposed at ERDF. Refer to the "Excavation Operations" section for the subject site for additional details.

d. Converted to metric tons from bank cubic meters by multiplying with a factor of 2.41 for concrete.

ERDF = Environmental Restoration Disposal Facility
OU = operable unit
UPR = unplanned release
WIDS = Waste Information Data System

Table 4-2. 100-DR-2 Operable Unit ERDF Waste Disposal Summary

WIDS Site Code	Site Type	Mass Disposed at ERDF (metric tons)
100-D-12	Pump Station	34.5
100-D-13	Septic Tank	2,220 [a]
100-D-14	Septic Tank	2,110 [a]
100-D-15	Dumping Area	29,700 [a]
100-D-23	French Drain	Included with 100-D-53
100-D-28:1	Septic Tank	9,080 [a]
100-D-43	Burial Ground	1,810 [a]
100-D-46	Burial Ground	Included with 116-D-1A
100-D-47	Burial Ground	6,300 [a]
100-D-53	Process Unit/Plant	14,011
100-D-54	French Drain	Included with 100-D-53
100-D-62	Septic Tank	1,780 [a]
100-D-64	Laboratory	Included with 100-D-53
100-D-77	Process Unit/Plant	32,190 [a]
100-D-100	UPR	476,075 [a]
100-D-106	Sanitary Sewer	3,600 [a,c]

Table 4-2. 100-DR-2 Operable Unit ERDF Waste Disposal Summary

WIDS Site Code	Site Type	Mass Disposed at ERDF (metric tons)
116-D-8	Storage	2,640 [a]
116-DR-10	Pond	13,500 [a]
116-DR-4	Crib	523
116-DR-6	Trench	2140
116-DR-7	Crib	59
116-DR-8	Crib	4,480 [a]
118-D-1	Burial Ground	96,140 [a]
118-D-2:1	Burial Ground	106,770 [a]
118-D-2:2	Burial Ground	930 [a]
118-D-3:1	Burial Ground	236,620 [a]
118-D-3:2	Burial Ground	761 [b]
118-D-4	Burial Ground	15,900 [a]
118-D-5	Burial Ground	710 [a]
118-DR-1	Burial Ground	3,760 [a]
118-DR-2:2	Reactor	17,317 [b]
126-DR-1	Dumping Area	23,790
132-DR-1	Pump Station	None
132-DR-2	Stack	Included with 100-D-53
1607-D1	Septic Tank	8,340 [a]
600-30	Dumping Area	24,525 [a]
	Total for 100-DR-2 Sites	**1,137,816 metric tons**

a. Converted to metric tons from bank cubic meters or m^3 by multiplying with a factor of 2.25 for soil.

b. Value for the site as reported by ERDF.

c. Mass does not include lengths of piping also disposed at ERDF. Refer to the "Excavation Operations" section for the subject site for additional details.

ERDF = Environmental Restoration Disposal Facility
UPR = unplanned release
WIDS = Waste Information Data System

Table 4-3. 100-HR-1 Operable Unit ERDF Waste Disposal Summary

WIDS Site Code	Site Type	Mass Disposed at ERDF (metric tons)
100-H-1	Storage	Included with 100-H-21
100-H-3	Storage Tank	2,010 [a]
100-H-4	Maintenance Shop	7,080 [a]
100-H-5	Burial Ground	23,525
100-H-9	French Drain	Included with 118-H-6:2
100-H-10	French Drain	Included with 118-H-6:2

Table 4-3. 100-HR-1 Operable Unit ERDF Waste Disposal Summary

WIDS Site Code	Site Type	Mass Disposed at ERDF (metric tons)
100-H-11	French Drain	Included with 118-H-6:2
100-H-12	French Drain	Included with 118-H-6:2
100-H-13	French Drain	Included with 118-H-6:2
100-H-14	UPR	Included with 118-H-6:2
100-H-17	UPR	19,920
100-H-21	Radioactive Process Sewer	32,725
100-H-22	UPR	Included with 100-H-21
100-H-24	Electrical Substation	19,924
100-H-28:2	Process Sewer	48,710 [a]
100-H-28:3	Process Sewer	89,390 [a]
100-H-28:4	Process Sewer	3,670 [a]
100-H-28:5	Process Sewer	Included with 100-H-28:3
100-H-30	Trench	Included with 100-H-17
100-H-31	UPR	Included with 118-H-6:2
100-H-41	UPR	Included with 100-H-37
100-H-42	Pump Station	11,700 [a]
100-H-43	Maintenance Shop	4,180 [a]
100-H-44	Process Unit/Plant	Included with 100-H-28:3
100-H-46	Process Unit/Plant	137,930 [a]
100-H-48	Product Piping	3,550 [a]
100-H-49:1	French Drain	380 [a]
100-H-51:1	Process Sewer	1,080 [a,c]
100-H-51:2	Process Sewer	725 [a]
100-H-51:3	Process Sewer	1,170 [a]
100-H-51:6	Product Piping	1,010 [a]
100-H-52	Drain/Tile Field	Included with 100-H-48
100-H-59:1	UPR	12,033 [b]
100-H-59:2	UPR	12,520 [a]
116-H-1	Trench	82,706
116-H-2	Trench	Included with 100-H-17
116-H-3	French Drain	2,707
116-H-5	Outfall	20,210 [a]
116-H-7	Retention Basin	218,130
116-H-9	Crib	5,470 [a]
118-H-6:2	Reactor	73,966

Table 4-3. 100-HR-1 Operable Unit ERDF Waste Disposal Summary

WIDS Site Code	Site Type	Mass Disposed at ERDF (metric tons)
118-H-6:3	Reactor	Included with 118-H-6:2
118-H-6:4	Reactor	6,030 [a]
118-H-6:5	Reactor	6,840 [a]
118-H-6:6	Reactor	Included with 118-H-6:2
126-H-2	Dumping Area	29,593
132-H-1	Burial Ground	None
132-H-3	Pump Station	34,465
1607-H2	Septic Tank	12,207
1607-H3	Septic Tank	8,470 [a,c]
1607-H4	Septic Tank	2,078
	Total for 100-HR-1 Sites	**936,104 metric tons**

a. Converted to metric tons from bank cubic meters or m^3 by multiplying with a factor of 2.25 for soil.

b. Value for the site as reported by ERDF.

c. Mass does not include lengths of piping also disposed at ERDF. Refer to the "Excavation Operations" section for the subject site for additional details.

ERDF = Environmental Restoration Disposal Facility WIDS = Waste Information Data System

UPR = unplanned release

Table 4-4. 100-HR-2 Operable Unit ERDF Waste Disposal Summary

WIDS Site Code	Site Type	Mass Disposed at ERDF (metric tons)
100-H-2	Burial Ground	Included with 100-H-17 (100-HR-1 OU)
100-H-37	Contamination Migration	20,955 [b]
118-H-1:1	Burial Ground	77,620 [a]
118-H-1:2	Burial Ground	790 [a]
118-H-2	Burial Ground	9,820 [a]
118-H-3	Burial Ground	14,360 [a]
118-H-4	Burial Ground	3,710 [a]
118-H-5	Burial Ground	900 [a]
128-H-1	Burn Pit	50,910 [a]
132-H-2	Burial Ground	None
1607-H1	Septic Tank	6,120 [a]
600-151	Dumping Area	3,430 [a]
600-152	Septic Tank	650 [a]
600-380	Dumping Area	Minimal
600-382	UPR	190 [a]
600-382:1	UPR	Included with 600-382
600-382:2	UPR	Included with 600-382
600-382:3	UPR	Included with 600-382

Table 4-4. 100-HR-2 Operable Unit ERDF Waste Disposal Summary

WIDS Site Code	Site Type	Mass Disposed at ERDF (metric tons)
600-382:4	UPR	Included with 600-382
600-382:5	UPR	Included with 600-382
600-383	Dumping Area	120 [a]
600-383:1	Dumping Area	Included with 600-383
600-383:2	Dumping Area	Included with 600-383
600-383:3	Dumping Area	Included with 600-383
600-383:4	Dumping Area	Included with 600-383
600-383:5	Dumping Area	Included with 600-383
600-383:6	Dumping Area	Included with 600-383
600-383:7	Dumping Area	Included with 600-383
600-383:8	Dumping Area	Included with 600-383
600-383:9	Dumping Area	Included with 600-383
600-383:10	Dumping Area	Included with 600-383
600-384	UPR	730 [a]
600-384:1	UPR	Included with 600-384
600-384:2	UPR	Included with 600-384
600-384:3	UPR	Included with 600-384
600-384:4	UPR	Included with 600-384
600-384:5	UPR	Included with 600-384
600-385	Dumping Area	11,930 [a]
	Total for 100-HR-2 Sites	**202,235 metric tons**

a. Converted to metric tons from bank cubic meters or m^3 by multiplying with a factor of 2.25 for soil.

b. Value for the site as reported by ERDF.

ERDF = Environmental Restoration Disposal Facility
OU = operable unit
UPR = unplanned release
WIDS = Waste Information Data System

Table 4-5. Unassigned Site ERDF Waste Disposal Summary

WIDS Site Code	Site Type	Mass Disposed at ERDF (metric tons)
100-D-58	Septic Tank	None
120-D-1	Pond	None
116-H-6	Retention Basin	Not Reported
	Total for Unassigned Sites	**None**

ERDF = Environmental Restoration Disposal Facility
WIDS = Waste Information Data System

Table 4-6. 100-D/H Areas Not Accepted and Rejected Waste Sites

Operable Unit	WIDS		WSRF	Reclassification	
	Site Code	Site Name		Date	Status
100-DR-1	100-D-10	Storm Drain Outfall, Undocumented Liquid Waste Site	---	---	Not Accepted
100-DR-1	100-D-50:3	Reactor Cooling Water Pipelines from 190-D High Bay	2012-067	09/26/2012	Rejected
100-DR-1	100-D-59	French Drain at the 183-D Acid Transfer Station	2002-042	01/30/2003	Rejected
Unassigned	100-D-33	Minor Construction Burial Ground #4 East Trench	2007-023	03/20/2008	Rejected
Unassigned	100-D-35	Minor Construction Burial Ground #4 West Trench	2007-024	03/20/2008	Rejected
Unassigned	100-D-40	Minor Construction Burial Ground #5 Hole	2007-025	03/20/2008	Rejected
Unassigned	100-D-41	Minor Construction Burial Ground #5 Trench	2007-026	03/20/2008	Rejected
Unassigned	100-D-79	Posted Soil Contamination Areas (SCAs)	2009-052	09/15/2010	Rejected
Unassigned	100-D-92	Potential UST Near Dichromate Station	2009-048	02/18/2010	Rejected
Unassigned	100-D-93	Potential UST Near Dichromate Station	2009-003	05/20/2010	Rejected
Unassigned	100-D-95	100-D/DR Unnumbered Septic Tanks and Tile Field	2009-004	11/10/2010	Rejected
Unassigned	100-H-39	100-H Possible Thimble Pit	2010-002	05/03/2010	Rejected
Unassigned	100-H-47	1717-H Geophysical Anomaly, Possible UST	2009-058	02/22/2010	Rejected
Unassigned	100-H-49:3	183-H and 1717-H French Drains	2011-065	01/23/2012	Rejected
Unassigned	100-H-55	100H Cast Iron Pipe (H-038)	2009-056	02/25/2010	Rejected

--- = not applicable
UST = underground storage tank
WIDS = Waste Information Data System
WSRF = waste site reclassification form

4.1 100-DR-1 Operable Unit

This section presents detailed remedial actions for sites within the 100-DR-1 OU.

4.1.1 100-D-1, Contaminated Drain, Contaminated Storm Drain

4.1.1.1 Site Description

The 100-D-1, Contaminated Storm Drain waste site consisted of a junction box and associated storm drain pipeline between the 116-D-5 and 116-DR-5 outfall structures on the northern side of the patrol road. The 100-D-1 waste site is located approximately 50 m (180 ft) northwest of the northwestern corner of the location of the former 116-D-7, 107-D Retention Basin. Operational dates for this site are not known, but the associated drainage system appears to have been at least partially removed or abandoned. Leaks are known to have been common from the nearby 116-D-7 (107D) and 116-DR-9 (107DR) retention basins, likely resulting in contaminant introduction to the 100-D-1 Contaminated Storm Drain.

4.1.1.2 Excavation Operations

Remedial action at the 100-D-1 waste site was performed on April 15, 2009, to remove the diversion box located at the eastern end of the waste site. Remedial action resumed on January 5, 2010, and continued through January 11, 2010, to remove the associated pipelines. During the time between remedial actions, a section of the pipeline was stored within the excavation footprint. All pipe associated with the junction box was removed; however, the portion of pipe that was removed did not extend to the river.
Process history indicates a portion of the pipe was previously removed; the portion of the pipe that was

there appears to lead to the 100-D-65 site, a spillway that does lead to the river shoreline. The two sites were not connected, and the potential association could not be confirmed. A total of approximately 495 bank cubic meters (BCM) (647 bank cubic yards [BCY]) of soil and debris were removed and directly loaded for disposal at ERDF. The 100-D-65 pipeline was left in place and is located at the western end of the 100-D-1 waste site excavation.

4.1.1.3 Verification Sampling

Verification sampling was conducted at the 100-D-1 waste site on May 20, 2010. A statistical sampling design was used to collect verification soil samples from the 100-D-1 excavation. Twelve verification soil samples were collected from the excavation. Evaluation of the verification sampling results indicates that residual concentrations of all site COPCs are below soil RAGs for direct exposure, protection of groundwater, and protection of the Columbia River.

4.1.1.4 Statement of Protectiveness

The results of verification sampling show that residual contaminant concentrations do not preclude any future uses (as bounded by the rural-residential scenario) and allow for unrestricted use of shallow zone soils (i.e., surface to 4.6 m [15 ft] deep). The results also demonstrate that residual contaminant concentrations are protective of groundwater and the Columbia River. Site contamination did not extend into the deep zone soils; therefore, institutional controls to prevent uncontrolled drilling or excavation into the deep zone are not required. The 100-D-1 site has been reclassified as “Interim Closed Out.”

4.1.2 100-D-2, Solid Waste Site, Lead Sheeting

4.1.2.1 Site Description

The 100-D-2 Lead Sheeting waste site, was located approximately 50 m (164 ft) southwest of the 185D Building and approximately 16 m (52 ft) north of the east/west oriented road (Paddock Street) that passes south of the former 100-D Area water treatment plant. The site consisted of a lead sheet covering a concrete pad. The process history of this site is not known. Aerial photographs of the 100-D Area from 1943 through 1976 indicate that the 151D electrical substation and the overhead steam lines were in the vicinity of the 100-D-2 waste site. Based on drawings of temporary construction facilities in 100-D Area, a temporary railroad was also located near this site. However, nothing conclusive has been found to indicate the purpose of the lead sheet covering the concrete.

4.1.2.2 Excavation Operations

Remediation of the 100-D-2 waste site was performed on April 12, 2007. The lead sheet, which was approximately 0.64 cm (0.25 in.) thick, was removed and placed in a drum for later treatment and disposal at ERDF. The soil surrounding the concrete pad was moved aside to expose the concrete pad for inspection. The concrete was determined to be solid to at least a depth of 0.6 m (2 ft).

Additional excavation to remove the concrete pad and surrounding soil was performed on October 15, 2007. Approximately 216 metric tons (239 tons) of soil and concrete were excavated and disposed at ERDF.

4.1.2.3 Verification Sampling

Verification soil sampling was performed on October 8, 2007, with one soil sample collected adjacent to each side of the concrete pad. Each sample consisted of 20 aliquots of soil distributed across the surface (0 to 0.15 m [0 to 6 in.]) below the existing ground surface, combined into one sample representative of each of the four sides. The analytical results indicated the presence of lead up to 578 mg/kg, exceeding the direct exposure cleanup criteria. Additionally, a sample chipped from the surface of the concrete exhibited lead at a concentration of 32,900 mg/kg.

Following the additional excavation of the 100-D-2 waste site, a second set of verification samples was collected on October 17, 2007. The analytical results of this sampling indicated that the waste removal action achieved compliance with the remedial action objectives (RAOs) and goals for the 100-D-2 waste site.

4.1.2.4 Statement of Protectiveness

The results of verification sampling show that residual contaminant concentrations do not preclude any future uses (as bounded by the rural-residential scenario) and allow for unrestricted use of shallow zone soils (i.e., surface to 4.6 m [15 ft] deep). The results also demonstrate that residual contaminant concentrations are protective of groundwater and the Columbia River. Site contamination did not extend into the deep zone soils; therefore, institutional controls to prevent uncontrolled drilling are not required. The 100-D-2 site has been reclassified as "Interim Closed Out."

4.1.3 100-D-3, Solid Waste Burial Ground, Silica Gel

The 100-D-3, Silica Gel Burial Ground waste site was a trench used to contain contaminated silica gel removed from the drying towers in 115D/DR. There is little information available to identify the precise location of the 100-D-3 waste site. Considerable effort has been made to identify and investigate possible locations where the silica gel may have been buried.

Three locations characteristic of disturbed soil were identified in the vicinity of the reported silica gel burial ground. One location was remediated in 1999 as the 116-D-2 waste site (Section 4.1.108). The other two were excavated and sampled as part of the 100-D-3 site investigation, but no evidence of silica gel was found. The 100-D-3 site has been reclassified as "Interim No Action."

4.1.4 100-D-4, Sludge Trench #5, 107-DR Sludge Trench #5, 107-D-5, 107-D5

4.1.4.1 Site Description

The 100-D-4 site was constructed in 1953. This pit was associated with maintenance cleanout of the 116-DR-9 Liquid Effluent Retention Basin, which was constructed in the late 1940s. The 116-DR-9 Liquid Effluent Retention Basin was used to hold reactor effluent water for a brief period, allowing radioactive decay and thermal cooling to occur before the water was discharged to the Columbia River. The sludge pit was built for disposal of sludge removed from the bottom of the effluent retention basin to enable periodic maintenance and repairs to the basin during operation of the 100D and 100DR Reactors. There is no indication from available records that this sludge pit directly received any regular and/or high-volume liquid effluent wastes.

The sludge pit consisted of an approximately 630 m^2 (6,779 ft^2) unlined excavation (bottom dimension) with moderately sloped sidewalls. This pit extended to a depth of about 3 m (10 ft) belowgrade, and was surrounded by native sandy gravel soils at the base and sidewalls of the excavation. After shutdown of the 100D and 100DR Reactors in the 1970s, subsequent decommissioning of the effluent retention basin and associated sludge pits (as part of the Radiation Area Remedial Action Program) included placement of approximately 2 m (6 ft) of materials in the sludge pit. These materials consisted primarily of soil with some miscellaneous debris from the effluent basin and surrounding area. Another 1 m (3 ft) layer of clean soil was placed over the top for interim radiological, health, and safety protection purposes.

4.1.4.2 Excavation Operations

Excavation of the 100-D-4 site began on March 18, 1997, by removing the overburden materials and underlying contaminated soil. Based on field screening, overburden materials that were identified as potentially clean were placed in stockpiles for potential use as backfill. Overburden materials that were

found to be contaminated were disposed at ERDF. On March 27, 1997, the excavation had reached the design depth, and closeout sampling was initiated.

Soils not meeting direct exposure RAGs based on field screening results were excavated, loaded into shipping containers, and disposed at ERDF. At the completion of the remedial action, the excavation area was approximately 630 m^2 (6,779 ft^2) at a depth of 2.9 m (9.5 ft), and approximately 1,678 metric tons (1,850 tons) of material from the site was disposed at ERDF.

4.1.4.3 Confirmatory Sampling

Initial confirmation sampling and testing using gamma energy analysis (GEA) began on March 28, 1997, to determine the number of final verification samples.

During excavation, field screening and onsite GEA at the Radiological Counting Facility were used to distinguish between potentially clean materials and contaminated materials for disposal at ERDF. Based on the size of the site, 24 random samples were collected for GEA and sent to the Radiological Counting Facility for analysis. Data from these samples were used to corroborate data obtained from field screening and to assist in waste characterization. The GEA indicated a low degree of variability and contaminant levels below the lookup values.

4.1.4.4 Verification Sampling

Final cleanup verification samples were collected following variance sampling. Verification sampling and testing were finished on September 24, 1997. The site was divided into four sampling areas for confirmation and verification testing. Four aliquots were collected at prescribed locations (nodes) within each of the four sampling areas (16 aliquots total). Aliquots from each sampling area were composited to create four analytical samples, one composite to represent each sampling area. The final verification samples were sent to offsite laboratories for analysis.

All COCs/COPCs were quantified below groundwater and/or river protection soil RAGs except for Aroclor-1260.[1] RESidual RADioactivity (RESRAD) modeling predicted that residual concentrations of Aroclor-1260 will be protective of groundwater and the Columbia River.

4.1.4.5 Statement of Protectiveness

The RAGs for direct exposure, groundwater protection, and surface water protection (including protection of the Columbia River) have all been achieved for the 100-D-4 site. Materials that contain COCs at concentrations that exceed the RAGs have been excavated, sampled, analyzed, and where required, were removed and shipped to ERDF. The remaining soil has been sampled, analyzed, and modeled to show that no residual COC concentrations in vadose zone soils pose a threat to human health, groundwater, or the Columbia River. The 100-D-4 site was remediated and no longer poses a threat to human health and the environment. No institutional controls are necessary for this shallow zone waste site. The 100-D-4 site has been reclassified as “Interim Closed Out.”

4.1.5 100-D-5, Waste Site Near 103-D, Undocumented Solid Waste Site, Undocumented Solid Waste Site Near 103-D

The 100-D-5 site is a burial ground that contained a former pipeline junction box and was used for disposal of debris generated during modification and tie-in of the 105-D and 105-DR effluent pipelines in 1950. The waste site was a belowgrade concrete structure located adjacent to the east side of the

[1] Aroclor is an expired trademark of commercial polychlorinated biphenyl (PCB) mixtures. The first two digits of the four-digit number refer to the product series as designated by the manufacturer; the second two digits indicate the percentage of chlorine by mass in the mixture.

103D Building, north of the 105D Reactor. The site was located within the footprint of a major segment of the D/DR Group 3 Pipelines (100-D-48:3 and 100-D-49:3).

Due to geographic location and similarity of remediation activities, the 100-D-48:3 (Section 4.1.37), 100-D-49:3 (Section 4.1.41), 100-D-5, and 100-D-6 (Section 4.1.6) sites were interim closed out as one decision unit referred to as the 100-D-48:3/49:3 site. For information regarding the excavation, verification sampling, or the statement of protectiveness for the 100-D-5 site, refer to the 100-D-48:3 site (Section 4.1.37).

The 100-D-5 site has been reclassified as "Interim Closed Out."

4.1.6 100-D-6, Buried VSR Thimble, Minor Construction Burial Ground #1, Burial Ground 4D, 118-D-4D

The 100-D-6 site is a burial ground that received radioactive and nonradioactive solid wastes and construction debris generated from various modifications in the 105D Reactor during 1953. The site was located within the footprint of a major segment of the D/DR Group 3 Pipelines (100-D-48:3 and 100-D-49:3).

Due to geographic location and similarity of remediation activities, the 100-D-48:3 (Section 4.1.37), 100-D-49:3 (Section 4.1.41), 100-D-5 (Section 4.1.5), and 100-D-6 sites were interim closed out as one decision unit referred to as the 100-D-48:3/49:3 site. For information regarding the 100-D-6 site, refer to the 100-D-48:3 site (Section 4.1.37).

The 100-D-6 site has been reclassified as "Interim Closed Out."

4.1.7 100-D-7, Undocumented Solid Waste Site

4.1.7.1 Site Description

The 100-D-7, Undocumented Solid Waste Site is located approximately 700 m (2,300 ft) northeast of the 105D Reactor and immediately northeast of the 128-D-2 Burn Pit. Documentation of the use or operational period of the 100-D-7 waste site has not been located. Aerial photography shows the primary access to the site as a road coming from the vicinity of the 128-D-2 Burn Pit and entering the site from the west.

Test pits excavated during confirmatory sampling activities in 2005 uncovered debris, including concrete, metal, bricks, paint cans, graphite blocks, vitrified clay pipe (VCP), assorted fibrous asbestos-containing material (ACM), glass, batteries, and localized surficial ash. Results of confirmatory sampling concluded that the waste site contained hazardous debris; therefore, the site was identified for remove, treat, and dispose (RTD).

4.1.7.2 Excavation Operations

Remediation of the 100-D-7 waste site was performed between December 22, 2009, and March 6, 2010. Excavation continued until all debris and contamination associated with the waste site had been removed. Approximately 24,120 BCM (31,548 BCY) of contaminated soil and debris were removed from the 100-D-7 waste site. The soil and debris were staged in staging piles to the southeast of the waste site before being loaded for disposal at ERDF. The staging area was then scraped to remove surface contaminated soil and disposed at ERDF.

Eight anomalies were initially identified during the remediation at the 100-D-7 waste site. These consisted of three 3.8 L (1 gal) bottles containing liquid, three areas of uncontained solid material, a white powder, a pink solid, and a yellow brown solid. The remaining two anomalies are identified as grease and a metal cylinder. The solid materials were sampled and characterized prior to removal and

shipment to ERDF. The liquids were overpacked and transferred to the 118-D-3:2 waste site anomaly characterization area.

4.1.7.3 Verification Sampling

Verification sampling of the 100-D-7 waste site was performed on September 7, 15, and 20, 2010. A statistical sampling design was used to collect verification soil samples from the 100-D-7 main excavation, the 100-D-7 remaining site area that was not remediated, the staging area for the 128-D-2 site, and 100-D-7 contaminated soil and debris. Twelve statistical soil samples were collected on the grid within each of the three decision units at the 100-D-7 waste site. A focused sampling approach was used for the two smaller 100-D-7 excavation areas to the east of the main excavation area. Three focused samples were collected from the two smaller 100-D-7 excavation areas to the east of the main excavation area.

All COPCs for all sampling areas were quantified below their respective soil RAGs or lookup values except for mercury, benzo(b)fluoranthene, bis(2-ethylhexyl)phthalate, dibenz(a,h)anthracene, and total polychlorinated biphenyls (PCBs) (including Aroclor-1248 and Aroclor-1260). These COPCs were quantified above soil RAGs for groundwater and/or river protection in one or more of the sampling areas. RESRAD modeling predicted that residual concentrations of these constituents will be protective of groundwater and the Columbia River.

4.1.7.4 Statement of Protectiveness

The results of verification sampling indicate that the waste removal action achieved compliance with the RAOs and RAGs of this waste site. They also show that residual contaminant concentrations do not preclude any future uses (as bounded by the rural-residential scenario) and allow for unrestricted use of shallow zone soils (i.e., surface to 4.6 m [15 ft] deep). The sample and modeling results also demonstrate that residual contaminant concentrations are protective of groundwater and the Columbia River. Institutional controls to prevent uncontrolled drilling or excavation into the deep zone are not required. The 100-D-7 site has been reclassified as “Interim Closed Out.”

4.1.8 100-D-8, 105-DR Process Sewer Outfall Site, Undocumented Liquid Waste Site, 1907-DR

4.1.8.1 Site Description

The 100-D-8, 105-DR Process Sewer Outfall waste site is located approximately 230 m (755 ft) upstream on the Columbia River from the 181D Pumphouse. The 105-DR Process Sewer Outfall was used as an emergency discharge spillway for wastewater from the 105-DR Reactor and for stormwater and process discharges from the 183DR and 190DR water treatment facilities. Construction of the 105-DR outfall was completed in 1949 with modifications made in 1950 to increase the discharge capacity. Operational use of the sewer and outfall began in 1950, although the frequency, volume, or nature of any discharges to the sewer from the 105-DR Reactor is not known. Use of the system ceased between 1965 and 1968. The outfall structure consisted of a concrete box flume that discharged to grouted riprap. The grouted riprap extended into the Columbia River approximately 13.1 m (43 ft) beyond the end of the spillway. The outfall structure was demolished using a wrecking ball in 1978, and the area was then covered and leveled to blend in with the surrounding riverbank.

The 100-D-8 waste site consists of two components: an upland segment located above the Columbia River ordinary high-water mark (OHWM) and a shoreline segment located between the ordinary high- and low-water marks.

4.1.8.2 Excavation Operations

Remediation of the upland segment of the 100-D-8 waste site was performed from September 29, 2010, through February 17, 2011. In late March 2011, additional soil was removed at the base of the excavation in the area where four in-process soil samples indicated residual contamination exceeding cleanup criteria. On May 18, 2011, high Columbia River flows resulted in river water entering the excavation and presenting a potential stranding hazard to juvenile fish. With Ecology approval, fill material was temporarily placed into the low areas of the excavation until such time that river flows were sufficiently low to resume excavation. On December 12, 2011, this fill material was removed, and the remediation completed. Approximately 118,440 metric tons (52,253 BCM) of material was excavated, stockpiled, and later disposed at ERDF.

Remediation, verification sampling, and backfill of the shoreline area of the spillway was performed October 30, 2011, to preclude fish stranding due to fluctuating Columbia River flow rates. Approximately 1,680 metric tons (741 BCM) of material was removed from the shoreline segment and disposed at ERDF.

4.1.8.3 Verification Sampling

Two separate sample designs were developed for the 100-D-8 waste site: one for the upland segment and another for the shoreline segment. Three decision units were identified for the upland segment of the 100-D-8 waste site: the excavation footprint located below the outfall and spillway, the overburden/layback soil piles, and the footprint of the waste staging piles. Twelve statistical soil samples were collected from each of these decision units. A focused sampling design was used to characterize the sediment after remediation of the shoreline segment. The footprint of the excavation in this area was divided into 4 segments that paralleled the shoreline of the river, with 3 discrete soil samples collected from within each segment, for a total of 12 samples. Verification sampling of the upland segment of the soil within the excavation was conducted on December 12, 2011, and verification sampling of the overburden/layback soil was performed on December 13, 2011. Verification samples within the footprint of the waste staging pile areas (SPAs) were collected on February 1, 2012, and March 12, 2012. Verification sampling of the shoreline segment was performed on October 30, 2011.

Several polycyclic aromatic hydrocarbons (PAHs) (benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene, and chrysene) were detected above soil criteria for protection of groundwater and the Columbia River. RESRAD modeling predicted that residual concentrations of these constituents will be protective of groundwater and the Columbia River.

4.1.8.4 Statement of Protectiveness

The results indicated that the removal action achieved compliance with the RAOs for the 100-D-8 waste site. The results of verification sampling show that residual contaminant concentrations do not preclude any future uses (as bounded by the rural-residential scenario) and allow for unrestricted use of shallow zone soils (i.e., surface to 4.6 m [15 ft] deep). The results also demonstrate that residual contaminant concentrations are sufficiently protective of groundwater and the Columbia River. Institutional controls to prevent uncontrolled drilling or excavation into the deep zone are not required. The 100-D-8 site has been reclassified as “Interim Closed Out.”

4.1.9 100-D-9, 184-DA Boiler Oil Tank

4.1.9.1 Site Description

The 100-D-9 Boiler Fuel Oil Tank Site is the location of a former underground fuel storage tank that held fuel oil for the 184-DA Boiler House. The site is in the 100-D Area about 55 m (180 ft) south of Palouse Street and 165 m (540 ft) east of Puget Avenue. The tank had a capacity of 94,600 L (25,000 gal) and was

covered by at least 0.6 m (2 ft) of overburden. The site now appears as a cobble-covered field with minimal vegetation.

The fuel tank was installed in 1967 or 1968 to hold oil that fueled the boilers in the 184-DA Steam Generating Building (Boiler House). The tank was likely removed as part of the general demolition of 100-D/DR Area facilities during 1985 and 1986.

4.1.9.2 Analytical Sampling

Six soil-gas probes were installed surrounding the tank site, during an analytical sampling event in July 1991, at depths ranging from 0.9 to 1.3 m (3 to 4 ft). The final summary of the soil-gas results for the tank concluded that no volatile organic compounds (VOCs) were present at detectable levels.

4.1.9.3 Excavation Operations

The site was first excavated on February 18, 1994, by the Decontamination and Decommissioning (D&D) Engineering Group to verify that the tank had been removed. There was no indication of soil contamination in any of the D&D records related to the excavation. However, there were no confirmatory sampling results for the site.

A geophysical survey was performed at the 100-D-9 site in October 2005. Ground-penetrating radar (GPR), electromagnetic surveys, and magnetic gradiometer surveys were performed over an extended area surrounding the former tank location. Several linear anomalies were interpreted within the survey area, all trending roughly east-west. The former tank location appears to be in the “disturbed” area that is near the center of the survey area. Small, relatively subtle geophysical anomalies were noted within this disturbed area, more typical of small debris or metal, but there was clearly no evidence of a tank of the documented size (94,600 L [25,000 gal]).

A trench approximately 10 m (23.8 ft) in length was excavated from the center of the former tank location to the east. Concrete, metal, and wood debris were encountered during the excavation. Below the debris, native soil was encountered at about 3.7 m (12 ft) at the western end of the trench and at about 2 m (6.5 ft) at the eastern end of the trench. During the excavation, suspect ACM was encountered and sampled. Field screening was also performed for VOCs, using an organic vapor monitor, and for radiological activity (alpha, beta, and gamma). No contaminants were detected during field screening. The excavation confirms that the tank was previously removed.

4.1.9.4 Confirmatory Sampling

Historical data, process knowledge, geophysical survey results, and site visit information were used to develop a stratified confirmatory sampling design with focused sampling of residual debris and soil at the 100-D-9 site. A test trench was excavated to verify the removal of the underground fuel tank and to provide access to native soil below the tank. Confirmatory sampling of the 100-D-9 Boiler Fuel Oil Tank Site was performed on January 4, 2006. Soil samples were collected at the interface of the native soil and previous site backfill material. Eight confirmatory samples were collected. Based on the results of this confirmatory sampling, it was determined that remedial action was not necessary at the site.

4.1.9.5 Statement of Protectiveness

The confirmatory sampling results show that residual soil concentrations support future land uses that can be represented (or bounded) by a rural-residential scenario. The results also demonstrate that residual contaminant concentrations support unrestricted future use of shallow zone soil (i.e., surface to 4.6 m [15 ft]) and contaminant levels remaining in the soil are protective of groundwater and the Columbia River. This site does not have a deep zone; therefore, no deep zone institutional controls are required. The 100-D-9 site has been reclassified as “Interim Closed Out.”

4.1.10 100-D-10, Storm Drain Outfall, Undocumented Liquid Waste Site

The 100-D-10 site was a small outfall structure upstream of the 1907-DR outfall. It was used as a discharge outfall for the storm drain system of the 190-DR tank pit, which consisted of drains, sump, and pump to lift runoff to the outfall. The trench from the outfall structure to the waterline is apparent and appears to have a telephone cable buried in its bottom. The 100-D-10 site is classified as "Not Accepted."

4.1.11 100-D-18, Sludge Trench #4, 107-D Sludge Trench #4, 107-D-4, 107-D4

4.1.11.1 Site Description

The 100-D-18 site is one of several trenches dug for disposal of sludge from the bottom of the 107-D Retention Basin (116-D-7 Retention Basin) during basin repairs in spring 1953. The trench is to the north of and adjacent to the retention basin. The 100-D-18 site is also directly over the top of the 100DR Group 2 pipeline. The trenches were covered with clean soil when the sludge disposal work was complete.

4.1.11.2 Excavation Operations

Remedial action at this site began on September 8, 1997, and ended on December 3, 1998. Excavation stopped when it reached the pipelines. Excavation of the 100-D-18 site involved removing the overburden materials, the contaminated structure, and underlying contaminated soil. Based on field screening, overburden materials identified as potentially clean were placed in stockpiles for potential use as backfill. Materials that were found to be contaminated were disposed at ERDF. The shallow zone sidewalls were lost to other nearby remedial activities, leaving only the floor of the excavation for the 100-D-18 site. At the completion of remedial action, the excavation area was approximately 344.3 m^2 (3,706 ft^2) with a maximum depth of approximately 6.6 m (21.7 ft). Approximately 8,700 metric tons (9,592 tons) of material from the site was disposed at ERDF.

4.1.11.3 Verification Sampling

Final cleanup verification samples were collected following variance sampling. Cleanup verification sampling began on September 13, 1999, and was finished on September 13, 1999. Three composite samples were collected from the deep zone, in addition to quality assurance/quality control (QA/QC) samples. The final verification samples were sent to offsite laboratories for analysis.

All nonradionuclide COCs, except hexavalent chromium, pass the Model Toxic Control Act (MTCA) three-part test for the deep zone. RESRAD modeling predicted that residual concentrations of hexavalent chromium will be protective of groundwater and the Columbia River.

4.1.11.4 Statement of Protectiveness

Materials from the 100-D-18 site that contain COCs at concentrations exceeding the RAGs have been excavated and disposed at ERDF. As a result of remedial actions at adjacent sites, the sidewalls of the 100-D-18 site excavation have also been excavated. As a result, there are no residual shallow zone soils left at the 100-D-18 site to sample and evaluate.

For the deep zone, residual COC concentrations pose no threat to groundwater or the Columbia River. The acceptability of unrestricted exposure to deep zone soils has not been demonstrated; therefore, institutional controls to prevent uncontrolled drilling or excavation into the deep zone (i.e., below 4.6 m [15 ft]) are required. The 100-D-18 site was remediated in accordance with the ROD. The 100-D-18 site has been reclassified as "Interim Closed Out."

4.1.12 100-D-19, Sludge Trench #6, 107-D Sludge Trench #6

The 100-D-19 site was a trench used for disposal of sludge from the 116-D-7 Retention Basin. Sludge from the basin was reportedly buried in the trench in 1953. The 100-D-19 Sludge Trench is located to the north of the 116-D-7 Retention Basin.

Due to the geographic location and similarity of remediation activities, the 100-D-48:1 (Section 4.1.35), 100-D-49:1 (Section 4.1.39), 100-D-19, and UPR-100-D-4 (Section 4.1.141) sites were interim closed out as one decision unit referred to as the 100-D-48:1/49:1 Pipelines site. For information regarding excavation, verification sampling or the statement of protectiveness for 100-D-19 site, refer to the 100-D-48:1 site (Section 4.1.35).

The 100-D-19 site has been reclassified as "Interim Closed Out."

4.1.13 100-D-20, Sludge Trench #3, 107-D Sludge Trench #3, 107-D-3, 107-D3

4.1.13.1 Site Description

The 100-D-20 Sludge Pit was constructed in 1953, and is located near the east side of the 116-DR-9 Liquid Effluent Retention Basin. This pit was associated with maintenance clean out of the 116-D-7 Liquid Effluent Retention Basin. The sludge pit was built for disposal of reactor effluent water sludge removed from the bottom of the 116-D-7 Liquid Effluent Retention Basin, enabling periodic maintenance and repairs to the basin during operation of the 100D and 100DR Reactors. There is no indication from available records that this sludge pit directly received any regular and/or high-volume liquid effluent wastes.

The sludge pit consisted of an approximate 575 m^2 (6,189 ft^2) unlined excavation (bottom dimension) with moderately sloped sidewalls. This pit extended to a depth of about 2.1 m (7 ft) belowgrade, and was surrounded by native sandy gravel soils at the base and sidewalls of the excavation. After shutdown of the 100D and 100DR Reactors in the 1970s, subsequent decommissioning of the effluent retention basin and associated sludge pits (as part of the Radiation Area Remedial Action Program) included placement of approximately 2 m (7 ft) of material in the sludge pit. This material consisted primarily of soil with some miscellaneous debris material from the effluent basin and surrounding area. Another 1 m (3 ft) of clean soil cover was placed over the top for interim radiological, health, and safety protection purposes.

4.1.13.2 Excavation Operations

Excavation of the 100-D-20 Sludge Pit began on July 30, 1997, by removing the overburden materials and underlying contaminated soil. Based on field screening, all overburden materials were found to be contaminated and were disposed at ERDF. On August 1, 1997, the excavation had reached the design depth and closeout sampling was initiated. At the completion of the remedial action, the excavation area was approximately 575 m^2 (6,189 ft^2) at a depth of 2.1 m (7 ft), and approximately 9,710 metric tons (10,700 tons) of material from the site was disposed at ERDF.

4.1.13.3 Verification Sampling

Final cleanup verification samples were collected following variance sampling that began on April 1, 1998. Based on the results from variance sampling, four final verification composite samples were collected and sent to an offsite laboratory for analysis.

4.1.13.4 Statement of Protectiveness

The RAGs for direct exposure, groundwater protection, and surface water protection (including protection of the Columbia River) have all been achieved at the 100-D-20 site. Materials that contain COCs at concentrations that exceed the RAGs have been excavated, sampled, analyzed, and where required,

removed and shipped to ERDF. The remaining soil has been sampled, analyzed, and modeled to show that no residual COC concentrations in vadose zone soils pose a threat to human health, groundwater, or the Columbia River. The 100-D-20 site was remediated and no longer poses an unacceptable threat to human health and the environment. The 100-D-20 site has been reclassified as "Interim Closed Out."

4.1.14 100-D-21, Sludge Trench #2, 107-DR Sludge Trench #2, 107-D-2, 107-D2

4.1.14.1 Site Description

The 100-D-21 Sludge Pit was constructed in 1953, and is located near the northwest side of the 116-DR-9 Liquid Effluent Retention Basin facility. This pit was associated with maintenance cleanout of the 116-D-7 Liquid Effluent Retention Basin. The sludge pit was built for disposal of reactor effluent sludge removed from the bottom of the 116-D-7 Liquid Effluent Retention Basin, enabling periodic maintenance and repairs to the basin during operation of the 100D and 100DR Reactors. There is no indication from available records that this sludge pit directly received any regular and/or high-volume liquid effluent wastes.

The sludge pit consisted of an approximate 891 m^2 (9,591 ft^2) unlined excavation (bottom dimension) with moderately sloped sidewalls. The pit extended to a depth of about 3 m (10 ft) belowgrade, and was surrounded by native sandy gravel soils at the base and sidewalls of the excavation. After shutdown of the 100D and 100DR Reactors in the 1970s, subsequent decommissioning of the effluent retention basin and associated sludge pits (as part of the Radiation Area Remedial Action Program) included placement of approximately 2 m (7 ft) of material in the sludge pit. The material consisted primarily of soil with some miscellaneous debris material from the effluent basin and surrounding area. Another 1 m (3 ft) layer of clean soil was placed over the top for interim radiological, health, and safety protection purposes.

4.1.14.2 Excavation Operations

Excavation of the 100-D-21 Sludge Pit began on December 31, 1997, by removing the overburden materials and contaminated soil. Based on field screening, all overburden materials were found to be contaminated and were disposed at ERDF. On January 8, 1998, the excavation had reached the design depth and closeout sampling was initiated. Elevated levels of PCBs were found and excavation was continued. On March 17, 1998, the final excavation was completed, and analysis of verification samples found the site to be clean.

At the completion of the remedial action, the excavation area was approximately 891 m^2 (9,591 ft^2) at a depth of 4.5 m (14.8 ft), and approximately 9,943 metric tons (10,957 tons) of material from the site was disposed at ERDF.

4.1.14.3 Verification Sampling

Final cleanup verification samples were collected following variance sampling. Four final verification composite samples were collected and sent to an offsite laboratory for analysis on May 21, 1998.

4.1.14.4 Statement of Protectiveness

The RAGs for direct exposure, groundwater protection, and surface water protection (including protection of the Columbia River) have all been achieved at the 100-D-21 site. Materials that contain COCs at concentrations that exceed the RAGs have been excavated, sampled, analyzed, and where required, removed and shipped to ERDF. The remaining soil has been sampled, analyzed, and modeled to show that no residual COC concentrations in vadose zone soils pose a threat to human health, groundwater, or the Columbia River. The 100-D-21 site was remediated and no longer poses an unacceptable threat to human health and the environment. The 100-D-21 site has been reclassified as "Interim Closed Out."

4.1.15 100-D-22, Sludge Trench #1, 107-DR Sludge Trench #1, 107-D-1, 107-D1

4.1.15.1 Site Description

The 100-D-22 Sludge Pit was constructed in 1953 and is located near the east side of the 116-DR-9 Liquid Retention Basin Facility. The 100-D-22 Sludge Pit was associated with maintenance cleanout of the 116-DR-9 Liquid Effluent Retention Basin. The sludge pit was built for disposal of reactor effluent water sludge removed from the bottom of the 116-DR-9 Liquid Effluent Retention Basin enabling periodic maintenance and repairs to the basin during operation of the 100D and 100DR Reactors. There is no indication from available records that this sludge pit directly received any regular and/or high-volume liquid effluent wastes.

The sludge pit consisted of an approximate 340 m^2 (3,658 ft^2) unlined excavation (bottom dimension) with moderately sloped sidewalls. This pit extended to a depth of about 3 m (10 ft) belowgrade, and was surrounded by native sandy gravel soils at the base and sidewalls of the excavation. After shutdown of the 100D and 100DR Reactors in the 1970s, subsequent decommissioning of the effluent retention basin and associated sludge pits (as part of the Radiation Area Remedial Action Program) included placement of approximately 2 m (7 ft) of material in the sludge pit. This material consisted primarily of soil with some miscellaneous debris materials from the effluent basin and surrounding area. Another 1 m (3 ft) layer of clean soil cover was placed over the top for interim radiological, health, and safety protection purposes.

4.1.15.2 Excavation Operations

Excavation of the 100-D-22 Sludge Pit began on March 14, 1997, by removing the overburden materials and underlying contaminated soil. Based on field screening, all overburden materials were found to be contaminated and were disposed at ERDF. On March 25, 1997, the excavation had reached the design depth and closeout sampling was initiated. Because of the presence of PCBs at that depth, the excavation was extended to 4.8 m (16 ft) belowgrade on November 11, 1997, to remove residual PCB contamination; closeout sampling for PCBs was initiated at this depth. At the completion of the remedial action, the bottom of the excavation was approximately 340 m^2 (3,658 ft^2) at a depth of 4.8 m (16 ft), and approximately 9,710 metric tons (4,960 loose m^3) of material from the site was disposed at ERDF.

4.1.15.3 Verification Sampling

For the exposed surface of the excavation, initial confirmation sampling and testing using GEA began on June 25, 1997, to determine the number of final verification samples. Verification sampling and testing began on July 29, 1997, and the presence of PCBs above cleanup criteria levels was found.
Field screening was used to monitor PCB levels as excavation at the 100-D-22 Sludge Pit continued through November 11, 1997. The PCB samples were taken again on December 16, 1997. The final verification samples were sent to offsite laboratories for analysis.

4.1.15.4 Statement of Protectiveness

The RAGs for direct exposure, groundwater protection, and surface water protection (including protection of the Columbia River) have all been achieved for the 100-D-22 site. Materials that contain COCs at concentrations that exceed the RAGs have been excavated, sampled, analyzed, and where required, were removed and shipped to ERDF. The remaining soil has been sampled, analyzed, and modeled to show that no residual COC concentrations in vadose zone soils pose a threat to human health, groundwater, or the Columbia River. The 100-D-22 site was remediated and no longer poses an unacceptable threat to human health and the environment. The 100-D-22 site has been reclassified as “Interim Closed Out.”

4.1.16 100-D-24, 119-D Sample Building Drywell

4.1.16.1 Site Description

The 100-D-24 site is located south of the 105D Reactor and former 119D Building, and between the intake and exhaust ducts for the 117-D Filter Building. The 100-D-24 site is a drywell that received drainage from a floor drain in the 119-D Sample Building. The 119-D Sample Building was situated over the intake and exhaust ducts to the 117-D Filter Building and was used to sample effluent gases and particulates. The drywell was connected to the building by a 2 in. drainage pipe buried at least 0.9 m (3 ft) belowgrade. A 0.75 in. drain line from the building's evaporative cooler connected into the 2 in. drain line near the southern edge of the building. It is likely the floor drain also received sample waste and janitorial waste because the building had no other drains or connections to an alternative sewer system. The site dimensions are 0.6 m (2 ft) long by 0.6 m (2 ft) wide by 3.1 m (10 ft) deep.

4.1.16.2 Excavation

One test pit was excavated at the drywell location shown on historic drawings. The drywell was not identified within the test pit area and was, therefore, presumed to have been removed at the time of D&D activities. Therefore, the excavation proceeded to 3 m (10 ft) below ground surface (bgs), at the suspected location of the former base of the drywell. During excavation, surveys were performed for organics, radiation, and for any debris within the test pit. No organics or radiation were detected, and there was no sign of debris.

4.1.16.3 Confirmatory Sampling

On November 3, 2005, the 100-D-24 site was investigated through field observations and focused sampling at the purpose of determining if hazardous or radiological contaminants exist. One soil grab sample was collected at 2.4 m (8 ft) bgs, and another grab sample was collected at 3 m (10 ft) bgs.

4.1.16.4 Statement of Protectiveness

The confirmatory sampling results show that residual soil concentrations support future land uses that can be represented (or bounded) by a rural-residential scenario. The results also demonstrate that residual contaminant concentrations support unrestricted future use of shallow zone soil (i.e., surface to 4.6 m [15 ft]) and that contaminant levels remaining in the soil are protective of groundwater and the Columbia River. This site does not have a deep zone; therefore, no deep zone institutional controls are required. The 100-D-24 site has been reclassified as "Interim No Action."

4.1.17 100-D-25, Unplanned Release: 107-DR Basin Leaks

Site 100-D-25, an unplanned release (UPR) that occurred as floor leaks beneath the basin, could not be distinguished from other contaminated soil and was remediated with the 116-DR-9 Retention Basin under the provisions for "proximity sites." The 100-D-25 UPR was remediated with the 116-DR-9 Retention Basin to meet cleanup standards. The institutional controls for 100-D-25 were revised in 2005 by DOE letter 05-AMRC-0078, "Data Revisions in Institutional Controls (IC) Field of Waste Information Data System (WIDS)." Based on this letter, institutional controls are required to prevent uncontrolled drilling or excavation into deep zone (i.e., below 4.6 m [15 ft]). For additional information regarding the 100-D-25 site, refer to the 116-DR-9 site (Section 4.1.118). The 100-D-25 site has been reclassified as "Interim Closed Out."

4.1.18 100-D-29, Effluent Line Leak #2

4.1.18.1 Site Description

The 100-D-29 site is located near the southwest, inlet end of the former 116-DR-9, 107-DR Retention Basin and southeast of the former 116-D-7, 107-D Retention Basin. The 100-D-29 site is a trench dug to

drain spilled reactor cooling water away from the inlet end of the 107-DR Retention Basin. The retention basins and attached effluent lines underwent thermal expansion and contraction which caused leaks to develop over time. This leaking caused ponding of the leaked effluent on the ground surface adjacent to the retention basins.

In 1951, inlet pipes pulled loose from the basin wall at the south inlet end of the 107-DR Retention Basin, spilling cooling water onto the soil outside of the retention basin. The area contaminated by the spill was remediated in 2000 as a part of the reactor process effluent pipeline remediation. The 100-D-29 waste site location was not remediated at that time. The trench had been backfilled with approximately 1.22 m (4 ft) of soil in 1952 after repairs to the inlet of the 107-DR Retention Basin were completed. Based on the absence of contamination discovered during site remediation, it is suspected that the contaminated soil associated with the site was removed in fall 1952 and used as backfill material for anchor blocks at the 116-D-7, 107-DR Retention Basin inlet.

4.1.18.2 Excavation Operations

Remedial activities at the 100-D-29 waste site began on March 7, 2008, and were completed on March 28, 2008. The excavation is approximately 4.6 m (15 ft) deep and 30 m (100 ft) long with variable width. Approximately 5,200 BCM (6,800 BCY) of soil was excavated and stockpiled adjacent to the site. During excavation, the soil was surveyed using hand-held radiological field instrumentation. Contamination was not detected; therefore, the soil was placed in two stockpiles for potential use as clean backfill. During stockpiling soil removed from the excavation, hand-held radiological surveys were performed followed by Global Positioning Environmental Radiological Survey (GPERS) system surveys of the surface of the soil stockpile in 1 m (3 ft) lifts. No radiological contamination was detected on the stockpiles. The survey identified one location near the eastern boundary of the excavation with elevated radiological activity. A limited amount of concrete and pipe debris, likely related to a former fire protection pipeline and valve box, was encountered during excavation; this was loaded directly into a container for disposal at ERDF.

4.1.18.3 Verification Sampling

Following remediation, verification sampling was conducted on June 3 and 4, 2009. The 100-D-29 waste site was divided into three decision units for verification sampling. Decision Unit A is the excavated area, Decision Unit B is the eastern soil stockpile, and Decision Unit C is the northwestern soil stockpile. Within Decision Unit A, verification soil samples were collected from 12 locations. Additionally, one focused verification soil sample was collected near the location of GPERS-indicated elevated radiological activity to verify the field radiological survey determination and the absence of contamination. Within Decision Unit B, verification soil samples were collected from 12 locations. Within Decision Unit C, verification soil samples were collected from 12 locations.

4.1.18.4 Statement of Protectiveness

The results of verification sampling indicate that the removal action achieved compliance with the RAOs and RAGs for the 100-D-29 waste site. The results of verification sampling show that residual contaminant concentrations do not preclude any future uses (as bounded by the rural-residential scenario) and allow for unrestricted use of shallow zone soils (i.e., surface to 4.6 m [15 ft] deep). The results also demonstrate that residual contaminant concentrations are protective of groundwater and the Columbia River. Site contamination did not extend into the deep zone soils; therefore, institutional controls to prevent uncontrolled drilling or excavation into the deep zone are not required. The 100-D-29 site has been reclassified as “Interim Closed Out.”

4.1.19 100-D-30, 185-D Sodium Dichromate Trench, 190-D Complex

Due to geographic location and similarity of remediation activities, cleanup activities for the 100-D-30 and 100-D-104 sites were conducted together. This section includes information about both sites.

4.1.19.1 Site Description

The 100-D-30 and 100-D-104 waste sites were releases associated with the use of sodium dichromate at the 190D Complex. The 190D Complex included the 190D, 189D, 185D, 190DA, 195D, and 1724D Buildings, with the 190D Building serving as the main pump house providing cooling water to the 105D Reactor. Sodium dichromate was added to the cooling water and used as a corrosion inhibitor.

During demolition of the 185D and 189D Buildings at the 190D Complex, sodium dichromate contamination was found in the sub-grade structures and at depths greater than 1 m (3 ft). Shortly after demolition and backfill of the site, yellow soil discoloration was observed at the surface. This residual contamination remaining in the soil and concrete rubble was located along the entire length of the demolished pipe trench at the eastern edge of the 185D Building footprint and was documented as the 100-D-30 waste site. Based on a review of the process information, the results of the geophysical survey, field observations, and photographs of surface soil staining, as well as previous sampling results, the site was determined to contain residual contamination. Residual total chromium and hexavalent chromium contamination in soil samples were measured at concentrations of 458 mg/kg and 500 mg/kg, respectively, exceeding the RAGs. Based on this information, it was determined that additional confirmatory sampling was not needed and remedial action at the site was necessary.

4.1.19.2 Excavation Operations

Initial remediation of the 100-D-30 waste site was performed from June 2006 through May 2007 and extended to a depth of 4.6 m (15 ft). Approximately 7,000 m^3 (9,160 yd^3) of stained soil, stained concrete, and construction debris were excavated, stockpiled next to the trench, and later disposed at ERDF. The 100-D-104 waste site (refer to Section 4.1.101 for more information) was discovered while performing the initial remedial action at the 100-D-30 waste site. Pieces of VCP were encountered at the southwest corner of the 100-D-30 excavation. A review of drawings indicated that an acid neutralization french drain, sulfuric acid tank, sodium dichromate tank, and sodium silicate tank were once located outside the southwest corner of the demolished 185D Building. Soil staining was observed in the general area of these former facilities within the 100-D-30 excavation. On December 20, 2007, additional soil removal was performed at this location to a depth of approximately 3 m (10 ft) bgs with stained soil and hexavalent chromium contamination present. Therefore, on March 4 and March 5, 2008, the excavation proceeded to a depth of 6 m (20 ft) bgs to open up the area for further evaluation. Stained soil and chromium contamination remained at this depth; however, the excavation was halted because digging any deeper required an engineering design. Subsequently, this location of sodium dichromate-contaminated soil that was excavated to a depth of 6 m (20 ft) was identified as a discovery site, 100-D-104.

Based upon the residual concentrations of contamination found at depth in the 100-D-30 and 100-D-104 waste sites, additional remediation was performed from October 2011 through March 2012, at each of these waste sites to a depth of approximately 15.2 m (50 ft) below surface grade. This excavation was identified as the Tier II excavation. Hexavalent chromium concentrations exceeding cleanup criteria were present at the base of the Tier II excavations. Therefore, the 100-D-30 and 100-D-104 Tier III excavation continued to a depth of approximately 24 m (78.7 ft) bgs. Beginning with the Tier III excavation, both waste sites were combined into one excavation. The Tier III excavation began in February 2013, and excavation to groundwater was completed in March 2014. Due to the depth and size of these excavations, considerable layback and overburden soil was removed and stockpiled.

In October 2014, stained soil was observed in the rewetted zone at two locations in the lower excavation sidewalls. Soil samples from the sidewalls above and below the water table and groundwater samples were collected. Hexavalent chromium was detected in these samples with concentrations ranging from 2.23 mg/kg up to 34.52 mg/kg. Additional soil removal was initiated on October 22, 2014, and completed on October 27, 2014. Approximately 722 BCM (944 BCY) of additional soil was removed and disposed at ERDF.

4.1.19.3 Verification Sampling

Verification sampling of the soil within the excavation and waste SPA footprints was conducted. The verification sampling of a SPA associated with 100-D-83:5 site (Section 4.1.82) remedial activities was included with the verification sampling at the 100-D-30 and 100-D-104 sites. Verification sampling consisted of 8 decision units for the excavation, 5 decision units for SPAs, and 16 decision units for overburden/layback. Twelve statistical samples were collected from each decision unit. A discrete soil sample was collected at each sample location. Verification sampling of the excavation was performed May 14, 2014, through May 27, 2014. Verification sampling of SPAs and overburden/layback was performed throughout the duration of the field activities, as needed, to support decision making related to closure of SPAs and use of overburden/layback for backfill.

All COCs/COPCs were quantified below groundwater and/or river protection soil RAGs except for lead, dichlorodiphenyldichloroethylene (DDE), and dichlorodiphenyltrichloroethane (DDT) that were detected in one decision unit; vanadium detected in one overburden/layback soil stockpile decision unit; and selenium detected in three decision units. In all instances, RESRAD modeling predicted that residual concentrations of these constituents will be protective of groundwater and the Columbia River.

4.1.19.4 Statement of Protectiveness

The results of verification sampling and modeling show that residual contaminant concentrations do not preclude any future uses (as bounded by the rural-residential scenario) and allow for unrestricted use of shallow zone soils (i.e., surface to 4.6 m [15 ft] deep). The results also demonstrate that residual contaminant concentrations are protective of groundwater and the Columbia River. Institutional controls to prevent uncontrolled drilling or excavation into the deep zone are not required. The 100-D-30 and 100-D-104 sites have been reclassified as “Interim Closed Out.”

4.1.20 100-D-31:1, 1607-D2 Septic Sewer Pipelines

Due to geographic location and similarity of remediation activities, cleanup activities for the 100-D-31:1 and 100-D-31:2 (Section 4.1.21) waste subsites were conducted together. This section includes information about both sites.

4.1.20.1 Site Description

The 100-D-31 waste site, comprising the 100D Water Treatment Facilities Underground Pipelines, is located to the northwest of the 105D Reactor. The 100-D-31 pipelines transported treated cooling water and process sewer wastes, including all nonradioactive waste streams from water treatment, reactor, and laboratory facilities. The 100-D-31:1 and 100-D-31:2 septic sewers fed into the 1607-D2:3 portion (Section 4.1.132) of the 1607-D2 sanitary sewer system, which was the main sanitary sewer servicing the 100-D Area. This system of sewers was active from 1944 to 1994.

The 100-D-31:1 subsite addresses a portion of the 1607-D2 septic sewer lines that transported sewage from manhole S-21D north to manhole S-25D. The 100-D-31:1 subsite consists of an approximately 390 m (1,280 ft) long, 8 in. diameter segment of VCP.

4.1.20.2 Excavation Operations

Remediation of the 100-D-31:1 and 100-D-31:2 subsites was performed between June 18, 2007 and July 17, 2008. The final excavation depths for the 100-D-31:1 and 100-D-31:2 subsites were approximately 5 m (16 ft) and 3 m (9 ft), respectively. The excavation resulted in approximately 2,512 BCM (3,287 BCY) of material being removed for disposal at ERDF, including approximately 756 m (2,480 ft) of pipe. Approximately 29,264 BCM (38,336 BCY) of soil (overburden) was removed and stockpiled for evaluation for use as clean backfill. There were no anomalies or stained soil discovered during remediation. Several miscellaneous pipelines crossing over the 100-D-31:1 and 100-D-31:2 pipelines were encountered during excavation. None of the crossing pipelines was connected to the 100-D-31:1 or 100-D-31:2 pipelines.

4.1.20.3 Verification Sampling

Verification sampling of the 100-D-31:1 and 100-D-31:2 subsites was performed on August 11 and 12, 2009. The footprints of the excavation and the overburden stockpiles were the decision units for verification sampling. A statistical sampling design was selected as the verification sampling approach. A total of 12 verification soil samples were collected for the combined 100-D-31:1 and 100-D-31:2 waste site excavation area. Additionally, 12 verification soil samples were taken from the overburden stockpiles.

All COCs/COPCs at the 100-D-31:1 and 100-D-31:2 subsites were undetected and/or quantified below RAGs and lookup values except for total PCBs in the excavation sampling. RESRAD modeling predicted that residual concentrations of total PCBs will be protective of groundwater and the Columbia River.

4.1.20.4 Statement of Protectiveness

Results of the verification sampling show that the 100-D-31:1 and 100-D-31:2 subsites meet the RAOs and RAGs. Residual contaminant concentrations support future land uses that can be represented (or bounded) by a rural-residential scenario. The results also demonstrate that residual contaminant concentrations support unrestricted future use of the shallow zone soil (i.e., surface to 4.6 m [15 ft]) and contaminant levels remaining in the soil are protective of groundwater and the Columbia River. This site does not have a deep zone; therefore, no deep zone institutional controls are required. The 100-D-31:1 and 100-D-31:2 subsites have been reclassified as “Interim Closed Out.”

4.1.21 100-D-31:2, 1700-D Series Buildings Septic Sewer Pipelines

The 100-D-31:2 site is the 1700D Series Buildings septic sewer pipelines. This pipeline segment is located between manholes S-19D and S-21D, where it is connected with the 100-D-31:1 pipeline. The 100-D-31:2 subsite consists of multiple segments of 8 in. diameter VCP totaling approximately 365 m (1,200 ft) in length. The majority of the 100-D-31:2 pipeline is parallel to D Avenue with offshoots that serviced multiple 1700D series buildings in the 100-D Area.

Due to geographic location and similarity of remediation activities, cleanup activities for the 100-D-31:1 (Section 4.1.20) and 100-D-31:2 subsites were conducted together. For information regarding the excavation, verification sampling, or the statement of protectiveness for the 100-D-31:2 site, refer to the 100-D-31:1 site. The 100-D-31:2 subsite has been reclassified as “Interim Closed Out.”

4.1.22 100-D-31:3, 105-D Sewer Pipelines

4.1.22.1 Site Description

The 100-D-31:3 and 100-D-31:4 (Section 4.1.23) process sewer pipelines actively transported process and septic sewer waste beginning in 1944 and continuing through 1994. During reactor operations from 1944 through 1967, the nonradioactive overflows, process cooling waste streams, filter backwashes, and floor drainage in nonradioactive areas became process sewer wastes. The 100-D-31:3 pipelines transported

septic sewer waste from the 105D Reactor north to manhole S-21D, and transported waste east from manhole S-13D and north to the 1607-D2 septic tank. The 100-D-31:3 subsite includes the septic sewer pipelines exiting the northwestern and eastern sides of the 108D Building and the septic sewer pipeline exiting the eastern side of the 1703D Building.

4.1.22.2 Excavation Operations

Remedial action at the 100-D-31:3 pipeline subsite was performed between May 19 and December 30, 2008. Excavation continued until all debris and contamination associated with the pipeline structures had been removed. The site was excavated to depths ranging from approximately 2.8 to 3.5 m (9.1 to 11.3 ft), resulting in approximately 7,687 BCM (10,070 BCY) of soil and piping/debris being removed for disposal at ERDF. In addition, approximately 785 linear m (2,576 linear ft) of pipe were removed. This piping was sorted within the excavation and direct loaded for disposal at ERDF. Overburden soil from the 100-D-31:3 and 100-D-31:4 subsites were stockpiled together.

On July 2, 2008, a 208.2 L (55 gal) metal drum was uncovered in the 100-D-31:3 excavation. Based on initial visual inspection, the drum was rusty but intact. The drum was determined to be empty and was managed as nonhazardous waste.

4.1.22.3 Verification Sampling

Verification sampling at the 100-D-31:3 and 100-D-31:4 subsites was performed between June 7, 2010, and January 21, 2011. The remediation footprint was used as the basis for the location of verification soil samples. The 100-D-31:3 and 100-D-31:4 subsites are identified as separate decision units. The overburden soil stockpile was formed from soil from both subsites and is also one decision unit. A total of 12 verification soil samples were specified and collected on a random-start triangular grid for each of the 100-D-31:3 and 100-D-31:4 subsite excavation areas. Twelve verification soil samples were collected from the overburden stockpiles.

All individual COC/COPC concentrations are below the groundwater and river protection soil RAGs except for selenium, Aroclor-1254, bis(2-ethylhexyl)phthalate, DDT, and DDE. RESRAD modeling predicted that residual concentrations of these contaminants are protective of groundwater and the Columbia River.

4.1.22.4 Statement of Protectiveness

Analytical results show that residual contaminant concentrations support future land uses that can be represented (or bounded) by a rural-residential scenario. The results also demonstrate that residual contaminant concentrations support unrestricted future use of shallow zone soil (i.e., surface to 4.6 m [15 ft]) and contaminant levels remaining in the soil are protective of groundwater and the Columbia River. The results also demonstrate that institutional controls are not required for the 100-D-31:3 or 100-D-31:4 subsites. Site contamination did not extend into the deep zone soils; therefore, no deep zone institutional controls are required. The 100-D-31:3 and 100-D-31:4 subsites have been reclassified as “Interim Closed Out.”

4.1.23 100-D-31:4, 190-D Sewer Pipelines

4.1.23.1 Site Description

The 100-D-31:4 process sewer pipelines actively transported process and septic sewer waste beginning in 1944 and continuing through 1994. During reactor operations from 1944 through 1967, the nonradioactive overflows, process cooling waste streams, filter backwashes, and floor drainage in nonradioactive areas became process sewer wastes that flowed through these pipelines. The 100-D-31:4 subsite pipelines consist of the 190D process sewer pipelines bounded by manholes S-13D and P-9D to

the east and manholes S-11D and P-13D to the west. The pipelines included in this subsection transported process sewer waste from the northeastern comer of the 186D Building and the northern side of the 190D Building to the 116-D-5 outfall (Section 4.1.111). The pipelines also transported the septic sewer waste from the northern side of the 186D Building and the northern and eastern sides of the 190D Building. The 100-D-31:4 subsite pipelines also intersect with pipelines from 100-D-31:8 (Section 4.1.27) and 100-D-31:9 (Section 4.1.28) at junction box P-13D and manhole S-11D, respectively.

4.1.23.2 Excavation Operations

Remedial action at the 100-D-31:4 pipeline subsite was performed between September 26, 2008, and December 10, 2009. Excavation continued until all debris and contamination associated with the pipeline structure had been removed. The site was excavated to depths ranging from approximately 3.8 to 4.8 m (13 to 16 ft), resulting in approximately 9,883 BCM (12,926 BCY) of soil and piping/debris being removed for disposal at ERDF. In addition, approximately 636 linear m (2,087 linear ft) of pipe were removed. This piping was sorted within the excavation and direct loaded for disposal at ERDF.

During the remediation of the 100-D-31:4 pipeline subsite, it was determined that construction of a land bridge spanning across a portion of the open excavated trench was needed to support both existing and future pump and treat lines prior to cleanup verification statistical sampling. To allow for the construction of the land bridge, three focused samples were collected within 1 m (3.3 ft) of either side of the pipeline along the center line of the bottom of the excavation. The focused sample results were directly compared to the shallow zone RAOs and RAGs. No results were above shallow zone RAGs.

4.1.23.3 Verification Sampling

Verification sampling at the 100-D-31:3 and 100-D-31:4 subsites were conducted together. Refer to Section 4.1.22 for additional information about 100-D-31:4 subsites verification sampling.

4.1.23.4 Statement of Protectiveness

Refer to Section 4.1.22 for the 100-D-31:4 subsite statement of protection.

4.1.24 100-D-31:5, 188-D Ash Disposal Pipeline

4.1.24.1 Site Description

The 184D Powerhouse produced significant amounts of coal ash as a byproduct of burning coal for steam production. Steam was used as a backup power source to pump cooling water and for heating of various buildings. The powerhouse began operation in 1944 and was demolished in 1980. The ash disposal basin was in operation from 1950 to 1960. Coal ash from the powerhouse and raw Columbia River water were mixed to produce a slurry that was sluiced to the 188D Ash Disposal Basin via a 133 m (370 ft) long underground 8 in. diameter Ashcolite® pipeline. The pipeline, which runs north from the 184D Powerhouse to the 188D Ash Disposal Basin, has been designated as the 100-D-31:5 subsite.

4.1.24.2 Excavation Operations

Remedial action at the 100-D-31:5 site was performed between October 29, 2007, and January 9, 2008. The site was excavated between 1.2 m (4 ft) and 1.7 m (5.5 ft) belowgrade, resulting in approximately 94 BCM (123 BCY) of material removed for disposal at ERDF, including removal of approximately 108 m (353 ft) of pipeline. Approximately 852 BCM (1,114 BCY) of soil (overburden) was removed and stockpiled for evaluation for use as clean backfill.

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4.1.24.3 Verification Sampling

Verification sampling at the 100-D-31:5 subsite was performed on August 26, October 13, and December 30, 2008. A preliminary examination of the analytical data from samples collected on August 26, 2008, found hexavalent chromium data with elevated practical quantitation limits. To get better QA/QC values, the project recollected the entire sample set on October 13 and December 30, 2008, and analyzed them for hexavalent chromium. Analytical results for hexavalent chromium were nondetected for all samples in both data sets. The footprints of the 100-D-31:5 subsite excavation area and the overburden soil stockpiles were selected as the decision units and used as the basis for location of a random-start systematic grid for verification soil sampling. For each of the three sampling events, 10 verification soil sample locations were identified for each of the decision units using a random-start, triangular grid.

Sample results indicate all residual COPC concentrations are below applicable RAGs except for barium, selenium, and zinc in the excavation area and barium and selenium in the overburden. RESRAD modeling predicted that residual concentrations of these contaminants will be protective of groundwater and the Columbia River.

4.1.24.4 Statement of Protectiveness

Verification sampling results support an evaluation that residual contaminant concentrations at the 100-D-31:5 subsite do not preclude any future uses (as bounded by the rural-residential scenario) and allow for unrestricted use of shallow zone soils (i.e., surface to 4.6 m [15 ft] deep). The results also demonstrate that residual contaminant concentrations are protective of groundwater and the Columbia River. Therefore, the 100-D-31:5 subsite does not pose a risk to human health and the envionrment, and no institutional controls are required. The subsite does not have a deep zone or residual contaminant concentrations that would require any institutional controls. The 100-D-31:5 site has been reclassified as “Interim Closed Out.”

4.1.25 100-D-31:6, 184-D Powerhouse Sewer Pipelines

4.1.25.1 Site Description

The 100-D-31:6 subsite is part of the 100-D-31, 100-D Water Treatment Facilities Underground Pipelines. The 100-D-31:6 subsite is located north and west of the 105D Reactor and included a total of four pipeline segments. Three of these were process sewer pipelines and the fourth was a sanitary sewer pipeline, all of which exited the 184D Building.

4.1.25.2 Excavation Operations

Remedial action at the 100-D-31:6 site was performed between November 1, 2007, and March 5, 2008. The site was excavated between 1.5 m (5 ft) and 3.3 m (7.5 ft) belowgrade resulting in approximately 371 BCM (485 BCY) of material removed for disposal at ERDF, including approximately 329 m (1,079 ft) of VCP encased in concrete and 30 m (98 ft) of steel pipe. Approximately 2,440 BCM (3,192 BCY) of soil (overburden) was removed and stockpiled for evaluation as clean backfill.

4.1.25.3 Verification Sampling

Verification sampling at the 100-D-31:6 subsite was performed on October 7, 2008. The 100-D-31:6 subsite was divided into two decision units for verification sampling. The first decision unit consisted of the excavated footprint of the pipelines and the second decision unit consisted of the overburden soil stockpile. A random-start systematic grid was used for verification soil sample collection. The sampling area was restricted to a narrow segment of the excavation floor directly below the locations of the remediated pipelines as well as the areas from which pipelines had been previously removed. This was

done to improve the chances for finding residual contamination should any still exist. Ten samples were collected from each decision unit.

Cleanup verification sample results for copper, mercury, and chrysene exceed soil RAGs for the protection of groundwater and/or the Columbia River. RESRAD modeling predicted that residual concentrations of these constituents will be protective of groundwater and the Columbia River.

4.1.25.4 Statement of Protectiveness

These results show that residual soil concentrations support future land uses that can be represented (or bounded) by a rural-residential scenario. The results also demonstrate that residual contaminant concentrations support unrestricted future use of shallow zone soil (i.e., surface to 4.6 m [15 ft]) and contaminant levels remaining in the soil are protective of groundwater and the Columbia River. This site does not have a deep zone; therefore, no deep zone institutional controls are required. The 100-D-31:6 site has been reclassified as "Interim Closed Out."

4.1.26 100-D-31:7, 116-D-5 and D-Pond Sewer Pipeline

4.1.26.1 Site Description

The 100-D-31:7, 166-D-5 and D-Pond Sewer Pipeline site transported process and septic sewer waste from 1944 to 1994. During reactor operations, the nonradioactive overflows, process cooling waste streams, filter backwashes, and floor drains in nonradioactive areas became process sewer wastes. The 100-D-31:7 main pipeline carried water treatment waste and rainwater runoff to the 116-D-5 Outfall until 1977, when the process sewer drainage was diverted solely to the 100D Ponds (120-D-1) from 1977 to 1994. The 100-D-31:7 process sewer received effluent from the following facilities: 105-D, 182D, 183D, 184D, 185D, 186D, 189D, and 190D.

4.1.26.2 Excavation Operations

Remedial action at the 100-D-31:7 pipeline subsite began on November 5, 2007, and continued through December 9, 2009. Excavation continued until all debris and contamination associated with the pipeline structure was removed. The site was excavated to depths between 12 m (40 ft) and 16 m (53 ft) belowgrade resulting in approximately 17,684 BCM (23,130 BCY) of material removed for disposal at ERDF, including approximately 480 m (1,575 ft) of pipe. Approximately 135,013 BCM (176,590 BCY) of overburden soil was removed and stockpiled for evaluation for use as clean backfill.

An intact 946.3 L (250 gal) motor oil storage tank was found within the layback of the 100-D-31:7 pipeline subsite excavation. The tank was determined to be associated with the 130-D-1, 1716 Gasoline Storage Tank waste site (Section 4.1.125). All piping associated with the 130-D-1 waste site that was present within the 100-D-31:7 excavation was removed.

4.1.26.3 Verification Sampling

On February 10, 2010, four verification soil samples were collected to support the construction of a land bridge at the northern end of the 100-D-31:7 pipeline subsite. One sample was collected from the pipeline excavation within the footprint of the proposed location of the land bridge. Three samples were collected from the portion of the overburden soil stockpile that was used as backfill material for the land bridge.

The remaining statistical and focused verification soil samples were collected on April 27 and 29, 2010. The 100-D-31:7 pipeline subsite was divided into two decision units consisting of the pipeline excavation and the overburden soil stockpiles. A statistical sampling approach was used for evaluation of both decision units. The footprint for each of the 100-D-31:7 pipeline excavation and overburden soil stockpile decision units were used as the basis for statistical verification soil sample locations.

Additionally, focused samples were placed at locations where the 100-D-31:6 pipeline subsite connected to the 100-D-31:7 pipeline.

Beryllium is the only constituent with a maximum value that exceeded groundwater and Columbia River protection RAGs, and greater than 10% of the data set for beryllium exceeded groundwater and Columbia River protection RAGs. RESRAD modeling predicted that residual concentrations of beryllium will be protective of groundwater and the Columbia River.

4.1.26.4 Statement of Protectiveness

The results of verification sampling show that residual contaminant concentrations do not preclude any future uses (as bounded by the rural-residential scenario) and allow for unrestricted use of shallow zone soils (i.e., surface to 4.6 m [15 ft] deep). The results also demonstrate that residual contaminant concentrations are protective of groundwater and the Columbia River. The site extended into the deep zone (greater than 4.6 m [15 ft] deep); however, the site was closed out using the more restrictive shallow zone criteria. Therefore, institutional controls to prevent uncontrolled drilling or excavation into the deep zone are not required. The 100-D-31:7 site has been reclassified as “Interim Closed Out.”

4.1.27 100-D-31:8, 183-D and 186-D Northern Sewer Pipelines

4.1.27.1 Site Description

The 100-D-31:8, 183-D and 186-D Northern Sewer Pipelines is a subsite of the 100-D-31, 100-D Water Treatment Facilities Underground Pipelines waste site. The 100-D-31 waste site is a collection of pipelines located north and west of the 105D Reactor. These pipelines carried treated cooling water and process sewer wastes, including all nonradioactive waste streams from the 100D water treatment, 105D Reactor, and laboratory facilities.

The 100-D-31:8 underground pipelines were pre-reactor (pre-irradiation) disposal and supply lines. The 100-D-31:8 pipelines were active from 1944 to 1994, transporting process and septic sewer waste. During reactor operations, the nonradioactive overflows, process cooling waste streams, filter backwashes, and floor drainage in nonradioactive areas became process sewer wastes.

A review of the waste flow for the 100-D-31 waste site showed that the 100-D-31:8 pipelines received waste from the 100-D-31:9 (Section 4.1.28), 100-D-31:10 (Section 4.1.29), 100-D-31:11 (Section 4.1.30), and 100-D-31:12 (Section 4.1.31) sewer pipelines before transferring the material to the 100-D-31:4 (Section 4.1.23) and 100-D-31:7 (Section 4.1.26) sewer pipelines.

The 100-D-31:8 pipelines received waste water from the north side of the 182D and 183D Buildings via the 100-D-31:11 pipelines. The 100-D-31:8 pipelines also received waste water from the 186D Building where it connected to the 100-D-31:9 pipelines. The waste water was then transferred to the 100-D-31:4 and 100-D-31:7 pipelines.

4.1.27.2 Excavation Operations

Remedial action at the 100-D-31:8 subsite was performed between August 27, 2009, and May 19, 2010. The final excavation depth for 100-D-31:8 was approximately 9 m (30 ft). The excavation resulted in approximately 5,732 BCM (7,509 BCY) of material removed for disposal at ERDF. Additionally, approximately 535 m (1,755 ft) of pipe were removed and disposed at ERDF. Approximately 61,330 BCM (80,432 BCY) of soil (overburden) was removed and stockpiled for evaluation for use as clean backfill.

The debris removed from the 100-D-31:8 subsite consisted of VCP, metal, and concrete material. All debris within the excavated areas, including contaminated soil, was disposed at ERDF. No unexpected stained soils or anomalous waste materials were discovered within the excavated area during remediation.

A water release from the 100-D-63 site was pumped to the 100-D-31:8 and 100-D-31:9 open excavation. On March 2, 2010, an in-process sample was collected from inside the water release footprint within 100-D-31:8. Based on results of this in-process sample, the soil from within the water release footprint was placed in the associated overburden stockpile.

4.1.27.3 Verification Sampling

On September 30 and October 6, 2009, three verification soil samples were collected to support the construction of a land bridge at the 100-D-31:8 pipeline subsite. Single focused samples were collected at the proposed center of the land bridge and at the east and west side edges of the planned land bridge. The 100-D-31:8 land bridge center sample had a hexavalent chromium result that did not meet the direct exposure RAG. An additional 6 by 1.6 m (20 by 5 ft) area by 1 m (3 ft) deep excavation was dug to remove potentially contaminated soil. A final focused sample was collected on October 28, 2009, from the center sample location at the bottom of the excavation and analyzed for hexavalent chromium only. This result met the RAGs.

Following site remediation, additional verification sampling of the 100-D-31:8 pipeline subsite was conducted from March 1 through 3, 2011. Twelve statistical samples were collected and analyzed in the excavated area and 12 statistical samples were collected and analyzed in the overburden stockpile area.

Groundwater and/or Columbia River protection soil RAGs are exceeded by benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, DDE, and DDT. The residual concentrations of these COPCs are not predicted to migrate to groundwater within 1,000 years, and are therefore protective of groundwater and the Columbia River. The results indicate that the remediation achieved compliance with the RAGs and RAOs.

4.1.27.4 Statement of Protectiveness

The results of verification sampling show that residual contaminant concentrations do not preclude any future uses (as bounded by the rural-residential scenario) and allow for unrestricted use of shallow zone soils (i.e., surface to 4.6 m [15 ft] deep). The results also demonstrate that residual contaminant concentrations are protective of groundwater and the Columbia River. Although excavation extended into the deep zone (below 4.6 m [15 ft]), the entire site is closed out using the more restrictive shallow zone direct exposure, groundwater, and river protection cleanup criteria. The results of verification sampling indicate that concentrations of residual contamination do not exceed direct exposure cleanup levels. Institutional controls to prevent uncontrolled drilling or excavation into the deep zone are not required. The 100-D-31:8 site has been reclassified as “Interim Closed Out.”

4.1.28 100-D-31:9, 183-D and 186-D Process Sewer Pipelines

4.1.28.1 Site Description

The 100-D-31:9, 183D and 186D Process Sewer Pipelines is a subsite of the 100-D-31, 100D Water Treatment Facilities Underground Pipelines waste site. The 100-D-31 waste site is a collection of pipelines located north and west of the 105D Reactor. These pipelines carried treated cooling water and process sewer wastes, including all nonradioactive waste streams from the 100D water treatment, 105D Reactor, and laboratory facilities.

The 100-D-31:9 underground pipelines were pre-reactor (pre-irradiation) disposal and supply lines. The 100-D-31:9 pipelines were active from 1944 to 1994, transporting process and septic sewer waste.

During reactor operations, the nonradioactive overflows, process cooling waste streams, filter backwashes, and floor drainage in nonradioactive areas became process sewer wastes.

The 100-D-31:9 pipelines consist of the 183D and 186D Buildings process sewer. These pipelines exit the buildings at various locations, including a 24 in. diameter VCP and a 54 in. diameter concrete pipe, which are continuations of the 100-D-50:7, 183DR Head House Floor Drain and Catch Basins Pipelines (Section 4.1.49) and connect to the 100-D-31:8 pipelines (Section 4.1.27).

4.1.28.2 Excavation Operations

Remedial action at the 100-D-31:9 subsite was performed between July 15, 2009, and April 21, 2010. The final excavation depth for 100-D-31:9 was approximately 7 m (23 ft). The excavation resulted in approximately 11,485 BCM (15,045 BCY) of material removed for disposal at ERDF. Additionally, approximately 705 m (2,313 ft) of pipe were removed and disposed at ERDF. Approximately 44,310 BCM (57,957 BCY) of soil (overburden) was removed and stockpiled for evaluation for use as clean backfill.

The debris removed consisted of VCP, metal, and concrete material. All debris within the excavated areas, including contaminated soil, was disposed at ERDF. No unexpected stained soils or anomalous waste materials were discovered within the excavated area during remediation.

A water release from the 100-D-63 site was pumped to the 100-D-31:8 and 100-D-31:9 open excavation. On March 2, 2010, an in-process sample was collected from inside the water release footprint within 100-D-31:9; and on March 4, 2010, an in-process sample was collected from outside the water release footprint. Based on results of these in-process samples, the soil from within the water release footprint was placed in the associated overburden stockpile.

4.1.28.3 Verification Sampling

Verification sampling was conducted from March 1 through 3, 2011, using a statistical sampling design. Twelve samples were collected and analyzed from each decision unit (excavated area and the overburden stockpile area).

Groundwater and/or Columbia River protection soil RAGs are exceeded by benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, DDE, and DDT. The residual concentrations of these COPCs are not predicted to migrate to groundwater within 1,000 years and are therefore protective of groundwater and the Columbia River. The results indicate that the remediation achieved compliance with the RAGs and RAOs.

4.1.28.4 Statement of Protectiveness

The results of verification sampling show that residual contaminant concentrations do not preclude any future uses (as bounded by the rural-residential scenario) and allow for unrestricted use of shallow zone soils (i.e., surface to 4.6 m [15 ft] deep). The results also demonstrate that residual contaminant concentrations are protective of groundwater and the Columbia River. Although excavation extended into the deep zone (below 4.6 m [15 ft]), the entire site is closed out using the more restrictive shallow zone direct exposure, groundwater, and river protection cleanup criteria. The results of verification sampling indicate that concentrations of residual contamination do not exceed direct exposure cleanup levels. Institutional controls to prevent uncontrolled drilling or excavation into the deep zone are not required. The 100-D-31:9 site has been reclassified as “Interim Closed Out.”

4.1.29 100-D-31:10, 182-D North Septic Sewer Pipeline

4.1.29.1 Site Description

The 100-D-31:10, 182-D North Septic Sewer Pipeline is a subsite of the 100-D-31, 100D Water Treatment Facilities Underground Pipelines waste site. The 100-D-31 waste site is a collection of pipelines located north and west of the 105D Reactor. These pipelines carried treated cooling water and process sewer wastes, including all nonradioactive waste streams from the 100D water treatment, 105D Reactor, and laboratory facilities.

The 100-D-31:10 underground pipeline was pre-reactor (pre-irradiation) disposal and supply lines. The 100-D-31:10 pipeline was active from 1944 to 1994, transporting process and septic sewer waste. During reactor operations, the nonradioactive overflows, process cooling waste streams, filter backwashes, and floor drainage in nonradioactive areas became process sewer wastes.

The 100-D-31:10 pipelines consist of the 182D Building septic sewer. These pipelines exit the building at various locations and connect to the 100-D-31:11 pipelines (Section 4.1.30).

4.1.29.2 Excavation Operations

Remedial action at the 100-D-31:10 subsite was performed between December 29, 2009, and January 27, 2010. The final excavation depth for 100-D-31:10 was approximately 3 m (10 ft). The excavation resulted in approximately 208 BCM (272 BCY) of material removed for disposal at ERDF. Additionally, approximately 128 m (420 ft) of pipe were removed and disposed at ERDF. Approximately 1,544 BCM (2,019 BCY) of soil (overburden) was removed and stockpiled for evaluation for use as clean backfill.

The debris removed consisted of VCP, metal, and concrete material. All debris within the excavated areas, including contaminated soil, was disposed at ERDF. No unexpected stained soils or anomalous waste materials were discovered within the excavated area during remediation.

4.1.29.3 Verification Sampling

Verification sampling was conducted from March 1 through 3, 2011. A statistical sample design was used. Fourteen samples were collected and analyzed in the excavated area, and 11 samples were collected and analyzed in the overburden stockpile area.

Groundwater and/or Columbia River protection soil RAGs are exceeded by benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, DDE, and DDT. The residual concentrations of these COPCs are not predicted to migrate to groundwater within 1,000 years, and are therefore protective of groundwater and the Columbia River. The sampling results indicate that the remediation achieved compliance with the RAGs and RAOs.

4.1.29.4 Statement of Protectiveness

The results of verification sampling show that residual contaminant concentrations do not preclude any future uses (as bounded by the rural-residential scenario) and allow for unrestricted use of shallow zone soils (i.e., surface to 4.6 m [15 ft] deep). The results also demonstrate that residual contaminant concentrations are protective of groundwater and the Columbia River. Although excavation extended into the deep zone (below 4.6 m [15 ft]), the entire site is closed out using the more restrictive shallow zone direct exposure, groundwater, and river protection cleanup criteria. The results of verification sampling indicate that concentrations of residual contamination do not exceed direct exposure cleanup levels. Institutional controls to prevent uncontrolled drilling or excavation into the deep zone are not required. The 100-D-31:10 site has been reclassified as “Interim Closed Out.”

4.1.30 100-D-31:11, 182-D and 183-D Sewer Pipelines

The 100-D-31, 100D Water Treatment Facilities Underground Pipelines transported treated cooling water, septic sewer wastes, and process sewer wastes. The 100-D-31:11 subsite consisted of sanitary sewer pipelines associated with the 182D and 183D facilities. A portion of the 100-D-31:11 pipeline was located on the north end of the northern 183D Clearwell that has been retained as a bat habitat.

Due to geographic location and similarity of remediation activities, the 100-D-31:11, 100-D-31:12 (Section 4.1.31), and 100-D-72 (Section 4.1.66) sites were interim closed as one decision unit. For information regarding 100-D-31:11, refer to the 100-D-72 site (Section 4.1.66).

The 100-D-31:11 site has been reclassified as “Interim Closed Out.”

4.1.31 100-D-31:12, 183-D West Process Sewer Pipelines

The 100-D-31, 100D Water Treatment Facilities Underground Pipelines transported treated cooling water, septic sewer wastes, and process sewer wastes. The 100-D-31:12 subsite consisted of process sewer pipelines associated with the 183D facility.

Due to geographic location and similarity of remediation activities, the 100-D-31.11 (Section 4.1.30), 100-D-31:12, and 100-D-72 (Section 4.1.66) sites were interim closed as one decision unit. For information regarding 100-D-31:12, refer to the 100-D-72 site (Section 4.1.66).

The 100-D-31:12 site has been reclassified as “Interim Closed Out.”

4.1.32 100-D-32, Minor Construction Burial Ground #6

4.1.32.1 Site Description

The 100-D-32, Minor Construction Burial Ground #6 was a trench dug in the fall of 1956. The burial ground was planned to be used for the disposal of contaminated material and equipment removed from the 105-D and 105-DR Reactors and effluent disposal systems during modification work. The site is located approximately 150 m (500 ft) southeast of the 105D Reactor and 25 m (80 ft) north of the railroad tracks. There is no documentation that this burial ground was used.

4.1.32.2 Excavation Operations

Remedial action at the 100-D-32 site began on August 28, 2007, with the removal of 375 BCM (490 BCY) of overburden material. The overburden was stockpiled east of the burial ground. Excavation continued through September 5, 2007, to a remedial design depth of approximately 3 m (10 ft), resulting in approximately 600 BCM (785 BCY) of material removed for disposal at ERDF.

Given that only a small amount of concrete debris was encountered during excavation, the floor of the excavation had not reached beyond the limit of disturbed soil, and the uncertainty of the depth of the burial ground. Further exploratory excavation was completed on July 31, 2008, at the base of the burial ground excavation to verify that no waste was present below the 3 m (10 ft) remedial design depth. An additional 525 BCM (687 BCY) of soil was removed from the side slopes and excavation floor and placed on the overburden stockpile. Exploratory excavation was performed to a depth of 6 m (20 ft), with native soil encountered at a depth of approximately 5 m (17 ft) bgs. A steel pipe was uncovered along the southwestern corner of the 100-D-32 excavation sidewall at approximately 0.6 m (2 ft) bgs.

4.1.32.3 Verification Sampling

The statistical sampling design was used for sampling the 100-D-32 site. The 100-D-32 site was divided into two decision units for verification sampling: the burial ground excavation and the overburden soil stockpile. Twelve verification soil samples were collected for the excavation shallow zone (Decision

Unit #1) and 12 verification soil samples were collected from the overburden stockpiles (Decision Unit #2) on December 17 and 18, 2008.

All COPCs were undetected and/or quantified below RAGs and lookup values except for vanadium and zinc. RESRAD modeling predicted that residual concentrations of vanadium and zinc will be protective of groundwater and the Columbia River.

4.1.32.4 Statement of Protectiveness

The results of verification sampling show that residual contaminant concentrations do not preclude any future uses (as bounded by the rural-residential scenario) and allow for unrestricted use of shallow zone soils (i.e., surface to 4.6 m [15 ft] deep). The results also demonstrate that residual contaminant concentrations are protective of groundwater and the Columbia River. Site contamination did not extend into the deep zone soils; therefore, institutional controls to prevent uncontrolled drilling or excavation into the deep zone are not required. The 100-D-32 site has been reclassified as "Interim Closed Out."

4.1.33 100-D-42, Buried VSR Thimble Site

Due to geographic location and similarity of remediation activities, the 100-D-42, 100-D-43 (Section 4.2.7), and 100-D-45 (Section 4.1.34) sites were interim closed out as one decision unit. The three waste sites have been collectively referred to as the "Undocumented Solid Waste Site, Buried VSR Thimble." This section includes information about all three sites.

4.1.33.1 Site Description

The 100-D-42 Buried Vertical Safety Rod (VSR) Thimble Site was a solid waste burial ground located east of the 105D Reactor and south of the railroad spur that serviced the 105D Reactor. Three monuments were located south of the 100-D-42 Burial Ground, bordering the 100-D-43 and 100-D-45 Burial Grounds marking the location of buried thimbles. No notable features with the characteristics of an excavated area or buried debris site were detected at the documented location of the 100-D-42 site.

4.1.33.2 Excavation Operations

Remedial action at the 100-D-42 Burial Ground began on April 22, 2008, with the removal of 495 BCM (647 BCY) of overburden material. Excavation of the burial ground was initiated on April 25, 2008, and continued through May 13, 2008, to a depth of approximately 5 m (16 ft), resulting in approximately 530 BCM (693 BCY) of contaminated soil and debris removed for disposal at ERDF. Only concrete debris and plastic sheeting were found to be present in the 100-D-42 Burial Ground.

Remedial action at the 100-D-43 Burial Ground began on September 10, 2007, with the removal of 165 BCM (216 BCY) of overburden material. Excavation began on September 25, 2007, and continued through October 10, 2007, to a depth of approximately 5.0 m (16 ft), resulting in approximately 803 BCM (1,050 BCY) of contaminated soil and debris removed for disposal at ERDF.

Remedial action at the 100-D-45 Burial Ground began on September 6, 2007, with the removal of 930 BCM (1,216 BCY) of overburden material. Excavation began on September 11, 2007, and continued through July 23, 2008 to a depth of approximately 7 m (23 ft) resulting in approximately 2,605 BCM (3,407 BCY) of contaminated soil and debris removed for disposal at ERDF. Mastic, aluminum pipe, VSR thimbles, reactor hardware, and a drum containing rags were found in the 100-D-45 Burial Ground.

4.1.33.3 Verification Sampling

The 100-D-42, 100-D-43, and 100-D-45 waste sites were divided into two decision units for verification sampling; specifically, the excavation footprint and the overburden soil stockpile. Two methods for

selecting the sampling locations were utilized: statistical sampling designs and focused sampling locations.

GPERS surveys were conducted within the 100-D-42, 100-D-43, and 100-D-45 Burial Grounds excavation as well as on the stockpiled material. There was no elevated contamination detected in the 100-D-42 Burial Grounds. Twelve statistical soil samples were collected from the excavation on a random-start, triangular grid. Verification sampling of the overburden soil stockpile was performed to evaluate the suitability of the soil for use as clean backfill for the excavation. Twelve statistical soil samples were collected from the overburden stockpile.

One focused sample was collected from the location where the GPERS results showed elevated radiological contamination. Additional material was removed from the location, and a replacement sample was collected. Upon review of the replacement sample data, it was determined additional excavation was required. The contaminated soil was removed, and a second replacement sample was collected.

All COCs/COPCs were undetected and/or quantified below RAGs and lookup values except for copper detected above the soil RAG for river protection in statistical sampling and nickel-63 detected above the soil lookup values for groundwater and river protection in focused sampling. Based on the RESRAD calculations for the 100 Area Analogous Sites, the residual concentration of copper is predicted to be protective of groundwater and the Columbia River. Site-specific RESRAD modeling was performed for nickel-63 and other residual radionuclides in the focused samples to determine that residual concentrations are protective of human health. The RESRAD model predicted that cesium-137, cobalt-60, and nickel-63 will impact groundwater within 1,000 years. Predicted groundwater concentrations of the three radionuclide contaminants are less than one-fifth of the maximum contaminant levels equivalent to a 4 mrem/yr beta/gamma drinking water dose rate. Therefore, the cumulative drinking water dose will be below the 4 mrem/yr dose rate standard.

4.1.33.4 Statement of Protectiveness

Due to the location of the thimble sites being in close proximity to each other and the type of debris encountered during excavation, the three sites are included as one decision unit. The results of verification sampling show that residual contaminant concentrations do not preclude any future uses (as bounded by the rural-residential scenario) and allow for unrestricted use of shallow zone soils (i.e., surface to 4.6 m [15 ft] deep). The results also demonstrate that residual contaminant concentrations are protective of groundwater and the Columbia River. The 100-D-42 site has been reclassified as “Interim Closed Out.”

4.1.34 100-D-45, Buried VSR Thimble Site, Burial Ground 4B, 118-D-4B

The 100-D-45 Buried VSR Thimble Site was a solid waste burial ground located east of the 105D Reactor and south of the railroad spur that serviced the 105D Reactor. The 100-D-45 site is predominantly located within the 100D Area perimeter fence (west side), but a portion extends outside of the fence to the east. Only the eastern side of the perimeter fence was investigated in June 2004 due to ongoing activities in the area that limited access to the site. The VSR thimbles, aluminum piping, and other reactor hardware were found to be present in the 100-D-45 Burial Ground.

Due to geographic location and similarity of remediation activities, the 100-D-42 (Section 4.1.33), 100-D-43 (Section 4.2.7), and 100-D-45 sites were interim closed out as one decision unit.
For information regarding excavation, verification sampling, or the statement of protectiveness for 100-D-45, refer to the 100-D-42 site (Section 4.1.33).

The 100-D-45 site has been reclassified as “Interim Closed Out.”

4.1.35 100-D-48:1, North Pipelines from 116-D-7 to the Outfalls

Due to the geographic location and similarity of remediation activities, the 100-D-48:1, 100-D-49:1 (Section 4.1.39), 100-D-19 (Section 4.1.12), and UPR-100-D-4 (Section 4.1.141) sites were interim closed out collectively as one decision unit referred to as the 100-D-48:1/49:1 Pipelines site. For the purposes of this report, the 100-D-48:1, 100-D-49:1, 100-D-19, and UPR-100-D-4 sites are collectively refered to as the 100-D-48:1/49:1 Pipelines site in the following subsections. Subsection 4.1.35.1 includes information specific to the 100-D-48:1 and 100-D-49:1 pipeline sections. The remaining subsections refer to the 100-D-48:1/49:1 Pipelines site.

4.1.35.1 Site Description

The 100-D-48:1 and 100-D-49:1 pipeline sections of the former 105-D and 105-DR Reactor cooling water effluent pipelines ran from the 116-D-7 and 116-DR-9 Retention Basins to the 116-D-5 and 116-DR-5 Outfalls. The pipelines are located to the north of the 116-DR-9 and 116-D-7 Retention Basins. The pipelines were constructed of 60 in. diameter carbon steel. The cooling water effluent pipelines were used from 1944 until 1967 when the 105D and 105DR Reactors were shut down.

4.1.35.2 Excavation Operations

Remedial action at the 100-D-48:1/49:1 Pipelines site began on December 28, 1998. Excavation of the site involved removing the overburden materials, the contaminated structure, and underlying contaminated soil. Based on field screening, overburden materials identified as potentially clean were placed in stockpiles for potential use as backfill. Materials that were found to be contaminated were disposed at ERDF. On July 24, 2000, the excavation reached the design depth. Because remediation of the 100-D-48:1/49:1 Pipelines site required moving an active overhead power line, site remedial action and sampling were conducted in two phases. These separate phases are reflected by the long period between the start and finish dates for excavation.

At the completion of remedial action, the excavation was approximately 15,504 m^2 (166,800 ft^2) in area with a maximum depth of approximately 6.0 m (20 ft) bgs. Approximately 107,266 metric tons (118,241 tons) of material from the 100-D-48:1/49:1 Pipelines site has been disposed at ERDF through July 2000.

4.1.35.3 Verification Sampling

Final cleanup verification samples were collected following variance sampling. Cleanup verification sampling began on April 3, 2000, and was finished on August 8, 2000. The 100-D-48:1/49:1 Pipelines site consisted of both a shallow and a deep zone decision unit. The shallow zone decision unit sample design contained three decision subunits. Four composite samples were collected from each of the three decision subunits (12 total samples). The deep zone decision unit design contained two decision subunits. Three composite samples were collected from each deep zone decision subunit (six total samples) in addition to QA/QC samples. Two additional samples were collected from the estimated footprint of the 100-D-19 site to assess for the COCs that are specific to 100-D-19. The COCs specific to 100-D-19 are only applicable to the deep zone, because the location of the 100-D-19 site footprint is entirely within the 100-D-48:1/49:1 site excavation and the adjacent 116-D-7 Retention Basin excavation. The final verification samples were sent to offsite laboratories for analysis.

Results for the deep zone decision unit indicate that hexavalent chromium and mercury concentrations exceeded the RAGs for groundwater and surface water protection. RESRAD modeling predicted that residual concentrations of hexavalent chromium and mercury will be protective of groundwater and the Columbia River.

4.1.35.4 Statement of Protectiveness

The remedial action at the 100-D-48:1/49:1 Pipelines site has achieved the RAOs and corresponding RAGs. The remaining soils at the 100-D-48:1/49:1 Pipelines site have been sampled, analyzed, and modeled. The results of this effort indicate that the materials from the 100-D-48:1/49:1 Pipelines site containing COCs at concentrations exceeding the RAGs have been excavated and disposed at ERDF. Residual concentrations in the shallow zone will support future land uses that can be represented (or bounded) by a rural-residential scenario and that residual COC concentrations throughout the site do not pose an unacceptable threat to groundwater or the Columbia River. The acceptability of unrestricted direct exposure to deep zone soils has not been demonstrated; therefore, institutional controls to prevent uncontrolled drilling or excavation into the deep zone (i.e., below 4.6 m [15 ft]) are required.
The 100-D-48:1/49:1 Pipelines site, including the 100-D-19 and UPR-100-D-4 sites have been reclassified as "Interim Closed Out."

4.1.36 100-D-48:2, West Pipelines from D Avenue to 116-D-7

Due to the geographic location and similarity of remediation activities, the 100-D-48:2, 100-D-49:2 (Section 4.1.40), UPR-100-D-2 (Section 4.1.139), and UPR-100-D-3 (Section 4.1.140) sites were interim closed out as one decision unit referred to as the 100-D-48:2/49:2 Pipelines site. Subsection 4.1.36.1 includes site description information specific to the 100-D-48:2 site. The remaining subsections refer to the 100-D-48:2/49:2 Pipelines site.

4.1.36.1 Site Description

The former 105D Reactor cooling water effluent 100-D-48:2 pipeline segments ran from the 105D Reactor to the 116-D-7 Retention Basin. One of the two pipelines was constructed of 5-ft diameter reinforced concrete. The other was constructed of 5-ft diameter by 1.3 cm (0.5 in.) thick carbon steel with welded joints. The concrete pipeline and 105D Reactor were constructed at the same time in 1944. During the mid-1950s, the concrete pipeline was abandoned, and the replacement steel pipeline constructed. The concrete pipeline carried reactor cooling water effluent from 1944 until the mid-1950s. The steel pipeline carried reactor cooling water effluent from the mid-1950s until 1967, when the 105D Reactor was shut down.

4.1.36.2 Excavation Operations

Remedial action at the 100-D-48:2/49:2 Pipeline site began in July 1997. Excavation of the site involved removing the overburden materials, contaminated structure, and underlying contaminated soil. Based on field screening, overburden materials identified as potentially clean were placed in stockpiles for potential use as backfill. Materials that were found to be contaminated were disposed at ERDF. In August 1999, the excavation reached the design depth.

At the completion of remedial action, the excavation was approximately 20,475 m^2 (220,280 ft^2) in area with a maximum depth of approximately 6 m (20 ft) bgs. During the time of excavation and waste disposal (through September 1999) at the 100-D-48:2/49:2 Pipeline site, approximately 57,106 metric tons (62,960 tons) of material was disposed at ERDF.

4.1.36.3 Verification Sampling

Final cleanup verification samples were collected following variance sampling. Cleanup verification sampling began on August 23, 1999, and was completed on October 20, 1999. Separate sample designs were prepared for the shallow zone, deep zone, and overburden decision units. The shallow zone decision unit sample design contains 5 decision subunits (20 sampling areas). The deep zone decision unit sample design contains 4 decision subunits (12 sampling areas). The overburden decision unit sample design contains 16 decision subunits (64 sampling areas).

Four composite verification samples were collected from each decision subunit. Three composite samples were also collected from each deep zone decision subunit in addition to QA/QC samples. The final verification samples were sent to offsite laboratories for analysis.

4.1.36.4 Statement of Protectiveness

Materials from the 100-D-48:2/49:2 Pipelines site that contain COCs at concentrations exceeding the RAGs have been excavated and disposed at ERDF. The remedial action at the 100-D-48:2/49:2 Pipelines site has achieved the RAOs and corresponding RAGs. The remaining soils, including pipeline overburden stockpiles, have been sampled, analyzed, and modeled to show that residual concentrations in the shallow zone will support future land uses that can be represented (or bounded) by a rural-residential scenario and that residual concentrations throughout the site and in overburden soils pose no threat to groundwater or the Columbia River. The acceptability of unrestricted direct exposure to deep zone soils has not been demonstrated; therefore, institutional controls to prevent uncontrolled drilling or excavation into the deep zone (i.e., below 4.6 m [15 ft]) are required. The 100-D-49:2 site has been reclassified as “Interim Closed Out.”

4.1.37 100-D-48:3, Effluent Pipelines from D Avenue to 105-D Reactor

Due to geographic location and similarity of remediation activities, the 100-D-48:3, 100-D-49:3 (Section 4.1.41), 100-D-5 (Section 4.1.5), and 100-D-6 (Section 4.1.6) sites were interim closed out as one decision unit referred to as the 100-D-48:3/49:3 site. Subsection 4.1.37.1 includes site description information specific to the 100-D-48 and 100-D-49:3 sites. The remaining subsections refer to the 100-D-48:3/49:3 site.

4.1.37.1 Site Description

The 100-D-48:3 and 100-D-49:3 pipeline segments include the section of the 105D and 105DR Reactor effluent pipelines extending south from D Avenue to about 1.5 m (5 ft) from the wall of each reactor foundation. The 100-D-5 and 100-D-6 Burial Grounds located, respectively, north and east of the 105D Reactor. The site was located near the center of the 100-D/DR Area and is approximately 750 m (2,461 ft) from the Columbia River at the nearest location.

4.1.37.2 Excavation Operations

Remedial action at the 100-D-48:3/49:3 site began on October 28, 1999. Excavation of the site involved removing the overburden materials, the contaminated structure, and underlying contaminated soil. Based on field screening, overburden materials identified as potentially clean were placed in stockpiles for potential use as backfill. Materials that were found to be contaminated were disposed at ERDF. On July 24, 2000, the excavation was completed.

At the completion of remedial action, the excavation was approximately 24,574 m^2 (264,517 ft^2) in area with a maximum depth of approximately 5.7 m (18.7 ft). Approximately 55,561 metric tons (61,245 tons) of material from the 100-D-48:4 (Section 4.1.38) and 100-D-48:3/49:3 Pipelines sites combined was disposed at ERDF.

4.1.37.3 Verification Sampling

Final cleanup verification sampling was performed following variance sampling. Cleanup verification sampling began on June 7, 2000, and was finished on October 4, 2000. The 100-D-48:3/49:3 site consisted of both a shallow and a deep zone decision unit. The shallow zone decision unit was divided into 5 decision subunits, the deep zone decision unit was divided into 2 decision subunits, and the overburden contained 11 decision subunits. Four verification samples were collected from each decision

subunit. Three composite samples were also collected from each deep zone decision subunit, in addition to QA/QC samples. The final verification samples were sent to offsite laboratories for analysis.

4.1.37.4 Statement of Protectiveness

The remaining soils at the 100-D-48:3/49:3 Pipelines site and overburden have been sampled, analyzed, and modeled. The results of this effort indicate that the materials from the 100-D-48:3/49:3 site containing COCs at concentrations exceeding the RAGs have been excavated and disposed at ERDF. These results also indicate that residual concentrations in the overburden and shallow zone will support future land uses that can be represented (or bounded) by a rural-residential scenario and that residual COC concentrations throughout the site do not pose an unacceptable threat to groundwater or the Columbia River. The acceptability of unrestricted direct exposure to deep zone soils has not been demonstrated; therefore, institutional controls to prevent uncontrolled drilling or excavation into the deep zone (i.e., below 4.6 m [15 ft]) are required. The 100-D-48:3 and 100-D-49:3 sites have been reclassified as “Interim Closed Out.”

4.1.38 100-D-48:4, Small Cooling Water Effluent Pipelines at 105-D Reactor

4.1.38.1 Site Description

The 100-D-48:4 site is located near the center of the 100-D Area and is approximately 750 m (2,461 ft) from the Columbia River. This site houses many small drain pipelines that leave from the east and south sides of the 105D Reactor and terminate at the 132-D-3 (1608D) Building site. The pipelines that run from the 132-D-3 (1608D) Building site to either the 116-D-1A and 116-D-1B Trenches or connect to the main cooling water effluent pipelines are also part of this site.

The pipelines were used to dispose of radioactive cooling and waste water from the reactor facility. One large main effluent pipeline drained cooling water from the 105D Reactor. The small effluent pipelines that drained process waste from the sides (east and south) of the 105D Reactor were joined into a single pipeline that ran to the 1608D Building (Waste Water Pumping Station or Process Lift Station). The 1608D Building was a rectangular-shaped, two-story reinforced concrete structure that was half below grade elevation. The purpose of the facility was to pump process effluent to the main effluent pipeline. The pipelines were removed up to 4.9 m (16 ft) from the 105D and 1608D Building extremities.

4.1.38.2 Excavation Operations

Remedial action at the 100-D-48:4 site began on October 28, 1999. Excavation of the site involved removing the overburden materials, the contaminated structure, and underlying contaminated soil. Based on field screening, overburden materials identified as potentially clean were placed in stockpiles for potential use as backfill. Materials that were found to be contaminated were disposed at ERDF. On July 24, 2000, the excavation reached the design depth.

At the completion of remedial action, the excavation was approximately 3,291 m^2 (35,420 ft^2) in area with a maximum depth of approximately 7 m (23 ft). Approximately 27,738 metric tons (30,576 tons) of material from the site was disposed at ERDF.

4.1.38.3 Verification Sampling

Final cleanup verification sampling was performed following variance sampling. For the 100-D-48:4 site, there is one decision unit (shallow zone) that is used to represent the entire vadose zone. This was done because very few of the excavation areas are greater than 4.6 m (15 ft) bgs and because field screening indicated that those areas met direct exposure RAGs. The vadose (shallow) zone decision unit contained one decision subunit, which was divided into 16 sampling areas. Four verification samples were collected. Cleanup verification sampling began on September 11, 2000, and was completed on October 18, 2000.

4.1.38.4 Statement of Protectiveness

The remaining soils at the 100-D-48:4 site have been sampled, analyzed, and modeled. The results of the remedial effort indicate that the materials from the 100-D-48:4 site containing COCs at concentrations exceeding the RAGs have been excavated and disposed at ERDF, that residual concentrations in the shallow zone will support future land uses that can be represented (or bounded) by a rural-residential scenario and that residual COC concentrations throughout the site do not pose an unacceptable threat to groundwater or the Columbia River. The acceptability of unrestricted direct exposure to deep zone soils has not been demonstrated; therefore, institutional controls to prevent uncontrolled drilling or excavation into the deep zone (i.e., below 4.6 m [15 ft]) are required. The 100-D-48:4 site has been reclassified as "Interim Closed Out."

4.1.39 100-D-49:1, North Pipelines from 116-DR-9 to the Outfalls

Due to the geographic location and similarity of remediation activities, the 100-D-48:1 (Section 4.1.35), 100-D-49:1, 100-D-19 (Section 4.1.12), and UPR-100-D-4 (Section 4.1.141) sites were interim closed out as one decision unit referred to as the 100-D-48:1/49:1 Pipelines site. For additional information about the 100-D-49:1 site, refer to the 100-D-48:1 site (Section 4.1.35).

The 100-D-49:1 site has been reclassified as "Interim Closed Out."

4.1.40 100-D-49:2, East Pipelines from D Avenue to 116-DR-9

The former 105DR Reactor cooling water effluent 100-D-49:2 pipeline segments ran from the 105DR Reactor to the 116-DR-9 Retention Basin. The two pipelines were constructed of 5 ft diameter by 1.3 cm (0.5 in.) thick carbon steel with welded joints. The two parallel pipelines were about 25 m (66 ft) apart. The pipelines were constructed at the same time as the 105DR Reactor and carried cooling water effluent from the 105DR Reactor to the 116-DR-9 Retention Basin between 1950 and 1967, when the 105DR Reactor was shut down.

Due to the geographic location and similarity of remediation activities, the 100-D-48:2 (Section 4.1.36), 100-D-49:2, UPR-100-D-2 (Section 4.1.139), and UPR-100-D-3 (Section 4.1.140) sites were interim closed out as one decision unit referred to as the 100-D-48:2/49:2 Pipelines site. For information regarding excavation, verification sampling or the statement of protectiveness for the 100-D-49:2 site, refer to the 100-D-48:2 site (Section 4.1.36).

The 100-D-49:2 site has been reclassified as "Interim Closed Out."

4.1.41 100-D-49:3, Effluent Pipelines from D Avenue to ~60 Meters from the 105-DR Reactor

The 100-D-49:3 site was a major segment of the D/DR Group 3 Pipelines. Due to geographic location and similarity of remediation activities, the 100-D-48:3 (Section 4.1.37), 100-D-49:3, 100-D-5 (Section 4.1.5), and 100-D-6 (Section 4.1.6) sites were interim closed out as one decision unit referred to as the 100-D-48:3/49:3 site. For information regarding the 100-D-49:3 site, refer to the 100-D-48:3 site (Section 4.1.37).

The 100-D-49:3 site has been reclassified as "Interim Closed Out."

4.1.42 100-D-49:4, 100DR Effluent Pipelines Within About 60 Meters of the Reactor

The 100-D-49:4 subsite contains the smaller effluent pipelines near the 132-DR-1 Pumping Station, and the large (1.5 m [60 in.]) main effluent steel pipelines (two adjacent pipes) extending from the reactor. These pipelines are on the north, northeast, and east sides of the 105-DR Reactor. The eastern main effluent pipe section is about 67 m (220 ft) long. The northern pipe section is about 35 m (115 ft) long.

The effluent pipelines were used to dispose of large quantities of radioactive cooling and waste water from the 105DR Reactor to the 107-DR Retention Basin (116-DR-9).

Due to geographic location and similarity of remediation activities, cleanup activities for the 100-D-49:4 site and 118-DR-2:2 site were conducted together. The sites are collectively referred to as the 105DR site. For additional information regarding the excavation, verification sampling, or the statement of protectiveness for the 100-D-49:4 site, refer to the 118-DR-2:2 site (Section 4.2.35).

The 100-D-49:4 site has been reclassified as "Interim Closed Out."

4.1.43 100-D-50:1, Emergency Discharge Pipeline

4.1.43.1 Site Description

The 100-D-50:1 Emergency Discharge Pipeline subsite is part of the 100-D-50 site, which was divided into 10 separate subsites for environmental evaluation and response. The 100-D-50:1 subsite encompasses the process and storm sewer collection main for the southern portion of the 100-D/DR Area. This sewer was also intended to serve as an emergency discharge pipeline for the 105-DR Reactor, and radionuclide detections in confirmatory samples demonstrate that the pipeline was used for radioactive effluent discharges in some capacity. The exact nature, frequency, or volume of these discharges is not known.

The 100-D-50:1 subsite includes approximately 1,550 m (5,100 ft) of reinforced concrete pipe (RCP). The line begins as a 42 in. pipeline at the 105-DR Reactor footprint; transitions to a 54 in. line upstream from the 183DR Clearwell process sewer (100-D-50:6 subsite) influent at manhole T-2a; transitions to a 72 in. line upstream from the 183DR sedimentation basin process sewer (100-D-50:5 subsite) influent at manhole T-3; and ultimately ends at a former headwall outfall (100-D-8 waste site). The 100-D-50:1 pipeline was completed to the outfall in 1949, with subsequent modifications to improve discharge capacity performed in 1950. Operational use of the system ceased between 1965 and 1968. The outfall structure was demolished in 1978.

In addition to servicing the 105-DR Reactor, the 100-D-50:1 subsite received discharges from the process and storm sewers associated with the 100DR water treatment facilities (addressed as the 100-D-50:5 and 100-D-50:6 subsites). These facilities used physical and chemical treatment to condition raw water for reactor use. Chemical addition included sulfuric acid, lime, chlorine, commercial coagulants containing primarily ferrous sulfate or alum, sodium silicate, and sodium dichromate. Discharges to the process sewers presumably consisted primarily of stormwater runoff, backwash water, and underflow drainage from the water treatment units. However, discharges of concentrated chemical products to these sewers likely also occurred.

4.1.43.2 Confirmatory Sampling

Test pit excavation and confirmatory sampling of the 100-D-50:1 subsite was performed from December 2005 to January 2006, with additional samples collected on April 12, 2006. The subsite was divided into four service areas based on the direction of historic waste flows, pipeline length, and the potential impact of tributary influents on the former waste streams. Test pits were excavated at manholes within each service area. During design of the test pits, it was determined that one planned excavation could not be completed due to the presence of an energized overhead power line.

Samples were collected from sediments within the manhole structures, except for a sample collected in a test pit, and from soils underlying the pipeline at the influent or effluent from the manhole structure. No sediment was found within the test pit or the proximate pipeline, but an area of elevated radiological activity was detected at the concrete sidewall of the pipeline immediately north (upstream) of the manhole structure by field instrumentation. The material displaying elevated radiological activity was scabbled and

sampled. No radiological activity was detected above background by field screening at the other sampling locations. Residual radionuclide activities in excess of soil lookup values for protection of groundwater and the Columbia River were detected in the concrete pipe scabble sample collected from Service Area 1. Therefore, site-specific RESRAD modeling was performed which indicates that residual radionuclides measured in confirmatory samples will not migrate to groundwater within 1,000 years; residual activity levels are, therefore, protective of groundwater. The only pathway for contamination to reach the Columbia River is via groundwater migration, so these activity levels are also protective of river water.

Residual concentrations of multiple metals DDT, PAHs, and Aroclor-1260 were detected above soil RAGs for groundwater and/or river protection in pipe sediment and/or scabble samples. However, based on RESRAD modeling, it is predicted that these constituents will not reach groundwater within 1,000 years, except for arsenic and antimony in Service Area 4 pipe sediment. The total mass of antimony and arsenic contamination at the 100-D-50:1 subsite is present within sparse sediment material in the pipeline and is therefore likely not present in a sufficient quantity to reasonably pose any risk to groundwater (or the Columbia River) within 1,000 years, thus achieving RAOs.

4.1.43.3 Excavation Operations

Remediation of Service Area 2 of the 100-D-50:1 emergency discharge pipeline was performed from February 14 through March 6, 2012. The excavation extended to a depth of 7.5 m (25 ft) bgs along the length of the pipeline. Approximately 17,000 BCM (22,000 BCY) of overburden material was placed in five stockpiles: one stockpile to the northeast of the excavation, one stockpile to the northwest of the excavation, and three stockpiles to the south of the excavation. Approximately 1,350 BCM (1,800 BCY) of potentially contaminated soil, concrete, and piping was excavated and stockpiled in one SPA east of the excavation and one SPA to the south of the excavation and later disposed at ERDF. No anomalous materials were encountered during the excavation.

4.1.43.4 Verification Sampling

Verification sampling at the 100-D-50:1 Service Area 2 remediation area was conducted on August 30 and September 4, 2012. Statistical verification sampling at the Service Area 2 remediation at the 100-D-50:1 subsite consists of four decision units: the excavated area, SPA, north overburden area (included two overburden piles), and south overburden area (included three overburden piles). A focused sample was also collected from the soil beneath the remaining 100-D-50:1 pipe at the west (downstream) end of the excavation area. There was no material within the remaining downstream pipe available for sampling. Twelve statistical soil samples were collected on the grid within each of the four decision units.

The RESRAD model indicates that only tritium is predicted migrate to groundwater within 1,000 years at a maximum activity of 2,667 pCi/L occurring at 27.62 years, well below the RAG of 20,000 pCi/L. Therefore, residual activity levels of radionuclides measured at the 100-D-50:1 subsite are protective of groundwater and the Columbia River.

Three statistical samples from the north overburden had vanadium concentrations that exceeded the cleanup criteria for protection of groundwater. However, the residual concentrations of vanadium are predicted to be protective of groundwater and the Columbia River. In the pipe sediment sample, hexavalent chromium was measured slightly above the river protection RAG for soil. Hexavalent chromium was undetected in the underlying soil. Only a minimal amount of sediment is present in the pipeline and does not present a credible risk for contamination of the river.

4.1.43.5 Statement of Protectiveness

The 100-D-50:1 Emergency Discharge Pipeline subsite confirmatory and verification sampling data, RESRAD modeling, site evaluations, and supporting documentation demonstrate that this site meets the

established objectives. These results show that residual soil concentrations support future land uses that can be represented (or bounded) by a rural-residential scenario. The results also demonstrate that residual contaminant concentrations support unrestricted future use of shallow zone soil (i.e., surface to 4.6 m [15 ft]) and that contaminant levels remaining in the soil are protective of groundwater and the Columbia River. The 100-D-50:1 pipelines exist at a depth greater than 4.6 m (15 ft) bgs. The acceptability of direct contact with residual deep zone contamination has not been demonstrated; therefore, institutional controls to prevent uncontrolled drilling or excavation into the deep zone of the site are required. The 100-D-50:1 subsite has been reclassified as "Interim Closed Out."

4.1.44 100-D-50:2, Reactor Cooling Water Pipelines from 190-DR Pumphouse

The 100-D-50:2 site is a subsite of the 100-D-50 site. The 100-D-50:2 subsite consists of the residual process cooling water supply lines between the 183-DR Clearwells and the 105-DR Reactor. The administrative boundaries for the 100-D-50:2 pipelines encompass those process supply lines from the points of discharge at the former 183-DR Clearwells to the boundaries of demolition of the 190-DR Pumphouse and from the points of discharge from the 190-DR Valve Houses to the boundaries of interim safe storage (ISS) activities at the 105-DR Reactor. The pipelines formerly connecting these two groups have been removed as part of decommissioning and demolition of the 190DR facility. Residual supply piping within the boundaries of the ISS project has been encased in concrete.

The pipeline tunnel from 190D to 105D tunnel has been identified as a bat habitat. The mitigation project at 100-D Area was initiated when a maternity roost was discovered in one of the process water tunnels connected to the 105DR Reactor. The ISS project plan included isolating the tunnels from the reactor, which would eliminate the bats' access to the tunnels and cause the loss of the maternity roost. The 100-D-50:2 Reactor Cooling Water Pipelines were contacted during remedial activities conducted at the 116-D-8 site (Section 4.2.20); and additional information about the pipelines may be found in Sections 4.2.20.2 and 4.2.20.3.

No further interim actions will be taken for the 100-D-50:2 pipelines. Instead, these pipelines will be considered in the final remedial action remedial investigation/feasibility study process so that potentially appropriate remedies other than RTD can be considered and evaluated. The 100-D-50:2 subsite has been reclassified as "Accepted." This site will be addressed in the final action ROD.

4.1.45 100-D-50:3, Reactor Cooling Water Pipelines from 190-D High Bay

The 100-D-50:3 Reactor Cooling Water Pipelines from 190-D High Bay subsite consists of steel piping within a subsurface concrete pipe tunnel that extends southeast from the 190D Building Annex to the 105DR Reactor. The 100-D-50:3 pipelines were designed to carry clean, treated (with sodium dichromate) water from the 190-D Pumphouse to the 105DR Reactor. The pipelines were used during low-volume startup testing between May and July 1950.

The 100-D-50:3 pipelines are not known to have ever been used in process operations. There is no known history of radiological contamination associated with the 100-D-50:3 cooling water pipelines or tunnels or of process incidents at the 105D or 105DR Reactor. The 100-D-50:3 subsite is determined to be protective of human health, ecological receptors, groundwater, and the Columbia River. The 100-D-50:3 site has been reclassified as "Rejected."

4.1.46 100-D-50:4, Gas Recirculation Pipelines

4.1.46.1 Site Description

The 100-D-50:4 Gas Recirculation Pipelines were part of the 100-D-50 site, which has been divided into 10 separate subsites for purposes of environmental evaluation and response. The 100-D-50:4 subsite is

south of the former 115D/DR facility, between the 105D and 105DR Reactors. The 100-D-50:4 subsite was composed of two 16 in. steel pipelines with a combined length of approximately 270 m (900 ft). The pipelines were formerly used for the recirculation of helium and carbon dioxide cover gases between the 105DR Reactor and the filters and driers in the 115D/DR facility. Operational use of the 105DR Reactor equipment and 100-D-50:4 pipelines began in 1950 and ceased in 1964. These pipelines were buried in the collapsed subsurface tunnel between the former 115D/DR Gas Recirculation Facility and the 105DR Reactor when the 115D/DR facility and adjoining tunnels were decommissioned in 1985 and 1986.

4.1.46.2 Excavation Operations

Remediation of the 100-D-50:4 Gas Recirculation Pipelines and tunnels was performed from May 5, 2011, through July 12, 2011. The excavation extended to a depth of 3.5 m (11.5 ft) bgs. Approximately 370 m^3 (13,000 ft^3) of contaminated soil, concrete, and piping was excavated and loaded for disposal at ERDF. No anomalous materials were encountered during the excavation. Waste material was stockpiled in a SPA east of the excavation prior to disposal at ERDF.

4.1.46.3 Verification Sampling

Verification sampling was conducted at the 100-D-50:4 subsite on January 5, 2012, and March 15, 2012. Separate statistical sampling designs were used to collect verification soil samples from the 100-D-50:4 excavated area and the SPA. Twelve statistical soil samples were collected on the grid within each of the two decision units at the 100-D-50:4 subsite.

All COPCs for all sampling areas were quantified below their respective soil RAGs or lookup values except for lead, benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, and benzo(k)fluoranthene in comparison against the soil RAGs for groundwater and/or river protection in the near-surface side excavation decision unit. RESRAD modeling predicted that residual concentrations of these constituents will be protective of groundwater and the Columbia River.

4.1.46.4 Statement of Protectiveness

The 100-D-50:4 Gas Recirculation Pipelines verification sampling data, site evaluations, and supporting documentation demonstrate that this site meets the established objectives. These results show that residual soil concentrations support future land uses that can be represented (or bounded) by a rural-residential scenario. The results also demonstrate that residual contaminant concentrations support unrestricted future use of shallow zone soil (i.e., surface to 4.6 m [15 ft]) and that contaminant levels remaining in the soil are protective of groundwater and the Columbia River. Site contamination did not extend into the deep zone soils; therefore, institutional controls to prevent uncontrolled drilling or excavation into the deep zone are not required. The 100-D-50:4 site has been reclassified as “Interim Closed Out.”

4.1.47 100-D-50:5, 183-DR Sedimentation Basin Drain Pipelines

4.1.47.1 Site Description

The 100-D-50:5 Sedimentation Basin Drain Pipelines were part of the 100-D-50 site, which has been divided into 10 separate subsites. The 100-D-50:5 subsite encompasses the southern process sewers for the 183DR coagulation and sedimentation basins. The 183DR coagulation and sedimentation basins were part of the coolant water treatment facilities for the 105DR Reactor. The function of these facilities was to use physical and chemical treatment to condition raw river water for reactor use. The chemicals added at the 183DR coagulation basins or at the upstream 183DR Head House included sulfuric acid, lime, chlorine, and commercial coagulants containing primarily ferrous sulfate or alum. Sodium dichromate was also added to cooling water as a corrosion inhibitor, but was injected downstream of the sedimentation basins.

The 100-D-50:5 process sewers discharged to the 100-D-50:1 process sewer collection line, which ultimately discharges to the Columbia River at the 100-D-8 outfall. The 100-D-50:5 subsite encompasses approximately 200 m (60 ft) of pipeline.

4.1.47.2 Confirmatory Sampling

Confirmatory sampling of the site was conducted on November 7 and December 28, 2015. Design drawings and process knowledge were used to develop a site-specific sample design for the 100-D-50:5 subsite. One test pit was excavated at a junction box on the upstream portion of the pipelines, and a second test pit was excavated at a runoff catch basin on the downstream portion of the pipelines. The junction box was observed to have a shallow layer of water below the invert of the outlet pipeline. Samples were collected from sediments within the junction box and catch basin and from soils underlying the structure or outlet pipeline. Six samples were collected, including QA/QC samples.

Cesium-137 was detected above background, at an activity below the direct exposure dose-equivalence lookup value. Site-specific RESRAD modeling predicted that cesium-137 will not reach groundwater (and thus the Columbia River) within 1,000 years. Maximum detected results for lead and zinc in pipe sediments exceeded soil RAGs for groundwater and/or river protection. RESRAD modeling predicted that residual concentrations of lead and zinc will be protective of groundwater and the Columbia River.

4.1.47.3 Statement of Protectiveness

The results of confirmatory sampling show that residual contaminant concentrations do not preclude any future uses (as bounded by the rural-residential scenario) and allow for unrestricted use of shallow zone soils (i.e., surface to 4.6 m [15 ft] deep). The results also demonstrate that residual contaminant concentrations are protective of groundwater and the Columbia River. This site does not have a deep zone; therefore, no deep zone institutional controls are required. The 100-D-50:5 site has been reclassified as “Interim No Action.”

4.1.48 100-D-50:6, 183-DR Clearwell Drain Pipelines

4.1.48.1 Site Description

The 100-D-50:6, 183DR Clearwell Drain Pipelines surrounded the former 183DR Clearwells, draining south to the 100-D-50:1 Emergency Discharge Pipeline at a manhole. The 100-D-50:6 pipelines are a subsite of the 100-D-50 waste site. The cooling water process pipelines associated with this subsite ran from the 183DR Filter Building to the 183DR Clearwells.

The 100-D-50:6 subsite encompassed three functional pipeline groups: (1) process sewers that provided underflow and overflow drainage for the 183DR Clearwells and drainage for proximate runoff catch basins, (2) process supply lines from the 183DR Filter Building, and (3) drainage lines for the 190-DR Pumphouse tunnel floor drains. The 100-D-50:6 subsite and remedial action recommendation was expanded to include the concrete clearwell pads.

The 183DR Clearwells were part of the coolant water treatment facilities. The function of these facilities was to provide storage and chemical contact time for river water conditioned to use in reactor cooling. The chemicals added upstream of the clearwells included sulfuric acid, lime, chlorine, and commercial coagulants including ferrous sulfate, alum, or polymeric flocculants to coagulate suspended solids in the water before filtration.

4.1.48.2 Confirmatory Sampling

Confirmatory sampling of the 100-D-50:6 subsite was performed on November 8 and 9, 2005. Design drawings and process knowledge were used to develop a sample design for the

100-D-50:6 subsite. The subsite was divided into three Service Areas based on the separation of functional pipeline groups and the direction of historic waste flows. A test trench was excavated to access pipeline contents and underlying soils at Service Areas 1 and 2 and a separate test pit was excavated to access pipeline contents and underlying soils at Service Area 3. Ten samples were collected. Confirmatory sampling results for portions of the 100-D-50 pipelines failed to meet RAGs for multiple metals. Based upon these results, the functionally analogous 100-D-50:6 pipelines were recommended for remedial action.

4.1.48.3 Excavation Operations

Remediation of the 100-D-50:6 subsite was performed from March 11, 2011, through May 28, 2012, to a depth of approximately 9 m (30 ft). Approximately 49,975 BCM (65,365 BCY) of contaminated soil, concrete, and piping was excavated for disposal at ERDF. A majority of the waste was direct loaded for shipment to ERDF, but a portion of the waste was stockpiled separately. Approximately 31,400 BCM (41,070 BCY) of soil (overburden) was removed and stockpiled for evaluation for use as clean backfill. Additionally, approximately 58,674 L (15,500 gal) of water from within the pipelines was removed and disposed at the Effluent Treatment Facility. Included within the excavation were the 100-D-50:2 process water pipelines from the 183DR Clearwells to the 190-DR Pumphouse. These pipelines were entirely removed from within the footprint of the 100-D-50:6 subsite remediation.

Following sample analysis of the original excavation, it was determined that additional remediation was required because two sample locations had detectable levels of asbestos and exceeded direct exposure cleanup criteria for PAHs, respectively. The additional remediation was conducted from January 21 through 24, 2013. Approximately 180 BCM (235 BCY) of additional soil was removed from one location within the excavation area on January 21 and 22, 2013, and disposed at ERDF. Approximately 100 BCM (131 BCY) of contaminated soil was removed from the other location on January 24, 2013, and placed into the deep zone of the 100-D-50:6 excavation.

4.1.48.4 Verification Sampling

Statistical verification sampling was conducted at the 100-D-50:6 subsite on September 4 through 6, 2012. The 100-D-50:6 subsite consists of four decision units for verification sampling: (1) the pipeline excavation (deep zone), (2) the clearwell excavation (deep zone), (3) the overburden soil (shallow zone), and (4) the soil SPA. Twelve statistical verification soil samples were collected within each of the four decision units at the 100-D-50:6 subsite. Four focused samples were collected from within the excavation.

After the initial verification samples were analyzed, it was determined that one sample location from each the pipeline area and waste SPA decision units had detectable levels of asbestos and exceeded RAGs for PAHs, respectively. On January 23 and 24, 2013, both the Pipe and SPA sample locations that exceeded cleanup criteria were subsequently resampled. The resamples were analyzed only for asbestos and PAH, respectively, using the original sample design coordinates.

Residual concentrations of copper, anthracene, benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(g,h,i)perylene, benzo(k)fluoranthene, chrysene, dibenz(a,h)anthracene, fluoranthene, fluorene, indeno(1,2,3-cd)pyrene, phenanthrene, pyrene, Aroclor-1254, and total PCBs exceeded the soil RAGs for the protection of groundwater and/or the Columbia River. RESRAD modeling predicted that residual concentrations of these constituents will be protective of groundwater and the Columbia River.

4.1.48.5 Statement of Protectiveness

The 100-D-50:6, 183-DR Clearwell Pipelines verification sample results show that residual contaminant concentrations do not preclude any future uses (as bounded by the rural-residential scenario) and allow

for unrestricted use of shallow zone soils (i.e., surface to 4.6 m [15 ft] deep). The results also demonstrate that residual contaminant concentrations are protective of groundwater and the Columbia River. The results of verification sampling indicate that deep zone concentrations of residual waste site contamination exceed direct exposure cleanup levels. Therefore, institutional controls to prevent uncontrolled drilling or excavation into the deep zone are required. The 100-D-50:6 site has been reclassified as "Interim Closed Out."

4.1.49 100-D-50:7, 183DR Head House Floor Drain and Catch Basins Pipelines

4.1.49.1 Site Description

The 100-D-50:7 Head House Floor Drain and Catch Basins Pipelines is a subsite of the 100-D-50 waste site. The 100-D-50:7 site consisted of pipelines that provided drainage for the 183DR Coagulation Basins, floor drain, and catch basins at the 183DR Head House, and mixing tanks in the vicinity of the 186D Waste Acid Reservoir. These pipelines ultimately discharged to the 100-D Area process sewer systems.

These pipes were connected to floor drains and catch basins at the 183DR and 186D water treatment facilities and nearby road and railroad embankment runoff. The chemicals used in the 183DR facility included sulfuric acid, lime, chlorine, sodium dichromate, and commercial coagulants containing primarily ferrous sulfate or alum.

4.1.49.2 Confirmatory Sampling

Design drawings and process knowledge were used to develop a site-specific confirmatory sample design for the 100-D-50:7 subsite. The subsite was divided into four service areas based on the separation of functional pipeline groups and the direction of historic waste flows. Confirmatory sampling was performed from November 9 to December 28, 2005. Twenty confirmatory samples were collected. Based upon the results, Service Areas 2 through 4 within the 100-D-50:7 pipelines were recommended for remedial action.

4.1.49.3 Excavation Operations

During remediation of the 100-D-50:7 subsite, all of the pipeline was remediated except for the portion of Service Area 3 in which a 7 m (23 ft) section of pipe was left in place beneath the 183DR foundation. Clean overburden was removed and stockpiled. Between August 8, 2011, and April 25, 2013, approximately 5,700 BCM of soil was excavated and sent to ERDF and 5,300 BCM of overburden soil was excavated from the 100-D-50:7 subsite to the 100-D-50:7 stockpiles to be used as clean backfill material.

4.1.49.4 Verification Sampling

Verification sampling was conducted at the 100-D-50:7 subsite on June 3, 4, and October 22, 2013. The 100-D-50:7 subsite consists of two decision units for verification sampling: the overburden stockpiles and the 100-D-50:7 pipeline. The 100-D-50:7 subsite will be closed out with these two decision units only. All other areas of this pipeline have been or will be removed and sampled with adjacent waste sites. Twelve statistical verification soil samples were collected at the 100-D-50:7 overburden decision unit.

Five focused samples were taken from the 100-D-50:7 pipeline footprint. Four samples were in the remediated pipeline footprint outside of the 100-D-100 excavation boundary. A fifth focused sample was collected beneath the pipeline section left in place, and a second sample at the same sample location was collected for informational purposes only from material within the pipe.

Evaluation of the results from the verification sampling at the 100D50:7 subsite indicate that all COPCs were undetected and/or quantified below RAGs, except for mercury, zinc, dichlorodiphenyldichloroethane (DDD), DDE, and DDT in the pipelines footprint and DDT in the overburden. RESRAD modeling predicted that residual concentrations of these constituents will be protective of groundwater and the Columbia River.

4.1.49.5 Statement of Protectiveness

The 100-D-50:7 Head House Floor Drain and Catch Basins Pipelines subsite verification sample results show that residual contaminant concentrations do not preclude any future uses (as bounded by the rural-residential scenario) and allow for unrestricted use of shallow zone soils (i.e., surface to 4.6 m [15 ft] deep). The results also demonstrate that residual contaminant concentrations are protective of groundwater and the Columbia River. Contamination from the 100-D-50:7 subsite that extended into the deep zone (greater than 4.6 m [15 ft] bgs) has been removed; therefore, institutional controls to prevent uncontrolled drilling or excavation into the deep zone of the site are not required. The 100-D-50:7 site has been reclassified as “Interim Closed Out.”

4.1.50 100-D-50:8, 117-DR Condensate Drain Pipelines

4.1.50.1 Site Description

The 100-D-50:8, 117DR Condensate Drain Pipelines is a subsite of the 100-D-50 waste site. The 100-D-50:8 subsite is located southeast of the 105-DR Reactor. The 100-D-50:8 waste subsite was a 4 in. diameter nonfriable asbestos cement distribution pipe that connected the 117DR high-efficiency particulate air (HEPA) Filter Building to the 116-DR-8 Seal Pit Crib. The pipeline exited the middle of the 117DR Building. The distribution pipe had a total length of 83 m (272 ft) and operated independently from all other pipelines. Although the 100-D-50 pipelines generally do not transport radioactive liquids, the distribution pipe received radioactive process effluent from the 117DR HEPA Filter Building. The 117DR HEPA Filter Building, which was later used for the 105-DR Large Sodium Fire Facility (LSFF), was demolished in 2004, and the 116-DR-8 Seal Pit Crib was filled with gravel and covered with clean soil. The 116-DR-8 waste site was remediated and interim closed out in 2009.

4.1.50.2 Confirmatory Sampling

Confirmatory sampling of this subsite was conducted on July 7, 2005. Three samples were collected. Geophysical survey results, process knowledge, drawings, and site visit information were used to develop confirmatory sampling designs for the 100-D-50:8 and 116-DR-8 waste sites. These sampling designs included collection of samples from the pipeline at the point of discharge to the crib and at an upstream bend and collection of soil samples from beneath the pipeline and crib.

The confirmatory sample results were below the RAGs for all contaminants. However, the 116-DR-8 waste site, which received the discharge from the 100-D-50:8 pipeline, exceeded the RAGs for multiple metals, including direct exposure RAGs for arsenic and hexavalent chromium. Based on these results, the 100-D-50:8, 117DR Condensate Drain Pipelines were recommended for remedial action.

4.1.50.3 Excavation Operations

Remediation of the 100-D-50:8 waste subsite was performed on April 11 and 12, 2012. The excavation extended to a depth of 3.3 m (10 ft) bgs. Approximately 720 BCM (941.7 BCY) of contaminated soil, concrete, and piping was excavated and staged in a stockpile area before disposal at ERDF. Approximately 70 m (230 ft) of pipe was also removed during remediation and disposed at ERDF. The remaining portion of the 100-D-50:8 pipeline (approximately 13 m [42 ft]) was removed during remediation activities of the 116-DR-8 waste site.

4.1.50.4 Verification Sampling

Verification sampling was conducted at the 100-D-50:8 waste subsite on July 31, 2012. The statistical verification sampling at the 100-D-50:8 waste subsite consisted of two decision units, the excavated area and the SPA. Twelve statistical soil samples were collected within each of the two decision units at the 100-D-50:8 waste subsite. The results indicated that, following the remediation, residual contaminant concentrations met the RAOs and RAGs for the 100-D-50:8 waste subsite.

4.1.50.5 Statement of Protectiveness

The verification sample results show that residual contaminant concentrations do not preclude any future uses (as bounded by the rural-residential scenario) and allow for unrestricted use of shallow zone soils (i.e., surface to 4.6 m [15 ft] deep). The results also demonstrate that residual contaminant concentrations are protective of groundwater and the Columbia River. Site contamination did not extend into the deep zone; therefore, institutional controls to prevent uncontrolled drilling or excavation into the deep zone are not required. The 100-D-50:8 site has been reclassified as “Interim Closed Out.”

4.1.51 100-D-50:9, 1607-DR3 Sanitary Sewer Pipelines

4.1.51.1 Site Description

The 100-D-50:9 site is a subsite of the 100-D-50 waste site. The 100-D-50:9 subsite encompasses two functional pipeline groups: (1) the overflow drain line and (2) the residual sanitary sewer lines.
The overflow drain line begins north of the 105-DR Reactor, travels south along the western side of the building, and then turns east to join the sanitary sewage system. The residual sanitary sewer lines are located south and southeast of the 105-DR Reactor. A pipeline entered the east side of a small structure located west of the 118-D-3:1 Burial Ground. The pipe is a water line that tied into a 6 in. cast iron water main pipeline. The 100-D-50:9 exited the west side of the small structure and turned to the south. Both pipeline functional groups discharged to the 100-D-13 septic tank.

4.1.51.2 Confirmatory Sampling

Confirmatory sampling of the 100-D-50:9 subsite was conducted on November 7, 2005. A stratified sampling strategy was employed to address the 100-D-50:9 subsite as two service areas. These service areas were determined based on the principles of hydraulics and the potential impact of different waste loading across the system. A total of eight samples were collected between the two service areas and consisted of soil samples from underneath the pipelines and sediment samples from within the pipelines. An additional test pit was excavated, and samples were collected on April 11, 2012, to support the closure of Service Area 1.

Benzo(a)pyrene was detected in the pipeline sediment of Service Area 2 at a concentration of 0.76 mg/kg, which is in exceedance of the direct exposure soil RAG. Therefore, all of Service Area 2 was recommended for remedial action with benzo(a)pyrene as a COC.

4.1.51.3 Excavation Operations

Remedial action at the 100-D-50:9 subsite, Service Area 2 began on January 25, 2011, with overburden removal. Remediation of Service Area 2 continued through March 30, 2011. Approximately 1,800 BCM (2,354 BCY) of overburden material was stockpiled for use as clean backfill material. Approximately 287 linear meters (942 linear feet) of pipeline was removed from the 100-D-50:9 subsite, Service Area 2 resulting in approximately 565 BCM (739 BCY) of soil and piping removed and staged in a SPA for subsequent disposal at ERDF. Final loadout of material was completed in June 2011.

4.1.51.4 Verification Sampling

Verification sampling was conducted at the 100-D-50:9 subsite, Service Area 2 on August 22 and 23, 2012. The 100-D-50:9 subsite, Service Area 2 consists of three decision units: the excavation, the overburden soil stockpile, and the waste SPA. Twelve statistical verification soil samples were collected within each of the three decision units.

Benzo(a)pyrene, benzo(a)anthracene, benzo(b)fluoranthene, benzo(k)fluoranthene, Aroclor-1254, Aroclor-1260, total PCBs, lead, and zinc are present at concentrations above soil RAGs for groundwater and/or Columbia River protection. RESRAD modeling predicted that residual concentrations of these constituents will be protective of groundwater and the Columbia River.

4.1.51.5 Statement of Protectiveness

Results show that residual soil concentrations support future land uses that can be represented (or bounded) by a rural-residential scenario. The results also demonstrate that residual contaminant concentrations support unrestricted future use of shallow zone soil (i.e., surface to 4.6 m [15 ft]) and that contaminant levels remaining in the soil are protective of groundwater and the Columbia River. Contamination above direct exposure levels was not observed in shallow zone soils and is concluded to not exist in deep zone soils; therefore, institutional controls to prevent uncontrolled drilling or excavation into the deep zone are not required. The 100-D-50:9 site has been reclassified as “Interim Closed Out.”

4.1.52 100-D-50:10, Construction Camp Potable Water Supply Pipelines

The 100-D-50:10 pipelines, a subsite of the 100-D-50 waste site, encompasses those residual pipelines of the former potable water supply system for a temporary construction camp located southeast of the 105-DR Reactor. A review of site history indicates that the sole operational use of the site was potable water supply, which does not suggest contact with or release of hazardous or dangerous wastes. The site will support future unrestricted land uses that can be represented (or bounded) by rural-residential scenario and is considered protective of human health, groundwater, and the Columbia River. No institutional controls are required. The 100-D-50:10 site has been reclassified as “Interim No Action.”

4.1.53 100-D-52, 105-D Downcomer Insulation Space Dry Well

4.1.53.1 Site Description

The 100-D-52 Drywell was a french drain located next to the 105D Reactor. This drywell was installed in 1955 to drain noncontaminated condensate water and contaminated cooling water from the space between the 105D Reactor process effluent downcomer and the reactor wall. The contaminated cooling water resulted from potential leakage from the downcomer. This site also contained a pipe providing access for radiation monitoring that extended from the bottom of the drywell to just above grade.

4.1.53.2 Excavation Operations

Remedial action at the 100-D-52 site began on January 4, 2000. Excavation of the site involved removing the overburden materials, the contaminated structure, and underlying contaminated soil. Based on field screening, overburden materials identified as potentially clean were placed in stockpiles for potential use as backfill. Materials that were found to be contaminated were disposed at ERDF. On February 25, 2000, the excavation reached the design depth. At the completion of remedial action, the excavation was approximately 415 m^2 (4,467 ft^2) in area with a maximum depth of approximately 7.6 m (25 ft). Approximately 199 metric tons (219 tons) of material from the site was disposed at ERDF.

4.1.53.3 Verification Sampling

Cleanup verification samples were collected on March 21, 2000 (following variance sampling, which was conducted on March 6, 2000). The site was divided into four sampling areas. Four final verification samples were collected from each decision subunit.

4.1.53.4 Statement of Protectiveness

Materials from the 100-D-52 site that contain contaminants at concentrations exceeding the RAGs have been excavated and disposed at ERDF. The remaining soils have been sampled, analyzed, and modeled to show that residual concentrations in the shallow zone will support future land uses that can be represented (or bounded) by a rural-residential scenario and that residual concentrations throughout the site pose no threat to groundwater or the Columbia River. The acceptability of unrestricted direct exposure to deep zone soils has not been demonstrated; therefore, institutional controls to prevent uncontrolled drilling or excavation into the deep zone (i.e., below 4.6 m [15 ft]) are required. The 100-D-52 site has been reclassified as "Interim Closed Out."

4.1.54 100-D-56:1, North Portion of 100-D-56

4.1.54.1 Site Description

The 100-D-56:1 North Portion of the 100-D-56 Sodium Dichromate Underground Supply Lines, a subsite of the 100-D-56 waste site, consisted of two abandoned 3 in. diameter underground supply lines that transported sodium silicate and sodium dichromate liquids from the 108D facility to the 190-D Complex. Originally, from about 1944 until 1950, the receiving, mixing, and transfer of sodium dichromate and other water treatment chemicals occurred in the 108-D Building. Research indicates that the mixing of sodium dichromate into solution in the 108-D Building and use of the associated underground supply line (100-D-56:1) was discontinued in 1950.

4.1.54.2 Excavation Operations

Remediation of the north portion of the 100-D-56 pipelines (100-D-56:1) began on December 18, 2006 and was completed on January 10, 2007. Remediation activities consisted of removal and stockpiling of overburden soil to expose the pipelines; tapping, draining, and collection of the pipeline contents; and removal and size reduction of the pipelines, including stained soil and contaminated soil identified during remediation. Approximately 1,500 L (400 gal) of liquid was drained and collected from the northern pipelines for disposition at the Effluent Treatment Facility. Approximately 1,885 BCM of stained soil and pipelines were excavated and disposed at ERDF.

4.1.54.3 Verification Sampling

Following site remediation, preliminary sampling was performed to support development of the verification soil sample design on March 25 and 26, 2008. A global positioning survey was used to delineate the boundaries of three areas for verification sampling: (1) the footprint of the pipeline excavation, (2) the overburden soil stockpiles, and (3) the pipeline storage (sump) area. Statistical sampling of the pipeline excavation and the overburden soil stockpiles was performed because the spatial distribution of potential residual soil contamination over the area was uncertain. Twelve verification soil sample locations were identified for the pipeline excavation area and 18 verification soil samples for the overburden soil stockpiles. In addition to performing statistical sampling of the pipeline excavation footprint and the overburden soil stockpiles, three focused verification soil samples distributed across the base of the pipeline storage area (sump) were collected. Residual concentrations of selenium are above the soil RAG for river protection. RESRAD modeling predicted that residual concentrations of selenium will be protective of groundwater and the Columbia River.

4.1.54.4 Statement of Protectiveness

The results of the verification sampling show that residual contaminant concentrations do not preclude any future uses (as bounded by the rural-residential scenario) and allow for unrestricted use of shallow zone soils (i.e., surface to 4.6 m [15 ft] deep). The results also demonstrate that residual contaminant concentrations are protective of groundwater and the Columbia River. The site does not have a deep zone or residual contaminant concentrations that would require any institutional controls. The 100-D-56:1 site has been reclassified as "Interim Closed Out."

4.1.55 100-D-56:2, South Portion of 100-D-56

4.1.55.1 Site Description

The 100-D-56:2 South Portion of the 100-D-56 Sodium Dichromate Underground Supply Lines waste site, a subsite of the 100-D-56 waste site, consisted of two abandoned 3 in. diameter underground supply lines that transported sodium silicate and sodium dichromate liquids from the 185D Building to the 183DR Head House. Originally, from about 1944 until 1950, the receiving, mixing, and transfer of sodium dichromate and other water treatment chemicals occurred in the 108D Building. Research indicates that the mixing of sodium dichromate into solution in the 108D Building and use of the associated underground supply line (100-D-56:1) was discontinued in 1950 when the mixing operations were transferred to the 185D Building. The use of dry material handling was also replaced with use of concentrated liquid sodium dichromate that was delivered by railcar and truck to an unloading facility/pumping station (100-D-12). The south portion (100-D-56:2) consists of pipelines that exited the south side of the 185D Building and continued to be used after the transition to use of concentrated liquid sodium dichromate.

4.1.55.2 Excavation Operations

Remediation of the south portion of the 100-D-56 pipelines (100-D-56:2) began on June 13, 2006, and was completed on February 7, 2007. Remediation activities consisted of removal and stockpiling of overburden soil to expose the pipelines; tapping, draining, and collection of the pipeline contents; and removal and size reduction of the pipelines, including stained soil and contaminated soil identified during remediation. Approximately 4,100 BCM of stained soil and pipelines were excavated and disposed at ERDF. Approximately 3,122 L (825 gal) of liquid was drained and collected from the south pipelines for offsite treatment and disposal at the Clean Harbors Grassy Mountain Utah landfill.

4.1.55.3 Verification Sampling

Following site remediation, preliminary sampling was performed to support development of the verification soil sample design. Verification sampling was performed on March 9 through March 11, 2009. The south portion of 100-D-56 was divided into eight separate sample areas for verification sampling, taking into consideration the operational history of the pipeline and the remediation process and events that occurred during remediation. A combination of statistical and focused soil sampling designs was used. The soil sample locations were surveyed and staked prior to sample collection and one discrete soil sample was collected at each location.

Sample Area A includes the southernmost portion of the south portion of the 100-D-56 pipelines where they were breached during excavation. Sample Area B consists of the base of the excavation below the pipelines north of Area A and south of the valves associated with the 100-D-12 Sodium Dichromate Transfer Station. Sample Area C consists of the base of the excavation below the pipelines north of the valves associated with the 100-D-12 Sodium Dichromate Transfer Station continuing to the 100-D-30 waste site. Sample Area D consists of overburden and layback soil stockpiles removed during excavation of the pipelines northeast of the 100-D-12 Sodium Dichromate Transfer Station. Sample Area E consists

of overburden and layback soil stockpiles removed during excavation of the pipelines southwest of the 100-D-12 Sodium Dichromate Transfer Station. Sample Area F is where the second pipeline break occurred resulting in a release of chromium to the soil. Sample Area G is the location of the plastic-lined pipeline sump that was created within one of the overburden layback soil stockpiles to temporarily store pipelines requiring size reduction and to capture residual liquids that might drain from the lines. Sample Area H is the footprint of two overburden and layback soil stockpiles that were removed for disposal at ERDF.

Statistical sampling of the pipeline excavation and the overburden soil stockpiles was performed because the spatial distribution of potential residual soil contamination over the area was uncertain. Sampling locations were distributed over the entire footprint of each sampling area to determine the potential residual presence of contamination. A minimum of 12 verification soil samples were collected from each area. In addition to performing statistical sampling of the pipeline excavation footprint and the overburden soil stockpiles, three focused verification soil samples were collected from each of Areas F and G and two focused samples were collected from Area H.

Total chromium, benzo(b)fluoranthene, and benzo(a)pyrene were detected at concentrations exceeding soil RAGs for groundwater and river protection. RESRAD modeling predicted that residual concentrations of these constituents will be protective of groundwater and the Columbia River.

4.1.55.4 Statement of Protectiveness

The results of the verification sampling show that residual contaminant concentrations do not preclude any future uses (as bounded by the rural-residential scenario) and allow for unrestricted use of shallow zone soils (i.e., surface to 4.6 m [15 ft. deep]). The results also demonstrate that residual contaminant concentrations are protective of groundwater and the Columbia River. The site does not have a deep zone or residual contaminant concentrations that would require any institutional controls. The 100-D-56:2 site has been reclassified as “Interim Closed Out.”

4.1.56 100-D-59, French Drain at the 183-D Acid Transfer Station

The 100-D-59 french drain received sulfuric acid that may have spilled from railroad car offloading operations. The french drain is still present, but the pipe leading to it has been removed. Based on this information, the 100-D-59 site has been reclassified as “Rejected.”

4.1.57 100-D-60, 100D/DR River Effluent Pipelines, 100D River Lines

This site includes the river effluent pipelines (river lines) that extend from the two outfalls in the 100-D/DR Area into the main channel of the Columbia River. The river pipelines extend from the 116-D-5 (1904-D Outfall) via two buried 42 in. diameter reinforced concrete/steel pipes. The pipe extends approximately 400 m (1,300 ft) into the river, passing through D Island. The pipelines are buried along their entire run to a depth of 0.6 m (2 ft) to 2.1 m (7 ft). The outlets are not exposed on the river bed. The river pipeline extends from the 116-DR-5 (1904-DR Outfall) via a buried 66 in. diameter carbon steel pipe. The line also extends approximately 400 m (1,300 ft) into the river, passing through D Island (100-D-67, D Island Contamination). The pipeline is buried along its entire run to a depth of 0.6 m (2 ft) to 1.8 m (6 ft). The DR outlet is exposed on the river bed. The 100-D-60 site is classified as “Accepted.” This site will be addressed in the final action ROD.

4.1.58 100-D-61, Utility Pole and Fixture Debris Piles

4.1.58.1 Site Description

The 100-D-61 site consisted of several piles of loosely sorted construction-related debris staged at ground surface. The piles contained utility poles, railroad ties, light fixtures, scrap wire and cable, scrap

construction wood, and other miscellaneous debris. The exact history of this site is not known, and the debris may have originated from multiple site contractors. The period of debris placement at the site is not known.

The 100-D-61 site is located northwest of the 105D Reactor on the northern side of Palouse Street, occupying a surface area of approximately 500 m^2 (5,400 ft^2). The site is above a section of vitrified clay sewer pipeline (100-D-31:6 site) that travels east underneath the 100-D-61 waste site from the former 184D Powerhouse.

4.1.58.2 Excavation Operations

Remediation of the 100-D-61 waste site was performed from November 12, 2007, through January 24, 2008 (Phase I of the remedial action). Approximately 270 metric tons (300 tons) of surface debris and soil was removed including utility poles, railroad ties, light fixtures, scrap wire and cable, scrap construction wood, and other miscellaneous debris. The soil within the waste site footprint was excavated to a depth of 0.3 m (1 ft.) bgs; the resulting 100 BCM (130 BCY) of soil was disposed at ERDF.

Additional remediation of the southern end of the 100-D-61 waste site was performed on October 13, 2008 (Phase II of the remedial action). Approximately 120 metric tons (130 tons) of soil was removed. The soil within the southern end of the waste site footprint (Phase II) was excavated to a depth of 1 m (3 ft) bgs. The resulting 50 BCM (65 BCY) of soil was disposed at ERDF.

4.1.58.3 Verification Sampling

Phase I verification sampling at the 100-D-61 site was performed on June 18, 2008. Verification sampling at the 100-D-61 site consists of the site excavation footprint, except for the area within the footprint associated with the 100-D-31:6 remediation trench. Ten statistical soil samples were collected on a random-start systematic grid. Verification sampling of the area associated with the 100-D-31:6 remediation trench was designed and performed as part of the 100-D-31:6 waste site.

Evaluation of the Phase I verification sample results indicated residual contamination exceeding soil RAG values. Phase II verification sampling at the 100-D-61 site was performed on January 21, 2009. The Phase II sampling included a statistical sample design with 10 soil samples to be collected. A grab sample of the surface soil from a depth of 0 to 15.2 cm (0 to 6 in.) was collected from each soil sample location.

Cleanup verification sample results for barium and benzo(a)anthracene exceed soil RAGs for protection of groundwater and/or the Columbia River. RESRAD modeling predicted that residual concentrations of these constituents will be protective of groundwater and the Columbia River. All remaining verification sample COPCs achieved compliance with direct exposure, groundwater, and river protection RAGs.

4.1.58.4 Statement of Protectiveness

The results of verification sampling and RESRAD modeling show that residual contaminant concentrations do not preclude any future uses (as bounded by the rural-residential scenario) and allow for unrestricted use of shallow zone soils (i.e., surface to 4.6 m [15 ft] deep). The results also demonstrate that residual contaminant concentrations are protective of groundwater and the Columbia River. Site contamination did not extend into the deep zone soils; therefore, institutional controls to prevent uncontrolled drilling or excavation into the deep zone are not required. The 100-D-61 site has been reclassified as “Interim Closed Out.”

4.1.59 100-D-63, 100-D/DR Service Water Pipelines, 100-D/DR Clean Water Pipelines

4.1.59.1 Site Description

The 100-D-63 waste site is assigned to the 100-DR-1 OU although the pipelines run through both the 100-DR-1 and 100-DR-2 OUs. It consists of the service water pipelines upstream of the 100D and 100DR Reactors that were not treated with hexavalent chromium. The service water pipelines are those that were used to transport raw water, filtered water, sanitary water, and condenser return water. The pipes generally ranged in size from 2 in. to 48 in. and were typically constructed of cast iron or steel. The service water pipelines were in use to support the 105-D and 105-DR Reactors during operations, from 1950 to 1964.

The 100-D-63 waste site also includes pipelines associated with the Plenum Filling Experiment (PFE). The PFE project, a light-water reactor test facility, was cancelled prior to construction. These pipelines are shown on design drawings but were never built. They are included with the 100-D-63 Service Water Pipelines to document that they were never constructed and require no action.

The temporary construction camp for the 105-DR Reactor was supplied with potable water via the fire-protection-loop piping. The water lines were abandoned in place once the reactor was constructed. The lines were assigned to the 100-D-50:10 subsite (Section 4.1.52) and reclassified as requiring no action on June 29, 2005. Subsequent to the waste site reclassification, the orphan sites evaluation process identified additional sanitary water pipelines on the temporary construction camp drawings. The newly identified pipelines were included within the 100-D-63 waste site to ensure that they are documented and reclassified. All of the temporary construction service water piping was included with the sanitary water piping (even though some of it was technically raw water) since many of these lines were later used to carry sanitary water.

4.1.59.2 Confirmatory Sampling

The confirmatory sampling work instruction stratified the 100-D-63 pipelines into eight service areas based on operational history and water use. Confirmatory sampling was initiated on January 26, 2010 and completed on March 15, 2010. The eight service areas are as follows: 181-RW Pipelines carrying raw water from the 181-D Building, 182-RW Pipelines carrying raw water from the 182-D Building, 183-FW Pipelines carrying filtered water from the 183-D Building, 183-SW Pipelines carrying sanitary water from the 183-D Building, 186-FW Pipelines carrying filtered water from the 186-D Building, 190-CW Pipelines carrying condenser return water from the 190-D Building, 190-DRCW Pipelines carrying condenser return water from the 190-DR Building, and the PFE Pipelines associated with the proposed PFE.

A total of 41 samples were collected from 16 test pits. Maximum concentrations of lead and zinc in the soil beneath the pipelines exceed soil criteria for protection of groundwater. RESRAD modeling predicted that residual concentrations of lead and zinc will be protective of groundwater and the Columbia River.

Multiple metals were identified in the pipelines interior rust, scale, and concrete linings at concentrations exceeding soil RAGs. However, these analytes are present in scale deposits inside of the pipelines and do not warrant remediation of the 100-D-63 pipelines.

4.1.59.3 Statement of Protectiveness

The 100-D-63 waste site evaluation and supporting documentation demonstrate that the site meets the RAOs. The results show that residual concentrations of COPCs do not preclude future uses (as bounded by the rural-residential scenario). The results also demonstrate that residual contaminant concentrations support unrestricted use of shallow zone soil (i.e., surface to 4.6 m [15 ft]), and contaminant levels

remaining in the soil are protective of groundwater and the Columbia River. The 100-D-63 waste site did not extend into the deep zone. Institutional controls to prevent uncontrolled drilling or excavation into the deep zone of the site are not required. The 100-D-63 site has been reclassified as "Interim No Action."

4.1.60 100-D-65, 1904D Spillway, 116-D-5 Outfall Spillway, 100-D-60:1 Flumes

4.1.60.1 Site Description

The 100-D-65, 116-D-5 Outfall Spillway waste site is located on the shore of the Columbia River, approximately 115 m (377 ft) northwest of the former location of the 116-D-7 (107D) retention basin and 145 m (476 ft) upstream of the 100-D-66 spillway.

The spillway was a 6.4 m (21 ft)-wide concrete structure that received overflow from the former 1904-D Outfall (116-D-5 waste site) in the event that effluent could not be completely discharged via the outfall pipelines (100-D-60 waste site). The 1904-D Outfall was used to discharge radioactive cooling water effluent from the 107D and 107DR retention basins (116-D-7 and 116-DR-9 waste sites). The sidewalls of the spillway tapered from 1.5 m (5 ft) tall at the outfall structure to 0.7 m (2 ft) tall at its discharge to a riprap erosion barrier at the river shoreline. A majority of the spillway structure was covered with soil in 1978 when the outfall structure was partially demolished; the bottom portion of the spillway structure was still visible during low water conditions.

4.1.60.2 Confirmatory Sampling

Confirmatory sampling was performed on January 4 through 5, 2006. A test pit was excavated to access the shallower downstream portion of the spillway through the rock and cobble cover. Four samples were taken from the test pit. An approximate 0.6 by 1.2 m (2 by 4 ft) section of the concrete spillway was exposed for sample collection. Concrete from the surface of the spillway was scabbled and collected into a primary sample for laboratory analysis.

Cesium-137, cobalt-60, europium-152, nickel-63, and total beta radiostrontium were detected at levels that would exceed the cumulative direct exposure RAG for beta and gamma emitters. Multiple nonradioactive metals were also detected at concentrations exceeding direct exposure RAGs and/or soil RAGs for the protection of groundwater and/or the Columbia River. Therefore, it was determined that remediation of the spillway was necessary.

4.1.60.3 Excavation Operations

The 100-D-65 spillway waste site consists of two components, an upland segment located above the Columbia River OHWM and a shoreline segment located between the high and low water mark. Remediation of the upland segment of the outfall was performed September 1 through September 15, 2011. Approximately 468 BCM of material was excavated, stockpiled, and later disposed at ERDF.

Remediation, verification sampling, and backfill of the below OHWM segment of the waste site were performed November 11 through November 13, 2011, during low Columbia River flows to preclude fish stranding. Approximately 336 BCM of material was removed from the shoreline area and disposed at ERDF. The portion of the concrete spillway remaining below water on the day of excavation was left in place and a sample of concrete exposed just above the water was collected.

A post-excavation GPERS survey of the excavation was conducted on September 27, 2011. A hand-held sodium iodide survey was performed on December 20, 2011, for a portion of the remediation that was not surveyed using GPERS. The results of these surveys do not indicate the presence of radiological contamination.

4.1.60.4 Verification Sampling

After excavation of the upland portion of the 100-D-65 waste site, in-process soil samples were collected from within the base of the excavation and used to evaluate the site to determine readiness for collection of verification soil samples. Verification sampling of the upland segment of the 100-D-65 waste site excavation was performed on July 18, 2012. Verification sampling of the shoreline segment was performed on November 13, 2011. Two separate sample designs were developed for the 100-D-65 waste site, one for the upland segment and another for the shoreline segment. A statistical sampling design was used for each of these segments, with twelve soil samples collected from within each of the two excavation footprint areas. In addition to sediment samples, one sample of concrete below the river level remaining after remediation was collected.

Evaluation of the verification sampling results shows that all direct exposure, groundwater protection, and Columbia River protection cleanup levels are met for all areas of the upland segment of the 100-D-65 waste site. The sediment sample results collected within the remediated shoreline segment exceed upland soil RAGs for chromium (total), copper, lead, manganese, nickel, and zinc. However, no further remediation of the below OHWM portion of the 100-D-65 waste site using the RTD remedy was recommended.

4.1.60.5 Statement of Protectiveness

The results of verification sampling show that residual contaminant concentrations do not preclude any future uses (as bounded by the rural-residential scenario) and allow for unrestricted use of shallow zone soils (i.e., surface to 4.6 m [15 ft] deep). The results also demonstrate that residual contaminant concentrations are sufficiently protective of groundwater and the Columbia River. Institutional controls to prevent uncontrolled drilling or excavation into the deep zone are not required. The 100-D-65 site has been reclassified as “Interim Closed Out.”

4.1.61 100-D-66, 1904-DR Spillway, 116-DR-5 Outfall, 100-D-60:1 Flume

4.1.61.1 Site Description

The 100-D-66, 116-DR-5 Outfall Spillway waste site was a buried emergency overflow spillway located east and north of the former 116-DR-5 Outfall and north of the former 116-D-7 Retention Basin. The spillway was designed to receive overflow from the 116-DR-5 Outfall in the event that effluent could not be completely discharged via the outfall pipeline. The 116-DR-5 Outfall was used to discharge radioactive cooling water effluent from the 116-DR-9 Retention Basin to the Columbia River. The 116-DR-5 Outfall was demolished in 1978, and the majority of the 100-D-66 spillway was covered with fill material at that time.

4.1.61.2 Confirmatory Sampling

The 100-D-66, 116-DR-5 Outfall Spillway waste site was identified for RTD based on confirmatory sampling performed on January 5 through January 9, 2006. A test pit was excavated to expose the surface of the concrete spillway. Elevated radiological activity measuring up to 14,000 disintegrations per minute (dpm) was detected on the concrete surface. Four samples were taken from the test pit location. A sample of the concrete was collected for laboratory analysis. Because the direct exposure RAGs were exceeded in the confirmatory sample results, the 100-D-66 waste site was recommended for remedial action.

4.1.61.3 Excavation Operations

The 100-D-66 spillway waste site consists of two components, an upland segment located above the Columbia River OHWM and a shoreline segment located between the high and low water mark.

Remediation of the upland segment of the spillway was initiated on June 15, 2011 and completed on May 1, 2012. Remediation of the portion of the 100-D-66 waste site located below the OHWM was performed November 18 through November 20, 2011, during low Columbia River flows to preclude fish stranding. Approximately 3,400 bulk m^3 of material was excavated, stockpiled, and later disposed at ERDF. A post-excavation GPERS survey of the excavation was conducted on May 2, 2012, and did not indicate the presence of radiological contamination.

4.1.61.4 Verification Sampling

Two separate sample designs were developed for the 100-D-66 waste site, one for the upland segment and another for the shoreline segment. A statistical sampling design was used for each of these segments, with 12 soil samples collected from within each of the 2 excavation footprint areas. In addition, the upland segment sampling design included verification sampling of two waste staging area footprints. Verification sampling of the upland segment of the 100-D-66 waste site excavation and waste staging area footprints was performed on August 15 and August 16, 2012, respectively. Verification sampling of the shoreline segment was performed on November 18, 2011.

Evaluation of the verification sampling results show that all direct exposure, groundwater protection, and Columbia River protection cleanup levels are met for all areas of the upland segment of the 100-D-66 waste site except for benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene, and chrysene within the excavation. RESRAD modeling predicted that residual concentrations of these constituents will be protective of groundwater and the Columbia River.

The sediment sample results collected within the remediated shoreline segment exceed upland soil RAGs for chromium (total), lead, zinc, benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene, dibenz(a,h)anthracene, indeno(1,2,3-cd)pyrene, and carbon-14. However, no further remediation of the below OHWM portion of the 100-D-66 waste site using the RTD remedy was recommended.

4.1.61.5 Statement of Protectiveness

The results of verification sampling show that residual contaminant concentrations do not preclude any future uses (as bounded by the rural-residential scenario) and allow for unrestricted use of shallow zone soils (i.e., surface to 4.6 m [15 ft] deep). The results also demonstrate that residual contaminant concentrations are sufficiently protective of groundwater and the Columbia River. Institutional controls to prevent uncontrolled drilling or excavation into the deep zone are not required. The 100-D-66 site was reclassified as “Interim Closed Out.”

4.1.62 100-D-67, D Island Contamination, D Island

4.1.62.1 Site Description

The 100-D-67, D Island waste site consists of the contamination that spread from vent risers that extended above the ground surface from the buried Columbia River effluent pipelines associated with the 100-D-60, River Effluent Discharge Lines waste site. The contamination is located on a 210 m (700 ft) wide island, approximately 180 m (600 ft) from the shoreline, directly across the west channel of the Columbia River from the former 1904-D and 1904-DR Outfall structures, waste sites 116-D-5 and 116-DR-5, respectively. The island is seasonally submersed during elevated Columbia River flow periods, and during high river levels, is completely underwater. Between 1982 and 1990, there was a steady decrease in radionuclide levels recorded at D Island. The radiological surveys conducted in 1990 indicated that radiological decay had caused the decrease in these levels on D Island.

4.1.62.2 Statement of Protectiveness

Site evaluations and supporting documentation for the 100-D-67, D Island waste site demonstrate that all nonradionuclide COPCs were undetected or quantified within or below the range of Hanford Site reference values in the riparian zone. Radionuclide data indicated risk levels were less than those that warrant a remedial action and radioactive decay of the radionuclides of concern has occurred as expected. The 100-D-67 waste site does not pose a risk to human health and the environment and permits reasonable future land use. No institutional controls are required. The 100-D-67 site has been reclassified as "Interim No Action."

4.1.63 100-D-69, Sodium Dichromate Found Near Pacific Avenue and Paddock Street

4.1.63.1 Site Description

The 100-D-69, Sodium Dichromate Found Near Pacific Avenue and Paddock Street waste site consisted of pieces of crushed concrete that was yellow-green in color. The concrete likely originated from the decommissioning of the 190-D Complex in 1996. The 100-D-69 waste site is in a parking lot area southwest of the intersection of Pacific Avenue and Paddock Street.

4.1.63.2 Excavation Operations

Based on the result of characterization sampling performed on April 9, 2007, the top 7.6 to 15.2 cm (3 to 6 in.) of the parking lot was removed and approximately 24 BCM (31 BCY) of gravel and crushed concrete debris were disposed at ERDF. Three composite samples were collected after the material was removed. The hexavalent chromium concentrations were below the RAGs.

Additional remediation of the 100-D-69 waste site was conducted on March 24, 2014. Approximately 250 BCM (327 BCY) of gravel, crushed concrete, and soil was removed from the 0.91 m (3.0 ft) deep excavation and placed in a SPA for disposal at ERDF. The disposal of the SPA to ERDF was completed in July 2014. There were no observed anomalies.

4.1.63.3 Confirmatory Sampling

Confirmatory sampling was performed at the 100-D-69 waste site on June 7, 2012. Six randomly chosen shallow (0.3 m [1 ft] deep) test pits were excavated and a sample collected from the bottom of each. No stained soil or concrete were observed during the sampling event. Results showed one test pit sample with a hexavalent chromium concentration of 2.37 mg/kg, and the 100-D-69 waste site was identified for RTD.

4.1.63.4 Verification Sampling

Verification sampling was conducted on September 14, 2014. One decision unit was identified for the 100-D-69 waste site and consists of the excavation and the SPAs. These areas are approximately 335 m^2 (3,600 ft^2). Twelve statistical verification soil samples were collected from the waste site decision unit. The sampling results indicate that the waste removal action achieved compliance with the remedial objectives and RAGs.

4.1.63.5 Statement of Protectiveness

The results of verification sampling show that residual soil concentrations do not preclude any future land uses that can be represented (or bounded) by a rural-residential scenario and allow for unrestricted future use of shallow zone soil (i.e., surface to 4.6 m [15 ft] deep). The results also demonstrate that contaminant levels remaining in the soil are protective of groundwater and the Columbia River. Contamination above direct exposure levels was not observed in shallow zone soils and is concluded to not exist in the deep

zone soils. Therefore, institutional controls to prevent uncontrolled drilling or excavation into the deep zone are not required. The 100-D-69 site has been reclassified as "Interim Closed Out."

4.1.64 100-D-70, 184-DA Steam Generating Plant Dry Well

4.1.64.1 Site Description

The 100-D-70 waste site consisted of a 48 in. diameter dry well located on the south side of the former 184DA Building. The 184DA Building was a metal building constructed in 1968 and was designed as an auxiliary steam generating facility. This dry well received steam separator discharge from the steam generator and blowdown separator equipment within the former 184DA Building. A site visit in March 2009 indicated no structures, debris, or staining at the location of the expected dry well. The dry well was expected to be located approximately 4.6 m (15 ft) belowgrade.

4.1.64.2 Confirmatory Sampling

Confirmatory sampling was performed on August 10, 2010. A focused sample from the excavated test pit was used to evaluate the 100-D-70 waste site. The drywell was uncovered at approximately 1 m (3 ft) bgs. The drywell was 0.61 m (2 ft) thick and the bottom of the drywell was found at 1.5 m (5 ft) bgs. No pipelines were found to be connected to the drywell. The excavated drywell consisted of concrete chunks and cobble. The rock within the drywell was well rounded and contained 5 to 10 cm (2 to 4 in.) of stained red cobble. There was no sediment within the drywell; therefore, no samples were obtained from within the drywell. One focused sample was collected from beneath the drywell at approximately 1.5 m (5 ft) bgs.

Field surveys for radiological contamination and VOCs were conducted during sampling. No radiological activity or VOCs were detected. Copper and zinc were quantified at concentrations exceeding soil RAGs for groundwater and river protection. RESRAD modeling predicted that residual concentrations of copper and zinc will be protective of groundwater and the Columbia River.

4.1.64.3 Statement of Protectiveness

The current site conditions achieve the RAOs and the corresponding RAGs. These results show that residual soil concentrations support future land uses that can be represented (or bounded) by a rural-residential scenario. The results also demonstrate that residual contaminant concentrations support unrestricted future use of shallow zone soil (i.e., surface to 4.6 m [15 ft]) and that contaminant levels remaining in the soil are protective of groundwater and the Columbia River. This site does not extend into the deep zone. Institutional controls to prevent uncontrolled drilling or excavation into the deep zone of the site are not required. The 100-D-70 site has been reclassified as "Interim No Action."

4.1.65 100-D-71, Vertical Safety Rod Tower Components

4.1.65.1 Site Description

The 100-D-71 waste site is located approximately 23 m (75 ft) southwest of the 189D Building footprint. The waste site consisted of the remaining components of the 195D VSR Tower that was used from 1957 to 1985 as part of a test facility for reactor VSRs and Ball-3X systems. The tall, narrow tower (5.5 by 5.5 m [18 by 18 ft] by 38 m [125 ft] high), constructed of corrugated steel wall over steel framing, was demolished with explosives in 1995. The tower stood on a 1 m (3 ft) thick underground octagonal concrete base. A review of operational information indicates that suspect contamination for the 100-D-71 waste site would have been associated with lubricating oils and greases in equipment that was used at the facility.

A floor pit approximately 30.5 cm (12 in.) square was located at the bottom of the tower's elevator, on the north side of the tower, and drained to a dry well through a 3 in. cast iron pipe. The drain pipe extended

underground from the floor pit west approximately 12 m (39 ft) to the 4 ft diameter, 2.2 m (7 ft) deep concrete dry well. The elevator shaft and floor pit extended approximately 1.4 m (4.5 ft) belowgrade. The foundations and belowgrade structures for the VSR tower were removed to a depth of at least 1 m (3 ft) during the 1995 D&D of the 190-D Complex.

The remaining components of the facility (i.e., drywell, pipeline, and elevator pit), identified as the 100-D-71 waste site, were removed with the Tier II remediation of the 100-D-104 waste site (Section 4.1.101). Upon completion of the 100-D-104 waste site remediation, soil below the base of the lowest elevation for the 100-D-71 waste site was removed into the deep zone (below 4.6 m [15 ft]). No evidence of soil staining or releases at the 100-D-71 waste site location was observed within the footprint of the 100-D-104 waste site excavation, indicating that adequate remediation has been performed for the 100-D-71 waste site. There are no direct exposure pathways and none of the 100-D-71 waste site COPCs would be predicted to be a threat to groundwater or the Columbia River.

4.1.65.2 Statement of Protectiveness

The supporting documentation and waste site evaluation demonstrate that 100-D-71, VSR Tower Components waste site meets the RAOs. Verification sampling is not required to support this decision. The 100-D-71 waste site has been remediated as part of the 100-D-104 waste site. The site does not pose a risk to human health and the environment and will support future unrestricted land uses that can be represented (or bounded) by a rural-residential scenario. No institutional controls are required. The 100-D-71 site has been reclassified as “Interim Closed Out.”

4.1.66 100-D-72, 183-D Acid Facility

Due to geographic location and similarity of remediation activities, the 100-D-31:11 (Section 4.1.30), 100-D-31:12 (Section 4.1.31), and 100-D-72 sites were interim closed as one decision unit. This section includes information about all three sites.

4.1.66.1 Site Description

The 100-D-72, 100-D-31:11, and 100-D-31:12 waste site and subsites are generally located between the active 182D Reservoir and the 183D Filter Building. The 100-D-72, 183D Acid Facility waste site primarily consisted of components related to the handling of sulfuric acid used in the treatment process for the 105D Reactor cooling water. These components consisted of a concrete trench, the acid-related underground piping within the trench, a dry well, two sumps (exterior to the trench), two storm drains, and a storm sewer. Additionally, pipeline segment 93 was added to the 100-D-72 waste site because the pipeline originated in and among the various components that made up the 100-D-72 waste site.

4.1.66.2 Excavation Operations

Remediation of the 100-D-72 waste site and the 100-D-31:11, and 100-D-31:12 subsites was conducted as a single effort beginning on December 3, 2013 and concluding on February 26, 2014. Remediation consisted of an excavation between the 182D Reservoir and the 183D Filter Building generally oriented in a north-south direction. The excavation is located more closely to the 183D Filter Building and extends beyond the length of the building both to the north and to the south. The south end of the excavation extends beyond Paddock St., approximately 30 m (98.4 ft), then turns 90 degrees to the east and extends to the edge of the 100-D-100 excavation. This part of the excavation followed pipeline segment 93, which was part of the 100-D-72 waste site. A small section of this part of the excavation was backfilled on March 12 and 14, 2014, to provide needed access to a groundwater well just south of Paddock St. Two samples were collected prior to backfilling.

Overburden was staged to the east of the excavation in the area of the former 183D Filter Building. Potentially contaminated soils were staged to the southwest of the excavation in a multiple waste site SPA. The multiple waste site SPA received materials for disposal from 100-D-31:11, 100-D-31:12, 100-D-50:7, 100-D-72, 100-D-81, and 100-D-100. These SPA materials have been disposed at ERDF.

The resulting excavation varied from 2.7 m (8.9 ft) to approximately 5.7 m (18.7 ft) bgs. Approximately 10,585 BCM (13,845 BCY) of soil, piping debris, steel, concrete, and VCP were removed at ERDF. No anomalies were identified during remediation.

4.1.66.3 Verification Sampling

Statistical sampling designs were developed for the combined 100-D-72, 100-D-31:11, and 100-D-31:12 excavations, overburden, and SPA. Twelve statistical samples were collected from each of the combined excavations, overburden, and SPA. In addition, focused sampling was conducted at the 100-D-108 (Section 4.1.104) pipeline stubs, the northern backfill area (100-D-31:11), the southern backfill area (100-D-72) and at the former location of the 100-D-59 french drain (Section 4.1.56), for a total of 10 focused samples. Verification sampling was conducted between September 9 and September 15, 2014.

All COPCs for the 100-D-72, 100-D-31:11, and 100-D-31:12 excavation, overburden, and multi-site SPAs were quantified below groundwater and/or river protection RAGs except for benzo(a)anthracene, benzo(a)pyrene, benzo(k)fluoranthene and benzo(b)fluoranthene. RESRAD modeling predicted that residual concentrations of these constituents will be protective of groundwater and the Columbia River.

All COPCs for the northern backfill area (100-D-31:11) focused samples were quantified below groundwater and/or river protection RAGs except for copper, mercury, zinc, benzo(a)anthracene, benzo(a)pyrene, and benzo(b)fluoranthene. RESRAD modeling predicted that residual concentrations of these constituents will be protective of groundwater and the Columbia River.

4.1.66.4 Statement of Protectiveness

Verification sampling was performed and the analytical results indicate that the residual concentrations of COPCs at the 100-D-72, 100-D-31:11, and 100-D-31:12 sites meet the RAOs for direct exposure, groundwater protection, and river protection. Residual soil concentrations support land uses that can be represented (or bounded) by a rural-residential scenario. The results also demonstrate that residual contaminant concentrations support unrestricted future use of shallow zone soil (i.e., surface to 4.6 m [15 ft]) and that contaminant levels remaining in the soil are protective of groundwater and the Columbia River. Contamination above direct exposure RAGs was not observed in shallow or deep zone soils. Therefore, institutional controls to prevent uncontrolled drilling or excavation into the deep zone of the site are not required. The 100-D-72, 100-D-31:11, and 100-D-31:12 sites have been reclassified as "Interim Closed Out."

4.1.67 100-D-73, 108-D Chemical Pump House Sodium Dichromate System

Due to geographic location and similarity of remediation activities, cleanup activities for the 100-D-76 (Section 4.1.72) and 100-D-73 sites were conducted together. This section includes information about both sites.

4.1.67.1 Site Description

The 100-D-73, 108D Chemical Pump House and 100-D-76, Potential Crib next to 108D; Potential Former 116-D-3 Crib waste sites, included soil and demolition debris under the former 108D Building and a potential crib or french drain south of the 108D Building.

The 108D Building operated as a chemical pump house from 1944 to 1950. In 1950, the sodium dichromate and other chemical systems, including the mixing tanks, were relocated to the 185D Building. The 108D Building was converted into a mechanical development laboratory to support reactor activities. The building was also used as an office complex and decontamination and repair shop for contaminated equipment used for reactor process tube replacement. From 1950 to 1967, the building received waste materials and equipment for decontamination and repair. The 108D Building was demolished in 1987 and the rubble disposed in the 126-D-2 (184D) coal pit, inert landfill (Section 4.1.123).

The 100-D-73 waste site was the soil and demolition debris under the former 108D Chemical Pump House Building. It was identified during orphan site research to locate sources of sodium dichromate in the 100D/100DR Reactor area. The abovegrade portions of the 108D facility had been previously demolished. The 108D Building was approximately 40 m (132 ft) long by 10 m (32 ft) wide and was originally designed to receive, store, and mix various chemicals (including sodium dichromate) for the preparation of the water treatment solutions that were piped to the 105D Reactor and the 185D Building. Two car spots for unloading sulfuric acid and sodium silicate were located on the west side of the building. The car spot that was southwest of the 108D Building is included in the 100-D-73 waste site, and the car spot northwest of the 108D Building is included for further evaluation as part of the 100-D-101 waste site (Section 4.1.99).

4.1.67.2 Confirmatory Sampling

Confirmatory sampling activities took place at the 100-D-76 waste site in September 2008. One test trench was dug to potentially locate and sample the 100-D-76 waste site. Four samples were collected. It appeared that this area had been previously disturbed as part of decommissioning activities for the 108D Building. Evidence of a structure was observed at the northernmost end of the test trench. The structure may have been the french drain and, as a result of previous decommissioning activities, was demolished in place. A gravel layer was encountered that was cobble-sized and had a distinct reddish coloration that rubbed off the rock. Total chromium was detected on the reddish-colored rock using the x-ray fluorescence (XRF) instrument. A soil sample was collected. The reddish color was mainly on the rocks, whereas the fines showed little to no discoloration. A piece of tar paper/mastic was observed in the excavation. The material was stiff and contained visible fibers along the edge. A sample was collected and was found to contain 30% to 40% chrysotile asbestos. The excavation at the northern most end of the trench continued to a depth of 6 m (20 ft) bgs with no additional structures or evidence of a french drain observed. Based on confirmatory sampling results and process information, the 100-D-76 waste site was recommended for remedial action.

4.1.67.3 Excavation Operations

The 100-D-73 and 100-D-76 waste sites were remediated between June 8 and 16, 2011. During the 100-D-73 and 100-D-76 remedial activities, various building demolition debris was found and removed to a SPA. The type of building demolition debris included concrete chunks, rebar, lumber, miscellaneous metal wire, and ropes. Concrete footings and concrete slabs were also encountered. One of the concrete footings had yellow/green staining indicative of hexavalent chromium. An in-process sample was collected from the stained material removed from the concrete footing. In addition, red/rust-colored rock and soil staining was observed and an in-process sample collected.

On July 11, 2011, 10 in-process samples were collected throughout the excavation, biased to locations where highest contamination was probable to guide remedial efforts. In-process analytical results indicated that additional remediation was necessary at several sampled locations within the 100-D-73 waste site footprint. Samples collected from 100-D-76 french drain showed that no additional remediation was required. After the remediation was completed per the excavation design, an additional 10 in-process

soil samples were collected on September 11, 2012, across the excavation area to confirm that no additional hexavalent chromium contamination was present beyond the excavation design.

Approximately 2,171 BCM (2,840 BCY) and 182 BCM (238 BCY) of soil and debris were excavated from the 100-D-73 and 100-D-76 waste sites, respectively. The total resulted in 2,353 BCM (3,078 BCY) of excavated materials removed and staged for disposal at ERDF. The deepest part of the excavation extended to approximately 5.5 m (18 ft) bgs.

Following the load out of stockpile materials, the SPA was scraped to 0.3 m (1 ft) bgs. No stained soil was observed within the SPA during verification sample collection.

4.1.67.4 Verification Sampling

Statistical sampling was the method chosen for selecting the sampling locations. The area identified for statistical verification sampling at the 100-D-73 and 100-D-76 waste sites consists of three decision units: the excavated area, overburden stockpile, and SPA. Twelve statistical soil grab samples were collected on the grid within each of the three decision units at the 100-D-73 and 100-D-76 waste sites. Verification sampling was performed on February 6, 13, and July 24, 2012.

All COPCs for all sampling areas were quantified below their respective soil RAGs or lookup values except for barium, copper, vanadium, benzo(a)pyrene, and benzo(b)fluoranthene in comparison against the soil RAGs for groundwater and/or river protection in the SPA decision unit. RESRAD modeling predicted that residual concentrations of these constituents will be protective of groundwater and the Columbia River. The results indicated that the 100-D-73 and 100-D-76 waste sites achieved compliance with the RAOs and RAGs.

4.1.67.5 Statement of Protectiveness

Verification sampling results show that residual soil concentrations support future land uses that can be represented (or bounded) by a rural-residential scenario. The results also demonstrate that residual contaminant concentrations support unrestricted future use of shallow zone soil (i.e., surface to 4.6 m [15 ft]) and that contaminant levels remaining in the soil are protective of groundwater and the Columbia River. These sites do not extend into the deep zone. Institutional controls to prevent uncontrolled drilling or excavation into the deep zone of the site are not required. The 100-D-73 and 100-D-76 sites have been reclassified as “Interim Closed Out.”

4.1.68 100-D-74, 105-DR Dry Well

4.1.68.1 Site Description

The 100-D-74, 105-DR Dry Well waste site, located just north of the 105-DR Reactor, received steam condensate from heating units inside the 105-DR Reactor. The site was connected to a flush tank, located inside the 105-DR Reactor wall, by a 2 in. drain line to the dry well. Neither the diameter nor the depth of the dry well is known. In reviewing remediation footprints in the area, it cannot be confirmed that the dry well was removed. However, because the dry well was in close proximity to the eternal wall of the 105-DR Reactor, it would have been difficult to remove the wall of the reactor without removing the dry well in the process. Site visits in March of 2008 and October 2009 observed no evidence of visible staining, structures, debris, or vegetation existing within a 5 m (16 ft) diameter area of the coordinates of the waste site. The area has been heavily disturbed by remediation activities at other waste sites and is overlaid by a gravel road.

The 105DR dry well was constructed in 1948. The purpose of this dry well was to receive steam condensate from heaters inside the 105-DR Reactor. Steam heating is a noncontact system vented through

the 117D Filter Building, eliminating the possibility of radiological contamination in this part of the building. It is also possible that floor drains in the reactor facility were connected to the dry well.

The area around the dry well was disturbed and/or excavated during the 105-DR Reactor decommissioning activities. The site was then backfilled and returned to grade. The dry well was likely removed during these decommissioning activities. However, the dry well would have been difficult to distinguish from the demolition debris, and no record of the dry well removal can be found.

4.1.68.2 Confirmatory Sampling

Confirmatory sampling was performed in August 2010. A test pit was excavated to evaluate the 100-D-74 waste site. No evidence of a dry well (vertical piping or sized gravel) was found. Only small pieces of metal debris, concrete pieces, and some asphalt were observed within the test pit. No undisturbed native soil was encountered during the excavation. The focused sample was collected from near the deepest extent of the sampling excavation, at approximately 4.6 m (15 ft) bgs. A focused sample was collected for analysis to evaluate if contamination associated with the discharged steam condensate was present. Field surveys for radiological contamination and VOCs were conducted during sampling.

Confirmatory sampling and field surveys determined that environmental contamination was not present at this waste site and that remedial action was determined to be unnecessary. The expected location of the dry well was identified as a worst-case location of the waste site. It was determined that if no contamination was present at the “worst-case” location of the waste site, then no contamination would extend into the deep zone. No anomalous features were identified during confirmatory sampling. The sampling results indicated that the waste site achieved compliance with the RAOs and RAGs.

4.1.68.3 Statement of Protectiveness

The confirmatory sample results show that residual soil concentrations support future land uses that can be represented (or bounded) by a rural-residential scenario. The results also demonstrate that residual contaminant concentrations support unrestricted future use of shallow zone soil (i.e., surface to 4.6 m [15 ft]) and that contaminant levels remaining in the soil are protective of groundwater and the Columbia River. This site does not extend into the deep zone. Institutional controls to prevent uncontrolled drilling or excavation into the deep zone of the site are not required. The 100-D-74 site has been reclassified as “Interim No Action.”

4.1.69 100-D-75:1, 151-D Primary Electrical Substation

4.1.69.1 Site Description

The 100-D-75:1, 151D Primary Electrical Substation consisted of a fenced gravel bed yard, the 151D Switch House, a railroad spur entering the yard from the east, and concrete pads used to support a variety of electrical equipment. The fenced gravel bed yard measured approximately 165 m (541 ft) on each side with the 151D Switch House along the northern fence line. The 100-D-75:1 subsite is located approximately 142 m (466 ft) northwest of the 105-DR Reactor. The substation was energized in 1944 and supplied electrical power to the 100-D/100-DR Area via secondary and distribution substations. The 151D substation had live 230 KV power lines routed across the 151D switchyard until the beginning of 2013 when the power lines were rerouted.

Oil for the transformers was brought into the switchyard via the railroad spur. The PCB-bearing oil was transferred as needed in aboveground lines and through over-ground hoses from the rail cars to electrical equipment including transformers and circuit breakers in the yard. Concrete pads of various sizes protruded from the crushed gravel bed throughout the yard, supporting a variety of electrical equipment, including transformers, circuit breakers, and power line towers and stands.

During the early years of operation, leaks and spills of PCBs from the electrical transformers, circuit breakers, and transfer systems went unreported at the electrical substations. There is a high probability that any leaks or spills that may have occurred would have been confined to the footprint of the over-ground transfer system, transformer pads and surrounding soil, oil circuit breaker pads and surrounding soil, and the railroad spur.

4.1.69.2 Excavation Operations

Remediation of the 100-D-75:1 subsite was performed between July 7 and October 28, 2014. The depth of the excavation varies between 1 to 4 m (3.3 to 13.1 ft) across the subsite. Approximately 17,039 BCM (22,286 BCY) of excavated materials were removed and staged for disposal at ERDF. The excavated materials were stockpiled east of the excavation in the approved SPA. Excavated materials consisted of concrete, rebar, asbestos conduit, steel pipe, wire, and stained soil. The staged materials were loaded out on August 14, 2014. Materials excavated from the waste site after this date were direct loaded for disposal at ERDF. Radiological field screening was performed during and immediately following remediation. No radiation was detected within the 100-D-75:1 excavation area.

During the 100-D-75:1 subsite remedial activities, oil-stained soils were discovered at several locations throughout the footprint of the 100-D-75:1 subsite. Over 70 in-process samples were collected from this subsite during remediation. In-process sampling was performed when oil-stained soils were encountered and following removal of the stained soils to confirm removal of contaminated materials.

4.1.69.3 Verification Sampling

Verification sampling of the excavation area and SPA was performed on February 2, 2015. The area identified for statistical verification sampling at the 100-D-75:1 subsite consisted of two decision units, the excavated area and the SPA. Twelve statistical discrete soil samples were collected on the triangular grid within each of the two decision units at the 100-D-75:1 subsite.

All COPCs for all sampling areas were quantified below their respective soil RAGs or lookup values except for Aroclor-1260 in the site excavation and SPA. RESRAD modeling predicted that residual concentrations of Aroclor-1260 will be protective of groundwater and the Columbia River.

4.1.69.4 Statement of Protectiveness

The evaluation of all verification sample data collected from the 100-D-75:1 subsite resulted in a determination that residual contaminant concentrations do not preclude any future uses (as bounded by the rural-residential scenario) and allow for unrestricted use of shallow zone soils (i.e., surface to 4.6 m [15 ft] deep). The results also demonstrate that residual contaminant concentrations are protective of groundwater and the Columbia River. Site contamination above direct exposure levels was not observed in the shallow zone soils and is concluded to not exist in the deep zone soils (i.e., below 4.6 m [15 ft]); therefore, institutional controls to prevent uncontrolled drilling or excavation into the deep zone are not required. The 100-D-75:1 site had been reclassified as “Interim Closed Out.”

4.1.70 100-D-75:2, 152-E1-D Secondary Electrical Substation, Substation C4-S1

4.1.70.1 Site Description

The 100-D-75:2 subsite consisted of a small fenced area with concrete pads for the former transformers and inactive electrical components. The 100-D-75:2, 152-E1-D Secondary Electrical Substation subsite is approximately 25 m (80 ft) long and 8 m (25 ft) wide. The two transformers were originally located behind the power poles that remain today. No transformer pads were observed at these locations. Two concrete pads that are currently located at this secondary substation are suspected to have housed

two smaller transformers after downsizing to provide power for the 181D River Pump House. The transformers have since been removed, but the two concrete pads remain.

Oil containing PCBs was transferred, as needed, from oil trucks through over-ground hoses to smaller transformers at the secondary and distribution substations. Historically, leaks and spills of PCBs from the electrical transformers, circuit breakers, and transfer systems during the early years of operation went unreported.

4.1.70.2 Confirmatory Sampling

Confirmatory sampling of the 100-D-75:2 subsite was performed on May 8, 2014. A walkdown of the 152-E1-D substation area was performed, and stained soil was not observed at the 100-D-75:2 subsite. Field screening for VOCs was performed and no VOCs were detected; therefore, volatile organic analysis was not requested. Four focused soil samples were collected from the 100-D-75:2 subsite. In addition, two concrete scabble samples were collected from two concrete pads located on the north side. No staining was observed during soil and concrete scabble sampling. No suspected ACM was observed and no radiological activity was detected during confirmatory sampling at any of the sample locations.

Antimony, cadmium, copper, lead, zinc, Aroclor-1260, and benzo(b)fluoranthene are present at maximum concentrations above soil RAGs for groundwater and/or Columbia River protection. RESRAD modeling predicted that residual concentrations of these constituents will be protective of groundwater and the Columbia River. The confirmatory sampling results indicated that the 100-D-75:2 subsite achieved compliance with the RAOs and RAGs. Therefore, remediation was not necessary.

4.1.70.3 Statement of Protectiveness

The results of confirmatory sampling show that residual contaminant concentrations do not preclude any future uses (as bounded by the rural-residential scenario) and allow for unrestricted use of shallow zone soils (i.e., surface to 4.6 m [15 ft] deep). The results also demonstrate that residual contaminant concentrations are protective of groundwater and the Columbia River. Contamination above direct exposure levels was not observed in shallow zone soils and is concluded not to exist in deep zone soils. Therefore, institutional controls to prevent uncontrolled drilling or excavation into the deep zone soil are not required. The 100-D-75:2 site had been reclassified as “Interim No Action.”

4.1.71 100-D-75:3, 152-C1-D Secondary Electrical Substation

4.1.71.1 Site Description

The 100-D-75:3, 152-C1-D Secondary Electrical Substation measured approximately 9 m (29 ft) long and 14 m (45 ft) wide. Three transformers were located at this substation, but have since been removed, leaving the three concrete pads that supported the transformers. A portion of the 100-D-31:9 pipeline was located directly beneath the 152-C1-D Secondary Electrical Substation. During the remediation of the 100-D-31:9 waste site (Section 4.1.28), the three concrete pads at the 152-C1-D Secondary Electrical Substation and portions of the surrounding soil were removed and disposed at ERDF. Additional surrounding soil was collected as part of the overburden for the 100-D-31:9 subsite.

4.1.71.2 Verification Sampling

Focused verification samples from the 100-D-31:9 subsite excavation (Section 4.1.28) were used to evaluate the 100-D-75:3 subsite. The sample locations were based on the actual concrete pad locations within the 100-D-75:3 subsite. Three focused samples were collected for analysis to evaluate if contamination associated with the secondary electrical substation was present. The sampling results indicated that contamination above cleanup levels was not present at this waste site. Based on focused

verification sampling at the 100-D-75:3 subsite, additional remedial action was determined to be unnecessary.

4.1.71.3 Statement of Protectiveness

The results of 100-D-31:9 verification sampling applicable to 100-D-75:3 show that residual contaminant concentrations do not preclude any future uses (as bounded by the rural-residential scenario) and allow for unrestricted use of shallow zone soils (i.e., surface to 4.6 m [15 ft]). The results also demonstrate that residual contaminant concentrations are protective of groundwater and the Columbia River.
Site contamination did not extend into the deep zone soils. Institutional controls to prevent uncontrolled drilling or excavation into the deep zone of the site are not required. The 100-D-75:3 site has been reclassified as "Interim No Action."

4.1.72 100-D-76, Former 116-D-3

The 100-D-76 waste site was a potential french drain or crib located next to the 108D Building. During the research conducted for the 100-D/100-DR Area orphan sites investigation, the 100-D-76 site was concluded to be the location of the 116-D-3 crib or french drain that received decontamination solutions containing low-level fission wastes from the operations inside the 108D Building.

Due to geographic location and similarity of remediation activities, cleanup activities for the 100-D-76 and 100-D-73 (Section 4.1.67) sites were conducted together. For information regarding confirmation sampling, excavation, verification, or the statement of protectiveness for the 100-D-76 waste site, refer to the 100-D-73 site (Section 4.1.67).

The 100-D-76 site has been reclassified as "Interim Closed Out."

4.1.73 100-D-78, 100D Yellow Stained Soils

4.1.73.1 Site Description

The 100-D-78, 100D Yellow Stained Soils waste site comprised four locations where surface staining was observed between the 183D and 186D Buildings. The staining was generally yellow in nature, but there was some white crusty material as well. Due to the location of the stains it was assumed that the source of the staining was sulfuric acid used in the 186D Building and disposed at the 120-D-2, Waste Acid Reservoir waste site.

Stained Soil Areas 1 and 2 of the 100-D-78 waste site were located on opposite ends of the acid-proof brick trench that extended nearly the entire interior length of the west wall of the former 186D Building. Stained Soil Area 1 was located on the northwest side of the 186D Building footprint and measured 4 m (13 ft) wide by 66 m (216 ft) long. Stained Soil Area 2 was located on the southwest side of the 186D Building footprint and originally measured 9.1 m (30 ft) wide by 65 m (213 ft) long. However, a portion of the Stained Soil Area 2 was removed as part of the 120-D-2 waste site remediation.
The acid-proof brick trench that contained Stained Soil Areas 1 and 2 was approximately 1.2 m by 1.8 m (4 ft deep by 6 ft wide) and extended almost the entire length of the former 186D Building.

Stained Soil Area 3 is near the southwest corner of the waste acid reservoir (120-D-2 waste site). Stained Soil Area 3 was partially removed during remediation of the 120-D-2 waste site, the waste acid reservoir. The stain observed at this location was likely associated with the sulfate stains seen at the 120-D-2 waste site.

Stained Soil Area 4 is southwest of the waste acid reservoir. The trench emptied into the 186D Waste Acid Reservoir (120-D-2 waste site). Approximately 3 m (10 ft) west of the south end of the building were six horizontal, aboveground steel sulfuric-acid tanks.

4.1.73.2 Confirmatory Sampling

Historical data, process knowledge, geophysical survey results, site walkdown observations, and other available information are used to develop a site-specific sample design. Confirmatory sampling at the 100-D-78 subsite was performed from September 11 through September 17, 2008. A focused sampling approach was used to assess 100-D-78 Stained Soil Areas. A total of 16 confirmatory samples were collected within Stained Soil Areas 1 and 2. Six confirmatory samples were collected within Stained Soil Areas 3 and 4 (three from each). A comparison of the maximum analytical results from Stained Soil Areas 3 and 4 showed that remedial action was not required at Stained Soil Areas 3 and 4.

4.1.73.3 Excavation Operations

The remediation of Stained Soil Areas 1 and 2 consisted of removal of the entire length of the acid-proof brick trench, and hence the entire length of subsurface structure along what was once the west wall of the 186D Building. Remediation was conducted between April 2 and April 26, 2012 and extended to a depth of 2 m (6.6 ft) bgs. Approximately 4,823 BCM of soil, building debris, and acid brick were removed, stockpiled, and later disposed at ERDF. A small volume of ion-exchange resin found within the acid trench was also removed and disposed at ERDF.

4.1.73.4 Verification Sampling

Verification sampling of the 100-D-78 waste site was conducted on January 16, 2013. Verification sampling of the associated stockpile area was conducted on April 1, 2013. Twelve verification samples were collected during each sampling event.

4.1.73.5 Statement of Protectiveness

The 100-D-78, 100D Yellow Stained Soils waste site verification data and supporting documentation demonstrate that this site meets the RAOs. Results show that residual soil concentrations support future land uses that can be represented (or bounded) by a rural-residential scenario. The results also demonstrate that residual contaminant concentrations support unrestricted future use of shallow zone soil (i.e., surface to 4.6 m [15 ft]) and that contaminant levels remaining in the soil are protective of groundwater and the Columbia River. The 100-D-78 waste site contamination does not extend into the deep zone soils; therefore, institutional controls to prevent uncontrolled drilling or excavation into the deep zone of the site are not required. The 100-D-78 site has been reclassified as “Interim Closed Out.”

4.1.74 100-D-80:1, Tar Stained Soil & Miscellaneous Debris (Areas 1, 2 and 3)

4.1.74.1 Site Description

The 100-D-80:1 site is a subsite of the 100-D-80 waste site. The 100-D-80:1 subsite consisted of three areas. Area 1 was located approximately 100 m (330 ft) south of the 118-D1 waste site. Area 2 was located approximately 260 m (850 ft) southeast of the 105-DR Reactor. Area 3 is located approximately 50 m (160 ft) south of the southwest corner of the 182D Reservoir.

Area 1 was identified as a single broken light bulb with a metal base, a clear glass cover, and two internal fluorescent-type bulbs. The bulb was approximately 6.4 cm (2.5 in.) in diameter and 0.61 m (2.0 ft) in length. During a site visit on November 4, 2009, no evidence of a light bulb was found at this location, and, as a result, no sampling occurred at this location. Area 2 contained a tarlike material with a fiber matrix that appeared to have been dumped. The area dimensions were approximately 1 by 1 m (3 by 3 ft). Because the area was located within the 118-D-3 Burial Ground sorting cells and was previously removed and disposed at ERDF during remediation activities for this waste site, no sampling occurred at this location. Area 3 consisted of a tar- and oil-stained area vegetated with native grasses, measuring approximately 1 by 2 m (3 by 7 ft), which was identified during the orphan sites evaluation in 2006.

4.1.74.2 Confirmatory Sampling

One shallow soil sample (0 to 0.15 m [0 to 6 in.] bgs) was collected from Area 3 at the location where evidence of tar and oil staining were observed during the orphan sites investigation in 2006. Confirmatory sampling at the 100-D-80:1 subsite indicated that environmental contamination was not present, and remedial action was not necessary.

4.1.74.3 Statement of Protectiveness

The 100-D-80:1, Tar Stained Soil and Miscellaneous Debris (Areas 1, 2, and 3) subsite confirmatory sampling results show that residual soil concentrations support future land uses that can be represented (or bounded) by a rural-residential scenario. The results also demonstrate that residual contaminant concentrations support unrestricted future use of shallow zone soil (i.e., surface to 4.6 m [15 ft]) and that contaminant levels remaining in the soil are protective of groundwater and the Columbia River. This site does not extend into the deep zone; therefore, institutional controls to prevent uncontrolled drilling or excavation into the deep zone of the site are not required. The 100-D-80:1 site has been reclassified as "Interim No Action."

4.1.75 100-D-80:2, Valve Box with Possible Asbestos Insulation (Area 4)

4.1.75.1 Site Description

The 100-D-80:2 waste site consisted of a small wooden structure possibly containing asbestos insulation. The structure was observed during the orphan sites field investigation walkdown in 2006. The structure is believed to be a valve box cover, possibly to prevent freezing of pipes during the winter months.
A portion of the 100-D-63 raw water pipeline exists in the area. The waste site dimensions are approximately 1 by 1 m (3 by 3 ft). The 100-D-80:2 waste site is located south of the 182D Reservoir and northwest of the 183DR Head House.

4.1.75.2 Excavation Operations

The 100-D-80:2 waste site was remediated on January 24, 2013. The wooden structure and contents were removed and disposed at ERDF. The insulation inside of the wooden structure was observed as "fiberglass" insulation rather than friable asbestos. No anomalies were found. Approximately 1.5 BCM (2 BCY) of soil was removed with the wooden structure resulting in an excavated area measuring approximately 3 by 3 m (10 by 10 ft) and approximately 0.18 m (6 in.) deep. No remnants of the wooden structure or the fiberglass insulation remain.

4.1.75.3 Statement of Protectiveness

The 100-D-80:2 waste site has been remediated and does not pose a risk to human health and the environment and will support future unrestricted land uses that can be represented (or bounded) by a rural-residential scenario, and no institutional controls are required. The supporting documentation and post remediation evaluation demonstrate that the removal of the 100-D-80:2, Valve Box with Possible Asbestos Insulation (Area 4) waste site meets the RAOs without verification sampling. The 100-D-80:2 site has been reclassified as "Interim Closed Out."

4.1.76 100-D-81, 100D Burn Areas and Other Stained Areas

4.1.76.1 Site Description

The 100-D-81, 100D Burn Areas and Other Stained Areas waste site was a compilation of eight areas that were discovered during the orphan sites evaluation field investigation, scattered throughout the 100-D Area. According to the remove-treat-dispose memo, Areas 1, 2, 5, 6, and 7 did not require remediation. Areas 4 and 8 were recommended for remove-treat-dispose without confirmatory sampling

based on observations at the sites. Area 3 was recommended for remove-treat-dispose because confirmatory sampling exceeded cleanup levels. Therefore, Areas 3, 4, and 8 required remediation.

4.1.76.2 Excavation Operations

Remedial action within Areas 3, 4, and 8 at the 100-D-81 waste site was performed on July 14, 2014, and July 31, 2014. On July 14, 2014, approximately 1,718 BCM (2,245 BCY) of material were excavated from Areas 3, 4, and 8 within the 100-D-81 waste site. This material was staged and loaded out to ERDF and closed out with the 100-D-72, 100-D-31:11, 100-D-31:12, 100-D-108, and 100-D-109 waste sites. On July 31, 2014, the remaining 14 BCM (18 BCY) of soil was remediated from Areas 4 and 8 and loaded out to ERDF. The waste from Areas 3, 4, and 8 included soil and debris, including a few old equipment oil filters. Excavation extended to a maximum depth of approximately 0.5 m (1.5 ft) bgs.

4.1.76.3 Verification Sampling

Verification sampling was conducted on October 15, 2014. One statistical sample design was identified for the 100-D-81 waste site excavation. This decision unit consisted of Area 3 with an area of 87 m^2 (932 ft^2), and Areas 4 and 8 with an area of 2,041 m^2 (21,891 ft^2) for a total of 2,128 m^2 (22,823 ft^2). No residual staining was identified within the excavated waste site area. Twelve statistical verification soil samples were collected.

4.1.76.4 Statement of Protectiveness

The 100-D-81, 100D Burn Areas and Other Stained Areas waste site verification sampling data results show that residual soil concentrations support future land uses that can be represented (or bounded) by a rural-residential scenario. The results also demonstrate that residual contaminant concentrations support unrestricted future use of shallow zone soil (i.e., surface to 4.6 m [15 ft]) and that contaminant levels remaining in the soil are protective of groundwater and the Columbia River. Contamination above direct exposure levels was not observed in shallow zone soils and is concluded to not exist in deep zone soils; therefore, institutional controls to prevent uncontrolled drilling or excavation into the deep zone are not required. The 100-D-81 site has been reclassified as “Interim Closed Out.”

4.1.77 100-D-82, 100D Garnet Sand Sites

4.1.77.1 Site Description

The 100-D-82 waste site was the site of garnet sands discovered during the orphan sites evaluation process in 2009. There were three separate areas that were discovered. Area 1 is located southeast of the 105-DR Reactor and has a surface footprint of approximately 839 m^2 (9,030 ft^2). Area 2 was located west of the 1716-D Building and had a surface footprint of approximately 97 m^2 (1,044 ft^2). Area 3 was located northwest of the 105D Reactor and northeast of the 190-D Building, and had a surface footprint of approximately 12 m^2 (130 ft^2). Due to the extent of the 100-D-31:2, 100-D-31:3, and 100-D-31:7 excavations (Sections 4.1.21, 4.1.22, and 4.1.26, respectively), Areas 2 and 3 of the 100-D-82 waste site were fully removed and disposed at ERDF.

4.1.77.2 Confirmatory Sampling

Focused samples from surficial garnet and soil material were used to evaluate the 100-D-82 waste site. Two shallow soil samples (0 to 0.15 m [0 to 6 in] bgs) were collected from Area 1 for confirmatory sampling purposes. Lead is present at concentrations above soil RAGs for groundwater and/or Columbia River protection. RESRAD modeling predicted that residual concentrations of lead will be protective of groundwater and the Columbia River. Based on confirmatory sampling at the 100-D-82 waste site, remedial action was determined to be unnecessary.

4.1.77.3 Statement of Protectiveness

The 100-D-82, 100D Garnet Sand waste site confirmatory sampling data results show that residual soil concentrations support future land uses that can be represented (or bounded) by a rural-residential scenario. The results also demonstrate that residual contaminant concentrations support unrestricted future use of shallow zone soil (i.e., surface to 4.6 m [15 ft]) and that contaminant levels remaining in the soil are protective of groundwater and the Columbia River. This site does not extend into the deep zone; therefore, institutional controls to prevent uncontrolled drilling or excavation into the deep zone of the site are not required. The 100-D-82 site has been reclassified as "Interim No Action."

4.1.78 100-D-83:1, 183-DR Acid Addition Pipelines

The 100-D-83 pipelines were separated into five subsites. The 100-D-83:1, 183DR Acid Addition Pipelines subsite encompassed 35 pipeline segments associated with the 183DR Acid Facility (100-D-77 site) and included low-pressure steam, sulfuric acid, and lime slurry, all located north of the 183DR Head House. The 100-D-83:1 pipelines transferred sulfuric acid from the acid facility to the 183DR Head House. Most of the pipeline segments were contained in the acid pipe trench (100-D-77).

Due to geographic location and similarity of remediation activities, the cleanup activities for the 100-D-62 (Section 4.2.12) and 100-D-77 (Section 4.2.15) sites, located within the 100-DR-2 OU, and the 100-D-83:1 site, located within the 100-DR-1 OU, were conducted together. For information regarding excavation, verification sampling, and the statement of protectiveness for the 100-D-83:1 site, refer to the 100-D-77 site.

The 100-D-83:1 site has been reclassified as "Interim Closed Out."

4.1.79 100-D-83:2, 183-DR Filter Backwash Connection

4.1.79.1 Site Description

The 100-D-83:2, 183-DR Filter Backwash Connection waste site is approximately 17 m (56 ft) northeast of the demolished 183DR Building. The waste site consisted of the 183DR water reducing valve pit and three pipeline segments. Backwash water for the 183DR filters was supplied from the 183D Pump Room via a 30 in. carbon steel cross-tie line (100-D-63) to the 183DR pipe gallery. This line was used to supplement the 183DR water requirements including makeup water for the 105-DR Reactor cooling water system. A redundant supply of filtered water was provided via a 16 in. pipeline (100-D-63) from the 105D filtered water supply. These two lines laid parallel to each other and were joined in the water reducing valve pit. The water reducing valve pit had two drain lines. One was connected to the cross-tie between backwash and filtered water lines. It received intermittent discharges during pressure surges between the lines. The other drain line collected water in the bottom of the valve pit from leaking valves or pipe repairs. Both drain lines discharged to the 100-D-50:7 process sewer (Section 4.1.49).

4.1.79.2 Excavation Operations

The 100-D-83:2 waste site was removed with the Tier III 100-D-100 waste site excavation (Section 4.2.17). Upon completion of the 100-D-100 waste site remediation, approximately 16 m (52.5 ft) of soil below the base of the lowest elevation of the 100-D-83:2 waste site location will have been removed. No evidence of soil staining or releases at the 100-D-83:2 waste site location was observed within the footprint of the 100-D-100 waste site excavation, indicating that adequate remediation has been performed to completely remove the 100-D-83:2 waste site.

The excavation for remediation of the 100-D-100 waste site extends into the deep zone (below 4.6 m [15 ft]) at the 100-D-83:2 waste site location. Therefore, there are no direct exposure pathways and none of the COPCs would be predicted to be a threat to groundwater or the Columbia River.

4.1.79.3 Statement of Protectiveness

The basis for interim closure of the 100-D-83:2 waste site is supported by operational information, field observations, and the excavation depth. The 100-D-83:2 waste site has been remediated as part of the remediation of the 100-D-100 waste site. The site does not pose a risk to human health and the environment and will support future unrestricted land uses that can be represented (or bounded) by a rural-residential scenario. No institutional controls are required. The 100-D-83:2 site has been reclassified as "Interim Closed Out."

4.1.80 100-D-83:3, 108-D Acid Addition Facility Pipelines

4.1.80.1 Site Description

The 100-D-83:3 subsite includes the northern segments of a sulfuric acid pipeline (2 in. diameter steel pipe) between the 108D tanks and the 105D Reactor and a process sewer pipeline (6 in. diameter VCP) between the 108-D acid neutralization pit and the 100-D-31:3 pipelines (Section 4.1.22). Sulfuric acid was added to the cooling water upstream of the reactor to lower the pH. This acid was stored in two aboveground storage tanks west of the 108D Acid Addition Facility (100-D-101, Section 4.1.99). The acid was carried to the 105D Reactor by a 2 in. diameter steel pipe (part of the 100-D-83:3 subsite). The acid neutralization pit at the 108D facility was used to adjust the pH of waste acid so it could be disposed. The pit drained to the process sewer (100-D-31:3) through a 6 in. diameter VCP (also part of the 100-D-83:3 subsite). The acid neutralization pit was within the 100-D-101 waste site. The southern segment of the pipelines between the 108D tanks and the 105D Reactor is 100-D-83:4 (Section 4.1.81).

4.1.80.2 Excavation Operations

Remedial action at the 100-D-83:3 subsite was performed on April 7, 2014. The waste from the site included soil and debris including steel piping, concrete, and brick. A small amount of acid-stained soil was removed in the northern portion of the waste site. Excavation extended to a maximum depth of approximately 2.4 m (8 ft) bgs. Approximately 150 BCM (196 BCY) of contaminated soil and debris was removed and staged at the SPA. Waste loadout with disposal at ERDF was completed on July 1, 2014. No anomalies were discovered during remediation.

4.1.80.3 Verification Sampling

Verification soil samples were collected at three decision units; the excavation and overburden areas on June 3, 2014; and the SPA on July 23, 2014. Twelve statistical soil samples were collected from each decision unit. All COPCs for the 100-D-83:3 subsite were quantified below groundwater and/or river protection RAGs except for lead, selenium, benzo(a)anthracene, benzo(a)pyrene, and benzo(b)fluoranthene. RESRAD modeling predicted that residual concentrations of these constituents will be protective of groundwater and the Columbia River.

4.1.80.4 Statement of Protectiveness

The verification sampling results show that residual soil concentrations support land uses that can be represented (or bounded) by a rural-residential scenario. The results also demonstrate that residual contaminant concentrations support unrestricted future use of shallow zone soil (i.e., surface to 4.6 m [15 ft]) and that contaminant levels remaining in the soil are protective of groundwater and the Columbia River; therefore, institutional controls to prevent uncontrolled drilling or excavation into the deep zone of the site are not required. The 100-D-83:3 site has been reclassified as "Interim Closed Out."

4.1.81 100-D-83:4, Additional Treated Water Pipelines

4.1.81.1 Site Description

The 100-D-83:4, Additional Treated Water Pipelines subsite consisted of the remaining treated water pipeline segments that were not addressed by the 100-D-83:1 (Section 4.1.78), 100-D-83:2 (Section 4.1.79), 100-D-83:3 (Section 4.1.80), and 100-D-83:5 (Section 4.1.82) remedial activities. Originally, 100-D-83:4 consisted of four areas of pipelines that were used for treated water and chemical transfer, however, Area 1 is addressed by the 100-D-83:5, 186-D Acid Neutralizing System Pipelines. Area 1 consisted of the 18 pipeline segments located west of the 186-D building that are associated with the acid and lime slurry transfer from tanks to the 120-D-2, 186-D Waste Acid Reservoir (Section 4.1.122). A portion of these pipelines entering the reservoir were removed during 120-D-2 remediation activities.

Area 2 consists of 19 pipeline segments located southwest of the 190-D Building that were associated with acid and reused water transfer from the 185-D De-aerating Plant to the underwater test facility. It was known prior to confirmatory sampling that many of these pipelines were removed with previous 100-D-30 (Section 4.1.19) remediation activities. As confirmatory sampling was conducted, it became apparent that these pipelines had been previously removed. The aboveground portion of the 100-D-83:4 pipeline that went south from this location had also been previously removed.

Area 3 consisted of the pipeline segment located at the 187-DR Elevated Water Tank that was associated with transporting untreated emergency cooling water to the reactor in the event that normal flow of cooling water was disrupted.

Area 4 of the 100-D-83:4 subsite consisted of the pipeline sections that ran from the 108D tanks toward the 105D Reactor. These pipelines could not be located during confirmatory sampling, and fall within the footprint of the 100-D-31:3 excavation (Section 4.1.22). Therefore, they were determined to have been removed with the 100-D-31:3 remedial activities.

4.1.81.2 Confirmatory Sampling

A geophysical survey was performed at the 100-D-83:4 subsite prior to confirmatory sampling. Focused samples from four test pit locations were used to evaluate the 100-D-83:4 subsite. Test pits were excavated at the locations of the pipeline segments of the 100-D-83:4 subsite to collect samples or verify removal of the associated piping between August 24 and 30, 2010.

Mercury was quantified at a concentration exceeding soil protection RAGs for groundwater and river protection. RESRAD modeling predicted that residual concentrations of mercury will be protective of groundwater and the Columbia River. Based on confirmatory sampling at the 100-D-83:4 subsite, remedial action was determined to be unnecessary.

4.1.81.3 Statement of Protectiveness

The confirmatory sampling results show that residual soil concentrations support future land uses that can be represented (or bounded) by a rural-residential scenario. The results also demonstrate that residual contaminant concentrations support unrestricted future use of shallow zone soil (i.e., surface to 4.6 m [15 ft]) and that contaminant levels remaining in the soil are protective of groundwater and the Columbia River. This site does not extend into the deep zone. Institutional controls to prevent uncontrolled drilling or excavation into the deep zone of the site are not required. The 100-D-83:4 site has been reclassified as “Interim No Action.”

4.1.82 100-D-83:5, 186-D Acid Neutralizing System Pipelines and Reactor Cooling Water Pipelines to 105-D

4.1.82.1 Site Description

The 100-D-83:5 waste site consisted of two unrelated pipeline areas. The western section of pipelines transported acid and lime slurry from the 186D Demineralization Plant acid neutralization tanks to the 120-D-2, 186D Waste Acid Reservoir (Section 4.1.122). The eastern section of pipelines carried raw water, filtered water, fire protection water, and potential sodium dichromate-treated process water from the 190D Process Pump House to the 105D Reactor.

The western section of the 100-D-83:5 waste site consisted of VCP, drains, and concrete trenches that were associated with the acid and lime slurry transfer from 186D tanks to the waste acid reservoir. In-process samples of the western section of the 100-D-83:5 pipelines were collected during remediation of 120-D-2.

The eastern section of the 100-D-83:5 pipelines, the reactor cooling water piping to the 105D Reactor, is unrelated to the western section of the waste site. The eastern pipelines consisted of two separate tunnels between the 190D Building and the reactor. Small water lines within these pipe tunnels carried raw water, filtered water, fire protection water, and potentially sodium dichromate-treated process water.

4.1.82.2 Confirmatory Sampling

The western section of the 100-D-83:5 pipelines was originally within the 100-D-83:4 waste site (Section 4.1.81). Confirmatory sampling at 100-D-83:4 was performed in August 2010. A focused sampling approach was used to evaluate the 100-D-83:4 waste site. Test Pit 1 was intended to sample the VCP between the 186D acid tanks and 120-D-2. Prior to 100-D-83:4 confirmatory sampling, it was known that some of the pipe trenches entering the 120-D-2 reservoir were removed during the previous 120-D-2 remediation. During confirmatory sampling of the 100-D-83:4 Test Pit 1, an unbreached pipe encasement was discovered rather than the expected VCP. A sample of soil beneath the encasement was collected at 5.2 to 5.5 m (17 to 18 ft) bgs. Based on the field investigation of 100-D-83:4 Test Pit 1, it became apparent that approximately 72 m (237 ft) of the concrete trenches remained in place between the south end of the 120-D-2 reservoir and the former acid and lime slurry transfer tanks. Therefore, this section of the 100-D-83:4 pipelines was reassigned to the western section of the 100-D-83:5 waste site.

4.1.82.3 Excavation Operations

Remedial action at the 100-D-83:5 waste site began on April 24, 2013, and continued through June 10, 2013. The waste from the site included residual pipe debris, concrete, soil and debris (including asphalt), building materials, and miscellaneous reactor hardware (unirradiated spacers and perfs). Lead sheeting material was removed from the acid neutralization tanks area. The remnants of the bases of two acid neutralization tanks and one lime storage silo and hopper associated with the demolished 186D Facility at the south end of the 100-D-83:5 pipeline (west portion) were also removed and disposed.

Remediation at the western portion of 100-D-83:5 at the 186D acid neutralizing system pipelines extended from 3.5 m (11.5 ft) bgs to a maximum depth of 8.0 m (26 ft) bgs. Remediation at the eastern portion of 100-D-83:5 waste site between 190D and 105D extended to a maximum depth of 6.5 m (21 ft) bgs. Approximately 1,800 BCM (2,350 BCY) of clean overburden was removed and stockpiled. In total, approximately 12,800 BCM (16,740 BCY) of contaminated soil and debris was removed and staged at the SPA pending loadout and disposal. The SPA received waste beginning April 25, 2013. The lead sheeting and nonirradiated reactor hardware have been loaded out and disposed at ERDF. The lead waste was macroencapsulated with grout. No anomalies were discovered during remediation.

4.1.82.4 Verification Sampling

Verification samples from the two excavation areas and the overburden stockpile were collected on January 14, 2014. Statistical sampling designs for both the east and west excavation area decision units and overburden pile were developed. Twelve statistical soil samples were collected on the triangular grid within each of the three decision units.

Disposition of waste from chromium-contaminated sites has been the highest priority for loadout activities in the 100-D Area. Therefore, loadout of the 100-D-83:5 SPA was not completed and was not included with the verification sampling of the 100-D-83:5 excavations and overburden. The 100-D-83:5 SPA was sampled and closed out with adjacent SPAs associated with the 100-D-30 (Section 4.1.19) and 100-D-104 (Section 4.1.101) waste sites.

All COPCs were quantified below groundwater and/or river protection soil RAGs except for lead and mercury in the west excavation. RESRAD modeling predicted that residual concentrations of lead and mercury will be protective of groundwater and the Columbia River.

4.1.82.5 Statement of Protectiveness

The verification sampling results show that residual soil concentrations support future land uses that can be represented (or bounded) by a rural-residential scenario. The results also demonstrate that residual contaminant concentrations support unrestricted future use of shallow zone soil (i.e., surface to 4.6 m [15 ft]) and that contaminant levels remaining in the soil are protective of groundwater and the Columbia River. Contamination from the 100-D-83:5 waste site that extended into the deep zone has been removed; therefore, institutional controls to prevent uncontrolled drilling or excavation into the deep zone of the site are not required. The 100-D-83:5 site has been reclassified as “Interim Closed Out.”

4.1.83 100-D-84:1, Sanitary Sewer Pipelines - Areas 1 and 2

4.1.83.1 Site Description

The 100-D-84:1 subsite consists of Areas 1 and 2 of the 100-D-84, 100D Sanitary Sewer Pipelines waste site. The 100-D-84 waste site consisted of pipelines that were service connections supporting ancillary and temporary construction facilities and discharged nonradioactive liquid sanitary sewage waste to associated septic systems.

Area 1 consisted of 23 pipeline segments to the south of the 105-DR Reactor. The pipelines were the result of temporary construction that was put into place to support the 1947 modification of 100-D Area buildings and facilities and provide a water supply for the existing 105-D Pile Building (water supply unrelated to 100-D-84:1). The temporary facilities and associated 100-D-84:1 subsite pipelines were placed approximately 121 m (400 ft) southeast of the 105-DR Reactor. It is believed that all of Area 1 of the 100-D-84:1 subsite drained to the 100-D-50:9 piping system (Section 4.1.51).

Area 2 is located approximately 150 m (500 ft) northwest of the 105D Reactor. The area includes seven sections of piping. The northern pipeline, running east to west, is associated with the 100-D-31:3 subsite (Section 4.1.22). The center pipeline sections run east to west, parallel to the 100-D-31:4 pipelines (Section 4.1.23), and have been removed with the remediation of 100-D-31:4. The southern pipeline that runs north to south parallel to 100-D-31:4 was also removed with this remediation. The northern pipeline, running north to south, is parallel to the 100-D-63 pipelines (Section 4.1.59).

4.1.83.2 Confirmatory Sampling

A geophysical survey was performed at the 100-D-84:1 subsite prior to confirmatory sampling, in support of an excavation permit. Confirmatory sampling of the 100-D-84:1 subsite was initiated and performed in

August 2010. Focused samples from four test pit locations were used to evaluate the 100-D-84:1 subsite. Focused confirmatory sampling was conducted at Test Pits 1, 2, and 3 of Area 1; and at the northern pipeline by excavation of Test Pit 4.

Lead, vanadium, benzo(a) anthracene, benzo(a)pyrene, benzo(b)fluoranthene, and benzo(k)fluoranthene were quantified at concentrations exceeding soil protection RAGs for groundwater and river protection. RESRAD modeling predicted that residual concentrations of these constituents will be protective of groundwater and the Columbia River. All other cleanup verification data values are less than the applicable RAGs. Based on confirmatory sampling at the 100-D-84:1 subsite, remedial action was determined to be unnecessary.

4.1.83.3 Statement of Protectiveness

The confirmatory sampling results show that residual soil concentrations support future land uses that can be represented (or bounded) by a rural-residential scenario. The results also demonstrate that residual contaminant concentrations support unrestricted future use of shallow zone soil (i.e., surface to 4.6 m [15 ft]), and contaminant levels remaining in the soil are protective of groundwater and the Columbia River. Institutional controls to prevent uncontrolled drilling or excavation into the deep zone of the site are not required. The 100-D-84:1 site has been reclassified as “Interim No Action.”

4.1.84 100-D-84:2, Sanitary Sewer Pipelines - Areas 3 and 4

4.1.84.1 Site Description

The 100-D-84:2, Sanitary Sewer Pipelines – Areas 3 and 4, is part of the 100-D-84, 100-D Sanitary Sewer pipelines waste site. The 100-D-84:2 subsite consists of piping located in two separate areas associated with the 1607-D2 and 1607-D5 septic systems.

Area 3 includes one pipeline segment approximately 40 m (132 ft) long located adjacent to the location of the former 116-DR-9, 107-DR Retention Basin (Section 4.1.118). This pipeline segment was associated with the 1607-D2:4 septic tank (Section 4.1.133) and originally carried waste from the septic tank to the location of the 1607-D2:1 Abandoned Tile Field (Section 4.1.130). Most of the 100-D-84:2 Area 3 pipeline was removed in 1950 when the 107-DR Retention Basin was built.

Area 4 includes one pipeline segment east of the 181D River Pump House that carried sanitary waste from the 181D River Pump House to the 1607-D5 septic tank (Section 4.1.136).

4.1.84.2 Excavation Operations

Remedial action at the 100-D-84:2 Area 3 pipeline segment was performed on April 7, 2014. The depth of the remediation extends approximately 3 m (10 ft) bgs resulting in approximately 170 BCM (222 BCY) of soil and debris being removed for disposal at ERDF. The debris consisted primarily of VCP. The waste material was staged prior to loadout to ERDF; therefore, a waste SPA was created. No stained soil or anomalous materials were encountered during the remediation.

Due to the location of the 100-D-84:2 Area 4 pipeline segment being near an active water line, the Area 4 pipeline segment was closed in place without remediation. Several small potholes approximately 46 to 61 cm (18 to 24 in.) deep were excavated by hand to locate the 100-D-84:2 Area 4 pipeline to collect a sample of the pipe contents and the underlying soil. No pipeline was encountered; therefore, a focused verification soil sample was collected from the pothole location closest to where the pipeline would have entered the drain field.

4.1.84.3 Verification Sampling

One focused verification soil sample was collected on April 7, 2014, from the Area 4 pothole location closest to where the pipeline would have entered the drain field. Verification sampling continued July 14, 15, and 30, 2014. Three decision units were identified for the 100-D-84:2 pipeline subsite; specifically, the Area 3 excavation, the Area 4 pipeline segment, and the waste SPA. Twelve statistical soil samples were collected from the Area 3 and waste SPA decision units, and one focused soil sample was collected from the Area 4 decision unit. All samples were grab samples collected at the predetermined coordinates.

All COPCs were quantified below direct exposure RAGs. All COPCs were quantified below groundwater and/or river protection soil RAGs except for benzo(a)anthracene, benzo(a)pyrene, and benzo(b)fluoranthene. RESRAD modeling predicted that residual concentrations of these constituents will be protective of groundwater and the Columbia River.

4.1.84.4 Statement of Protectiveness

The results of verification sampling and modeling show that residual soil concentrations do not preclude any future uses (as bounded by the rural-residential scenario) and allow for unrestricted use of shallow zone soils (i.e., surface to 4.6 m [15 ft] deep). The results also demonstrate that residual contaminant concentrations are protective of groundwater and the Columbia River. Contamination above direct exposure levels was not observed in shallow zone soils and is concluded to not exist in deep zone soils; therefore, institutional controls to prevent uncontrolled drilling or excavation into the deep zone soil are not required. The 100-D-84:2 site has been reclassified as “Interim Closed Out.”

4.1.85 100-D-85:1, Additional 107-DR Effluent Pipeline

4.1.85.1 Site Description

The 100-D-85:1, Additional 107-DR Effluent Pipeline subsite was a single pipeline segment identified on one drawing; however, it was not known whether it was ever constructed. The pipeline was believed to be approximately 92 m (300 ft) in length, buried at approximately 5 m (16 ft) bgs. The construction material is not known. If constructed, it was anticipated that the pipe would not have been removed by any previous effluent sewer remedial actions.

At the west terminus, the pipe was shown to connect with the 100-D-48:2 pipelines (Section 4.1.36). Although the 100-D-85:1 pipeline was identified on the drawing, there was no other indication of it in the area. During excavation of the 100-D-29 waste site, which extended to approximately 4.6 m (15 ft) bgs in this location, there was no indication of a pipeline.

A geophysical investigation was performed in August 2007 in support of the 100-D-29 waste site remediation. The linear anomalies identified in this survey are not at the location of the 100-D-85:1 waste site. These have been identified on project drawings as a 6 in. fire protection main (100-D-63, Section 4.1.59) that supplied raw water to the 107-DR Retention Basin. The associated geophysical interpretation map indicates that no linear anomaly was detected in the area where the drawing shows the 100-D-85:1 pipeline would have been constructed.

4.1.85.2 Confirmatory Sampling

Confirmatory sampling was initiated and performed in August 2010. A single focused sample and was collected from the soil at the base of the 100-D-85:1 excavation at approximately 5 m (16 ft) bgs. The diameter of the test pit was approximately 9 m (30 ft) at the surface, and no pipeline was encountered during excavation. Field surveys for radiological contamination and VOCs were conducted during sampling. All field surveys were less than detectable.

There were no constituents with maximum results exceeding soil RAGs for direct exposure, groundwater and/or river protection. Based on confirmatory sampling and field observations at the 100-D-85:1 subsite, remedial action was determined to be unnecessary.

4.1.85.3 Statement of Protectiveness

The confirmatory sampling results show that residual soil concentrations support future land uses that can be represented (or bounded) by a rural-residential scenario. The results also demonstrate that residual contaminant concentrations support unrestricted future use of shallow zone soil (i.e., surface to 4.6 m [15 ft]), and contaminant levels remaining in the soil are protective of groundwater and the Columbia River. Confirmatory sampling activities extended into the deep zone (i.e., greater than 4.6 m [15 ft]); however, no pipe was found and soil sample results indicate no contamination is present in the deep zone. Therefore, institutional controls to prevent uncontrolled drilling or excavation into the deep zone soil are not required. The 100-D-85:1 site has been reclassified as “Interim No Action.”

4.1.86 100-D-85:2, Additional 105-DR Reactor Effluent Pipelines

4.1.86.1 Site Description

The 100-D-85:2 waste consisted of 16 pipe segments associated with the discharge of effluent from the 105-DR Reactor to the 1608DR Waste Water Pump House (132-DR-1, Section 4.2.38). The pipelines carried process water and steam condensate collected from sumps, floor drains, sinks, and steam traps on the eastern half of the 105-DR Building. The process water drained by gravity to the 1608DR Waste Water Pump House where it was pumped to the main effluent pipeline (100-D-49:3, Section 4.1.41). Many of the 100-D-85:2 pipelines were found to be leaking in 1958. Repairs were made and the steam condensate drains were disconnected from the sewers (100-D-85:2) on the north end of the building.

4.1.86.2 Excavation Operations

Remedial action at the 100-D-85:2 subsite began on March 26, 2014. Approximately 13,048 BCM (17,066 BCY) of soil and debris were removed resulting in an excavation that is a maximum of 6.5 m (21.3 ft) bgs. A combination of direct loadout and a SPA were used to manage the removed material, all of which was ultimately disposed at ERDF. Materials from the SPA were completely disposed at ERDF by May 6, 2014. Direct loadout from the excavation to ERDF was complete on August 13, 2014. Materials removed from the 100-D-85:2 excavation included concrete, rebar, and steel pipe. Within the excavation the partially intact subsurface concrete foundations of several buildings were uncovered and remain. There were no observed anomalies.

4.1.86.3 Verification Sampling

Verification sampling was conducted on January 20 and 21, 2015. Two decision units were identified for the 100-D-85:2 subsite consisting of the excavation and the SPA. These areas are in total approximately 5,163 m^2 (58,808 ft^2). A statistical sample design was utilized to evaluate each decision unit. No residual staining or anomalies were identified within the excavated waste site and SPA. Concrete protruding into the excavation was excluded from the sample design. Twelve statistical verification soil samples were collected from the excavation, and 12 statistical verification soil samples were collected from the SPA decision unit.

All COPCs were quantified below direct exposure, groundwater, and river protection soil RAGs except for Aroclor-1254. RESRAD modeling predicted that residual concentrations of Aroclor-1254 will be protective of groundwater and the Columbia River.

4.1.86.4 Statement of Protectiveness

The results of verification sampling show that residual contaminant concentrations do not preclude any future uses, as bounded by the rural-residential scenario, and allow for unrestricted use of shallow zone soils (i.e., surface to 4.6 m [15 ft] deep). The results also demonstrate that residual contaminant concentrations are protective of groundwater and the Columbia River. Contamination above direct exposure levels was not observed in the shallow zone soils and is concluded to not exist in deep zone soils (i.e., below 4.6 m [15 ft]); therefore, institutional controls to prevent uncontrolled drilling or excavation into the deep zone are not required. The 100-D-85:2 site has been reclassified as "Interim Closed Out."

4.1.87 100-D-86:1, 105-D Gas Recirculation Pipelines

4.1.87.1 Site Description

The 100-D-86:1, 105-D Gas Recirculation Pipelines subsite is part of the 100-D-86, Process Sewer Pipelines waste site. The 100-D-86:1 subsite consisted of two 16 in. diameter steel gas recirculation pipelines between the former 115-D/DR Gas Recirculation Facility and the 105D Reactor. The gas recirculation pipelines were part of the system that was used to remove radioactive particulates and water from the reactor cover gases. The pipelines were used for the recirculation of helium and carbon dioxide cover gases between the 105D Reactor and the filters and driers in the 115D/DR Gas Recirculation Facility.

The 115D Facility was constructed in 1943 and was operated until 1967. The pipe tunnel was demolished in situ in 1986. The adjoining tunnels were decommissioned in 1985 and 1986. The tunnel piping and valves were not removed.

4.1.87.2 Excavation Operations

Remedial action at the 100-D-86:1 subsite was performed between March 24 and August 5, 2014. The remediation extended to an approximate maximum depth of 7 m (23 ft) bgs, resulting in approximately 3,202 BCM (4,188 BCY) of soil and debris being removed for disposal at ERDF. The debris consisted of steel pipe, concrete, and rebar. All material was direct loaded from the excavation for disposal at ERDF; therefore, no waste SPA was generated. Approximately 2,946 BCM (3,853 BCY) of overburden material was salvaged from the 100-D-86:1 subsite and stockpiled for use as clean backfill material. No stained soil or anomalous materials were encountered during the remediation.

A GPERS survey of the overburden pile, conducted in March 2014, detected a radiological hot spot above background. The hot spot was excavated on September 24, 2014, and new GPERS surveys were conducted on the overburden pile in November 2014. No elevated activity above background was detected. A GPERS survey of the excavation was conducted following site remediation. The survey results indicated gamma detections above background levels in the deep zone of the excavation, localized to a small area near the 105D Reactor wall. Due to the proximity of the radiological activity to the reactor, no additional soil was removed.

4.1.87.3 Verification Sampling

Verification sampling was conducted on January 6 and 7, 2015. The waste site was divided into shallow zone (0 to 4.6 m [0 to 15 ft] bgs) and deep zone (greater than 4.6 m [15 ft] bgs) decision units for verification sampling. A total of three decision units were identified for the 100-D-86:1 pipeline subsite; specifically, the excavation shallow zone, the excavation deep zone, and the overburden soil stockpile. Twelve statistical soil samples were collected from each of the three decision units. All samples were grab samples collected at the predetermined coordinates.

All COPCs were quantified below direct exposure RAGs. All COPCs were quantified below groundwater and/or river protection soil RAGs except for vanadium, benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene, Aroclor-1254, Aroclor-1260, and total PCBs. RESRAD modeling predicted that residual concentrations of these constituents will be protective of groundwater and the Columbia River.

4.1.87.4 Statement of Protectiveness

The results of verification sampling and modeling results show that residual soil concentrations do not preclude any future uses (as bounded by the rural-residential scenario) and allow for unrestricted use of shallow zone soils (i.e., surface to 4.6 m [15 ft] deep). The results also demonstrate that residual contaminant concentrations are protective of groundwater and the Columbia River. Contamination above direct exposure levels was not observed in the deep zone soils; therefore, institutional controls to prevent uncontrolled drilling or excavation into the deep zone soil are not required. The 100-D-86:1 site has been reclassified as “Interim Closed Out.”

4.1.88 100-D-86:2, Additional Process Sewer Pipelines

4.1.88.1 Site Description

The 100-D-86:2, Additional Process Sewer Pipelines subsite consisted of suspected process sewer segments from the 190D and 190DR buildings and the 105D Reactor that were not included in the l00-D-31 and l00-D-50 waste sites, including pipelines, manholes, and drains, which would have carried nonradioactive waste streams from laboratories, water treatment facilities, and the reactor buildings.

4.1.88.2 Investigation Operations

Investigation at the 100-D-86:2 subsite was carried out on November 16 and 17, 2010. Test pits were excavated at six locations. The purpose of each test pit was to determine if process sewer segments associated with the 100-D-86:2 subsite were present in any location. Where pipelines associated with the 100-D-86:2 subsite were found, the test pit area was transferred to the 100-D-86:3 subsite (Section 4.1.89). Where no pipelines, manholes, or drains associated with the 100-D-86:2 subsite were found, it was assumed that any process sewer segments had been previously removed with other field activities. Except for the pipelines associated with the l05DR LSFF at Test Pit 1, no process sewer segments were found during the investigation.

4.1.88.3 Statement of Protectiveness

Test pits dug at selected locations determined that process sewer segments do not exist at five of the six test pit locations. Test Pit 1 was transferred to subsite 100-D-86:3 for RTD. The results also show that residual soil concentrations support future land uses that can be represented (or bounded) by a rural-residential scenario. Current results also demonstrate that residual contaminant concentrations support unrestricted future use of shallow zone soil (i.e., surface to 4.6 m [15 ft]) and that no known evidence of deep zone contamination exists for this site; therefore, according to currently available documentation, no deep zone institutional controls are required. The 100-D-86:2 site has been reclassified as “Interim No Action.”

4.1.89 100-D-86:3, 105-DR Fan Room Sewer Pipelines

4.1.89.1 Site Description

The 100-D-86:3, 105-DR Fan Room Sewer Pipelines subsite consists of the process sewer pipelines that received waste from the 105-DR Fan Room floor drains and condensate. The 100-D-86:3 subsite pipelines were located on the west side of the 105-DR Fan Room. The fan room housed the main blowers,

heaters, and air filters for the 105-DR Reactor, which supplied and distributed conditioned air in the building.

A geophysical survey was performed in May 2010 and November 2012 to support excavation of the subsite. Multiple linears indicating a possible utility corridor adjacent to the waste site were identified during the survey.

1.1.1.1 Confirmatory Sampling

Confirmatory sampling at the 100-D-86 waste site was conducted in November 2010. One test pit was excavated to an approximate depth of 6 m (19 ft) bgs to access a pipe of unknown construction. The pipe was associated with the 105-DR LSFF and flowed to the Test Pit 1 location where it connected with the 100-D-50:1 pipelines. No pipeline was encountered during the excavation of this test pit; therefore, an alternative test pit location was excavated. During excavation of Test Pit 1 at the alternate location, a concrete pipe chase was encountered beginning at approximately 1.2 m (4 ft) bgs. The pipe chase extended to the south and was approximately 30 cm (12 in.) wide and 46 cm (18 in.) thick. The discovery of a pipe chase in this test pit was the basis for remedial action.

1.1.1.2 Excavation Operations

Remediation of the 100-D-86:3 subsite was initially performed on November 14, 2013. The maximum depth of the waste site excavation was approximately 2 m (6.6 ft). Approximately 2,130 BCM (2,786 BCY) of excavated materials were removed and staged in a waste SPA prior to disposal at ERDF. Excavated materials consisted of soil, gravel, and pipe debris. All excavated materials that were stockpiled west of the excavation in the approved SPA were loaded out for disposal to ERDF. The loadout of the waste materials was completed on May 19, 2014. Only 100-D-86:3 subsite waste materials were staged within the SPA.

Several sample locations failed direct exposure RAGs; therefore, additional remediation was performed from June 26 through July 31, 2014, and again on January 9, 2015. Approximately 740 BCM (809 BCY) of additional material was removed from the 100-D-86:3 excavation area. All waste materials were direct loaded for disposal at ERDF. No SPAs were utilized.

In-process samples were taken from several locations following the re-excavation of the subsite. The in-process sampling results indicated that some PCB contamination was present on the north and south ends of the excavation. The northern half of the excavation was excavated further, to the maximum extent possible. Physical interferences with concrete structures, overhead power lines, and the bat tunnel precluded the excavation from proceeding further. Another in-process sample collected at the north end of the excavation and sampling results again indicated Aroclor-1260 levels above direct exposure RAGs. The northern section had been excavated to the maximum depth of 5.1 m (16.4 ft) bgs, where the roof of the bat tunnel was exposed. This section of the excavation could not be excavated further without demolition of the bat tunnel. The southern section was excavated to the maximum depth of 4.6 m (15 ft) bgs.

For the entire 100-D-86:3 subsite remediation approximately 3,536 BCM (4,612 BCY) of excavated materials were removed from the 100-D-86:3 subsite excavation and disposed at ERDF. Radiological field screening was performed during and immediately following remediation. No radiation was detected within the 100-D-86:3 excavation area.

4.1.89.2 Verification Sampling

Verification sampling was conducted at the 100-D-86:3 waste site on June 2 and October 28, 2014. Replacement samples were collected on January 13, 2015, after additional remediation of selected areas

was performed. The area identified for statistical verification sampling at the 100-D-86:3 waste site consists of two decision units, the excavated area and the SPA. Twelve statistical discrete soil samples were collected on the triangular grid within each of the two decision units at the 100-D-86:3 waste site.

All COPCs for all sampling areas were quantified below their respective soil RAGs or lookup values except for benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, and Aroclor-1260 in comparison against the soil RAGs for groundwater and/or river protection in the site excavation and SPA decision units. RESRAD modeling predicted that residual concentrations of these constituents will be protective of groundwater and the Columbia River.

4.1.89.3 Statement of Protectiveness

The evaluation of all verification sample data collected from the south side of the 100-D-86:3 subsite suggests that residual contaminant concentrations do not preclude any future uses (as bounded by the rural-residential scenario) and allow for unrestricted use of shallow zone soils (i.e., surface to 4.6 m [15 ft] deep). The results also demonstrate that residual contaminant concentrations are protective of groundwater and the Columbia River. Sample data collected from the north end of the 100-D-86:3 excavation indicates that Aroclor-1260 contamination is present in the deep zone. Site contamination above direct exposure RAGs extended into the deep zone soils on the north side of the excavation; therefore, institutional controls to prevent uncontrolled drilling or excavation into the deep zone are required. The 100-D-86:3 site has been reclassified as “Interim Closed Out.”

4.1.90 100-D-87, Spill Near Railroad Car Spot

4.1.90.1 Site Description

The 100-D-87, Spill Near Railroad Car Spot waste site, was the site of a suspected UPR of liquid near the acid railroad tank car spot. A photograph taken on January 1, 1945 indicated liquid spilled on the ground surface between the 186D Water Treatment Plant Building and the 190D Pump House. Site visits in 2006, 2008, and 2010 indicated no staining or other visible features at this location. The documentation of the spill was indicated as 57 m (187 ft) by 5 m (16 ft), approximated from the photograph. The total area of the waste site was 285 m^2 (3,086 ft^2).

4.1.90.2 Confirmatory Sampling

Based on observations during the site visit and geophysical survey of the 100-D-87 waste site, confirmatory sampling was performed in August 2010. A total of five focused samples (one from each of the five test pits) were used to evaluate the waste site. Test pits 1 through 4 were excavated to 0.6 m (2 ft) bgs, and Test Pit 5 was excavated to 3.05 m (10 ft) bgs. Field pH readings in each location indicated neutral pH at all locations. No staining, anomalies, or linear features were encountered during confirmatory sampling. Analysis was performed to evaluate if contamination associated with the potential spill was present, and field surveys for radiological contamination and VOCs were conducted during sampling. Confirmatory sampling indicated that environmental contamination was not present at this waste site. The sampling results indicated that the 100-D-87 waste site achieved compliance with the RAOs and RAGs, therefore remediation was not necessary.

4.1.90.3 Statement of Protectiveness

The confirmatory sampling results show that residual contaminant concentrations support future land uses that can be represented (or bounded) by a rural-residential scenario. The results also demonstrate that residual contaminant concentrations support unrestricted future use of shallow zone soil (i.e., surface to 4.6 m [15 ft]), and contaminant levels remaining in the soil are protective of groundwater and the Columbia River. The 100-D-87 waste site did not extend into the deep zone; therefore, institutional

controls to prevent uncontrolled drilling or excavation into the deep zone of the site are not required. The 100-D-87 site has been reclassified as "Interim No Action."

4.1.91 100-D-88, Miscellaneous Pipelines

4.1.91.1 Site Description

The 100-D-88, Miscellaneous Pipelines waste site consisted of pipeline segments that were used for unique building processes, such as fuel oil supply lines, equipment drains, steam condensate pipes, and french drains. Manholes, drains, catch basins, and junction boxes were all associated with this waste site.

The pipelines are in multiple areas throughout the 100-D/100-DR Area. Pipeline segments of the 100-D-88 waste site are part of several facilities that are associated with 105-D and 105-DR Reactor operations. These include the 183D and 183DR filter plants, the 185D De-Aerating Plant, and the 190D and 190DR Pump Houses.

4.1.91.2 Confirmatory Sampling

Confirmatory sampling of the 100-D-88 waste site was initiated and performed in August 2010. Focused samples from eight test pit locations were planned to be used to evaluate the 100-D-88 waste site. It was determined that Test Pit 7 could not be excavated, due to the presence of an internet tower in this location. The tower, which includes a base in the location of the french drain, indicates that this drain no longer exists due to the presence of guy wires at approximately 2 to 2.5 m (6 to 8 ft) bgs. Therefore, sampling was not necessary to make a decision for this portion of the 100-D-88 waste site. Test pits were excavated at the remaining seven locations of the pipeline segments of the 100-D-88 waste site to collect samples or verify removal of the associated piping. After excavation of the test pits a total of three focused samples were collected (Test Pits 3, 4, and 6). At Test Pits 1, 2, 5, and 8 no pipelines could be found and no sampling took place. All radiological and volatile organic vapor readings in the field were less than detectable.

The confirmatory sampling results indicated that the waste site achieved compliance with the RAOs and RAGs and that remediation was not necessary.

4.1.91.3 Statement of Protectiveness

The confirmatory sampling results show that residual soil concentrations support future land uses that can be represented (or bounded) by a rural-residential scenario. The results also demonstrate that residual contaminant concentrations support unrestricted future use of shallow zone soil (i.e., surface to 4.6 m [15 ft]), and contaminant levels remaining in the soil are protective of groundwater and the Columbia River. Institutional controls to prevent uncontrolled drilling or excavation into the deep zone of the site are not required. The 100-D-88 site has been reclassified as "Interim No Action."

4.1.92 100-D-90, Two Transformers

4.1.92.1 Site Description

The 100-D-90, 100D/100DR Out-of-Service Transformers waste site consisted of the soil underlying two drained, reportedly non-PCB transformers that were previously staged on railroad ties. The waste site was located 18 m (60 ft) west of the 183D Facility, next to the paved two-lane road. The site measured 1.8 by 6.1 m (6 by 20 ft). The soil exhibited no visible staining, and the transformers and railroad ties have since been removed and staged in the 200 Area laydown yard. Although the waste site had been originally described as a UPR, a known release at the 100-D-90 waste site did not occur.

The waste site was initially identified through the orphan sites evaluation process as Orphan Site D-63. The two transformers were thought to have originated in the 190DR Building and were placed in

"removed from use" status at the end of June 2005. The transformers were drained on July 12, 2005, prior to staging on railroad ties at the 100-D-90 waste site. The transformers were believed to have been sampled and determined to contain less than 499 ppm PCBs before being drained. Both the transformers and the railroad ties were removed from the site at an unknown time prior to confirmatory sampling and are currently staged in the 200 Area laydown yard.

A site visit was performed in October 2009 to verify site location and confirm the presence of surface features previously identified. No staining was visible at the waste site.

4.1.92.2 Confirmatory Sampling

Confirmatory sampling was performed in August 2010. Two focused soil samples, one from beneath the location of each transformer, were collected to evaluate the 100-D-90 waste site. Each sample was collected from the surface (0 to 0.15 m [0 to 6 in.]) at each location and submitted for PCB analysis. No staining or anomalous features were encountered during confirmatory sampling. Confirmatory sampling indicated that environmental contamination was not present at this waste site. The results indicated that the waste site achieved compliance with the RAOs and RAGs and remediation was not necessary.

4.1.92.3 Statement of Protectiveness

The confirmatory sampling results show that residual soil concentrations support future land uses that can be represented (or bounded) by a rural-residential scenario. The results also demonstrate that residual contaminant concentrations support unrestricted future use of shallow zone soil (i.e., surface to 4.6 m [15 ft]), and contaminant levels remaining in the soil are protective of groundwater and the Columbia River. The 100-D-90 waste site did not extend into the deep zone; therefore, institutional controls to prevent uncontrolled drilling or excavation into the deep zone of the site are not required. The 100-D-90 site has been reclassified as "Interim No Action."

4.1.93 100-D-96:1, 100-D/DR Additional French Drains Group 1

4.1.93.1 Site Description

The 100-D-96:1 subsite includes six individual french drain locations, two dry well locations, and the underlying soil. The 100-D-96:1 subsite is located near the 151D switch yard, 1716D maintenance garage, 1902D water tank, 181D river pump house, 183D clear wells, and 184-DA Building. Furthermore, drywell DDR-200, which is associated with the 151D annex building, was added to the 100-D-96:1 subsite.

Three concrete french drains and one VCP french drain were all visible during the site walkdown in December 2011. One french drain was excavated during the remediation of the 100-D-31:8 (Section 4.1.27), 183D and 186D Northern Sewer Pipelines subsite in 2009 and 2010. One french drain was not located during the discovery site investigation, and it is unknown if the french drain was removed or was covered.

One concrete dry well was removed during remediation of the 100-D-31:9, 183D and 186D Process Sewer Pipelines subsite (Section 4.1.28) in 2009 and 2010. The second concrete drywell was covered with a steel plate with a concrete rim at grade level. The drywell was initially thought to be a manhole. However, after further research and a walkdown, it was determined that the location is consistent with the pressure relief valve for the high-pressure steam supply line to the 151D Annex Building.

4.1.93.2 Confirmatory Sampling

Confirmatory sampling at the 100-D-96:1 waste site took place on June 6 and 7, 2012. One french drain from each of the building locations within the waste site was selected for sampling, except for two removed locations for a total of four french drain test pits for six french drains. Two french drains were associated with the 151D switchyard, therefore the sample results obtained from a single test pit were used to make decisions for both. Two french drains were associated with the same 1716D maintenance garage, therefore sample results from a single test pit were used to make decisions for both. One french drain was associated with the 1902D water tank, and was reassigned to the 100-D-96:2 subsite following confirmatory sampling. One french drain was associated with the 181D river pump house. The second drywell was added to 100-D-96:1 subsite following confirmatory sampling, and is not included in the confirmatory work instruction.

Based on the observations made during each test pit excavation, the sampling approach could be adjusted as necessary to achieve the following objectives: (1) collect a discrete sample of the french drain contents if possible, and (2) collect a discrete sample of the underlying soil. No suspected ACM was observed and no radiological activity was detected during confirmatory sampling at any of the sample locations.

The results and additional analysis data of the remaining french drain locations included in the 100-D-96:1 subsite indicated that this subsite achieved compliance with the RAOs and RAGs; therefore, remediation was not necessary.

4.1.93.3 Statement of Protectiveness

The confirmatory sampling results show that residual soil concentrations support future land uses that can be represented (or bounded) by a rural-residential scenario. The results also demonstrate that residual contaminant concentrations support unrestricted future use of shallow zone soil (i.e., surface to 4.6 m [15 ft]) and that contaminant levels remaining in the soil are protective of groundwater and the Columbia River. The 100-D-96:1 subsite does not extend into the deep zone. Institutional controls to prevent uncontrolled drilling or excavation into the deep zone of the site are not required. The 100-D-96:1 site has been reclassified as “Interim No Action.”

4.1.94 100-D-96:2, 100-D/DR Additional French Drains Group 2

4.1.94.1 Site Description

The 100-D-96:2, 100D/DR Additional French Drains Group 2 subsite, consisted of one french drain that was determined to be contaminated during confirmatory sampling of the 100-D-96 waste site. The french drain was a cobble-filled 0.6 m (2 ft) concrete french drain at grade level located approximately 90 m (295 ft) northeast of the 183D Water Treatment Plant and west of the 1902D water tank.

The 100-D-96:2 subsite french drain was determined to be contaminated with concentrations of benzo(a)pyrene above the direct exposure RAG during confirmatory sampling of the 100-D-96 waste site. Therefore, french drain was designated for remediation as the 100-D-96:2 subsite.

4.1.94.2 Confirmatory Sampling

Confirmatory sampling of 100-D-96:2 french drain was performed on June 7, 2012. The french drain was excavated and found to be two sections of RCP. Stacked together vertically, these two sections of pipe extended to approximately 1.5 m (5 ft) bgs. The contents of the french drain were primarily rusty cobbles at the top and sandy soil near the bottom. A sample was collected of sandy soil inside the french drain. A sample was collected of the underlying soil, at an approximate depth of 2.7 m (9 ft) bgs. Following sample collection of the underlying soil, the concrete pipe structures were placed sideways at the bottom of the excavation and backfilled with the excavated materials.

Because no suspected ACM was observed during confirmatory sampling, analysis was not performed for asbestos. Radiological activity was not detected in the field during confirmatory sampling activities; therefore, no analysis for radionuclides was performed. Benzo(a)pyrene was detected above the direct exposure RAGs, and it was determined that the site would require remediation.

4.1.94.3 Excavation Operations

Remediation of the 100-D-96:2 subsite was performed on May 13, 2014. Approximately 150 BCM (196 BCY) of excavated materials were removed and staged for disposal at ERDF. The depth of the waste site excavation was approximately 1.8 m (6 ft) bgs. Excavated materials consisted of soil, french drain rock, and RCP. The french drain concrete pipe sections were found at an approximate depth of 1.5 m (5 ft) bgs during remediation. These concrete pipe sections and an additional 0.3 m (1 ft) of underlying soil were excavated for disposal at ERDF.

All excavated materials were stockpiled adjacent to the excavation in an approved SPA. Only 100-D-96:2 subsite waste materials were staged within the SPA. Radiological field screening was performed during and immediately following remediation. No radiation was detected within the 100-D-96:2 excavation area. No anomalies were found during remediation of the 100-D-96:2 subsite.

4.1.94.4 Verification Sampling

Verification sampling was conducted at the 100-D-96:2 subsite on August 27, 2014. The size of the remediated waste site is 68.7 m^2 (740 ft^2) and the SPA is 33.7 m^2 (363 ft^2). The remediated subsite and the SPA were each divided into halves for verification sampling. One discrete grab soil sample was collected from each half. Each sample location was at the approximate center of the half. No residual staining was identified within the excavated subsite and SPA. A total of four samples were analyzed. The results indicate that the waste removal action achieved compliance with the RAOs and RAGs.

4.1.94.5 Statement of Protectiveness

Verification sampling results show that residual soil concentrations support future land uses that can be represented (or bounded) by a rural-residential scenario. The results also demonstrate that residual contaminant concentrations support unrestricted future use of shallow zone soil (i.e., surface to 4.6 m [15 ft]) and that contaminant levels remaining in the soil are protective of groundwater and the Columbia River. Site contamination did not extend into the deep zone soils; therefore, institutional controls to prevent uncontrolled drilling or excavation into the deep zone are not required.
The 100-D-96:2 site has been reclassified as “Interim Closed Out.”

4.1.95 100-D-97, 184-DA Fuel Tank

4.1.95.1 Site Description

The 100-D-97, 184DA, underground storage tank (UST), supplied fuel to the 184-DA Steam Generating Facility, which provided steam to 184D and other surrounding 100-D Area facilities. The UST had a capacity of 1,900 L (500 gal), was covered with approximately 0.6 m (2 ft) of overburden, and was located near the southeast corner of the 184-DA Steam Generating Facility. The 100-D-97 waste site is adjacent to the analogous 100-D-9, 185-DA Boiler Oil Tank.

In addition to the UST, the waste site included the associated underlying soils, a fuel oil supply pipeline, and a fuel oil return pipeline. It had been reported that the UST and the associated piping were removed in 1985 and 1986 as part of the 100-DR Area general demolition efforts; however, sections of piping were discovered during confirmatory sampling activities. The UST was not found during sampling. Fuel oil supply and fuel oil return piping were present in confirmatory test trenches.

4.1.95.2 Excavation Operations

Remediation of the 100-D-97 waste site was conducted on February 25, 2014. The remediation extended to approximately 2 m (6.6 ft) deep, resulting in approximately 70 BCM (92 BCY) of soil and piping debris removed and placed in a SPA awaiting loadout and disposal at ERDF. Materials staged in the SPA were disposed at ERDF on June 26, 2014. The steel piping debris that was removed is thought to be boiler fuel oil piping. The fuel tank was not found in the excavation. The soil and debris was later loaded out and disposed at ERDF. No anomalous materials were encountered during the excavation.

4.1.95.3 Verification Sampling

Verification sampling was conducted on August 6, 2014. One decision unit was identified for the 100-D-97 waste site and consists of the 60 m^2 (646 ft^2) excavation and the 180 m^2 (1940 ft^2) SPA. Twelve statistical verification soil samples were collected. Additionally, a single focused sample was collected from directly below the former location of the fuel tank. No residual staining was identified within the excavated waste site and SPA.

All COPCs were quantified below direct exposure RAGs. All COPCs were quantified below groundwater and/or river protection soil RAGs except for Aroclor-1254. RESRAD modeling predicted that residual concentrations of Aroclor-1254 will be protective of groundwater and the Columbia River.

4.1.95.4 Statement of Protectiveness

The 100-D-97, 184-DA Fuel Tank waste site verification sampling data, site evaluations, and supporting documentation demonstrate that this site meets RAOs. These results show that residual soil concentrations support future land uses that can be represented (or bounded) by a rural-residential scenario. The results also demonstrate that residual contaminant concentrations support unrestricted future use of shallow zone soil (i.e., surface to 4.6 m [15 ft]) and that contaminant levels remaining in the soil are protective of groundwater and the Columbia River. Contamination above direct exposure levels was not observed in shallow zone soils and is concluded to not exist in deep zone soils; therefore, institutional controls to prevent uncontrolled drilling or excavation into the deep zone are not required. The 100-D-97 site has been reclassified as “Interim Closed Out.”

4.1.96 100-D-98:2, 152D and 153D Substations – Inactive

4.1.96.1 Site Description

The 100-D-98:2 subsite includes 19 inactive former electrical substations and underlying soil. New electrical equipment was installed at the northwest corner of the 105D Reactor in 1960 replacing the original substation that was removed. Two substations were removed in 1956 to make space for the new annex to the 190DR Building and relocated just north of the annex. Because these three substations were relocated it results in a total of 22 locations.

No staining was observed at any of the 22 former substation locations, and only one location near the 183D Building still has a concrete transformer pad as evidence of the site. Each substation had a primary voltage of 13.8 kV and a secondary voltage ranging from 110 V to 230 kV. Each substation was originally an open wooden pole structure surrounded by a picket fence and contained transformers at or near ground level, set on concrete pads.

4.1.96.2 Confirmatory Sampling

Confirmatory sampling of the 100-D-98:2 subsite was performed to support evaluation of the site against the RAGs. A site-specific sample design for the 100-D-98:2 subsite was developed. Except for one substation location where concrete transformer pad is still located, all concrete transformer pads and contaminated soils have been loaded out, and there has been no evidence of stained soil. It was proposed

that the remaining pad be taken out during demolition of the 183D Building. Eleven of the 22 substation are within another waste site boundary. These substation locations were either part of the associated waste site remediation during cleanup activities or beneath a SPA. In either case, soil was removed, sampling was conducted, and the associated waste site was reclassified as "Interim Closed Out."

Of the remaining 10 substation locations, five were chosen for test pits. Eight soil samples were collected from Test Pits 1-5. In addition, an anomalous brown-orange cluster of dirt and rock was sampled from Test Pit 3. COPCs for all sampling areas were quantified below their respective direct exposure, groundwater, and Columbia River soil RAGs.

4.1.96.3 Statement of Protectiveness

Confirmatory sampling was performed, and the analytical results indicate that the residual concentrations of COPCs at this site meet the RAGs and associated RAOs for direct exposure, groundwater protection, and river protection. Residual contaminant concentrations do not preclude any future uses (as bounded by the rural-residential scenario). The 100-D-98:2 subsite did not extend into the deep zone; therefore, institutional controls to prevent uncontrolled drilling or excavation into the deep zone of the site are not required. The 100-D-98:2 site has been reclassified as "Interim No Action."

4.1.97 100-D-98:3, 153-D-5 Distribution Substation

4.1.97.1 Site Description

The 100-D-98:3 subsite was located on the west side of the 183D Building. The 100-D-98:3 subsite was the location of one former distribution substation (153-D-5). It was an open wooden pole structure surrounded by a picket fence and was constructed with six transformers set on a concrete pad. The transformers each had a capacity of 75 kVA, which transmitted power via overhead and underground cables to secondary and distribution substations located throughout the 100-D Area. The 100-D-98:3 subsite consisted of a 35 m^2 (381 ft^2) concrete slab.

The 100-D-98:3, 153-D-5 Distribution Substation subsite was originally part of the 100-D-98:2 subsite (Section 4.1.96) as associated substation #12. Because this was the only 100-D-98:2 subsite with a concrete pad and it was located so close to the 183D Building, it was deferred to the 183D Building D4 Closure Project.

4.1.97.2 Excavation Operations

During the demolition of the 183D Building in 2013, the 100-D-98:3 subsite concrete slab and underlying soil were excavated to a depth of 1.5 m (5 ft) bgs, removed, and disposed at ERDF. No soil staining was observed on the surface or during the removal of the concrete slab and underlying soil. Documentation has shown, when there is no sign of stained soil within or around the substations, confirmatory samples were undetected or detected below RAGs. Additionally, the 100-D-98:3 subsite location was excavated to the same depth or deeper than some of the locations that required no confirmatory sampling in the 100-D-98:2 subsite.

4.1.97.3 Statement of Protectiveness

The 100-D-98:3 subsite did not extend into the deep zone; therefore, institutional controls to prevent uncontrolled drilling or excavation into the deep zone of the site are not required. The 100-D-98:3 site has been reclassified as "Interim Closed Out."

4.1.98 100-D-99, Two Suspect Features Identified by Ground Penetrating Radar

4.1.98.1 Site Description

The 100-D-99; Two Suspect Features Identified by Ground Penetrating Radar waste site is located between the former locations of the 1716D Maintenance Garage and the 1719D First Aid Station. It was believed that the fenced area of the 1719D Building indicated the location of a potential temporary septic system, based on similar fenced septic systems from that period. Temporary sewers and septic tanks were constructed in the 100-D Area up until April 1944.

4.1.98.2 Excavation Operations

Remediation of the 100-D-99 waste site was performed on May 12, 2014, and excavated materials were staged at a SPA. Approximately 383 BCM (500 BCY) of excavated materials were staged. On June 25 and June 30, 2014, this material was taken from the SPA and disposed at ERDF. The maximum depth of the waste site excavation was approximately 1.5 m (5 ft) bgs. Excavated materials consisted of soil and concrete debris. No anomalies or staining were encountered.

4.1.98.3 Verification Sampling

Verification sampling was conducted on October 22, 2014. Twelve statistical samples were collected at each of the decision units (excavation and SPA). No residual staining was identified within the excavated waste site area.

All COPCs were quantified below direct exposure RAGs. All COPCs were quantified below groundwater and/or river protection soil RAGs except for selenium, benzo(a)pyrene, and benzo(b)fluoranthene. RESRAD modeling predicted that residual concentrations of these constituents will be protective of groundwater and the Columbia River.

4.1.98.4 Statement of Protectiveness

These results show that residual soil concentrations support future land uses that can be represented (or bounded) by a rural-residential scenario. The results also demonstrate that residual contaminant concentrations support unrestricted future use of shallow zone soil (i.e., surface to 4.6 m [15 ft]) and that contaminant levels remaining in the soil are protective of groundwater and the Columbia River. Contamination above direct exposure levels was not observed in shallow zone soils and is concluded to not exist in deep zone soils; therefore, institutional controls to prevent uncontrolled drilling or excavation into the deep zone are not required. The 100-D-99 site has been reclassified as “Interim Closed Out.”

4.1.99 100-D-101, 108-D Acid Pit and Sump, 108-D Car Spot, 108D Sodium Silicate Sump, 108-D Storage Tanks, Miscellaneous Structures

4.1.99.1 Site Description

The 100-D-101, 108D Acid Pit and Sump, 108D Car Spot, 108D Sodium Silicate Sump, 108D Storage Tanks, Miscellaneous Structures waste site was the location of a water treatment chemical delivery, storage, and handling facility. The 100-D-101 site is located north of the 105D Reactor and includes several features associated with a railroad car chemical unloading facility and storage tanks adjacent to the 108D Building. The original site facilities consisted of two sulfuric acid storage tanks, two sodium silicate storage tanks, an acid neutralization pit and sump, a sodium silicate pump, two sets of pumps, and a railroad tank car spot.

4.1.99.2 Confirmatory Sampling

Confirmatory sampling was performed on May 31, June 4 and 5, 2012, and February 27, 2013, and consisted of excavating three test pits and two test trenches and collecting soil samples at each.

Twelve discrete samples were collected. One additional sample was also collected from heavily stained soil.

Three COPCs (lead, zinc, and chrysene) were detected above the applicable groundwater and river protection RAGs. RESRAD modeling predicted that residual concentrations of these constituents will be protective of groundwater and the Columbia River.

4.1.99.3 Statement of Protectiveness

These results show that residual soil concentrations support future land uses that can be represented (or bounded) by a rural-residential scenario. The results also demonstrate that residual contaminant concentrations support unrestricted future use of shallow zone soil (i.e., surface to 4.6 m [15 ft]) and that contaminant levels remaining in the soil are protective of groundwater and the Columbia River. The 100-D-101 waste site contamination does not extend into the deep zone soils; therefore, institutional controls to prevent uncontrolled drilling or excavation into the deep zone of the site are not required. The 100-D-101 site has been reclassified as “Interim No Action.”

4.1.100 100-D-102, Suspect Effluent Leak Adjacent to 107-DR Basin

4.1.100.1 Site Description

The 100-D-102, Suspect Effluent Leak Adjacent to 107-DR Basin waste site is the location of a suspected leak of reactor cooling water effluent. The 100-D-102 waste site was identified as a dark area compared to the surrounding terrain in a 1962 aerial photograph. The dark area was suspected to be effluent that leaked to the ground outside of the 107-DR Basin. The surface of the site has been re-graded many times, and the feature is no longer discernable from the surrounding area.

4.1.100.2 Confirmatory Sampling

The 100-D-102 waste site was sampled on May 30 and 31, 2012, and June 5, 2012. Discrete samples were collected as available at each sample location. The sample design called for five test pits to be excavated to a maximum depth of 4.6 m (15 ft). The intent of sampling was to evaluate the 100-D-102 site for the potential presence of radiological and nonradiological soil contamination resulting from the suspected effluent leak adjacent to the 107-DR Retention Basin and to determine if the site meets cleanup criteria. Five samples were collected.

Confirmatory sampling results, in conjunction with field instrumentation screening results, indicate that the residual concentrations of COPCs at this site meet the RAGs for direct exposure, groundwater protection, and river protection.

4.1.100.3 Statement of Protectiveness

Results show that residual soil concentrations support future land uses that can be represented (or bounded) by a rural-residential scenario. The results also demonstrate that residual contaminant concentrations support unrestricted future use of shallow zone soil (i.e., surface to 4.6 m [15 ft]) and that contaminant levels remaining in the soil are protective of groundwater and the Columbia River. The 100-D-102 site did not extend into the deep zone; therefore, institutional controls to prevent uncontrolled drilling or excavation into the deep zone of the site are not required. The 100-D-102 site has been reclassified as “Interim No Action.”

4.1.101 100-D-104, Unplanned Release near 185-D Sodium Dichromate Storage Tank and Acid Neutralization French Drain

The 100-D-104 waste site was discovered while performing the initial remedial action at the 100-D-30 waste site. Due to geographic location and similarity of remediation activities, cleanup activities for the

100-D-30 and 100-D-104 sites were conducted together. For additional information regarding the 100-D-104 site, refer to the 100-D-30 site (Section 4.1.19).

The 100-D-104 site has been reclassified as "Interim Closed Out."

4.1.102 100-D-105, D/DR-Area Pipelines Discovered During Remediation

4.1.102.1 Site Description

The 100-D-105 site consists of 17 unrelated pipeline segments in the 100-D/DR Area. Fourteen of these segments were discovered during remediation of unrelated waste sites. These 14 pipelines were determined not to be associated with any existing waste site based on spatial analysis of the geographic information system assignments of these pipelines with those contained in regulator-approved work instructions and closure documents. The pipeline segments were either not assigned to a waste site or were found to be incorrectly assigned to a waste site when compared to the regulator-approved documents.

1.1.1.1 Confirmatory Sampling

Confirmatory sampling of 14 pipeline segments with unknown process history was performed between July 24 and September 6, 2013. Focused sampling was used to characterize the pipeline segments in the 100-D-105 waste site. A total of 24 samples were collected. Sample locations were determined based on observations during previous waste site remediation activities and existing geophysical data.
Where possible, the pipeline segment sample location was positioned 1 to 2 m (3.3 to 6.6 ft) outside the former waste site excavation boundary along the pipeline trajectory. The objective in locating the confirmatory sampling location outside of the former excavation was to obtain sample material that had not been impacted by previous remedial action and backfill. However, some pipeline segments were fully within former excavation areas and the confirmatory sample locations were within a previously disturbed area. Confirmatory sampling was not conducted for the remaining three pipeline segments with established process history that were known to not have carried regulated chemicals.

In the 100-D-105 confirmatory soil samples, all COPCs were quantified below groundwater and/or river protection soil RAGs except for cadmium, vanadium, and zinc. RESRAD modeling predicted that residual concentrations of these constituents will be protective of groundwater and the Columbia River.

4.1.102.2 Statement of Protectiveness

These results show that residual soil concentrations support future land uses that can be represented (or bounded) by a rural-residential scenario. The results also demonstrate that residual contaminant concentrations support unrestricted future use of shallow zone soil (i.e., surface to 4.6 m [15 ft]) and that contaminant levels remaining in the soil are protective of groundwater and the Columbia River.
The 100-D-105 waste site contamination did not extend into the deep zone. Institutional controls to prevent uncontrolled drilling or excavation into the deep zone of the site are not required. The 100-D-105 site has been reclassified as "Interim No Action."

4.1.103 100-D-107, Soil Beneath the 1713DA Essential Materials Warehouse

4.1.103.1 Site Description

The 100-D-107, Soil Beneath the 1713DA Essential Materials Warehouse site is an area approximately 2,434 m^2 (26,199 ft^2) in size, consisting of the soil beneath and surrounding the demolished 1713DA Essential Materials Warehouse. The 1713DA Building was used as the main receiving and storage warehouse in support of the initial construction of the 100-D Area. After the end of the 105-D and 105-DR Reactors construction period, the building was kept in use as the "Essential Materials Warehouse." During the 1940s and/or 1950s, the building may have been used to store solid sodium

dichromate, which was classified as an essential material. Additional items that may have been stored within the building include other dry chemicals used in the 100-D Area (e.g., lime, oxalic acid), spare parts, and equipment.

4.1.103.2 Confirmatory Sampling

Confirmatory sampling was performed on July 17, 18, and 23, 2013. The sample design called for two test trenches to be excavated to a depth of 1.5 m (5 ft) and 3.0 m (9.8 ft) bgs to locate contaminated soil for confirmatory sampling. A total of 13 samples were collected.

In addition to laboratory analyses of soil samples, the confirmatory sample design called for VOC and radiological field screening of excavated materials and visual inspection of the excavations for possible indication of soil contamination. There were no elevated VOC readings observed and no radiological activity detected during confirmatory sampling of the site. Visual staining was observed at one location; therefore, an additional sample was collected for this site.

All COPCs from the 100-D-107 confirmatory sampling were quantified below their respective direct exposure RAGs. Groundwater and the Columbia River soil protection RAGs are exceeded by antimony, barium, beryllium, copper, lead, manganese, and vanadium. RESRAD modeling predicted that residual concentrations of these constituents will be protective of groundwater and the Columbia River.

4.1.103.3 Statement of Protectiveness

These results show that residual soil concentrations support future land uses that can be represented (or bounded) by a rural-residential scenario. The results also demonstrate that residual contaminant concentrations support unrestricted future use of shallow zone soil (i.e., surface to 4.6 m [15 ft]) and that contaminant levels remaining in the soil are protective of groundwater and the Columbia River. Contamination above direct exposure levels was not observed in the shallow zone soils and is concluded to not exist in deep zone soils. Therefore, institutional controls to prevent uncontrolled drilling or excavation into the deep zone of the site are not required. The 100-D-107 site has been reclassified as "Interim No Action."

4.1.104 100-D-108, 182-D Remaining Pipeline Stubs

4.1.104.1 Site Description

This site consists of six pipeline segments that remained after the remediation of 100-D-31 to preserve the structural integrity of the active 182D Water Reservoir. The pipelines are located adjacent to the 182D Water Reservoir. During excavation of 100-D-72 (Section 4.1.66) the ends of the 100-D-108 pipeline stubs were revealed within the excavation sidewalls. Two areas of the excavation were backfilled after the collection of representative samples from within those areas. The 100-D-108 site is classified as "Accepted." This site will be addressed in the final action ROD.

4.1.104.2 Verification Sampling

Verification sampling of the 100-D-108 waste site was conducted between September 9 and September 15, 2014. The verification sampling design included three focused samples collected at the 100-D-108 pipeline stubs.

4.1.105 100-D-109, 183-D Remaining Pipeline Stubs

The site consists of the pipeline segments that remained after the remediation of 100-D-31 to preserve the structural integrity of the 183D clearwell bat habitat. Short sections of two pipes could not be excavated during removal of 100-D-31:9 (Section 4.1.28). These now make up site 100-D-109. The 100-D-109 site is classified as "Accepted." This site will be addressed in the final action ROD.

4.1.106 116-D-1A, 105-D Storage Basin Trench #1

Due to geographic location and similarity of remediation activities, cleanup activities for the 116-D-1A, 116-D-1B, and 100-D-46 sites were conducted together. This section includes information about all three sites, which are referred to as the 116-D-1A/116-D-1B site. Descriptions of 116-D-1B and 100-D-46 sites are included in Sections 4.1.107 and 4.2.8, respectively. Information regarding excavation, verification sampling, and the statement of protectiveness for all three sites are included in this section.

4.1.106.1 Site Description

The 116-D-1A site was a trench located approximately 30 m (100 ft) east of the 105D Reactor. This trench was 40 m (130 ft) by 3 m (10 ft) by 1.8 m (6 ft) deep. It was used from 1947 to 1952 and received contaminated water and sludge from the 118-D-6 fuel storage basin (FSB).

4.1.106.2 Excavation Operations

Remedial action at the 116-D-1A/116-D-1B site began on October 21, 1999. Excavation of the site involved removing the overburden materials, the contaminated structure, and underlying contaminated soil. On July 11, 2000, the excavation reached the design depth. At the completion of remedial action, the excavation was approximately 2,648 m^2 (28,470 ft^2) in area with a maximum depth of approximately 4.6 m (15 ft). Approximately 10,987 metric tons (12,111 tons) of material from the site was disposed at ERDF.

4.1.106.3 Verification Sampling

Final cleanup verification samples were collected following variance sampling. Cleanup verification sampling began on July 26, 2000 and was finished on August 2, 2000. The site consisted of both a shallow and a deep zone decision unit. The site was excavated to a depth greater than 4.6 m (15 ft) with the shallow zone consisting of the excavation sidewalls and the deep zone consisting of the floor of the excavation. The shallow zone decision unit contained two decision subunits, which were divided into eight sampling areas. Four samples were collected from each shallow zone decision subunit. The deep zone decision unit contained one decision subunit, which was divided into three sampling areas. Three composite samples were also collected from the deep zone (i.e., below 4.6 m [15 ft]).

4.1.106.4 Statement of Protectiveness

The remaining soils at the 116-D-1A/116-D-1B site have been sampled, analyzed, and modeled. The results indicate materials from the 116-D-1A/116-D-1B site containing COCs at concentrations exceeding the RAGs have been excavated and disposed at ERDF, residual COC concentrations in the shallow zone will support future land uses that can be represented (or bounded) by rural-residential scenario, and residual COC concentrations throughout the site are protective of groundwater and the Columbia River. The acceptability of unrestricted direct exposure to deep zone soils has not been demonstrated; therefore, institutional controls to prevent uncontrolled drilling or excavation into the deep zone (i.e., below 4.6 m [15 ft]) are required. The 116-D-1A/116-D-1B site (which includes 100-D-46) has been reclassified as “Interim Closed Out.”

4.1.107 116-D-1B, 116D1B, 105-D Storage Basin Trench #2

The 116-D-1B Trench was constructed in 1953 to replace the 116-D-1A Trench. This trench was 30 m (100 ft) by 3 m (10 ft) by 5 m (15 ft) deep and received contaminated water and sludge from the 118-D-6 FSB from 1953 to 1967.

Due to geographic location and similarity of remediation activities, the 116-D-1A (Section 4.1.106), 116-D-1B, and 100-D-46 (Section 4.2.8) sites were interim closed out as one decision unit referred to as

the 116-D-1A/116-D-1B site. For additional information regarding excavation, verification sampling, or the statement of protectiveness for the 116-D-1B site, refer to the 116-D-1A site (Section 4.1.106).

The 100-D-46 site has been reclassified as "Interim Closed Out."

4.1.108 116-D-2, 105-D Pluto Crib, 116-D-2A

4.1.108.1 Site Description

The 116-D-2 site was a liquid waste site located about 30.5 m (100 ft) east of the 115D/DR Gas Treatment Facility (132-D-1, Section 4.1.126) and was approximately 920 m (3,018 ft) from the Columbia River. Two pluto cribs were associated with the 116-D-2 site. The first was suspected to have been a hole dug for a one-time use, and the second was the main pluto crib.

The 116-D-2 site was used to isolate coolant flow from process tubes containing ruptured fuel elements until the ruptured fuel could be discharged. A pluto valve was installed on the downstream end of the process tube, connecting the tube to a rubber hose. The coolant then flowed through the rubber hose into the crib. An estimated 4,000 L (1,060 gal) of liquid wastes was disposed at the 116-D-2 site, and the known hazardous chemical inventory included an estimated 0.004 kg (0.14 oz.) of sodium dichromate.

The main crib's dimensions were 3.1 m (10 ft) by 3.1 m (10 ft) by 3.1 m (10 ft). The crib was set into the ground with its upper surface at grade. It had a hatch, which was opened to receive the rubber hose. The 116-D-2 site was used regularly from 1950 to 1952, and was possibly used as late as 1956.

4.1.108.2 Excavation Operations

Remedial action at the 116-D-2 site began on November 1, 1999. Excavation of the site involved removing the overburden materials, the contaminated structure, and underlying contaminated soil. Based on field screening, overburden materials identified as potentially clean were placed in stockpiles for potential use as backfill. Materials that were found to be contaminated were disposed at ERDF. On November 2, 1999, the excavation reached the design depth.

At the completion of remedial action, the excavation was approximately 217.9 m^2 (714.9 ft^2) in area with a maximum depth of approximately 4.6 m (15 ft). Approximately 623.2 metric tons (687 tons) of material from the site was disposed at ERDF.

4.1.108.3 Verification Sampling

Final cleanup verification samples were collected following variance sampling. Cleanup verification sampling was conducted on January 3, 2000. The 116-D-2 site consisted of only a shallow zone decision unit. The shallow zone decision unit contained one decision subunit, which was divided into four sampling areas. Each verification sample is a composite formed by combining samples collected at a minimum of four randomly selected nodes within each sampling area. Four samples were collected.

4.1.108.4 Statement of Protectiveness

Remedial action at the 116-D-2 site has achieved the RAOs and corresponding RAGs. Materials from the 116-D-2 site that contain COCs at concentrations exceeding the RAGs have been excavated and disposed at ERDF. The remaining soils have been sampled, analyzed, and modeled to show that residual concentrations in the shallow zone will support future land uses that can be represented (or bounded) by a rural-residential scenario and that residual concentrations throughout the site pose no threat to groundwater or the Columbia River. The acceptability of unrestricted direct exposure to deep zone soils has not been demonstrated, therefore, institutional controls to prevent uncontrolled drilling or excavation into the deep zone (i.e., below 4.6 m [15 ft]) are required.

In 2005, the statement of protectiveness for 116-D-2 was revised by DOE letter 05-AMRC-0078. Based on this letter, institutional controls have been removed from this waste site. The 116-D-2 site has been reclassified as "Interim Closed Out."

4.1.109 116-D-3, 116D3, 108-D Crib #1

Based upon excavations, a review of Hanford Site drawings, GPR investigations, discussions with field personnel and the original design team, it has been determined that the 166-D-3 Crib and 116-D-4 Crib (Section 4.1.110) are the same site. Remediation activities of the 116-D-4 Crib took place on October 20 through 21, 1999. The 116-D-3 site was identified as a french drain in WHC-SD-EN-TI-181, *100-D Area Technical Baseline Report*; however, this identification was based on drawings that were not as-built.

The 116-D-3 site was originally reclassified as "Rejected" in April 2000. The site was reclassified in January 2003, to "Interim No Action" to align with the Remaining Sites ROD.

4.1.110 116-D-4, 108-D Crib #2

4.1.110.1 Site Description

The 116-D-4 Crib, alternately known as the 116-D-4 french drain, the 108D Crib #2, or the 116-D-4 french drain #2, is an inactive liquid waste site that operated from 1956 to 1967. Site 116-D-3 (Section 4.1.109) is a duplicate number for this crib.

The 116-D-4 site has been described as a 2.4 by 2.4 m (8 by 8 ft) crib, 5 m (16 ft) deep. It has also been described as a french drain 3-ft in diameter and 1.7 m (5 ft) deep. The site is located 65.4 m (281 ft) directly east of the former 108D Shipping Cask Handling Facility. A 4 in. VCP connected the crib to the building drain line from the former 108D wash area. The crib was filled with 8 cm (3 in.) rock. The site received contaminated liquid wastes from the 108D contaminated maintenance shops and technical laboratory. The liquid wastes included contaminated water, decontamination solutions, solvents, and low-level fission products.

4.1.110.2 Excavation Operations

Remedial action at the 116-D-4 site began on October 20, 1999. Excavation of the site involved removing the overburden materials, any encountered engineered structure, and underlying soil. Based on field screening, excavated materials identified as potentially clean were placed in stockpiles for potential use as backfill. On October 21, 1999, the excavation reached the design depth. At the completion of remedial action, the excavation was approximately 137.8 m^2 (1,482 ft^2) in area with a maximum depth of approximately 2.8 m (9 ft).

4.1.110.3 Verification Sampling

Final cleanup verification samples were collected following variance sampling. Cleanup verification sampling began on January 3, 2000, and was finished on January 4, 2000. For the 116-D-4 site, a sample design was developed for the shallow zone decision unit only. The shallow zone sample design covered the excavation sidewalls to a depth of 2.8 m (9 ft) and the floor of the excavation. The shallow zone decision unit contained one decision subunit, which was divided into four sampling areas.
Each verification sample is a composite formed by combining samples collected at a minimum of four randomly selected nodes within each sampling area. Four samples were collected.

4.1.110.4 Statement of Protectiveness

The remaining soils have been sampled and analyzed to show that residual concentrations in the shallow zone will support future land uses that can be represented (or bounded) by a rural-residential scenario and that residual concentrations throughout the site pose no threat to groundwater or the Columbia River.

The acceptability of unrestricted direct exposure to deep zone soils has not been demonstrated, therefore, institutional controls to prevent uncontrolled drilling or excavation into the deep zone (i.e., below 4.6 m [15 ft]) are required.

In 2005, the statement of protectiveness for 116-D-4 was revised by DOE letter 05-AMRC-0078. Based on this letter, institutional controls have been removed from this waste site. The 116-D-4 site has been reclassified as "Interim Closed Out."

4.1.111 116-D-5, 1904-D Outfall Structure

4.1.111.1 Site Description

The 116-D-5, 1904-D Outfall Structure was located on the bank of the Columbia River approximately 122 m (400 ft) west of the former location of the 116-D-7, 107-D Retention Basin (Section 4.1.113, removed and disposed from 1997 to 1998).

The 116-D-5 waste site was a liquid waste site that operated from 1944 to 1967 for the disposal of reactor cooling water. It continued to operate until 1975 for the disposal of 100-D Area process sewer effluents. Reactor cooling water collected and was temporarily stored in the 116-D-7, 107-D Retention Basin and 116-DR-9, 107-DR Retention Basin (Section 4.1.114) before being discharged to the Columbia River via the outfall structure and associated 100-D-60 river effluent pipelines (Section 4.1.57). Process sewer wastes were discharged directly to the 116-D-5 outfall structure via the 100-D-31:7 process sewer main line (Section 4.1.26). Influents to the outfall structure discharged into the upper chamber of the concrete outfall structure, flowed through a bar grillwork, and fell about 6 m (20 ft) to the lower chamber of the outfall structure. It then overflowed from the lower chamber into the discharge pipe (100-D-60) to the river. If the outfall pipeline could not accommodate the full discharge capacity, effluent would overflow to the river via an emergency overflow spillway (100-D-65, Section 4.1.60). The outfall structure was demolished and caved into itself and backfilled with soil in 1998.

4.1.111.2 Excavation Operations

Remedial action at the 116-D-5 waste site was performed between February 6 and April 1, 2009. Additional remediation was conducted on March 15, 2011 to remove residual contamination identified after the initial round of verification sampling. The site was originally excavated to a depth of approximately 5 m (16 ft) on the northwestern side of the excavation and 10 m (33 ft) on the southeastern side of the excavation. The depth of the excavation following additional remediation is approximately 6 m (20 ft) on the northwestern side and 11 m (36 ft) on the southeastern side of the excavation. The outfall structure was completely removed. The entire excavation resulted in approximately 2,275 BCM (2,976 BCY) of contaminated soil and debris removed for disposal to ERDF. Some of the material removed from the excavation was placed in a SPA prior to being loaded out for disposal at ERDF.

The southern edge of the 116-D-5 footprint is collocated with a section of concrete pipeline associated with the 100-D-31:7 waste site. Overburden material has been removed from over the top of the northernmost end of the pipeline where it enters the 116-D-5 outfall.

GPERS surveys capable of detecting gamma radiation were conducted at the 116-D-5 waste site upon completion of remedial action activities. Areas exhibiting elevated radiological activity were identified near the base of the excavation. The highest activity reported is 3,893 gross counts per minute (cpm). The radiological activity is present at a depth of greater than 4.6 m (15 ft) bgs, taking into account the slope of the surface at the site. Therefore, the site was stratified into a deep zone decision unit and a shallow zone decision unit.

No additional material was removed, and no further radiological surveys were conducted within the excavation. No elevated radiological activity was detected. The overburden soil stockpiles were surveyed in 1 m (3 ft) lifts. No elevated radiological activity was detected.

4.1.111.3 Verification Sampling

Verification sampling at the 116-D-5 waste site was conducted in November 2009. The original verification sample results indicated residual contamination present in the deep zone of the site; therefore, additional remediation and resampling was conducted. Replacement sampling following additional remediation was conducted on March 16, 2011.

The 116-D-5 waste site was divided into four decision units for statistical verification sampling: the shallow zone excavation, the deep zone excavation, the SPA, and the overburden soil stockpile. The post-excavation global positioning survey was used to determine the boundaries of the decision units. A total of 12 statistical soil samples were collected from each of the four decision units.

The results of the verification sampling indicate that the RAOs and RAGs for direct exposure, protection of groundwater, and protection of the Columbia River have been met.

4.1.111.4 Statement of Protectiveness

The results of verification sampling show that residual contaminant concentrations do not preclude any future uses (as bounded by the rural-residential scenario) and allow for unrestricted use of shallow zone soils (i.e., surface to 4.6 m [15 ft] deep). The analytical results also demonstrate that residual contaminant concentrations at the site are protective of groundwater and the Columbia River. The 116-D-5 site was excavated to a maximum depth of 6 m (20 ft) on the northwestern side of the excavation and 11 m (36 ft) on the southeastern side of the excavation. Institutional controls to prevent uncontrolled drilling or excavation into the deep zone soil are not required. The 116-D-5 site has been reclassified as “Interim Closed Out.”

4.1.112 116-D-6, 116D6, 105-D Cushion Corridor French Drain

4.1.112.1 Site Description

The 116-D-6 site is located adjacent to the northeast corner of the 105D Reactor. It is bordered on two sides by the reactor wall and foundation, and on the other two sides by the 100-D-48 cooling water effluent pipelines. The 116-D-6 waste site was a 1 m (3.3 ft) diameter french drain, 1 m (3.3 ft) deep, made of vitreous tile conduit fed by a single 4 in. galvanized steel pipe. The french drain was covered by approximately 1 m (3.3 ft) of gravel and soil. It was surrounded by a steel barricade structure bolted to an outside wall. The drain received domestic wastewater from the change room and wastewater from the mask decontamination station located in the cushion corridor during reactor operation from 1953 to 1967. Additional decontamination effluents and solvents were also likely disposed in this french drain. Shallow zone soils (i.e., the upper 4.6 m [15 ft]) associated with the 116-D-6 site were excavated and disposed at ERDF with the remediation of the 100-D-48 cooling water effluent pipelines (Sections 4.1.35 through 4.1.38). The floor of the excavation is in the deep zone; no shallow zone soils remain to be characterized and evaluated.

4.1.112.2 Excavation Operations

Shallow soils associated with the 116-D-6 site were excavated and disposed at ERDF during the remediation of the 100-D-48 cooling water effluent pipelines. Remedial action at the 116-D-6 site began on October 21, 1999. Excavation of the site involved removing the overburden materials, the contaminated structure, and the underlying deep zone soils. Based on field screening, overburden materials identified as potentially clean were placed in stockpiles for potential use as backfill.

Materials that were found to be contaminated were disposed at ERDF. On January 3, 2000, the excavation reached the design depth. At the completion of remedial action, the excavation was approximately 10.1 m^2 (109 ft^2) in area with a maximum depth of approximately 4.6 m (15 ft). Approximately 200 metric tons (221 tons) of material from the site was disposed at ERDF.

4.1.112.3 Verification Sampling

Final cleanup verification samples were collected following variance sampling. Cleanup verification sampling began on February 29, 2000, and was finished the same day. The 116-D-6 site consisted of only a deep zone decision unit. The site was excavated to a depth of 4.6 m (15 ft) with the deep zone consisting of the floor of the excavation. The deep zone decision unit contained one decision subunit, which was divided into three sampling areas. Each verification sample was a composite formed by combining samples collected at a minimum of four randomly selected nodes within each sampling area. For the 116-D-6 site, three composite samples were collected from the deep zone in addition to QA/QC samples.

4.1.112.4 Statement of Protectiveness

Materials from the 116-D-6 site that contain COCs at concentrations exceeding the RAGs have been excavated and disposed at ERDF. The remaining soils have been sampled, analyzed, and modeled to show that residual concentrations in the shallow zone will support future land uses that can be represented (or bounded) by a rural-residential scenario and that residual concentrations throughout the site pose no threat to groundwater or the Columbia River. The acceptability of unrestricted direct exposure to deep zone soils has not been demonstrated; therefore, institutional controls to prevent uncontrolled drilling or excavation into the deep zone (i.e., below 4.6 m [15 ft]) are required. The 116-D-6 site has been reclassified as “Interim Closed Out.”

4.1.113 116-D-7, 107-D Retention Basin, 107-D

4.1.113.1 Site Description

The 116-D-7 site is located near the northern edge of the 100-D Area and is approximately 110 m (360 ft) from the Columbia River. The 116-D-7 site received 100D Reactor cooling water from 1944 until 1967. The 142 by 70 by 5.7 m (467 by 230 by 19 ft) deep basin was an open concrete structure with a vertical concrete flume dividing the basin. Floor joints were originally sealed with neoprene. The purpose of the basin was to allow time for thermal cooling and radioactive decay of short-lived radionuclides prior to discharge of process effluent to the Columbia River.

Leakage from the retention basin was common due to thermal expansion and contraction of the concrete panels used to form the walls and the floors. There are several documented occurrences of major leaks or UPRs from the 116-D-7 basin. These UPRs are included under the site identifier UPR-100-D-4 (Section 4.1.141). After the 105D Reactor was shut down in 1967, decommissioning of the 116-D-7 site included in situ demolition of the basin walls and placement of a minimum of 0.3 m (1 ft) of soil over the site. The cover soil was taken from areas immediately surrounding the basin, potentially including an area where basin sludge had been buried in 1953.

4.1.113.2 Excavation Operations

Excavation of the 116-D-7 site began on May 1, 1997, and involved removing the overburden materials, the contaminated structure, and underlying contaminated soil. Based on field screening, overburden materials identified as potentially clean were placed in stockpiles for potential use as backfill. Materials that were found to be contaminated were disposed at ERDF. After the original excavation and sampling reached the design depth, hexavalent chromium concentrations were above the soil RAG for river protection (2.2 mg/kg). To remediate areas that were above the hexavalent chromium soil RAG, approximately two-thirds of the floor was excavated an additional meter.

The lowest elevation that the excavation extended to was about 7.4 m (24.4 ft) bgs. The low areas of the site excavation are two relatively small areas near the east and west ends of the site. The remainder of the site, except for the sidewalls, was generally excavated to the design limit depth. At the completion of remedial action, the excavation was approximately 12,940 m^2 (139,200 ft^2) in area. Approximately 177,724 metric tons (195,941 tons) of material from the site was disposed at ERDF.

4.1.113.3 Verification Sampling

Final cleanup verification samples were collected following variance sampling. Cleanup verification sampling was conducted during August, September, and November 1998, and during January and February 1999. For the 116-D-7 site, the excavation surface area was divided into two decision units, the shallow zone and the deep zone. A statistical composite sampling design was developed for each decision unit. For the 116-D-7 site, the shallow zone sample design does not include all excavation sidewalls because the adjoining sites 100-D-18 (Section 4.1.11), 100-D-19 (Section 4.1.12), 100-D-20 (Section 4.1.13), and D Group 2 Pipelines (100-D-48:2, Section 4.1.36) include the sidewall areas.

The 116-D-7 deep zone decision unit is the excavation floor. The deep zone is typically represented by soil from the excavation sidewalls and the excavation floor that is 4.6 m (15 ft) or greater (bgs). The sampling designs divide each decision unit into decision subunits. The shallow zone decision unit was divided into two decision subunits that were further divided into eight sampling areas. The deep zone decision unit was divided into three decision subunits that were further divided into nine sampling areas. Each sampling area was divided into 16 grid areas.

One cleanup verification sample was collected from each sampling area. Each cleanup verification sample is a composite of four sample nodes. For the shallow zone, samples were collected from a total of 32 nodes (4 per sample area) and composited by sample area into 8 cleanup verification samples. For the deep zone, samples were collected from a total of 36 nodes (4 per sample area) and composited by sample area into 9 cleanup verification samples.

The deep zone was divided into two levels (Level I and Level II) to perform RESRAD evaluations. Level I of the deep zone is 2 m (6.6 ft) thick, extending from bottom of design excavation depth. Level II of the deep zone for analysis purposes is 11.45 m (37.6 ft) thick, extending from the bottom of Level I to groundwater.

The results indicated that radionuclides do not reach groundwater (and, by extension, do not reach the Columbia River) at levels above the 4 mrem/yr RAG. Individual COC residual soil concentrations do not result in groundwater or river concentrations at levels above the individual COC RAG. Therefore, the Columbia River protection RAGs have been attained. The shallow zone cleanup verification values for nonradionuclide COCs are all below the soil RAGs for river protection. Therefore, the shallow zone soils are considered to be protective of the river.

The hexavalent chromium cleanup verification values for Levels I and II are 3.26 mg/kg and <2.2 mg/kg, respectively. The hexavalent chromium Level I cleanup verification value of 3.26 mg/kg is above the 2.2 mg/kg river protection RAG. DOE commissioned a leach rate study to evaluate the mobility of hexavalent chromium at the 116-D-7 site. Based on the study findings, the hexavalent chromium remaining in the sediments at the 116-D-7 site do not pose a risk to the river; therefore, hexavalent chromium concentrations in the 116-D-7 site deep zone meet the river protection RAG.

4.1.113.4 Statement of Protectiveness

Remedial action at the 116-D-7 site has achieved the RAOs and corresponding RAGs. Materials that contain COCs at concentrations exceeding the RAGs have been excavated and disposed at ERDF.

The remaining soils have been sampled, analyzed, and modeled to show that residual COC concentrations will support future land uses that can be represented (or bounded) by a rural-residential scenario. This scenario assumes multiple exposure pathways (e.g., ingestion, inhalation, and direct exposure) for shallow zone soils. The acceptability of unrestricted direct exposure to deep zone soils has not been demonstrated; therefore, institutional controls to prevent uncontrolled drilling or excavation into the deep zone (i.e., below 4.6 m [15 ft]) are required. The 116-D-7 site has been reclassified as "Interim Closed Out."

4.1.114 116-D-9, 116D9, 117-D Crib, 117-D Seal Pit Crib

4.1.114.1 Site Description

The 116-D-9 site was located 90.7 m (200 ft) southeast of the 105-D Building. The 116-D-9 Crib was an inactive liquid waste site that operated from 1960 to 1967. The crib was a 3 by 3 by 3 m (10 by 10 by 10 ft) deep gravel-filled crib with a large steel vent cap extending above the ground surface. It received an estimated 420,000 L (110,950 gal) of process effluent drainage from the confinement seal pits located at the 117D Building (Section 4.1.127). The seal pit effluent entered the 116-D-9 Crib through a 91.4 m (300 ft) long, 4 in. diameter asbestos cement pipe.

4.1.114.2 Excavation Operations

Remedial action at the 116-D-9 Crib and pipeline site began on October 29, 1999. Excavation of the site involved removing the overburden materials, the contaminated crib and pipeline structure, and underlying contaminated soil. Based on field screening, overburden materials identified as potentially clean were placed in stockpiles for potential use as backfill. Materials that were found to be contaminated were disposed at ERDF. On August 11, 2000, the excavation reached the design depth.

At the completion of remedial action, the excavation was approximately 598.4 m^2 (6,441 ft^2) in area with a maximum depth of approximately 5.5 m (18 ft). An estimated 100 m (328 ft) of pipeline was removed. Approximately 7.3 metric tons (8.0 tons) of material from the site was disposed at ERDF.

4.1.114.3 Verification Sampling

Final cleanup verification samples were collected following variance sampling. Cleanup verification sampling was conducted on January 5, 2000, for the 116-D-9 Crib, and on September 12, 2000, for the pipeline excavation. For the 116-D-9 Crib and pipeline, a sample design was developed for the shallow zone decision unit only. The site was excavated to a depth of 5.5 m (18 ft) with the shallow zone consisting of the excavation sidewalls and the floor of the excavation. The shallow zone decision unit contained one decision subunit, which was divided into seven sampling areas. Each verification sample is a composite formed by combining samples collected at a minimum of four randomly selected nodes within each sampling area.

4.1.114.4 Statement of Protectiveness

Remedial action at the 116-D-9 site has achieved the RAOs and corresponding RAGs. Materials from the 116-D-9 site that contain COCs at concentrations exceeding the RAGs have been excavated and disposed at ERDF. The remaining soils have been sampled, analyzed, and modeled to show that residual concentrations in the shallow zone will support future land uses that can be represented (or bounded) by a rural-residential scenario and that residual concentrations throughout the site pose no threat to groundwater or the Columbia River. The acceptability of unrestricted direct exposure to deep zone soils has not been demonstrated; therefore, institutional controls to prevent uncontrolled drilling or excavation into the deep zone (i.e., below 4.6 m [15 ft]) are required. The 116-D-9 site has been reclassified as "Interim Closed Out."

4.1.115 116-D-10, 105-D Fuel Storage Basin Cleanout Percolation Pit, 105-D Fuel Storage Discharge Ponds, 105-D Ponds

4.1.115.1 Site Description

The 116-D-10 Fuel Storage Basin Cleanout Percolation Pit is located 100 m (328 ft) east of the 105D Reactor. It was used during the 1984 cleanout of the 105-D FSB to dispose of water to the soil. During cleanout of the basin, radiologically contaminated shielding water was processed through ion-exchange columns and retained in holding tanks for analysis before being released to the soil. The water was released to two open excavated pits (ponds) with a connecting channel. The west pond was small and only allowed for the discharge of one holding tank per day, while the east pond was larger to handle an increase in needed capacity. During cleanout of the basin, radiologically contaminated shielding water was processed through ion-exchange columns and released to the ponds. It is reported that no hazardous substances were released with the water; however, chemical analysis was not a standard practice during that period.

On August 27, 1984, a process equipment failure affected approximately 2,350,000 L (620,000 gal) of water that was processed from the 105-D FSB and introduced very fine particles of sludge into the processed water holdup tanks. When the previously clean water from the holdup tanks was discharged, the fine sludge particles were also released, allowing radioactive material to enter the soil.
Water processing operations were immediately suspended and a detailed radiological survey was performed. Contamination levels ranged from 1 pCi/g to several hundred pCi/g.

Equipment was repaired and operations resumed on September 6, 1984. After discharge of the FSB water was complete, approximately 28 m^3 (1,000 ft^3) of contaminated soil was removed from the bottom of the ponds and taken to the 200 West Area for burial. Radiological surveys and sampling were then performed to support the completion of contamination removal. The mean alpha and beta-gamma activities were calculated and met the unrestricted release criteria that was applicable at that time. The ponds were then filled to grade with 0.9 to 1.2 m (3 to 4 ft) of clean soil. A 2005 review of the maximum detected isotopic activity levels concluded that residual beta-gamma activity exceeded current RAGs in some areas.

4.1.115.2 Excavation Operations

Remedial action at the 116-D-10 waste site was performed from April 24 to May 13, 2008. Approximately 2,700 BCM (3,500 BCY) of soil was removed and stockpiled. The excavation was approximately 33 m (110 ft) long, 25 m (84 ft) wide, and 5 m (15 ft) deep. Contaminated soil was not found during this remediation, likely because the contamination would have been localized in a very thin layer, located about 1 m (3 ft) belowgrade, and would not be readily separated from the surrounding clean soil. Because the excavation reached a depth of 4.6 m (15 ft), the contaminated soil was blended within the soil stockpile as a result of the excavation and stockpiling. Although no radiological contamination was identified, the staged material was removed to ERDF because of the potential for residual contamination existing within the stockpile. This removal occurred on January 7 through 26, 2009.

Radiological surveys of the 116-D-10 waste site, using the GPERS, were performed on March 21, 2008 (pre-excavation) and May 5, 19, and 27, 2008 (post-excavation). One in-process sample was taken from the excavation and one in-process sample was take from the stockpile.

4.1.115.3 Verification Sampling

The 116-D-10 waste site was divided into two decision units for verification sampling. Decision Unit 1 was the shallow zone excavated area and Decision Unit 2 was the SPA footprint. Verification sampling at the 116-D-10 waste site was performed on May 19 through 26, 2009. For each decision unit, statistical verification soil samples were taken from 12 locations.

4.1.115.4 Statement of Protectiveness

Verification sampling was performed, and the analytical results indicate that the residual concentrations of COPCs at this site meet the RAOs for direct exposure, groundwater protection, and river protection. The results of verification sampling show that residual contaminant concentrations do not preclude any future uses (as bounded by the rural-residential scenario) and allow for unrestricted use of shallow zone soils (i.e., surface to 4.6 m [15 ft] deep). Site contamination did not extend into the deep zone soils; therefore, institutional controls to prevent uncontrolled drilling or excavation into the deep zone are not required. The 116-D-10 site has been reclassified as "Interim Closed Out."

4.1.116 116-DR-1&2, 107-DR Liquid Waste Disposal Trench #1, 107-DR Liquid Waste Disposal Trench #2, 116-DR-1, 116-DR-2

4.1.116.1 Site Description

As originally constructed, the 116-DR-1&2 site was comprised of the 116-DR-1 and 116-DR-2 trenches, which were connected by an underground pipe. Sometime prior to 1967, they were joined to create a single large trench by removal of the soils between them. Normally, the site received effluent from the 107-D and 107-DR Retention Basins (Sections 4.1.113 and 4.1.118, respectively) when cooling water was contaminated due to ruptured fuel elements. The trench was used also for a 4-month test period during which the total volume of waste effluent from the 107-D and 107-DR Retention Basins was discharged to the soil column.

4.1.116.2 Excavation Operations

Remedial action at the 116-DR-1&2 site began on November 25, 1996. Excavation of the site involved removing the overburden materials, the contaminated structure, and underlying contaminated soil. Based on field screening, overburden materials identified as potentially clean were placed in stockpiles for potential use as backfill. Materials that were found to be contaminated were disposed at ERDF. On October 21, 1999, the excavation reached the design depth.

At the completion of remedial action, the excavation was approximately 9,730 m^2 (104,700 ft^2) in area with a maximum depth of approximately 5.0 m (16.4 ft). Approximately 82,768 metric tons (91,200 tons) of material from the site was disposed at ERDF.

4.1.116.3 Verification Sampling

Final cleanup verification samples were collected following variance sampling. Cleanup verification sampling began on December 8, 1999, and was finished on December 17, 1999. For the 116-DR-1&2 site, sample designs were developed for the shallow zone and deep zone decision units. The site was excavated to a depth of 5.0 m (16.4 ft) with the shallow zone consisting of the excavation sidewalls to a depth of 4.6 m (15 ft) and the deep zone consisting of the excavation sidewalls below 4.6 m (15 ft) together with the floor of the excavation. The shallow zone decision unit contained three decision subunits, which were divided into a total of 16 sampling areas. The deep zone decision unit contained two decision subunits, which were divided into a total of six sampling areas. Each sample was a composite sample formed by combining samples collected at a minimum of four randomly selected nodes within each sampling area.

4.1.116.4 Statement of Protectiveness

The remedial action at the 116-DR-1&2 site has achieved the RAOs and corresponding RAGs. Materials from the 116-DR-1&2 site that contain COCs at concentrations exceeding the RAGs have been excavated and disposed at ERDF. The remaining soils have been sampled, analyzed, and modeled to show that residual concentrations in the shallow zone will support future land uses that can be represented

(or bounded) by a rural-residential scenario and that residual concentrations throughout the site pose no threat to groundwater or the Columbia River. The acceptability of unrestricted direct exposure to deep zone soils has not been demonstrated; therefore, institutional controls to prevent uncontrolled drilling or excavation into the deep zone (i.e., below 4.6 m [15 ft]) are required. The 116-DR-1&2 site has been reclassified as "Interim Closed Out."

4.1.117 116-DR-5, 1904-DR Outfall Structure, 1904-DR

4.1.117.1 Site Description

The 116-DR-5, 1904-DR Outfall Structure was a liquid waste site that operated from 1956 to 1967 for the disposal of 100-D Area reactor cooling water. The site was located at the top of the river bank, north of the northwest corner of the 116-D-7 Retention Basin (Section 4.1.113). The site consisted of an open, reinforced, compartmentalized concrete outfall structure that routinely discharged effluent to the Columbia River via the 100-D-60 River Effluent Pipelines (Section 4.1.57). When the river pipelines were blocked, damaged, or undergoing maintenance, the flow was diverted to the 100-D-66 concrete overflow spillway (Section 4.1.61).

The 116-DR-5 Outfall was constructed as part of a project to increase coolant flow through the 100-D Area reactor facilities and subsequently increase effluent flow to the river via the outfall structures. Reactor cooling water was collected and temporarily stored in the 116-D-7 and 116-DR-9 (Section 4.1.118) Retention Basins. These retention basins were then pumped to the river via the 116-DR-5 Outfall structure and associated river effluent pipeline. The outfall was fed by two 60 in. diameter steel pipes from the 116-DR-9, 107-DR Retention Basin via a weir that allowed effluent flow to be diverted to either or both 1904D (Section 4.1.111) and 1904-DR Outfall Structures. The 116-DR-5, 1904-DR Outfall Structure was demolished in 1978, and the area was covered with soil and leveled to blend in with the adjacent riverbank.

4.1.117.2 Excavation Operations

Remedial action at the 116-DR-5 Outfall site began on January 12, 2009, and continued through May 13, 2009. The site was excavated to a maximum depth of approximately 11 m (36 ft) resulting in approximately 2,613 BCM (3,417 BCY) of soil and debris removed for disposal at ERDF. Approximately 1,190 BCM (1,556 BCY) of overburden and layback material was removed and stockpiled for evaluation for use as clean backfill.

Field observations during excavation indicated the presence of concrete, rebar, piping, and miscellaneous debris consistent with the outfall structure and manhole. A small, 1 to 2 oz. polyurethane bottle was found during excavation. The bottle was found to be empty; therefore, no waste characterization sample was collected. The bottle was disposed at ERDF.

4.1.117.3 Verification Sampling

The 116-DR-5 waste site was divided into three decision units consisting of the waste site excavation, the overburden soil stockpile, and the waste SPA footprint. A statistical sampling approach was used for evaluation of all decision units. Twelve samples were collected from each of the three decision units.

In addition to the statistical sample locations, three focused sample locations were added to the 116-DR-5 excavation. Focused samples were collected at the locations within the excavation that exhibited the highest radiological activity on the final GPERS survey.

Verification sampling at the 116-DR-5 waste site show that no contaminants exceed direct exposure RAGs. Copper, benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, and chrysene exceeded

groundwater and Columbia River protection soil RAGs. RESRAD modeling predicted that residual concentrations of these constituents will be protective of groundwater and the Columbia River.

4.1.117.4 Statement of Protectiveness

The results of verification sampling show that residual contaminant concentrations do not preclude any future uses (as bounded by the rural-residential scenario) and allow for unrestricted use of shallow zone soils (i.e., surface to 4.6 m [15 ft] deep). The results also demonstrate that residual contaminant concentrations down to the bottom of the excavation are protective of groundwater and the Columbia River. The site extended into the deep zone (greater than 4.6 m [15 ft] deep); however, the entire site was closed out using shallow zone criteria (i.e., including consideration of direct contact cleanup levels). Therefore, institutional controls to prevent uncontrolled drilling or excavation into the deep zone are not required. The 116-DR-5 site has been reclassified as “Interim Closed Out.”

4.1.118 116-DR-9, 107-DR Retention Basin, 107-DR

4.1.118.1 Site Description

The 116-DR-9 Retention Basin was constructed in 1950 to hold cooling water effluent from the 105-DR Reactor to allow for thermal cooling and radioactive decay prior to release to the Columbia River. The retention basin was a rectangular, reinforced-concrete reservoir measuring 183 by 83 by 6 m (600 by 273 by 20 ft) deep, located immediately east of the 116-D-7 Retention Basin, near the northern edge of the 100-D Area. The basin was partially aboveground and divided into two sections by a vertical concrete baffle that ran the length of the basin. The retention basin received cooling water effluent from the 105-DR Reactor from 1950 until 1965. After the 105D Reactor was deactivated in 1965, the basin remained active until 1967 as part of the 105D Reactor effluent system. Leakage occurred as UPRs in 1951 beneath the basin and outside the south end of the basin when seals in the concrete floor of the basin failed and the pipes pulled away from the basin walls at the retention basin inlet. Waste site 100-D-25, a UPR that occurred as floor leaks beneath the basin, could not be distinguished from other contaminated soil and was remediated with the 116-DR-9 Retention Basin under the provisions for “proximity sites.” The waste site was removed to complete cleanup of the contamination associated with the 116-DR-9 site.

4.1.118.2 Excavation Operations

Excavation of the 116-DR-9 site began on October 21, 1997, by removing the overburden materials and underlying contaminated soil. Overburden materials, which were contaminated, were disposed at ERDF. On December 28, 1998, the excavation had reached the design depth and cleanup verification sampling was initiated.

Waste materials that were excavated, loaded into shipping containers, and disposed at ERDF consisted of soils not meeting direct exposure RAGs based on field screening results. At the completion of the remedial action, the excavation area floor was approximately 16,352 m^2 (176,013 ft^2) at a depth of 4.75 m (15.6 ft), and approximately 201,519 metric tons (222,122 tons) of material from the site was disposed at ERDF.

Contaminated soil associated with the process effluent pipelines was not removed completely, but remains for final remediation with the pipelines. The 116-DR-9 sidewall areas that are adjacent to future pipeline excavation areas were not sampled as part of the cleanup verification effort. These areas will be sampled and verified clean as part of the effluent pipeline remediation efforts.

4.1.118.3 Verification Sampling

Final cleanup verification samples were collected following variance sampling. The shallow zone was divided into 8 sampling areas and the deep zone was divided into 12 sampling areas for confirmation and

verification testing. Four aliquots were collected at prescribed locations (nodes) within both the shallow zone and deep zone sampling areas. The 4 aliquots from each sampling area were composited to create 8 final cleanup verification samples for the shallow zone soils and 12 final samples for the deep zone.

The cleanup verification value for the PCBs Arochlor-1242 and Arochlor-1260, in the deep zone, exceeded the river protection soil RAG. RESRAD modeling predicted that residual concentrations of these constituents will be protective of groundwater and the Columbia River.

4.1.118.4 Statement of Protectiveness

The 100-D-25 UPR was remediated with the 116-DR-9 Retention Basin to meet cleanup standards. As demonstrated in this verification package, the RAGs for direct exposure, groundwater protection, and surface water protection (including protection of the Columbia River) have all been achieved. Because the RAGs have been achieved, the RAOs have also been met. Materials that contain COCs at concentrations that exceed the RAGs have been excavated, sampled, analyzed, and where required, removed and shipped to ERDF. The remaining soil has been sampled, analyzed, and modeled to show that no residual COC concentrations in vadose zone soils pose a threat to human health, groundwater, or the Columbia River. The 116-DR-9 site was remediated and no longer poses a threat to human health and the environment.

The institutional controls for 116-DR-9 were revised in 2005 by DOE letter 05-AMRC-0078. Based on this letter, institutional controls are required to prevent uncontrolled drilling or excavation into deep zone (i.e., below 4.6 m [15 ft]). The 116-DR-9 site has been reclassified as “Interim Closed Out.”

4.1.119 118-D-6:2, 105-D Reactor Ancillary Support Areas, Below-Grade Structures and Underlying Soils

Due to geographic location and similarity of remediation activities, cleanup activities for the 132-D-4 site, 118-D-6:2 site and 118-D-6:3 site were conducted together. The sites are collectively referred to as the 105-D site. This section contains general information about the 105-D site, and information specific to the 118-D-6:2 and 118-D-6:3 sites.

4.1.119.1 Site Description

The 105-D site is approximately 250 m (820 ft) north of the 105-DR Reactor. Construction of the 105D Reactor began in November 1943 with operations commencing on December 17, 1944. The 105D Reactor was shut down on June 26, 1967. Liquids and sediments in the 105-D FSB were dispositioned to the low-level disposal site in the 200 West Area in 1985. The 118-D-6:2 site includes the north, west, and south sides of the 105-D Building outside the reactor shield walls while the 118-D-6:3 site is the FSB on the east side of the building.

The D&D activities in support of the 105D Reactor have resulted in the removal of all above- and belowgrade structures outside of the 105-D Safe Storage Enclosure to a depth of 0.9 m (3 ft) below the surrounding grade. All contaminated structures were removed to a depth of at least 4.6 m (15 ft) belowgrade. The remaining structure of the 105D Reactor within the shield walls has been preserved to act as temporary storage for the reactor core.

The primary source of contamination at the 105-D site was reactor coolant water and water in the FSB that became contaminated through contact with irradiated and ruptured fuel elements and components from the reactor cooling system. This water is believed to have contaminated the concrete surfaces of the FSB; however, there is no documentation of basin water leakage into the underlying soils.

4.1.119.2 Excavation Operations

Removal and disposal activities at the 105D site began in January 2000. The D&D activities resulted in complete removal of abovegrade structures outside of the 105D Reactor core shield walls. Most of the belowgrade structures outside of the 105D Reactor core shield walls were demolished. A portion of the south wall of the valve pit area (demolished to 0.9 m [3 ft] belowgrade) and the entire FSB floor and a portion of the walls (demolished to 4.6 m [15 ft] belowgrade) were left in place with deep zone cleanup criteria (groundwater and river protection) satisfied. The fan room structure of 132-D-4, including the lower plenum, was completely removed as part of site 118-D-6:2.

The overburden piles produced during excavation were found to be contaminated and were removed to ERDF. The 105-D D&D activities generated approximately 1,585 bulk containers of low-level contaminated material that were shipped to ERDF, accounting for approximately 21,613 metric tons (23,824 tons).

4.1.119.3 Verification Sampling

The 105D Reactor Ancillary Support Areas, Below Grade Structures, and Underlying Soils (118-D-6:2) did not require sampling and analysis because the structures were removed in their entirety and there were no water-bearing structures that could have caused soil contamination.

Experience at the 105F and 105-DR FSBs showed that a default of five randomly selected samples was sufficient for the radiological COCs, while additional samples were needed to address nonradiological COCs. To address this issue in the 105-D FSB sampling plan, 10 additional randomly located samples were collected to be analyzed for nonradionuclide COCs only. Samples were collected using 1 in. diameter rotohammer drill bits penetrating to a depth of 0.6 cm (0.25 in.). Collection of samples from the surface layer of concrete increased the likelihood that the most contaminated concrete would be tested. Concrete sampling from the 105-D FSB started on November 27, 2001, and concluded on December 19, 2001. Residual concentrations of lead, mercury, and PCBs are above the groundwater protection RAGs. RESRAD modeling predicted that residual concentrations of these constituents will be protective of groundwater and the Columbia River.

4.1.119.4 Statement of Protectiveness

The remaining soils and concrete at the 105D site have either been deferred to the Remedial Action Project or sampled, analyzed, and modeled. The results of this effort indicate that materials were disposed at ERDF from sites 118-D-6:2 and 118-D-6:3 at the 105D site that contained COCs at concentrations exceeding the RAGs. These results also indicate that residual concentrations in the shallow zone will support future uses that can be represented (or bounded) by a rural-residential scenario and that residual concentrations throughout the site pose no threat to groundwater or the Columbia River. The results do not demonstrate the acceptability of unrestricted access to deep zone soils (i.e., below 4.6 m [15 ft]); therefore, institutional controls to prevent uncontrolled drilling or excavation into deep zone soils are required. The 118-D-6:2 site has been reclassified as “Interim Closed Out.”

4.1.120 118-D-6:3, 105-D Reactor Fuel Storage Basin and Underlying Soils

Due to geographic location and similarity of remediation activities, cleanup activities for the 132-D-4 site, 118-D-6:2 site and 118-D-6:3 site were conducted together. The sites are collectively referred to as the 105D site. For additional information regarding the 118-D-6:3 site, refer to Section 4.1.119, which includes general information about the 105D site, and information specific to the 118-D-6:2 and 118-D-6:3 sites.

The 118-D-6:3 site has been reclassified as “Interim Closed Out.”

4.1.121 118-D-6:4, 105-D Fuel Storage Basin Side Slope Soils

4.1.121.1 Site Description

The 118-D-6:4 subsite consists of the former 105-D FSB Side Slope Soils, a former decontamination pad, and an effluent pipeline segment. The 118-D-6:4 decontamination pad and effluent pipeline segment were located north of the 105D Reactor, and the side slope soils location is just outside of the remaining structure of the 105-D Reactor FSB on the east side of the original 105D Reactor.

The FSB side slopes could not be completely remediated during demolition of the 118-D-6:3 FSB, and were therefore placed in a separate subsite for future remedial action. One of two areas used to decontaminate equipment used during D&D of the 105D Reactor could not be interim closed out as originally planned; it was therefore separated out and placed with the FSB side slope soils subsite for closeout purposes. A section of effluent pipeline also could not be remediated as originally planned due to ongoing D&D activities at the time. It too was placed into the FSB side slope soils subsite for remediation and close-out purposes.

4.1.121.2 Excavation Operations

Remediation of the 118-D-6:4 subsite was performed from May 5, 2008, through August 24, 2009. Approximately 8,500 BCM (11,000 BCY) of soil was removed and disposed at ERDF. In addition, the remaining section of pipeline beneath the 105D Reactor Room 210 was removed, and approximately 8 BCM (10 BCY) of concrete was removed from the decontamination pad portion of the 118-D-6:4 subsite, and these were also disposed at ERDF.

Two sites containing suspect anomalous materials were found during remediation of the 118-D-6:4 subsite. The first anomaly was characterized as less than 0.76 m^3 (1 yd^3) of red-stained soil uncovered in the FSB side slope soils approximately 3 m (12 ft) belowgrade. The material appeared to be soil stained from either FSB sediments or an effluent pipeline leak from a north-south pipeline in the area. Effluent pipeline leaks at other 100 Area sites have often exhibited red-rusty-salmon-colored staining on adjacent soils. The anomalous red-stained soil material was disposed at ERDF.

The second anomaly was dust suppression and rain water retained within the soil in the residual FSB concrete structure. For safety purposes, the water was covered with soil. The material was subsequently excavated and disposed at ERDF.

4.1.121.3 Verification Sampling

Verification sampling of the 118-D-6:4 subsite was performed on May 24 and 25, 2010. The area identified for verification sampling at the 118-D-6:4 subsite consisted of four decision units: (1) the decontamination pad excavation footprint, (2) the FSB side slope shallow zone excavation footprint, (3) the FSB side slope deep zone excavation footprints, and (4) the area of potential radiological contamination at the center and southern sections of the FSB excavation. Two methods for selecting the sampling locations were utilized: statistical sampling design and focused sampling.

Statistical sampling designs were developed for sample collection in Decision Units 1, 2, and 3. Twelve statistical soil samples were collected on the random-start triangular grid within each of these three decision units at the site.

A focused sampling approach was used to evaluate the area of elevated radiological activity at the center and southern sections of the FSB excavation (Decision Unit 4). One surface soil sample was collected at each of three locations selected as worst-case radiological contamination, as these three locations exhibited the highest cpm based on the gamma radiological survey results.

Residual concentrations of cadmium, chromium, copper, mercury, vanadium, zinc, and Aroclor-1254 are above the groundwater and/or river protection soil RAGs. RESRAD modeling predicted that residual concentrations of these constituents will be protective of groundwater and the Columbia River.

4.1.121.4 Statement of Protectiveness

The verification sampling results show that residual soil concentrations support future land uses that can be represented (or bounded) by a rural-residential scenario. The results also demonstrate that residual contaminant concentrations support unrestricted future use of shallow zone soil (i.e., surface to 4.6 m [15 ft]) and that contaminant levels remaining in the soil are protective of groundwater and the Columbia River. The acceptability of unrestricted access to deep zone soils (i.e., below 4.6 m [15 ft]) has not been demonstrated; therefore, institutional controls to prevent uncontrolled drilling or excavation into the deep zone are required. The 118-D-6:4 site has been reclassified as “Interim Closed Out.”

4.1.122 120-D-2, 186-D Waste Acid Reservoir

4.1.122.1 Site Description

The 120-D-2, 186D Waste Acid Reservoir is part of the 186D demineralization facilities. The waste acid reservoir is located west and south of center of the 186D Building. An acid-proof brick-lined trench, running almost the entire length of the 186D Building, was designed to gather waste acid from the demineralization process and deliver it to the 120-D-2 waste site. Acid stored in the reservoir could be transferred to the 186D acid mixing/neutralization tanks, and subsequently discharged to the 100-D-50:7 (Service Area 1) segment of the process sewer. Underflow and overflow drains in the waste acid reservoir could also discharge directly to the 100-D-31:9 segment of the process sewer. The 120-D-2 waste site consists only of the 186D Waste Acid Reservoir and associated soils.

Construction of the 186D facilities concluded in late 1944 and early 1945. The aboveground portion of the 186D facilities, including 120-D-2, were decommissioned and demolished to a depth of 1 m (3 ft) bgs in 1979. The fate of lead flashing that was part of the waste acid reservoir was not documented and was therefore assumed to have been disposed in place during demolition.

Excavation at the northern end of the 100-D-50:7 subsite extended into the northwest corner of the former 120-D-2 waste site. The excavation uncovered demolition debris associated with the reservoir, including concrete, rebar, brick, lead sheeting, and cinder blocks. A sample of yellow stained soil was collected at the surface above the reservoir. Samples for asbestos analysis were also collected from a piece of tile, coated with mastic that was unearthed in the acid reservoir. The results of these analyses showed 1 to 3% asbestos present in the tile and mastic.

4.1.122.2 Excavation Operations

Remediation of the 120-D-2 waste site was performed in May through July 2007. Approximately 3,361 m^3 (4,396 yd^3) of stained soil, stained concrete, demolition debris, and lead sheet were excavated and disposed at ERDF. All material was directly loaded out and no soil stockpiles were created. Samples were collected to support waste designation and assist in guiding the excavation. The final depth of the excavation ranged from 3 to 5 m (10 to 16 ft) bgs.

Observations and in-process samples taken during the excavation of adjacent waste sites and during remediation of the 120-D-2 waste site confirmed the presence of low pH soils stained yellow, presumably from sulfuric acid used in testing the demineralization process. Observations during remediation confirmed that the visible yellow stains were present outside of the waste acid reservoir. All of the visibly affected soils were removed. Soil pH was monitored during excavation to help direct the extent of the excavation and ensure all of the affected soils were removed. Piping associated with an overflow and an

underflow drain in the northwest corner of the waste acid reservoir was removed from within the footprint of the 120-D-2 remediation. Remaining portions of the drain sewer outside the 120-D-2 remediation area footprint will be removed with remediation of the 100-D-31:9 pipelines (Section 4.1.28).

During excavation at the 120-D-2 waste site, an empty 11.4 L (3 gal) Nalgene® container was identified as an anomaly. It is suspected that the container might have been used in cleaning up mercury spills as indicated by labeling written on the container. Although the container was empty, direct readings detected >1 ppm mercury vapor in the headspace of the container but were not detected in the surrounding soils. No organics or radioactivity was detected with the field survey instruments. The container was packaged and transported to ERDF for macro-encapsulation and disposal.

4.1.122.3 Verification Sampling

Verification sampling at the 120-D-2 waste site was performed on September 17, 2008. The 120-D-2 waste site was considered a single decision unit for verification sampling. Ten verification soil sample locations were identified using a random-start, triangular grid within the footprint of the 120-D-2 waste site. In addition to performing statistical sampling of the excavation footprint, a focused soil sample was collected at an area where the deepest visual soil staining had been observed and excavated. This sample was collected from 0.6 m (2 ft) below the surface of the base of the excavation to verify that all contaminated soils had been removed.

4.1.122.4 Statement of Protectiveness

The results of verification sampling show that residual contaminant concentrations do not preclude any future uses (as bounded by the rural-residential scenario) and allow for unrestricted use of shallow zone soils (i.e., surface to 4.6 m [15 ft] deep). The results also demonstrate that residual contaminant concentrations are protective of groundwater and the Columbia River. The site does not have a deep zone or residual contaminant concentrations that would require any institutional controls. The 120-D-2 site has been reclassified as “Interim Closed Out.”

4.1.123 126-D-2, 126D2, 184-D Coal Pit

4.1.123.1 Site Description

The 126-D-2, 184-D Coal Pit, Inert Landfill waste site is located west of the demolished 184-D Power House site, north of the 183-D Water Treatment Facility, and northwest of the 105D Reactor. Initially the site was an excavated pit that was used to store coal for the 184-D Power House. The site was first used as a coal storage area in 1943. Use as a demolition and inert waste landfill for nonradioactive materials began in 1970 and continued for 16 years. Debris associated with demolition of the 1717D, 1719D, 1716D, 108D, 1704D, 1707D, 184D, 115D/DR, and 186D Buildings was disposed in the coal pit. In addition to demolition debris, the site also received waste from the 100N Area and the 189D Maintenance Facility. Wastes included full and empty 18.9 L (5 gal) paint cans, miscellaneous 3.8 L (1 gal) paint cans, 280 L (55 gal) drums, wood, and other solid wastes. Miscellaneous waste materials disposed from decommissioned facilities are suspected to have included dry waste chemicals, herbicides, laboratory chemicals and glassware, furniture, and welding materials. The site also reportedly received large amounts of asbestos waste materials bagged in plastic and transported to the site from various work sites throughout the 100 Areas for disposal from the mid to late 1970s to the early 1980s. In 1986, the site was covered with about 0.3 m (1 ft) of pit-run backfill material and graded to conform to the natural terrain.

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4.1.123.2 Excavation Operations

Prior to initiating remedial action at the 126-D-2 waste site, a GPERS was conducted on November 14, 2006, to support evaluation of surface soil radiological conditions. Initial remedial action at the 126-D-2 waste site began on May 29, 2007, and excavation continued through October 6, 2008. Approximately 1,379 BCM (1,804 BCY) of layback soil was stockpiled for use as clean fill. Approximately 41,873 BCM (54,770 BCY) of soil and debris were removed for disposal at ERDF. Debris removed included concrete, steel reinforcing rod, metal pipes, reactor components, drums, various containers, transite material, and a white powdery substance. Excavation continued to a depth below the base of the original coal pit, at which debris was no longer present. During cleanup activities excavation extended past the northern boundary of the 126-D-2 waste site to ensure all anomalous material was excavated. Since no evidence of debris was present, the remediation was stopped.

Additional excavation was performed along the north end of the coal pit to verify the absence of debris. After excavating this shelf and finding native soil at a shallower depth, the excavation depth was scaled back.

During excavation, surveys using hand-held radiological instrumentation were performed to evaluate the presence of radiological contamination. Layback soil was stockpiled onsite for potential use as clean backfill material. The surface of the soil stockpile was surveyed for gamma activity using GPERS. The south portion of the soil stockpile was surveyed on June 25, 2007, about one month after excavation began. The north portion was surveyed September 13, 2007. The results of these surveys indicate radiological contamination is not present in the layback soil. At the completion of excavation, three GPERS surveys were performed of the excavation area. Only two measurements within the excavation exceeded background activity.

Supplemental remedial action at the 126-D-2 waste site began on October 19, 2009, and excavation continued through March 16, 2010. Approximately 2,116 BCM (2,768 BCY) of soil was removed for disposal to ERDF. The supplementary remedial action performed was due to a number of samples in the excavation area exceeding the direct contact RAGs. The final depth of the excavation ranged from approximately 5.5 m (18 ft) in a small portion of the southeast corner of the excavation to 3 m (10 ft) in a variety of locations in the excavation.

4.1.123.3 Verification Sampling

Initial verification sampling was performed on June 22 and 23, 2009. Due to a laboratory error with the stockpile data, the stockpile was resampled June 29, 2009. The 126-D-2 waste site was divided into two decision units for verification sampling: the burial ground excavation and the layback soil stockpile. Two methods for selecting the sampling locations were utilized: statistical sampling designs and focused sampling locations. Twelve statistical soil samples were collected on a random-start, triangular grid from both the excavated area and the layback stockpile (24 total samples). Approximately 12 m (39.4 ft) at the west end of the 126-D-2 excavation was excluded from sample collection due to the potential for collapse of a concrete wall.

In addition to performing statistical sampling of the burial ground excavation and the layback stockpile, four focused soil samples were collected. Three focused soil samples were collected at locations of anomalies. In addition, one focused soil sample was collected from the location of the highest gamma reading for the post-excavation GPERS surveys.

Verification sampling revealed five sample locations in the excavation area that were above the direct exposure RAGs. Roughly 1 m (3 ft) of soil was removed and resampled at those specific locations for the direct exposure COPCs that were exceeded.

Evaluation of the results from the verification sampling at the 126-D-2 waste site indicates that all COPCs were undetected and/or quantified below RAGs and lookup values except for benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene, bis(2-ethylhexyl)phthalate, DDE, DDT, heptachlor epoxide, and lead concentrations that exceeded soil RAGs for the protection of groundwater and/or the Columbia River. However, these are not expected to migrate more than 2 m (6.6 ft) vertically in 1,000 years. Residual concentrations of all contaminants are predicted to be protective of groundwater and the Columbia River.

4.1.123.4 Statement of Protectiveness

The results of verification sampling show that residual contaminant concentrations do not preclude any future uses (as bounded by the rural-residential scenario) and allow for unrestricted use of shallow zone soils (i.e., surface to 4.6 m [15 ft] deep). The results also demonstrate that residual contaminant concentrations are protective of groundwater and the Columbia River. The 126-D-2 excavation area has a maximum depth of approximately 5.5 m (18 ft), which includes both shallow zone and deep zone soil. However, the entire excavation area is being closed out using the more restrictive shallow zone cleanup criteria; therefore, institutional controls to prevent uncontrolled drilling or excavation into the deep zone are not required. The 126-D-2 site has been reclassified as “Interim Closed Out.”

4.1.124 128-D-2, 128-D-2 Burn Pit

4.1.124.1 Site Description

The 128-D-2 Burn Pit waste site is located approximately 440 m (1,444 ft) northeast of the 105D Reactor between D Avenue and the perimeter road. The 128-D-2 Burn Pit was an inactive solid waste site with evidence of surface burning. Concrete and metallic debris exposed on the surface indicated possible buried solid waste. The site appeared to have been built up with backfill material, although it was difficult to determine where the burn area ended and the burial area began. The site was also used as a disposal area for tumbleweeds.

4.1.124.2 Confirmatory Sampling

Test pits excavated during confirmatory sampling in 2005 uncovered evidence of burning and miscellaneous noncombustible debris including concrete, metal, brick, VCP, and electrical wiring. Results of confirmatory sampling concluded that the site contained hazardous debris; the site was identified for RTD.

4.1.124.3 Excavation Operations

Remediation of the 128-D-2 waste site was performed between July 22, 2009, and January 14, 2010. Excavation continued until all debris and contamination associated with the waste site had been removed. Approximately 39,570 BCM (51,756 BCY) of contaminated soil and debris were removed from the 128-D-2 waste site. The debris removed from the 128-D-2 waste site consisted of miscellaneous noncombustible debris including concrete, metal, bricks, VCP, and electrical wiring. No radiologically contaminated material was discovered during remediation at the 128-D-2 waste site. No indications of previous spills or releases were detected during remediation at the 128-D-2 waste site.

The soil and debris from the 128-D-2 Burn Pit and the 100-D-7 Undocumented Solid Waste Site (Section 4.1.7) were staged in a staging pile to the east of the 128-D-2 waste site and southeast of the 100-D-7 waste site before being loaded for disposal at ERDF. The staging area includes a smaller area where topsoil from the waste sites was placed for use on top of the backfill to support successful re-vegetation as required by the ecological review for the 128-D-2 and 100-D-7 waste sites. All staged waste has been disposed at ERDF. The staging area was then scraped to remove surface contaminated

soil, which was disposed at ERDF. The location of the staging pile was closed out with the 100-D-7 waste site.

Three anomalies were initially identified during the remediation at the 128-D-2 waste site. These consisted of white powder, an area with clumps of yellow sand, and a white solid material. All these materials were sampled and characterized prior to removal and shipment to ERDF.

4.1.124.4 Verification Sampling

Verification sampling was conducted at the 128-D-2 waste site on September 9 and 13, 2010. The area identified for statistical verification sampling at the 128-D-2 waste site consisted of two decision units, the 128-D-2 near-surface (side) excavation footprints and the 128-D-2 main (center) excavation footprint. Twelve statistical soil samples were collected on the triangular grid within each of the two decision units at the 128-D-2 waste site. One sample reported a lead result that did not pass direct exposure RAGs, and further excavation was performed at that location. This location was resampled on March 7, 2011.

All COPCs were quantified below their respective soil RAGs or lookup values except for selenium, Aroclor-1260, benzo(a)pyrene, and benzo(b)fluoranthene, in comparison against the soil RAGs for groundwater and/or river protection in the near-surface side excavation decision unit. RESRAD modeling predicted that residual concentrations of these constituents will be protective of groundwater and the Columbia River.

4.1.124.5 Statement of Protectiveness

The results of verification sampling show that residual contaminant concentrations do not preclude any future uses (as bounded by the rural-residential scenario) and allow for unrestricted use of shallow zone soils (i.e., surface to 4.6 m [15 ft] deep). The results also demonstrate that residual contaminant concentrations are protective of groundwater and the Columbia River. Site contamination did not extend into the deep zone soils (i.e., below 4.6 m [15 ft]); therefore, institutional controls to prevent uncontrolled drilling or excavation into the deep zone are not required. The 128-D-2 site has been reclassified as "Interim Closed Out."

4.1.125 130-D-1, 130D1, 1716-D Gasoline and Oil Storage Tanks, 1706-D Gasoline Storage Tank

4.1.125.1 Site Description

The 130-D-1, 1716D Gasoline and Oil Storage Tanks waste site was located northeast of the 190D pump room and high bays and adjacent to the demolished 1716D Building, northwest of the 105D Reactor. The site was the former location of steel tanks associated with the former 1716D Garage Facilities and Offices (also known as the Automotive Repair Shop).

The 130-D-1, 1716D Gasoline Storage Tank was used for storage of leaded gasoline in support of the garage and gas dispensing operation from 1944 until 1968. In 1968, the 3,800 L (1,000 gal) gasoline tank on the east side of 1716D was emptied and filled with water following deactivation of the 100-D Area. In July 1978, the 1716D Building was removed except for the foundation and the two related underground tanks. The gasoline tank was removed in 1989 as part of the Hanford Site UST removal program and was noted to be devoid of any contents and heavily deteriorated, and the underlying soils were visibly impacted. No remediation or removal activities were performed, and the excavation was backfilled with clean material.

In January 2009, a tank identified as the 1716D Abandoned Oil Tank was discovered within the layback of the 100-D-31:7 (Section 4.1.26) excavation at a depth of approximately 3.3 m (10.8 ft). While relocating the tank from the 100-D-31:7 excavation layback, approximately 95 L (25 gal) of oily fluid was spilled onto a lined containment area, which was set up adjacent to the tank. The 1716D

Abandoned Oil Tank and all associated piping within the 100-D-31:7 excavation was removed and disposed at ERDF.

4.1.125.2 Excavation Operations

Remedial action at the 130-D-1 waste site began on July 21, 2010, and continued through July 26, 2010. Additional remediation was conducted on March 17, 2011, and April 15, 2011, due to residual contamination identified following verification sampling activities. The entire excavation resulted in approximately 780 BCM (1,020 BCY) of soil and debris being removed for disposal at ERDF. The site was excavated to an approximate depth of 3.5 m (11.5 ft) deep.

Prior to being loaded out for disposal at ERDF, the contaminated soil and debris was staged in a SPA on asphalt located east of the 130-D-1 excavation. Following loadout of the waste material, the SPA was excavated, removing the asphalt and underlying soil to a depth of approximately 0.5 m (1.5 ft) below the surface.

4.1.125.3 Verification Sampling

Verification sampling of the 130-D-1 waste site was performed on January 31 and February 1, 2011. Three decision units were identified for the 130-D-1 waste site and related 1716D Abandoned Oil Tank. The decision units consist of the 130-D-1 excavation, the waste SPA footprint, and the location where the 1716D Abandoned Oil Tank was discovered in the layback of the 100-D-31:7 excavation.
Twelve statistical verification soil samples were collected from each of the two decision units. A focused sampling approach was used for the tank area. Five focused samples were collected from the abandoned oil tank area.

Replacement samples were collected on March 17 and April 15, 2011, after additional remediation was conducted to remove residual contamination identified following the review of the initial verification sampling data. The replacement samples were analyzed for the same list of COPCs as the original samples.

All COPCs were quantified below groundwater and/or river protection soil RAGs except for benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene, and Aroclor-1260 in the excavation; and benzo(k)fluoranthene and bis(2-ethylhexyl)phthalate in the SPA. RESRAD modeling predicted that residual concentrations of these constituents will be protective of groundwater and the Columbia River.

4.1.125.4 Statement of Protectiveness

The results of verification sampling show that residual contaminant concentrations do not preclude any future uses (as bounded by the rural-residential scenario) and allow for unrestricted use of shallow zone soils (i.e., surface to 4.6 m [15 ft] deep). The sampling and modeling results also demonstrate that residual contaminant concentrations are protective of groundwater and the Columbia River. The waste site contamination did not extend into the deep zone soils. Institutional controls to prevent uncontrolled drilling or excavation into the deep zone are not required. The 130-D-1 site has been reclassified as "Interim Closed Out."

4.1.126 132-D-1, 115-D/DR Gas Recirculating Facility

4.1.126.1 Site Description

The 132-D-1 waste site was identified as the remaining footprint and debris of the 115D/DR Gas Recirculation Building and its associated piping tunnels. The building consisted of a single-story reinforced concrete structure 6.1 m (20 ft) high, with a basement underlying part of the building.
The basement extended to approximately 3.4 m (11 ft) below surrounding grade. The operating gallery,

cells that contained gas processing equipment, and fan room were located at ground level with related piping located in the basement. At each end of the basement, a tunnel containing the gas recirculation piping led to the reactors. The tunnel to 105D Reactor was 3.7 m (12 ft) wide by 2.0 m (6.5 ft) high. The tunnel to 105-DR Reactor was 1.5 m (5.0 ft) wide. Connected to, and part of the 105D Reactor tunnel, was the vacuum and pressure seal pit.

4.1.126.2 Excavation Operations

Remedial action at the 132-D-1, 115D/DR Gas Recirculating Facility waste site began on September 27, 2010. The excavation continued through March 3, 2011, to a depth of approximately 3.6 to 4.5 m (12.0 to 15.0 ft) resulting in complete removal of the 115D/DR Building. Contaminated soil, concrete, piping, and rebar were removed from the 132-D-1, 115D/DR Gas Recirculating excavation for disposal at ERDF. The excavation resulted in approximately 11,370 BCM (14,871.5 BCY) of contaminated soil and debris removed for disposal to ERDF. Some of the material removed from the excavation was placed in two SPAs prior to being loaded out for disposal at ERDF. Two pipelines were encountered during remediation, one on the north side of the excavation and the other on the south side of the excavation. These pipelines are the 100-D-86:1, 105-D Gas Recirculation Pipelines waste subsite and the 100-D-50:4, Gas Recirculation Pipelines waste subsite, which are excluded from the 132-D-1 waste site.

Following sample analysis of the initial remediation, it was determined that additional remediation was needed. An additional 1.0 m (3.3 ft) of soil was removed from two sample locations. This additional remediation began June 22, 2011, and included the removal and disposal of 300 BCM (392 BCY) of soil material.

4.1.126.3 Verification Sampling

Following remediation, verification sampling was conducted on June 1, 2011. The 132-D-1 waste site was divided into two decision units for verification sampling: the excavation and the waste SPA footprint. A statistical sampling design was used to collect 12 discrete samples from each decision unit (24 total). Results showed that two sample locations within the waste SPA footprint contained concentrations of benzo(a)pyrene in excess of the cleanup criteria. As a result, additional remedial excavation was performed to remove the soils in these two waste SPA locations. Replacement verification samples were collected from the original failed locations on June 22, 2011.

Evaluation of the verification sampling at the 132-D-1 waste site indicate that no contaminants exceed direct exposure RAGs except for benzo(a)pyrene, which is a constituent of roadway asphalt. Samples from the waste SPA decision unit were visibly cross-contaminated with asphalt from roadways and other construction activities in the area. The waste site is recommended for interim closed out because excavation through the asphalt that remains in the SPA would be more hazardous to human health and the environment than backfilling the decision unit and leaving the asphalt in place. As a result, PAH analytical results, the primary COCs with asphalt material were excluded from the determination of direct exposure and groundwater and Columbia River protection RAGs.

Groundwater and/or the Columbia River protection soil RAGs are exceeded by mercury, Aroclor-1248, Aroclor-1260, total PCBs, benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene, chrysene, and dibenz(a,h)anthracene. RESRAD modeling predicted that residual concentrations of these constituents will be protective of groundwater and the Columbia River.

4.1.126.4 Statement of Protectiveness

The verification sample results show that residual contaminant concentrations do not preclude any future uses (as bounded by the rural-residential scenario) and allow for unrestricted use of shallow zone soils (i.e., surface to 4.6 m [15 ft] deep). The results also demonstrate that residual contaminant concentrations

are protective of groundwater and the Columbia River. Site contamination did not extend into the deep zone; therefore, institutional controls to prevent uncontrolled drilling or excavation into the deep zone are not required. The 132-D-1 site has been reclassified as "Interim Closed Out."

4.1.127 132-D-2, 117-D Filter Building

4.1.127.1 Site Description

The 132-D-2, 117D Filter Building was built in 1960, approximately 16 years after the startup of the 105D Reactor, to filter the exhaust air from the reactor building before it was routed to the 132-D-4 (116D) stack. The exhaust air was routed to the 117D Filter Building via an underground concrete inlet duct, filtered through particulate (high-efficiency particulate air) and halogen (activated charcoal) filters, and then routed to the stack via an underground concrete exhaust duct. In 1967, the reactor and associated facilities including the 117D Filter Building were shut down.

The 117D Filter Building, located approximately 30.5 m (100 ft) south of the 105D Reactor, was a reinforced concrete structure 18 m (59 ft) long, 11.9 m (39 ft) wide, and 10.7 m (35 ft) high, of which only 2.4 m (8 ft) was above grade. The concrete walls and floors were generally 20.3 cm (8 in.) thick, with a maximum thickness of 30.5 cm (12 in.).

4.1.127.2 Excavation Operations

The 117D Filter Building and associated belowgrade ductwork were D&D in two phases in 1985 and 1986. The building and ducts were excavated and demolished in situ. Contaminated equipment was packaged and shipped to the Hanford Site 200 West Area burial grounds for disposal. The rubble was buried under at least 1 m (3.3 ft) of clean fill, except for the rubble from the seal pits, which was buried under a minimum of 5 meter (16.4 ft) of clean earth.

4.1.127.3 Characterization Sampling

As part of decommissioning activities, extensive radiological surveying and sampling activities were performed to characterize residual radiological contamination on the accessible internal surface areas of the 117D Filter Building. Characterization results indicated that residual contamination was confined to the 1 mm (0.04 in.) vinyl paint layer and underlying surface concrete.

Using the maximum radiological activities from the pre-demolition characterization data to represent residual contamination levels over 100% of the paint and concrete of the former building, RESRAD modeling was performed in 2005 to support the previous decision to demolish and bury the building in place. Tritium is the only radionuclide that is predicted to reach groundwater but its maximum concentration will not exceed the RAG based on RESRAD modeling.

4.1.127.4 Statement of Protectiveness

The 1985 sampling results and subsequent modeling show that the site and contaminant levels remaining in the soil will be protective of direct exposure, groundwater, and the Columbia River. However, the acceptability of unrestricted direct exposure to belowgrade structure surfaces in the deep zone has not been demonstrated; therefore, institutional controls to prevent uncontrolled drilling or excavation into the deep zone are required. The 132-D-2 site has been reclassified as "Interim Closed Out."

4.1.128 132-D-3, 132D3, 1608-D Waste Water Pumping Station, 1608-D Effluent Pumping Station

4.1.128.1 Site Description

The 132-D-3, 1608-D Effluent Pumping Station collected water from 105D Reactor drains and the 115D Gas Recirculation Building and pumped it to the process effluent pipelines that discharged to the 107D Retention Basin. The facility, located approximately 9 m (30 ft) south of the 105-DR Reactor was

constructed predominantly belowgrade, to a maximum depth of 7 m (23 ft), with 1.2 m (4 ft) of structure above grade. The facility walls and floors were constructed of reinforced concrete. The roof was constructed of a wood frame with composite surface. This facility operated from 1944 until shutdown of the 105D Reactor in 1965.

4.1.128.2 Excavation Operations

The 1608D Effluent Pumping Station was released for unrestricted use based on the post-decontamination characterization results and dose assessment. Demolition and site grading were performed in 1986 using conventional heavy equipment. Holes were punched in the floor to allow precipitation to drain and the facility was demolished to at least 1 m (3.3 ft) belowgrade and the rubble buried in situ under at least 1 m (3.3 ft) of clean fill.

4.1.128.3 Characterization Sampling

A total of 43 samples were taken from the decontaminated concrete surfaces. A statistical sample design was not implemented. Residual contamination was confined to the concrete of the surface of the walls and the floor of the facility sumps.

Using the maximum radiological activities from the pre-demolition characterization data to represent residual contamination levels throughout all the residual concrete of the former building, RESRAD modeling was performed in 2005 to support the previous decision to demolish and bury the building in place. The RESRAD modeling accounts for radioactive decay from 1986 (year of sampling) to 2005 and predicted that the site achieves the dose limits and risk objectives for rural-residential land use with institutional controls, groundwater protection, and river protection. Tritium is the only radionuclide that is predicted to reach groundwater but its maximum concentration will not exceed the RAG based on RESRAD modeling.

4.1.128.4 Statement of Protectiveness

The 1986 sampling results show that the site and contaminant levels remaining in the soil will be protective of direct exposure, groundwater, and the Columbia River. However, the acceptability of unrestricted direct exposure to belowgrade structure surfaces in the deep zone has not been demonstrated; therefore, institutional controls to prevent uncontrolled drilling or excavation into the deep zone are required. The 132-D-3 site has been reclassified as “Interim Closed Out.”

4.1.129 132-D-4, 132D4, 105-D Reactor Exhaust Stack, 116-D Reactor Exhaust Stack

Due to geographic location and similarity of remediation activities, cleanup activities for the 132-D-4 site, 118-D-6:2 site and 118-D-6:3 site were conducted together. The sites were collectively referred to as the 105-D site. For additional information about the 105-D site, refer to Section 4.1.119.

4.1.129.1 Site Description

The 105-D Reactor Stack, which was located on the south side of the 105D Reactor, was a reinforced concrete, monolithic, 61 m (200 ft) high structure that discharged ventilation exhaust air to the atmosphere. The stack rested on a double octagon-shaped base that extended 5.3 m (17.4 ft) belowgrade. The stack was 4.9 m (16.1 ft) in diameter at its base and was fed by belowgrade air exhaust ducts from the 117D Exhaust Filter Building, which filtered exhaust air generated in the 105D Reactor.

4.1.129.2 Excavation Operations

The foundation of the 105-D Reactor Stack was removed to 0.9 m (3 ft) belowgrade at the time the stack was demolished and disposed at ERDF in 1999. Sampling results from the demolition of the 116C, 116F, and 116H stacks determined that contamination in the stack concrete only penetrated to a maximum depth

of 0.6 cm (0.25 in.). Removal of the stack concrete to 0.9 m (3 ft) belowgrade removed the 0.6 cm (0.25 in.) of contaminated concrete from the bottom interior of the stack. Therefore, sampling of the 132-D-4 reactor stack foundation was not required to characterize the remaining portion of the foundation.

The portion of the stack foundation that remained contained a floor drain in the bottom of the stack that emptied into the lower plenum of the fan room structure. The lower plenum had a sump that discharged to a process drain line. The fan room structure, including the lower plenum, was completely removed as part of site 118-D-6:2. Residual contamination that could remain in the floor drain pipe would be analogous to residual contamination in the buried 105C and 105F Reactor stacks that have been reclassified as no action sites based on RESRAD dose modeling.

4.1.129.3 Statement of Protectiveness

The results of this effort indicate that materials were disposed at ERDF from site 132-D-4 at the 105D Reactor site that contained COCs at concentrations exceeding the RAGs. These results also indicate that residual concentrations in the shallow zone will support future uses that can be represented (or bounded) by a rural-residential scenario and that residual concentrations throughout the site pose no threat to groundwater or the Columbia River. The acceptability of unrestricted access to deep zone soils (i.e., below 4.6 m [15 ft]) has not been demonstrated; therefore, institutional controls to prevent uncontrolled drilling or excavation into deep zone soils are required. The 132-D-4 site has been reclassified as “Interim Closed Out.”

4.1.130 1607-D2:1, Original 1607-D2 Tile Field, Eastern 1607-D2 Tile Field

4.1.130.1 Site Description

The 1607-D2 Abandoned Tile Field was a subsite associated with the 100-D Area sanitary sewage system. The tile field consisted of a clay pipe drain field positioned approximately 1 to 2 m (3.3 to 6.6 ft) below surrounding grade. A thick layer of aggregate and native sandy gravel soils was placed around the clay pipes. The 1607-D2:1 site was created in 1944, and sewage liquid from the 553-person-capacity 1607-D2 septic tank discharged to the tile field from 1944 to 1950. The septic tank was designed to capture the solids, and the decant liquid effluent was transported to the tile field. Solids and sludge were retained in the 91,500 L (24,160 gal) septic tank.

In 1950, the tile field was partially demolished for the construction of the 116-DR-9 Liquid Effluent Retention Basin, and a replacement tile field was constructed north of the retention basins. The name “abandoned tile field” was assigned to the infrastructure remaining and adjacent to the 116-DR-9 retention basin. The area of the abandoned tile field sub-site is approximately 1,203 m^2 (12,949 ft^2).

4.1.130.2 Excavation Operations

Excavation of the 1607-D2:1 site began on January 8, 1998, by removing the overburden materials, contaminated soil, clay tiles, and aggregate. This first excavation effort removed approximately the top 2 m (6.6 ft) of soil. All overburden material was found to be contaminated based on field screening results and was disposed at ERDF with other contaminated material. Contamination was encountered at the base of the first excavation based on field screening results. A second excavation effort was initiated on January 9, 1998 and was completed on February 4, 1998. The site was judged to be clean based on field screening results. Cleanup verification sampling was initiated at the final excavation.

At the completion of the remedial action, the area of the excavation was approximately 1,203 m^2 (12,949 ft^2) at a depth of 3.4 m (11 ft), and approximately 10,040 metric tons (11,064 tons) of material from the site was disposed at ERDF.

4.1.130.3 Verification Sampling

Final cleanup verification samples were collected following variance sampling. Verification sampling at the 1607-D2:1 waste site was conducted in February 1998. A shallow zone sample design was used to verify site status after remedial action excavation. The site was divided into four sampling areas for verification testing. Four aliquots were collected at prescribed locations (nodes) within each of the four sampling areas (16 aliquots total). Aliquots from each sampling area were composited to create four analytical samples, one composite to represent each sampling area.

4.1.130.4 Statement of Protectiveness

Results of the sampling, testing, and analysis for the 1607-D2:1 site cleanup indicate that all RAOs and RAGs for direct exposure, protection of groundwater, and protection of surface waters (including the Columbia River) have been met. Materials that contain COCs at concentrations that exceed the RAGs have been excavated, sampled, analyzed, and where required, removed and shipped to ERDF.
The remaining soil has been sampled and analyzed to show that no residual COC concentrations in vadose zone soils pose a threat to human health, groundwater, or the Columbia River. The 1607-D2:1 site was remediated and no longer poses a threat to human health and the environment. The 1607-D2:1 site has been reclassified as “Interim Closed Out.”

4.1.131 1607-D2:2, Replacement 1607-D2 Tile Field, Northern Tile Field

4.1.131.1 Site Description

The 1607-D2:2 Replacement Drain Field is a subsite of the 1607-D2 Septic System. The 1607-D2:2 subsite is located north of the 100-D Area perimeter road, approximately 244 m (800 ft) north of the former 1607-D2 septic tank, and approximately 30 m (100 ft) southeast of the former 116-D-7 Retention Basin.

The original drain field (1607-D2:1) was abandoned in 1950 when the 116-DR-9 Retention Basin was built over a portion of that drain field. The 1607-D2:2 Replacement Drain Field was put into service at that time and continued to service buildings in the 100-D Area until 1996 when a new underground septic system was installed. The 1607-D2 Septic System serviced many buildings in the 100-D Area including the 189-D Storage Yard and Mechanical Development Laboratory, 185-D Thermal Hydraulics Laboratory, 182-D Reservoir and Pump House, 183-D Water Filter Plant, 1700D Administration and Services Building, and the 105D Reactor. The replacement drain field consisted of long underground perforated pipes or tiles that connected to the septic tank. This network of pipes was set into 0.3 to 0.9 m (2 to 3 ft) wide gravel-filled trenches in the native soil.

In February 2008, a geophysical survey was conducted to locate electrical utilities in the vicinity of the 1607-D2:2 Replacement Drain Field. Surface electrical lines from a nearby pump-and-treat operation were also documented on the geophysical interpretation map. Piping and electrical lines from the pump-and treat operation precluded the excavation of a section of the inlet piping to the 1607-D2:2 Replacement Drain Field. This small section was administratively placed in to the 1607-D2:5 subsite to ensure the section of pipe will be remediated at a later date.

4.1.131.2 Excavation Operations

Remedial action at the 1607-02:2 Replacement Drain Field began on April 7, 2008, and concluded on April 23, 2008 with approximately 3,471 BCM of material removed and disposed at ERDF. The entire excavation floor is in the shallow zone. The excavation is approximately 100 m (330 ft) long, 60 m (200 ft) wide, and ranges from 1.8 m (6 ft) to 3.1 m (10 ft) deep.

During remediation, the inlet pipeline to the drain field was in the sidewall of the excavation. A review of the excavation footprint of the 1607-D2:3 waste site indicates that a portion of the pipeline north of the perimeter road had not been removed. It was also observed that the active 100-D Area Pump and Treat Project pipelines run directly over the ground surface in this location. Therefore, due to the proximity of the pump and treat pipelines, this remaining pipeline has been administratively identified as the 1607-D2:5 subsite and will be remediated at a future date.

4.1.131.3 Verification Sampling

On April 14, 2008, two in-process samples were collected from the 1607-D2:2 Replacement Drain Field waste site. One sample consisted of a composite of random aliquots taken from the bottom of the excavation. The other sample was collected from the original location of the header (diversion) box.

Final cleanup verification samples were initially collected between October 7, 2008, and December 16, 2008. A total of 10 verification soil samples were collected on a random-start, triangular grid for the 1607-D2:2 site. A laboratory error resulted in rejection of most of the mercury data. To mitigate this, the project recollected samples on May 4, 2009 for mercury only.

Eight nonradionuclide COPCs (barium, chromium, copper, mercury, silver, zinc, Aroclor-1254, and Aroclor-1260) were quantitated above the groundwater and/or river soil RAGs. RESRAD modeling predicted that residual concentrations of these constituents will be protective of groundwater and the Columbia River.

GPERS surveys of the 1607D2:2 Replacement Drain Field were performed on March 25, 2008 (pre-excavation) and May 5, 2008 (post-excavation). The GPERS survey results did not detect any elevated radiological activity.

4.1.131.4 Statement of Protectiveness

The results of verification sampling show that residual contaminant concentrations do not preclude any future uses (as bounded by the rural-residential scenario) and allow for unrestricted use of shallow zone soils (i.e., surface to 4.6 m [15 ft] deep). The results also demonstrate that residual contaminant concentrations are protective of groundwater and the Columbia River. The 1607-D2:2 excavation area has a maximum depth of approximately 3.1 m (10 ft). The entire excavation area is considered one decision unit and is closed out using the shallow zone cleanup criteria. Therefore, institutional controls to prevent uncontrolled drilling or excavation into the deep zone are not required. The 1607-D2:2 site has been reclassified as “Interim Closed Out.”

4.1.132 1607-D2:3, Septic Pipelines

4.1.132.1 Site Description

The 1607-D2:3 site is 8 in. vitrified clay septic sewer pipes that ran from the 1607-D2:4 Septic Tank to the 1607-D2:2 Replacement Tile Field. The Septic Pipelines are also referred to as the 1607-D2 Pipeline site.

The 1607-D2 pipeline site was in the northern part of the 100-D Area and is approximately 310 m (1,017 ft) from the Columbia River. The 1607-D2 Septic Pipelines were constructed in 1944 as part of the 1607-D2 septic system, which included tile fields and a septic tank. The pipelines were fed by the 189-D Storage Yard and Mechanical Development Laboratory, the 185-D Thermal Hydraulics Laboratory, the 182-D Reservoir and Pump House, the 183-D Water Filter Plant, the 1700D Administration and Services Building, and the 105D Reactor. The septic tank associated with the pipelines was located approximately 30 m (100 ft) southeast of the 116-D-7 Retention Basin.

4.1.132.2 Excavation Operations

Remedial action at the 1607-D2 pipeline site began on August 20, 1999. Excavation of the site involved removing the overburden materials, the contaminated structure, and the underlying contaminated soil. Based on field screening, overburden materials identified as potentially clean were placed in stockpiles for potential use as backfill. Materials that were found to be contaminated were disposed at ERDF. On August 30, 1999, the excavation reached the design depth.

At the completion of remedial action, the shallow zone excavation was approximately 1,780 m^2 (19,200 ft^2) in area with a maximum depth of approximately 4.6 m (15 ft). The overburden area was approximately 1,850 m^2 (19,900 ft^2).

4.1.132.3 Verification Sampling

Final cleanup verification samples were collected following variance sampling. For the 1607-D2 pipeline site, a single sample design was developed for each of the shallow zone and overburden decision units. Since the 1607-D2 site was a small site, at which very low levels remained after remediation, a separate sample design was not prepared for the deep zone; deep zone soils are conservatively represented by data collected for the shallow zone decision unit. Cleanup verification sampling was conducted on December 9, 1999. The shallow zone decision unit contained one decision subunit, which was divided into eight sampling areas. The overburden decision unit also contained one decision subunit, which was divided into eight sampling areas. Each verification sample (16 total) is a composite formed by combining samples collected at a minimum of four randomly selected nodes within each sampling area.

4.1.132.4 Statement of Protectiveness

Materials from the 1607-D2 pipeline site that contain COCs at concentrations exceeding the RAGs have been excavated and disposed at ERDF. The remaining soils have been sampled, analyzed, and modeled to show that residual concentrations in the shallow zone will support future land uses that can be represented (or bounded) by a rural-residential scenario and that residual concentrations throughout the site pose no threat to groundwater or the Columbia River. Similarly, overburden associated with the site has been sampled, analyzed, and modeled to show that it is suitable for use as waste site backfill. The acceptability of unrestricted direct exposure to deep zone soils has not been demonstrated; therefore, institutional controls to prevent uncontrolled drilling or excavation into the deep zone (i.e., below 4.6 m [15 ft]) are required.

In 2005, the statement of protectiveness for 1607-D-2:3 was revised by DOE letter 05-AMRC-0078. Based on this letter, institutional controls have been removed from this waste site. The 1607-D2:3 site has been reclassified as “Interim Closed Out.”

4.1.133 1607-D2:4, 1607-D2 Septic Tank

4.1.133.1 Site Description

The 1607-D2:4 Septic Tank was constructed in 1944 and is located approximately 30 m (100 ft) southeast of the 116-D-7 Retention Basin. The site serviced the 189-D Storage Yard and Mechanical Development Laboratory, the 185-D Thermal Hydraulics Laboratory, the 182D Reservoir and Pump House, the 183D Water Filter Plant, the 1700-D Administration and Services, and the 105D Reactor. The 1607-D2 Septic Tank was 4.1 m (13.5 ft) deep, constructed of reinforced concrete, and had a 553-person capacity (130 L [35 gal] per capita) and an average retention period of 24 hours.

4.1.133.2 Excavation Operations

Excavation of the 1607-D2 site began on July 17, 1998, by removing the soil surrounding the septic tank and breaking in place the cover and sides of the tank prior to drying and sampling sludge. The 1607-D2

Septic Tank cover, sidewalls, and excavated soil were found to be contaminated and were disposed at ERDF. The sludge was sampled on September 29, 1998, to determine contamination levels. The sludge was tested for free liquids using the paint filter test on October 20, 1998. The second phase of excavation began on October 21, 1998, and was completed on October 27, 1998. Excavated materials were disposed at ERDF. The site was judged to be clean based on field screening results.

At the completion of the remedial action the area of the excavation was approximately 506 m^2 (5,449 ft^2) at a depth of 4.7 m (15.4 ft), and approximately 2,041 metric tons (2,250 tons) of material from the site was disposed at ERDF.

4.1.133.3 Verification Sampling

Final cleanup verification samples were collected following variance sampling. The shallow zone was divided into four sampling areas for verification testing. Four aliquots were collected at prescribed locations within each of the 4 sampling areas (16 aliquots total). To simplify the cleanup verification efforts (e.g., verification sampling, data management, and mapping) conservatively, the entire depth of the excavation sidewalls and the base of the excavation were in the shallow zone. Aliquots from each sampling area were composited to create four analytical samples, one composite to represent each sampling area.

All COCs/COPCs were quantified below groundwater and/or river protection soil RAGs except for europium-152. RESRAD modeling predicted that residual concentrations of europium-152 will be protective of groundwater and the Columbia River.

4.1.133.4 Statement of Protectiveness

The RAGs for direct exposure, groundwater protection, and surface water protection (including protection of the Columbia River) have all been achieved. Because the RAGs have been achieved, the RAOs that define the extent to which the waste sites require cleanup have also been met. Materials that contain COCs at concentrations that exceed the RAGs have been excavated, sampled, analyzed, and where required, removed and shipped to ERDF. The remaining soil has been sampled, analyzed, and modeled to show that no residual COC concentrations in vadose zone soils pose a threat to human health, groundwater, or the Columbia River. The 1607-D2:4 site was remediated and no longer poses a threat to human health and the environment. The 1607-D2:4 site has been reclassified as “Interim Closed Out.”

4.1.134 1607-D2:5, Inlet Pipe to Replacement System Tile Field

4.1.134.1 Site Description

The 1607-D2:5 Inlet Pipe to Replacement System Tile Field subsite is related to the 1607-D2:2 Replacement Tile Field, the 1607-D2:3 Septic Pipelines, and the 1607-D2:4 Septic Tank subsites. The 1607-D2:2 Replacement Drain Field was connected to the 1607-D2:4 Septic Tank via the 1607-D2:3 Septic Pipeline and the 1607-D2:5 subsite pipeline. The 1607-D2:5 subsite pipeline was left in place when the 1607-D2:2 Replacement Drain Field was removed in 2008 because pipelines for the 100-D Area pump and treat system covered this portion of the septage pipelines.

4.1.134.2 Excavation Operations

Remedial action at the 1607-D2:5 subsite was performed on April 22, 2014. The depth of the excavation extended approximately 1.5 m (5 ft) bgs resulting in approximately 340 BCM (445 BCY) of soil and debris being removed for disposal at ERDF. The waste material was staged prior to loadout to ERDF; therefore, a waste SPA was created. No stained soil or anomalous materials were encountered during the remediation.

4.1.134.3 Verification Sampling

Verification sampling started on June 26, 2014, within the excavation and July 29, 2014, for the SPA. Two decision units were identified for the 1607-D2:5 subsite; specifically, the excavation and the waste SPA. Twelve statistical soil samples were collected from each decision unit. All samples were grab samples collected at predetermined coordinates.

All residual COPC concentrations pass the MTCA three-part test in comparison against applicable RAGs except for barium, beryllium, copper, lead, DDE, DDT, benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene, chrysene, dibenz(a,h)anthracene, and indeno(1,2,3-cd)pyrene. RESRAD modeling predicted that residual concentrations of barium, beryllium, copper, lead, DDE, and DDT, will be protective of groundwater and the Columbia River. The remaining PAH results are due to cross-contamination from preservative on nearby support poles for an overhead steam line and are not attributed to the 1607-D5 waste site and therefore, excluded from an evaluation relative to the direct exposure, groundwater, and Columbia River protection RAGs.

4.1.134.4 Statement of Protectiveness

The 1607-D2:5 subsite cleanup verification sampling data, site evaluations, and supporting documentation demonstrate that this site meets the RAOs and RAGs. The results of verification sampling and modeling show that residual soil concentrations do not preclude any future uses (as bounded by the rural-residential scenario) and allow for unrestricted use of shallow zone soils (i.e., surface to 4.6 m [15 ft] deep). The results also demonstrate that residual contaminant concentrations are protective of groundwater and the Columbia River. Contamination above direct exposure levels was not observed in shallow zone soils and is concluded to not exist in deep zone soils; therefore, institutional controls to prevent uncontrolled drilling or excavation into the deep zone soil are not required. The 1607-D2:5 site has been reclassified as “Interim Closed Out.”

4.1.135 1607-D4, 1607-D4 Septic Tank and Drain Field, 124-D-4, 1607-D4 Sanitary Sewer System, 1607-D4 Septic Tank

4.1.135.1 Site Description

The 1607-D4 Septic System consists of a septic tank and tile field. Operational dates for the septic system span from 1944 to 1968. This septic system received sanitary sewage from the 115D/DR Gas Recirculation Facility. That facility was decommissioned in 1985 and 1986, including demolition of abovegrade features. The 1607-D4 Septic System may have been filled in as part of the decommissioning of the 115D/DR facility, or at some other time after its operational lifetime ended in 1968.

The 1607-D4 Septic System is located between the 105-D and the 105-DR Reactors. Drawings indicate that the 1607-D4 Septic System consisted of a rectangular prismatic septic tank and tile field. The tank dimensions are 0.6 by 1.2 m (2 by 4 ft) in plan and 2.5 m (8.3 ft) deep. The design waste capacity of the tank was 795 L (210 gal), leaving up to 1.4 m (4.5 ft) of freeboard/headspace. The tank was constructed of reinforced concrete with 0.2 m (8 in.) thick walls and a 0.15 m (6 in.) thick floor. Piping layouts show the influent to the tank as a 6 in. VCP running from the southeast corner of the 115D/DR Building. Other sources describe the tile field as being constructed of at least 14.6 m (48 ft) of 4 in. vitrified pipe, concrete pipe, or drain tile with open-jointed laterals spaced at 2.4 m (8 ft).

4.1.135.2 Confirmatory Sampling

On July 5, 2005, focused confirmatory samples were collected from under the septic tank and from within the drain field tile and below the drain field. The 1607-D4 site was investigated through field observations and focused sampling and analysis to determine if hazardous or radiological contaminants were present. The septic tank was located within the test trench and a sample collected from below it.

The septic tank and the geophysical interpretation map indicated the location of the drain field. Along the VCP between the septic tank and the drain field, a “tee” section of 6 in. VCP was found. A sediment sample was collected from within the VCP “tee” at 2 m (6.5 ft) bgs. A soil sample was collected from below the VCP at 2.5 m (8 ft) bgs.

Maximum detected results for Aroclor-1254 are above groundwater and river protection RAGs. However, generic RESRAD model results indicate that residual concentrations achieve the RAOs for groundwater and river protection.

4.1.135.3 Excavation Operations

During excavation, the field sampler inspected the sidewalls and excavated materials for the presence of stained soil, evidence of burning, and/or debris. In the excavation at the top of the drain field, a 0.2 m (8 in.) piece of paper-wrapped pipe was found. The original function of the small section of pipe is not known, but the wrapping was suspected to be asbestos. A sample of the paper coating on the pipe was taken and analyzed for asbestos (no asbestos was detected).

4.1.135.4 Statement of Protectiveness

Examination of the data has led to the conclusion that the site passes the RAGs without further remedial action. The analytical results from soil and drain field samples were shown to meet the cleanup objectives for direct exposure, groundwater protection, and river protection. These results show that residual soil concentrations support future land uses that can be represented (or bounded) by a rural-residential scenario. The results also demonstrate that residual contaminant concentrations support unrestricted future use of shallow zone soil (i.e., surface to 4.6 m [15 ft]) and that contaminant levels remaining in the soil are protective of groundwater and the Columbia River. This site does not have a deep zone; therefore, no deep zone institutional controls are required. The 1607-D4 site has been reclassified as “Interim Closed Out.”

4.1.136 1607-D5, 1607-D5 Septic Tank and Associated Drain Field, 124-D-5, 1607-D5 Sanitary Sewer System, 1607-D5 Septic Tank

4.1.136.1 Site Description

The 1607-D5 waste site consisted of a septic system formerly servicing the 181D River Pumphouse and located east of that facility. The 181D River Pumphouse is an active facility used for raw water intake for Hanford Site operations. The sanitary facilities serviced by the 1607-D5 septic system were placed in service in 1944 and deactivated in 1998. At the time of confirmatory sampling, it was confirmed that the former sanitary facilities in the 181D Building had been sealed off. Prior to removal, the septic tank and drain field were located adjacent to a steep embankment surrounding the parking area for the 181D Building.

The 1607-D5 septic system tank was described as a reinforced concrete tank measuring approximately 0.9 by 1.5 m (3 by 5 ft) in plan and 2.4 m (7 ft 10 in.) deep with a metal cover. Effluent piping that consisted of 6 in. or 8 in. VCP lead to a four-way coupler that formerly discharged to a sorted gravel drain field. The septic system was designed for a six-person capacity.

4.1.136.2 Excavation Operations

Remedial action at the 1607-D5 waste site was performed between October 22 and 26, 2010. Excavation continued to a maximum depth of 3.3 m (11 ft) until all contaminated soil and debris associated with the waste site had been removed. Approximately 500 BCM (654 BCY) of contaminated soil and debris were removed from the excavation and directly loaded out for disposal at ERDF.

4.1.136.3 Verification Sampling

Verification sampling at the 1607-D5 waste site was performed on April 12, 2011. The statistical sampling design for the 1607-D5 waste site was prepared using the remediation footprint as the basis for the location of verification soil samples. A total of 12 verification soil samples were collected on a random-start triangular grid.

The results of the MTCA three-part test indicate that all residual COPC concentrations pass the three-part test in comparison against applicable RAGs except for barium, beryllium, copper, lead, DDE, DDT, benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene, chrysene, dibenz(a,h)anthracene, and indeno(1,2,3, cd)pyrene. RESRAD modeling predicted that residual concentrations of barium, beryllium, copper, lead, DDE, and DDT, will be protective of groundwater and the Columbia River. The remaining PAH results are due to cross-contamination from preservative on nearby support poles for an overhead steam line and are not attributed to the 1607-D5 waste site and therefore, were excluded from an evaluation relative to the direct exposure, groundwater, and Columbia River protection RAGs.

4.1.136.4 Statement of Protectiveness

Analytical results show that residual contaminant concentrations support future land uses that can be represented (or bounded) by a rural-residential scenario. The results also demonstrate that residual contaminant concentrations support unrestricted future use of shallow zone soil (i.e., surface to 4.6 m [15 ft]) and contaminant levels remaining in the soil are protective of groundwater and the Columbia River. Site contamination did not extend into the deep zone soils; therefore, no deep zone institutional controls are required for the 1607-D5 waste site, which has been reclassified as “Interim Closed Out.”

4.1.137 628-3, 628-3 Burn Pit

4.1.137.1 Site Description

The 628-3 waste site is located outside of the 100-D perimeter road. The waste site is a roughly oval-shaped area with a length of 76 m (250 ft), a width of 12 m (40 ft), and a depth of 1.2 m (4 ft). The center of the burn pit was distinguished by a 1.2 m (4 ft) depression. The 628-3 waste site is described as a man-made burn pit that received miscellaneous nonradioactive materials such as paper, trash, pieces of metal, plastic parts, and noncontaminated hardware. Burnt wood, nails, metal pipes, rebar, and glass were all present. Friable and nonfriable asbestos may have been disposed in this pit. Debris was likely dumped along the edges of the pit and covered with soil from the surrounding areas. The waste site showed signs of severe plant stress and soil discoloration, and there was debris consisting of burnt wood, nails, metal pipes, rebar, and glass scattered across the area.

4.1.137.2 Excavation Operations

Remedial activities at the 628-3 waste site were carried out from March to June 2009. The excavation depth reached a maximum depth of 4.6 m (15 ft) near the center of the pit. Relative to the excavation area, soil and concrete/debris was staged to the south, suspected ACM was staged to the northeast, and metal pipe and concrete debris was staged to the northwest. All staged material was disposed at ERDF.

After further review of the post-excavation civil survey and comparison to the geophysical survey, the northern excavation boundary was extended. The excavation was completed in January 2010. The additional area of investigation was excavated to 1 m (3 ft). No debris or indication of previous subsurface disturbance was encountered; therefore, the sample design was not changed to reflect this extended boundary. The geophysical anomalies present in the survey are believed to have been interference from surface debris and/or the basalt layer in this area.

Several anomalous items were identified during remediation. On March 20, 2009, a small ruptured container containing blue granular material was found. It was suspected to be a type of filter or trap. The blue granular material was sampled on March 30, 2009, and none of the material remained after sampling. However, approximately 0.3 m (1 ft) of underlying soil was removed and sent to ERDF. On April 2, 2009, a silver powder substance was found. The metallic friable material was sampled on April 6, 2009, and moved to the exclusion area. Analytical results showed that the material met ERDF acceptance criteria, and the material, as well as underlying soil, was shipped to ERDF. On April 7, 2009, a 114 L (30 gal) intact tar drum was found. The drum was overpacked and removed from the site. Soils underlying the drum were removed to ERDF.

4.1.137.3 Verification Sampling

The 628-3 waste site was divided into four decision units for verification sampling, specifically, the excavation, the waste SPA, the suspect ACM SPA, and the pipeline-related materials staging area (PSA). A statistical sampling approach was used for evaluation of three of these decision units (12 samples from each unit). Due to the small footprint of the PSA, two focused samples were collected in that area, one where the concrete was staged and one where the pipe and metal debris was staged. Statistical verification sampling at the 628-3 waste site was performed on March 30, 2010. Based on the initial results, additional remediation was conducted within the footprint of the SPA and ACM staging areas. Replacement samples for the affected areas were collected on November 11, 2010.

Residual concentrations of total chromium, lead, Aroclor-1254, and total PCBs exceed soil RAGs for groundwater and river protection. RESRAD modeling predicted that residual concentrations of these constituents will be protective of groundwater and the Columbia River.

4.1.137.4 Statement of Protectiveness

The results of verification sampling show that residual contaminant concentrations do not preclude any future uses (as bounded by the rural-residential scenario) and allow for unrestricted use of shallow zone soil (i.e., surface to 4.6 m [15 ft] deep). The results also demonstrate that residual contaminant concentrations are protective of groundwater and the Columbia River. Site contamination did not extend into the deep zone soils; therefore, institutional controls to prevent uncontrolled drilling or excavation into the deep zone are not required for the 628-3 waste site, which has been reclassified as “Interim Closed Out.”

4.1.138 UPR-100-D-1, Oil Soaked Soil

4.1.138.1 Site Description

The UPR-100-D-1 site is described as a UPR that appears as a small depression surrounded by oil-stained soil. The stained soil was observed to be approximately 0.6 m (2 ft) in diameter, the source of the staining could not be determined, and the estimated volume was noted as “small.”

The project team performed a site walkdown in February 2005 to locate the site. The site as 18.3 m (60 ft) east of the 190D and 1724-D Building Trampoline Test Facilities. The project team discovered that the oil-stained soil is no longer visible and that the UPR-100-D-1 site is in a highly disturbed land area.

4.1.138.2 Statement of Protectiveness

The site will support future unrestricted land uses that can be represented (or bounded) by a rural-residential scenario and no institutional controls are required. The UPR-100-D-1 site has been reclassified as “Interim No Action.”

4.1.139 UPR-100-D-2, Effluent Line Leak #1

4.1.139.1 Site Description

The UPR (UPR-100-D-2) of 105D Reactor cooling water was discovered aboveground in 1951 about 46 m (150 ft) southeast of the 116-D-7 Retention Basin. Repairs to the concrete piping were apparently made, but cooling water effluent leakage continued to appear at the ground surface following repair.

Due to the geographic location and similarity of remediation activities, the 100D48:2 (Section 4.1.36), 100D49:2 (Section 4.1.40), UPR100D2, and UPR100D3 (Section 4.1.140) sites were interim closed out as one decision unit referred to as the 100D48:2/49:2 Pipelines site. For information regarding excavation, verification sampling, or the statement of protectiveness for the UPR-100-D-2 site, refer to the 100D48:2 site (Section 4.1.36).

The UPR-100-D-2 site has been reclassified as "Interim Closed Out."

4.1.140 UPR-100-D-3, Effluent Line Leak #3

4.1.140.1 Site Description

The UPR (UPR-100-D-3) of 105-DR Reactor cooling water occurred in 1951 at the south end of the 116-DR-9 Retention Basin when the 105-DR Reactor cooling water effluent pipelines separated from the basin wall. During repair, a trench was excavated near the pipe inlet to drain the area. Estimated volumes of water that were released during the UPRs are not available.

Due to the geographic location and similarity of remediation activities, the 100D48:2 (Section 4.1.36), 100D49:2 (Section 4.1.40), UPR-100-D-2 (Section 4.1.139), and UPR-100-D-3 sites were interim closed out as one decision unit referred to as the 100D48:2/49:2 Pipelines site. For information regarding excavation, verification sampling, or the statement of protectiveness for the UPR-100-D-3 site, refer to the 100D48:2 site (Section 4.1.36).

The UPR-100-D-3 site has been reclassified as "Interim Closed Out."

4.1.141 UPR-100-D-4, Unplanned Release: 107-D Basin Leaks

The UPR (UPR-100-D-4) of 105D Reactor cooling water from the 116-D-7 Retention Basin occurred in 1950 on the north side of the basin, between the basin and the river. The water drained under the road to a section between the road and the perimeter fence. Estimated volumes of water associated with the UPRs are not available.

Due to geographic location and similarity of remediation activities, 100-D-48:1 (Section 4.1.35), 100-D-49:1 (Section 4.1.39), 100-D-19 (Section 4.1.12), and UPR-100-D-4 sites were interim closed out as one decision unit referred to as the 100-D-48:1/49:1 Pipelines site. For information regarding excavation, verification sampling or the statement of protectiveness for UPR-100-D-4 site, refer to the 100-D-48:1 site (Section 4.1.35).

The UPR-100-D-4 site has been reclassified as "Interim Closed Out."

4.1.142 UPR-100-D-5, Effluent Line Leak #4

4.1.142.1 Site Description

The UPR-100-D-5, Effluent Line Leak #4 waste site is described as an unplanned effluent release due to leakage at the 107-DR Retention Basin that occurred in 1951. The only known reference to the UPR-100-D-5 Effluent Line Leak #4 waste site is on a site drawing on which the UPR is identified as item 22, "effluent leak."

4.1.142.2 Excavation Operations

Remediation of the UPR-100-D-5 waste site began on March 7, 2008, and concluded on April 3, 2008. Approximately 4,485 BCM (5,586 BCY) of soil was removed and stockpiled adjacent to the site. No soil was removed for disposal to ERDF. The excavation is approximately 4.6 m (15 ft) deep and 30.5 m (100 ft) long, with variable width.

During remediation, the soil being removed was regularly surveyed using hand-held radiological field instrumentation followed by GPERS surveys of the surface of the soil stockpile performed in 1 m (3.3 ft) lifts. Radiological contamination was not detected; therefore, the soil was placed in two stockpiles for potential use as clean backfill of the excavation.

On March 20 and April 7, 2008, GPERS surveys were performed within the excavation and on the two stockpiles. Results indicated the excavation had several locations with radiological activity above the background measurement, although only one location was identified with significantly elevated radiological activity. Project radiological control technicians using hand-held instrumentation resurveyed the location and concluded the GPERS result to be a false-positive measurement.

4.1.142.3 Verification Sampling

Verification sampling at the UPR-100-D-5 waste site was performed on July 6 and 7, 2009. The footprints of the excavation and each of the two stockpiles were the three decision units for verification sampling. A statistical sampling design was selected for this site.

A total of 12 verification soil samples were collected on a random-start triangular grid for the UPR-100-D-5 waste site excavation area. One focused verification soil sample was collected at the location where GPERS detected radiological contamination that was subsequently determined to be a false-positive measurement by hand-held radiological survey instrumentation. Verification sampling of the soil stockpiles was performed to evaluate the suitability of this soil for use as clean backfill for the excavation. Each stockpile was considered a separate decision unit. Twelve verification soil samples were collected from the northern stockpile, and 12 verification soil samples were collected from the western stockpile.

All residual COPC concentrations are below RAGs, except for manganese in one sample collected in the western overburden pile. RESRAD modeling predicted that residual concentrations of manganese will be protective of groundwater and the Columbia River.

4.1.142.4 Statement of Protectiveness

The verification sample results demonstrate compliance with the RAOs for the UPR-100-D-5 waste site. Analytical results show that residual contaminant concentrations support future land uses that can be represented (or bounded) by a rural-residential scenario. The results also demonstrate that residual contaminant concentrations support unrestricted future use of shallow zone soil (i.e., surface to 4.6 m [15 ft]) and contaminant levels remaining in the soil are protective of groundwater and the Columbia River. This site does not have a deep zone component; therefore, no deep zone institutional controls are required. The UPR-100-D-5 site has been reclassified as “Interim No Action.”

4.2 100-DR-2 Operable Unit

This section presents detailed remedial actions for sites within the 100-DR-2 OU.

4.2.1 100-D-12, Sodium Dichromate / Acid Railcar and Truck Unloading Station and Associated French Drain, Undocumented Liquid Waste Site

4.2.1.1 Site Description

The 100-D-12 site is located just south of the 183D and 184D Buildings next to the railroad tracks. Undiluted sodium dichromate and acid solutions were pumped through underground lines to storage tanks located outside the 185D and 190DR facilities. Prior to remediation, the site appeared as a small concrete pad enclosed by a curb. The containment area drained to an adjacent concrete pipe french drain that supported the flushing and draining of lines that were connected to railroad tank cars. The majority of the spills and hose drainage were routinely discharged to the french drain. Undiluted volumes of sodium dichromate and acid solutions were also spilled directly to the soil column at this location.

4.2.1.2 Excavation Operations

Remedial action at the 100-D-12 site began on November 8, 1999. Excavation of the site involved removing the overburden materials, the contaminated structure, and underlying contaminated soil. Based on field screening, overburden materials identified as potentially clean were placed in stockpiles for potential use as backfill. Materials that were found to be contaminated were disposed at ERDF. On April 19, 2000, the excavation reached the design depth. At the completion of remedial action, the excavation was approximately 202.5 m^2 (2,180 ft^2) in area with a maximum depth of approximately 2.4 m (7.9 ft). Approximately 34.5 metric tons (38 tons) of material from the site was disposed at ERDF.

4.2.1.3 Verification Sampling

Cleanup verification sampling was performed on May 1, 2000. For the 100-D-12 site, a single sample design was developed. A sample design was not prepared for deep zone soils separately since the maximum depth of the excavation was 2.4 m (7.9 ft), the entire excavation consisting of shallow zone soils. The single decision unit was divided into four sampling areas. Six nodes were randomly selected in each sampling area for collection of variance samples. For the 100-D-12 site, 24 variance samples were collected from random locations in the shallow zone. The samples collected to support the variance analysis were also used for the cleanup verification analysis.

4.2.1.4 Statement of Protectiveness

The remaining soils have been sampled and analyzed to show that residual concentrations in the shallow zone will support future land uses that can be represented (or bounded) by a rural-residential scenario and that residual concentrations throughout the site pose no threat to groundwater or the Columbia River. The acceptability of unrestricted direct exposure to deep zone soils has not been demonstrated; therefore, institutional controls to prevent uncontrolled drilling or excavation into the deep zone (i.e., below 4.6 m [15 ft]) are required.

In 2005, the statement of protectiveness for 100-D-12 was revised by DOE letter 05-AMRC-0078. Based on this letter, institutional controls have been removed from this waste site. The 100-D-12 site has been reclassified as “Interim Closed Out.”

4.2.2 100-D-13, Unnumbered Septic System A, Septic Tank D-13, 100-DR Area Sewage Disposal Unit, 124-DR-3, 1607-DR3

4.2.2.1 Site Description

The 100-D-13, Unnumbered Septic System A waste site consists of a septic tank, dosing tank, filter bed, and associated piping located east-southeast of the 105-DR Reactor. This system formerly received sanitary sewage from temporary construction facilities for the 105-DR Reactor and overflow from a drain for the elevated water tank at the reactor facility.

A geophysical survey was performed at the 100-D-13 site in June 2004. Because the septic tank and filter bed are visible at the surface of the site, the investigation focused on locating the connecting subsurface pipeline. Separate surveys were performed around the tank and filter bed with no survey performed between the two areas. The survey noted subsurface linear anomalies at both the septic tank and filter bed, the orientations of which would be consistent with a connecting conduit.

4.2.2.2 Confirmatory Sampling

Confirmatory sampling of the 100-D-13 waste site was conducted on July 11 and 12, 2005. The septic tank was discovered to contain residual free liquid and sludge, and appropriate waste characterization samples were collected. Confirmatory samples were collected from surficial and underlying soils at the filter bed. Eight samples were collected.

On August 18, 2010, an additional pipeline sample was collected to further characterize the pipeline between the septic tank and dosing tank and to confirm that no contamination was present between the septic tank and the dosing tank.

On March 14, 2011, following the removal of the dosing tank, three soil samples were collected from soils underlying the dosing tank.

The analytical results indicated no elevated residual concentrations exceeding cleanup criteria, except zinc that exceeded river protection RAGs. RESRAD modeling predicted that residual concentrations of zinc will be protective of groundwater and the Columbia River. Therefore, remedial action was determined to be unnecessary. However, removal of the contents of the septic tank and dosing tank and subsequent structural abandonment of the tank was warranted.

4.2.2.3 Excavation Operations

The liquid levels within the septic tank observed on August 18, 2010 were compared to the liquid levels observed during the confirmatory sampling effort in 2005. The liquid level check confirmed that the tank has not leaked any fluids since the confirmatory sampling effort in 2005. The lid of the tank was removed and disposed at ERDF during the efforts to appropriately disposition the residual tank contents. The contents of the tank were treated, solidified, and then removed and disposed at ERDF. The tank was filled with soil.

The tank extended down to 7.3 m (24 ft) bgs; therefore, to completely remove the solidified liquids from the tank, the top portion of the tank had to be broken off and removed. An engineered excavation was designed to access and appropriately disposition the septic tank. Approximately 885 BCM (1,159 BCY) of solidified liquid and septic tank components were removed from the excavation and staged in the SPA to the north of the excavation before being loaded for disposal at ERDF. Approximately 3,540 BCM (4,638 BCY) of soil was removed to provide access to the septic tank and stockpiled for use as backfill. Following the removal of all liquids and other solids from the tank, the void of the septic tank was filled with soil.

In January 2011, the dosing tank was uncovered to perform visual observation of the tank contents. The wooden lid that covered the dosing tank was found to be partially deteriorated; therefore, rainwater collection inside the tank was expected. The tank was found to be partially backfilled with soil and containing a small amount of water in the two corners of the tank. On March 14, 2011, the removal and dispositioning of the dosing tank was initiated and completed. The dosing tank measured approximately 3 by 1.5 by 2.5 m (10 by 5 by 8 ft). The entire dosing tank was removed, resulting in approximately 100 BCM (131 BCY) of dosing tank components, backfill materials, and soil. All materials were directly loaded for disposal at ERDF.

4.2.2.4 Statement of Protectiveness

Residual wastes have been removed from the septic tank and the unit backfilled. There is no evidence to suggest leakage to surrounding soils occurred at the tank. The results also show that residual soil concentrations support future land uses that can be represented (or bounded) by a rural-residential scenario. The results also demonstrate that residual contaminant concentrations support unrestricted future use of shallow zone soil (i.e., surface to 4.6 m [15 ft]) and that contaminant levels remaining in the soil are protective of groundwater and the Columbia River. No evidence of deep zone contamination exists at this site; therefore, institutional controls to prevent uncontrolled drilling or excavation into the deep zone of the site are not required. The 100-D-13 site has been reclassified as "Interim Closed Out."

4.2.3 100-D-14, Unnumbered Septic Tank #2, Unnumbered Septic System

4.2.3.1 Site Description

The 100-D-14 site was suspected to be a septic system formerly supporting the construction camp badge house before its relocation. No documentation of any decommissioning activities or nonsanitary releases to the septic system has been located.

Prior to confirmatory sampling, the only feature of the site visible at the surface was a 4 in. vertical concrete pipe extending slightly above the surrounding ground surface. The pipe was suspected to be a vent line for a septic drain field. A geophysical survey was performed at the 100-D-14 site in October 2005 to locate and map surface and subsurface features. No significant anomalous features were noted by the survey, including possible foreign material or past excavation horizons. The surface inspection identified a soil mound and surface contours, as well as remnants of a (possibly pre-Hanford Site era) wood post and barbed wire fence.

4.2.3.2 Confirmatory Sampling

Confirmatory sampling at the 100-D-14 site was conducted on January 4, 2006, and July 11, 2007. On January 4, 2006, during confirmatory sampling activities, the pipe was discovered to extend approximately 1 m (3 ft) bgs to an elbow connected to a generally horizontal concrete pipeline extending to the east. Approximately 6 lateral meters (20 lateral ft) of this pipeline were excavated, and no perforations or other features suggestive of a drain field were discovered. Following this excavation, evidence was discovered that indicated the septic tank location was in a different orientation and farther east than originally assumed for the 100-D-14 waste site. Excavation at the suspect septic tank location on July 11, 2007, revealed the suspect influent VCP and suspect effluent VCP belled at one end (consistent with the configuration for connection to a tank). A gap of approximately 5 m (16.4 ft) between the two pipes indicated that the septic tank had been removed.

Based on the confirmatory data evaluation, residual concentrations of nitrate (as nitrogen), DDE, and DDT exceeded the soils RAGs for the protection of groundwater and/or the Columbia River. Considering that there are two nitrate groundwater plumes within the 100-D Area, the 100-D-14 site was perceived as a potential source of nitrate contamination that could contribute to the nitrate groundwater plumes. It was decided that the 100-D-14 site required remedial action.

4.2.3.3 Excavation Operations

Remediation of the 100-D-14 waste site was performed from March 28 through March 29, 2012. Approximately 936 BCM (1,224 BCY) of excavated materials were removed and stockpiled in a SPA west of the excavation prior to disposal at ERDF. During the 100-D-14 site remediation activities, no septic tank was found. Only several segments of pipeline were observed during remediation in addition to an area that resembled a drain field. No anomalous materials were encountered during the excavation.

4.2.3.4 Verification Sampling

Verification sampling was conducted at the 100-D-14 site on July 17, 2012. Statistical sampling was the method chosen for selecting the sampling locations. The area identified for statistical verification sampling consists of two decision units, the excavated area and the SPA. Separate statistical sampling designs were used to collect verification soil samples from the 100-D-14 excavated area and the SPA. Twelve statistical discrete soil samples were collected on the grid within each of the two decision units at the 100-D-14 site.

The verification sampling at the 100-D-14 site indicates that all COC/COPCs were undetected and/or quantified below RAGs and lookup values, except for selenium concentrations that exceeded soil RAGs for the protection of groundwater. RESRAD modeling predicted that residual concentrations of selenium will be protective of groundwater and the Columbia River.

4.2.3.5 Statement of Protectiveness

These results show that residual soil concentrations support future land uses that can be represented (or bounded) by a rural-residential scenario. The results also demonstrate that residual contaminant concentrations support unrestricted future use of shallow zone soil (i.e., surface to 4.6 m [15 ft]) and that contaminant levels remaining in the soil are protective of groundwater and the Columbia River. Site contamination did not extend into the deep zone soils; therefore, institutional controls to prevent uncontrolled drilling or excavation into the deep zone are not required. The 100-D-14 site has been reclassified as “Interim Closed Out.”

4.2.4 100-D-15, Debris North of 100-D Area Perimeter Road and Debris South of 100-D Perimeter Road - Within 100-D-55, Gravel Pit #2, Pit 21

4.2.4.1 Site Description

The 100-D-15 site consisted of two separate areas containing debris. The northern area, located north of the perimeter road, was visible as mounds of fill with some debris present at the surface. The southern area, located south of the perimeter road, was visible as multiple small fill piles within the east end of Gravel Pit 21 (100-D-55 Borrow Pit), although very little debris was evident at the surface.

The northern area of the 100-D-15 site contained debris consisting of concrete rubble, metallic and asphalt debris, and other inert materials. Potential ACMs were also found to be present. The site was also reportedly used to dispose of empty cans formerly containing oil and cleaning solvents from Army sites located northeast of the 100-D Area, and it is considered the older of the two disposal areas. The southern area of the 100-D-15 waste site was used as a disposal location for sediment that was removed during the cleanout of the 182D Basin. Scrap pieces suspected to be debris from gaskets used in the expansion joints of the 182D water basins were identified at the surface of the western portion of this location.

4.2.4.2 Excavation Operations

Remedial action at the 100-D-15 waste site was performed between October 6 and December 1, 2008. The northern location was excavated between 2 m (6.6 ft) and 4 m (13 ft) belowgrade, and the southern location was excavated 3.5 m (11.5 ft) belowgrade. Approximately 9,198 BCM (10,059 BCY) of soil and debris were removed from the north area, and 4,003 BCM (4,378 BCY) was removed from the south area. All material was direct loaded for disposal at ERDF.

The sediment piles from the historical cleanout of the 182D Basin that were disposed in the southern area of the 100-D-15 site were completely removed. The sediment was observed to contain clamshells and clumps of asphalt-type sealant used in the 182D Basin. Remediation also included removal of a layer of underlying soil. A crushed drum was found during excavation and was determined to be empty.

Remediation of the northern area proceeded by excavating and disposing of material beginning at the outer edges and surface of the debris pile. The debris consisted of concrete rubble, metallic and asphaltic debris, and other inert materials. Potential ACM was also removed. After approximately 1 month of excavation, the remaining material in the north area pile appeared to consist predominantly of soil with less than 5% debris. Only inert, nonhazardous debris was observed to be present in the exposed vertical surfaces within the remaining pile. Therefore, a decision was made to excavate potholes in the center of the remaining pile at two locations where the geophysical survey indicated the potential presence of subsurface debris.

The potholes were each excavated to a depth of approximately 1.2 m to 1.5 m (4 to 5 ft). No waste material was encountered within the pothole. Some debris (potentially asphalt and tar roofing) was observed in the north sidewall of this pothole; however, no debris was found at the base of the pothole. A layer of vegetation was present, demarcating the boundary between the overlying debris layer and underlying debris-free soil observed in the sidewall. A decision was made to remove this debris layer.

4.2.4.3 Verification Sampling

Verification sampling at the 100-D-15 waste site was performed on September 16 and 17, 2009. The 100-D-15 waste site was divided into two decision units for verification sampling, specifically, the north excavation and the south excavation. A statistical sampling approach was used for evaluation of both decision units. Twelve samples were taken from each decision unit.

Evaluation of the results from verification sampling at the 100-D-15 waste site show that no contaminants exceed direct exposure RAGs. Groundwater and/or Columbia River protection soil RAGs are exceeded by zinc, bis(2-ethylhexyl) phthalate, DDD, and DDE. RESRAD modeling predicted that residual concentrations of these constituents will be protective of groundwater and the Columbia River.

4.2.4.4 Statement of Protectiveness

The results of verification sampling show that residual contaminant concentrations do not preclude any future uses (as bounded by the rural-residential scenario) and allow for unrestricted use of shallow zone soils (i.e., surface to 4.6 m [15 ft] deep). The results also demonstrate that residual contaminant concentrations are protective of groundwater and the Columbia River. Site contamination did not extend into the deep zone soils; therefore, institutional controls to prevent uncontrolled drilling or excavation into the deep zone are not required. The 100-D-15 site has been reclassified as “Interim Closed Out.”

4.2.5 100-D-23, 119-DR Sample Building Drywell

Due to the geographic proximity and similarity of remediation activities, the 100-D-23, 100-D-53 (Section 4.2.10), 100-D-54 (Section 4.2.11), 100-D-64 (Section 4.2.13), and 132-DR-2 (Section 4.2.39) sites were interim closed out as one site referred to as the 117DR facilities site. For additional information regarding the 100-D-23 site, refer to the 100-D-53 site (Section 4.2.10).

The 100-D-23 site has been reclassified as “Interim Closed Out.”

4.2.6 100-D-28:1, Replacement Septic System

4.2.6.1 Site Description

The 100-D-28:1 subsite is located approximately 25 m (82 ft) southwest of the former 190DR Building. The 100-D-28:1 septic system was installed as a replacement system and consisted of a 2,730 L (720 gal) septic tank, a vitrified clay drain field, and associated cast iron piping. The system processed and disposed sewage from the 190-DR Main Process Water Pumphouse. The 190DR Building housed the pumps and related equipment used to supply the 105-DR Reactor with cooling water from the 183DR Clearwells.

During excavation for confirmatory sampling, the tank and drain field were discovered to have been abandoned leaving the cast iron inlet line and a small quantity of metal, asphalt, and pipe debris unrelated to the operational use of the site.

4.2.6.2 Excavation Operations

Remedial action at the 100-D-28:1 subsite was performed between July 27 and August 17, 2010. Additional remediation was conducted on March 17, 2011, due to residual contamination identified following verification sampling activities. The excavation continued to a maximum depth of 5 m (16 ft) until all contaminated soil and debris associated with the waste site had been removed.

Approximately 2,760 BCM (3,610 BCY) of contaminated soil and debris were removed from the excavation and staged in a SPA to the north of the excavation before being loaded for disposal at ERDF. Approximately 1,275 BCM (1,668 BCY) of overburden material was stockpiled for use as clean backfill. However, verification sampling found unacceptable contaminant concentrations and after additional remediation and resampling, contamination was still present above direct exposure RAGs, and the entire overburden soil stockpile was loaded out for disposal at ERDF between April 20 and 21, 2011. The debris removed from the 100-D-28:1 subsite consisted of contaminated soil, concrete, and piping associated with the septic tank and drain field. No anomalous material was encountered during excavation.

4.2.6.3 Verification Sampling

Final cleanup verification samples were collected following variance sampling. The excavated area, waste SPA, and the overburden soil stockpile are the decision units identified for the 100-D-28:1 subsite. Verification sampling was conducted at the 100-D-28:1 excavation, waste SPA, and overburden soil stockpile on February 4 and 7, 2011. Twelve statistical verification soil samples were collected from each of the decision units.

Additional material was removed from the excavation and from the overburden stockpile due to direct exposure exceedances, and replacement samples were collected on March 18, 2011. A final round of replacement sampling was conducted on April 27, 2011 at the overburden stockpile locations where residual contamination exceeding direct exposure RAGs had been detected.

Evaluation of the results from verification sampling at the 100-D-28:1 subsite indicates that residual concentrations of all site COPCs are below soil RAGs for direct exposure. Soil RAGs for protection of groundwater, and/or the Columbia River are exceeded for benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene, and indeno(1,2,3-cd)pyrene. RESRAD modeling predicted that residual concentrations of these constituents will be protective of groundwater and the Columbia River.

4.2.6.4 Statement of Protectiveness

The waste site was excavated to a maximum depth of 5 m (16 ft) until all contaminated soil and debris had been removed. Although excavation extended into the deep zone (below 4.6 m [15 ft]), the entire site was closed out using the more restrictive shallow zone direct exposure, groundwater, and river protection cleanup criteria. The results of verification sampling indicate that concentrations of residual contamination do not exceed direct exposure cleanup levels. Institutional controls to prevent uncontrolled drilling or excavation into the deep zone are not required. The 100-D-28:1 site has been reclassified as “Interim Closed Out.”

4.2.7 100-D-43, Buried VSR Thimble Site, Burial Ground 4C, 118-D-4C

4.2.7.1 Site Description

The 100-D-43 Buried VSR Thimble Site was a solid waste burial ground located east of the 105D Reactor and south of the railroad spur that serviced the 105D Reactor. The documented location of the 100-D-43 Burial Ground falls within a distinct excavation boundary. Within the excavation boundary were several concentrations of geophysical anomalies with the characteristics of buried debris. The excavation for the site appears to merge with a much larger excavated area that continues to the south and northwest beyond the documented location for 100-D-43, within the proximity of the 100-D-45 Burial Ground.

Due to geographic location and similarity of remediation activities, the 100-D-42 (Section 4.1.33), 100-D-43, and 100-D-45 (Section 4.1.34) sites were interim closed out as one decision unit. For information regarding excavation, verification sampling or the statement of protectiveness for 100-D-43, refer to the 100-D-42 site (Section 4.1.33).

The 100-D-43 site has been reclassified as “Interim Closed Out.”

4.2.8 100-D-46, Burial Ground 4A, 118-D-4A

The 100-D-46 site is a burial ground that received radioactive and nonradioactive solid wastes and construction debris generated from various reactor modifications in the 105D Reactor after 1967.

Due to geographic location and similarity of remediation activities, the 116-D-1A (Section 4.1.106), 116-D-1B (Section 4.1.107), and 100-D-46 sites were interim closed out as one decision unit referred to as the 116-D-1A/116-D-1B site. For additional information regarding excavation, verification sampling, or statement of protectiveness for the 100-D-46 site, refer to the 116-D-1A site (Section 4.1.106).

The 100-D-46 site has been reclassified as “Interim Closed Out.”

4.2.9 100-D-47, Construction C.G. 558-Rod Burial, Burial Ground 4E, 118-D-4E

4.2.9.1 Site Description

The 100-D-47, Burial Ground 4E, is located southeast of the 105D Reactor outside of the reactor exclusion fence and south of the railroad spur that serviced the reactor building. The burial ground is west of Burial Ground 4F (118-D-4, Section 4.2.32) and south of the Minor Construction Burial Ground #5 pit (100-D-40) and trench (100-D-41). It is located within the 118-D-4 cobblefield (Section 4.2.32) but not separately marked. It was constructed to receive control rod waste from Project CG-558. The 100-D-47 Burial Ground is one of several that received waste from the modifications made to the 105D Reactor during that project.

Project CG-558 made modifications to the older Hanford Site reactors that permitted considerable power level increases. Nine new horizontal control rods were installed, seven of which were replaced between June 26 and July 10, 1955. These presumably were buried at the 100-D-47 waste site. The original rods were constructed of steel and spray coated with boron.

4.2.9.2 Excavation Operations

Remedial action at the 100-D-47 Burial Ground began on January 16, 2008, and continued through March 20, 2008. Approximately 2,800 BCM (3,660 BCY) of material was removed for disposal at ERDF. Approximately 247 BCM (323 BCY) of overburden and layback was stockpiled for use as clean fill. The material excavated was consistent with the burial of scrap (e.g., piping, concrete, valves) from miscellaneous equipment modifications accomplished during Project CG-558. No spent nuclear fuel

(SNF) or other anomalous material (containers, stained soils, or other waste forms) were discovered at the 100-D-47 Burial Ground.

In-process soil samples were taken in support of remedial action activities. GPERS were conducted within the 100-D-47 Burial Grounds and overburden stockpile upon completion of remedial action. Initial GPERS surveys indicated residual radioactivity in the bottom of the trenches. Additional material was excavated, and GPERS were conducted at those locations to verify that contamination was removed.

4.2.9.3 Verification Sampling

Verification samples were collected from November 25 to December 3, 2008. The 100-D-47 Burial Ground was divided into two decision units: the burial ground excavation and the overburden soil stockpiles. Twelve statistical verification soil samples were collected from each decision unit.

In addition to performing statistical sampling of the burial ground excavation and the overburden stockpiles, five focused soil samples were collected. Lead acid batteries, bulk chunks of lead, and ACM were staged in piles within the excavation. One soil sample was collected from each of these areas to verify that the soil below where the items were staged did not exceed the RAGs. In addition, post-excavation radiological surveys indicated elevated radiological contamination. Additional material was removed and the area was resurveyed. One soil sample was collected from two locations within the excavation that exhibited the highest radiological reading.

Because the hold time for mercury was exceeded for all samples at the analytical laboratory, new soil samples were collected at all statistical and focused sampling locations.

The verification sampling at the 100-D-47 Burial Ground indicates that all COC/COPCs were undetected and/or quantified below RAGs and lookup values, except for a vanadium concentration that exceeded soil RAGs for the protection of groundwater. RESRAD modeling predicted that residual concentrations of vanadium will be protective of groundwater and the Columbia River.

4.2.9.4 Statement of Protectiveness

The results of this effort indicate that residual concentrations will support future land uses that can be represented (or bounded) by a rural-residential scenario and that residual concentrations throughout the site pose no threat to groundwater or the Columbia River. The 100-D-47 excavation area has a maximum depth of approximately 5.5 m (18 ft), which includes both shallow zone and deep zone soils. However, the entire excavation area is considered one decision unit, and will be closed out using the more restrictive shallow zone cleanup criteria; therefore, institutional controls to prevent uncontrolled drilling or excavation into the deep zone are not required. The 100-D-47 site has been reclassified as “Interim Closed Out.”

4.2.10 100-D-53, 117-DR Filter Building, 117-DR HEPA Filter Building

Due to the geographic proximity and similarity of remediation activities, the 100-D-23 (Section 4.2.5), 100-D-53, 100-D-54 (Section 4.2.11), 100-D-64 (Section 4.2.13), and 132-DR-2 (Section 4.2.39) sites were interim closed out as one site referred to as the 117DR facilities site. This section contains information about all five sites.

4.2.10.1 Site Description

The 117DR facilities site includes components of the 105-DR LSFF located at the south end of the 105-DR Reactor. The LSFF occupied the former supply/exhaust fan room of the 105-DR Reactor and used the 105-DR Reactor exhaust system, which includes the 117DR Filter Building, exhaust tunnels, exhaust stack, exhaust sack sampling building, and exhaust stack sampling building drywell. The 105-DR Reactor

exhaust system began operations in 1960, and ceased operations in 1964. The exhaust system was reactivated in 1972 for the LSFF.

Portions of the permitted LSFF treatment, storage, and disposal unit are the 117DR Exhaust Filter Building (100-D-53), which also includes the downstream (post-filter) tunnel between the filter building and the exhaust stack and the underground exhaust tunnel between the 105-DR Building and the 117DR Building, and the 116DR Exhaust Stack (132-DR-2).

The 117DR Exhaust Filter Building (100-D-53) was a reinforced concrete structure 20.7 m (68 ft) long, 91.9 m (39 ft) wide, and 10.4 m (34 ft) deep, with 2.4 m (8 ft) of the building abovegrade. The facility was connected to the 105-DR Reactor and the 116DR Reactor Exhaust Stack by underground reinforced concrete exhaust ducts. The aboveground portion of the 116DR Stack was decommissioned in 1999. The 119-DR Exhaust Stack Sampling Building (100-D-64) was a 33.4 m^2 (360 ft^2) single-story, pre-fabricated metal structure on a concrete slab. The two drywells (100-D-23 and 100-D-54) and the 119-DR Exhaust Stack Sampling Building were included in the removal action.

The 100-D-23 Dry Well is shown on drawings to the south of the 119-DR Exhaust Stack Sampling Building, but was not located during walkdown or excavation activities. The dry well was likely removed during construction of the nearby gravel scrubber in 1982. The 100-D-54 Dry Well was a 22 in. diameter concrete pipe with a depth of approximately 1.5 m (4.9 ft) and was likely constructed as a replacement to the 100-D-23 Dry Well. The 100-D-54 Dry Well was located southwest of the 119-DR Exhaust Stack Sampling Building.

4.2.10.2 Excavation Operations

Remedial action at the 117DR facilities site was conducted in July 2003. Remedial action activities removed the 117DR Exhaust Filter Building (100-D-53), the downstream (post-filter) tunnel, and the upper 0.9 m (3 ft) of the 116DR Reactor Exhaust Stack (132-DR-2). The 119-DR Exhaust Stack Sampling Building (100-D-64), and two stack sampling building dry wells (100-D-23 and 100-D-54) were also demolished and excavated as part of remedial action activities.

Excavation of the site involved removal of the structure and slab floor, and removal of underlying soil to a depth of approximately 4.6 m (15 ft) in an area of approximately 1,010 m^2 (10,872 ft^2). Approximately 14,011 metric tons (15,412 tons) of contaminated materials were transported and disposed at ERDF.

The 116DR Exhaust Stack foundation was removed to a minimum of 0.9 m (3 ft) below the surrounding grade and, based on process history, was determined to be uncontaminated. A radiological mapping survey was performed for the shallow zone soil surface around the 116DR Exhaust Stack foundation.

4.2.10.3 Verification Sampling

Final cleanup verification samples were collected following variance sampling. Variance sampling was performed to determine the site-specific number of cleanup verification samples to be collected. Cleanup verification sampling was conducted on August 8, 2003.

The 117DR facilities site consisted of one shallow zone decision unit and one deep zone decision unit. The shallow zone decision unit was divided into four sampling areas, and the deep zone decision unit was divided into three sampling areas. One composite cleanup verification sample was collected from each sample area. Composite samples were formed by combining soil collected at four randomly selected nodes within each sampling area. In addition to the cleanup verification samples described above, four discrete soil samples were collected from well-spaced locations along the footprint of the former LSFF exhaust duct.

4.2.10.4 Statement of Protectiveness

The remaining soils at the 117DR facilities site have been sampled, analyzed, and modeled. The results of this effort indicate that the materials from the 117DR facilities site containing COCs at concentrations exceeding RAGs have been excavated and disposed at ERDF. These results also indicate that residual concentrations will support future land uses that can be represented (or bounded) by a, rural-residential scenario and that residual concentrations throughout the site are protective of groundwater and the Columbia River.

However, the deep zone data are not typically assessed against direct exposure criteria. Therefore, the acceptability of unrestricted direct exposure to deep zone soils has not been demonstrated, and institutional controls are required to prevent uncontrolled drilling or excavation into the deep zone (i.e., below 4.6 m [15 ft]). The 117DR facilities (which include the 100-D-53, 100-D-54, 100-D-23, 100-D-64, and 132-DR-2 sites) have been reclassified as "Interim Closed Out."

4.2.11 100-D-54, Drywell Near Fire Facility Gravel Scrubber

Due to the geographic proximity and similarity of remediation activities, the 100-D-23 (Section 4.2.5), 100-D-53 (Section 4.2.10), 100-D-54, 100-D-64 (Section 4.2.13), and 132-DR-2 (Section 4.2.39) sites were interim closed out as one site referred to as the 117DR facilities site. For additional information regarding the 100-D-54 site, refer to the 100-D-53 site (Section 4.2.10).

The 100-D-54 site has been reclassified as "Interim Closed Out."

4.2.12 100-D-62, 183-DR Head House Septic Tank

4.2.12.1 Site Description

The 100-D-62, 183DR Head House septic tank waste site includes the septic tank, drainfield, and associated piping. The septic tank was located approximately 15.2 m (50 ft) south of the 183DR Head House. The drainfield pipeline extended 6.1 m (20 ft) from the southern end of the septic tank. The overall dimensions of the tile field measured 8.2 m (27 ft) long by 4.3 m (14 ft) wide. The septic system received sanitary sewage from the 183DR Head House. The entire 183DR Water Treatment Facility was a nonradiological area; therefore, the 100-D-62 septic system waste site was not considered radiologically contaminated.

Due to geographic location and similarity of remediation activities, cleanup activities for the 100-D-62 and 100-D-77 (Section 4.2.15) sites, located within the 100-DR-2 OU, and the 100-D-83:1 (Section 4.1.78) site, located within the 100-DR-1 OU, were conducted together. For information regarding excavation, verification sampling, and the statement of protectiveness for the 100-D-62 site, refer to the 100-D-77 site (Section 4.2.15).

The 100-D-62 site has been reclassified as "Interim Closed Out."

4.2.13 100-D-64, 119-DR Sample Building, 105-DR Reactor Exhaust Stack Sampling Building

Due to the geographic proximity and similarity of remediation activities, the 100-D-23 (Section 4.2.5), 100-D-53 (Section 4.2.10), 100-D-54 (Section 4.2.11), 100-D-64, and 132-DR-2 (Section 4.2.39) sites were interim closed out as one site referred to as the 117DR facilities site. For additional information regarding the 100-D-64 site, refer to the 100-D-53 site (Section 4.2.10).

The 100-D-64 site has been reclassified as "Interim Closed Out."

4.2.14 100-D-68, 190-DR Process Water Pump House

Waste site 100-D-68, the belowgrade remaining concrete structures for the 190-DR facility, was sampled at agreed worst-case locations at the low points in the belowgrade structure. The closure sampling results demonstrated that the residual concentrations of the COCs were below the 100 Area cleanup levels. The analysis of the closure sample results demonstrated that the site is protective of the surrounding soil, groundwater, and the Columbia River. These results support unrestricted land uses that can be represented (or bounded) by a rural-residential scenario for the shallow zone (i.e. surface down to 4.6 m [15 ft]). No deep zone institutional controls are required. The 100-D-68 site has been reclassified as "No Action."

4.2.15 100-D-77, 183-DR Acid Facility, 183-DR Head House, 183-DR Flocculation, 183-DR Sedimentation Basins, and 183-DR Filter Plant

Due to the geographic location and similarity of remediation activities, cleanup activities for the 100-D-62 (Section 4.2.12) and 100-D-77 sites, located within the 100-DR-2 OU, and the 100-D-83:1 (Section 4.1.78) site, located within the 100-DR-1 OU were conducted together. Subsection 4.2.15.1 includes site description information specific to 100-D-77. The remaining subsections include information regarding excavation, verification sampling, and the statement of protectiveness for all three sites.

4.2.15.1 Site Description

The 100-D-77 waste site is the former 183DR Reactor Water Treatment Facility and is located approximately 350 m (1,150 ft) west of the 105-DR Reactor. The site is immediately west of the 183DR Clearwells. All facilities in the waste site were demolished to grade in 1978. The 100-D-77 waste site includes the former 183DR Head House, train shed, 183DR Filter Building, 183DR Acid Facility, 183DR Flocculation Basins, and 183DR Sedimentation Basins. The site also includes the former 152-C1-DR substation that had been located on the north side of the 183DR Head House.

The primary concern was the use of sulfuric acid and sodium dichromate. Sulfuric acid, potentially containing impurities such as lead and mercury, was added to raw river water prior to entry into the flocculation basins. Sodium dichromate was added as the final water treatment step in the sample room located on the east side of the 183DR Filter Building.

4.2.15.2 Excavation Operations

Remedial action at the 100-D-62 waste site was conducted on May 2 and 3, 2011. A reinforced concrete septic tank, associated concrete piping, and soil were removed and staged at the SPAs. Approximately 793 BCM (1,037 BCY) of soil and debris were loaded out on July 12 and 13, 2011, for disposal at ERDF.

Remedial action at the 100-D-77 waste site began on May 3, 2011, and continued through July 13, 2011. The 100-D-83:1 pipelines were fully removed during the 100-D-77 remediation. The Tier 1 remediation continued to approximately 4.6 m (15 ft) bgs. Approximately 7,103 BCM (9,290 BCY) of contaminated soil and debris was removed and staged at the SPAs prior to disposal at ERDF. A 20 m (65.6 ft) long section of the 100-D-56:2 pipelines (Section 4.1.55), located at the entry of the pipeline into the 183DR Head House, was removed during the 100-D-77 remediation. Loadout and disposal of 100-D-77 and 100-D-83:1 waste, including material from the remaining 100-D-56:2 pipelines, was conducted between July 13 and October 18, 2011.

At the completion of the Tier 1 remediation, in-process soil samples were collected to determine if additional remediation of the waste site was necessary. The in-process sample data showed mercury concentrations exceeding the direct exposure RAGs. Therefore, a second tier of excavation was designed and implemented.

Tier 2 remediation began on December 8, 2011, and continued through January 16, 2012. Approximately 7,126 BCM (9,320 BCY) of contaminated soil and debris were removed from the excavation and moved to the SPAs for loadout and disposal at ERDF. The excavation depth extended as deep as 9.5 m (31 ft) bgs. Loadout of the Tier 2 waste material began on December 14, 2011. An additional 76 BCM (100 BCY) of contaminated soil and debris were removed from the excavation on March 15, 2013, and staged prior to disposal at ERDF.

Contaminated soil, concrete, and rebar from previously demolished buildings, piping, and a brick-lined concrete acid trap were among the types of material removed from the excavation. Additionally, two fire extinguishers were found in the SPAs (North SPA 1 and North SPA 2) during waste loadout. Both were found to be discharged and were subsequently disposed.

A total of five SPAs received waste from the 100-D-62, 100-D-77, and 100-D-83:1 remediation. Sampling and data evaluation for three of the five SPAs (North SPA 1, North SPA 2, and North SPA 3) were conducted with the 100-D-62, 100-D-77, and 100-D-83:1 waste sites cleanup verification. Sampling and data evaluation of the other two SPAs were performed and documented with the 100-D-50:6 site (Section 4.1.48).

4.2.15.3 Verification Sampling

A verification sample design for the combined 100-D-62, 100-D-77, and 100-D-83:1 waste site remediation was developed. Two decision units (excavation area and SPAs) were identified for statistical verification sampling. Twelve statistical soil samples were collected on the triangular grid within each of the two decision units. Six focused sample locations were identified within the excavation area based on anomalous material observed during remediation. A seventh focused sample was located at the remediated location of the 183DR Filter Building sample room. Verification samples for the excavation area were collected on September 4 and 18, 2012. Replacement verification samples in the excavation area were collected on March 15, 2013. Two revisions to the sample design were approved and included relocating five SPA sample locations and adding three focused samples in the 100-D-83:1 pipelines footprint. The remaining verification samples were collected on April 8 and 29, 2013, and May 29, 2013.

All COPCs were quantified below groundwater and/or river protection soil RAGs except for vanadium, benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene, chrysene, dibenz(a,h)anthracene, and indeno(1,2,3-cd)pyrene. RESRAD modeling predicted that residual concentrations of these constituents will be protective of groundwater and the Columbia River.

4.2.15.4 Statement of Protectiveness

Results show that residual contaminant concentrations do not preclude any future uses (as bounded by the rural-residential scenario) and allow for unrestricted use of shallow zone soils (i.e., surface to 4.6 m [15 ft] deep). Contamination that extended into the deep zone (greater than 4.6 m [15 ft] bgs) has been removed. Therefore, institutional controls to prevent uncontrolled drilling or excavation into the deep zone of the sites are not required. The 100-D-77 site has been reclassified as “Interim Closed Out.”

4.2.16 100-D-94, Dichromate Contaminated Pit Associated with 187-DR

4.2.16.1 Site Description

The 100-D-94 waste site is located directly under the former 187DR water tower, south of the 105-DR Reactor. The 187DR water tower provided emergency cooling water to the 105-DR Reactor. The pipeline leading to the water tower was a clean water pipe (100-D-63, Section 4.1.59). The 100-D-94 waste site consists of the location of a former valve pit for the 187DR water tower that was potentially

contaminated with hexavalent chromium. This site was identified during the 100-D Area orphan sites evaluation.

Yellow material suspected to be dichromate contamination was found in a 1.8 by 1.8 by 1.8 m (6 by 6 by 6 ft) valve pit directly under the 187DR water tower. The water tower, valve pit, and yellow material were removed in 2003, but no samples were collected of the yellow material. The reactor water towers did not normally receive water treated with sodium dichromate, and not enough information is available to confirm if the material observed and removed contained hexavalent chromium. A site visit in October 2009 found no features associated with the suspected hexavalent chromium-contaminated pit. The information available does not make it clear whether the yellow material was observed at the 100-DR or 100H water towers.

4.2.16.2 Confirmatory Sampling

Confirmatory sampling was completed on August 8, 2010. Two focused soil samples were collected from the excavated test pit and were used to evaluate whether contamination associated with the dichromate contaminated pit was present at the 100-D-94 waste site. The test pit was excavated to 2.0 m (6.6 ft) bgs, and a soil sample was collected. The test pit was extended to 3 m (9.8 ft) bgs, and a second soil sample was collected. One pipe flange was found loose in the excavation, and no other debris or staining was observed. The soil appeared to be fill material. No undisturbed native soil was encountered during the excavation. Field surveys for radiological activity and VOCs were conducted during sampling. No radiological activity or VOCs were detected. The confirmatory sampling results indicated that environmental contamination was not present at the 100-D-94 waste site; therefore, remedial action was determined to be unnecessary.

4.2.16.3 Statement of Protectiveness

These results show that residual soil concentrations support future land uses that can be represented (or bounded) by a rural-residential scenario. The results also demonstrate that residual contaminant concentrations support unrestricted future use of shallow zone soil (i.e., surface to 4.6 m [15 ft]) and that contaminant levels remaining in the soil are protective of groundwater and the Columbia River. This site does not extend into the deep zone. Institutional controls to prevent uncontrolled drilling or excavation into the deep zone of the site are not required. The 100-D-94 site has been reclassified as “Interim No Action.”

4.2.17 100-D-100, Stained Soil Near 183DR Railroad Tracks

4.2.17.1 Site Description

The 100-D-100, Stained Soil Near the 183DR Railroad Track waste site was the location where stained surface soil was identified on April 6, 2008, near the southern portion of the 100-D-56 pipeline remediation (Section 4.1.55). The area was roped off to control access, and a soil fixative was applied to control dust. Five focused soil samples were collected to evaluate potential contaminants associated with the stains. Chromium and hexavalent chromium were present in all the samples.

Research indicates that several buildings and waste sites were associated with sodium dichromate use. Originally, from about 1944 until 1950, the receiving, mixing, and transfer of sodium dichromate and other water treatment chemicals occurred in the 108D Building. The chemicals were unloaded from railcars in bags or barrels. Sodium dichromate was received in crystalline form, dissolved in water, and diluted to a 10% to 15% dichromate solution then transferred to feed tanks in the 105-D and 185D Buildings. The historical use of sodium dichromate in 100 Area reactor operations has resulted in elevated hexavalent chromium contamination in groundwater at the 100-D Area.

In April 2009, a test pit and trench were excavated and sampled at the 100-D-100 waste site to a depth of 4.6 m (15 ft) to evaluate the extent of hexavalent chromium contamination. The results of this sampling indicated that remediation of subsurface soil at the 100-D-100 waste site was necessary.

4.2.17.2 Excavation Operations

Remediation of the 100-D-100 waste site was initiated in August 2011 and continued through October 2011, to a depth of approximately 16 m (52.5 ft) bgs. This excavation depth was identified as the 100-D-100 Tier II excavation. Hexavalent chromium contamination exceeding cleanup criteria was present at the base of the Tier II excavation and in portions of the sidewalls of the excavation. Therefore, a Tier III excavation was conducted to a depth of approximately 26 m (85.3 ft) bgs, the estimated elevation of groundwater.

Contaminated material removed during remediation was placed in SPAs prior to shipment to ERDF. During the removal of 100-D-100 layback/overburden material, two french drains were encountered and removed for disposal to ERDF.

Vadose zone remediation of the 100-D-100 waste site was completed on January 30, 2014. Approximately 196,000 BCM (256,360 BCY) of contaminated soil was excavated and disposed at ERDF. Approximately 29,000 BCM (37,900 BCY) of this material was treated at ERDF as land disposal restricted for chromium. Approximately 330,000 BCM (431,600 BCY) of overburden/layback soil was available for use as clean backfill material. No anomalies were identified during remediation.

After vadose zone remediation was completed in January 2014, elevated levels of hexavalent chromium remained at the interface of the vadose zone with the unconfined aquifer. Therefore, an investigation was initiated to determine the distribution and potential persistence of hexavalent chromium within the aquifer and the aquifer sediment. Four temporary boreholes were drilled at the bottom of the 100-D-100 excavation beginning on April 24, 2014, and were completed May 12, 2014, to assess the vertical and horizontal distribution of hexavalent chromium remaining in the aquifer and the aquifer sediment.

Based upon the results of this investigation, it was decided to remove approximately 3 m (10 ft) of aquifer sediment from below the elevation of the seasonal low water table. This additional removal was performed from December 15, 2014, through February 4, 2015. Approximately 15,589 BCM (20,390 BCY) of aquifer sediment was removed, dewatered, and disposed at ERDF.

4.2.17.3 Verification Sampling

Verification sampling of the excavation was performed on October 21, 2013; February 20 and 24, 2014; and March 4, 11, and 19, 2014. Verification sampling of SPAs and overburden/layback was performed throughout the duration of the field activities, as needed, to support decision making related to closure of SPAs and use of overburden/layback for backfill. Statistical verification sampling for the 100-D-100 waste site consisted of 8 decision units for the excavation, 4 decision units for SPAs, 17 decision units for overburden/layback, and 1 decision unit for the equipment decontamination area. A total of 354 samples were taken from the 30 decision units.

All COPCs were quantified below groundwater and/or river protection soil RAGs except for selenium, mercury, benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, chrysene, and indeno(1,2,3-cd)pyrene. RESRAD modeling predicted that residual concentrations of these constituents will be protective of groundwater and the Columbia River.

4.2.17.4 Statement of Protectiveness

The results show that residual soil concentrations support land uses that can be represented (or bounded) by a rural-residential scenario. The results also demonstrate that residual contaminant concentrations

support unrestricted future use of shallow zone soil (i.e., surface to 4.6 m [15 ft]) and that contaminant levels remaining in the soil are protective of groundwater and the Columbia River. Contamination from the 100-D-100 waste site that extended into the deep zone (greater than 4.6 m [15 ft] bgs) has been removed through removal of the vadose zone. Therefore, institutional controls to prevent uncontrolled drilling or excavation into the deep zone of the site are not required. The 100-D-100 site has been reclassified as "Interim Closed Out."

4.2.18 100-D-103, Suspected Trench and French Drain from 116-D-8 Cask Pad

4.2.18.1 Site Description

The 100-D-103 waste site was identified on a December 1949 aerial photograph as an irregularly shaped feature, south of the 116-D-8 Cask Pad (Section 4.2.20). It has been suggested that the feature may be evidence of a pipeline and french drain used in connection with the 116-D-8 Cask Pad.

4.2.18.2 Confirmatory Sampling

Focused sampling was used to characterize the suspected trench and french drain at the 100-D-103 waste site. Confirmatory sampling of the 100-D-103 waste site was performed on February 22, 2013. A test pit was excavated at the suspected french drain location to investigate the presence of a french drain and to collect appropriate samples. The excavation extended to 3 m (10 ft) bgs; however, no french- drain or drain components were found. No pipelines or other debris were excavated at this test pit location. One soil sample was collected from the bottom of the test pit.

4.2.18.3 Statement of Protectiveness

Confirmatory sampling was performed, and the analytical results indicate that the residual concentrations of COPCs at this site meet the RAGs and associated RAOs for direct exposure, groundwater protection, and river protection. The results also demonstrate that residual contaminant concentrations support unrestricted future use of shallow zone soil (i.e., surface to 4.6 m [15 ft]). The 100-D-103 waste site contamination did not extend into the deep zone; therefore, institutional controls to prevent uncontrolled drilling or excavation into the deep zone of the site are not required. The 100-D-103 site has been reclassified as "Interim No Action."

4.2.19 100-D-106, 1607-D1 Influent Pipelines

4.2.19.1 Site Description

The 100-D-106 waste site consisted of the sanitary sewer pipelines that connected the service buildings at the 100-D main gate to the 1607D1 septic tank. It also included a french drain approximately 21 m (70 ft) north of the 1709D Building. The site provided sanitary service for patrol and fire personnel located at the entrance to the 100D/DR Reactor area.

4.2.19.2 Excavation Operations

Remedial action at the 100-D-106 waste site was performed from March 31, 2014, until April 2, 2014. Approximately 1,600 BCM (2,093 BCY) of excavated materials was removed and staged within the SPA for disposal at ERDF. The maximum depth of the waste site excavation was approximately 1.2 m (4 ft) bgs; the depth of the excavation where the french drain was removed was approximately 4.4 m (10 ft) bgs. Excavated materials consisted of concrete-encased 6 in. diameter VCP, concrete from foundations, asphalt debris from roadways, a french drain, soil, gravel, and approximately 285 linear m (935 linear ft) of pipe debris. No stained soil or anomalous materials were encountered during remediation.

4.2.19.3 Verification Sampling

Verification sampling was performed on April 2, July 16, and July 22, 2014. Two decision units were identified for the 100-D-106 waste site; specifically, the excavation and the waste SPA. Twelve statistical soil samples were collected from each decision unit along with a total of three focused samples. Two of the focused samples were collected at road crossings on April 2, 2014, and immediately backfilled to allow road access.

The analytical results indicate that the residual concentrations of COPCs at the site meet the RAOs for direct exposure, groundwater protection, and river protection. Selenium and zinc are present at maximum concentrations above soil RAGs for groundwater and/or Columbia River protection. RESRAD modeling predicted that residual concentrations of selenium and zinc will be protective of groundwater and the Columbia River.

4.2.19.4 Statement of Protectiveness

Results show that residual soil concentrations support future land uses that can be represented (or bounded) by a rural-residential scenario. Residual contaminant concentrations support unrestricted future use of shallow zone soil (i.e., surface to 4.6 m [15 ft]) and that contaminant levels remaining in the soil are protective of groundwater and the Columbia River. Institutional controls to prevent uncontrolled drilling or excavation into the deep zone of the sites are not required. The 100-D-106 site has been reclassified as “Interim Closed Out.”

4.2.20 116-D-8, 100-D Cask Storage Pad

4.2.20.1 Site Description

The 116-D-8, 100-D Cask Storage Pad waste site was a large rectangular concrete pad located on the west side of the 105-DR Reactor, which includes two degreasing pits and two french drains. During the construction of the 105D Reactor in 1948, this site functioned as the foundation and degreasing pits for a temporary airlock to clean and store reactor components before their installation. Subsequently, the concrete pad was modified to provide storage and a decontamination station for shielded casks used for shipping irradiated materials. After the 105D Reactor was shut down in 1967, the casks and other materials were stored on the pad until general cleanup was performed in 1987. Surface contamination on the pad was stabilized by application of an asphalt fixative. The 116-D-8 waste site also includes an area south of the cask storage pad that was remediated after elevated radiological contamination levels were detected.

4.2.20.2 Excavation Operations

Remediation of the 116-D-8 waste site was performed from August 19, 2008, through February 8, 2009. Approximately 1,170 BCM (1,530 BCY) of concrete debris, asphalt emulsion, tan fibrous material, black plastic, grout, steel, and soil was removed from the 116-D-8 cask storage pad waste site and disposed at ERDF. An additional 0.53 BCM (0.69 BCY) of soil was removed from the area at the south degreasing pit and approximately 1.0 BCM (1.2 BCY) of soil was removed from the south radiological contamination area. This material was also disposed at ERDF.

On August 25, 2008, a manhole was discovered during excavation of the 116-D-8 waste site. Based on the coordinate location, it was determined that the manhole was associated with the 100-D-50:1 subsite (Section 4.1.43). The manhole was filled with clean borrow pit soil to eliminate a safety concern and left in place. In addition, there was no indication that the two drains from the water coolers on the temporary airlock discharged to the 100-D-50:1 or 100-D-50:9 sewers (Section 4.1.51).

On October 6, 2008, a post-excavation GPERS survey was conducted on the 116-D-8 waste site. The radiological survey included a small area outside of the southern excavation boundary of the cask pad where radiological contamination levels above background were detected. Focused samples were collected from the area south of the excavation footprint at locations exhibiting elevated radiological contamination and initial verification data indicated exceedances of cleanup levels for multiple contaminants. The project conducted further remediation in January 2011 at the southern radiological contamination area and dug approximately 0.3 m (1 ft) before contacting the top of the 100-D-50:2 Reactor Cooling Water Pipelines from 190DR Pumphouse concrete tunnel (Section 4.1.44). The tunnel is an ecologically sensitive area, housing maternal bat colonies. A study conducted between June 2007 and September 2008 showed that the bats at the 100-D-50:2 subsite use the site as a maternity roost where they give birth and rear their young.

4.2.20.3 Verification Sampling

Statistical sampling was conducted on June 16, 2009, and focused sampling was conducted at the south degreasing pit and south radiological contamination area on October 6, 2009. Additional sampling was requested at the south degreasing pit and south radiological contamination area. The samples were collected on November 3, 2010, and February 8, 2011. The footprint of the 116-D-8 cask storage pad excavated area was used as the basis for locations of 12 primary soil samples collected from the excavation footprint.

The results indicated that the waste removal action achieved compliance with the RAOs and RAGs for the cask storage pad portion of the 116-D-8 waste site. Direct exposure exceedances for cesium-137 in two samples at the southern radiological contamination area of the 116-D-8 waste site from the November 2010 sampling event were identified. After further remediation, the locations were resampled for the original analytical suite, and analytical results for the southernmost location exceeded the direct exposure cleanup criteria for cesium-137 (6.2 pCi/g), at an activity of 7.63 pCi/g.

No further remediation can be conducted at the location with the cesium-137 direct exposure exceedance, without incurring significant adverse impacts to the bat colonies at the 100-D-50:2 pipeline subsite. The preferred alternative to eliminate or mitigate impacts to the bat colony is to leave the structure intact and add perimeter fencing and signage to deter human entry. Therefore, institutional controls are required at the location of the cesium-137 contamination south of the 116-D-8 cask storage pad.

4.2.20.4 Statement of Protectiveness

These results show that residual soil concentrations support future land uses that can be represented (or bounded) by a rural-residential scenario, with a requirement for institutional controls in the area south of the former cask storage pad, near the 100-D-50:2 pipeline location (the 190-DR reactor cooling water pipelines). The results also demonstrate that residual contaminant concentrations are protective of groundwater and the Columbia River. The 116-D-8 site has been reclassified as “Interim Closed Out.”

4.2.21 116-DR-10, 105-DR Fuel Storage Basin Cleanout Percolation Pit, 105-DR Fuel Storage Discharge Pond, 105-DR Pond

4.2.21.1 Site Description

The 116-DR-10 waste site is located due east of the 105-DR Reactor, approximately 100 m (328 ft) from the 100-DR Area exclusion fence. It consisted of an open pit that was excavated in a natural depression and used for disposal of processed water from the 105-DR FSB cleanout during October and November 1984. The pit was 24.4 m (80 ft) long and 15.2 m (50 ft) wide. The bottom of the pit was irregular with an average depth of 1.8 to 2.4 m (6 to 8 ft). Approximately 908,499 L (240,000 gal) of processed water was discharged to the pond between October and November 1984, via an aboveground

hose. The processed water was filtered to remove particulates, run through ion exchange columns to remove colloidal material, and then held in 76,000 L (20,000 gal) batch tanks until sampling verified that radiological release criteria had been met. However, minute quantities of radionuclides remained in the processed water and presented the potential for accumulation of radionuclides at the bottom of the pond.

4.2.21.2 Investigation Operations

After the final tank of processed water was discharged on November 2, 1984, a radiological survey was performed of the percolation pond bottom to evaluate the extent of contamination. The pond was divided into equal-sized grids and a direct reading survey was conducted in each grid. Direct readings ranged from less than background to 500 cpm beta-gamma and nondetectable for alpha. Soil was removed from the locations where radioactivity was detected above background, containerized, and shipped to a 200 West Area burial site. A post-removal radiological survey was conducted using portable alpha and beta-gamma instrumentation. No radioactivity was detected above background. Soil samples were then collected on a systematic grid across the floor of the pond, with samples taken from a depth of 0 to 0.45 m (0 to 18 in.) below the floor of the pond. Based on a review of this information, the backfilled 116-DR-10 percolation pit was believed to have residual radiological contamination exceeding RAGs and was recommended for remediation in 2005.

4.2.21.3 Excavation Operations

Remedial activities at the 116-DR-10 waste site began on November 11, 2008, and concluded on January 7, 2009. Historical information was used to develop a remediation strategy for the percolation pond. Since the bottom of the pond ranged from 1.8 to 2.4 m (6 to 8 ft) bgs and was then later backfilled to the local terrain, the remediation strategy consisted of removing the surface soil at the site to a depth of approximately 1.2 m (4 ft) and stockpiling it at the site as overburden soil. The soil from 1.2 m (4 ft) to a depth of approximately 2.7 m (9 ft) was to be excavated and direct loaded for disposal to ERDF since it delimited the original bottom of the pond that was reported as having residual radiological contamination. The excavation depth ranged from 2.7 m (9 ft) to 4 m (13 ft), resulting in approximately 6,000 BCM (7,847 BCY) of soil removed to ERDF. Approximately 2,462 BCM (3,220 BCY) of overburden material was stockpiled adjacent to the site.

4.2.21.4 Verification Sampling

Verification sampling was conducted at the 116-DR-10 waste site on January 25 and February 3, 2010. The 116-DR-10 waste site was divided into two decision units for verification sampling, the excavation and the overburden soil stockpile. A global positioning survey was used to determine the boundaries of the excavation area and the overburden soil stockpile requiring soil verification sampling. Twelve statistical verification soil samples were collected from each of the decision units.

In addition to the statistical samples, three focused samples were collected from the 116-DR-10 waste site during excavation of a test pit approximately at the center of the excavation. The test pit location was selected within the portion of the excavation with the lowest elevation. Focused samples were collected at approximate depths of 4.4 m (14.5 ft), 4.9 m (16 ft), and 5.3 m (17.5 ft). The test pit was excavated to the originally approved design depth to assess the vertical nature and extent of contamination below the depth of the excavation.

4.2.21.5 Statement of Protectiveness

The results of verification sampling show that residual contaminant concentrations do not preclude any future uses (as bounded by the rural-residential scenario) and allow for unrestricted use of shallow zone soils (i.e., surface to 4.6 m [15 ft] deep). The results also demonstrate that residual contaminant concentrations are protective of groundwater and the Columbia River. This site does not extend into the

deep zone; therefore, no deep zone institutional controls are required. The 116-DR-10 site has been reclassified as “Interim Closed Out.”

4.2.22 116-DR-3, 105-DR Storage Basin Trench

4.2.22.1 Site Description

The 116-DR-3, 105-DR Storage Basin Trench is a trench that measured between 15 to 18 m (50 to 60 ft) long by 12 m (40 ft) wide and 3.3 m (10 ft) deep. The trench received water and sludge from the 105-DR FSB in 1955 that was pumped through a pipeline lying on the ground. The trench received an estimated 4 million L (1 million gal) of waste. The trench was backfilled as soon as it was practical to avoid spread of contamination.

The trench is reportedly located south of the 105-DR Building, outside of the exclusion fence; however, evidence as to the precise waste site location is conflicting and unclear. Documentation has been studied, and site investigations have been undertaken to determine the exact location of the 116-DR-3 waste site. Based on the findings from the investigations performed over the past 30 years, it appeared that the 116-DR-3 waste site was near the boreholes that were excavated to the west of the 116-DR-3 official location.

4.2.22.2 Confirmatory Sampling

Confirmatory sampling for the 116-DR-3 waste site was performed on April 11, 2012. The site was evaluated by excavating two test pits where radiological contamination had previously been detected. Four grab samples were collected from each test pit.

Evaluation of the maximum sample results from the confirmatory sampling indicates that all COPCs were undetected and/or quantified below RAGs and lookup values except for lead and selenium, which were detected above the RAGs for groundwater and/or river protection. RESRAD modeling predicted that residual concentrations of lead and selenium will be protective of groundwater and the Columbia River.

4.2.22.3 Statement of Protectiveness

The results of confirmatory sampling and RESRAD modeling show that residual contaminant concentrations do not preclude any future uses (as bounded by the rural-residential scenario) and allow for unrestricted use of shallow zone soils (i.e., surface to 4.6 m [15 ft]). The sampling and modeling results also demonstrate that residual contaminant concentrations are protective of groundwater and the Columbia River. The confirmatory sampling test pits were excavated to a maximum depth of 6 m (20 ft) with samples collected at various intervals including the base of the test pit. The results of confirmatory sampling indicate that concentrations of residual contamination in the soils do not exceed direct exposure cleanup levels. Therefore, institutional controls to prevent uncontrolled drilling or excavation into the deep zone (i.e., soils greater than 4.6 m [15 ft]) are not required. The 116-DR-3 site has been reclassified as “Interim No Action.”

4.2.23 116-DR-4, 105-DR Pluto Crib

4.2.23.1 Site Description

The 116-DR-4 Pluto Crib was a liquid waste site located approximately 61 m (200 ft) southeast of the 105-DR Reactor. The 116-DR-4 Pluto Crib was also known as the 105-DR Pluto Crib. The site received liquid wastes from isolated reactor tubes containing ruptured fuel elements in the 105-DR FSB. The site may have also received excess “ink” (liquid boron solution) used in the 3X safety system. The crib was reported to be a gravel-filled, wooden structure approximately 3 m (10 ft) long, 3 m (10 ft) wide, and 3 m (10 ft) deep. The bottom of the crib was reported to be approximately 6 m (20 ft) belowgrade. The site

was sampled in 1976 and the samples appeared to have no gravel. A GPR survey conducted in 1993 identified a large concentration of anomalous materia1 near the monument that marks the crib location.

During the actual excavation, the crib configuration was found to be a vertical, 8 in. perforated feed pipe that emptied to a gravel-filled excavation. No wooden structure was present. The feed pipe and portions of the gravel were removed and the excavation sampled. A contamination plume was identified that required additional excavation to 4.6 m (15 ft) bgs, which is the final excavation depth.

4.2.23.2 Excavation Operations

Remedial action at the 116-DR-4 site began on November 5, 1999. Excavation of the site involved removing the overburden materials, the contaminated structure, and underlying contaminated soil. Based on field screening, overburden materials identified as potentially clean were placed in stockpiles for potential use as backfill. Materials that were found to be contaminated were disposed at ERDF. On November 8, 1999, the excavation reached the design depth. A plume of contamination was detected and excavated, resulting in an excavation 0.7 m (2.3 ft) deeper than originally planned. The final excavation was completed on January 3, 2000. At the completion of remedial action, the excavation was approximately 237.9 m^2 (2,560 ft^2) in area with a maximum depth of approximately 4.6 m (15 ft). Approximately 523 metric tons (575 tons) of material from the site was disposed at ERDF.

4.2.23.3 Verification Sampling

Verification samples were collected on January 17, 2000, following variance sampling. The 116-DR-4 site consisted of only a shallow zone decision unit. Four composite samples were collected. The site was excavated to a depth of 4.6 m (15 ft), and the shallow zone sample design covered the excavation sidewalls and the floor of the excavation. Each verification sample is a composite formed by combining samples collected at a minimum of four randomly selected nodes within each sampling area.

4.2.23.4 Statement of Protectiveness

Results of verification sampling indicate that RAOs and corresponding RAGs have been achieved. Materials from the 116-DR-4 site that contain COCs at concentrations exceeding the RAGs have been excavated and disposed at ERDF. The remaining residual concentrations in the shallow zone will support future land uses that can be represented (or bounded) by a rural-residential scenario, and pose no threat to groundwater or the Columbia River. The acceptability of unrestricted direct exposure to deep zone soils has not been demonstrated; therefore, institutional controls to prevent uncontrolled drilling or excavation into the deep zone (i.e., below 4.6 m [15 ft]) are required. The 116-DR-4 site has been reclassified as "Interim Closed Out."

4.2.24 116-DR-6, 1608DR Liquid Disposal Trench, Wash Pad Liquid Waste Site 3C

4.2.24.1 Site Description

The 116-DR-6 Liquid Disposal Trench was a liquid waste site located approximately 37 m (120 ft) east of the 100DR Reactor. The 15 m (50 ft) by 3 m (10 ft) by 3 m (10 ft) deep 116-DR-6 Trench received DR Reactor cooling water effluent during upgrade of the reactor emergency shutdown system. During reactor shutdown, the trench also received water during maintenance of the cooling water effluent system. In addition, decontamination effluents from the DR fuel storage decontamination pad were routed into the trench. The trench received an estimated 7 million L (26.5 million gal) of liquid during its use between 1953 and 1965.

The 116-DR-6 Trench has also been described as a crib (subsurface trench) that would sometimes receive effluent volumes great enough to cause seepage to the surface with drainage across the ground surface to the east. Aerial photographs from the period of trench operation (1953-1965) do not indicate the presence

of an open trench in the 116-DR-6 site area. Upon closure in 1965, the area of the 116-DR-6 Trench was covered with about 1.8 m (6 ft) of soil.

4.2.24.2 Excavation Operations

Remedial action at the 116-DR-6 site began on November 2, 1999. Excavation of the site involved removing the overburden materials, the contaminated structure, and underlying contaminated soil. Based on field screening, overburden materials identified as potentially clean were placed in stockpiles for potential use as backfill. Materials that were found to be contaminated were disposed at ERDF. The excavation design floor elevation was reached, but because field screening at that depth indicated the presence of radionuclides above the RAGs, an additional meter of soil was removed from the bottom of the excavation.

At the completion of the remedial action, the excavation was approximately 485 m^2 (5,218 ft^2) in area with a maximum depth of approximately 4.8 m (16 ft). Approximately 2,140 metric tons (2,354 tons) of material from the site was disposed at ERDF.

4.2.24.3 Verification Sampling

Final cleanup verification samples were collected following variance sampling. Cleanup verification sampling began on February 2, 2000, and was finished on February 3, 2000. The 116-DR-6 site consisted of shallow and deep zone decision units. The site was excavated to a depth of 4.8 m (16 ft), with the shallow zone consisting of the excavation sidewalls to a depth of 4.6 m (15 ft) and the deep zone consisting of the excavation sidewall below 4.6 m (15 ft) together with the floor of the excavation. The shallow zone decision unit contained one decision subunit, which was divided into four sampling areas. The deep zone decision unit also contained one decision subunit, which was divided into three sampling areas. Four samples were collected from the shallow zone decision unit and three were collected from the deep zone decision unit.

4.2.24.4 Statement of Protectiveness

Materials from the 116-DR-6 site that contain COCs at concentrations exceeding the RAGs have been excavated and disposed at ERDF. The remaining soils have been sampled, analyzed, and modeled to show that residual concentrations in the shallow zone will support future land uses that can be represented (or bounded) by a rural-residential scenario and that residual concentrations throughout the site pose no threat to groundwater or the Columbia River. The acceptability of unrestricted direct exposure to deep zone soils has not been demonstrated; therefore, institutional controls to prevent uncontrolled drilling or excavation into the deep zone (i.e., below 4.6 m [15 ft]) are required. The 116-DR-6 site has been reclassified as “Interim Closed Out.”

4.2.25 116-DR-7, 105-DR Inkwell Crib, 105-DR DR Ink Facility Tank

4.2.25.1 Site Description

The 116-DR-7 Inkwell Crib was an inactive waste site that operated in 1953. It was used to receive the liquid potassium borate solution (called “ink” because it resembles printer’s ink in color and viscosity) that was drained from the 3X system prior to the Ball 3X system upgrade.

The 1.5 by 1.5 by 3 m (5 by 5 by 10 ft) deep crib has also been described as a tank of unknown size that is buried under about 1.8 m (6 ft) of soil. The site was marked by a single concrete marker and was adjacent to a concrete pad that once supported a storage building.

4.2.25.2 Excavation Operations

Remedial action at the 116-DR-7 Inkwell Crib site began on December 7, 1999. Excavation of the site involved removing the overburden materials, the contaminated structure, and underlying contaminated soil. Based on field screening, overburden materials identified as potentially clean were placed in stockpiles for potential use as backfill. Materials that were found to be contaminated were disposed at ERDF. On December 8, 1999, the excavation was completed.

At the completion of remedial action, the excavation was approximately 250.6 m^2 (2,697 ft^2) in area with a maximum depth of approximately 4.8 m (16 ft). Approximately 59 metric tons (65 tons) of material from the site were disposed at ERDF.

4.2.25.3 Verification Sampling

Final cleanup verification samples were collected following variance sampling. Cleanup verification sampling began and finished on January 21, 2000. For the 116-DR-7 site, a single sample design was developed. Sample designs were not prepared for the deep and shallow zones separately; soils were conservatively represented by data collected for the single decision unit. Four samples were collected from the decision unit.

4.2.25.4 Statement of Protectiveness

Materials from the 116-DR-7 site that contain COCs at concentrations exceeding the RAGs have been excavated and disposed at ERDF. The remaining soils have been sampled, analyzed, and modeled to show that residual concentrations in the shallow zone will support future land uses that can be represented (or bounded) by a rural-residential scenario and that residual concentrations throughout the site pose no threat to groundwater or the Columbia River. The acceptability of unrestricted direct exposure to deep zone soils has not been demonstrated; therefore, institutional controls to prevent uncontrolled drilling or excavation into the deep zone (i.e., below 4.6 m [15 ft]) are required.

In 2005, the statement of protectiveness for 116-DR-7 was revised by DOE letter 05-AMRC-0078. Based on this letter, institutional controls have been removed from this waste site. The 116-DR-7 site has been reclassified as “Interim Closed Out.”

4.2.26 116-DR-8, 117-DR Crib, 117-DR Seal Pit Crib (CERCLA)

4.2.26.1 Site Description

The 116-DR-8 waste site consists of a seal pit crib located 100 m (328 ft) southeast of the 105-DR Reactor. From 1960 to 1964, the crib received radioactive process effluent from the 117DR HEPA Filter Building seal pits, and was later used for disposal of noncorrosive wash water from the 105-DR LSFF.

The square bottom of the crib was 3 by 3 m (10 by 10 ft) and was 3.3 to 4.6 m (11 to 15 ft) bgs. The crib was filled with gravel and covered with approximately 1 m (3 ft) of clean soil. The crib had a large steel vent pipe that extended above the ground surface, near the center of the crib. In July 2000, the vent risers were sealed to eliminate potential passive radioactive emissions. A 4 in. asbestos cement distribution pipe ran to this site from the 117DR HEPA Filter Building, which was demolished in 2004.

4.2.26.2 Confirmatory Sampling

Geophysical survey results, process knowledge, drawings, and site visit information were used to develop a confirmatory sampling design for the 116-DR-8 waste site. The project team performed a site visit in February 2005. The team could confirm the location of the site by locating the crib’s vent pipe.

Confirmatory sampling was conducted at the 116-DR-8 Seal Pit Crib from July 7 to 11, 2005. Confirmatory samples were collected from the drain line, from distribution piping at the crib, from soil underlying the drain line, and from soil at the base of the crib. A focused sampling design was used to collect samples from locations anticipated to exhibit the highest concentrations of contamination. A total of four samples were collected.

4.2.26.3 Excavation Operations

Remedial action at the 116-DR-8 waste site was performed from June 18 through July 24, 2008. Approximately 3,056 BCM (3,997 BCY) of soil overlying the crib was removed and stockpiled as overburden for potential use as clean backfill. The depth of overburden was determined using confirmatory sampling information and construction history for the crib. The site was then further excavated to a depth of approximately 6.8 m (22 ft) belowgrade resulting in approximately 1,991 BCM (2,604 BCY) of material that was directly loaded out and disposed at ERDF.

Portions of the 100-D-50:8 and 100-D-50:10 pipelines (Sections 4.1.50 and 4.1.52, respectively) were encountered during remediation. The portion of the 100-D-50:8 pipeline that was encountered within the 116-DR-8 waste site was removed and disposed at ERDF. On July 7, 2008, the 100-D-50:10 pipeline was breached and approximately 57 L (15 gal) of water was released to the ground. The pipeline was capped to prevent additional water from being released. Although the pipeline was identified as a fire protection/service water line that was used to support construction camps, a decision was made to load out affected soils. Other pipelines encountered during remediation of the 116-DR-8 waste site included two pipelines that are part of the 100-D-84 Sanitary Sewer Pipelines (Section 4.1.83 and 4.1.84). A north-south-trending pipeline was also located within the northwest portion of the excavation and identified as part of the 100-D-63, 100-D/DR Service Water Pipelines (Section 4.1.59). During remediation, these pipelines were breached within the excavation and found to be empty; they were directly loaded into a roll-off container and disposed at ERDF. None of the pipelines affected remedial activities at the 116-DR-8 waste site.

4.2.26.4 Verification Sampling

Verification sampling for the 116-DR-8 waste site was conducted May 19 through 26, 2009. The post-excavation global positioning survey was used to determine the boundaries of the excavation area requiring soil verification sampling. Twelve statistical soil samples were collected from each of the three decision units on a random-start, triangular grid.

All COPCs for all sampling areas were quantified below their respective soil RAGs or lookup values except for beryllium, lithium, silver, zinc, benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, and chrysene. These COPCs were quantified above soil RAGs for groundwater and/or river protection in one or more of the sampling areas. RESRAD modeling predicted that residual concentrations of these constituents will be protective of groundwater and the Columbia River.

4.2.26.5 Statement of Protectiveness

These results show that residual soil concentrations support future land uses that can be represented (or bounded) by a rural-residential scenario. The results also demonstrate that residual contaminant concentrations support unrestricted future use of shallow zone soil (i.e., surface to 4.6 m [15 ft]) and that contaminant levels remaining in the soil are protective of groundwater and the Columbia River. This site does not have a deep zone; therefore, no deep zone institutional controls are required. The 116-DR-8 site has been reclassified as “Interim Closed Out.”

4.2.27 118-D-1, 100D Burial Ground No. 1

4.2.27.1 Site Description

The 118-D-1, 100D Burial Ground No. 1 was constructed in 1944. Additional trenches were added later and used regularly until 1949, when construction of the 100DR Reactor made it necessary to begin a new burial ground. The burial ground was used occasionally until the 100D and 10DR reactors were shut down in 1967.

The 118-D-1 Burial Ground was located south of the 105-DR Reactor. The 118-D-1 waste site consists of the 118-D-1 Burial Ground excavation and adjacent remedial support areas including a sorting cell and an overburden soil stockpile to the west of the burial grounds. The 118-D-1 waste site was a solid waste disposal facility used for the disposal of irradiated reactor hardware, including thimbles, dummies, control rods, gun barrels, and other contaminated solid waste. Other waste items included soft waste, desiccant, miscellaneous waste, and thermocouple waste. A geophysical survey was conducted at the 118-D-1 Burial Ground waste site in June 2004. Numerous anomalous areas within the 118-D-1 waste site were identified as potentially containing individual trenches, pits, or groups of pits. Areas of moderate-to-high concentrations of buried debris were identified. The thickness of fill overlying anomalies suspected to be buried waste was interpreted to range from 0.6 to 1 m (2 to 3 ft) to over 3 m (10 ft). There were numerous linear geophysical anomalies ranging from 9.1 to 57.9 m (30 to 190 ft) long. Most had the characteristics of pipes or cables.

4.2.27.2 Excavation Operations

Remedial action at the 118-D-1 Burial Ground began on November 20, 2008, and continued through May 5, 2011. Approximately 42,730 BCM (55,890 BCY) of material was removed for disposal at ERDF. Approximately 5,595 BCM (7,318 BCY) of overburden and layback was stockpiled for use as clean backfill. A trench was constructed to the west of the site for sorting, sampling, and storage pending shipment to ERDF. During excavation, the main solid waste staged in the sorting cell was potentially contaminated soil and metal debris. Two stained soil anomalies were identified during the remedial activities at the 118-D-1 Burial Ground: black stained soil and oil-stained soil from a breached drum. Both anomalies were sampled for waste designation. The stained soil associated with both anomalies and the drum were removed and shipped to ERDF for disposal. One drum filled with soil was uncovered in the west excavation, and moved to the 118-D-3:2 (Section 4.2.30) characterization area for processing.

4.2.27.3 Verification Sampling

Verification sampling for the 118-D-1 Burial Ground was performed between May 5 and 13, 2010. The 118-D-1 waste site was originally divided into four decision units, specifically, the shallow zone excavation, deep zone excavation, sorting cells, and the overburden soil stockpile. Two methods were used for selecting the sampling locations: statistical sampling design and focused sampling locations. After conducting the initial verification sampling, it was determined that additional remediation was necessary on the west end of the burial ground; therefore, the west excavation decision unit was added. The west excavation overlapped a small portion of the shallow zone decision unit. Twelve samples duplicate were taken from each of the five decision units.

Five discrete focused soil samples were collected at the 118-D-1 waste site. One focused sample was collected from the location where oil-stained soil was found. One focused sample was collected from the location where a drum spill was observed. One focused sample was collected from the location where miscellaneous solid waste had been staged within the excavation. The fourth focused sample was collected from the location where white semisolid material was found. The fifth focused sample was collected from the location where a drum was removed.

All COPCs were undetected and/or quantified below RAGs and lookup values except for technetium-99 in the shallow zone excavation, uranium-233/234 and uranium-238 in the focused samples, and benzo(b)fluoranthene in the overburden decision unit. For the radionuclides that were quantified above shallow zone lookup values, site-specific RESRAD modeling dose rate predictions are determined to be less than the 15 mrem/yr dose limit. RESRAD modeling predicted that residual concentrations of benzo(b)fluoranthene will be protective of groundwater and the Columbia River.

4.2.27.4 Statement of Protectiveness

The 118-D-1 waste site has achieved the RAOs and corresponding RAGs. Materials from the 118-D-1 waste site containing COPCs at concentrations exceeding RAOs have been excavated and disposed at ERDF. Residual concentrations will support future land uses that can be represented (or bounded) by a rural-residential scenario and that residual concentrations throughout the site pose no threat to groundwater or the Columbia River. The 118-D-1 excavation area has a maximum depth of approximately 6.5 m (21 ft), which includes both shallow zone and deep zone soils. The entire excavation area is being closed out using the more restrictive shallow zone cleanup criteria; therefore, institutional controls to prevent uncontrolled drilling or excavation into the deep zone are not required. The 118-D-1 site has been reclassified as “Interim Closed Out.”

4.2.28 118-D-2:1, 100D Burial Ground No. 2 Trenches and Disposal Pits

4.2.28.1 Site Description

The 118-D-2, 100D Burial Ground No. 2 was located about 907 m (2,976 ft) southwest of the 105-DR Reactor. The 118-D-2 Burial Ground waste site has been administratively divided into the 118-D-2:1 and 118-D-2:2 (Section 4.2.29) subsites. The 118-D-2:1 subsite specifically addresses the burial ground trenches, pits, and the overburden soil stockpiles.

The 118-D-2 Burial Ground operated from 1949 to 1970 and was the primary burial ground for the disposal of 105D Reactor operations waste, including aluminum tubes and spacers; metallic wastes of aluminum, cadmium, and lead; irradiated dummies; splines; VSRs; thimbles; and gun barrels. The burial ground was extended in April 1966 to provide space for the burial of contaminated solid wastes from the 100N Area. The burial ground consisted of several trenches running east to west and five pairs of disposal pits. The trenches were said to be 20 m (66 ft) wide at the surface, 6.1 m (20 ft) wide at the bottom, and 6.1 m (20 ft) deep, and were used for the disposal of 105D Reactor operations waste. The disposal pits were constructed by stacking railroad ties, creating two spaces with interior dimensions of approximately 1.8 by 1.8 m (6 by 6 ft) that shared a common wall. The structures were built within an excavation reportedly 7.3 m (24 ft) wide by 7.3 m (24 ft) deep.

4.2.28.2 Excavation Operations

Remediation of the 118-D-2:1 Burial Ground began in February 2009 and continued through May 2011. Approximately 14,524 BCM (18,997 BCY) of overburden soil was removed and stockpiled west of the burial ground for use as clean backfill. Approximately 45,752 BCM (59,842 BCY) of contaminated soil and debris were removed for disposal at ERDF. All excavated materials were sorted within the burial ground and direct loaded for disposal to ERDF.

The initial verification sampling conducted in September 2011 indicated contamination remained in the excavation. Additional material was removed in February 2012, resulting in an additional 1,700 BCM (2,223 BCY) of material disposed at ERDF.

Field observations during the excavation and sorting of material identified miscellaneous metal debris, piping, lead pigs, and perforated tubes among the types of debris removed from the burial ground

excavation. Twelve pieces of suspect spent nuclear fuel (SSNF) were discovered at the 118-D-2:1 Burial Ground subsite. The SSNF was then transferred to the 118-D-3:2 subsite for characterization. Of the 12 pieces of SSNF, 10 were characterized as SNF and two were characterized as reactor debris. All waste material has been disposed. Several anomalous items capable of containing liquids or solids were encountered during excavation of the 118-D-2:1 subsite. These items were inspected within the burial ground footprint and were either determined to be empty and loaded out for disposal at ERDF, or the contents were unknown; therefore, the items were moved to the 118-D-2:2 or 118-D-3:2 (Section 4.2.31) anomaly characterization area.

4.2.28.3 Verification Sampling

Verification sampling was conducted at the 118-D-2:1 Burial Ground subsite on September 8 and 12, 2011. Four decision units were identified for the 118-D-2:1 Burial Ground subsite; specifically, three located within the burial ground and one overburden soil stockpile. Twelve samples were collected from each decision unit. Five focused soil samples were collected at locations where anomalous material was observed within the burial ground.

Replacement sampling was conducted at one sample location on February 14, 2012, following additional remediation after initial verification samples indicated that residual total petroleum hydrocarbons (TPH) contamination exceeded direct exposure cleanup criteria. Replacement samples were also collected at two sample locations following additional remediation because tritium exceeded the groundwater RAG at one and cesium-137 was detected close to the direct exposure RAG at the other.

Verification sampling at the 118-D-2:1 subsite indicates that all COPCs were undetected and/or quantified below RAGs and lookup values except for selenium, Aroclor-1254, and total PCBs, which were detected above the soil RAGs for groundwater and/or river protection. RESRAD modeling predicted that residual concentrations of these constituents will be protective of groundwater and the Columbia River.

4.2.28.4 Statement of Protectiveness

The results of verification sampling and RESRAD modeling show that residual contaminant concentrations do not preclude any future uses (as bounded by the rural-residential scenario) and allow for unrestricted use of shallow zone soils (i.e., surface to 4.6 m [15 ft] deep); the excavation extended to an approximate maximum depth of 7.5 m (24.6 ft) until all debris had been removed and verification sampling indicated that contamination did not exceed soil cleanup levels. Although excavation extended into the deep zone (below 4.6 m [15 ft]), the entire site is closed out using the more restrictive shallow zone direct exposure, groundwater, and river protection criteria. Therefore, institutional controls to prevent uncontrolled drilling or excavation into the deep zone are not required. The 118-D-2:1 site has been reclassified as “Interim Closed Out.”

4.2.29 118-D-2:2, Anomaly Characterization Area

4.2.29.1 Site Description

The 118-D-2:2 subsite is located approximately 379 m (1,243 ft) west-southwest of the 183D Head House and 844 m (2,770 ft) west-southwest of the 105-DR Reactor. The site lies directly to the north of the 118-D-2:1, 100D Burial Ground No. 2, excavation (Section 4.2.28). The 118-D-2:2 subsite was used to characterize and store the SSNF and anomalous materials found within the 100D Burial Ground No. 2, which was the primary burial ground for the disposal of 105D Reactor operations waste.

The 118-D-2:2 subsite was created to support the remediation of the 118-D-2 Burial Ground. Within the 118-D-2 Burial Ground various containers designed to transport radioactive materials were found.

These containers are known as "pigs." SSNF was also found within the burial ground. The SSNF and pigs required special processing prior to disposal and were staged in the 118-D-2:2 support areas. The 118-D-2:2 subsite comprised six different support areas used to decontaminate equipment and to stage/process SSNF and pigs.

The six distinct support areas are as follows. The Bunker was used to store SSNF removed from the 118-D-2 Burial Ground. The radioactive materials area (RMA) was used to stage pigs and anomalous items removed from the 118-D-2 Burial Ground. The carport was used to stage clean equipment. The radiological area was an area used to examine and process pigs. The control area was the safety buffer around the radiological area. The decontamination pad was an equipment decontamination area.

4.2.29.2 Excavation Operations

A 0.3 m (1 ft) scrape and removal at the 118-D-2:2 subsite was performed on June 13, 2011, at the radiological area, the bunker, the RMA, and portions of the control area. A 0.9 m (3 ft) scrape was performed that same day at the decontamination pad. Prior to operations, the carport area was covered in plastic and a layer of clean gravel during operations. This was removed after operations.

The verification sampling results indicated that a small area in the RMA required additional remediation. On April 18, 2012, an additional 0.45 m (1.5 ft) of material was scraped and removed on the southern edge of the RMA. The material removed was disposed at ERDF. A total of approximately 415 BCM (543 BCY) of material was disposed at ERDF from the 118-D-2:2 subsite.

None of the pigs or other anomalous materials were found to contain hazardous materials and were disposed at ERDF. The SSNF was transferred to the 118-D-3:2 subsite (Section 4.2.31) for characterization and was ultimately disposed at the 100K Basins. The 118-D-3:2 subsite lies approximately 0.7 miles due east of the 118-D-2:2.

4.2.29.3 Verification Sampling

Verification sampling was conducted on January 31, 2012 at the 118-D-2:2 subsite, which was divided into two sampling areas. Area A comprises the radiological area, the control area, and the decontamination pad. These areas were considered the most likely to have become contaminated. Area B comprises the bunker, the RMA, and the carport. A total of 12 verification soil samples were collected from each of the sampling areas and used in the statistical data set.

Verification sampling at the 118-D-2:2 subsite indicates that all COPCs were undetected and/or quantified below RAGs and lookup values except for lead, mercury, Aroclor-1260, benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, and benzo(k)fluoranthene, which were detected above the soil lookup values for groundwater and/or river protection. RESRAD modeling predicted that residual concentrations of these constituents will be protective of groundwater and the Columbia River.

4.2.29.4 Statement of Protectiveness

The results of verification sampling indicate that residual contamination does not exceed direct exposure cleanup levels. Residual contaminant concentrations do not preclude any future uses (as bounded by the rural-residential scenario) and allow for unrestricted use of shallow zone soils (i.e., surface to 4.6 m [15 ft] deep). The excavation did not extend into the deep zone (below 4.6 m [15 ft]), and the entire site is closed out using the shallow zone direct exposure, groundwater, and river protection criteria. Institutional controls to prevent uncontrolled drilling or excavation into the deep zone are not required. The 118-D-2:2 site has been reclassified as "Interim Closed Out."

4.2.30 118-D-3:1, 100D Burial Ground No. 3 and Process Cells

4.2.30.1 Site Description

The 118-D-3 Burial Ground waste site has been administratively divided into the 118-D-3:1 and 118-D-3:2 (Section 4.2.31) subsites to allow for the closeout of the anomaly characterization area (118-D-3:2) separate from the remainder of the site.

The 118-D-3:1 waste site consists of the burial ground excavation which measures approximately 18,088 m^2 (194,703 ft^2) and is located east of the 105-DR Reactor, and the adjacent remedial support areas, including the process (sorting) cells and the overburden soil stockpile located south of the burial ground. The 118-D-3:1, 100D Burial Ground No. 3 subsite operated from 1956 to 1973 as a solid waste disposal facility. The burial ground was the primary disposal site for 105-DR Reactor operations waste, which included irradiated dummies, splines, control rods, thimbles, gun barrels, and SNF elements.

4.2.30.2 Excavation Operations

Remedial action at the 118-D-3:1 Burial Ground began in July 2007, and continued through May 2009. Approximately 9,120 BCM (11,929 BCY) of overburden and layback soil were removed from the burial ground and stockpiled for use as clean backfill. Approximately 86,165 BCM (112,700 BCY) of contaminated soil and debris were removed for disposal at ERDF. Two sorting cells were established south of the burial ground and were used to process the soil from the burial ground prior to being loaded out for disposal at ERDF. Field observations during the excavation and sorting of material identified miscellaneous reactor hardware, including dummies, splines, rods, and piping.

The initial verification sampling conducted between May and June 2010 indicated contamination was still present in the excavation, the sorting cells, and the overburden soil stockpile. Additional material was removed in January 2011 from the locations exceeding direct exposure RAGs, and those areas were resampled in January 2011.

The resample results indicated that contamination was still present at some locations within the burial ground excavation. While performing additional remediation to remove the contaminated soil, reactor debris was observed within the excavation. Therefore, it was decided to aggressively pursue further remediation at the burial ground site. Remedial actions resumed within the burial ground in March 2011 and continued through June 2011. The additional remediation resulted in approximately 19,000 BCM (24,851 BCY) of contaminated soil and debris removed from the burial ground for disposal at ERDF.

Three potentially stained soil locations were identified during the remedial activities at the 118-D-3:1 Burial Ground, including two suspect oil-stained locations and one orange-stained soil location. The first location was determined to be the result of oil spilled from an oil pan on a motor. The anomalous material was sampled for waste designation purposes, and the material was loaded out for disposal at ERDF. The second potentially stained soil location was originally thought to be an oil stain; however, after further observations, it was determined not to be from oil. The suspect soil, located near the eastern end of the burial ground excavation, was loaded out for disposal at ERDF and no soil sample was collected. The third stained soil area was in the southwest corner of the burial ground. The stained area was remediated and disposed at ERDF, resulting in a pit approximately 6 m (20 ft) deep. In-process soil samples were collected during the remediation of the stained material.

Red, solid floor sweep material was discovered on the northern side of the eastern portion of the 118-D-3:1 Burial Ground. The material was sampled for waste designation purposes, and loaded out for disposal at ERDF.

Several anomalous materials such as drums, intact containers, lead pigs, and suspect SNF were also found in the burial ground excavation. The materials were investigated to determine if waste characterization sampling or treatment was necessary prior to shipment to ERDF. Forty-four pieces were identified as suspect SNF. Twenty-five were confirmed to be SNF and were packaged and shipped to the 100 Area KE Basin for disposal. Three were confirmed as nonfuel and were shipped to ERDF. The remaining suspect SNF and the other anomalies were transported to the anomaly characterization area (118-D-3:2) where they were examined and sampled as necessary for final disposal.

GPERS surveys were conducted to determine if elevated radiological activity was present. The initial surveys were conducted in the 118-D-3:1 excavation, sorting cells, and the overburden soil stockpile. Following the initial round of verification sampling, it was determined that additional remediation was necessary within the burial ground, and follow-up GPERS surveys were conducted.

4.2.30.3 Verification Sampling

Verification sampling for the 118-D-3:1 Burial Ground was performed between May 18 and June 3, 2010. Following the initial round of verification sampling, it was determined that contamination exceeding RAGs was still present within the excavation, the sorting cells, and the overburden soil stockpile. Additional remediation was conducted, and follow-up verification samples were collected on January 20 and 21, 2011. Contamination remained within the burial ground; therefore, additional remediation was conducted within the entire burial ground footprint. A new sample design was generated for all decision units within the burial ground only. Replacement verification samples were collected on November 11 and 13, 2011.

The 118-D-3:1 Burial Ground waste site was divided into seven decision units for verification sampling. The decision units include two shallow zone decision units, three deep zone decision units, the overburden soil stockpile and the sorting cells. The sorting cells consists of two east-west trenches used to sort and process soil and debris removed from the burial ground prior to shipment to ERDF. Twelve soil samples were collected from each of the seven decision units. Fifteen focused soil samples were collected at the 118-D-3:1 Burial Ground waste site. The first 14 locations represented the areas within the burial ground excavation where the initial GPERS surveys indicated that elevated radiological contamination (greater than or equal to 10,000 cpm gamma) remained. The last focused soil sample was individually compared directly to the RAGs rather than using it as part of a statistical data set.

Evaluation of the statistical and focused sample results from the verification sampling at the 118-D-3:1 Burial Ground indicates that all COPCs were undetected and/or quantified below RAGs and lookup values except for benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene, nickel-63, vanadium, and bis(2-ethylhexyl)phthalate, which were detected above the soil lookup values for groundwater and/or river protection. RESRAD modeling predicted that residual concentrations of these constituents will be protective of groundwater and the Columbia River.

Site-specific RESRAD modeling was performed for nickel-63 and other residual radionuclides for two focused sample locations to determine that residual concentrations are protective of human health. The total activity of the radionuclides in the focused samples exceeded the 15 mrem/yr dose limits. A site-specific RESRAD evaluation was performed to more accurately determine the actual dose predicted from each of the two areas of the focused samples. The maximum all-pathways dose rate for one location is 8.65 mrem/yr at year zero (2012), and the maximum all-pathways dose rate for the other location is 8.15 mrem/yr at year zero (2012), which are below the dose limitation of 15 mrem/yr.

4.2.30.4 Statement of Protectiveness

The results of verification sampling show that residual contaminant concentrations do not preclude any future uses (as bounded by the rural-residential scenario) and that residual concentrations throughout the site pose no threat to groundwater or the Columbia River. The 118-D-3:1 excavation area has a maximum depth of approximately 10 m (33 ft), which includes both shallow zone and deep zone soils. However, the entire site was closed out using the more restrictive shallow zone criteria. Institutional controls to prevent uncontrolled drilling or excavation into the deep zone (greater than 4.6 m [15 ft]) are not required. The 118-D-3:1 site has been reclassified as "Interim Closed Out."

4.2.31 118-D-3:2, Fuel and Anomaly Characterization Areas

4.2.31.1 Site Description

The 118-D-3 Burial Ground waste site has been administratively divided into the 118-D-3:1 (Section 4.2.30) and 118-D-3:2 subsites to allow for the closeout of the anomaly characterization area (118-D-3:2) separate from the remainder of the site.

The 118-D-3:2 subsite is located east of the 105-DR Reactor. The 118-D-3:2 fuel and anomaly characterization area consists of the anomaly staging area, characterization area, SSNF bunker area, sodium-potassium alloy (NaK) processing area, and the new bunker area.

The 118-D-3:2 subsite was used to characterize and store the SSNF and other anomalous materials found at 100-D including the items found in the 118-D-3:1 Burial Ground. The first waste was brought into the 118-D-3:2 subsite on 3/18/09 and the last of the waste was removed from the area on 2/2/11.

During the anomaly characterization phase, debris and other anomalous materials were transported from the anomaly staging area to the anomaly characterization area for sampling. These materials included irradiated dummies, splines, rods, and spent fuel rods. All anomalies were properly stored and containerized in boxes or on pallets, and there were no visible signs of stained soil.

During remediation of the 100-D/100-DR Area burial grounds, numerous pieces of SSNF were identified and segregated for special processing. Processing included careful inspection and comparison of each piece to reference material, sometimes including serial numbers and physical features. There were two SSNF-like pieces that were later identified to be test specimens for 110DR Reactor testing of uranium expansion and fuel rod failures. These test specimens contained uranium fuel pellets inside aluminum casings with NaK filling the annular space and an internal expansion chamber. Engineering documents indicated that each test specimen contains between 10 and 16 cm^3 of NaK, a pyrophoric material that will react with water/moisture to release energy and heat. Because the NaK and uranium were together, shipment and storage of the test specimens as SNF to the 105KW basins was not possible. Accordingly, it was determined that the NaK would need to be deactivated and then the uranium capsules could be sent to the Central Waste Complex (CWC) for storage. During the winter of 2011, a separate facility for NaK deactivation was constructed and operated at the 118-D-3:2 subsite.

To ensure complete deactivation, each test specimen was inserted into a lathe where the outer casings were cut and the uranium capsules removed, further exposing the NaK to an atomized water spray. The uranium capsules were then placed inside a shielded shipping container and sent to CWC for long-term storage. After the moisture from the NaK atomized water spray evaporated and dried, the casings, the deactivated NaK residue, and most of the building and equipment were size-reduced/demolished and shipped to ERDF for disposal.

4.2.31.2 Excavation Operations

Remedial action at the 118-D-3:2 subsite was performed on January 9, 2012, and February 6, 2012. The subsite was scraped in two stages to a total depth of 0.3 m (1 ft). The first 0.3 m (1 ft) scrape incorporated everything inside the area of contamination surrounding the 118-D-3:2 subsite except the new bunker area. This allowed in-process samples to be taken at the majority of the site. On February 6, 2012, the new bunker area was moved outside of the area of contamination to expedite the closure of the 118-D-3:2 subsite. This allowed a second and final scrape to be done on the same day, February 6, 2012, at the original new bunker area location. The material scraped was disposed at ERDF. Uranium capsules (from NaK test specimens) were shipped to CWC on March 1, 2012. No stained soil was observed.

4.2.31.3 Verification Sampling

Verification sampling for the 118-D-3:2 subsite was performed on February 7, 2012. The 118-D-3:2 subsite comprised one decision unit that included 12 statistical samples. A 0.3 m (1 ft) scrape was performed for remediation; therefore, the 118-D-3:2 subsite is considered entirely a shallow zone excavation. The excavation decision unit consisted of the anomaly staging area, SSNF bunker area, characterization area, NaK processing area, and the new bunker area.

A global positioning survey was used to determine the boundaries of the 118-D-3:2 subsite requiring statistical soil verification sampling.

Six focused soil samples were collected at the 118-D-3:2 subsite. The first three locations represented the areas within the NaK processing area where a majority of the contamination was expected to be. The final three focused samples where located directly underneath and at the center of each of the three SSNF bunkers. Remedial action at the 118-D-3:2 subsite achieved the RAOs and corresponding RAGs.

4.2.31.4 Statement of Protectiveness

The results of verification sampling show that residual contaminant concentrations do not preclude any future uses (as bounded by the rural-residential scenario) and that residual concentrations throughout the site pose no threat to groundwater or the Columbia River. The 118-D-3:2 excavation area has a maximum depth of 0.3 m (1 ft). Site contamination did not extend into the deep zone soils. Institutional controls to prevent uncontrolled drilling or excavation into the deep zone (greater than 4.6 m [15 ft]) are not required. The 118-D-3:2 site has been reclassified as “Interim Closed Out.”

4.2.32 118-D-4, 118-D4, Construction Burial Ground, Burial Ground 4F, 118-D-4F

4.2.32.1 Site Description

The 118-D-4 Burial Ground 4F was constructed in 1956 to receive construction waste, primarily reactor components and hardware associated with Project CG-558. The CG-558 project made modifications to the older Hanford Site reactors that permitted considerable power level increases. The 118-D-4 Burial Ground was located southeast of the 105D Reactor, between two railroad spurs. A geophysical survey was conducted at the 118-D-4 Burial Ground site in June 2004. The survey identified three trenches each with notable excavation boundaries.

4.2.32.2 Excavation Operations

Remedial action at the 118-D-4 Burial Ground began on October 10, 2007, with the removal of 5,500 BCM (7,200 BCY) of overburden material. The overburden was stockpiled southeast of the burial ground. Excavation continued through March 20, 2008, to a maximum depth of approximately 6.5 m (21 ft), resulting in approximately 7,067 BCM (9,243 BCY) of waste material removed for disposal at ERDF. Although the excavation extended into the deep zone, the entire excavation area is treated as shallow zone for verification sampling.

Waste encountered during excavation of the 118-D-4 Burial Ground was consistent with the types of material anticipated based on its reported use for disposal of construction waste (primarily contaminated reactor components) and hardware associated with Project CG-558. Field observations during excavation indicated the presence of piping, lead, concrete, steel, reactor hardware, valves, a metal solvent container, and leaded glass.

A 19 L (5 gal) metal solvent container with an unknown amount of liquid was removed from the excavation. In addition, red-stained soil was also observed on the floor of the center excavation. A waste characterization sample was collected of the red-stained soil and showed elevated levels of cadmium, total chromium, and nickel. The soil was excavated and disposed. Focused samples were collected at the location where the metal container and red-stained soil were observed.

4.2.32.3 Verification Sampling

Verification sampling for the 118-D-4 Burial Ground was performed between December 9, and December 11, 2008. The 118-D-4 waste site was divided into two decision units for verification sampling: specifically, the excavation footprint and the overburden soil stockpile. Two methods were used for selecting the sampling locations: statistical sampling design and focused sampling locations. A global positioning survey was used to determine the boundaries of the excavation area requiring soil verification sampling. Verification sampling of the overburden soil stockpile was performed to evaluate the suitability of the soil for use as clean backfill for the excavation. The overburden stockpile and the excavation footprint each had 12 statistical verification soil samples collected. Five discrete focused soil samples were collected at the 118-D-4 waste site. One focused sample was collected from the location where a 19 L (5 gal) solvent container with an unknown amount of liquid was found. One focused sample was collected from the location where red-stained soil was observed. Three focused samples were collected from locations where the GPERS results showed elevated radiological contamination.

Because the analytical hold time was exceeded at the analytical laboratory for mercury, pesticides, and semivolatile organic compounds (SVOCs) for all samples, replacement samples were collected. Cadmium exceeded the RAGs at one location; therefore, additional material was excavated at that location and a replacement sample for inductively coupled plasma (ICP) metals only was collected.

Evaluation of the statistical results from the verification sampling at the 118-D-4 Burial Ground indicates that all COPCs were undetected and/or quantified below RAGs and lookup values except for cadmium, total chromium, nickel, and vanadium. RESRAD modeling predicted that residual concentrations of these constituents will be protective of groundwater and the Columbia River. Results of the verification sampling, laboratory analyses, and data evaluations for the 118-D-4 site indicate that all RAOs and RAGs for direct exposure, protection of groundwater, and protection of the Columbia River have been met.

4.2.32.4 Statement of Protectiveness

The results of verification sampling show that residual contaminant concentrations do not preclude any future uses (as bounded by the rural-residential scenario) and allow for unrestricted use of shallow zone soil (i.e., surface to 4.6 m [15 ft] deep). The results also demonstrate that residual contaminant concentrations are protective of groundwater and the Columbia River. The entire excavation area is closed out using the more restrictive shallow zone cleanup criteria; therefore, institutional controls to prevent uncontrolled drilling or excavation into the deep zone are not required. The 118-D-4 site has been reclassified as “Interim Closed Out.”

4.2.33 118-D-5, 118-D5, Ball 3X Burial Ground, Burial Ground 4G, 118-D-4G, Minor Construction Burial Ground Number 3

4.2.33.1 Site Description

The 118-D-5 Burial Ground 4G was a solid waste site that operated during 1954. The burial ground reportedly received thimbles from the 105-DR Reactor during the Ball 3X Project in 1954, which replaced the original liquid boron safety system with a solid boron ball-type safety system. The site is located 30 m (100 ft) south of the 105-DR Reactor, outside of the exclusion area fence.

A geophysical survey was conducted west of the perimeter fence at the 118-D-5 site in December 1993 to determine the location of the burial ground. An earlier investigation conducted in November 1993 to locate the 116-DR-3 waste site (Section 4.2.22) included an area east of the perimeter fence adjacent to the 118-D-5 Burial Ground. The area east of the perimeter fence was also considered a potential location of the 118-D-5 Burial Ground; however, the results of the November 1993 investigation showed no direct evidence of a trench or concentrations of buried solid waste. The documentation from the 116-DR-3 and 118-D-5 geophysical investigations was believed to suggest that the 118-D-5 Burial Ground trench was located within the grid west of the perimeter fence. However, there was no direct evidence of either trench in the GPR data.

4.2.33.2 Excavation Operations

Remedial action at the 118-D-5 Burial Ground began on June 2, 2008, and continued through August 12, 2008. Approximately 1,943 BCM (2,541 BCY) of overburden material was stockpiled for use as clean fill. Approximately 314 BCM (411 BCY) of soil and debris were removed for disposal to ERDF.

The depth of the excavation ranged from 2 m (6.5 ft) in the easternmost portion of the excavation to 7 m (23 ft) in the westernmost portion of the excavation. Although defined trenches were not observed on the geophysical data, the debris removed indicates that the 118-D-5 Burial Ground was located and remediated. Concrete, piping, and split tubes (reactor process tubes that were split to allow removal from the reactor core) were among the type of debris removed from the burial ground excavation. No thimbles were identifiable in debris found during the remediation of the burial ground.

A concrete junction vault located in the southern portion of the burial ground was opened prior to the start of the burial ground excavation and found to contain a breached 6 in. VCP. The pipeline is part of the 100-D-50:9, 1607-DR-3 Sanitary Sewer (Section 4.1.51). The concrete junction vault and pipe located within the excavation were removed for disposal to ERDF. A section of the 100-D-50:10, Potable Water Supply Lines subsite (Section 4.1.52), running east-west crosses the north end of the burial ground. The section of pipe within the excavation was removed and disposed. Another 6 in. pipe, part of the 100-D-50:10 subsite, was found in the east sidewall of the easternmost excavation. The pipeline remains in place.

4.2.33.3 Verification Sampling

Verification sampling for the 118-D-5 Burial Ground was performed between April 28 and April 30, 2009. The 118-D-5 waste site was divided into two decision units for verification sampling; specifically, the excavation footprint and the overburden soil stockpile. Two methods for selecting the sampling locations were utilized: statistical sampling designs and focused sampling locations. The global positioning survey was used to determine the boundaries of the excavation area requiring soil verification sampling. Twelve soil samples were collected on a random-start, triangular grid. Twelve statistical verification soil samples were collected from the overburden stockpile. In addition to performing statistical sampling of the burial ground excavation and the overburden stockpiles, two focused soil samples were collected.

4.2.33.4 Statement of Protectiveness

The results of verification sampling show that residual contaminant concentrations do not preclude any future uses (as bounded by the rural-residential scenario) and allow for unrestricted use of shallow zone soils (i.e., surface to 4.6 m [15 ft] deep). The results also demonstrate that residual contaminant concentrations are protective of groundwater and the Columbia River. The 118-D-5 excavation area has a maximum depth of approximately 7 m (23 ft), which includes a shallow zone and a deep zone. However, the entire excavation area was closed out using the more restrictive shallow zone cleanup criteria; therefore, institutional controls to prevent uncontrolled drilling or excavation into the deep zone are not required. The 118-D-5 site has been reclassified as "Interim Closed Out."

4.2.34 118-DR-1, 105-DR Gas Loop Burial Ground

4.2.34.1 Site Description

The 118-DR-1, 105-DR Gas Loop Burial Ground was located south of the 105-DR Reactor. The 118-DR-1 Burial Ground was an inactive solid waste site that operated from 1963 to 1964. The site contained a single north-south gunite-lined trench, originally used to perform examinations and sectioning of irradiated test assemblies. It was later used for the disposal of irradiated metal assemblies from the 105-DR gas loop.

4.2.34.2 Excavation Operations

Remedial action at the 118-DR-1 Burial Ground began on June 3, 2008, and continued through July 23, 2008. Approximately 1,673 BCM (2,188 BCY) of soil and debris was removed for disposal at ERDF. Approximately 221 BCM (290 BCY) of clean soil was removed from outside of the burial ground excavation footprint and stockpiled west of the excavation. The soil was removed during construction of a ramp into the excavation, allowing the excavation equipment access to continue to remove soil and debris at a greater depth. The ramp soil stockpile is not considered overburden; therefore, it was not included in the closeout sample design. No overburden was removed from the 118-DR-1 Burial Ground.

One anomalous waste item was encountered in the 118-DR-1 Burial Ground. A breached 208 L (55 gal) drum suspected of containing an undetermined amount of liquid was removed from the sidewall of the excavation. The drum, along with the soil directly below the drum, was placed on a plastic sheet within the burial ground footprint for waste characterization sampling. However, the drum was found to be empty so the soil that was removed with the drum was sampled for waste characterization. No SNF was discovered at the 118-DR-1 Burial Ground.

4.2.34.3 Verification Sampling

The excavation footprint is the only decision unit identified for the 118-DR-1 waste site for verification sampling. Two methods for selecting the sampling locations were utilized: statistical sampling design and focused sampling. A global positioning survey was used to determine the boundaries of the excavation area requiring soil verification sampling. Twelve soil samples were collected on a random-start, triangular grid. In addition to performing statistical sampling of the burial ground excavation and the overburden stockpiles, two focused soil samples were collected.

4.2.34.4 Statement of Protectiveness

The results of verification sampling show that residual contaminant concentrations do not preclude any future uses (as bounded by the rural-residential scenario) and allow for unrestricted use of shallow zone soils. The results also demonstrate that residual contaminant concentrations are protective of groundwater and the Columbia River. The 118-DR-1 excavation area has a maximum depth of approximately 6 m (20 ft), which includes both shallow zone and deep zone soils. However, the entire excavation area was

closed out using the more restrictive shallow zone cleanup criteria; therefore, institutional controls to prevent uncontrolled drilling or excavation into the deep zone are not required. The 116-DR-8 site has been reclassified as "Interim Closed Out."

4.2.35 118-DR-2:2, 105-DR Reactor Below-Grade Structures and Soil

Due to geographic location and similarity of remediation activities, cleanup activities for the 100-D-49:4 and 118-DR-2:2 site were conducted together. The sites are collectively referred to as the 105-DR site. This section contains general information about the 105DR site, and information specific the 100-D-49:4 and 118-DR-6:2 sites.

4.2.35.1 Site Description

118-DR-2:2, 105-DR Reactor Below-Grade Structures and Underlying Soils, and 100-D-49:4, Reactor Cooling Water Effluent Underground Pipeline, are collectively referred to as the 105DR site.
The 105DR site is in the 100-D/100-DR Area and is located approximately 250 m (820 ft) south of the 105D Reactor. The 105-DR Reactor was a graphite-moderated, water-cooled reactor that was used to produce weapons-grade plutonium. Construction of the 105-DR Reactor began in 1947 with operations commencing in October 1950. The 105-DR Reactor was retired in December 1964.

The 105DR site was divided into seven zones. The 100-D-49:4 site was its own zone and the 118-DR-2:2 belowgrade structures was split into five zones plus a decontamination area. The 118-DR-2:2 belowgrade structures include the FSB (and underlying soils), storage areas, transfer bay, valve pit, solids feed area, north water tunnel, trench under accumulator room, gas recirculation tunnel, lower instrument room, exhaust plenum, south effluent pipe, and decontamination areas.

The primary source of contamination was reactor coolant water and water in the FSB that became contaminated through contact with spent fuel elements and components from the reactor cooling system. This water is believed to have contaminated the concrete surfaces of the FSB; however, there is no documentation of basin water leakage into the underlying soils.

4.2.35.2 Excavation Operations

Removal and disposal activities at the 105DR site began in September 1998 and concluded on September 19, 2001. Excavation of the site involved removing the overburden materials, building structure, debris, and underlying contaminated soil. The 105-DR Reactor D&D activities resulted in removal of abovegrade structures and belowgrade structures outside of the 105-DR Reactor core shield walls, to 1 m (3 ft) below surrounding grade, except for the FSB. The FSB structure was removed to 4.6 m (15 ft) below surrounding grade. Approximately 7,220 m^3 (25,500 ft^3) of contaminated materials was disposed at ERDF.

4.2.35.3 Verification Sampling

Final cleanup verification samples were collected following field screening and data evaluation.
100-D-49:4 north effluent pipeline soil verification samples were collected from the floor and side slopes of the north effluent pipe tunnel. Six samples were collected from the soil floor on July 6, 2000.
Ten samples were collected from the side slopes (i.e., shallow zone) of the north effluent pipe tunnel on July 12, 2000.

Site 118-DR-2:2 Zone 1 concrete and soil verification samples were collected in five locations at the FSB floor. Concrete samples were taken from July 17, 1999, to August 4, 1999. Soil samples were taken between September 20, 1999, and September 29, 1999.

Site 118-DR-2:2 Zone 2 concrete verification samples were originally collected from the valve pit floor in 16 locations on December 15 and December 16, 1999. Hexavalent chromium and PCBs were detected in the valve pit floor above the cleanup standard, and the floor was demolished and disposed at ERDF. Samples were then obtained from the soil underlying the valve pit and the valve pit walls between July 19, 2000 and July 28, 2000. Samples were also collected from the west wall near a 24 in. pipe, the northeast quadrant, and the south side of the valve pit on July 28, 2000.

Site 118-DR-2:2 Zone 3 concrete verification samples were collected from three areas in the shallow zone. Thirty-five samples were collected from the 228c solids feed area between December 17, 1999, and December 21, 1999. Five samples were collected from the trench under the accumulator room on April 20, 2000, and two samples were collected from the north water tunnel on September 27, 1999.

Site 118-DR-2:2 Zone 4 concrete verification samples were collected from four areas in the deep zone. Five samples were collected from the 103 Gas Recirculation Tunnel on May 23, 2000. Two samples were collected from the 104 Instrument Room and four samples were collected from the 316 Exhaust Plenum on May 23, 2000. Five samples were collected from the 105 Gas Tunnel on April 25, 2000.

Site 118-DR-2:2 Zone 5 soil verification samples were collected from three areas in the shallow zone. Eight samples were originally collected on the side slope soils on August 3, 2000. Two samples exceeded the cleanup standards for cesium-137 and strontium-90. This area was remediated, and two replacement samples were taken on September 27, 2000. The south effluent pipe (part of the 100-D-49:4 effluent pipeline subsite) was adjacent to the FSB, and the samples taken for the side slope soils were also used to characterize the south effluent pipe soils. The samples also represent room 412 adjacent to the east side of the FSB. In addition, five soil samples were collected from beneath the former 224a room on March 20, 2000, and were analyzed for mercury.

Three areas were used during D&D activities for decontamination of equipment. The decontamination areas were located northwest, northeast, and south of the 105-DR Reactor. The sample results from the three decontamination areas were combined into one unit for cleanup verification. Eight verification samples were taken in April 2001. Analytical results from the initial sampling effort indicated that contaminant levels in the south and northwest decontamination areas exceeded the RAGs. The south decontamination area was re-excavated and resampled in August 2001. The northwest decontamination area was re-excavated and resampled in September 2001.

Results of the sampling, laboratory analyses, and data evaluations for the 105DR site indicate that all RAOs and RAGs for direct exposure, protection of groundwater, and protection of the Columbia River have been met.

4.2.35.4 Statement of Protectiveness

The remaining soils and concrete at the 105DR site have been sampled, analyzed, and modeled. The results of this effort indicate that the materials from the 105DR site containing COCs at concentrations exceeding RAGs have been excavated and disposed at ERDF. These results also indicate that residual concentrations in the shallow zone will support future land uses that can be represented (or bounded) by a rural-residential scenario and that residual concentrations throughout the site pose no threat to groundwater or the Columbia River. The 118-DR-2:2 site has been reclassified as “Interim Closed Out.”

4.2.36 126-DR-1, 190-DR Clearwell Tank Pit

4.2.36.1 Site Description

The 126-DR-1 waste site was used for disposal of demolition debris, including nonfriable asbestos. The site is in the former 190-DR Clearwell Tank Pit, directly east of the demolished 183-DR Water Treatment Facility and west of the demolished 190DR Pumphouse. It is west-southwest of the 105-DR Reactor. The original clearwells consisted of four aboveground steel tanks, 53.6 m (176 ft) in diameter and 5.4 m (17.7 ft) high. The tanks were constructed outdoors in an area excavated more than 2.4 m (8 ft) belowgrade. The tank bottom, constructed of 1 cm (3/8 in.) plate, sat on 3.8 cm (1.5 in.) of sand fill above a 30 cm (12 in.) reinforced concrete slab. The perimeter of the slab was thickened and these portions were provided as concrete encasements for pipes penetrating the tank bottom. The tanks were constructed in 1950 and operated until 1964 when the 105-DR Reactor was deactivated. The tanks were most likely dismantled by a salvage operator between 1978 and 1979 when all salvageable material was removed from the 190-D Main Pump Room.

Shortly after the tanks were dismantled, the area was used for disposal of demolition debris. Demolition of the 183DR and 186D Facilities took place in 1978 and 1979, respectively, and related debris is believed to have been disposed in the clearwell pits.

The 115D/DR concrete superstructure was demolished with a wrecking ball between April and June 1986. The associated rubble and equipment, after the material was considered clean, was transported to the clearwell tank pit. The radioactive material, process equipment, and associated piping had been removed from the process cells and disposed in the Hanford 200 West Burial Grounds prior to demolition of the superstructure.

In February and March 1988, debris from the demolition of the 184-D Power House and stack foundations was disposed in the clearwell pit. A total 1,790 m^3 (2,340 yd^3) of clean fill was used to cover the rubble dumped into the clearwell pit between March 14 and 24, 1988. Small amounts of friable asbestos were reportedly scattered throughout the southern sector. The asbestos is believed to be pipe lagging remnants that resulted from salvage operations during the 1970s.

4.2.36.2 Excavation Operations

Field work to remediate the 126-DR-1 Waste Site commenced on April 5, 2007, by demarking the excavation boundary. The site was prepared by leveling the surface and constructing a soil berm around the open face of the waste pile. The soil berm was built to prevent the spread of contamination by rainwater and/or dust suppression water during excavation of the waste.

The excavated material was directly loaded into roll-off boxes. Remediation of the waste site concluded on July 24, 2008, after 23,790 metric tons (26,230 tons) were removed, transported, and disposed at ERDF. A radiation detector, on the arm of the backhoe, was used during excavation of this waste site and there was no evidence of radiation during the excavation.

The majority of waste was described as construction and demolition debris including concrete rubble, rebar, soil, and rocks. The debris also contained pipe insulation, suspected to contain asbestos; cans of dry paint; empty drums; welding material; laboratory glassware; steel beams; empty process tanks; electrical panels and fuses; actuators; empty cylinders; and structural steel, piping, valves, and duct work. A number of anomalous waste items were identified, characterized, and disposed during the project. All but one of these items were determined to be inert debris and required no additional treatment prior to disposal at ERDF. The single exception was the discovery of three drums filled with white granular material on June 21, 2007.

Some of the white material was visible in the excavation. When exposed to water, the material reacted by changing red in color. The first drum to be uncovered was sampled and analyzed. The results showed the material had a pH of 13. Aluminum, calcium, iron, magnesium, potassium, silicon, and sodium were abundant in the material. Chromium, hexavalent chromium, nickel, and selenium were also present, though at significantly lower concentrations. The source of the anomalous material remains uncertain. Based on its analytical composition and reactive nature, the material was suspected to be related to the 105-DR Sodium Fire Facility that operated between 1972 and 1986.

4.2.36.3 In-Process Sampling

Verification sampling was not conducted at the 126-DR-1 Waste Site because it is located entirely above areas planned for remediation. Underlying pipelines are planned for remediation as the 100-D-50:6 waste site (Section 4.1.48). Samples were collected from the 190DR Clearwell concrete pads and surrounding soils and analyzed for hexavalent chromium. The concrete samples were also analyzed by ICP metal analysis. The results show that the surface of the concrete for all four pads is contaminated with hexavalent chromium above direct exposure RAGs. One sample of the surrounding soils exceeded the direct exposure soil RAG for hexavalent chromium. These samples were not used to support reclassification of the 126-DR-1 waste site. Instead, the information was used to assess the current condition of the overlying 100-D-50:6 soils and concrete pads.

4.2.36.4 Statement of Protectiveness

The 126-DR-1 waste site consisted of debris disposed in the 190DR clearwell pit. All waste was removed to the lower boundary of the waste site; and underlying concrete and soil was removed as part of remediation of the 100-D-50:6 waste site (Section 4.1.48). No institutional controls are required for the 126-DR-1 waste site. The waste terminated above the concrete clearwell pads, and visual observation was effective in remediating the extent of the waste site. The 126-DR-1 site has been reclassified as “Interim Closed Out.”

4.2.37 128-D-1, 100D/DR Burning Pit

The exact location of this waste site is unknown, although evidence of burning and waste materials were found at the site. On September 29, 1951, contaminated materials were found in the burning pit. All contaminated materials were removed to the radioactive burial ground for proper disposal.

The site location is a largely undisturbed area of rabbitbrush and cheatgrass. Based on the description in the technical baseline report, a field walkdown, geophysical surveys, and aerial photos from 1956, 1960, and 1988, it has been determined that this site does not exist at the mapped location. It is a misidentified location of 128-D-2 (Section 4.1.124) or 628-3 (Section 4.1.137). The 128-D-1 site has been reclassified as “Interim No Action.”

4.2.38 132-DR-1, 132DR1, 1608DR Waste Water Pumping Station, 1608-DR Effluent Pumping Station

4.2.38.1 Site Description

The 132-DR-1, 1608-DR Effluent Pumping Station site, was constructed in 1950 and was located adjacent to the northeast corner of the 105DR Reactor within the 105-D and 105-DR Exclusion Area Fence. The facility functioned as a sump to collect radioactively contaminated liquid wastes from the 105DR Reactor. The liquid wastes were collected in the sumps for final disposal by pumping to the 107DR Retention Basin via a 16 in. diameter pipe. The 1608-DR Effluent Pumping Station consisted of an abovegrade structure consisting of concrete block walls, a reinforced concrete floor, and a roof constructed of reinforced concrete deck with composition surface, and a belowgrade structure of

reinforced concrete. The facility extended 3.7 m (12 ft) abovegrade and 9.8 m (32 ft) belowgrade and was 11 m (36 ft) in length and 10.4 m (34 ft) in width.

4.2.38.2 Excavation Operations

The 1608-DR Effluent Pumping Station was decommissioned and demolished in 1987. Initial decommissioning activities consisted of removing and disposing of all asbestos and equipment within the building and removing residual water and sludge from the sumps. Demolition activities began in July 1987 when excavation around the periphery of the north and east sides of the structure extended to a depth of 5 m (16.4 ft) belowgrade. Actual demolition of the structure was initiated in September 1987. The structure was demolished to 5 m (16.4 ft) belowgrade. Fill dirt was hauled to the site to allow grading to conform to the surrounding terrain.

Samples of sludge from the sumps were taken for analysis. The sludge was designated based on the equivalent concentration of various possible toxic compounds in the sludge. Equivalent concentrations were derived by making "worst-case" assumptions about the form of the various cations in the waste. The sludge did not designate as a hazardous waste. However, the concentrations of lead and phosphate were used to calculate a concentration of lead phosphate that resulted in designating the sludge as a state-only toxic dangerous waste (i.e., extremely hazardous waste) according to Washington State regulations. The sludge was also radioactive, giving it the classification of radioactive mixed waste.

4.2.38.3 Verification Sampling

Decommissioning activities continued with extensive radiological surveying and sampling of concrete surfaces and piping scale/rust to characterize residual radiological contamination for the 1608-DR Effluent Pumping Station. These survey results were then used to identify five strata corresponding to the different contamination levels found in the 1608-DR Effluent Pumping Station. Samples of concrete and pipe scale were collected from each of these five strata. A total of eight concrete samples were taken from the floor surfaces. A total of 24 concrete samples were taken from sump walls below water line. A total of 12 concrete samples were taken from sump ceilings and walls above water line. A total of nine concrete samples were taken from the equipment room floor. A total of eight rust scale samples were collected from the inside surfaces of the overflow/vent piping and the outside surfaces of the distribution gates.

In 2005, the waste site was conservatively modeled with all exposure pathways evaluated in RESRAD. The evaluation predicted that the dose limits will not be exceeded for either the rural-residential scenario or the groundwater pathway. RESRAD modeling showed that of the contaminants detected, only tritium is predicted to reach groundwater within 1,000 years. The maximum tritium concentration in groundwater is predicted to be less than the RAG.

No detailed analyses were performed for nonradionuclides at the 1608-DR Effluent Pumping Station. Analogous facilities at the 190-DR Process Water Pump House (100-D-68 [Section 4.2.14]) were sampled for a series of nonradionuclide COCs and were closed as "no action" sites with remaining concrete structures reduced to 1 m (3.3 ft) belowgrade. The 190DR and 1608DR facilities pumped liquids containing approximately the same concentrations of nonradionuclides, but liquids from 1608DR also contained radionuclides. All residual contaminant levels from sampling at worst-case locations at the 190DR facility were found to be below the RAGs for direct exposure and groundwater/river protection. By analogy, residual nonradionuclide contamination at 1608DR is also believed to meet the RAGs for direct exposure and groundwater/river protection.

4.2.38.4 Statement of Protectiveness

The 132-DR-1 site residual contaminant levels will be protective of direct exposure, groundwater, and the Columbia River. However, the acceptability of unrestricted direct exposure to belowgrade structure

surfaces in the deep zone has not been demonstrated; therefore, institutional controls to prevent uncontrolled drilling or excavation into the deep zone are required. Based on the 1987 sampling results and 2005 modeling, the 132-DR-1 site has been reclassified as "Interim Closed Out."

4.2.39 132-DR-2, 132-DR2, 116-DR Reactor Exhaust Stack

Due to the geographic proximity and similarity of remediation activities, the 100-D-23 (Section 4.2.5), 100-D-53 (Section 4.2.10), 100-D-54 (Section 4.2.11), 100-D-64 (Section 4.2.13), and 132-DR-2 sites were interim closed out as one site referred to as the 117DR facilities site. For additional information regarding the 132-DR-2 site, refer to the 100-D-53 site (Section 4.2.10).

The 132-DR-2 site has been reclassified as "Interim Closed Out."

4.2.40 1607-D1, 1607-D1 Septic Tank and Associated Drain Field, 124-D-1, 1607-D1 Sanitary Sewer System, 1607-D1 Septic Tank

4.2.40.1 Site Description

The 1607-D1, Septic Tank and Associated Drain Field waste site is located approximately 900 m (2,953 ft) southeast of the 100D/DR Reactor area and consisted of a septic tank, drain field, and outlet pipeline between the septic tank and drain field. The septic system received sanitary sewage from 100D/DR entrance facilities that housed fire and patrol personnel.

The septic system operated from 1944 to around 1965 when the 105-DR Reactor was shut down. The perimeter fence was relocated, and a new patrol building was built in 1966 to replace the original 100D/DR entrance. The 105D Reactor was shut down shortly thereafter, in 1967. The septic tank was designed to be 15 cm (6 in.) above surrounding grade. However, the wooden covers for the three manholes failed at some point, resulting in the tank becoming covered and filled with sandy soil typical of this locale.

The 1607-D1 septic tank is a reinforced concrete tank with a 125-person capacity. The tank dimensions were 5.8 m (19 ft) long, 2.1 m (7 ft) wide, and 3.4 m (11 ft) tall, with three manholes located on top of the tank. The 1607-D1 tile field was constructed of 4 in. vitrified pipe, concrete pipe, or drain tile. The tile field was about 110 m (360 ft) north of the septic tank.

A geophysical investigation of the 1607-D1 waste site and its immediate area was conducted in October 2005 to evaluate the structure prior to confirmatory sampling activities. GPR surveys were conducted within a 30 m (98 ft) square area established around the septic tank. The outlet pipe on the north side of the tank was interpreted to be about 1.4 m (5 ft) bgs. The data suggested the septic tank extended to a maximum depth of 4 m (13 ft) bgs. The outlet pipeline was then tracked with GPR approximately 100 m (330 ft) north to where the pipeline bent. The GPR survey was continued at the drain field where a rectangular shaped change in vegetation and surface soil was noted.

4.2.40.2 Confirmatory Sampling

Confirmatory sampling of the site was conducted on January 3, 2006. Focused sampling was used to characterize the 1607-D1 waste site. The two targets for sampling were the septic tank and the effluent line where it enters the drain field laterals. Excavation began at the septic tank. At a depth of approximately 1.5 m (5 ft) in the fill inside the tank, lead and silver nitrate battery parts and pieces were found. This debris was presumed to have leaked hazardous substances into the fill above action levels. For this reason, excavation was halted, no samples were taken, and the septic tank was recommended for remediation.

At the drain field sample location, excavation revealed the distribution (header) pipe approximately 0.6 m (2 ft) below the surface. Very little sediment material was in the distribution pipe. The laterals (drain field tiles) had significantly more sediment, so a sample was taken of this material. A sample was also taken of the soils underlying the drain field. No anomalous material or stained soil was encountered during the excavation of the drain field. No radiological readings above background or VOCs were detected by field instruments during sampling.

Analytical results of sediment samples from the drain field tiles indicated the drain field failed to meet direct exposure RAGs. Analytical results of the soil underlying the drain field indicated it failed to meet groundwater and river protection RAGs.

4.2.40.3 Excavation Operations

In preparation for excavating the 1607-D1 waste site, three in-process samples were collected for waste characterization. One sample was collected on October 29, 2010, from septic tank contents at the location of previous confirmatory sampling in 2006. The battery remained uncovered during confirmatory sampling activities, where it was originally located, and the surrounding soil was sampled. Sampling activities continued November 1, 2010, to collect two samples from the drain field. Results of in-process sampling were considered in determining the list of COPCs for verification sampling, though no additional COPCs were identified based on the sample results.

Remediation of the 1607-D1 waste site occurred from December 16, 2010 to February 4, 2011 and resulted in approximately 3,705 BCM (4,846 BCY) of waste materials being removed and stockpiled southeast of the septic tank prior to disposal at ERDF. No overburden material was associated with the site.

Due to the active 76 cm (30 in.) waterline (100-D-63, Section 4.1.59) that bisects the pipeline close to the drain field, a 9 m (30 ft) section of the 1607-D1 pipeline was left in place to avoid impact to the waterline during excavation. It was agreed that samples would be taken from within and beneath the pipeline from either side of the waterline to determine if the portion of pipeline left in place met cleanup criteria and could be closed with the 1607-D1 waste site excavation. However, no material was present inside the pipe during sampling; therefore, each pair of samples was collected from the bottom (below the pipe), one on the east side and one on the west side. Sample results determined that the soil beneath the pipeline meets all applicable cleanup criteria.

Excavation began by removing the drain field in the northernmost part of the 1607-D1 waste site, which was completed by mid-January 2011. The drain field was excavated to a depth of 2 m (6.6 ft) bgs and consisted primarily of gray and brown sand, gravel, and sections of VCP. The outlet pipeline north of the waterline was excavated to about 1 to 1.5 m (3.3 to 5 ft) bgs.

The septic tank excavation of the 1607-D1 waste site south of the waterline involved demolition of the reinforced concrete tank prior to removal. The septic tank contents, including battery debris, were removed, and the reinforced concrete was sheared for removal. The septic tank excavation extended to 3.5 m (11.5 ft) bgs. Excavation of the pipeline south of the active waterline included work beneath active power lines. A front-end loader was utilized to excavate this portion of the 1607-D1 pipeline to about 1.5 to 2 m (5 to 6.6 ft) bgs.

No anomalous materials were encountered during the excavation. A post-excavation civil survey was conducted at the 1607-D1 waste site on February 28, 2011. The 9 m (30 ft) break in the excavation for the active waterline is also marked where the service road crosses the waste site.

4.2.40.4 Verification Sampling

Verification sampling was conducted on November 29 and December 5, 2011. A statistical sampling design was used to collect soil samples from 1607-D1. The 1607-D1 verification sampling area was divided into four decision units consisting of the north excavation (Decision Unit 1), the south excavation (Decision Unit 2), the SPA footprint (Decision Unit 3), and the portion of the pipeline left in place beneath the waterline (Decision Unit 4). The sample design consisted of 12 statistical samples from Decision Units 1, 2, and 3. In Decision Unit 4, focused sampling of the 1607-D1 pipeline was performed to verify that the segment to be left in place met the RAGs. A total of four focused samples were taken from beneath the ends of the 9 m (30 ft) section of 1607-D1 outlet pipeline left in place where it goes under the active 100-D-63 waterline. Two samples were collected at the north end, and two samples were collected from the south end. The sample design planned that with each sample pair, one sample would consist of the interior contents of the pipe, and the other sample was to be collected from the soil underlying the pipe. However, no material was present inside the pipe; therefore, each pair of samples was collected from the bottom (below the pipe), one on the east side and one on the west side. These results indicated that residual contaminant concentrations meet the RAOs and RAGs for the 1607-D1 waste site.

4.2.40.5 Statement of Protectiveness

The verification sampling results show that residual soil concentrations support future land uses that can be represented (or bounded) by a rural-residential scenario. The results also demonstrate that residual contaminant concentrations support unrestricted future use of shallow zone soil (i.e., surface to 4.6 m [15 ft]) and that contaminant levels remaining in the soil are protective of groundwater and the Columbia River. Contamination from the 1607-D1 waste site does not extend into the deep zone; therefore, institutional controls to prevent uncontrolled drilling or excavation into the deep zone of the site are not required. The 1607-D1 site has been reclassified as “Interim Closed Out.”

4.2.41 600-30, 100-DR Construction Lay-down Area

4.2.41.1 Site Description

The 600-30, 100-DR Construction Laydown Area waste site is a 4-ha (10 ac) waste site south of 100-D Area and Route 2 North. The site appears to have been a laydown yard used during construction of the 105DR Reactor. The 600-30 waste site was covered with scattered construction-related debris and showed signs of plant stress ranging from reduced to no vegetation. There was also evidence of burning throughout the waste site. Actual start and end dates associated with use of the 600-30 waste site are unknown. However, if this site was used during construction of the 105DR Reactor as suspected, it was probably used from 1947 through 1950.

A geophysical survey of the 600-30 waste site was performed in March 2003. Scattered pockets of anomalies were noted throughout the survey area. Anomalous items included a rusty can containing a white solid, an 18.9 L (5 gal) drum containing oil, an 18.9 L (5 gal) bucket containing grease or tar, and a tar blob. Four distinct burn areas were identified, and their central coordinates recorded. Three in-process samples were collected of surface soil from burn areas prior to remediation.

4.2.41.2 Excavation Operations

Initial remediation of the 600-30 waste site was performed in October and November 2008. Remediation consisted of scraping 0.5 to 1 m (1.6 to 3.3 ft) of soil and debris into piles that were then loaded into ERDF containers. Scraping removed the surface debris at the site. At two locations the excavation extended to 1.5 m (4.9 ft) deep to remove additional subsurface material.

Additional materials discovered during remediation included lead acid batteries and a suspected fire extinguisher. The batteries were found stacked in two shallow pits. The batteries were hand removed from the ground, drummed, and then disposed at ERDF. The suspected fire extinguisher was disposed using anomalous media procedures and was determined to be an actual fire extinguisher; therefore, it was no longer considered an anomaly. There was no indication that the fire extinguisher leaked hazardous material to the ground. No other items were discovered during remediation that were considered anomalous. Approximately 7,400 BCM (9,679 BCY) of material were removed from the 600-30 waste site and disposed at ERDF.

The northernmost portion of the site was not scraped during this initial remediation effort due to the presence of established native plants and very little surface debris. Larger pieces of debris, including a bucket, were removed by hand. Only a minor amount of debris (such as small pieces of wire, nails and bolts) all of which is inert and nonhazardous, remained in the unscraped area.

Following initial remediation, verification sampling performed in August 2009 found a sample result that exceeded the direct exposure RAG for lead. A walkdown of the area determined that lead acid debris was widespread. The recommended path forward was to remediate a 45.7 by 6.1 by 0.6 m (150 by 20 by 2 ft) area. While remediating the northwest corner of the waste site, additional debris was encountered. As a result of finding this debris, the entire northern section of the waste site, which was originally removed from the design, was recommended for remediation. Additional remediation was performed in February and March 2011, which involved scraping 0.5 to 1 m (1.6 to 3.3 ft) of soil and debris across the northern boundary of the waste site and the lead-contaminated area. Approximately 3,500 additional BCM (4,578 BCY) of soil was removed for disposal at ERDF.

4.2.41.3 Verification Sampling

Verification sampling for the 600-30 waste site was performed in August 2009 and again in March 2011. A combination of statistical and focused soil sampling was performed. The area identified for verification sampling for the 600-30 waste site consists of three decision units in addition to focused sampling for verification sampling. A total of 12 statistical samples and 12 focused samples were collected and analyzed. Two focused sample locations were resampled following additional remediation.

All results are below rural-residential scenario direct exposure, groundwater protection, and Columbia River protection soil RAGs at the 600-30 waste site, except for lead and aldrin, which exceeded soil RAGs for groundwater and river protection cleanup levels. RESRAD modeling predicted that residual concentrations of lead and aldrin will be protective of groundwater and the Columbia River. All other COPCs were either not detected or were quantified below the RAGs.

4.2.41.4 Statement of Protectiveness

The results of the verification sampling show that residual contaminant concentrations do not preclude any future uses (as bounded by the rural-residential scenario) and allow for unrestricted use of shallow zone soils (i.e., surface to 4.6 m [15 ft] deep). The results also demonstrate that residual contaminant concentrations are protective of groundwater and the Columbia River. Site contamination did not extend into the deep zone; therefore, institutional controls to prevent uncontrolled drilling or excavation into the deep zone are not required. The 600-30 site has been reclassified as “Interim Closed Out.”

4.3 100-HR-1 Operable Unit

This section presents detailed remedial actions for sites within the 100-HR-1 OU.

4.3.1 100-H-1, 105-H Rod Cave

The 100-H-1 Rod Cave was located 23 m (75 ft) southwest of the southwest corner of the 105H Reactor. The cave was used during the operation of the 105H Reactor for temporary storage of irradiated reactor control rods as well as tools used in control rod removal and installation. The cave was 12.1 m (40 ft) long and 2.1 m (7 ft) wide. The rod cave was about 1.4 m (4.5 ft) high and partially buried and the end walls were constructed of lead bricks.

Due to geographic location and similarity of remediation activities, the 100-H-1, 100-H-22 (Section 4.3.15), and 100-H-21 (Section 4.3.14) sites were interim closed out as one decision unit referred to as the 100-H-21 Pipelines site. For additional information regarding the 100-H-1 site, refer to the 100-H-21 site (Section 4.3.14).

The 100-H-1 site has been reclassified as “Interim Closed Out.”

4.3.2 100-H-3, 1716-H Garage Fuel Tanks Site

4.3.2.1 Site Description

The 100-H-3 waste site was the location of one or more USTs associated with the 1716-H Maintenance Garage Building in the 100-H Area, west of the 107H Retention Basin (116-H-7, Section 4.3.61) and north of the 1717-H Combined Shops (Section 4.3.3). The 1716-H Garage Building operated from 1949 through 1965 as an automotive service station and repair facility. The site contained the automotive service area which included gasoline pumps and an oil pit. The entire maintenance garage structure has been demolished.

4.3.2.2 Confirmatory Sampling

Confirmatory sampling was performed on August 28 and September 2, 2008. Confirmatory sampling began with the excavation of a trench to native soil at a depth of approximately 3 m (10 ft). Tar and tar paper-like material was found, as well as asphalt and concrete debris. No tanks were found. Three samples of suspect asbestos were collected in addition to three focused soil samples; no asbestos was detected. Results of confirmatory sampling revealed that five analytes exceeded direct exposure RAGs for soil.

Two geophysical surveys were performed for the 100-H-3 waste site to provide comprehensive coverage of the 1716-H Garage Building footprint and surrounding vicinity. GPR and electromagnetic induction surveys were performed to establish the presence of any underground fuel tank(s) that may have been associated with the 1716H Garage Building. The geophysical data did not indicate the presence of USTs at this site.

4.3.2.3 Excavation Operations

The 100-H-3 waste site was remediated between December 21 and 30, 2009. A total of 894 BCM (1,170 BCY) of soil and debris were removed from the site and disposed at ERDF. At the expected location of the tanks, the excavation continued until an approximate depth of 3.5 m (11.5 ft) was reached. Remediation included removal of the pump island as well as the fuel supply lines. The adjacent french drain and debris at the former tank location was also removed. There were no tanks found at this site when either the confirmatory sampling or waste site remediation activities were performed.

4.3.2.4 Verification Sampling

Verification sampling for the 100-H-3 waste site was performed on September 21, 2010, and March 29, 2011. The footprint of the entire excavation was the only decision unit for verification sampling. A total of 12 soil sample locations were collected.

Evaluation of the verification sampling results showed that all results are below rural-residential scenario direct exposure, groundwater protection, and Columbia River protection soil RAGs at the 100-H-3 waste site, except for lead, mercury, dieldrin, benzo(a)anthracene, benzo(b)fluoranthene and benzo(k)fluoranthene, which exceeded soil RAGs for groundwater and river protection cleanup levels. RESRAD modeling predicted that residual concentrations of these constituents will be protective of groundwater and the Columbia River.

4.3.2.5 Statement of Protectiveness

The results of the verification sampling show that residual contaminant concentrations do not preclude any future uses (as bounded by the rural-residential scenario) and allow for unrestricted use of shallow zone soils (i.e., surface to 4.6 m [15 ft] deep). The analytical data results and RESRAD modeling results also demonstrate that residual contaminant concentrations are protective of groundwater and the Columbia River. The site does not have a deep zone or residual contaminant concentrations that would require any institutional controls. The 100-H-3 site has been reclassified as “Interim Closed Out.”

4.3.3 100-H-4, 1717-H Hot Shop, French Drain, and Contaminated Storage Unit

4.3.3.1 Site Description

The 100-H-4, 1717-H Hot Shop, French Drain, and Contaminated Storage Unit waste site was located 200 m (656 ft) west of the 105H Reactor. The 1717H Building provided centralized service facilities for certain 100 Area maintenance requirements. The 1717H Building housed a machine shop, sheet metal shop, fabrication shop, hot shop, and carpenter shop. The fabrication shop was used for fabrication and repair of reactor system components. The 1717H Building was removed during general D&D of 100-H Area facilities in 1974.

4.3.3.2 Excavation Operations

Remedial action at the 100-H-4, 1717-H Hot Shop, French Drain, and Contaminated Storage Unit waste site was performed between January 4 and 18, 2010. The excavation resulted in approximately 3,148 BCM (4,117 BCY) of contaminated soil. All material was direct loaded for disposal at ERDF.

The footprint of the 1717H Building, including the 1717-H Hot Shop and the foundation wall, was excavated to a depth of approximately 1 m (3 ft) bgs. The remediation activities also included the former locations of decontamination tanks and exterior exhaust. The french drain located northeast of the building footprint was excavated to a depth of approximately 4 m (12 ft). A concrete floor trap with a metal lid and insulation piece were uncovered and removed. The process sewer line and the sanitary sewer line were completely removed within the 1717H Building footprint and excavation boundaries.

4.3.3.3 Verification Sampling

Final cleanup verification samples were collected following variance sampling. Verification sampling was performed on September 22, 2010. The footprint of the entire excavation was the only decision unit for verification sampling. A total of 12 soil samples were collected at the 100-H-4 waste site. Five additional focused samples were also collected at the former french drain, floor drain pipe, decontamination tanks, exterior exhaust, and floor trap.

Evaluation of the verification sampling results show that all statistical results are below direct exposure, groundwater protection, and Columbia River protection soil RAGs at the 100-H-4 waste site excavation, except for lead, mercury, and total PCBs, which exceed the RAGs for groundwater and river protection. Contaminants evaluated in the focused samples were below soil RAGs for direct exposure, groundwater protection, and Columbia River protection, except for the uranium isotopes, lead, total PCBs, benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene and benzo(k)fluoranthene. RESRAD

modeling predicted that residual concentrations of these constituents will be protective of groundwater and the Columbia River. RESRAD modeling also predicted that residual radionuclide dose limitations will be protective of groundwater and the Columbia River.

4.3.3.4 Statement of Protectiveness

The results of the verification sampling show that residual contaminant concentrations do not preclude any future uses (as bounded by the rural-residential scenario) and allow for unrestricted use of shallow zone soils (i.e., surface to 4.6 m [15 ft] deep). The results also demonstrate that residual contaminant concentrations are protective of groundwater and the Columbia River. The site does not have a deep zone or residual contaminant concentrations that would require any institutional controls. The 100-H-4 site has been reclassified as "Interim Closed Out."

4.3.4 100-H-5, 107-H Retention Basin Sludge Burial Site, 107-H Buried Sludge Site, Sludge Disposal Trench, 107-H Grave

4.3.4.1 Site Description

The 100-H-5 site is located near the eastern edge of the 100-H Area and is approximately 90 m (295 ft) from the Columbia River. The site is in an area that, prior to World War II and the formation of the Hanford Site, was occupied by fruit tree orchards.

The 100-H-5 Sludge Disposal Trench is located about 52 m (170 ft) east of the southeast corner of the former 116-H-7 Retention Basin. The site location was confirmed by conducting a GPR scan in 1997. The trench was about 100 m (328 ft) long, 16 m (52 ft) wide, and 4.6 m (15 ft) deep. The 100-H-5 Sludge Disposal Trench received an unknown quantity of sludge removed from the 116-H-7 Retention Basin during repair work in the spring of 1953.

After disposing the sludge into the trench, the trench was covered to surface grade with 1.5 m (5 ft) of soil. In May 1965, the trench location was excavated to a depth of about 1.8 m (6 ft) to obtain fill material for the 116-H-7 Retention Basin.

4.3.4.2 Excavation Operations

Remedial action at the 100-H-5 site began on September 27, 1999. Excavation of the site involved removing the overburden materials, buried sludge and debris, and underlying contaminated soil. Based on field screening, overburden materials identified as potentially clean were placed in stockpiles for potential use as backfill. Contaminated materials were disposed at ERDF. During site excavation, the area where buried sludge and debris were encountered at the south end of the site was not as wide as the estimated footprint of the sludge trench. To avoid unnecessarily excavating and disposing of uncontaminated soil, the excavation at the south end of the site narrowed from the original estimated design site footprint.

On April 28, 2000, the excavation was completed. The elevation of the bottom of the excavation was at 121.4 m (398.2 ft) upon completion. The surface reference elevation and design backfill elevation are 126.5 m (415 ft). The excavation was approximately 3,308 m^2 (35,589 ft^2) in area with a maximum depth of approximately 5.1 m (16.7 ft). Approximately 23,525 metric tons (25,877 tons) of material from the site was disposed at ERDF.

Field screening was used to guide the excavation to quickly assess the presence and level of contamination and to assess when remediation was complete. Field screening for the 100-H-5 site was conducted at the completion of the remedial excavation and indicated that the 100-H-5 site met the RAGs.

4.3.4.3 Verification Sampling

Final cleanup verification samples were collected following variance sampling, analysis, and data evaluation. Cleanup verification sampling began on May 23, 2000, and was finished on June 8, 2000. Each verification sample was a composite formed by combining samples collected at four randomly selected nodes within each sampling area. The 100-H-5 site consisted of both a shallow and a deep zone decision unit. The shallow zone decision unit contained two decision subunits, which were divided into eight sampling areas. A total of eight samples (excluding QA/QC samples) were collected from the shallow zone decision unit. The deep zone decision unit contained one decision subunit, which was divided into three sampling areas. A total of three samples (excluding QA/QC samples) were collected from the deep zone decision unit.

Results of the sampling indicate that all RAOs and RAGs for direct exposure, protection of groundwater, and protection of the Columbia River have been met.

4.3.4.4 Statement of Protectiveness

Remedial action at the 100-H-5 waste site has achieved the RAOs and corresponding RAGs.
The remaining soils at the 100-H-5 site have been sampled, analyzed, and modeled. The results of this effort indicate that the materials from the 100-H-5 site containing COCs at concentrations exceeding RAGs have been excavated and disposed at ERDF, that residual COC concentrations in the shallow zone will support future land uses that can be represented (or bounded) by a rural-residential scenario and that residual COC concentrations throughout the site do not pose an unacceptable threat to groundwater or the Columbia River. The acceptability of unrestricted direct exposure to deep zone soils has not been demonstrated; therefore, institutional controls to prevent uncontrolled drilling or excavation into the deep zone (i.e., below 4.6 m [15 ft]) are required. The 100-H-5 site has been reclassified as “Interim Closed Out.”

4.3.5 100-H-7, French Drain A

4.3.5.1 Site Description

The 100-H-7, French Drain A waste site is a vertical, 30 in. diameter VCP with a metal lid near the original footprint of the 105H Reactor. It was also described as a 2.5 in. steel pipe exiting the reactor building at a point in line with the drain, which suggested the possibility of drainage from the 105H Reactor to the drain.

4.3.5.2 Confirmatory Sampling

Confirmatory sampling was performed at the 100-H-7 waste site on November 10, 2008. Excavation at the waste site revealed the french drain was in place and largely intact. Inside the french drain were red-stained leach rocks with a small amount of fine sediment interspersed. No elevated VOCs or radiological readings were detected on the french drain contents. A sample was collected from below the french drain at a depth of 3.7 m (12 ft) to represent soil underlying the french drain. A sample was also collected of the fine-grained sediment from inside the french drain.

Results of confirmatory sample analysis show groundwater and/or Columbia River protection RAGs are exceeded by copper, lead, zinc, indeno(1,2,3-cd)pyrene, and Aroclor-1260. RESRAD modeling predicted that residual concentrations of these constituents will be protective of groundwater and the Columbia River.

4.3.5.3 Statement of Protectiveness

The results of confirmatory sampling show that residual contaminant concentrations support future land uses that can be represented (or bounded) by a rural-residential scenario. The results also demonstrate that

residual contaminant concentrations support unrestricted future use of shallow zone soil (i.e., surface to 4.6 m [15 ft]) and contaminant levels remaining in the soil are protective of groundwater and the Columbia River. This site does not have a deep zone component; therefore, no deep zone institutional controls are required. The 100-H-7 site has been reclassified as "Interim No Action."

4.3.6 100-H-8, French Drain B

4.3.6.1 Site Description

The 100-H-8 French Drain B was located near the northeast corner of the 105H Reactor safe storage enclosure. The 100-H-8 waste site consisted of a vertically buried 36 in. diameter, gravel-filled concrete pipe. The drain was designed and used to collect steam condensate from a former overhead steam line that serviced the emergency cooling water tower located on the northeast side of the 105H Reactor.

4.3.6.2 Confirmation Sampling

Confirmatory sampling was performed at the 100-H-8 waste site in November 2008. Excavation of the 100-H-8 waste site revealed the french drain was in place and largely intact. Inside the french drain were leach rocks that were stained red. There was no fine sediment inside the drain to sample. No elevated VOCs or radiological readings were detected on the french drain contents.

The vertical concrete pipe comprising the french drain was found to extend to a depth of approximately 3.7 m (12 ft). Directly below the drain, red-stained soil was visible extending to the bottom of the excavation. A sample was collected of the stained soil directly below the drain.

Results of confirmatory sampling show no contaminants exceed direct exposure RAGs. Groundwater and/or Columbia River protection RAGs are exceeded by copper and lead. RESRAD modeling predicted that residual concentrations of copper and lead will be protective of groundwater and the Columbia River.

4.3.6.3 Statement of Protectiveness

Based on the results of confirmatory sampling, the 100-H-8 site meets the RAOs and RAGs. Residual contaminant concentrations will support future unrestricted land uses that can be represented (or bounded) by a rural-residential scenario. These results also showed that this site will support unrestricted future use of shallow zone soil (i.e., surface to 4.6 m [15 ft]) and is protective of groundwater and the Columbia River. Site contamination did not extend into the deep zone; therefore, institutional controls to prevent uncontrolled drilling or excavation into the deep zone are not required. The 100-H-8 site has been reclassified as "Interim No Action."

4.3.7 100-H-9, French Drain C

Due to geographic location and similarity of remediation activities, cleanup activities for the 100-H-9 site and six additional sites were conducted with removal actions for the 118-H-6:2 (Section 4.3.63), 118-H-6:3 (Section 4.3.64), and 118-H-6:6 (Section 4.3.67) sites. The 10 sites are collectively referred to as the 105H site. For additional information about the 100-H-9 site, refer to Section 4.3.63.

4.3.7.1 Site Description

The 100-H-9 waste site was a french drain located outside the northeast corner of the original 105H Reactor. The 100-H-9 waste site was a vertically buried 24 in. diameter concrete pipe. Based on drawings of similar french drains in the 100-H Area, the 100-H-9 french drain would have extended approximately 1.8 m (6 ft) bgs. The 100-H-9 french drain was likely a condensate drain for the steam heating system for the building and would not have been subject to contamination from within the reactor building.

4.3.7.2 Excavation Operations

Removal and disposal activities at the 105H site were completed in 2004. D&D excavations required for the demolition of the 105H Reactor (118-H-6:2) and construction of the 105H Reactor safe storage enclosure removed the 100-H-9 drain structure (refer to Section 4.3.63 for additional information). All soil and demolition debris generated during excavation activities were shipped to ERDF.

4.3.7.3 Statement of Protectiveness

Soil contamination that may remain as a result of waste site 100-H-9 would be analogous to residual contamination in the analogous french drains surrounding the 105C Reactor (118-C-3:3) and the 105F Reactor (100-F-12). These analogous sites have been demonstrated to meet the RAOs and RAGs and were reclassified as interim closed out and no action, respectively. Based on removal of the french drain and evaluation of analogous french drains, the 100-H-9 waste site meets the RAGs and RAOs.

Evaluation of analogous waste site data indicates that residual contaminant concentrations at 100-H-9 do not preclude any future land uses (as bounded by a rural-residential scenario) and allow for unrestricted future use of shallow zone soils (i.e., surface to 4.6 m [15 ft]). The evaluation also shows that contaminant levels remaining in the soil are protective of groundwater and the Columbia River. This site does not have a deep zone; therefore, no deep zone institutional controls are required. The 100-H-9 site has been reclassified as “Interim Closed Out.”

4.3.8 100-H-10, French Drain D

Due to geographic location and similarity of remediation activities, cleanup activities for the 100-H-10 site and six additional sites were conducted with removal actions for the 118-H-6:2 (Section 4.3.63), 118-H-6:3 (Section 4.3.64), and 118-H-6:6 (Section 4.3.67) sites. The 10 sites are collectively referred to as the 105H site. For additional information about the 100-H-10 site, refer to Section 4.3.63.

4.3.8.1 Site Description

French Drain D (100-H-10) was located on the north side of the 105H Reactor about 8 m (26 ft) north of the original north wall. The drain structure was situated above and slightly west of the western belowgrade process cooling water tunnel. The drain consisted of a vertically buried 48 in. diameter VCP. Based on drawings, the french drain extended approximately 1.8 m (6 ft) bgs. The 100-H-10 french drain was likely a condensate drain for the steam heating system and would not have been subject to contamination from within the reactor building.

4.3.8.2 Excavation Operations

Removal and disposal activities at the 105H site were completed in 2004. The 100-H-10 structure was removed during the deep excavations required for the removal of the process cooling water tunnels on the north side of the 105H Reactor (118-H-6:2). All soil and demolition debris generated during excavation activities were shipped to ERDF.

4.3.8.3 Statement of Protectiveness

Soil contamination that may remain as a result of the 100-H-10 waste site would be analogous to residual contamination in the analogous french drains surrounding the 105C Reactor (118-C-3:3) and the 105F Reactor (100-F-12). These analogous sites have been demonstrated to meet the RAOs and RAGs and were reclassified as interim closed out and no action, respectively. Based on removal of the french drain and evaluation of analogous french drains, the 100-H-10 waste site meets the RAGs and RAOs.

Evaluation of analogous waste site data indicates that residual contaminant concentrations at 100-H-10 do not preclude any future land uses (as bounded by a rural-residential scenario) and allow for unrestricted

future use of shallow zone soils (i.e., surface to 4.6 m [15 ft]). The evaluation also shows that contaminant levels remaining in the soil are protective of groundwater and the Columbia River. This site does not have a deep zone; therefore, no deep zone institutional controls are required. The 100-H-10 site has been reclassified as "Interim Closed Out."

4.3.9 100-H-11, Expansion Box French Drain E

Due to geographic location and similarity of remediation activities, cleanup activities for the 100-H-11 site and six additional sites were conducted with removal actions for the 118-H-6:2 (Section 4.3.63), 118-H-6:3 (Section 4.3.64), and 118-H-6:6 (Section 4.3.67) sites. The 10 sites are collectively referred to as the 105H site. For additional information about the 100-H-11 site, refer to Section 4.3.63.

4.3.9.1 Site Description

The 100-H-11 waste site was in the southwest corner of the former 105H Reactor. The site was a floor drain positioned underneath a concrete expansion box. The floor drain is estimated to have been 2.5-ft in diameter and to have fed into a 4 in. vertical drain line. A 2.5-ft diameter steel manhole was set in the concrete expansion box to provide access to the floor drain. Within the expansion box was a 5-ft diameter steel reactor effluent line that made a 45-degree turn from the south to southwest. The 100-H-11 french drain provided drainage for any leakage that might have occurred from the effluent line within the expansion box.

4.3.9.2 Excavation Operations

Removal and disposal activities at the 105H site were completed in 2004. Deep excavations (approximately 6 m [20 ft] bgs) within the 118-H-6:3 FSB site removed the 100-H-11 expansion box, drain, and underlying soils. All soil and demolition debris generated during excavation activities were shipped to ERDF.

4.3.9.3 Verification Sampling

Verification sampling of the soils underlying the FSB floor (118-H-6:3) also pertains to the soils beneath the 100-H-11 waste site, and evaluation of sample data demonstrates that the underlying soils meet the RAOs and RAGs. Refer to Section 4.3.63 for additional information.

4.3.9.4 Statement of Protectiveness

The verification sampling and modeling results demonstrate that residual contaminant concentrations do not preclude any future land uses (as bounded by a rural-residential scenario) and allow for unrestricted future use of shallow zone soils (i.e., surface to 4.6 m [15 ft]). The results also show that contaminant levels remaining in the soil are protective of groundwater and the Columbia River. This site does not have a deep zone; therefore, no deep zone institutional controls are required. The 100-H-11 site has been reclassified as "Interim Closed Out."

4.3.10 100-H-12, Expansion Box French Drain F and Shielding Lead

Due to geographic location and similarity of remediation activities, cleanup activities for the 100-H-12 site and six additional sites were conducted with the removal actions for the 118-H-6:2 (Section 4.3.63), 118-H-6:3 (Section 4.3.64), and 118-H-6:6 (Section 4.3.67) sites. The 10 sites are collectively referred to as the 105H site. For additional information about the 100-H-12 site, refer to Section 4.3.63.

4.3.10.1 Site Description

The 100-H-12 waste site was in the southeast corner of the former 105H Reactor. The site was a floor drain positioned underneath a concrete expansion box. The drain is estimated to have been 2.5-ft in diameter and to have fed into a 4 in. vertical drain line. A 2.5-ft diameter steel manhole was set in the

concrete expansion box to provide access to the floor drain. Within the expansion box was a 5-ft diameter steel reactor effluent line that made a 90-degree turn from the south to east. The 100-H-12 waste site provided drainage for any leakage that might occur from the effluent line within the expansion box.

4.3.10.2 Excavation Operations

Removal and disposal activities at the 105H site were completed in 2004. The surface of the concrete pad and manhole was covered with lead bricks. The lead bricks were installed as shielding from the nominally high dose rates coming from within the expansion box. Deep excavations (approximately 6 m [20 ft] bgs) within the 118-H-6:3 FSB site removed the 100-H-12 expansion box, drain, shielding lead, and underlying soils. All soil and demolition debris generated during excavation activities were shipped to ERDF.

4.3.10.3 Verification Sampling

Verification sampling from the soils in the deep zone side slopes (118-H-6:6) and underlying the FSB floor (118-H-6:3) pertains to the soils beneath the 100-H-12 drain, and evaluation of sample data demonstrates that the underlying soils meet the RAOs and RAGs. Refer to Section 4.3.63 for additional information.

4.3.10.4 Statement of Protectiveness

The verification sampling and modeling results demonstrate that residual contaminant concentrations do not preclude any future land uses (as bounded by a rural-residential scenario) and allow for unrestricted future use of shallow zone soils (i.e., surface to 4.6 m [15 ft]). The results also show that contaminant levels remaining in the soil are protective of groundwater and the Columbia River. This site does not have a deep zone; therefore, no deep zone institutional controls are required. The 100-H-12 site has been reclassified as “Interim Closed Out.”

4.3.11 100-H-13, French Drain G

Due to geographic location and similarity of remediation activities, cleanup activities for the 100-H-13 site and six additional sites were conducted with removal actions for the 118-H-6:2 (Section 4.3.63), 118-H-6:3 (Section 4.3.64), and 118-H-6:6 (Section 4.3.67) sites. The 10 sites are collectively referred to as the 105H site. For additional information about the 100-H-13 site, refer to Section 4.3.63.

4.3.11.1 Site Description

The 100-H-13 waste site was located on the east side of the 105H Reactor. The drain was constructed of VCP and covered by two metal lids. The drain was approximately 4-ft in diameter and 1.8 m (6 ft) deep. The 100-H-13 french drain was likely a condensate drain for the steam heating system and would not have been subject to contamination from within the reactor building.

4.3.11.2 Excavation Operations

Removal and disposal activities at the 105H site were completed in 2004. D&D excavations to remove the concrete ramp on the east side of the reactor building (118-H-6:2) also resulted in the removal of the 100-H-13 french drain. All soil and demolition debris generated during excavation activities were shipped to ERDF.

4.3.11.3 Statement of Protectiveness

Soil contamination that could remain as a result of the 100-H-13 waste site would be analogous to residual contamination in the analogous french drains surrounding the 105C Reactor (118-C-3:3) and 105F Reactor (100-F-12). These analogous sites have been demonstrated to meet the RAOs and RAGs

and were reclassified as interim closed out and no action, respectively. Based on removal of the french drain and evaluation of analogous french drains, the 100-H-13 waste site meets the RAGs and RAOs.

Evaluation of analogous waste site data indicates that residual contaminant concentrations at 100-H-13 do not preclude any future land uses (as bounded by a rural-residential scenario) and allow for unrestricted future use of shallow zone soils (i.e., surface to 4.6 m [15 ft]). The evaluation also shows that contaminant levels remaining in the soil are protective of groundwater and the Columbia River. This site does not have a deep zone; therefore, no deep zone institutional controls are required. The 100-H-13 site has been reclassified as "Interim Closed Out."

4.3.12 100-H-14, Surface Contamination Zone H

Due to geographic location and similarity of remediation activities, cleanup activities for the 100-H-14 site and six additional sites were conducted with removal actions for the 118-H-6:2 (Section 4.3.63), 118-H-6:3 (Section 4.3.64), and 118-H-6:6 (Section 4.3.67) sites. The 10 sites are collectively referred to as the 105H site. For additional information about the 100-H-14 site, refer to Section 4.3.63.

4.3.12.1 Site Description

The 100-H-14 waste site was a UPR site, located next to the former south wall of the 105H FSB. The site had been surface stabilized by 0.3 to 0.6 m (1 to 2 ft) of gravel and cobbles. The contamination area was adjacent to the wash rack room associated with the FSB. The excavation depths at the location of the 100-H-14 waste site are projected to be about 4.8 m (16 ft) bgs.

4.3.12.2 Excavation Operations

Removal and disposal activities at the 105H site were completed in 2004. This waste site was removed during D&D excavations of the 105H FSB (118-H-6:3). All soil generated during excavation activities was shipped to ERDF.

4.3.12.3 Verification Sampling

Verification sampling from the soils in the deep zone side slopes (118-H-6:6) pertains to the soils beneath the 100-H-14 surface contamination, and evaluation of these data demonstrates that the underlying soils meet the RAOs and RAGs. Refer to Section 4.3.63 for additional information.

4.3.12.4 Statement of Protectiveness

The verification sampling and modeling results demonstrate that residual contaminant concentrations do not preclude any future land uses (as bounded by a rural-residential scenario) and allow for unrestricted future use of shallow zone soils (i.e., surface to 4.6 m [15 ft]). The results also show that contaminant levels remaining in the soil are protective of groundwater and the Columbia River. This site does not have a deep zone; therefore, no deep zone institutional controls are required. The 100-H-14 site has been reclassified as "Interim Closed Out."

4.3.13 100-H-17, 116-H-2 Trench Overflow

Due to geographic location and similarity of remediation activities, cleanup activities for the 100-H-17, 100-H-30 (Section 4.3.25), 100-H-2 (Section 4.4.1), and 116-H-2 (Section 4.3.57) sites were conducted together. These sites are collectively referred to as the 100-H-17 Site. This section contains information about all four sites.

4.3.13.1 Site Description

This site is in an area that, prior to World War II and formation of the Hanford Site, was occupied by fruit tree orchards. The 100-H-17, 116-H-2, 100-H-2, and the 100-H-30 sites were grouped together due to

their proximity and similarity in the type of waste they received. The following is a description of each site.

The 116-H-2 Liquid Waste Disposal Trench received 105H Reactor cooling water diverted from the normal disposal system during various upgrade programs between the years 1953 and 1965. The cooling water was pumped from the 105H Reactor to the trench via the 1608 Pump House. In 1953, the 116-H-2 Trench overflowed and flooded a triangular area bounded by railroad tracks, which is known as the 100-H-17 Overflow. The 100-H-30 Sanitary Sewer Trench was also contaminated with effluent that overflowed from the116-H-2 Liquid Waste Disposal Trench.

Also, reportedly contained within this overflow area, is the 100-H-2 Buried Thimble Site. This site reportedly contained a VSR thimble from the 105H Reactor that was buried in 1953. No evidence of this site was discovered during excavation.

4.3.13.2 Excavation Operations

Remedial action at the 100-H-17 site began on February 2, 2000. Excavation of the site involved removing the overburden materials, miscellaneous debris, the contaminated structure, and underlying contaminated soil. Overburden materials identified as potentially clean were placed in stockpiles for potential use as backfill. On February 10, 2000, the excavation was completed. The excavation was approximately 6,240 m^2 (67,170 ft^2) in area with a maximum depth of approximately 2.6 m (8.5 ft). A total of 19,920 metric tons (21,960 tons) of material from the site was disposed at ERDF.

4.3.13.3 Verification Sampling

Final cleanup verification samples were collected following variance sampling. Cleanup verification sampling began on August 10, 2000 and was finished on August 24, 2000. The 100-H-17 site consisted of a single decision unit, the shallow zone. The shallow zone decision unit contained two decision subunits, which were divided into four sampling areas each. Each verification sample was a composite formed by combining samples collected at four randomly selected nodes within each sampling area. A total of 8 verification samples were analyzed.

4.3.13.4 Statement of Protectiveness

The remedial action at the 100-H-17 Site (including sites 116-H-2, 100-H-2, and 100-H-30) has achieved the RAOs and corresponding RAGs. The remaining soils at the 100-H-17 site have been sampled, analyzed, and modeled. The results of this effort indicate that the materials from the 100-H-17 site containing COCs at concentrations exceeding RAGs have been excavated and disposed at ERDF. These results also indicate that residual concentrations in the shallow zone will support future land uses that can be represented (or bounded) by a rural-residential scenario and that residual concentrations throughout the site pose no threat to groundwater or the Columbia River. The acceptability of unrestricted direct exposure to deep zone soils has not been demonstrated; therefore, institutional controls to prevent uncontrolled drilling or excavation into the deep zone (i.e., below 4.6 m [15 ft]) are required. The 100-H-17 site has been reclassified as “Interim Closed Out.”

4.3.14 100-H-21, 100H Reactor Cooling Water Effluent Underground Pipelines

Due to geographic location and similarity of remediation activities, the 100-H-1 (Section 4.3.1), 100-H-22 (Section 4.3.15), and 100-H-21 sites were interim closed out as one decision unit referred to as the 100-H-21 Pipelines site. Subsection 4.3.14.1 includes site description information specific to 100-H-21. The remaining subsections include information regarding excavation, verification sampling, and the statement of protectiveness for all three sites.

4.3.14.1 Site Description

The 100-H-21 Reactor Effluent Pipelines site includes two former 60 in. diameter steel pipelines that carried 105H Reactor cooling water effluent from the reactor building to the 116-H-7 Retention Basin (Section 4.3.61) and from the basin to the 116-H-5 Outfall (Section 4.3.60). The 100-H-21 site also includes a 20 in. diameter steel pipeline that was used to divert reactor cooling water from the retention basin to the 116-H-1 Trench and a 20 in. diameter steel pipeline along the west side of the retention basin and pipelines from the reactor building to the 1608H Pumphouse and the 116-H-2 Trench (Section 4.3.57). The pipelines were used during operation of the 105H Reactor from 1949 until 1965.

4.3.14.2 Excavation Operations

Remedial action at the 100-H-21 Pipelines site began on October 19, 1999. Excavation of the site involved removing the overburden materials, pipelines (including miscellaneous small pipelines near the reactor building), the 100-H-1 Rod Cave structure, and underlying contaminated soil. Overburden materials identified as potentially clean were placed in stockpiles for potential use as backfill. Approximately 2,500 lead bricks from the end walls of the rod cave underwent radiological release surveys so that the lead could be recycled. On July 21, 2000, the majority of the excavation was completed. Due to elevated lead levels in an area of the site excavation, additional soil was excavated on December 12, 2000.

The general average depth of the bottom of the excavation in the deep zone sampling areas was 5.6 m (18.4 ft) bgs. The majority of the site excavation depth was 4.6 m (15 ft) bgs or less, generally corresponding with the former pipeline invert depth. The excavation was approximately 17,629 m^2 (189,660 ft^2) in area and a total of 32,725 metric tons (35,998 tons) of material from the site was disposed at ERDF.

Field screening was conducted during the site remedial action to guide the excavation, quickly assess the presence and level of contamination, and to assess when remediation was complete. Field screening for the 100-H-21 Pipelines site and overburden included using a radiological data mapping system survey, hand-held sodium iodide detectors, gamma energy analyses, and nonradionuclide analyses.
The radiological mapping survey was performed over more than 50% of the site excavation surface area and overburden piles. Field screening at the completion of the remedial excavation indicated that the 100-H-21 Pipelines site and overburden met the RAGs.

4.3.14.3 Verification Sampling

Final cleanup verification samples were collected following variance sampling. Cleanup verification sampling began on July 17, 2000, and was completed on December 12, 2000. A site-specific cleanup verification model was developed for the site that consisted of both a shallow and a deep zone decision unit. Sixteen samples were collected in the shallow zone which consisted of the excavation sidewalls and floor that were less than 4.6 m (15 ft) bgs. Nine samples were collected in the deep zone which consisted of the portions of the excavation sidewalls and excavation floor that were more than 4.6 m (15 ft) bgs. Twenty samples were collected in the overburden stockpile.

The groundwater protection RAG was not met for lead. RESRAD modeling predicted that residual concentrations of lead will be protective of groundwater.

4.3.14.4 Statement of Protectiveness

Remedial action at the 100-H-21 Pipelines site has achieved the RAOs and corresponding RAGs.
The remaining soils at the 100-H-21 Pipelines site have been sampled, analyzed, and modeled. The results of this effort indicate that the materials from the 100-H-21 Pipelines site containing COCs at

concentrations exceeding RAGs have been excavated and disposed at ERDF. These results also indicate that residual concentrations in overburden and the shallow zone will support future land uses that can be represented (or bounded) by a rural-residential scenario and that residual concentrations throughout the site are protective of groundwater and the Columbia River. The acceptability of unrestricted direct exposure to deep zone soils has not been demonstrated; therefore, institutional controls to prevent uncontrolled drilling or excavation into the deep zone (i.e., below 4.6 m [15 ft]) are required. The 100-H2-1 site has been reclassified as "Interim Closed Out."

4.3.15 100-H-22, Soil Contaminated by Effluent Line Leakage

The 100-H-22 effluent line leakage site is associated with general underground leaks from cooling water effluent pipelines. The pipelines were used during operation of the 105H Reactor from 1949 until 1965.

Due to geographic location and similarity of remediation activities, the 100-H-1 (Section 4.3.1), 100-H-22, and 100-H-21 (Section 4.3.14) sites were interim closed out as one decision unit referred to as the 100-H-21 Pipelines site. For additional information regarding the 100-H-22 site, refer to the 100-H-21 site (Section 4.3.14).

The 100-H-22 site has been reclassified as "Interim Closed Out."

4.3.16 100-H-24, 151-H Electrical Facilities, 100-H-24 Substation, 151-H Substation

4.3.16.1 Site Description

The 100-H-24 site is located approximately 200 m (656 ft) west of the 105H Reactor in the western part of the 100-H Area. The 100-H-24 site is in an area that was occupied by fruit tree orchards prior to World War II and the formation of the Hanford Site.

The site is the area of the demolished 151-H Electrical Substation including the former 151H Building and adjacent switchyard. The electrical facilities were used from 1948 until 1978. The 151-H Electrical Substation provided electric power to the 100-H Area and contained several electrical transformers known to contain PCBs. The 151H Substation was composed of a fenced area and a switch house. The fenced area contained two power transformers, overhead static wires, a large ground mat, lightning arrestors, and 13.8-kV electrical feeders.

4.3.16.2 Excavation Operations

Remedial action at the 100-H-24 site began in November 1999. Excavation of the site involved removing contaminated concrete and debris and contaminated soil. Contaminated materials were disposed at ERDF. Based on process knowledge and visual observation, the remaining portions (all bgs) of the 151H Building concrete basement walls, foundation, and demolition debris did not require removal and were left in place. Operational history, building demolition observations, and remedial action observations indicate that no hazardous materials were stored or used in the building and that there was no contamination associated with the building.

In December 2000, the excavation was completed. The excavation was approximately 12,289.8 m^2 (132,286.4 ft^2) in area with a maximum depth of approximately 4.6 m (15 ft). Approximately 19,924 metric tons (21,268 tons) of material from the site was disposed at ERDF.

4.3.16.3 Verification Sampling

Because PCBs are the only COCs for the 100-H-24 site, variance and cleanup verification sampling were performed as one step. A total of 72 discrete samples were collected from 12 sampling areas (6 discrete samples per sample area) at the 100-H-24 site.

For the 100-H-24 site, one decision unit (shallow zone) was established and used to represent soil from ground surface to groundwater. A separate deep zone decision unit was not established for this site, because the entire site excavation floor was generally less than 4.6 m (15 ft) bgs.

Initial cleanup verification sample collection was done in August 2000; however, following receipt of PCB analytical results, additional remediation was conducted in two sample areas with additional cleanup verification sampling conducted in December 2000.

The groundwater protection RAG was not met for Aroclor-1260. RESRAD modeling predicted that residual concentrations of Aroclor-1260 will be protective of groundwater.

4.3.16.4 Statement of Protectiveness

Remedial action at the 100-H-24 site has achieved the RAOs and corresponding RAGs. The remaining soils at the 100-H-24 site have been sampled, analyzed, and modeled. The results of this effort indicate that the materials from the 100-H-24 site containing COCs at concentrations exceeding RAGs have been excavated and disposed at ERDF. These results also indicate that residual concentrations in the shallow zone will support future land uses that can be represented (or bounded) by a rural-residential scenario and that residual concentrations throughout the site are protective of groundwater and the Columbia River. No institutional controls are required for this site. The 100-H-24 site has been reclassified as “Interim Closed Out.”

4.3.17 100-H-28:1, 184-H Power House Ash Sluicing Line

4.3.17.1 Site Description

The 100-H-28:1 pipeline subsite consists of a single 8 in. Ashcolite pipeline, formerly used to sluice coal ash from the 184-H Boiler House to the 126-H-1 ash pit. This pipeline is located between the east side of the former 184-H Boiler House and the east side of the 126-H-1 ash pit. The total length of the pipeline is approximately 265 m (870 ft), and exists approximately 1.5 m (5 ft) below existing grade.

The primary operational period of the 100-H-28:1 pipeline is expected to coincide with that of the reactor and its support facilities, from 1949 to 1965. The pipeline was designed to sluice coal ash from boiler operation to disposal at the 126-H-1 ash pit using raw water or filtered water supplied by the 183-H Water Treatment Facility. The pipeline would have been used only as necessary to remove accumulated coal ash, indicating sporadic historic loading.

4.3.17.2 Confirmatory Sampling

A focused sampling design was selected for confirmatory sampling based on drawings, process knowledge, and other available information. On August 28, 2008, Test Pit 1 was excavated to locate the buried 100-H-28:1 pipeline outfall. The pipeline was not located; however, a concrete slab was found approximately 1.8 m (6 ft) bgs. The excavation then progressed approximately 3 m (10 ft) to the east in search of the outfall pipeline; the pipeline was not found.

The equipment was then moved to excavate at Test Pit 2 in search of the pipeline. The pipeline was located at a depth of approximately 1.5 m (5 ft). Based on field observations, it was decided that the location for Test Pit 1 needed to be adjusted to the north of the first excavation attempt. The field crew moved to the adjusted location for Test Pit 1 with the excavation encountering an 8 in. steel pipeline, broken at the end and filled with soil and gravel. Field observations of the end of the pipeline and the broken concrete slab indicate that the pipeline outfall had been demolished in place and backfilled. The excavator was then used to break into the pipeline near the exposed end. No scale or sediment was found inside the pipeline. A decision was made to excavate below the concrete slab underlying the pipeline for collection of a soil sample.

On September 24, 2008, the field crew relocated to Test Pit 2 to verify that no material was present inside the pipeline. The excavator broke into the pipeline and it was found empty. Therefore, no additional sampling was performed and the excavation was backfilled.

During excavation and sampling, radiological field screening was performed; no radiological contamination was detected. Field screening for the presence of VOCs was also negative. No suspect ACM or stained soil was observed during test pit excavations.

Evaluation of the results indicate that residual concentrations of all detected site COPCs are below soil RAGs, except for soil cleanup levels protective of groundwater and the Columbia River for barium, copper, benzo(b)fluoranthene, and indeno(1,2,3-cd)pyrene. RESRAD modeling predicted that residual concentrations of these constituents will be protective of groundwater and the Columbia River.

4.3.17.3 Statement of Protectiveness

The results of confirmatory sampling show that the residential contaminant concentrations do not preclude any future uses, as bounded by the rural-residential scenario, and allow for unrestricted use of shallow zone soils (i.e., surface to 4.6 m [15 ft] deep). The results also demonstrate that residual contamination concentrations are protective of groundwater and the Columbia River. This subsite does not have a deep zone component; therefore, institutional controls to prevent uncontrolled drilling or excavation into the deep zone are not required. The 100-H-28:1 site has been reclassified as “Interim No Action.”

4.3.18 100-H-28:2, South Process Sewers

4.3.18.1 Site Description

The 100-H-28:2, South Process Sewers subsite consisted of vitrified clay, reinforced concrete, and cast-iron process sewer lines formerly servicing the 105H Reactor, 190H Pumphouse, 183H Clearwells and Pumphouse, and miscellaneous 1700 series buildings east of the 190H Pumphouse. These process sewers formerly drained to the 1906H Lift Station, which pumped wastes to the 1904-H Outfall. The operational history of the 100-H-28:2 pipelines is expected to coincide with that of the 105H Reactor from 1949 to 1965. These pipelines were located around the former buildings in the southern portion of the 100-H Area.

The main pipelines for these sewers consisted of 42 in. and 54 in. diameter RCP up to the confluence with the 100-H-28:3 north process sewers, from which a 72 in. diameter RCP line carried the combined flow to the 1906H lift station. Waste flow from the process sewers was ultimately discharged to the Columbia River at the 1904H Outfall; however, past remediation of radioactive liquid waste effluent pipelines and demolition of the 1906H Lift Station included removal of the downstream portion of the process sewers to a point slightly west of the 1906H Facility. The feeder lines formerly discharging to the 100-H-28:2 main pipelines consisted of small diameter (3 to 8 in.) vitrified clay and cast-iron pipe and larger diameter (up to 36 in.) RCP.

4.3.18.2 Confirmatory Sampling

Confirmatory sampling at the 100-H-28:2 subsite was conducted between May 2008 and December 2008. The confirmatory sampling design was developed using a phased sampling approach. Phase I consisted of the collection of representative samples of accessible sediments within manhole structures. Because the results of Phase I sampling did not support a determination that the entirety of the 100-H-28:2 pipelines required remediation, additional data was necessary and Phase II sampling was initiated. Phase II consisted of the excavation of test pits at manhole structures and junction boxes within each service area at locations likely to contain the highest levels of residual contamination from historic waste flows.

Representative samples were taken from pipeline/manhole contents and underlying soils potentially impacted by leakage in each service area as needed to expand the data set generated under Phase I.

The 100-H-28:2 subsite was divided into six service areas for confirmatory sampling. The 100-H-28:2 pipelines extended into the deep zone to a depth such that contamination could migrate to groundwater and the river. Therefore, sections of the pipeline in Service Areas 5 and 6 and portions of Service Areas 2 and 3 that were in the deep zone downstream from Service Area 1 were recommended for remediation. It was not practical to continue confirmatory sampling to support a potential no action decision for the remainder of the pipelines in the 100-H-28:2 subsite; therefore, the remediation recommendation was extended to include the entire 100-H-28:2 subsite.

The contents of two french drains that were discovered during the confirmatory sampling activities were sampled and the results for each exceeded groundwater and river protection RAGs for lead. Therefore, the french drains and impacted soil, as evidenced from soil staining within and below the drain, were recommended for remediation as part of the 100-H-28:2 subsite. The french drains were located within the planned excavation layback.

4.3.18.3 Excavation Operations

Remedial action at the 100-H-28:2 subsite was performed from September 2011 through March 2012; September 2013 through March 20, 2014; and September 2 through September 23, 2014. The 100-H-28:2 excavation extended to an approximate maximum depth of 9 m (29.5 ft) bgs. The waste material included 36 to 72 in. diameter concrete pipe, 6 to 8 in. diameter concrete-encased VCP, manhole debris, interfering structural debris, and former building demolition debris. The majority of the interfering structural and demolition debris was encountered along the east-west pipe section immediately south of the former 190H Building. The structural and demolition debris included reinforced concrete, coal ash, steel pipe, asbestos transite, and other general building demolition debris. The asbestos transite debris was encountered at the ground surface prior to excavation of the 100-H-28:2 pipeline. The asbestos transite debris was removed and direct loaded for disposal at ERDF. All removal and handling of asbestos transite debris was conducted and directed by asbestos-competent individuals. Following removal of asbestos debris, the area was inspected by an asbestos-competent person to verify that all visible asbestos debris had been removed.

Approximately 21,650 BCM (28,317 BCY) of contaminated soil and debris were removed from the 100-H-28:2 subsite and staged at the SPAs pending loadout and disposal. These SPAs also received waste from nine other waste sites including 100-H-46 (Section 4.3.38), 100-H-28:3 (Section 4.3.19), 100-H-28:4 (Section 4.3.20), 100-H-28:5 (Section 4.3.21), 100-H-42, 100-H-44 (Section 4.3.36), 100-H-48 (Section 4.3.39), 100-H-51:3 (Section 4.3.45), and 100-H-52 (Section 4.3.49). A total of eight SPAs were designated and used to stage waste from these waste sites. Following the load out of stockpile materials, the SPAs were scraped to 0.3 m (1 ft) bgs. The loadout and disposal of the waste material was completed in April 2015. No stained soil was observed.

Approximately 93,000 BCM (121,639 BCY) of material was salvaged from the 100-H-28:2 subsite and stockpiled for use as clean backfill material. A crushed drum containing residual oil was encountered in the layback of the 100-H-28:2 subsite excavation. No other anomalous materials were encountered. Waste loadout with disposal at ERDF was completed in April 2015.

4.3.18.4 Verification Sampling

Verification samples were collected from the 100-H-28:2 and 100-H-42 excavations, associated overburden piles, and waste SPAs on November 18, 2013; February 26, 2014; December 10, 12, and 15, 2014; February 26, 2015; March 16, 2015; and April 2, 2015. Four decision units were identified for the

100-H-28:2 subsite and the 100-H-42 waste site. Specifically, the 100-H-28:2 excavation, the 100-H-42 excavation, the waste SPAs, and the overburden stockpiles. A combination of statistical and focused sampling design was used to evaluate the 100-H-28:2 pipeline subsite. Statistical designs were used to evaluate the 100-H-42 waste site, the waste SPAs, and the overburden soil stockpiles. Twelve statistical verification soil samples were collected from each of the decision units. All samples were grab samples collected at the predetermined coordinates.

All COPCs were quantified below direct exposure RAGs. All COPCs were quantified below groundwater and/or river protection soil RAGs except for chromium (total), lead, mercury, Aroclor-1254, Aroclor-1260, DDE, benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, and benzo(k)fluoranthene. RESRAD modeling predicted that residual concentrations of these constituents will be protective of groundwater and the Columbia River.

4.3.18.5 Statement of Protectiveness

The verification sample results show that residual soil concentrations support future land uses that can be represented (or bounded) by a rural-residential scenario. The results also demonstrate that residual contaminant concentrations support unrestricted future use of shallow zone soil (i.e., surface to 4.6 m [15 ft]) and that contaminant levels remaining in the soil are protective of groundwater and the Columbia River. Although the maximum depth of the excavation extended into the deep zone (i.e., greater than 4.6 m [15 ft] bgs), the waste site was evaluated against the shallow zone criteria. Contamination above direct exposure levels was not observed in the verification soil samples collected from the excavations; therefore, institutional controls to prevent uncontrolled drilling or excavation into the deep zone soil are not required. The 100-H-28:2 site has been reclassified as “Interim Closed Out.”

4.3.19 100-H-28:3, North Process Sewers

Due to geographic location and similarity of remediation activities, cleanup activities for the 100-H-28:3, 100-H-28:5 (Section 4.3.21), and 100-H-44 (Section 4.3.36) waste subsites were conducted together. Subsection 4.3.19.1 includes site description information specific to 100-H-28:3. The remaining subsections include information regarding excavation, verification sampling, and the statement of protectiveness for all three sites.

4.3.19.1 Site Description

The 100-H-28:3 North Process Sewers subsite consisted of process sewers formerly servicing the 183H Filter Plant, 182H Reservoir, and the 184-H Boiler House/Alternative Power House. The mainline of the 100-H-28:3 sewer consisted of various sizes of RCP leading up to the confluence with the 100-H-28:2 South Process Sewer (Section 4.2.18), which carried the combined flow to the 1906H Lift Station. Effluent from the process sewers was ultimately discharged to the Columbia River at the 1904H Outfall. The operational history of the 100-H-28:3 pipelines is linked to the operation of the 100-H Area reactor, from 1949 to 1965.

The 100-H-28:3 process sewer feeder lines associated with the 183H Facility primarily serviced the northern portion of the facility where the coagulation/flocculation/settling basins existed and where the solar evaporation basins were later operated. The exact design use or nature of historic discharges to this sewer is unknown but are presumed to be related to underflow drains for the basins and sumps related to process supply lines and filter backwash. Based on the design use of the solar evaporation ponds, associated wastes would not have been discharged to the process sewer system.

4.3.19.2 Confirmatory Sampling

Confirmatory sampling of the 100-H-28:3 and 100-H-28:5 subsites was developed using a phased approach. Phase I consisted of the collection of a representative sample of accessible sediments within a selected manhole structure. The purpose of Phase I was to make an initial determination if residual pipeline contents fail RAGs and if the pipelines should be recommended for remedial action. Since the Phase I results indicated site remediation was needed, the Phase II portion of the confirmatory sampling design was not conducted.

Confirmatory sampling was conducted at the 100-H-28:3 subsite on June 2, 2008. Sampling activities consisted of opening three selected manholes with the intent of retrieving a sample of the sewer contents. A liquid/slurry sample was collected from within one manhole. Insufficient material was available to sample at the other two manholes.

Confirmatory sampling was conducted at the 100-H-28:5 subsite on June 2 and 3, 2008. At Sample Location 1, a sample of gray, powdery solid was taken at a depth of about 3 m (9.8 ft). No elevated VOC readings or radiological contamination were detected during sampling activities. At Sample Location 2, a sample of gray, sandy material was taken at a depth of about 1.2 m (4 ft). When the manhole was opened, the initial alpha count from a smear of the underside of the manhole cover was elevated; however, rate of decay indicated the probable source as radon decay products.

A focused sampling approach was used to assess the 100-H-44 waste site. The focused sampling locations were identified based on the potential worst-case locations that have the highest potential for the presence of environmental contaminants. Confirmatory sampling was conducted at the 100-H-44 waste site on November 4 and 5, 2009. Four test pits were excavated and sampled.

4.3.19.3 Excavation Operations

Remedial actions at the 100-H-28:3 and 100-H-28:5 subsites and the 100-H-44 waste site were conducted concurrently and began on July 17, 2013, with removal of overburden material. The overburden was combined with material from the 100-H-28:2 and 100-H-28:4 pipeline subsites (Sections 4.3.18 and 4.3.20, respectively).

Remediation at the 100-H-28:3 and 100-H-28:5 subsites and the 100-H-44 waste site continued through September 9, 2014, to a maximum depth of 10 m (33 ft) bgs. The remediation resulted in a total of approximately 29,435 BCM (38,500 BCY) of contaminated soil and debris being removed and staged at SPAs pending loadout and disposal at ERDF. Approximately 13,850 BCM (18,115 BCY) was removed from 100-H-28:3; 7,828 BCM (10,239 BCY) was removed from 100-H-28:5; and 7,760 BCM (10,150 BCY) was removed from 100-H-44. Waste loadout with disposal at ERDF was completed in September 2014. Due to samples exceeding direct exposure RAGs for arsenic, hexavalent chromium, and PAHs, additional remediation was conducted at 100-H-28:5 to remove the residual contamination. This resulted in approximately 10,295 BCM (13,465 BCY) of additional contaminated material disposed at ERDF.

The waste from the 100-H-28:3 and 100-H-28:5 subsites included soil; concrete, steel, and VCP debris; and brick manhole debris. Waste materials associated with the 100-H-44 waste site included acid-stained soils, concrete sump debris, and small-diameter steel pipe debris. Additional wastes included interfering concrete building foundations, surface asphalt, interfering clean water pipelines, interfering steam lines, coal ash, railroad ties, and miscellaneous building demolition debris (e.g., concrete and steel rebar adjacent to previously demolished buildings).

The 100-H-35, 100 Area export water line (Section 4.3.29) crossed portions of the northwest sections of the 100-H-28:3 and 100-H-28:5 pipelines. Due to the necessity of the export water line and complications associated with relocation or modification, approximately 18 m (60 ft) of the 100-H-28:3 and 12 m (40 ft) of the 100-H-28:5 pipelines were left in place. Verification soil samples were collected at each end of the pipeline to support leaving the pipeline segment in place.

4.3.19.4 Verification Sampling

Verification samples from the combined 100-H-28:3 and 100-H-28:5 subsites and the 100-H-44 waste site were collected on August 13 and December 12, 2013; November 5, 12, 13, and 20, 2014; and February 5 and March 5, 16, and 18, 2015. The 100-H-28:3 pipeline subsite and the 100-H-44 pipeline were combined into one decision unit for verification sampling, and a second decision unit was identified for the 100-H-28:5 pipeline subsite. Additionally, two decision units were identified for the overburden soil stockpiles; specifically, the north overburden stockpiles that included material from the 100-H-28:2, 100-H-28:3, 100-H-28:4, and 100-H-28:5 pipeline subsites, and the south overburden soil stockpiles that included material from the 100-H-28:2 and 100-H-28:4 pipeline subsites.

A combination statistical and focused sampling design was used to evaluate the pipeline subsites excavations and a statistical sampling design was used to evaluate the overburden soil stockpiles. Twelve statistical verification soil samples were collected from each of the excavation decision units and the overburden soil stockpile decision units. Focused samples were collected at each end of the 100-H-28:3 and 100-H-28:5 pipeline segments that remain in place where they are crossed by the export water line. All samples were grab samples collected at the predetermined coordinates.

All COPCs for the 100-H-28:3 and 100-H-44 excavation decision unit were quantified below direct exposure RAGs. All COPCs were quantified below groundwater and/or river protection soil RAGs except for copper, lead, mercury, silver, and Aroclor-1254. RESRAD modeling predicted that residual concentrations of these constituents will be protective of groundwater and the Columbia River.

All COPCs for the 100-H-28:5 excavation north overburden stockpile, south overburden stockpile, and the focused soil samples were quantified below direct exposure RAGs. All COPCs were quantified below groundwater and/or river protection soil RAGs except for chromium (total), lead, selenium, DDE, benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene, and chrysene. RESRAD modeling predicted that residual concentrations of these constituents will be protective of groundwater and the Columbia River.

4.3.19.5 Statement of Protectiveness

The verification sampling and modeling results for the 100-H-28:3 and 100-H-28:5 subsites and the 100-H-44 waste site show that residual soil concentrations support future land uses that can be represented (or bounded) by a rural-residential scenario. The results also demonstrate that residual contaminant concentrations support unrestricted future use of shallow zone soil (i.e., surface to 4.6 m [15 ft]) and that contaminant levels remaining in the soil are protective of groundwater and the Columbia River. Although the maximum depth of the excavation extended into the deep zone (i.e., greater than 4.6 m [15 ft]) bgs, the waste sites were evaluated against the shallow zone criteria. Contamination above direct exposure levels was not observed in shallow zone soils and is concluded to not exist in deep zone soils; therefore, institutional controls to prevent uncontrolled drilling or excavation into the deep zone soil are not required. The 100-H-28:3 site has been reclassified as “Interim Closed Out.”

4.3.20 100-H-28:4, 1607-H1 Sanitary Sewer Pipelines

4.3.20.1 Site Description

The 100-H-28:4 subsite consisted of a 6 in. vitrified clay sanitary sewer pipeline. It was designed to receive waste from the 105H Reactor, the 151-H Electrical Substation, and the 190H Pumphouse. The waste was discharged to the 1607-H1 Septic System.

4.3.20.2 Confirmatory Sampling

Confirmatory sampling of the 100-H-28:4 subsite was developed using a phased approach. Phase I consisted of the collection of a representative sample of accessible sediments within a selected manhole structure. The purpose of Phase I was to make an initial determination if residual pipeline contents fail RAGs and if the pipelines should be recommended for remedial action. Confirmatory sampling was performed at the site on June 3, 2008. The sample was collected of the brown, crumbly material within the flow channels at the bottom of the manhole. Since the Phase I results indicated site remediation was needed, the Phase II portion of the confirmatory sampling design was not conducted.

4.3.20.3 Excavation Operations

Remedial action at the 100-H-28:4 pipeline subsite was performed between November 14, 2013, and March 25, 2014. The depth of the remediation ranged from approximately 0.9 to 3.7 m (3 to 12 ft) bgs resulting in approximately 1,630 BCM (2,132 BCY) of soil and debris removed for disposal at ERDF. The debris consisted primarily of 6 in. and 8 in. diameter VCP encased in concrete. The waste material was staged in a combined SPA, and has since been loaded out and disposed at ERDF. Overburden material was removed from above the pipeline and stockpiled along with overburden material from the 100-H-28:2 (Section 4.3.18), 100-H-28:3 (Section 4.3.19), and 100-H-28:5 subsites for use as clean backfill.

4.3.20.4 Verification Sampling

Focused verification soil samples were collected on November 18, 2013, and March 18 and 25, 2014, at locations where backfill was necessary to maintain safe access to the area. One decision unit was identified for the 100-H-28:4 subsite and consists of the excavation only. A combination statistical and focused sampling design was used to evaluate the waste site excavation. Twelve statistical verification soil samples were collected. Two focused samples were collected at separate locations where 100-H-28:4 pipeline segments crossed under established roadways. The pipelines were removed from the roadways and the areas were sampled, and the road crossing areas were backfilled. Two focused verification soil samples were collected from below a pipeline segment that could not be removed because of the proximity to a power pole support guy wire. A sample was collected of the soil below each end of the remaining segment of pipeline. The pipeline segment remains at this location.

All COPCs were quantified below direct exposure RAGs. All COPCs were quantified below groundwater and/or river protection soil RAGs except for lead, Aroclor-1260, and DDT. RESRAD modeling predicted that residual concentrations of these constituents will be protective of groundwater and the Columbia River.

4.3.20.5 Statement of Protectiveness

The results of verification sampling and modeling show that residual soil concentrations do not preclude any future uses (as bounded by the rural-residential scenario) and allow for unrestricted use of shallow zone soils (i.e., surface to 4.6 m [15 ft] deep). The results also demonstrate that residual contaminant concentrations are protective of groundwater and the Columbia River. Contamination above direct exposure levels was not observed in shallow zone soils and is concluded to not exist in deep zone soils;

therefore, institutional controls to prevent uncontrolled drilling or excavation into the deep zone soil are not required. The 100-H-28:4 site has been reclassified as "Interim Closed Out."

4.3.21 100-H-28:5, 1607-H2 Sanitary Sewer Pipelines

The 100-H-28:5, 1607-H2 Sanitary Sewer Pipelines were designed to receive sanitary waste from the 182H, 183H, and 190H water treatment facilities, the 184-H Boiler House, and 1700 series support buildings. The former 1700-series buildings serviced by the 100-H-28:5 sanitary sewers included a fueling station (1716H), paint shop (1722H), machine shop (1717H, 100-H-4 waste site, Section 4.3.3), first aid station (1719H), and administrative building (1704H). The pipelines discharged to the 1607-H2 Septic System.

No documentation of anomalous discharges to the sanitary sewers at these facilities has been located, but nonsanitary wastes may have been discharged to the sewers. Former Hanford personnel have stated that it should be assumed that any materials used in the 100-H Area (e.g., chemicals, oils) were discharged to the septic system. Additionally, sanitary facilities that formerly discharged to the 100-H-28:5 pipelines are stated to have been used for personnel decontamination.

The 1607-H2 septic system was remediated in 1999 by removing approximately 12,207 metric tons (13,456 US tons) of material, including piping, the septic tank, drain field, and suspect impacted soils. Analyses of samples collected from sludge within the septic tank detected several radionuclides (cesium-137, plutonium 239/240, uranium-233/234, uranium-235, and uranium-238) and metals (barium, cadmium, chromium, copper, lead, mercury, silver, and zinc) above soil background levels.

Due to geographic location and similarity of remediation activities, cleanup activities for the 100-H-28:3 (Section 4.3.19), 100-H-28:5, and 100-H-44 (Section 4.3.36) subsites were conducted together. For information regarding excavation, verification sampling, or the statement of protectiveness for the 100-H-28:5 site, refer to the 100-H-28:3 site (Section 4.3.19).

The 100-H-28:5 site has been reclassified as "Interim Closed Out."

4.3.22 100-H-28:6, 182-H Reservoir Sump Drains

4.3.22.1 Site Description

The 100-H-28:6 subsite consists of approximately 190 m (620 ft) of 8 in. VCP north of the 182H Reservoir. The pipeline is approximately 4.6 m (15 ft) bgs. The pipeline was installed during construction of the 182H Reservoir. The water that traveled through the pipeline originated directly from the Columbia River via the 181H Pumphouse, except for steam condensate. The pipeline returned water to the Columbia River from the 182-H Inlet House No. 1, a flow nozzle pit, and a valve chamber.

Cooling water for the 105H Reactor was drawn from the Columbia River through pumps in the 181H Pumphouse. Some of the water was pumped to the 182H Reservoir where it was stored prior to treatment. Use of the 182H Reservoir was discontinued in 1957, and raw water was supplied directly to the 183H water treatment facility. No chemical treatment was performed at the 182H Reservoir except for chlorination for algae control.

Informal surface tracking of the 100-H-28:6 pipeline subsite was performed on March 1, 2006. The outfall was the only related structure visible. The 181H Pumphouse was demolished and the 182H Reservoir backfilled. Any manholes associated with the pipeline that may exist were buried. The area contains an active groundwater pump and treat remediation system with numerous aboveground lines connecting the wells with the treatment facility. No other restrictive overhead or terrain features were observed.

4.3.22.2 Confirmatory Sampling

Confirmatory sampling activities at the 100-H-28:6 site were performed on September 2, 3, and 24, 2008. A focused sampling design was selected for confirmatory sampling based on drawings and process information. Two locations were specified for confirmatory sampling. The two locations were the former pipeline outfall and the junction box where the two short pipe runs meet.

During excavation and sampling, radiological field screening was performed. No radiological contamination was detected above background levels. Field screening for the presence of VOCs was also negative.

Residual concentrations of all detected site COPCs are below soil shallow zone soil RAGs, except for cadmium, chromium (total), copper, lead, and zinc, which exceed soil RAGs for the protection of groundwater and/or the Columbia River. RESRAD modeling predicted that residual concentrations of these constituents will be protective of groundwater and the Columbia River.

4.3.22.3 Statement of Protectiveness

The results of confirmatory sampling show that residual contaminant concentrations do not preclude any future uses (as bounded by the rural-residential scenario) and allow for unrestricted use of shallow zone soils (i.e., surface to 4.6 m [15 ft] deep). The results also demonstrate that residual contaminant concentrations are protective of groundwater and the Columbia River. Site contamination did not extend into the deep zone soils; therefore, institutional controls to prevent uncontrolled drilling or excavation into the deep zone are not required. The 100-H-28:6 site has been reclassified as “Interim No Action.”

4.3.23 100-H-28:7, Process Water Pipelines

4.3.23.1 Site Description

The 100-H-28:7 subsite consists of pipelines located between the former 183-H Filter Plant Pumphouse and the 182H Reservoir, 184-H Boiler House, 190H Pumphouse, and the 105H Reactor facilities. The 100-H-28:7 pipelines were used to supply treated water to these facilities. The 100-H-28:7 pipelines are approximately 1.8 to 3 m (6 to 10 ft) below existing grade. These steel pipelines consist of 6 in., 8 in., 10 in., 24 in., 30 in., and 36 in. pipes. The primary operational period for these pipelines coincides with the 105H Reactor and its support facilities, from 1949 to 1965.

4.3.23.2 Confirmatory Sampling

Confirmatory sampling of the 100-H-28:7 pipelines occurred over the period beginning September 3, 2008 and concluding on March 23, 2009. The pipelines were accessed and sampled via three test pits. The subject pipeline(s) were located at each of the prescribed test pits and accessed to obtain a sample of available pipe scale/rust. A soil sample from beneath each pipe was also collected. Suspect ACM (mastic on pipelines) was identified during field sampling and subsequently sampled and analyzed.

A 24 in. diameter pipe found in Test Pit 2 was an unknown pipeline not related to the 100-H-28:7 pipelines and has since been included as part of 100-H-35, 100-H Service Water Pipelines (Section 4.3.29). A french drain unrelated to the 100-H-28:7 pipelines was discovered in Test Pit 3 and has since been included as part of the 100-H-49:1, 184-H Boiler House and 1717-H Hot Shop French Drains subsite (Section 4.3.40).

Radionuclide COPCs were not detected in soil samples above background levels and those detected in scale inside of the pipelines (cesium-137, uranium-238, cobalt-60, and europium-152) are shown to meet the RAOs using a site-specific RESRAD evaluation. Of the constituents with elevated results in the pipe scale, only chromium, lead, benzo(a)pyrene, and benzo(k)fluoranthene were quantified above

groundwater and/or Columbia River protection RAGs in soil samples. RESRAD modeling predicted that residual concentrations of these constituents will be protective of groundwater and the Columbia River.

Confirmatory sampling of the soil underlying these pipelines determined that constituents inside the pipeline have not had an impact on the underlying soil. Arsenic, cobalt, and benzo(a)pyrene concentrations were present in rust/scale inside the pipeline exceeding direct exposure RAGs for soil, and additional metals (antimony, cadmium, chromium, copper, lead, manganese, mercury, molybdenum, nickel, silver, and zinc) were quantified in pipe scale at levels above groundwater and/or river protection RAGs for soil. The presence of these constituents in pipe scale at concentrations above soil RAGs does not present a risk that warrants remediation of the 100-H-28:7 pipelines.

4.3.23.3 Statement of Protectiveness

The confirmatory sampling results show that residual soil concentrations support future land uses that can be represented (or bounded) by a rural-residential scenario. The results also demonstrate that residual contaminant concentrations support unrestricted future use of shallow zone soil (i.e., surface to 4.6 m [15 ft]), and contaminant levels remaining in the soil are protective of groundwater and the Columbia River. The 100-H-28:7 subsite did not extend into the deep zone. Institutional controls to prevent uncontrolled drilling or excavation into the deep zone of the site are not required. The 100-H-28:7 site has been reclassified as “Interim No Action.”

4.3.24 100-H-28:8, 190-H Process Water Pipelines

4.3.24.1 Site Description

The 100-H-28:8 subsite consisted of four 24 in. diameter seamless welded steel pipelines located in two subsurface, reinforced concrete tunnels between the 190H and 105H facilities, as well as possible ancillary piping within the tunnels. These pipelines were used to provide final treated cooling water from the 190H Pumphouse to the 105H Reactor during operations from 1949 to 1965.

The 190H Pumphouse was demolished in 1977, and the tunnels between the 190H footprint and the 105H exclusion fence were excavated and collapsed in 1985. Piping in the tunnels north of the reactor exclusion fence was removed prior to demolition; no piping was observed south of the exclusion fence at the time of demolition activities. The remaining portions of the tunnels between the reactor block and the exclusion fence were excavated and removed during ISS activities for the 105H Reactor. Remaining portions of the tunnels and piping at the reactor block were sealed as part of ISS activities and will be addressed as part of closure of the reactor facilities (118-H-6 waste site).

The cooling water tunnels were sloped downwards toward the 190H Pumphouse; accordingly, any water entering the tunnel would accumulate at the pumphouse facility. There is no known record of any leaks occurring within the cooling water tunnels. Sampling of soils underlying the cooling water tunnels at the 105C Reactor where radioactive process water from the reactor backflowed into the tunnels-showed no residual hexavalent chromium or uranium (the sole COPC) above RAGs.

4.3.24.2 Statement of Protectiveness

The 100-H-28:8 subsite evaluation and supporting documentation demonstrate that the pipeline subsite meets the RAOs. The evaluation showed that there are no constituents present that pose a risk to human health and the environment at the subsite. Therefore, the current status of the subsite is protective of human health, groundwater, and the Columbia River and no institutional controls are required. The 100-H-28:8 site has been reclassified as “Interim No Action.”

4.3.25 100-H-30, 110-H Sanitary Sewer Trench

Due to geographic location and similarity of remediation activities, cleanup activities for the 100-H-30, 100-H-17 (Section 4.3.13), 100-H-2 (Section 4.4.1), and 116-H-2 (Section 4.3.57) sites were conducted together. These sites are collectively referred to as the 100-H-17 site. For additional information regarding the 100-H-30 site, refer to the 100-H-17 site (Section 4.3.13).

The 100-H-30 site has been reclassified as "Interim Closed Out."

4.3.26 100-H-31, Polychlorinated Biphenyl in Soil on North Side of 105-H Reactor Building

Due to geographic location and similarity of remediation activities, cleanup activities for the 100-H-31 site and six additional sites were conducted with remedial actions for the 118-H-6:2, 118-H-6:3, and 118-H-6:6 sites (Sections 4.3.63, 4.3.64, and 4.3.67, respectively). The 10 sites are collectively referred to as the 105H site. For additional information about the 100-H-31 site, refer to Section 4.3.63.

4.3.26.1 Site Description

The 100-H-31 waste site was a UPR of PCBs on the north side of the former 105H Reactor. The site was a gravel area near a former electrical substation with no visible oil stains or vegetation. Surface soil sampling was conducted at this site based on its location near an inactive electrical facility. Aroclor-1260 was detected at a concentration of 1.2 mg/kg in the soil near the former electrical substation.

4.3.26.2 Excavation Operations

Removal and disposal activities at the 105H site were completed in 2004. The surface contamination was removed, along with approximately 4.6 m (15 ft) of underlying soil and the west influent water tunnel (part of the 118-H-6:2 site). All soil generated during excavation activities was shipped to ERDF.

Sampling of soils underlying the 100-H-31 waste site was not performed; however, any residual contamination would be below 4.6 m (15 ft) where direct exposure RAGs would not apply. Any residual contamination would be protective of groundwater and the river based on RESRAD modeling.

4.3.26.3 Statement of Protectiveness

Evaluation of the waste site using RESRAD modeling indicates that residual contaminant concentrations do not preclude any future land uses (as bounded by a rural-residential scenario) and allow for unrestricted future use of shallow zone soils (i.e., surface to 4.6 m [15 ft]). The evaluation also shows that contaminant levels remaining in the soil are protective of groundwater and the Columbia River. This site does not have a deep zone; therefore, no deep zone institutional controls are required. The 100-H-31 site has been reclassified as "Interim Closed Out."

4.3.27 100-H-33, 183-H Solar Evaporation Basins Radionuclide Components

4.3.27.1 Site Description

The 100-H-33, 183-H Solar Evaporation Basins Radionuclide Components waste site is located north of the 105H Reactor and north of the eastern 183H Clearwell (126-H-2 waste site) within the former 183H Water Treatment Facility. Four of the former water treatment basins within the 183H facility were used for solar evaporation of liquid wastes from the 300 Area. These basins, identified as the 116-H-6 waste site (Section 4.5.15), were remediated and reclassified with a modified RCRA closure. There is no radiological posting associated with the backfilled basin.

As a part of the modified RCRA closure of the 116-H-6 waste site, four groundwater monitoring wells were put into place, three downgradient of the 183H Basins, and one upgradient. The 2010 results of the groundwater monitoring report show that technetium-99 and total uranium are present well under the

maximum contaminant level for each constituent. The combination of borehole results and groundwater sampling indicate that source removal has occurred and that residual radionuclide contamination warranting cleanup is not present in the deep vadose zone. Results of groundwater monitoring for technetium-99 and uranium show continued decline since monitoring began, indicating that residual contamination only remains in the groundwater and is slowly dissipating.

4.3.27.2 Statement of Protectiveness

Due to the presence of nonradiological contaminants at the same physical location as the 116-H-6 waste site, associated engineering and institutional controls have been identified. Institutional controls are required to be maintained to ensure that groundwater is not used as a drinking water or irrigation source. Because DOE will maintain control over this site for the foreseeable future and potentially until the groundwater is remediated, it is not anticipated that additional actions will be required to limit controls over groundwater usage. Should groundwater use restrictions be required after DOE relinquishment of the area, appropriate deed restrictions will be made. The 100-H-33 Solar Evaporation Basins Radionuclide Components site has been reclassified as “Interim No Action.”

4.3.28 100-H-34, 100H River Effluent Pipelines, 100H River Lines

The 100-H-34, 100-H River Effluent Pipelines site includes two 60 in. diameter steel river effluent pipelines that extend 229.5 m (753 linear feet) from the face of the 1904H outfall structure into the main channel of the Columbia River. The river pipelines were capped with concrete and left in place following the remediation of the 1904H Outfall in 2011. In 1998, the results of previous studies were reviewed to conclude the pipelines presented no risk to humans. No interim action was taken on this river effluent pipeline. The 100-H-34 site is classified as “Accepted.” This site will be addressed in the final action ROD.

4.3.29 100-H-35, 100-H Service Water Pipelines, 100-H Clean Water Pipelines

4.3.29.1 Site Description

The 100-H-35 waste site consists of the underground service water pipelines upstream of the 105H Reactor that carried water not treated with sodium dichromate. The service water pipelines are those that were used to transport raw water, sanitary water, and steam condensate.

4.3.29.2 Confirmatory Sampling

Confirmatory sampling of the 100-H-35 waste site occurred primarily in September and October 2010. One location was sampled during a 2008 sampling campaign; another was resampled in November 2010. A total of 11 test pits were excavated. A stratified sampling design with focused sampling of pipelines and underlying soil was used to evaluate the 100-H-35 waste site. Seven samples of underlying soil and four samples of pipeline contents (scale) were collected.

The analytical results indicated no residual concentrations in soil exceeding cleanup criteria, except for total chromium, lead, and zinc, which exceeded the soil RAGs for the protection of groundwater and/or the Columbia River. RESRAD modeling predicted that residual concentrations of these constituents will be protective of groundwater and the Columbia River.

4.3.29.3 Statement of Protectiveness

The results of confirmatory sampling show that residual contaminant concentrations do not preclude any future uses (as bounded by the rural-residential scenario) and allow for unrestricted use of shallow zone soils (i.e., surface to 4.6 m [15 ft] deep). The results also demonstrate that residual contaminant concentrations are protective of groundwater and the Columbia River. Site contamination did not extend

into the deep zone soils; therefore, institutional controls to prevent uncontrolled drilling or excavation into the deep zone are not required. The 100-H-35 site has been reclassified as "Interim No Action."

4.3.30 100-H-36, 1904-H Spillway, 116-H-5 Spillway, 100-H-34:1 Flume (Spillway) for the 116-H-5 Outfall Structure

The 100-H-36, 1904-H Spillway waste site was an emergency overflow spillway that served as an alternate discharge point for the 116-H-5 outfall structure (Section 4.3.60) in the 100-H Area of the Hanford Site. The spillway carried effluent overflow from the outfall structure to the shoreline of the river for release. It was planned to be used only if the river effluent pipelines were blocked, damaged, or undergoing maintenance. There is no corroborated physical or historical evidence that the spillway was ever used. The 100-H-36 site area was affected by the 116-H-5 site 2011 remedial excavation and 2013 backfilling activities. The 100-H-36 site is classified as "Accepted." This site will be addressed in the final action ROD.

4.3.31 100-H-38, Trenches and Pit Southwest of 105-H

4.3.31.1 Site Description

The 100-H-38 waste site is located within the 100-H Area of the Hanford Site, situated along a natural depression on the western boundary of the 100-H Area perimeter fence. It is located approximately 430 m (0.25 mi) southwest of the 105H Reactor. The 100-H-38 waste site is described as an area approximately 1.2 ha (3 ac) in size, marked by ground scars resembling trenches and pits. A large pit in the western portion of this waste site, first identified by an aerial photographic analysis of the 100-H Area, was later determined to have been a pre-Hanford gravel pit. The two apparent trenches just east of the gravel pit were associated with preconstruction site cleaning activities at the 100-H Area.

Prior to being acquired by the federal government in 1943, the land area of this waste site was occupied by a farmstead. A 1941 aerial photograph of the site shows the gravel pit and the farmstead with features resembling an orchard. Construction of the 100-H Area began in March 1948. The buildings of the homestead were still visible in an April 23, 1948, photograph of the area. It was in this photograph that the two apparent trenches first appeared in the available historical record, which suggests the trenches were built during preconstruction site leaning activities at the 100-H Area.

During construction of the 100-H Area, the 100-H-38 waste site was temporarily occupied with objects resembling a crane, building materials, and storage sheds that are visible on this tract of land in later aerial photographs.

4.3.31.2 Confirmatory Sampling

The sample design called for one test pit and two test trenches to be excavated to either a depth of 4.6 m (15 ft) or until native soil was encountered to locate radiologically and nonradiologically contaminated soil for confirmatory sampling. On June 14, 2013, four soil samples were collected from test pit and test trench locations. No elevated radiological or elevated VOCs readings were noted in the field.
No suspected ACM or other anomalous material was observed during confirmatory sampling. Accordingly, no further analysis for radiological contaminants, VOCs, or asbestos was required.

All COPCs from the 100-H-38 confirmatory sampling were quantified below their respective direct exposure RAGs. Groundwater and the Columbia River soil protection RAGs were exceeded by nickel at one sample location. RESRAD modeling predicted that residual concentrations of nickel will be protective of groundwater and the Columbia River.

4.3.31.3 Statement of Protectiveness

The results show that residual soil concentrations support future land uses that can be represented (or bounded) by a rural-residential scenario. The results also demonstrate that residual contaminant concentrations support unrestricted future use of shallow zone soil (i.e., surface to 4.6 m [15 ft]) and that contaminant levels remaining in the soil are protective of groundwater and the Columbia River. Contamination above direct exposure levels was not observed in the shallow zone soils and is concluded to not exist in deep zone soils. Therefore, institutional controls to prevent uncontrolled drilling or excavation into the deep zone of the site are not required. The 100-H-38 site has been reclassified as "No Interim Action."

4.3.32 100-H-40, 100H Disposal Pit

4.3.32.1 Site Description

The 100-H-40, 100-H Disposal Pit waste site is an area containing debris pits and surface debris that was reportedly used for the disposal of maintenance shop waste between 1949 and 1950. The 100-H-40 site is located southeast of the 118-H-1 Burial Ground (Section 4.4.4) between an access road and railroad tracks. The site is triangular with each of the three sides measuring approximately 200 m (660 ft) in length.

The site was identified from information provided during an interview with a former employee that was conducted in 1990. The employee worked in the 100-H Area between 1949 and 1950 during the last 6 months of construction and the first year of 105H Reactor operations following startup. He observed the disposal of wastes from the 1700H Buildings in a pit or cluster of pits west of a central access road. The employee stated during the interview that the waste was covered with dirt after disposal.

4.3.32.2 Confirmatory Sampling

A 20 by 30 m (66 by 98 ft) disturbed area displayed an elevated metallic response typical of a disposal pit containing metallic debris. The coordinates of the three subsurface electromagnetic point anomalies within this disturbed area were selected as test pit locations. The remainder of the 20 m by 30 m (66 by 98 ft) disturbed area showed an elevated metallic response due to surface debris, but not subsurface anomalies. Five electromagnetic point anomalies that did not correlate to metallic surface debris and were consistent with an individual target (i.e., not a disposal pit) were also mapped within the survey area. This sample design included focused sampling of anomalous debris/media and subsurface soil at the suspected disposal pit locations.

Confirmatory sampling activities at the 100-H-40 site were performed from October 27 to 29, 2009. The eight locations with indications of geophysical anomalies were excavated and sampled to investigate for potential buried maintenance shop debris. Excavations at all but one of the locations unearthed small pieces of metallic surface debris and transite siding, then native soil, or small volumes of debris at shallow depths.

At one test pit location, materials observed within the excavation were consistent with the burial of a demolished building. Debris included concrete sections ranging in size from 3 to 4 m (10 to 12 ft), wood, nails, and wire. VCP, transite siding, and roofing materials were also identified within the excavation. The pit extended to a depth of approximately 2.7 m (9 ft), at which point no further material was observed. A sample of the soil in contact with the debris was collected. The excavation continued to a depth of approximately 3 m (10 ft) to access native soil below the debris.

Evaluation of the results from confirmatory sampling at the 100-H-40 waste site indicates that residual concentrations of all site COPCs are below soil RAGs, except for copper, lead, zinc, benzo(a)anthracene,

benzo(a)pyrene, and benzo(b)fluoranthene. Residual concentrations of these contaminants exceed the soil RAGs for the protection of groundwater and/or the Columbia River. RESRAD modeling predicted that residual concentrations of these constituents will be protective of groundwater and the Columbia River.

4.3.32.3 Statement of Protectiveness

The results of confirmatory sampling show that residual contaminant concentrations do not preclude any future uses (as bounded by the rural-residential scenario) and allow for unrestricted use of shallow zone soils (i.e., surface to 4.6 m [15 ft] deep). The results also demonstrate that residual contaminant concentrations are protective of groundwater and the Columbia River. Site contamination did not extend into the deep zone soils; therefore, institutional controls to prevent uncontrolled drilling or excavation into the deep zone are not required. The 100-H-40 site has been reclassified as "Interim No Action."

4.3.33 100-H-41, 100-H Contaminated Area

4.3.33.1 Site Description

The 100-H-41, 100-H Contaminated Area (CA) waste site is a posted radiological CA. A 14 in. diameter, vertically oriented, concrete pipe was present within the posted CA. It was suspected that the 35.6 cm (14 in.) concrete structure may have been associated with underground pipelines. The basis for the radiological posting of the site as a contamination area was unknown; however, it was thought that the posting may have been associated with the spread of mud dauber contamination that was prevalent in the surrounding area.

4.3.33.2 Confirmatory Sampling

On November 10, 2009, confirmatory sampling of the 100-H-41 waste site was initiated. Prior to performing the excavation, a radiological survey of the surface soil was performed with no radiological contamination detected above background. As the excavation proceeded, plastic sheeting was noted approximately 15 cm (6 in.) below the ground surface, holding the soil above it from entering the pipe. The pipe was empty below the plastic to a depth of approximately 0.9 m (3 ft). Mud dauber nests were found on the inside of the pipe. Field radiological surveys of the nests identified up to 450,000 dpm beta-gamma contamination on the nests.

Because the contamination was determined to be due to the presence of mud dauber nests, it was determined that the contamination was more appropriately identified as part of the 100-H-37 Mud Dauber Contamination Area waste site (Section 4.4.2). Therefore, on November 12, 2009, the Field Remediation project excavated and removed the contaminated materials, including the pipe and soil, for disposal at ERDF as part of the ongoing 100-H-37 remediation effort.

On November 23, 2009, after removal of the pipe and soil containing the mud dauber contamination, a confirmatory sample of the soil from the excavated area was collected at a depth of 1.8 m (6 ft). Results of confirmatory sampling analyses show that residual soil concentrations of contaminants comply with the RAOs and RAGs for the 100-H-41 waste site.

4.3.33.3 Statement of Protectiveness

The results of confirmatory sampling show that residual contaminant concentrations do not preclude any future uses (as bounded by the rural-residential scenario) and allow for unrestricted use of shallow zone soils (i.e., surface to 4.6 m [15 ft] deep). The results also demonstrate that residual contaminant concentrations are protective of groundwater and the Columbia River. The site does not have a deep zone or residual contaminant concentrations that would require any institutional controls. The 100-H-41 site has been reclassified as "Interim Closed Out."

4.3.34 100-H-42, 1906-H Drainage Lift Station

4.3.34.1 Site Description

The 100-H-42 waste site includes the 1906-H Drainage Lift Station, the 1908-H Effluent Monitoring Station, and associated pipelines connecting these facilities to the former 1904-H Outfall Structure (116-H-5, Section 4.3.60).

The 1906H process sewer/drainage lift station was designated and built to receive nonradioactive process sewer discharges (primarily floor drains) from buildings in the 100-H Area. Influent to the facility came through a 72 in. diameter RCP (100-H-28:2 subsite, Section 4.3.17) and was received in an underground reinforced concrete reservoir before being pumped to the 1904-H Outfall Structure. Three pumps, switch gear, and controls were housed in a one-story concrete block building over a portion of the reservoir. Effluent from the underground reservoir was conveyed to the 1904-H Outfall Structure via the 72 in. diameter RCP that was part of the 100-H-42 waste site.

The 100-H-42 waste site facilities operated from 1949 to 1965, the operational period of the H Reactor. In 1974, the abovegrade portion of the 1906H facility was demolished into the belowgrade reservoir and the site was backfilled with clean soil. The demolition report provides no information regarding contamination or possible hazardous material remaining in the structure at the time of demolition.

The 1908-H Effluent Monitoring Station was designed and built to provide a means of continuous monitoring and sampling of cooling water effluent that was being discharged to the river via the 1904-H Outfall Structure. The building had a 36,400 L (10,000 gal) open-topped monitoring tank. The tank was fed by a 6 in. diameter line from pumps in the 1904-H Outfall Structure. The tank drained back to the outfall through an 8 in. diameter line. The 100-H-42 site includes these two pipelines. In 1974, the 1908-H Effluent Monitoring Station was demolished and all materials were sent to the 200 Area for burial. No information is available on the status of the building foundation or potential residual contamination from operation of the facility.

Portions of the 100-H-42 waste site pipelines were removed during remediation of the 116-H-5, 1904-H Outfall Structure.

4.3.34.2 Excavation Operations

Remediation at the 100-H-42 waste site began in October 2013 and was completed on March 3, 2014. The waste from this site included reinforced concrete, steel pipe, asphalt, soil, and miscellaneous demolition debris from the large subsurface structure associated with the 1906-H Drainage Lift Station. Approximately 5,200 BCM (6,801 BCY) of contaminated material was removed from the 100-H-42 excavation and staged at SPA locations for disposal at ERDF. The 100-H-42 waste site was excavated to an approximate depth of 9 m (29.5 ft) bgs.

A large concrete monolith remains at the bottom of the 100-H-42 excavation and likely protrudes to groundwater. The concrete monolith was inspected for staining; no staining was identified on the concrete surface. In accordance with regulatory agreement, the concrete monolith will be left in place.

Approximately 24,000 BCM (31,390 BCY) of overburden material was excavated from the 100-H-42 waste site and stockpiled at two designated areas. Overburden material removed from the 100-H-28:2 (Section 4.3.18), 100-H-28:3 (Section 4.3.19), 100-H-28:4 (Section 4.3.20), and 100-H-28:5 (Section 4.3.21) pipeline sites was also stockpiled at these two overburden stockpiles.

4.3.34.3 Verification Sampling

Verification samples were collected from the 100-H-28:2 and 100-H-42 excavations, associated overburden piles, and waste SPAs on November 18, 2013; February 26, 2014; December 10, 12, and 15, 2014; February 26, 2015; March 16, 2015; and April 2, 2015. Four decision units were identified for the 100-H-28:2 subsite and the 100-H-42 waste site. Specifically, the 100-H-28:2 excavation, the 100-H-42 excavation, the waste SPAs, and the overburden stockpiles. A combination statistical and focused sampling design was used to evaluate the 100-H-28:2 pipeline subsite. Statistical designs were used to evaluate the 100-H-42 waste site, the waste SPAs, and the overburden soil stockpiles. Twelve statistical verification soil samples were collected from each of the decision units. All samples were grab samples collected at the predetermined coordinates.

All COPCs were quantified below direct exposure RAGs. All COPCs were quantified below groundwater and/or river protection soil RAGs except for chromium (total), lead, mercury, Aroclor-1254, Aroclor-1260, DDE, benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, and benzo(k)fluoranthene. RESRAD modeling predicted that residual concentrations of these constituents will be protective of groundwater and the Columbia River.

4.3.34.4 Statement of Protectiveness

The verification sample results show that residual soil concentrations support future land uses that can be represented (or bounded) by a rural-residential scenario. The results also demonstrate that residual contaminant concentrations support unrestricted future use of shallow zone soil (i.e., surface to 4.6 m [15 ft]) and that contaminant levels remaining in the soil are protective of groundwater and the Columbia River. Although the maximum depth of the excavation extended into the deep zone (i.e., greater than 4.6 m [15 ft] bgs), the waste site was evaluated against the shallow zone criteria. Contamination above direct exposure levels was not observed in the verification soil samples collected from the excavations; therefore, institutional controls to prevent uncontrolled drilling or excavation into the deep zone soil are not required. The 100-H-42 site has been reclassified as “Interim Closed Out.”

4.3.35 100-H-43, 1716-H Maintenance Garage, Repair Shop

4.3.35.1 Site Description

The 100-H-43 waste site consisted of the belowgrade remnants of the 1716-H Maintenance Garage. The waste site included a lubrication pit, a waste oil tank, floor drains, underground piping, and two french drains that may have received drainage waste from the facility. The 1716-H Maintenance Garage was built during construction of the 100-H Area reactor and ancillary facilities from 1948 to 1949 to service area vehicles.

The original building was a one-story, wood-frame structure with an area of 660 m^2 (7,100 ft^2). The building included a tire shop, battery room, compressor oil storage room, and vehicle service area. At some point during its operation about half of the building was converted to shops for maintenance, calibration, and repair of electrical and electronic instruments. There were also underground fuel storage tanks and a fuel pump island at the site that were within the adjacent 100-H-3, 1716-H Garage Fuel Tanks Site. The 100-H-3 waste site was remediated in 2009 and interim closed out in 2011. The 1716H Building was demolished and the site leveled in 1974.

4.3.35.2 Confirmatory Sampling

The 100-H-43 waste site shared design details, namely the lubrication pit, with the 100-F-49, 1716-F Maintenance Garage Lubrication Pit waste site. The 1716F facility also served the same operational purpose during the same general time period as the 1716H facility. Confirmatory sampling results from the 100-F-49, 1716F Maintenance Garage Lubrication Pit waste site exceeded direct exposure RAGs for

lead and PCBs, and groundwater and/or river protection RAGs for multiple metals, SVOCs, pesticides, and TPHs. Friable asbestos was also identified in wire insulation at the 100-F-49 waste site. Due to the 100-F-49 confirmatory sampling results, it was considered likely that sampling results from the 100-H-43 waste site would also exceed RAGs. Therefore, the 100-H-43 site was recommended for RTD dispose without confirmatory sampling.

4.3.35.3 Excavation Operations

Remedial action at the 100-H-43 waste site began on March 3, 2014, and was completed on March 10, 2014. All components of the waste site have been removed. Approximately 1,500 BCM (1,960 BCY) of contaminated soil and debris was removed and staged at a SPA pending loadout and disposal. The waste from the site included soil and debris consisting of concrete, asphalt, steel piping, and miscellaneous demolition type debris (e.g., rebar, wood). An additional 358 BCM (468 BCY) of soil was removed from the excavation on September 18 and 19, 2014. The excavation extended to a maximum depth of approximately 2.7 m (9 ft) bgs. The SPA had previously received waste from the 100-H-46 waste site. Waste staging from the 100-H-43 waste site began on March 3, 2014. Additionally, waste from the 100-H-49:1, 100-H-51:1, and 100-H-51:6 waste sites was added to this SPA. Waste loadout of the SPA with disposal at ERDF was conducted in July 2014. All material removed from the 100-H-43 waste site was disposed at ERDF; therefore, no overburden material was stockpiled for use as backfill. No anomalies were discovered during remediation.

4.3.35.4 Verification Sampling

Verification soil sampling was conducted from August 18 to 20, 2014. Two decision units were identified for the 100-H-43 waste site; specifically, the excavation and the SPA. The areas identified for statistical verification sampling were used as the basis for a random-start systematic grid for verification soil sample collection at the site. Twelve statistical soil samples were collected from each decision unit, and four focused samples were collected from the excavation. The focused sample locations were the former locations of the two french drains, the waste oil tank, and the lubrication pit.

Benzo(a)pyrene and arsenic were detected above direct exposure RAGs; therefore, additional remediation was conducted on September 18 and 19, 2014. Verification replacement samples were collected on September 22, 2014.

All COPCs were quantified below direct exposure RAGs. All COPCs were quantified below groundwater and/or river protection except for lead, benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, DDE, DDT, and dieldrin. RESRAD modeling predicted that residual concentrations of these constituents will be protective of groundwater and the Columbia River.

4.3.35.5 Statement of Protectiveness

The verification sampling results show that residual soil concentrations support future land uses that can be represented (or bounded) by a rural-residential scenario. The results also demonstrate that residual contaminant concentrations support unrestricted future use of shallow zone soil (i.e., surface to 4.6 m [15 ft]) and that contaminant levels remaining in the soil are protective of groundwater and the Columbia River. Contamination above direct exposure levels was not observed in shallow zone soils and is concluded to not exist in deep zone soils; therefore, institutional controls to prevent uncontrolled drilling or excavation into the deep zone soil are not required. The 100-H-43 site has been reclassified as “Interim Closed Out.”

4.3.36 100-H-44, 183-H Neutralization Pit

The 100-H-44, 183-H Neutralization Pit waste site included a concrete pit and trench, acid resistant brick, the acid pump foundation, piping, two french drains, and a steam trap. The neutralization pit received sulfuric acid from two storage tanks and one acid head tank, and lime slurry from the 183-H Head House. The neutralization pit served as a structure to treat spilled chemicals and excess concentrated sulfuric acid (from acid tank cleanouts) prior to disposal through the 100-H-28:3 pipelines (Section 4.3.19).
The pipelines were contained in a concrete trench extending from the acid head tank to the neutralization pit and then to the west wall of the 183-H Head House. One 12 in. french drain was located adjacent to the covered car spot and a second french drain received steam condensate. A steam trap was located between the silica tank and the 183-H Head House and was the termination point for a silica tank condensate pipeline. The french drain and steam trap both supported the silica tank.

In 1974, the 183-H Filter Plant and other facilities in the vicinity of the 100-H-44 site were demolished and backfilled to grade. The neutralization pit and aboveground features were likely removed during the 1974 demolition while belowgrade features (french drains, piping, trench, and acid pump foundation) remained at the site.

Due to geographic location and similarity of remediation activities, cleanup activities for the 100-H-28:3, 100-H-28:5 (Section 4.3.21), and 100-H-44 waste subsites were conducted together. For information regarding excavation, verification sampling, or the statement of protectiveness for the 100-H-44 site, refer to the 100-H-28:3 site (Section 4.3.19).

The 100-H-44 site has been reclassified as “Interim Closed Out.”

4.3.37 100-H-45, 1717-H UST, Underground Propane Tank

4.3.37.1 Site Description

The 100-H-45 Underground Propane Tank waste site is described as a suspected UST. The waste site is located near the northeastern comer of the 1717H Building, which housed a machine shop, sheet metal shop, fabrication shop, and carpenter shop that provided services for all of the 100 Area operations.
An orphan sites investigation identified the location of the suspected UST. A geophysical survey of the site indicated the presence of metallic and linear anomalies but no targets consistent with the presence of a buried tank.

4.3.37.2 Confirmatory Sampling

A geophysical survey was performed at the 100-H-45 waste site in May 2009 with the objective of detecting a potential underground propane tank. The surrounding area of the 100-H-45 waste site contains superficial metal that may account for the elevated metallic response; however, the differential response is not typical of a buried tank. GPR identified small point reflectors at a depth of 1 m (3.3 ft) but no targets consistent with a buried tank. Several linear anomalies were identified on the eastern side of the 1717H Building, and one electromagnetic target was identified on the eastern side of the 1722H Building. None of these metallic anomalies are characteristic of a UST.

The lateral extent of the excavation for confirmatory sampling was determined based on the geophysical survey, historical information, process knowledge, and site visit observations that defined a distinct boundary. Soil was removed down to 2.4 m (8 ft), a level that was determined to be undisturbed native soil based on soil density and sediment composition. No elevated radiological or organic vapor monitor readings were observed; no stained soil was observed, and all removed soil was returned to the excavation. Confirmatory sampling for the 100-H-45 waste site was performed on November 10, 2009. One test pit was excavated. One sample was collected from the test pit.

The results of confirmatory sampling analyses show that residual soil concentrations of contaminants meet the RAOs and RAGs for the 100-H-45 site.

4.3.37.3 Statement of Protectiveness

The results of confirmatory sampling show that residual contaminant concentrations do not preclude any future uses (as bounded by the rural-residential scenario) and allow for unrestricted use of shallow zone soils (i.e., surface to 4.6 m [15 ft] deep). The results also demonstrate that residual contaminant concentrations are protective of groundwater and the Columbia River. The site does not have a deep zone or residual contaminant concentrations that would require any institutional controls. The 100-H-45 site has been reclassified as "Interim No Action."

4.3.38 100-H-46, 190-H Potential Contaminated Soil

4.3.38.1 Site Description

The 100-H-46, 190-H Potential Contaminated Soil waste site, was part of the former 190-H Main Process Pump House. The site consisted of several locations along the northern and western sections of the former 190H Building where sodium dichromate was handled, mixed, and injected into the 105H Reactor process cooling water system.

The 190H complex was a process water pump house that supplied the 105H Reactor with nonradioactive cooling water. A 15% sodium dichromate solution was prepared by adding dry crystalline sodium dichromate to filtered water. The solution was injected into reactor cooling water piping as an anticorrosive agent for the aluminum process tubes in the reactor. This piping fed to four process water storage tanks within the 190-H Facility. Spills and leaks of sodium dichromate from the mixing, injection, and drain line systems are believed to have caused accumulation of sodium dichromate contamination in the vadose zone of the 100-H-46 waste site.

In 1977, the 190H Building was demolished and the debris buried in the 183H clearwells. In 1986, the pipe tunnels between the 190H facility and the 105H Reactor were uncovered and filled to grade with clean soil after removing the pipelines.

4.3.38.2 Confirmatory Sampling

Because historical knowledge of the 190H Building demolition in 1977 did not include the condition of the belowgrade portion of the pumphouse, several locations were identified on and below the ground floor as possible worst-case locations for confirmatory sampling. The locations selected for sampling included the soil between the former loading dock and railroad tracks (Test Pit 1), the suspected drain connection for the sodium dichromate overflow pipe (Test Pit 2), and tank drain sumps (Test Pits 3 through 6). On November 23, 2009, excavation was started on Test Pit 6. On December 1, 2009, the excavation and sampling crew completed excavations at Test Pits 4, 5, and 6. No samples were taken at Test Pits 4, 5, and 6 due to a lack of appropriate available sample material. On December 2, 2009, Test Pits 1 and 2 were excavated and sampled. On December 10, 2009, pipe scale in Test Pit 3 was collected. Ten samples were taken from Test Pits 1, 2, and 3. Portions of the 100-H-46 site at Test Pits 1 and 3 failed direct exposure RAGs for three analytes. Additionally, asbestos was detected in a sample from Test Pit 2.

4.3.38.3 Excavation Operations

Remedial action at the 100-H-46 waste site began on February 5, 2013, and continued through July 16, 2013. Waste removed from the site included concrete and demolition debris, steel pipe, steel rebar, and chromium-contaminated soil. The original design included removal of material to a depth of approximately 3 m (10 ft) bgs. However, green-stained concrete with concentrations of hexavalent chromium greater than RAGs was discovered in March 2013. The concrete originated from the western

portion of the remediation. Several test pits were excavated with in-process samples collected as deep as 5.5 m (18 ft) below the original surface grade. Due to the discovery of green-stained concrete and the test pit results, the remedial design was changed to allow removal of additional hexavalent chromium-contaminated material in the western portion of the former 190H Building. The updated 100-H-46 design conservatively allowed for remediation to the depth of groundwater in the area with hexavalent chromium contamination.

Due to the increased remediation depth, additional overburden/layback material was removed and staged in a pile to the west of the remediation. The clean overburden pile contained approximately 62,000 BCM (81,100 BCY) of soil.

As remediation progressed, in-process samples were collected to measure hexavalent chromium and chromium (total) concentrations in 1.5 m (5 ft) depth intervals A sample collected May 16, 2013, from the southwestern corner of the excavation indicated hexavalent chromium concentrations in excess of RAGs extended past the design boundary. The remedial design was then expanded to allow additional removal of material in the southwest area of the excavation.

Remediation in the western portion of the waste site extended to the periodically rewetted zone at a depth of 12.5 m (41 ft) bgs, effectively removing all of the vadose zone soil in this area. In-process sampling of the sidewalls surrounding the excavation floor in the periodically rewetted zone indicated that the concentration of hexavalent chromium in the remaining soil was less than RAGs.

During remediation, the portion of the 190H Building foundation within the 100-H-46 boundary was removed in its entirety. All 100-H-46 confirmatory sampling locations were removed in their entirety. The only remaining portion of the 190H Building foundation that remains lies outside of the 100-H-46 waste site boundary, along the southeast edge of the former building.

In total, approximately 61,300 BCM (80,200 BCY) of contaminated soil and debris was removed and staged at multiple SPAs pending loadout and disposal. The SPAs received waste beginning February 5, 2013.

During remediation, a previously unidentified french drain was discovered. The base of the french drain extended to approximately 4.6 m (15 ft) bgs. Red-stained soil and rock were present in the french drain and were sampled. The hexavalent chromium concentration in the sample slightly exceeded direct exposure and river protection RAGs. The french drain location was within the area of the site in which the vadose zone was removed during remedial action. No other anomalies were discovered.

4.3.38.4 Verification Sampling

A total of three decision units were identified for statistical verification sampling. The 100-H-46 excavation area was divided into two decision units (Decision Units 1 and 2). Decision Unit 3 was the overburden pile. Sampling of Decision Units 1 and 2 was performed on December 13, 2013, and January 6, 2014. Sampling of the overburden was conducted on August 19, 2013.The areas identified for statistical verification sampling were used as the basis for a random-start systematic grid for verification soil sample collection at the site. Twelve statistical soil samples were collected on the grid within each of the three decision units. Decision Unit 1 included areas within the excavation boundary that are above the lower tier bench and within the 100-H-46 site boundary and former 190H Building footprint.

Decision Unit 2 included the excavation area from a depth of approximately 9.5 m (31.2 ft) bgs to 11.5 m (37.7 ft) bgs, just above the floor of the deepest excavated area and the groundwater rewetted zone. The floor of the excavation below 11.5 m (37.7 ft) bgs and within the rewetted zone was not included for cleanup verification sampling.

All COPCs from the 100-H-46 waste site were quantified below direct exposure RAGs. All COPCs were quantified below groundwater and/or river protection soil RAGs except for copper in Decision Unit 1. Lead was detected at greater than twice the cleanup level at a single sample location. RESRAD modeling predicted that residual concentrations of copper and lead will be protective of groundwater and the Columbia River.

4.3.38.5 Statement of Protectiveness

These results show that residual soil concentrations support future land uses that can be represented (or bounded) by a rural-residential scenario. The results also demonstrate that residual contaminant concentrations support unrestricted future use of shallow zone soil (i.e., surface to 4.6 m [15 ft]) and that contaminant levels remaining in the soil are protective of groundwater and the Columbia River. Contamination from the 100-H-46 waste site that extended into the deep zone has been removed through removal of the vadose zone; therefore, institutional controls to prevent uncontrolled drilling or excavation into the deep zone of the site are not required. The 100-H-46 site has been reclassified as "Interim Closed Out."

4.3.39 100-H-48, 184-HA Underground Fuel Oil Tanks Associated Piping

Due to geographic location and similarity of remediation activities, cleanup activities for the 100-H-48 and the 100-H-52 waste sites were conducted together. Subsection 4.1.39.1 includes information specific to the 100-H-48 site. The remaining subsections refer to both the 100-H-48 and 100-H-52 sites. For a site description of 100-H-52, refer to Section 4.3.49.

4.3.39.1 Site Description

The 100-H-48, 184-HA Underground Fuel Oil Tanks Associated Piping waste site is located south of the former 184-HA, Auxiliary Boiler Facility location and southeast of the former 190-HA Annex.
The 100-H-48 site was believed to consist of remaining fuel oil piping for two 46,000 L (12,000 gal) fuel oil USTs that were removed in 1974. The amount of piping left in place was unknown prior to confirmatory sampling activities. The 100-H-48 pipelines provided fuel oil supply and fuel oil return between a pump pit on the southern side of the 184-HA Auxiliary Boiler Facility to two USTs.

4.3.39.2 Confirmatory Sampling

Confirmatory sampling of the 100-H-48 and 100-H-52 waste sites was conducted on November 3 and November 9, 2009. Confirmatory samples were collected for the 100-H-48 waste site from soils underneath one pipeline location. Confirmatory samples were collected for the 100-H-52 waste site from material within the pipeline as well as from soils beneath the pipeline at two locations. Confirmatory sampling results for the 100-H-48 waste site failed to meet RAGs for PCBs. Confirmatory sampling results for the 100-H-52 waste site failed to meet RAGs for various metals, PAHs, and PCBs. Based upon these results, both the 100-H-48 and 100-H-52 waste sites were recommended for remedial action.
No elevated radioactivity was detected during excavation or sampling activities. Additionally, no suspect ACM or suspect hazardous debris or other anomalous media unrelated to the 100-H-48 or 100-H-52 waste sites was observed.

4.3.39.3 Excavation Operations

Remediation of the combined 100-H-48 and 100-H-52 waste sites was performed from July 25, 2013, through July 29, 2013 to a depth of approximately 4.6 m (15 ft). A combined volume of approximately 1,576 BCM (2,061 BCY) of contaminated soil and debris was excavated and stockpiled for disposal at ERDF. Debris waste included piping associated with the former underground fuel tanks and piping associated with the 100-H-52 drain field. Other concrete and steel debris was encountered at the former

underground tank location. During remediation, field screening for VOCs was conducted and no elevated readings were detected. All waste material was stockpiled, prior to shipment and disposal at ERDF.

One pipe segment was observed at the south edge of the excavation. This pipe section is included in the 100-H-35 waste site (Section 4.3.29). No anomalous material was observed during excavation activities.

4.3.39.4 Verification Sampling

Statistical verification sampling was conducted at the 100-H-48 and 100-H-52 waste sites on September 3, 2013. The combined waste sites consist of one decision unit for verification sampling: the excavation. Twelve statistical verification soil samples were collected on the grid within the decision unit at the 100-H-48 and 100-H-52 waste sites.

Evaluation of the results from the verification sampling at the 100-H-48 and 100-H-52 waste sites indicate that all COPCs were undetected and/or quantified below RAGs and lookup values, except for lead, benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene, chrysene, dibenz(a,h)anthracene, fluoranthene, indeno(1,2,3-cd)pyrene, Aroclor-1254, Aroclor-1260, and total PCBs. All PAH direct exposure exceedances are attributed to cross-contamination from asphaltic material and are not considered in evaluation of direct exposure soil RAGs. RESRAD modeling predicted that residual concentrations of these constituents will be protective of groundwater and the Columbia River.

4.3.39.5 Statement of Protectiveness

The verification sample results show that residual contaminant concentrations do not preclude any future uses (as bounded by the rural-residential scenario) and allow for unrestricted use of shallow zone soils (i.e., surface to 4.6 m [15 ft] deep). The results also demonstrate that residual contaminant concentrations are protective of groundwater and the Columbia River. Based on verification sampling and/or modeling, site contamination is not expected to extend into the deep zone soils; therefore, institutional controls to prevent uncontrolled drilling or excavation into the deep zone are not required. The 100-H-48 and 100-H-52 sites have been reclassified as “Interim Closed Out.”

4.3.40 100-H-49:1, 184-H Boiler House and 1717-H Hot Shop French Drains

4.3.40.1 Site Description

The 100-H-49:1, 184-H Boiler House and 1717-H Hot Shop French Drains subsite consisted of four french drains, the underlying soil, and their associated belowgrade piping components. The first french drain consisted of a 36 in. diameter french drain with an 11 m (36 ft) long, 4 in. diameter steam condensate drain line from the 184-H Boiler House Reclaiming Hopper. The second consisted of a 24 in. diameter french drain with a 7.2 m (24 ft) long, 4 in. diameter VCP steam condensate drain line to the 184-H Boiler House Transfer House. The third consisted of a 36 in. diameter french drain with a 5.2 m (17 ft) long pipeline and an 11 m (36 ft) long pipeline. Each pipeline was a 3 in. diameter heating/steam return line to the west side of the 1717-H Hot Shop. The last french drain was discovered along the edge of a test pit that was excavated in support of the 100-H-28:7 confirmatory sampling (Section 4.3.23) and consisted of a 36 in. diameter vitrified clay french drain.

4.3.40.2 Confirmatory Sampling

Confirmatory sampling was performed at the 100-H-28:7 test pit location on March 23, 2009 and at the 100H-49:1 subsite french drains on October 4 and 11, 2010. An evaluation of the confirmatory sample results shows that RAGs were exceeded for motor oil, arsenic, lead, diesel oil, and benzo(a)pyrene. Additionally, antimony, arsenic, barium, cadmium, chromium, copper, lead, mercury, molybdenum, nickel, zinc, benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene, chrysene, dibenz(a,h,)anthracene, indeno(1,2,3-cd)pyrene, beta-BHC, DDD, DDE, DDT, dieldrin, endosulfan I,

endrin, gamma-chlordane, Aroclor-1254, and Aroclor-1260 failed groundwater and/or river protection RAGs at one or more of the sample locations.

4.3.40.3 Excavation Operations

Remedial action at the 100-H-49:1 subsite was conducted from May 7 through May 20, 2014. All the french drains except for the 100-H-28:7 french drain were excavated to approximately 2.7 m (9 ft) bgs. Because of its proximity to an adjacent utility pole, the 100-H-28:7 french drain was excavated to approximately 1.8 m (6 ft) bgs. A total of approximately 170 BCM (222 BCY) of soil and debris were removed from the excavations. The debris consisted of rock, concrete, and various types of pipe. Coal ash was present on the ground surface near two french drains. All four french drains are in close proximity to asphalt roadways. No in-process soil samples were collected. Waste material from the 100-H-49:1 subsite was staged in a SPA prior to loadout. Waste loadout of the SPA with disposal at ERDF was conducted in July 2014. No anomalies were discovered during remediation.

4.3.40.4 Verification Sampling

Verification soil sampling was conducted on August 25, 2014. A focused sample design was used to evaluate the 100-H-49:1 subsite excavations. One discrete grab soil sample was collected from each of the excavated areas at the location where confirmatory samples were collected and failed direct exposure RAGs for one or more contaminants. Because the confirmatory sampling location for the 100-H-28:7 test pit is positioned near the edge of the excavation boundary, an additional focused sample was collected from the approximate center of the excavation to provide sufficient sample coverage of the french drain components.

All COPCs were quantified below direct exposure RAGs. All COPCs were quantified below groundwater and/or river protection soil RAGs except for copper, lead, benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene, chrysene, Aroclor-1260, and DDE. RESRAD modeling predicted that residual concentrations of these constituents will be protective of groundwater and the Columbia River.

4.3.40.5 Statement of Protectiveness

The analytical results indicate that that residual soil concentrations support future land uses that can be represented (or bounded) by a rural-residential scenario. The results also demonstrate that residual contaminant concentrations support unrestricted future use of shallow zone soil (i.e., surface to 4.6 m [15 ft]) and that contaminant levels remaining in the soil are protective of groundwater and the Columbia River. Contamination above direct exposure levels was not observed in shallow zone soils and is concluded to not exist in deep zone soils; therefore, institutional controls to prevent uncontrolled drilling or excavation into the deep zone soil are not required. The 100-H-49:1 subsite has been reclassified as “Interim Closed Out.”

4.3.41 100-H-49:2, 119-H, 181-H, and 183-H French Drains

4.3.41.1 Site Description

The 100-H-49:2, 119H, 181H, 184H, and 183-H French Drains subsite is part of the 100-H-49, Potentially Contaminated French Drains waste site. The 100-H-49:2 subsite includes seven individual french drains and piping that are associated with the 119H Sample Building, 181-H Battery Room, and 184-H Boiler House. In addition, two estimated french drain locations, one associated with the 1719H First Aid Building, the second associated with the 1717-H Machine/Welding Shop, are included in the 100-H-49:2 subsite.

4.3.41.2 Confirmatory Sampling

Confirmatory sampling activities at the 100-H-49:2 subsite were performed from September 24 to October 11, 2010. Sampling at the 100-H-49:2 subsite involved excavating a test pit at the known, or suspected, location of the french drain to confirm its presence. Once the drain was located, excavation continued in a manner to allow collection of sample material from the french drain contents. There was not sufficient fine material inside the drains associated with the 100-H-49:2 subsite to collect a sample, and no influent piping was observed for these drains; therefore, no samples of drain material or influent piping contents were taken. Excavation continued to remove the french drain structures and access the underlying soil. A sample of the underlying soil was collected, and the physical characteristics of the underlying soil were recorded in the field logbook. The confirmatory sampling included collection of focused samples of subsurface soil encountered in the test pits that contained the seven individual french drains. At the two estimated french drain locations, no french drain was found. A total of nine focused soil samples were analyzed. No rubble or debris was observed, no sample was collected, and the excavations were backfilled.

The analytical results indicated the residual concentrations for chromium, copper, lead, zinc, Aroclor-1254, Aroclor-1260, DDE, benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, and benzo(k)fluoranthene exceeded the soil RAGs for the protection of groundwater and/or the Columbia River. RESRAD modeling predicted that residual concentrations of these constituents will be protective of groundwater and the Columbia River.

4.3.41.3 Statement of Protectiveness

The results of confirmatory sampling show that residual contaminant concentrations do not preclude any future uses (as bounded by the rural-residential scenario) and allow for unrestricted use of shallow zone soils (i.e., surface to 4.6 m [15 ft] deep). The analytical data results and RESRAD modeling also demonstrate that residual contaminant concentrations are protective of groundwater and the Columbia River. Site contamination did not extend into the deep zone soils; therefore, institutional controls to prevent uncontrolled drilling or excavation into the deep zone are not required. The 100-H-49:2 site has been reclassified as “Interim No Action.”

4.3.42 100-H-50, Steam Condensate French Drains

4.3.42.1 Site Description

The 100-H-50, 100H Steam Condensate French Drains waste site is located near the 182H Reservoir and Pumphouse, 190H Process Pumphouse, 1703H and 1704-H Office Buildings, 184-H Powerhouse, and 1901-H Soft Water Tank. The buildings listed above were demolished between 1974 and 1977, except for the 184-H Powerhouse, which was demolished between 1968 and 1973.

The 100-H-50 waste site includes 14 individual french drain locations, the underlying soil, and the associated belowgrade piping components for steam condensate french drains. Thirteen of the french drains were identified through an examination of building drawings as part of the orphan site evaluation process. During an orphan site field walkdown, one additional french drain was identified; however, a subsequent review of the location and description of the additional french drain concluded it is a redundant identification.

Steam condensate discharge sites are located intermittently along the routes of steam transfer lines. The 184-H Powerhouse Boiler facility supplied high-pressure steam to area buildings through an abovegrade pipeline system. The boiler facility utilized clean filtered water from the 183H Filter Building. As steam moves through pipes, a portion condenses to liquid and needs to be removed. The condensate was typical blowoff from the abovegrade piping system into a belowgrade covered french

drain. Without removal of the condensed water, the steam system loses efficiency, and pipes can be damaged from accumulated, fast-moving water driven by the steam. Therefore, condensate water was collected and discharged at multiple locations along the steam pipelines.

4.3.42.2 Confirmatory Sampling

Confirmatory sampling activities at the 100-H-50 waste site were performed from October 5 to 11, 2010. The sample design included focused sampling of the french drain contents, influent pipeline contents, underlying soil, and potentially hazardous substances, if any, discovered during sampling activities. One french drain from each of the building locations within the 100-H-50 waste site were selected for sampling, for a total of five french drain test pits. The active pump and treat lines were observed at one location during confirmatory sampling, and no excavation or sampling was conducted at the location because of the resulting surface interference. At another location, an area approximately 3 by 3 m (12 by 12 ft) was excavated. Based on the absence of debris and rubble observed in the excavated area, it was determined that there is no french drain at the location, and the excavation was backfilled. The remaining 100-H-50 waste site french drain locations were excavated and sampled. A total of three focused samples were analyzed. The current site conditions achieve the RAOs and the corresponding RAGs.

4.3.42.3 Statement of Protectiveness

The results of confirmatory sampling show that residual contaminant concentrations do not preclude any future uses (as bounded by the rural-residential scenario) and allow for unrestricted use of shallow zone soils (i.e., surface to 4.6 m [15 ft] deep). The results also demonstrate that residual contaminant concentrations are protective of groundwater and the Columbia River. Site contamination did not extend into the deep zone soils; therefore, institutional controls to prevent uncontrolled drilling or excavation into the deep zone are not required. The 100-H-50 site has been reclassified as “Interim No Action.”

4.3.43 100-H-51:1, 1703-H Sanitary Sewer Segment

4.3.43.1 Site Description

The 100-H-51:1 subsite consisted of a 6 in. vitrified clay sanitary sewer pipeline that ran from the 1703H Building and tied into the 100-H-28 pipeline. The 1703H Building was constructed in 1949 and contained offices for area administrative and technical personnel. The pipeline exited the west side of the 1703H Building, turned north, and terminated at a manhole where it joined the 100-H-28:5 sanitary sewer pipeline (Section 4.3.21).

4.3.43.2 Confirmatory Sampling

A focused sampling approach was used to evaluate the pipeline contents and underlying soil. Confirmatory sampling was performed at the 100-H-51:1 subsite on November 30, 2009. Test Pit 1 uncovered the pipeline at approximately 0.6 m (2 ft) bgs. The inside of the pipeline was clear of debris, scale, and sediment; therefore, no sample of pipe content was collected. A soil sample was collected from below the pipeline at approximately 0.9 m (3 ft) bgs. Additionally, a sample of the pipe sealant was collected. Test Pit 2 found no pipeline at the location; therefore, no samples were collected. A third test pit location was identified as an alternative to the Test Pit 2 location. Test Pit 3 was excavated and measured 4 m^2 (12 ft^2) and 2 m (6 ft) deep. No pipeline was observed; therefore, no sample was collected.

An evaluation of the sample results shows that the pipe sealant on the 100-H-51:1 pipeline subsite failed the direct exposure RAG for benzo(a)anthracene. Therefore, the 100 H-51:1 subsite was recommended for remediation.

4.3.43.3 Excavation Operations

Remedial action at the 100-H-51:1 subsite was performed on May 7, 2014. The remediation extended to approximately 1.5 m (5 ft) bgs, resulting in approximately 200 BCM (262 BCY) of soil and debris being removed for disposal at ERDF. The debris consisted of the VCP and concrete. Approximately 105 linear meters (345 linear feet) of pipeline was removed. The waste material was staged in a waste SPA prior to loadout to ERDF. The SPA was used for multiple waste sites and was addressed in the 100-H-28:2/100-H-42 closure (Sections 4.3.18 and 4.3.34, respectively).

Arsenic was detected above the direct exposure RAGs; therefore, additional remediation was conducted on September 24, 2014. An additional 280 BCM (366 BCY) of soil was removed from the excavation and disposed at ERDF.

4.3.43.4 Verification Sampling

One focused verification soil sample was collected on May 13, 2014. Verification sampling continued August 26, 2014. One decision unit was identified for the 100-H-51:1 subsite and consists of the excavation only. A combination statistical and focused sampling design was used to evaluate the waste site excavation. Twelve statistical verification soil samples were collected. Additionally, one focused sample was collected from the location where the pipeline crossed under an established roadway. The sample was collected from the approximate center of the roadway. All samples were grab samples.

Because arsenic was detected above the direct exposure RAG at two locations, additional remediation was conducted at these two locations and replacement samples were collected on September 29, 2014, and analyzed for metals only.

All COPCs were quantified below direct exposure RAGs. All COPCs were quantified below groundwater and/or river protection soil RAGs except for lead, benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, chrysene, and indeno(1,2,3 cd)pyrene. RESRAD modeling predicted that residual concentrations of these constituents will be protective of groundwater and the Columbia River.

4.3.43.5 Statement of Protectiveness

The results of verification sampling and modeling show that residual soil concentrations do not preclude any future uses (as bounded by the rural-residential scenario) and allow for unrestricted use of shallow zone soils (i.e., surface to 4.6 m [15 ft] deep). The results also demonstrate that residual contaminant concentrations are protective of groundwater and the Columbia River. Contamination above direct exposure levels was not observed in shallow zone soils and is concluded to not exist in deep zone soils; therefore, institutional controls to prevent uncontrolled drilling or excavation into the deep zone soil are not required. The 100-H-51:1 site has been reclassified as “Interim Closed Out.”

4.3.44 100-H-51:2, 117-H Seal Pit Crib Feedline

4.3.44.1 Site Description

The 100-H-51:2, 117-H Seal Pit Crib Feedline subsite is located southwest of the 105H Reactor between the demolished 132-H-2, 117-H Air Filter Building footprint (Section 4.4.13) and the former 116-H-9, 117-H Seal Pit Crib waste site (Section 4.3.62). The 117-H Filter Building and the 117-H Seal Pit Crib, along with the connecting pipeline, were constructed in 1960. During operation, the 117H Building filtered ventilation air from the reactor building containment zone prior to discharge to the environment. The 117H Seal Pit Crib Feedline transported drainage from the 117H Building seal pits to the seal pit crib where it was discharged to the soil column. In 1984, the 117H Building was decontaminated to remove all hazardous materials and demolished to 1 m (3 ft) belowgrade.

4.3.44.2 Excavation Operations

Remedial action at the 100-H-51:2 subsite was conducted on September 23 and 24, 2014. The remediation extended to an approximate maximum depth of 2 m (6.6 ft) bgs, resulting in approximately 322 BCM (421 BCY) of contaminated soil and debris (cement asbestos pipe) being loaded out and disposed at ERDF. The soil and debris were direct loaded for disposal at ERDF; therefore, no waste SPAs were generated. No overburden material was salvaged for use as clean backfill and no anomalies were encountered during remediation. No in-process soil samples were collected. Following remediation, GPERS surveys were conducted over the pipeline excavation.

4.3.44.3 Verification Sampling

Following remediation, verification soil sampling was conducted on February 15, 2015. One decision unit was identified for the 100-H-51:2 subsite and consists of the excavation only. A statistical sample design was used to evaluate the decision unit. Thirteen statistical verification soil samples were collected from the excavation. All samples were grab samples collected at the predetermined coordinates.

4.3.44.4 Statement of Protectiveness

The verification sampling results show that residual soil concentrations support future land uses that can be represented (or bounded) by a rural-residential scenario. The results also demonstrate that residual contaminant concentrations support unrestricted future use of shallow zone soil (i.e., surface to 4.6 m [15 ft]) and that contaminant levels remaining in the soil are protective of groundwater and the Columbia River. Contamination above direct exposure levels was not observed in shallow zone soils and is concluded to not exist in deep zone soils; therefore, institutional controls to prevent uncontrolled drilling or excavation into the deep zone soil are not required. The 100-H-51:2 site has been reclassified as “Interim Closed Out.”

4.3.45 100-H-51:3, 184-H Brine Discharge Line

4.3.45.1 Site Description

The 100-H-51:3 subsite consisted of two parallel pipelines that transported water from the 184-H Power House to the 184-H Salt Dissolving Pit and transported salt brine back to the Power House. The water pipeline was a 3 in. diameter steel pipeline that transported filtered water from the 184-H Power House to the 184-H Salt Dissolving Pit and Brine Pump House. The salt brine pipeline was a 2 in. diameter steel pipeline and was designed to transport salt brine from the 184-H Salt Dissolving Pit and Brine Pump House to the 184H Power House. At the 184-H Salt Dissolving Pit and Brine Pump House, sodium chloride was dissolved, forming salt brine, and the brine was pumped back to the 184-H Power House where it was used to regenerate the zeolite ion exchange beds in the water softener tanks. The operation period of the 100-H-51:3 pipelines coincided with that of the 105H Reactor and its support facilities, from 1949 to 1965.

4.3.45.2 Confirmatory Sampling

Confirmatory sampling of the 100-H-51:3 subsite was performed on October 4 and 5, 2010. Three test pits were dug with a sample taken in each pit of the soil beneath the pipeline. No radiological activity was detected during confirmatory sampling and field screening did not detect VOCs.

An evaluation of the sample results shows that the 100-H-51:3 subsite exceeded the direct exposure RAGs for benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, and benzo(k)fluoranthene. Additionally, groundwater protection and/or Columbia River protection RAGs were exceeded for chromium, zinc, chrysene, and fluoranthene. Based on these results, the 100-H-51:3 subsite was recommended for remediation.

4.3.45.3 Excavation Operations

Remedial action at the 100-H-51:3 pipeline subsite was performed on March 18, 2014. The remediation extended to approximately 1.5 m (5 ft) bgs resulting in approximately 520 BCM (680 BCY) of soil and debris being removed for disposal at ERDF. The debris consisted of the 2 in. and 3 in. diameter steel pipelines, concrete, and near-surface demolition debris. Coal ash was also present in the pipeline area; as a result, no overburden soil was stockpiled for use as backfill. The waste material including the coal ash was staged in a waste SPA, and has since been loaded out and disposed at ERDF. The waste SPA was used for multiple waste sites and the SPA footprint will be addressed in the 100-H-28:2/100-H-42 closure (Sections 4.3.18 and 4.3.34, respectively). No stained soil or anomalous materials were encountered during the remediation. Asphaltic material was observed in and around the pipeline excavation.

4.3.45.4 Verification Sampling

Verification soil sampling was conducted on August 4, 2014. The 100-H-51:3 and 100-H-51:6 pipeline (Section 4.3.48) subsites were combined into one decision unit for verification sampling. A combination statistical and focused sampling design was used to evaluate the waste site excavations. Twelve statistical verification soil samples were collected from the excavations. To provide sufficient sample coverage over the entire pipeline excavation, one focused sample was collected from the east end of the east/west segment of the 100-H-51:6 excavation. All samples were grab samples collected at the predetermined coordinates, except for one sample location which was moved due to interference with the aboveground pump and treat pipelines crossing over the 100-H-51:6 subsite.

PAHs were detected in the verification samples above the RAGs; however, it was determined that the PAH were related to the tar coating on the pipelines rather than the 100-H-51:3 and 100-H-51:6 pipeline processes. Therefore, PAHs were excluded from further evaluation.

All COPCs were quantified below direct exposure RAGs. All COPCs were quantified below groundwater and/or river protection soil RAGs except for barium, chromium, copper, lead, and nickel. RESRAD modeling predicted that residual concentrations of these constituents will be protective of groundwater and the Columbia River.

4.3.45.5 Statement of Protectiveness

The results of verification sampling and modeling show that residual soil concentrations do not preclude any future uses (as bounded by the rural-residential scenario) and allow for unrestricted use of shallow zone soils (i.e., surface to 4.6 m [15 ft] deep). The results also demonstrate that residual contaminant concentrations are protective of groundwater and the Columbia River. Contamination above direct exposure levels was not observed in shallow zone soils and is concluded to not exist in deep zone soils; therefore, institutional controls to prevent uncontrolled drilling or excavation into the deep zone soil are not required. The 100-H-51:3 site has been reclassified as “Interim Closed Out.”

4.3.46 100-H-51:4, 100-H Main Gate Storm Drain

4.3.46.1 Site Description

The 100-H-51:4 subsite consists of a storm drain constructed of VCP that collected precipitation runoff from the 1720-H Patrol Headquarters, the 1709-H Fire Headquarters, and the 1701-H Badge House in a main discharge line that terminates at a concrete headwall approximately 0.6 m (2 ft) thick located at the 100-H-27, 100-H Area Patrol Headquarters Storm Runoff Ditch. The 100-H-27 waste site was classified as “Not Accepted” because it was determined to have received storm water only. The 100-H-51:4 subsite is located between the 1701H Building and the 100-H-27 storm runoff ditch. Additionally, the 100-H-51:4 pipeline runs parallel to and approximately 11 m (36 ft) north of the former location of the 1607-H3 septic system (Section 4.3.72). Small portions of lateral pipelines associated with the

100-H-51:4 waste site were removed during the 1607-H3 waste site remediation. Remedial action at the 1607-H3 waste site was performed between October 13 and November 10, 2009.

The primary operational period of the 100-H-51:4 storm drain coincides with the operation of the 105H Reactor from 1949 through 1965. The 1701H, 1720H, and 1709H buildings were decommissioned in 1974. The 100-H-51:4 storm drain discharged at a headwall located at the 100-H-27 site. All of the buildings associated with the 100-H-51:4 storm drain have been removed to grade.

A site visit of the 100-H-51:4 subsite was conducted on December 11, 2009. The short lateral sections of the 100-H-51:4 pipelines running to the 1701H, 1709H, and 1720H buildings were removed during excavation of the 1607-H3 waste site. Little evidence of the 100-H-51:4 pipeline segments could be seen in the excavation banks. The pipeline segments were left in place within the foundations of the buildings and can be seen exposed at the building foundations within the 1607-H3 waste site excavation.
The interior of the pipelines was observed to be exposed at the building foundation walls for visual inspection and potential pipeline content sampling. The headwall at the northern end of the 100-H-51:4 pipeline and related 100-H-27 drainage ditch have been backfilled to support safe transportation around the 1607-H3 waste site excavation.

4.3.46.2 Confirmatory Sampling

Confirmatory sampling was performed on October 7, 2010. A focused sample collected from the excavated Test Pit 5 was used to evaluate the 100-H-51:4 subsite. The pipeline was found 3 ft bgs, encased in 0.91 by 0.61 m (3 by 2 ft) concrete chunk. The pipe was found to be filled with rodent bedding and soil. A focused sample was collected from the contents of the pipeline. An additional focused sample were collected from the silty soils underlying the pipeline. No samples were collected from Test Pits 1 through 4 because the pipeline was not visible from the sidewalls of the 1607-H3 excavation. Also, Test Pit 5 was downstream from all other proposed test pits and thus received discharge from all other test pit areas. Test Pit 5 was the only sampling location that was not impacted by the 1607-H3 excavation.

Field surveys for radiological contamination and VOCs were conducted during sampling. No radiological activity or VOCs were detected. Confirmatory sampling determined that environmental contamination was not present at this waste site. Based on confirmatory sampling at the 100-H-51:4 subsite, remedial action was determined to be unnecessary.

4.3.46.3 Statement of Protectiveness

The results of confirmatory sampling show that residual soil concentrations support future land uses that can be represented (or bounded) by a rural-residential scenario. The results also demonstrate that residual contaminant concentrations support unrestricted future use of shallow zone soil (i.e., surface to 4.6 m [15 ft]) and that contaminant levels remaining in the soil are protective of groundwater and the Columbia River. This site does not extend into the deep zone. Institutional controls to prevent uncontrolled drilling or excavation into the deep zone of the site are not required. The 118-H-51:4 site has been reclassified as “Interim No Action.”

4.3.47 100-H-51:5, Discovery Pipeline at 128-H-1

4.3.47.1 Site Description

The 100-H-51:5 Discovery Pipeline waste subsite is described as a 10 in. carbon steel pipeline starting approximately 30 m (100 ft) south of the Columbia River shoreline and ending approximately 50 m (170 ft) south of the 128-H-1 waste site (Section 4.4.10). The exposed southern end of the 100-H-51:5 pipeline resembles the 10 in. carbon steel pipe near the river (100-H-53, Section 4.3.50).

Originally, the 100-H-51:5 waste subsite included a separate southern section of pipe that started approximately 70 m (231 ft) south of the 100-H-51:5 waste subsite and ended near the 1713H Building. This southern section of pipe (originally part of 100-H-51:5) has been determined to be a separate waste site, the 100-H-51:6 subsite (Section 4.3.48).

4.3.47.2 Confirmatory Sampling

A focused sampling approach was used to characterize the 100-H-51:5 waste site. Confirmatory sampling of the 100-H-51:5 pipeline occurred in November 2010. There was not any material to sample inside the southern exposed end of the pipe. A sample of the brown-tan silt was taken from below the pipe. The pipe size was not documented.

The analytical results indicated no residual contaminant concentrations in soil exceeding cleanup criteria, except for lead, zinc, and benzo(a)anthracene that exceeded the soil RAGs for the protection of groundwater and/or the Columbia River. RESRAD modeling predicted that residual concentrations of these constituents will be protective of groundwater and the Columbia River. Cesium-137 was detected in soil samples but does not exceed cleanup criteria.

4.3.47.3 Statement of Protectiveness

The results of confirmatory sampling show that residual contaminant concentrations do not preclude any future uses (as bounded by the rural-residential scenario) and allow for unrestricted use of shallow zone soils (i.e., surface to 4.6 m [15 ft] deep). The results also demonstrate that residual contaminant concentrations are protective of groundwater and the Columbia River. Site contamination did not extend into the deep zone soils; therefore, institutional controls to prevent uncontrolled drilling or excavation into the deep zone are not required. The 100-H-51:5 site has been reclassified as “Interim No Action.”

4.3.48 100-H-51:6, Carbon Steel Pipe

4.3.48.1 Site Description

The 100-H-51:6 subsite consisted of a section of 10 in. diameter steel pipeline that started approximately 70 m (231 ft) south of the 100-H-51:5 subsite (Section 4.3.47) and ended near the 1713H Building. This pipeline was suspected to have been part of an extensive temporary water system for construction of the 100-H Area in 1948.

4.3.48.2 Confirmatory Sampling

Confirmatory sampling of the 100-H-51:6 subsite was performed on November 15, 2010. Eleven samples were taken at five locations along the pipeline. Samples included pipe contents, soil beneath the pipeline, surface soil, and pipe scale.

Originally, the 100-H-51:6 pipeline was included as part of the 100-H-51:5 pipeline subsite (Section 4.3.47); however, following the confirmatory sampling event, it was determined the southern segment of 100-H-51:5 was a separate pipeline. Therefore, the 100-H-51:5 pipeline subsite was divided into two subsites and the southern segment became the 100-H-51:6 Carbon Steel Pipe subsite.

An evaluation of the sample results for the 100-H-51:6 subsite show that the direct exposure RAG was exceeded for benzo(a)pyrene. Additionally, groundwater protection and/or Columbia River protection RAGs were exceeded for cadmium, chromium (total), copper, manganese, molybdenum, nickel, zinc, benzo(a)anthracene, benzo(b)fluoranthene, benzo(k)fluoranthene, chrysene, and dibenz(a,h)anthracene. Based on these results, the 100-H-51:6 subsite was recommended for remediation.

4.3.48.3 Excavation Operations

Remedial action at the 100-H-51:6 pipeline subsite was performed on March 12 and 13, 2014. The depth of the remediation ranged from approximately 0.3 to 0.9 m (1 to 3 ft) bgs, resulting in approximately 450 BCM (588 BCY) of soil and debris being removed for disposal at ERDF. The debris consisted primarily of 10 in. diameter steel pipeline. Coal ash was also present on the surface; therefore, no overburden soil was stockpiled for use as backfill. The waste material including the coal ash was staged in a SPA and has since been loaded out to ERDF. The SPA was used for multiple waste sites and the SPA footprint was addressed in the 100-H-43 closure (Section 4.3.35). No stained soil or anomalous materials were encountered during the remediation. Asphaltic material was observed in and around the pipeline excavation.

Due to the above ground pump and treat pipelines crossing over the top of a portion of the northern segment of the 100-H-51:6 subsite, remediation of the 100-H-51:6 pipeline in this area was conducted by pulling the pipe through and out of the trench. Soils from above and below the pipeline could not be removed.

4.3.48.4 Verification Sampling

Verification soil sampling at the 100-H-51:6 pipeline subsite was conducted with the 100-H-51:3 pipeline subsite (Section 4.3.45). Additional information may be found in Section 4.3.45.4.

4.3.48.5 Statement of Protectiveness

The results of verification sampling and modeling show that residual soil concentrations do not preclude any future uses (as bounded by the rural-residential scenario) and allow for unrestricted use of shallow zone soils (i.e., surface to 4.6 m [15 ft] deep). The results also demonstrate that residual contaminant concentrations are protective of groundwater and the Columbia River. Contamination above direct exposure levels was not observed in shallow zone soils and is concluded to not exist in deep zone soils; therefore, institutional controls to prevent uncontrolled drilling or excavation into the deep zone soil are not required. The 100-H-51:6 site has been reclassified as “Interim Closed Out.”

4.3.49 100-H-52, 184-HA Drain Field and Associated Piping

Due to geographic location and similarity of remediation activities, cleanup activities for the 100-H-52 and the 100-H-48 (Section 4.3.39) waste sites were conducted together. For information regarding confirmatory and verification sampling, excavation operations, and the statement of protectiveness, refer to 100-H-48 (Section 4.3.39).

The 100-H-52 site has been reclassified as “Interim Closed Out.”

4.3.49.1 Site Description

The 100-H-52, 184-HA Septic Drain Field and Associated Piping waste site was on the western side of the former 184-HA, Auxiliary Boiler Facility location, approximately 20.8 m (68.2 ft) east of the former 190HA Building site.

The 100-H-52 waste site consisted of a drain field and associated piping. The area of the drain field was 24 m^2 (256 ft^2). The 100-H-52 waste site influent piping was connected at the eastern end of the main 8 in. diameter perforated concrete pipe entering the drain field. These influent pipelines include a cast iron 2 in. sanitary drain effluent pipeline that proceeded west from the 184-HA, Auxiliary Boiler Facility, a 2 in. equipment drain effluent, wrought iron pipeline that connected into the sanitary drain pipeline upstream of the perforated pipe connection, and a 4 in. condensate effluent, wrought iron pipeline that

proceeded west from the 184-HA, Auxiliary Boiler Facility and connected directly into the eastern end of the main perforated drain field pipe.

The 100-H-52 drain field consisted of a main perforated concrete pipe with four perforated concrete pipe laterals extending off the main pipeline within the drain field. All pipes were 8 in. in diameter with the main pipe oriented in an east-west direction from the center of the field and the laterals extending from the main at northwest-southeast and northeast-southwest directions. Additionally, a 4 in. vent pipe extended above the ground at the western end of the main 8 in. perforated drain line. The drain field piping was covered with a buried 20 mm (0.8 in.) thick polyethylene barrier. A layer of pit-run gravel 1.3 to 3.8 cm (0.5 to 1.5 in.) thick was placed beneath the drain field piping. Discharges to the 100-H-52 drain field consisted of effluent from two water softeners, overflow from the boiler deaerator, and condensate from the boiler.

4.3.50 100-H-53, Carbon Steel Pipe

4.3.50.1 Site Description

The 100-H-53 waste site is a 10 in. diameter, 1.8 m (6 ft) long (exposed portion) carbon steel pipe located north of the 128-H-1 waste site (Section 4.4.10) and running northeast toward the shore of the Columbia River. Review of documents, process knowledge, field observations, and a geophysical investigation indicate that this carbon steel pipe is very likely a remnant of a temporary water system used during the construction period of the 100-H Area.

4.3.50.2 Confirmatory Sampling

A focused sampling approach was used to characterize the 100-H-53 waste site. Confirmatory sampling of the 100-H-53 waste site occurred in November 2010. The exposed portion of the 100-H-53 pipeline was breached with a drill. No material was found inside the pipeline to sample. The pipe at this location was 3/8 in. thick and 10 in. diameter. The soil sample taken from below the pipe was composed of brown silt.

The analytical results indicated no residual contaminant concentrations in soil exceeding cleanup criteria, except for lead, zinc, and benzo(a)anthracene that exceeded the soil RAGs for the protection of groundwater and/or the Columbia River. RESRAD modeling predicted that residual concentrations of these constituents will be protective of groundwater and the Columbia River. Cesium-137 was detected in soil samples but does not exceed cleanup criteria.

4.3.50.3 Statement of Protectiveness

The results of confirmatory sampling show that residual contaminant concentrations do not preclude any future uses (as bounded by the rural-residential scenario) and allow for unrestricted use of shallow zone soils (i.e., surface to 4.6 m [15 ft] deep). The results also demonstrate that residual contaminant concentrations are protective of groundwater and the Columbia River. Site contamination did not extend into the deep zone soils; therefore, institutional controls to prevent uncontrolled drilling or excavation into the deep zone are not required. The 100-H-53 site has been reclassified as “Interim No Action.”

4.3.51 100-H-54, GPERS 100-H Shoreline Survey UPR

4.3.51.1 Site Description

The 100-H-54, GPERS 100H Shoreline Survey UPR waste site is an area with the most elevated radiological activity measured in radiological field surveys of the 100-H Area shoreline in 2004. The location of the most elevated survey readings was used to create the 100-H-54 waste site boundary. The 100-H-54 waste site is located approximately 150 m (432 ft) southeast of the 107H Retention Basin

(116-H-7, Section 4.3.61), along the Columbia River embankment. The entire embankment is covered with tumbleweeds.

In May 2012, a GPERS survey was conducted in downslope transects along the shoreline area evaluated during the 2004 GPERS survey. Significantly elevated radiological measurements were not observed in this survey. Portable alpha/beta surveys were conducted at the five areas with detections greater than background. No alpha contamination was detected; however, gamma activity of approximately 7,000 dpm/100 cm^2 was reported.

4.3.51.2 Confirmatory Sampling

Confirmatory sampling of the 100-H-54 waste site was performed on September 18, 2013. A focused sampling approach was used to characterize the 100-H-54 waste site based on the coordinate locations of elevated beta-gamma activity identified in the radiological surface survey conducted in May 2012. The location for focused sampling was further refined using field instrumentation to determine the specific location with the most elevated radiological activity. Discrete soil samples were collected at the surface and directly underneath the surface sample at a depth of 0.3 m (1 ft) bgs.

All COPCs were quantified below groundwater and/or river protection soil RAGs except for cadmium, chromium, copper, lead, and zinc. RESRAD modeling predicted that residual concentrations of these constituents will be protective of groundwater and the Columbia River.

4.3.51.3 Statement of Protectiveness

The confirmatory sampling results show that residual soil concentrations support future land uses that can be represented (or bounded) by a rural-residential scenario. The results also demonstrate that residual contaminant concentrations support unrestricted future use of shallow zone soil (i.e., surface to 4.6 m [15 ft]) and that contaminant levels remaining in the soil are protective of groundwater and the Columbia River. Waste site contamination did not extend into the deep zone. Institutional controls to prevent uncontrolled drilling or excavation into the deep zone of the site are not required. The 100-H-54 site has been reclassified as “Interim No Action.”

4.3.52 100-H-56, H-Area Miscellaneous Pipelines

4.3.52.1 Site Description

The 100-H-56 waste site consisted of all the 100-H Area miscellaneous pipelines not associated with an existing waste site. These consisted of four sewer lines that will be included in a RTD report; two pipelines that have been taken out with the 132-H-3 waste site (Section 4.3.70); and eleven pipelines that were sampled within the confirmatory sampling. One pipeline is within the 100-H-28:3 subsite excavation (Section 4.3.19).

These pipeline segments were discovered during a spatial analysis of the pipeline geographic information system assignments with those contained in regulator-approved work instructions and closure documents. Some of these pipeline segments were either not assigned to waste sites or incorrectly assigned to a waste site when compared to the documents. Additional pipeline segments were discovered in the field during field remediation activities. In total there are 17 pipelines associated with this site.

4.3.52.2 Confirmatory Sampling

Confirmatory sampling occurred in June and July 2013, and in March 2014. Eight test pits and two test trenches were excavated on the downgradient end of the miscellaneous pipelines, which would be the area most likely to contain contamination. The 11 pipelines selected for sampling included those that were not

being sent to a RTD report (sewer pipelines) and pipelines that were not taken out with another site. A total of 11 soil samples were collected.

Field screening for VOCs was performed during soil sampling using an organic vapor monitor. VOCs were not detected in the field. The possible presence of radiological contaminants was evaluated using field radiological survey instrumentation (capable of detecting alpha, beta, and gamma radiation) during confirmatory sampling. Radiological activity was not detected in the field above background levels.

All COPCs were quantified below groundwater and/or river protection soil RAGs except for barium, copper, lead, mercury, selenium, and zinc. Of these, barium, copper, lead, mercury, and zinc are predicted to be protective of groundwater and the Columbia River. One focused confirmatory sample taken at Test Trench 5, at 4.6 m (15 ft) bgs, was above the river protection lookup value. A pipeline was not encountered within this test trench. Selenium is not a product of any known processes related to reactor operations. Examination of the data has concluded that the selenium concentration reported is due to the natural mineralogy found in the sample matrix and not to any type of waste disposal or man-made contamination. Therefore, it is concluded the selenium concentrations at the 100-H-56 site meet the RAOs.

4.3.52.3 Statement of Protectiveness

The confirmatory sampling results show that residual soil concentrations support future land uses that can be represented (or bounded) by a rural-residential scenario. The results also demonstrate that residual contaminant concentrations support unrestricted future use of shallow zone soil (i.e., surface to 4.6 m [15 ft]) and that contaminant levels remaining in the soil are protective of groundwater and the Columbia River. Contamination above direct exposure levels was not observed in shallow zone soils and is concluded to not exist in deep zone soils; therefore, institutional controls to prevent uncontrolled drilling or excavation into the deep zone of the site are not required. The 100-H-56 site has been reclassified as “Interim No Action.”

4.3.53 100-H-57, Water Tower Foundations at 100-H

4.3.53.1 Site Description

The 100-H-57, Water Tower Foundations at 100H waste site consists of the underground piping, valves, sumps, and other structures at the base of the two former elevated water towers adjacent to the 105H Reactor. The waste site has an approximate area of 35.6 m^2 (383 ft^2). The principal purpose of the two water towers at the 105H Reactor was to provide standby storage of cooling water in the event that the normal cooling water service provided by pumps to the reactor pile was interrupted.

The 105H Reactor had two 1,135,620 L (300,000 gal) capacity ellipsoidal steel-plate water tanks (187-H1 and 187-H2) that were elevated 37 m (120 ft) above ground level. Sodium silicate was supplied to the tanks for corrosion prevention. Construction drawings for the 187-H1 and 187-H2 water tower foundations show a sump at the base of the water tower valve pits and a french drain receiving condensate through a 1.5 in. pipeline. The drawings indicate that the sump in the bottom of the valve pit fed into this french drain. The valve pits at both 105H water towers were completely removed during previous facility activities.

Water to the 187-H1 and 187-H2 water towers was supplied by pipelines within the 100-H-28:7 Process Water Pipelines (Section 4.3.23). Water was conveyed from the 187-H1 and 187-H2 water towers by pipelines within the 100-H-56, H-Area Miscellaneous Pipelines (Section 4.3.52).

4.3.53.2 Confirmatory Sampling

A focused sampling approach was used to evaluate the contents and potential releases at each of the former water tower locations at the 100-H-57 waste site. Test pits were excavated at the former locations of the valve pits in the water tower foundations. Confirmatory sampling of the 100-H-57 waste site was performed on June 21, 2013. The test pits were excavated by mechanical means to a depth of 4 m (13 ft) bgs, which is approximately 1 m (3 ft) below the depth for the valve pit.

Two discrete soil samples were collected at each test pit. The test pits were investigated to determine if the native soil interface could be identified below the 3 m (10 ft) depth. Native soil was encountered at approximately 4 m (13 ft) bgs in each test pit and a sample of native soil was collected at this depth. A second sample was collected in each test pit from the sidewall at 3 m (10 ft) bgs. All samples were collected from the excavator bucket. No pipelines were discovered in either test pit. No suspected ACM was observed and no radiological activity was detected during confirmatory sampling at either sample location.

All COPCs were quantified below groundwater and/or river protection soil RAGs except for barium, lead, and mercury. RESRAD modeling predicted that residual concentrations of these constituents will be protective of groundwater and the Columbia River.

4.3.53.3 Statement of Protectiveness

The confirmatory sampling results show that residual soil concentrations support future land uses that can be represented (or bounded) by a rural-residential scenario. The results also demonstrate that residual contaminant concentrations support unrestricted future use of shallow zone soil (i.e., surface to 4.6 m [15 ft]) and that contaminant levels remaining in the soil are protective of groundwater and the Columbia River. Waste site contamination did not extend into the deep zone. Institutional controls to prevent uncontrolled drilling or excavation into the deep zone of the site are not required. The 100-H-57 site has been reclassified as “Interim No Action.”

4.3.54 100-H-59:1, 100-H Area Railroad Track Soil Contamination Area

4.3.54.1 Site Description

The 100-H-59:1, 100H Area Railroad Track Soil Contamination Area subsite consisted of radiological contamination along two sections of railroad track in the 100-H Area south and west of the 105H Reactor. The areas were discovered in 2011 during removal of the railroad berm and tracks and were believed to be due to material deposited by mud daubers. Therefore, the 100-H-59:1 subsite is regarded as being analogous to the 100-H-37, Mud Daubers waste site (Section 4.4.2).

4.3.54.2 Excavation Operations

Remedial action at the 100-H-59:1 subsite began on August 20, 2014, and was completed on August 21, 2014. Two areas of radiological contamination were removed to less than 1 m (3.3 ft) bgs, resulting in approximately 334 BCM (437 BCY) of contaminated soil being disposed at ERDF. Approximately 109 tons of steel railroad track and wood railroad ties were also removed and disposed. The soil was direct loaded for disposal at ERDF; however, the railroad ties and rails were staged prior to loadout, thus creating two small waste SPAs. The SPA waste was loaded out for disposal at ERDF on September 17, 2014. Following the remediation, GPERS surveys were conducted over the north and south excavations.

4.3.54.3 Verification Sampling

Verification samples from the 100-H-59:1 subsite were collected on January 5, 2015. Two decision units were identified for the 100-H-59:1 waste site; specifically, the excavation and the SPA. The excavation

decision unit included two excavated areas (north and south excavations), and the SPA decision unit included two SPA footprints (north and south SPAs). A statistical sample design was used to evaluate the 100-H-59:1 excavations and the SPAs. Twelve statistical verification soil samples were collected from the excavations and 12 statistical verification soil samples were collected from the SPAs, for a total of 26 samples. All samples were grab samples collected at the predetermined coordinates.

All COPCs were quantified below direct exposure RAGs. All COPCs were quantified below groundwater and/or river protection soil RAGs except for lead. RESRAD modeling predicted that residual concentrations of lead will be protective of groundwater and the Columbia River.

4.3.54.4 Statement of Protectiveness

The verification sampling results show that residual soil concentrations support future land uses that can be represented (or bounded) by a rural-residential scenario. The results also demonstrate that residual contaminant concentrations support unrestricted future use of shallow zone soil (i.e., surface to 4.6 m [15 ft]) and that contaminant levels remaining in the soil are protective of groundwater and the Columbia River. Contamination above direct exposure levels was not observed in shallow zone soils and is concluded to not exist in deep zone soils; therefore, institutional controls to prevent uncontrolled drilling or excavation into the deep zone soil are not required. The 100-H-59:1 site has been reclassified as “Interim Closed Out.”

4.3.55 100-H-59:2, Debris Piles near 100-H Area Railroad Track

4.3.55.1 Site Description

The 100-H-59:2, Debris Piles Near 100-H Area Railroad Track subsite consisted of buried debris found during the remediation of the 100-H-59 waste site. The debris included steel wire cable, pipe, signs, concrete and brick pieces, glass, and asbestos insulation. An intact glass bottle containing an unknown liquid was also encountered.

4.3.55.2 Excavation Operations

Remedial action at the 100-H-59:2 subsite began on March 23, 2015, and continued through April 30, 2015. The depth of remediation ranged from 1 to 3 m (3.3 to 9.8 ft) bgs, resulting in approximately 4,181 BCM (5,469 BCY) of soil and debris along with approximately 1,383 BCM (1,809 BCY) of additional plating material being removed and disposed at ERDF. Debris removed from the excavation included steel, wire cable, pipe, signs, concrete and brick pieces, glass, and asbestos insulation. The soil and debris were direct loaded for disposal at ERDF; therefore, no waste SPAs were generated. Several in-process soil samples were collected during the remediation.

One glass bottle anomaly containing an unknown liquid was also encountered during remediation. The glass bottle anomaly was staged in a small anomaly staging area adjacent to the northern edge of the excavation prior to being sampled for disposal. The liquid was sampled on May 12, 2015, and the glass bottle was disposed at ERDF. No liquid remained in the bottle following sample collection.

4.3.55.3 Verification Sampling

Verification samples from the 100-H-59:2 subsite were collected on July 6, 2015. Two decision units were identified for the 100-H-59:2 subsite; specifically, the excavation and the anomaly staging area. A combination of a statistical and focused sample design was used to evaluate the 100-H-59:2 excavation. Twelve statistical verification soil samples were collected from the excavation. Additionally, one focused soil sample was collected from the excavation at the location where the glass bottle anomaly was encountered within the excavation. One focused soil sample was collected from the approximate center of

the anomaly staging area, located outside of the excavation boundary, where the anomaly was staged prior to being sampled.

All COPCs were quantified below direct exposure RAGs. All COPCs were quantified below groundwater and/or river protection soil RAGs except for benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, and benzo(k)fluoranthene. RESRAD modeling predicted that residual concentrations of these constituents will be protective of groundwater and the Columbia River.

4.3.55.4 Statement of Protectiveness

The verification sample results show that residual soil concentrations support future land uses that can be represented (or bounded) by a rural-residential scenario. The results also demonstrate that residual contaminant concentrations support unrestricted future use of shallow zone soil (i.e., surface to 4.6 m [15 ft]) and that contaminant levels remaining in the soil are protective of groundwater and the Columbia River. Contamination above direct exposure levels was not observed in shallow zone soils and is concluded to not exist in deep zone soils; therefore, institutional controls to prevent uncontrolled drilling or excavation into the deep zone soil are not required. The 100-H-59:2 site has been reclassified as “Interim Closed Out.”

4.3.56 116-H-1, 107-H Liquid Waste Disposal Trench

4.3.56.1 Site Description

The 116-H-1 site is an inactive liquid waste site located approximately 91 m (300 ft) south of the 107H Retention Basin (116-H-7, Section 4.3.61). The site was commonly known as the 107-H Liquid Waste Disposal Trench, although it has also been known as the 107H Rupture Effluent Trench, the 107H Liquid Waste Trench, and the 107H Trench. The trench operated from 1952 until 1958, receiving mixed waste effluent from the 116-H-7 Retention Basin during reactor shutdowns caused by fuel element ruptures. The process effluent coolant received by this trench reportedly contained debris from fuel element ruptures. Additionally, the trench received water and sludge removed from the 116-H-7 Retention Basin in April and May 1965 during basin deactivation.

The trench was divided into three lobes that were oriented from north to south. Aerial photographs taken in 1954 indicated that the first lobe overflowed into the second, and the second overflowed into the third. However, interviews with site personnel suggest that the waste effluents may have never reached the third, downstream lobe. The primary lobe was supplied by a DN500 (20 in.) steel pipe that entered near its bottom. The pipe originated at the 1607H Pump House, near the northwest corner of the 116-H-7 Retention Basin.

4.3.56.2 Excavation Operations

Remedial action at the 116-H-1 site began on June 29, 1999. Excavation of the site involved removing the overburden materials and underlying contaminated soil. Based on field screening, overburden materials identified as potentially clean were placed in stockpiles for potential use as backfill. Contaminated materials were disposed at ERDF.

On June 8, 2000, the excavation was completed. The elevation of the bottom of the excavation was at 123.4 m (405 ft) upon completion. The excavation was approximately 12,735 m^2 (137,077 ft^2) in area with a maximum depth of approximately 4.6 m (15 ft). Approximately 82,706 metric tons (91,168 tons) of material from the site were disposed at ERDF.

4.3.56.3 Verification Sampling

Final cleanup verification samples for the shallow zone were collected following variance sampling. Cleanup verification sampling for the deep and shallow zones was done on June 15, 2000, and July 25, 2000, respectively. The 116-H-1 site consisted of both a shallow and a deep zone decision unit. The site was excavated to a depth greater than 4.6 m (15 ft), with the shallow zone consisting of the excavation sidewalls and the deep zone consisting of the floor of the excavation. The shallow zone decision unit contained two decision subunits, which were divided into eight sampling areas. The deep zone decision unit also contained two decision subunits, which were divided into six sampling areas. Four composite samples were collected from each shallow zone decision subunit (excluding QA/QC samples). Three composite samples were collected from each deep zone decision unit in addition to QA/QC samples. Each verification sample was a composite formed by combining samples collected at four randomly selected nodes within each sampling area.

4.3.56.4 Statement of Protectiveness

The remaining soils at the 116-H-1 site have been sampled, analyzed, and modeled. The results of this effort indicate that the materials from the 116-H-1 site containing COCs at concentrations exceeding RAGs have been excavated and disposed at ERDF. These results also indicate that residual concentrations in the shallow zone will support future land uses that can be represented (or bounded) by a rural-residential scenario and that residual concentrations throughout the site pose no threat to groundwater or the Columbia River. The acceptability of unrestricted direct exposure to deep zone soils has not been demonstrated; therefore, institutional controls to prevent uncontrolled drilling or excavation into the deep zone (i.e., below 4.6 m [15 ft]) are required. The 116-H-1 site has been reclassified as "Interim Closed Out."

4.3.57 116-H-2, 1608-H Liquid Waste Disposal Trench, 1608-H Crib & Trench

Due to geographic location and similarity of remediation activities, cleanup activities for the 116-H-2,100-H-17 (Section 4.3.13), 100-H-2 (Section 4.4.1), and 100-H-30 (Section 4.3.25) sites were conducted together. These sites are collectively referred to as the 100-H-17 Site. For additional information regarding the 116-H-2 site, refer to 100-H-17 (Section 4.3.13).

The 116-H-2 site has been reclassified as "Interim Closed Out."

4.3.58 116-H-3, 105-H Dummy Decontamination French Drain, Perf Decontamination Drain

4.3.58.1 Site Description

The 116-H-3, Dummy Decontamination French Drain site is located about 50 m (165 ft) east of the 105H Reactor. This site also includes the pipeline leading from the reactor building to the french drain. The 116-H-3 French Drain was about 4.6 m (15 ft) deep with a diameter of 3 ft and was made of vitreous tile conduit. The 116-H-3 French Drain received spent nitric acid and rinse water from the decontamination of fuel element spacers, reactor process tube caps, and other reactor hardware between 1950 and 1965.

4.3.58.2 Excavation Operations

Remedial action at the 116-H-3 site began on February 17, 2000. Excavation of the site involved removing the overburden materials, the french drain, the pipeline leading from the reactor building to the french drain, and underlying contaminated soil. Based on field screening, overburden materials identified as potentially clean were placed in stockpiles for potential use as backfill. Contaminated materials were disposed at ERDF.

On June 26, 2000, the excavation was completed. The excavation was approximately 855 m^2 (9,203 ft^2) in area with a maximum depth of approximately 4.6 m (15 ft). Approximately 2,707 metric tons (2,985 tons) of material from the site was disposed at ERDF.

4.3.58.3 Verification Sampling

Final cleanup verification samples were collected following variance sampling. Cleanup verification sampling began on August 1, 2000. The 116-H-3 site was excavated to a depth of 5 m (16.4 ft) with the shallow zone consisting of the excavation sidewalls and the deep zone consisting of the floor of the excavation. The shallow zone decision unit contained one decision subunit, which was divided into four sampling areas. The deep zone decision unit also contained one decision subunit, which was divided into three sampling areas. Each verification sample was a composite formed by combining samples collected at four randomly selected nodes within each sampling area.

4.3.58.4 Statement of Protectiveness

The remaining soils at the 116-H-3 site have been sampled, analyzed, and modeled. The results of this effort indicate that the materials from the 116-H-3 site containing COCs at concentrations exceeding RAGs have been excavated and disposed at ERDF. These results also indicate that residual concentrations in the shallow zone will support future land uses that can be represented (or bounded) by a rural-residential scenario and that residual concentrations throughout the site are protective of groundwater and the Columbia River. The acceptability of unrestricted direct exposure to deep zone soils has not been demonstrated; therefore, institutional controls to prevent uncontrolled drilling or excavation into the deep zone (i.e., below 4.6 m [15 ft]) are required. The 116-H-3 site has been reclassified as "Interim Closed Out."

4.3.59 116-H-4, 105-H Pluto Crib

The 116-H-4, 105-H Pluto Crib was located southwest of the 105H Reactor. The pluto crib was a mixed liquid waste site that operated from 1950 to 1952 to receive contaminated cooling water from reactor process tubes containing ruptured fuel elements. The crib was 3 m (10 ft) long, 3 m (10 ft) wide, and 3 m (10 ft) deep. In 1960, the crib was removed during the deep excavations required to build the 117H Filter Building, which was constructed at the same location. Solid waste from the pluto crib was buried in the 105H Thimble Pit burial ground (118-H-5, Section 4.4.9).

No remedial action for the 116-H-4 site was identified in the ROD. Additionally, a remedial investigation borehole was drilled through the waste site in 2010. Characterization samples collected from the borehole indicate that residual contaminant concentrations do not exceed human health, groundwater protection, or surface water protection thresholds. The 116-H-4 site has been reclassified as "Interim No Action."

4.3.60 116-H-5, 116-H-5 Outfall Structure, 1904-H Outfall Structure

4.3.60.1 Site Description

The 116-H-5, 1904-H Outfall Structure was located northeast of the 105H Reactor and north of the 116-H-7, 107H Retention Basin (Section 4.3.61) on the Columbia River shoreline. The 116-H-5 was a liquid waste site that operated from 1949 to 1965 as a weir box to discharge 105H Reactor coolant water and process sewer waste to the Columbia River, and to provide overflow capability in case the outfall discharge pipelines became plugged or received too much flow. The 116-H-5 outfall received effluent via the 100-H-21, 100H Reactor Cooling Water Effluent Underground Pipelines (Section 4.3.14) from the 116-H-7, 107H Retention Basin and the 100-H-42 process sewer pipelines (Section 4.3.34) from the 1906H Drainage Lift Station. Water flowed from the outfall structure and discharged to the Columbia River via the 100-H-34, 100H River Effluent Pipelines (Section 4.3.28). In the event that the outfall river effluent pipelines became plugged or received too much flow, effluent would back up into

the outfall structure and overflow into the 100-H-36 underground concrete spillway (Section 4.3.30) that led to the river.

4.3.60.2 Excavation Operations

Remedial action at the 116-H-5 waste site began on November 17, 2008, and continued through April 9, 2009, to a depth of approximately 7 m (23 ft) on the eastern side of the excavation and 13 m (43 ft) on the western side of the excavation. The excavation resulted in approximately 2,510 BCM (3,283 BCY) of contaminated soil and debris being removed for disposal at ERDF. Approximately 15,696 BCM (20,529 BCY) of overburden material was stockpiled southwest of the excavation for use as clean backfill. The overburden material, including the installed riprap along the river slope was excavated up to the concrete outfall structure walls. Most of the soil was direct loaded from the excavation; however, small SPAs were used for pipe, concrete, and fence material, which were later loaded out and disposed at ERDF. The debris removed was consistent with that of an outfall structure and consistent with the pre-excavation geophysical survey findings. No anomalies were discovered during the remediation.

Several pipelines that discharged to or from the 116-H-5, 1904-H Outfall Structure remain at the site. A 72 in. RCP that transferred effluent from the 1906H Building to the 116-H-5 outfall remains near the base of the western sidewall of the 116-H-5 excavation. The pipeline is part of the 100-H-42, 1906H Drainage Lift Station waste site (Section 4.3.34). Two small-diameter pipelines, also a part of the 100-H-42 waste site, that extended between the 1908H Effluent Monitoring Station and the outfall were removed during the 116-H-5 excavation. The 100-H-36 spillway and the 100-H-34, 100H River Effluent Pipelines that discharged effluent from the outfall structure to the river also remain.

Columnar basalt riprap boulders, cemented together and used as a retaining wall, were also excavated from the site and will be used as backfill. The basalt riprap was installed along the river slope near the outfall structure to prevent erosion of the slope during high river levels. There is no evidence or historical information that would indicate the basalt riprap was contaminated during operation due to spills. Radiological surveys were conducted during the removal of the riprap and no contamination was detected.

Following sample analysis of the original excavation, it was determined that additional remediation was needed because some sample locations exceeded cleanup criteria for some ICP metals, SVOCs, PAHs, pesticides, and PCBs. This extra remediation was conducted from February 11 through March 15, 2011. Approximately 5,813.8 BCM (7,604.2 BCY) of additional soil was removed from areas that exceeded direct exposure and/or groundwater and river protection RAGs in the shallow zone excavation, deep zone excavation, and overburden soil stockpile.

Following the second sample analysis, it was determined that additional remediation was still required because some sample locations within the deep zone decision unit exceeded cleanup criteria for some ICP metals, SVOCs, and PAHs. This extra remediation was conducted on April 11 and 12, 2011. Approximately 658.6 BCM (861.4 BCY) of additional soil was removed from areas that exceeded groundwater and river protection RAGs in the deep zone decision unit. Additional remediation did not occur at one location that exceeded the groundwater and river protection cleanup criteria for lead because of the proximity of the sample location to the 100-H-42 pipeline that enters the outfall excavation. This location will be included in the remediation of the 100-H-42 site (Section 4.3.34).

4.3.60.3 Verification Sampling

Verification sampling was conducted May 13 through 18, 2010. The 116-H-5 waste site was divided into four decision units for verification sampling: the shallow zone excavation, the deep zone excavation, the overburden soil stockpile, and the SPA footprint. Portions of the deep zone were not accessible due to

concrete-encased pipes reinforced with rebar and were excluded from the sample design. Additionally, portions of the southernmost overburden soil stockpile were excluded from the sample design due to mud dauber contamination.

Twelve verification soil samples were collected from the shallow zone excavation. Twelve verification soil samples were collected from the deep zone excavation. Fifteen verification soil samples were collected from the overburden soil stockpile. Fifteen were chosen to encompass all five overburden areas. Twelve verification soil samples were collected from the SPA footprint. One discrete soil sample was collected at each verification sample location of surficial soils (0 to 0.15 m [0 to 6 in.] bgs).

Additional verification sampling was conducted at the 116-H-5 waste site on March 16, 2011, following the second remediation campaign of the failed locations. Further verification sampling was also conducted on April 13, 2011 following the third remediation campaign of failed sample locations.

Groundwater and/or the Columbia River protection soil RAGs are exceeded in the shallow zone, overburden, and SPAs for lead, benzo(a)anthracene, benzo(b)fluoranthene, benzo(a)pyrene, benzo(k)fluoranthene, chrysene, DDE, DDT, and total PCBs. RESRAD modeling predicted that residual concentrations of these constituents will be protective of groundwater and the Columbia River. Technetium-99 concentrations exceed the soil RAG for protection of groundwater in the waste SPA footprint. RESRAD modeling predicted that residual concentrations of technetium-99 will be protective of groundwater.

Groundwater and the Columbia River protection soil RAGs are exceeded in the deep zone for lead, benzo(a)anthracene, benzo(b)fluoranthene, benzo(a)pyrene, and benzo(k)fluoranthene. RESRAD modeling predicted that residual concentrations of these constituents will be protective of groundwater and the Columbia River.

4.3.60.4 Statement of Protectiveness

The verification sampling and modeling results show that residual contaminant concentrations do not preclude any future uses (as bounded by the rural-residential scenario) and allow for unrestricted use of shallow zone soils (i.e., surface to 4.6 m [15 ft] deep). The results (including consideration of modeling) also demonstrate that residual contaminant concentrations are protective of groundwater and the Columbia River except for lead and PAHs in the deep zone. Supplemental evaluation demonstrates protectiveness for lead and PAHs in the deep zone. The 116-H-5 site has been reclassified as “Interim Closed Out.”

4.3.61 116-H-7, 107-H Retention Basin, 107-H

4.3.61.1 Site Description

The 116-H-7 site is located on the east side of the 100-H Area. This site operated from 1949 to 1965 and was an integral part of the 105H Reactor cooling water disposal system. The site is commonly known as the 107H Retention Basin. The retention basin was a concrete-lined rectangular structure used for temporary storage of cooling water from the 105H Reactor. This allowed radioactive decay and thermal cooling to occur before water was discharged to the Columbia River. It received nearly all of the water used to cool the 105H Reactor. When it was operating, the retention basin had the capacity to hold nearly 92 million L (24 million gal) of cooling water.

The retention basin was divided into two chambers by a concrete overflow flume in its center. Cooling water flowed from the reactor into the south end of the retention basin through two steel pipelines and was discharged at the north end of the basin to the 116-H-5 Outfall Structure (Section 4.3.60) through two steel lines. Cooling water flowed from the outfall structure into the

Columbia River through steel and concrete discharge lines. The retention basin and its associated effluent lines developed leaks during the years of operation. Due to this leakage, numerous plumes were excavated along with the waste site.

4.3.61.2 Excavation Operations

Remedial action at the 116-H-7 site began on March 17, 1999. Excavation of the site involved removing the overburden materials, the contaminated structure, and underlying contaminated soil. Due to leakage from the retention basin and its associated pipelines, numerous plumes were excavated along with the waste site. Based on field screening, overburden materials identified as potentially clean were placed in stockpiles for potential use as backfill. Contaminated materials were disposed at ERDF.

On July 17, 2000, the excavation of the waste site and associated plumes was completed. The excavation was approximately 23,660 m^2 (254,700 ft^2) in area with a depth of approximately 4.8 m (15.7 ft). Approximately 218,130 metric tons (240,440 tons) of material from the site was disposed at ERDF.

4.3.61.3 Verification Sampling

Final cleanup verification samples were collected following variance sampling. The 116-H-7 site consisted of overburden, shallow, and deep zone decision units. The site was excavated to a general average depth of approximately 4.8 m (15.7 ft) with the shallow zone consisting of the excavation sidewalls to a depth of 4.6 m (15 ft) and the deep zone consisting of the excavation sidewalls below 4.6 m (15 ft), together with the floor of the excavation.

The shallow zone decision unit contained two decision subunits, which were divided into eight sampling areas. The deep zone decision unit contained 5 decision subunits, which were divided into 15 sampling areas. In addition, an overburden decision unit was included with this site, which contained two decision subunits that were divided into eight sampling areas. Each verification sample was a composite formed by combining samples collected at four randomly selected nodes within each sampling area. The majority of the cleanup verification sampling was performed between August 10 and 24, 2000. Resampling of PCBs in one of the shallow zone sample areas was performed on December 6, 2000.

The shallow zone, deep zone, and overburden nonradionuclide COC concentrations are less than the listed groundwater and/or river protection soil RAGs with the following exceptions: overburden (Aroclor-1260), shallow zone (lead and Aroclor-1260), and deep zone (hexavalent chromium, total chromium, Aroclor-1242, and Aroclor-1260). RESRAD modeling was performed to provide a more detailed analysis of the potential impacts of residual contaminant concentrations on groundwater and the river. RESRAD predicts that the residual concentration of these COCs will not impact groundwater during the 1,000-year time frame. Because hexavalent chromium was detected in deep zone cleanup verification samples at concentrations greater than the soil RAG, a hexavalent chromium leachability study was conducted. Based on comparison with groundwater and river protection RAGs, RESRAD modeling, and the 100H leachability study, cleanup verification results indicate that residual concentrations of nonradionuclide COCs are protective of groundwater and the river.

4.3.61.4 Statement of Protectiveness

The remaining soils at the 116-H-7 site have been sampled, analyzed, and modeled. The results of this effort indicate that the materials from the 116-H-7 site containing COCs at concentrations exceeding RAGs have been excavated and disposed at ERDF. These results also indicate that residual concentrations in the shallow zone will support future land uses that can be represented (or bounded) by a rural-residential scenario and that residual concentrations throughout the site are protective of groundwater and the Columbia River. The acceptability of unrestricted direct exposure to deep zone soils has not been demonstrated; therefore, institutional controls to prevent uncontrolled drilling or excavation

into the deep zone (i.e., below 4.6 m [15 ft]) are required. The 116-H-7 site has been reclassified as "Interim Closed Out."

4.3.62 116-H-9, 117-H Crib, 117-H Seal Pit Crib

4.3.62.1 Site Description

The 116-H-9 waste site is a gravel-filled crib located approximately 150 m (492 ft) southwest of the 105H Building. The crib bottom dimensions are 6 m (20 ft) long, 6 m (20 ft) wide, and between 4 m (13 ft) and 4.6 m (15 ft) deep. A black polyurethane vapor barrier was placed over the gravel, and a 36 in. vertical steel vent pipe was present from the base of the crib to 1.2 m (4 ft) abovegrade.

During its period of operation from 1960 to 1965, the 116-H-9 Crib is reported to have received approximately 300,000 L (79,200 gal) of low-level radioactive effluent that drained from the 117-H Filter Building confinement system seal pits. The crib was released from radiological controls in the late 1960s because of short half-lives associated with the radioisotopes of concern.

4.3.62.2 Excavation Operations

Remedial action at the 116-H-9, 117-H Seal Pit Crib began on October 28, 2008, and continued through February 3, 2009, to a depth of approximately 4.6 m (15 ft). The lateral extent of the excavation was determined based on the geophysical survey that clearly defines a distinct boundary. Approximately 2,430 BCM (3,180 BCY) of soil and debris was removed for disposal at ERDF. The material was direct loaded, and no staging pile was created for this site. In addition, during remediation, no stained soil or radiological or chemical contamination was identified.

Contaminated soil and debris were excavated and removed from for shipment and disposal to ERDF. The material removed included gravel, the polyurethane vapor barrier, a small portion of the 4 in. diameter asbestos cement pipe, and the perforated 36 in. diameter steel vent pipe. A GPERS survey was conducted over the 116-H-9 waste site upon completion of remedial action activities. The results showed that no radionuclide contamination above site background was detected.

4.3.62.3 Verification Sampling

Verification sampling for the 116-H-9 waste site was performed on July 16, 2009. The footprint of the entire excavation was the only decision unit for verification sampling. Twelve statistical soil sample locations were identified in the 116-H-9 waste site.

All results are below rural-residential scenario direct exposure, groundwater protection, and Columbia River protection soil RAGs at the 116-H-9 waste site, except for Aroclor-1254 in the southeast corner of the excavation. RESRAD modeling predicted that residual concentrations of Aroclor-1254 will be protective of groundwater and the Columbia River.

4.3.62.4 Statement of Protectiveness

The results of the verification sampling show that residual contaminant concentrations do not preclude any future uses (as bounded by the rural-residential scenario) and allow for unrestricted use of shallow zone soils (i.e., surface to 4.6 m [15 ft] deep). The results also demonstrate that residual contaminant concentrations are protective of groundwater and the Columbia River. The site does not have a deep zone or residual contaminant concentrations that would require any institutional controls. The 116-H-9 site has been reclassified as "Interim Closed Out."

4.3.63 118-H-6:2, 105-H Reactor Ancillary Support Areas, Below-Grade Structures and Underlying Soils

Due to geographic location and similarity of remediation activities, cleanup activities for the 118-H-6:2, 118-H-6:3 (Section 4.3.64), and 118-H-6:6 (Section 4.3.67) sites were conducted together. Remediation activities at these three sites resulted in the remediation of waste sites 100-H-9 (Section 4.3.7), 100-H-10 (Section 4.3.8), 100-H-11 (Section 4.3.9), 100-H-12 (Section 4.3.10), 100-H-13 (Section 4.3.11), 100-H-14 (Section 4.3.12), and 100-H-31 (Section 4.3.26). These 10 sites are collectively referred to as the 105H Site. This section contains general information about the 105H Site, and information specific to the 118-H-6:2, 118-H-6:3, and 118-H-6:6 sites.

4.3.63.1 Site Description

The 105H Reactor is in the 100-H Area of the Hanford Site. The 105H Reactor was one of eight single-pass plutonium production reactors built along the Columbia River. Construction of the 105H Reactor began in March 1948 with operations commencing on October 29, 1949. The 105H Reactor was shut down in April 1965. The 118-H-6:2 site includes the north, west, and east sides of the 105H Building outside the reactor shield walls and consists of the 105H Reactor ancillary support areas, belowgrade structures, and underlying soils. The 118-H-6:3 site is the FSB on the south side of the 105H Building and the underlying soils. The 118-H-6:6 site is the FSB deep zone (below 4.6 m [15 ft]) side slope soils.

During the shutdown activities it was determined that the FSB had leaked. Miscellaneous process equipment and sludge was left in the basin, and the sludge was stabilized in place in 1970 with approximately 6 m (20 ft) of soil backfill. In the years following deactivation, several other significant cleanup efforts were completed at the 105H Reactor complex. These include the 1983 demolition of the 116H reactor exhaust stack and abovegrade exhaust ducting and the 1984 demolition of the 117H exhaust air filter building.

The primary source of contamination at the 105H site was reactor coolant water and water in the FSB that became contaminated through contact with irradiated and ruptured fuel elements and components from the reactor cooling system. Effluent pipelines external to the reactor building were previously removed and remediated.

4.3.63.2 Excavation Operations

Removal and disposal activities at the 105H site were completed in 2004. After the hazardous materials were removed, the above- and belowgrade structures were segregated for disposal or salvage; all nonsalvageable material was shipped to ERDF for disposal. The 105H site D&D activities resulted in complete removal of all above- and belowgrade structures outside of the 105H safe storage enclosure. A portion of the FSB floor remains, at its northern end between the two access labyrinths to the D elevator on the rear reactor face. The remaining structure of the 105H Reactor within the shield walls has been preserved to act as temporary storage (up to 75 years) for the reactor core.

The overburden piles produced during excavation were found to be contaminated. The overburden was deemed unsuitable for use as backfill of the site and was removed to ERDF. The site was backfilled with clean soil/aggregate and graded to match the surrounding terrain. All materials from the 105H Reactor ISS Project were demolished and disposed at ERDF. The 105H D&D activities generated approximately 4,863 bulk containers of low-level contaminated material that were shipped to ERDF, accounting for approximately 73,966 metric tons (81,365 tons). D&D activities for construction of the 105H Reactor safe storage enclosure also resulted in the removal of remaining waste sites 100-H-9, 100-H-10, 100-H-11, 100-H-12, 100-H-13, 100-H-14, and 100-H-31.

The remediation and cleanup verification of the 105H FSB shallow zone side slope soils (118-H-6:4, Section 4.3.65) was deferred. Also deferred were three decontamination pads created during the 105H D&D project (118-H-6:5, Section 4.3.66).

4.3.63.3 Verification Sampling

Final cleanup verification samples for the 105H FSB underlying soils and deep zone side slope soils were collected following evaluation of field screening for radiological contaminants using GPERS and laser-assisted ranging and data system surveys. This field screening was performed to obtain an initial assessment of attainment of radiological cleanup levels.

The removal action did not require soil sampling for the 118-H-6:2 site because the structures were removed in their entirety. Sampling of the underlying soils was not required because the structures that were removed were not subjected to standing contaminated water and there was no mechanism for residual surface contamination to penetrate into the concrete and underlying soil.

The sample design for the 105H FSB underlying soils (118-H-6:3) was developed specifically to address potential contamination from the known leakage of the 105H FSB. Samples were collected from 10 random sample locations and three focused sample locations. At each location, soil grab samples were collected from two intervals: the first native soils below the FSB over a 0.3 m (1 ft) interval and at 2.4 m (8 ft) to 3.1 m (10 ft) below the surface. Soil samples were collected on March 24 and 25, 2004, and on April 6, 2004. The results of the focused sampling are consistent with the statistical sampling results.

The verification sample design for the deep zone side slope soils (118-H-6:6) consisted of dividing the area into three equal sections, with a composite of four soil grab samples being collected within each area. Soil samples were collected on March 29, 2004.

4.3.63.4 Statement of Protectiveness

The remaining soils at the 105H Reactor site have either been deferred or have been shown to meet the applicable RAGs through verification sampling, analysis, and RESRAD modeling. All excavated materials generated during the D&D activities at the 105H Reactor site were disposed at ERDF, and the area was backfilled to grade with clean backfill. These results also indicate that residual concentrations in the shallow zone will support future land uses that can be represented (or bounded) by a rural-residential scenario and that residual concentrations throughout the site pose no threat to groundwater or the Columbia River. The acceptability of unrestricted access to deep zone soils (i.e., below 4.6 m [15 ft]) has not been demonstrated; therefore, institutional controls to prevent uncontrolled drilling or excavation into deep zone soils are required. The 118-H-6:2 site has been reclassified as “Interim Closed Out.”

4.3.64 118-H-6:3, 105-H Reactor Fuel Storage Basin and Underlying Soils

Due to geographic location and similarity of remediation activities, cleanup activities for the 118-H-6:2 (Section 4.3.63), 118-H-6:3, and 118-H-6:6 (Section 4.3.67) sites were conducted together.
The remediation of these sites resulted in the remediation of seven additional sites. The 10 sites are collectively referred to as the 105H Site. For additional information about the 118-H-6:3 site, refer to Section 4.3.63.

The 118-H-6:3 site has been reclassified as “Interim Closed Out.”

4.3.65 118-H-6:4, 105-H Fuel Storage Basin Shallow Zone Side Slope Soils

4.3.65.1 Site Description

The 118-H-6:6, 105-H Fuel Storage Basin Shallow Zone Side Slopes Soils waste site is located on the south side of the 105H Reactor. Remediation at the site was deferred to support the safe storage enclosure

replacement of the 105H Building roof structure. Backfill and stabilization of the FSB excavation was required to accommodate the roof replacement.

4.3.65.2 Excavation Operations

Remedial actions at the 118-H-6:4 FSB occurred in two stages. The first stage of remedial action at the 118-H-6:4 waste site was conducted in 2004 during D&D of the 105H Reactor ancillary facilities and the FSB (Section 4.3.63). In March 2004, the excavated area was sampled and indicated that radiological cleanup criteria had not been met in the FSB side slope shallow zone. Excavation of the 118-H-6:4 waste site was resumed on March 17, 2009 and continued through June 29, 2009. Approximately 2,682 BCM (3,508 BCY) of contaminated shallow zone side slope soil was excavated and direct loaded for disposal at ERDF.

4.3.65.3 Verification Sampling

Verification sampling at the 118 H-6:4 waste subsite was conducted on January 20 and 21, 2010. The subsite was divided into two decision units for verification sampling, the excavation side slopes and the overburden soil stockpiles. A total of 12 statistical soil samples were collected from each of the two decision units.

4.3.65.4 Statement of Protectiveness

Verification sampling was performed and the analytical results indicate that the residual concentrations of COPCs at this site meet the RAGs for direct exposure, groundwater protection, and river protection. Residual contaminant concentrations do not preclude any future uses (as bounded by the rural-residential scenario) and allow for unrestricted use of shallow zone soils (i.e., surface to 4.6 m [15 ft]) deep. The results also demonstrate that residual contaminant concentrations are protective of groundwater and the Columbia River. Site contamination did not extend into the deep zone soils; therefore, institutional controls to prevent uncontrolled drilling or excavation into the deep zone are not required. The 118-H-6:4 site has been reclassified as “Interim Closed Out.”

4.3.66 118-H-6:5, 105-H Decontamination Pads

4.3.66.1 Site Description

The 118-H-6:5 subsite consists of three decontamination (decon) pads. The decon pads were arranged in an arc on the south and southeast side of the 105H safe storage enclosure excavations. The decon pads consisted of compact level gravel areas where cranes and heavy equipment were staged to support the movement and decontamination of parts and equipment in support of the 105H Reactor ISS activities.

4.3.66.2 Excavation Operations

Remediation of the 118-H-6:5 waste subsite was performed from April 30 through September 30, 2009. A total of 2,181 BCM (2,852 BCY) of soil was removed and direct loaded for disposal at ERDF. On March 17 through 25, 2009, an additional 64 BCM (84 BCY) of oily soil was excavated from the surface of the decon pads and the area between and around the decon pads, and stockpiled on the decon pad for waste characterization and removal. The excavation depth for each pad was approximately 1.0 to 2.0 m (3.3 to 6.6 ft). Following the main excavation, 468 BCM (612 BCY) of stained soil was removed and disposed at ERDF between July 15 and September 30, 2009. The excavations occurred to a depth of 3.0 to 4.0 m (9.8 to 13.1 ft) in the center decon pad. An additional 327 BCM (427 BCY) of soil was removed on February 17 and March 28, 2011 in three locations that exceeded the cleanup levels within the original excavation.

4.3.66.3 Verification Sampling

Verification sampling was conducted at the 118-H-6:5 subsite on June 9, 2010, October 11, 2010, and April 11, 2011. The 118-H-6:5 waste subsite was divided into three sampling areas for statistical verification sampling. The three areas are the east decon pad, the center decon pad, and the west decon pad. Twelve statistical soil samples were collected on the grid within each of the three areas remediation footprint at the site.

A single focused sample was collected at each of three oil stain locations that were cleaned up in March 2009 prior to remediation of the 118-H-6:5 decon pads. In addition, two focus samples were collected within the 100-H-39 excavation boundary at the west decon pad.

Direct exposure, groundwater protection and Columbia River protection RAGs were met except for arsenic, copper, lead, and four PAH constituents (benzo[a]anthracene, benzo[a]pyrene, benzo[b]fluoranthene, and benzo[k]fluoranthene). The lead and arsenic exceedances are attributed to pesticide use previous to the Manhattan Project, and therefore are excluded from the COC list. RESRAD modeling predicted that residual concentrations of these constituents will be protective of groundwater and the Columbia River.

4.3.66.4 Statement of Protectiveness

The results of verification sampling show that residual contaminant concentrations do not preclude any future uses (as bounded by the rural-residential scenario) and allow for unrestricted use of shallow zone soils (i.e., surface to 4.6 m [15 ft]) deep. The results also demonstrate that residual contaminant concentrations are protective of groundwater and the Columbia River. Site contamination did not extend into the deep zone soils; therefore, institutional controls to prevent uncontrolled drilling or excavation into the deep zone are not required. The 118-H-6:5 site has been reclassified as “Interim Closed Out.”

4.3.67 118-H-6:6, 118-H-6:6 Deep Zone Side Slope Soils

Due to geographic location and similarity of remediation activities, cleanup activities for the 118-H-6:2 (Section 4.3.63), 118-H-6:3 (Section 4.3.64), and 118-H-6:6 sites were conducted together.
The remediation of these sites resulted in the remediation of seven additional sites. The 10 sites are collectively referred to as the 105H Site. For additional information about the 118-H-6:6 site, refer to Section 4.3.63.

The 118-H-6:6 site has been reclassified as “Interim Closed Out.”

4.3.68 126-H-2, 183-H Clearwells/Disposal Pit

4.3.68.1 Site Description

The 126-H-2, 183-H Clearwells/Disposal Pit waste site is located approximately 275 m (900 ft) north of the 105H Reactor. The 183H Clearwells were part of the 183-H Water Treatment Facility and consisted of two reinforced concrete basins (east and west) 229 m (750 ft) long and 41 m (135 ft) wide with a 38 million L (10 million gal) capacity. The east and west clearwells were separated by a pump room, which was previously demolished and the belowgrade portion filled with pump room rubble, fly ash, and backfill material. The treatment facility began operation in 1949 to store Columbia River water being processed for reactor coolant. During reactor operations, the clearwells held clean, uncontaminated water.

Sometime after the shutdown of the 105H Reactor in 1965, part of the roof on the east clearwell was demolished to allow dumping of inert demolition waste into the clearwell cavity. Historical information indicates the east clearwell was used for disposal of nonhazardous, nonradioactive debris such as

concrete, wood, pipe, insulation, transite, composition roof materials, rebar, and asphalt from 1974 through 1997.

The west clearwell remained intact until decommissioning in 2010. There is no evidence that the west clearwell ever held anything other than clean, uncontaminated water from the 183-H Water Treatment Facility. As a result, no hazardous or radiological contamination was expected to be present within the west clearwell. The roof of the west clearwell was demolished and the debris disposed at ERDF.

4.3.68.2 Excavation Operations

Remediation of the 126-H-2 waste site was performed from August 5, 2009, through January 28, 2010, and consisted of the removal of debris within the eastern clearwell structure down to the concrete floor. Prior to performing remediation, in-process soil samples and concrete samples were collected to support evaluation of the radiological posting and waste disposal characterization.

A number of waste items were encountered and removed during remediation, including fire extinguishers, aerosol cans, glass bottles, cylinders, and metal drums. Many of the drums were in the western portion of the east clearwell and found to contain oil; some were breached during remediation, releasing contents into the soil inside the clearwell structure. Samples of soil, oil, and other waste material were collected as necessary to support waste characterization and disposal.

Approximately 29,593 metric tons (32,621 U.S. tons) of material was removed for disposal at ERDF. Coal ash contaminated with PCBs was found in the belowgrade structure of the clearwell pump room. The D4 Project removed the coal ash during July through September 2010 for disposal at ERDF.

Radiological surveys performed during remediation did not identify any radiological contamination. Following removal of all debris, a GPERS survey for beta and gamma activity was performed. Evaluation of the results indicates that beta and gamma radiological activity is well within the range of background at the site.

4.3.68.3 Verification Sampling

Following remediation, verification sampling of the concrete floor of the pump room and the east clearwell was conducted March 3 through 8, 2011. A statistical sampling design was used to collect verification samples of concrete chipped from the floor of the east clearwell structure and the pump room. The floor of the east clearwell and the floor of the pump room were each delineated as separate decision units. Twelve verification concrete chip samples were collected from each of these areas.

Additionally, soil samples were collected from beneath the concrete floor of the pump room and the east clearwell on July 10, 2012, because arsenic, selenium, hexavalent chromium, and technetium-99 were detected in the concrete samples at concentrations exceeding soil cleanup criteria for protection of groundwater and the river. These samples were obtained by performing local demolition of the concrete floor with a hydraulic hammer and collecting focused grab samples from underlying soil at designated locations. Two of the three locations for each area were selected based on verification data results biased for locations with elevated hexavalent chromium results in the concrete samples. The third sample locations in both the clearwell and the pump room were placed at seams in the concrete, where there was potential to have allowed liquid drainage to the underlying soil.

Concentrations of cadmium, copper, lead, mercury, zinc, diesel range petroleum hydrocarbons, Aroclor-1260, benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene, and chrysene are above the respective RAGs for groundwater and/or river protection. RESRAD modeling predicted that residual concentrations of these constituents will be protective of groundwater and the Columbia River. Residual concentrations of arsenic, selenium, and hexavalent chromium present within

the concrete in the clearwell and pump room floors will not migrate to groundwater (and thus the Columbia River) at concentrations exceeding groundwater or river criteria within 1,000 years based on the results of soil samples collected from beneath the concrete floor of the pump room and clearwell. These soil samples indicate concentrations of arsenic to be protective of groundwater and the river, with selenium and hexavalent chromium not detected. Therefore, residual concentrations of constituents of the concrete achieve the RAOs for groundwater and river protection.

4.3.68.4 Statement of Protectiveness

The results of verification sampling show that residual contaminant concentrations do not preclude any future uses (as bounded by the rural-residential scenario) and allow for unrestricted use of shallow zone soils (i.e., surface to 4.6 m [15 ft] deep). The results also demonstrate that residual contaminant concentrations present within the concrete of the floor of the east clearwell and the pump room are protective of groundwater and the Columbia River. However, since the contamination resides within the concrete floor of the clearwell below an approximate depth of 4.9 m (16 ft), institutional controls to prevent uncontrolled drilling or excavation into the deep zone are required. The 126-H-2 site has been reclassified as “Interim Closed Out.”

4.3.69 132-H-1, 116-H Reactor Exhaust Stack Burial Site

4.3.69.1 Site Description

The 116-H Reactor Exhaust Stack began operation in 1949 and was operational until the 105H Reactor and its associated facilities were shut down in 1965. The stack, located in the southwest corner of the former 105H Reactor, was originally built as part of the reactor’s ventilation system to disperse unfiltered exhaust air from the reactor to the atmosphere. In 1960, the 117H Filter Building was installed to filter the air through particulate (HEPA) and halogen (activated charcoal) filters prior to its atmospheric release through the exhaust stack.

The stack stood approximately 61 m (200 ft) high with a base diameter of 5.1 m (16.6 ft).
The 116H Exhaust Stack and foundation were decommissioned and demolished in 1983 and the site was graded to match the surrounding terrain. The 116-H Exhaust Stack burial trench and buried concrete stack foundation, which includes an embedded condensate drain line, are identified as the 132-H-1 site.
The drain line connecting the stack base to the 1608-H Lift Station was removed during previous remedial action and does not require further remedial action.

As part of decommissioning activities, extensive radiological surveying and sampling activities were performed to characterize residual radiological contamination of the 116-H Exhaust Stack. Samples of the concrete were collected by coring the stack at five elevations. Characterization results indicated that the contamination was confined to a 0.01 m (0.4 in.) surface layer of concrete on the interior wall of the stack.

Using the maximum radiological activities from the pre-demolition characterization data to represent residual contamination levels over the entire mass of concrete of the former stack, RESRAD modeling was performed in 2006 to support the previous decision to demolish and bury the stack in place.
The RESRAD modeling was performed only for the contaminated rubble which was buried in the shallow zone. An evaluation of the concrete foundation that extends greater than 4.5 m (15 ft) was not required because the foundation was not contaminated. The condensate drain embedded in the stack foundation is in the shallow zone. The RESRAD modeling accounts for radioactive decay from 1983 (year of sampling) to 2006 and predicts that the site achieves the dose limits and risk objectives for rural-residential land use, groundwater protection, and river protection.

4.3.69.2 Statement of Protectiveness

Residual concentrations support future land uses that can be represented (or bounded) by a rural-residential scenario and pose no threat to groundwater or the Columbia river based on RESRAD modeling. This site does not have a deep zone; therefore, no deep zone institutional controls are required. The 132-H-1 site has been reclassified as "Interim Closed Out."

4.3.70 132-H-3, 1608H Waste Water Pumping Station Site

4.3.70.1 Site Description

The 132-H-3, 1608-H Effluent Pumping Station waste site is located approximately 9.1 m (30 ft) southwest of the 105-H Reactor FSB. The 132-H-3 waste site is the remaining footprint and debris of the 1608-H Effluent Pumping Station. The effluent pumping station was constructed primarily of reinforced concrete and extended 3.7 m (12 ft) abovegrade and 11.4 m (37.5 ft) belowgrade. The facility was 10.8 m (36 ft) in length and 10.4 m (34 ft) in width. The maximum thickness of concrete used in the structure was 0.61 m (2 ft), which occurred at the base of the sump walls, the floor above the sump inlet chamber, and the floor above the sump chamber.

The 1608H facility was constructed in 1949 and served as a lift station to pump effluent water from the various reactor building drains. From the reactor startup in 1949 until 1953, the 1608H effluent was pumped into the process effluent waste lines that discharged into the 107H Retention Basin. From 1953 until 1965, the 1608H effluent was pumped into the 116-H-2 liquid waste disposal trench (Section 4.3.57). The effluent pumping station was operational from 1949 until 1965, when the 105H Reactor and its supporting facilities were shut down. The 1608-H Effluent Pumping Station was decommissioned in 1987, and contaminated water, sludge, and process equipment were removed for disposal. The demolition was performed to a depth of at least 5 m (16.4 ft) belowgrade and the site backfilled with soil to surrounding grade.

4.3.70.2 Excavation Operations

Remediation of the 132-H-3 waste site was performed from September 27, 2010, through July 13, 2011. Contaminated soil and concrete debris associated with the demolished 1608H facility was removed and stockpiled for disposal at ERDF. Approximately 34,465 metric tons (15,260 BCM) of material was removed for disposal at ERDF. The excavation proceeded to the planned excavation depth at approximately 116.5 m (382 ft) above mean sea level (amsl) to support complete removal of the previously demolished pumping station structure. This excavation depth was reached in January 2011.

A decision was made to update the remediation design to accommodate additional stained soil removal on the north excavation wall from surface grade to the base of the current excavation (116 m [380.6 ft]). Surface grade elevation ranges from 129 m (423.2 ft) to 130 m (426.5 ft) amsl, or an average of 129.5 m (424.9 ft) amsl. In-process soil samples were collected on June 6, 2011, on the east, west, and south walls of the excavation. The stained soil removal on the north/northwest wall of the excavation was completed in June 2011. An additional round of in-process samples were collected on July 5, 2011, from the north sidewall of the excavation to evaluate whether the stained soil was adequately removed. The results of in-process sampling indicated that contaminated soil removal was complete and the site was ready for collection of verification samples to support closeout of the waste site. GPERS surveys of the excavation were conducted on January 27, 2010, March 4, 2011, and July 11, 2011.

4.3.70.3 Verification Sampling

Verification sampling of the 132-H-3 waste site was performed as two separate events. Verification sampling of the overburden/layback and waste staging area footprint decision units was expedited from July 25 through July 27, 2011. Verification sampling of the excavation was performed on February 15,

2012. A statistical sampling design was used to collect verification soil samples from within the excavation and from the overburden/layback and waste SPA footprints. The excavation was a single decision unit with 12 verification samples collected. The overburden/layback soil stockpiles were divided into 2 decision subunits, and 12 verification samples were collected from each subunit. The waste SPA footprint was divided into two decision subunits with twelve verification samples collected from each subunit.

Selenium, Aroclor-1260, benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, and benzo(k)fluoranthene are present at concentrations slightly above soil RAGs for groundwater and/or Columbia River protection. RESRAD modeling predicted that residual concentrations of these constituents (except for selenium) will be protective of groundwater and the Columbia River. The limited mass of residual selenium detected in the waste SPA footprints is not expected to migrate through the vadose zone to groundwater, and ultimately the Columbia River at a concentration exceeding ambient water quality criteria.

4.3.70.4 Statement of Protectiveness

The results of verification sampling show that residual contaminant concentrations do not preclude any future uses (as bounded by the rural-residential scenario) and allow for unrestricted use of shallow zone soils (i.e., surface to 4.6 m [15 ft] deep). Residual contaminant concentrations meet direct exposure cleanup criteria and are protective of groundwater and the Columbia River. The 132-H-3 excavation area has a maximum depth of approximately 13.5 m (44.3 ft), which includes both shallow and deep zone soils. However, the entire site was closed out using the more restrictive shallow zone criteria. Therefore, institutional controls to prevent uncontrolled drilling or excavation into the deep zone are not required. The 132-H-3 site has been reclassified as “Interim Closed Out.”

4.3.71 1607-H-2, 1607-H-2 Septic Tank and Associated Drain Field

4.3.71.1 Site Description

The 1607-H2 site, also known as the 124-H2 Sanitary Sewer System, is located north of the 105H Reactor. The site operated from 1949 until 1965, receiving sanitary waste from the 182H, 183H, 190H, and other 100-H Area office and maintenance buildings. The site formerly included a septic tank, drain field, and associated piping. The septic tank was about 11.8 m (38.5 ft) long, 4.1 m (13.5 ft) wide, and 4.8 m (15.6 ft) deep. The drain field was about 93.3 m (306 ft) long, 30.8 m (101 ft) wide, and 0.9 m (3 ft) deep. About 140 m (460 ft) of the 8 in. diameter sewage influent pipe is included in the 1607-H2 site.

This site is in an area that, prior to World War II and the formation of the Hanford Site, was occupied by fruit tree orchards.

4.3.71.2 Excavation Operations

Remedial action at the 1607-H2 site began on October 21, 1999. Excavation involved removing the overburden materials, the structure (septic tank, drain field, and piping), and underlying contaminated soil. Approximately 140 m (460 ft) of the 8 in. diameter sewage influent pipe was removed during excavation. Based on field screening, overburden materials identified as potentially clean were placed in stockpiles for potential use as backfill. Contaminated materials were disposed at ERDF.

On November 11, 1999, the excavation was completed. The site excavation was approximately 5,054 m^2 (54,405 ft^2) in area with a maximum depth of approximately 5.6 m (18.4 ft). Approximately 12,207 metric tons (13,456 tons) of material from the site was disposed at ERDF.

4.3.71.3 Verification Sampling

Verification samples were collected following variance sampling, analysis, and data evaluation. The site excavation contained two decision subunits, which were divided into eight sampling areas. Cleanup verification sampling was conducted on February 16, 2000. A total of eight statistical verification samples were collected from the site excavation (excluding QA/QC samples). The overburden pile contained one decision subunit that was divided into four sampling areas. A total of four statistical verification samples were collected from the overburden pile (excluding QA/QC samples).

On May 5, 2000, a test pit was excavated at the bottom of the 1607H2 drain field excavation. The purpose of the test pit was to characterize soil lead and mercury concentrations at depth for development of a site-specific model. The test pit was excavated to 4.6 m (15 ft) below the bottom of the drain field excavation. Samples were collected from the test pit at intervals of 1 m (3.3 ft) and analyzed for arsenic, total chromium, mercury, and lead.

COC concentrations were less than the RAGs, with the exceptions of lead, total chromium, mercury, and Aroclor-1254. RESRAD modeling predicts that the residual concentration of these COCs are protective of groundwater and the Columbia River.

4.3.71.4 Statement of Protectiveness

The remaining soils, including overburden, have been sampled, analyzed, and modeled. The results of this effort indicate that the materials from the 1607-H2 site that contain COCs at concentrations exceeding the RAGs have been excavated and disposed at ERDF and that residual COC concentrations will support future land uses that can be represented (or bounded) by a rural-residential scenario and that residual COC concentrations throughout the site and overburden do not pose an unacceptable threat to groundwater or the Columbia River. The acceptability of unrestricted direct exposure to deep zone soils has not been demonstrated; therefore, institutional controls to prevent uncontrolled drilling or excavation into the deep zone (i.e., below 4.6 m [15 ft]) are required. The 1607-H2 site has been reclassified as “Interim Closed Out.”

4.3.72 1607-H-3, 1607-H-3 Septic Tank and Associated Drain Field

4.3.72.1 Site Description

The 1607-H3 waste site was located along H Avenue northeast of the 1701-H Badge House. The waste site consisted of a septic tank, associated drain field, and piping up to the buildings of origin. The 1607-H3 septic system received sanitary sewage from the 1701-H Badge House, the 1709H Fire Station, and the 1720-H Security Patrol Change Room between 1948 and 1968. The 1701-H Badge House included a darkroom for film badge processing. Liquids from the darkroom were disposed to the 1607-H3 septic system. All of the facilities associated with the septic system have been removed to grade. In January 2007, the 1607-H3 waste site was assigned for RTD.

4.3.72.2 Excavation Operations

Remedial action at the 1607-H3 waste site was performed between October 13 and November 10, 2009, and encompassed the removal of the belowgrade septic tank and the drainage field pipelines. Excavation continued until all debris and contamination associated with the pipeline structure had been removed. The site was excavated to depths ranging from approximately 1.6 m (5.3 ft) at the drain field to 4 m (13 ft) at the septic tank location, resulting in approximately 3,763 BCM (4,922 BCY) of soil and piping/debris being removed for disposal at ERDF. In addition, approximately 235 m (771 ft) of VCP were removed. This soil was sorted within the excavation and direct loaded for disposal at ERDF. Approximately 1,729 BCM (2,261 BCY) of overburden soil was removed from above the drain field piping and stockpiled for evaluation for use as clean backfill. The debris removed from the 1607-H3

waste site was consistent with that of a sewage system and in agreement with the pre-excavation geophysical survey findings. Some of the 6 in. and 8 in. diameter piping that was excavated had soldered joints on the pipes and thus the piping was segregated for macro-encapsulation as a lead contaminate prior to disposal at ERDF. No anomalies were discovered during the remediation. Small portions of lateral pipelines associated with the 100-H-51:4, 100H Main Gate Storm Drain waste site (Section 4.3.46) were removed during the 1607-H3 waste site remediation.

4.3.72.3 Verification Sampling

Verification sampling was conducted at the 1607-H3 waste site on June 10 and 15, 2010, and a statistical sampling design was used to collect the soil samples. The 1607-H3 waste site was divided into three decision units for verification sampling: the septic tank and piping excavation, drain field excavation, and the overburden soil stockpile. A global positioning survey was used to determine the boundaries. Twelve verification soil samples were collected from the septic tank and piping excavation. Twelve verification soil samples were collected from the drain field excavation. Also, 12 verification soil samples were collected from the overburden soil stockpile.

All COPCs for all sampling areas were quantified below their respective soil RAGs, except for benzo(a)anthracene, chrysene, Aroclor-1260, DDE, and DDT in the septic tank and piping excavation decision unit, and total chromium, lead, nickel, silver, arclor-1260, and DDE in the overburden decision unit. Based on RESRAD modeling, residual concentrations of these contaminants are predicted to be protective of groundwater and the Columbia River.

4.3.72.4 Statement of Protectiveness

The results of verification sampling show that residual contaminant concentrations do not preclude any future uses (as bounded by the rural-residential scenario) and allow for unrestricted use of shallow zone soils (i.e., surface to 4.6 m [15 ft] deep). The results also demonstrate that residual contaminant concentrations are protective of groundwater and the Columbia River. Site contamination did not extend into the deep zone; therefore, no institutional controls to prevent uncontrolled drilling or excavation into the deep zone are required. The 1607-H3 waste site has been reclassified as “Interim Closed Out.”

4.3.73 1607-H-4, 1607-H-4 Septic Tank and Associated Drain Field

4.3.73.1 Site Description

The 1607-H4 site is located north of the 105H Reactor in an area that prior to World War II and the formation of the Hanford Site was occupied by fruit tree orchards. The 1607-H4 Septic System was used from 1948 until 1965, receiving sanitary waste from the 181-H River Pumphouse. The 1607-H4 site consisted of a septic tank, drain field, and associated piping, and was designed to accommodate six people.

4.3.73.2 Excavation Operations

Remedial action at the 1607-H4 site began on November 5, 1999. Excavation of the site involved removing the overburden materials, the structure, and underlying contaminated soil. Contaminated materials were disposed at ERDF. On July 24, 2000, the excavation was completed. The excavation was approximately 161 m^2 (1,732 ft^2) in area with a maximum depth of approximately 3.6 m (11.8 ft). Approximately 2,078 metric tons (2,286 tons) of material from the site was disposed at ERDF.

4.3.73.3 Verification Sampling

Final cleanup verification samples were collected following variance sampling. Cleanup verification sampling began on February 16, 2000, and was finished on July 31, 2000. The site excavation contained one decision subunit. Four samples were collected from the decision subunit. Cleanup verification

samples collected on February 16, 2000, indicated that the site did not meet the RAGs for PAHs; therefore, additional remediation was conducted in May and July 2000 and additional cleanup verification samples were collected for PAH analyses on July 31, 2000.

Residual concentrations of lead, benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene, chrysene, dibenzo(a,h)anthracene, and indeno(1,2,3-cd)pyrene were greater than the listed RAGs. RESRAD modeling predicted that residual concentrations of these constituents will be protective of groundwater and the Columbia River.

4.3.73.4 Statement of Protectiveness

The remaining soils at the 1607-H4 site have been sampled, analyzed, and modeled. The results of this effort indicate that the materials from the 1607-H4 site containing COCs at concentrations exceeding RAGs have been excavated and disposed at ERDF. These results also indicate that residual concentrations in the shallow zone will support future land uses that can be represented (or bounded) by a rural-residential scenario and that residual concentrations throughout the site do not pose a threat to groundwater or the Columbia River. The acceptability of unrestricted direct exposure to deep zone soils has not been demonstrated; therefore, institutional controls to prevent uncontrolled drilling or excavation into the deep zone (i.e., below 4.6 m [15 ft]) are required.

In 2005, the statement of protectiveness for the 1607-H4 site was revised by DOE letter 05-AMRC-0078. Based on this letter, institutional controls have been removed from this waste site. The 1607-H4 site has been reclassified as “Interim Closed Out.”

4.4 100-HR-2 Operable Unit

This section presents detailed remedial actions for sites within the 100-HR-2 OU.

4.4.1 100-H-2, Buried Thimble Site

Due to geographic location and similarity of remediation activities, cleanup activities for the 100-H-2, 100-H-17 (Section 4.3.13), 116-H-2 (Section 4.3.57), and 100-H-30 (Section 4.3.25) sites were conducted together. These sites are collectively referred to as the 100-H-17 Site. For additional information regarding the 100-H-2 site, refer to the 100-H-17 site (Section 4.3.13).

The 100-H-2 site has been reclassified as “Interim Closed Out.”

4.4.2 100-H-37, 100-H Mud Dauber Contamination Area

4.4.2.1 Site Description

The 100-H-37 waste site is a set of radiologically dispersed contamination areas caused by mud dauber wasp nesting activity. During cleanup of the 105H FSB, dirt and sediment were removed from the lower 38 cm (15 in.) of the basin, which was 6.1 m (20 ft) bgs. Some dust became airborne during the scraping of the basin floor and stem walls, and airborne radiological posting criteria were exceeded. Consequently, one of the corrective actions was to maintain at least 5.1 cm (2 in.) of water on the basin floor to reduce airborne dirt and sediment, which created mud. The mud dauber wasps transported mud from the FSB floor to other sediment and debris areas surrounding the 105H Reactor using the mud for construction of their tube nests. The waste site is comprised of 43 areas where contaminated mud dauber nests were located.

4.4.2.2 Excavation Operations

Remedial action began with the excavation of individual nests with a backhoe, due to the difficulty in hand digging and the sloughing of excavation material. Areas containing numerous and individual nests

were removed. The number of nests in an area and the vegetative cover were considered in decisions to excavate individual nests or scrape an entire area. In addition to 40 small, dispersed excavations, 3 large areas of the waste site were excavated. These large scrapes ensured remediation of locations with many nests and protection of field radiological instrumentation that could be damaged by taking readings in areas with dense rabbitbrush and other vegetation. The depths of the excavation ranged from 18 to 30 cm (7 to 12 in.). After excavation, GPERS surveys were performed on these 3 large areas and hand-held radiological surveys verified that the 40 smaller excavations are no longer contaminated. Several of the areas which appear on the original overall site location map were remediated with other waste sites at the 100-H Area.

4.4.2.3 Verification Sampling

A mud dauber characterization strategy was developed to guide remediation activities and provide closure documentation for the 100-H-37 waste site. The area consisted of seven discrete nest areas east of the 105H Reactor. Sampling was initiated on February 19, 2009, and completed on March 11, 2009.

4.4.2.4 Statement of Protectiveness

The data evaluation indicates that all RAOs for direct exposure, protection of groundwater, and protection of the Columbia River have been met. The site will support future unrestricted land uses that can be represented (or bounded) by a rural-residential scenario. No institutional controls are required for this site to prevent uncontrolled drilling or excavation into the deep zone (i.e., below 4.6 m [15 ft]). The 100-H-37 site has been reclassified as “Interim Closed Out.”

4.4.3 100-H-58, Mud Dauber Nests on Active Powerlines in H-Area

During cleanup of the 105H FSB, dirt and sediment were removed from the lower 38 cm (15 in.) of the basin, which was 6.1 m (20 ft) bgs. Some dust became airborne during the scraping of the basin floor and stem walls, and airborne radiological posting criteria were exceeded. Consequently, one of the corrective actions was to maintain at least 5.1 cm (2 in.) of water on the basin floor to reduce airborne dirt and sediment, which created mud. The mud dauber wasps transported mud from the FSB floor to other sediment and debris areas surrounding the 105H Reactor using the mud for construction of their tube nests. These mud dauber areas became the 100-H-37 waste site (Section 4.4.2). However, during remediation, multiple mud dauber nests were discovered on power lines that could not be remediated because the lines were in use. These mud dauber areas were designated as the 100-H-58 waste site. The power lines are along H Avenue, Herron Avenue, and from the west of the 105H Reactor to the warehouse. Thirty-five nests have been counted, primarily within crevices in the wooden poles. It is possible that more nests could be present, as characterization did not occur at heights above 2.1 m (7 ft). The 100-H-58 site is classified as “Accepted.” This site will be addressed in the final action ROD.

4.4.4 118-H-1:1, 100-H Burial Ground Trenches and Sorting Cells

4.4.4.1 Site Description

The 118-H-1 was located 400 m (1,300 ft) southwest of the south side of the 105H Reactor and was an inactive, mixed solid waste burial site recognized as having been the primary burial ground for the 100-H Area. The site was commonly known as 100-H Burial Ground No. 1, although it has also been known as the Solid Waste Burial Ground. This site operated from 1949 until 1965, to receive an estimated 10,000 m^3 (13,080 yd^3) of wastes from 100H Reactor operations, including reactor process tubing, dummy fuel elements, contaminated lead bricks, and other reactor hardware. There were numerous trenches of various dimensions, generally running north and south. The burial ground measured 213 m (700 ft) long and 107 m (350 ft) wide. The 118-H-1 Burial Ground waste site was divided into the

118-H-1:1 and 118-H-1:2 (Section 4.4.5) subsites. The 118-H-1:1 subsite was the combined excavation footprints of the trenches in the burial ground, sorting cells, and overburden stockpiles.

4.4.4.2 Excavation Operations

Remedial action at the 118-H-1:1 Burial Ground began on July 22, 2008 and continued through June 29, 2009. Six trenches were excavated with approximately 8,160 BCM (10,673 BCY) of overburden soil stockpiled for use as clean fill. Approximately 34,496 BCM (45,119 BCY) of soil and debris were removed for disposal at ERDF. The depth of the excavation ranged from about 1.5 to 6.5 m (5 to 21 ft). No SNF was discovered at the 118-H-1:1 Burial Ground. No thimbles were found during remediation of the burial ground. Field observations during excavation indicated the presence of concrete, piping, lead bricks, perforated tubes, and control rods among the types of debris removed from the burial ground excavation.

4.4.4.3 Verification Sampling

Cleanup verification sampling at the 118-H-1:1 waste subsite was conducted on May 10 through 12, 2010; and on January 19 and March 2, 2011. The 118-H-1:1 Burial Ground was divided into four sampling areas; the sorting cells, the overburden stockpile, and two trench areas. A total of 12 statistical samples were collected from each sampling area. Twelve focused soil samples were also collected at locations within the excavation and sorting cells that exhibited anomalous materials with risk of contamination. Process knowledge and professional judgment were used to determine the location and analysis for these samples. Each focused sample had specific items found at the identified locations, therefore allowing the project to determine what analysis to request.

Groundwater protection and Columbia River protection cleanup levels were exceeded for lead and four PAH constituents (benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, and chrysene) in the overburden verification samples, and for lead, Aroclor-1254, and Aroclor-1260 for the focused samples. RESRAD modeling predicted that residual concentrations of these constituents will be protective of groundwater and the Columbia River.

4.4.4.4 Statement of Protectiveness

The results of verification sampling and RESRAD modeling show that residual contaminant concentrations do not preclude any future uses (as bounded by the rural-residential scenario) and allow for unrestricted use of shallow zone soils (i.e., surface to 4.6 m [15 ft]) deep. The results also demonstrate that residual contaminant concentrations are protective of groundwater and the Columbia River.
The excavation area is interim closed out using the more restrictive of the shallow zone direct exposure and groundwater/river protection criteria; therefore, institutional controls to prevent uncontrolled drilling or excavation into the deep zone are not required for 118-H-1:1. The 118-H-1:1 site has been reclassified as “Interim Closed Out.”

4.4.5 118-H-1:2, Anomaly Staging Area and Fuel Bunker

4.4.5.1 Site Description

The 118-H-1 was located 400 m (1,300 ft) southwest of the south side of the 105H Reactor and was an inactive, mixed solid waste burial site recognized as having been the primary burial ground for the 100-H Area. The site was commonly known as 100-H Burial Ground No. 1, although it has also been known as the Solid Waste Burial Ground. This site operated from 1949 until 1965, to receive an estimated 10,000 m^3 (13,080 yd^3) of wastes from 100-H Reactor operations, including reactor process tubing, dummy fuel elements, contaminated lead bricks, and other reactor hardware. There were numerous trenches of various dimensions, generally running north and south. The burial ground measured 213 m (700 ft) long and 107 m (350 ft) wide. The 118-H-1 Burial Ground waste site was divided into the

118-H-1:1 (Section 4.4.4) and 118-H-1:2 subsites. The 118-H-1:2 subsite was the anomaly characterization and staging area, and the SNF bunker area.

4.4.5.2 Excavation Operations

The SSNF was transferred from the 118 H-1:2 bunker area to the 100D, 118-D-3:2 (Section 4.2.31) south bunker area on February 18, 2011. The fuel was then shipped from the 100-D Area to the 100K Basins on April 27 and May 3, 2011. Following the removal of the fuel and the concrete bunkers, and the characterization and processing of staged anomalies, a 0.3 m (1 ft) scrape of the staging area, characterization area, and SSNF bunker area was conducted. The soil was scraped from these areas to ensure that any potential contamination that may exist as a result of the anomaly characterization and processing has been removed. Approximately 272 BCM (356 BCY) of soil was direct loaded for disposal at ERDF. An additional 80 BCM (105 BCY) was removed on June 8, 2011 to remove residual contamination identified after verification sampling was conducted.

4.4.5.3 Verification Sampling

Cleanup verification sampling was conducted at the 118-H-1:2 subsite on May 17, 2011. The anomaly staging area and the characterization area were combined into one decision unit with a total of 12 samples. Four focused sample locations were identified for the SSNF bunker area and were determined based on the locations of the fuel bunkers.

Analysis of the initial cleanup verification samples collected from the anomaly staging and characterization area exceeded the direct exposure cleanup level for benzo(a)pyrene; therefore, an additional 80 BCM (105 BCY) of material was removed and a replacement sample was collected and analyzed for PAH only. Residual concentrations of all site COPCs are below soil RAGs for direct exposure. Soil RAGs for the protection of groundwater and/or the Columbia River are exceeded for lead, benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, and benzo(k)fluoranthene. RESRAD modeling predicted that residual concentrations of these constituents will be protective of groundwater and the Columbia River.

4.4.5.4 Statement of Protectiveness

The results of verification sampling and RESRAD modeling show that residual contaminant concentrations do not preclude any future uses (as bounded by the rural-residential scenario) and allow for unrestricted use of shallow zone soils (i.e., surface to 4.6 m [15 ft]) deep. The results also demonstrate that residual contaminant concentrations are protective of groundwater and the Columbia River. Contamination at the 118-H-1:2 site did not extend into the deep zone soils, therefore, institutional controls to prevent uncontrolled drilling or excavation into the deep zone are not required. The 118-H-1:2 waste site has been reclassified as “Interim Closed Out.”

4.4.6 118-H-2, H-1 Loop Burial Ground

4.4.6.1 Site Description

The 118-H-2 waste site is located west of the 105H Reactor and originally consisted of two in-line concrete vaults oriented in an east and west direction. The burial ground operated between 1955 and 1965 to receive an irradiated test loop and contaminated piping from the 105H Reactor. After the 105H Reactor was shut down in 1965, the concrete vaults were filled and covered to grade with approximately 3.7 m (12 ft) of soil.

4.4.6.2 Excavation Operations

Remedial action at the 118-H-2 waste site began on April 20, 2009 and was completed on June 3, 2009. Additional soil was excavated on June 16, 2009 from an area with elevated residual radioactivity during

an initial GPERS radiological survey. A follow-on radiological survey was conducted to verify that the contamination was removed. A total of 4,366 BCM (5,711 BCY) of soil and debris was removed and disposed at ERDF.

4.4.6.3 Verification Sampling

Verification sampling for the 118-H-2 waste site was performed January 26 and 27, 2010. One decision unit was identified within the excavation area of the 118-H-2 waste site. A total of 12 statistical soil samples were collected.

All COC/COPCs were undetected and/or quantified below RAGs and lookup values, except for lead concentrations that exceeded soil RAGs for the protection of groundwater and river protection. RESRAD modeling predicted that residual concentrations of lead will be protective of groundwater and the Columbia River.

4.4.6.4 Statement of Protectiveness

The results of this effort indicate that the materials from the 118-H-2 waste site containing COPCs at concentrations exceeding RAOs have been excavated and disposed at ERDF. These results also indicate that residual concentrations will support future land uses that can be represented (or bounded) by a rural-residential scenario and that residual concentrations throughout the site pose no threat to groundwater or the Columbia River. The 118-H-2 waste site excavation area has a maximum depth of approximately 5 m (16.4 ft), which includes both shallow zone and deep zone soils. However, the entire excavation area is considered one decision unit and meets the more restrictive shallow zone cleanup criteria. Therefore, institutional controls to prevent uncontrolled drilling or excavation into the deep zone are not required. The 118-H-2 site has been reclassified as “Interim Closed Out.”

4.4.7 118-H-3, Construction Burial Ground

4.4.7.1 Site Description

The 118-H-3, Construction Burial Ground operated from 1953 to 1957 and received approximately 3,000 m^3 (3,924 yd^3) of reactor components and hardware, including contaminated 16 in. diameter pipes that were used as chutes for the removal of reactor VSR thimbles and other components from reactor modification programs. Originally, two northern trenches were used mostly for the disposal of the chute pipes. A third trench, south of the original two trenches, was developed later as a disposal site for large reactor components and hardware.

4.4.7.2 Excavation Operations

Remedial action at the 118-H-3, Construction Burial Ground waste site began on March 4, 2009, and was completed on April 22, 2009, to a depth of approximately 4.6 to 5.5 m (15 to 18 ft). A total of 6,384 BCM (8,350 BCY) of debris and soil removed for disposal at ERDF. All material removed from within the trenches was taken to sorting cells for surveying and unloading. Large metal and reactor hardware components excavated from trench A were stockpiled in a waste staging area for size reduction prior to shipment for disposal. After size reduction was completed on May 18, 2009; the metal debris and an additional 0.3 m (1 ft) layer of underlying soil (60 BCM [75 BCY]) within the waste staging area footprint was removed. The debris from 118-H-3 consisted mostly of metal components and very large pieces of reactor hardware (pipes, elbows, etc.). On March 17, 2009, a suspected flammable 1.2 m (4 ft) gas cylinder, believed to be propane, was discovered. The cylinder was inspected, found to be empty, and shipped to ERDF March 19, 2009. No other anomalous material was discovered during the excavation.

4.4.7.3 Verification Sampling

Verification sampling for the 118-H-3, Construction Burial Ground was performed on December 14 and 21, 2009, and January 5 and April 15, 2010. Two decision units were identified to support soil sample collection. Decision Unit 1 consisted of the two original trenches used for disposal of the 16 in. diameter chute pipes. Decision Unit 2 consisted of a trench that was the disposal site for large reactor components and hardware, and the waste staging area adjacent to the trench. A total of 12 statistical verification soil samples were collected from this decision unit. In addition to performing statistical sampling of the burial ground excavation, two focused soil samples were also collected.

All COCs/COPCs were undetected and/or quantified below RAGs and lookup values, except for copper, zinc, and Aroclor-1260 in Decision Unit 1, and cadmium and lead in the focused verification samples. RESRAD modeling predicted that residual concentrations of these constituents will be protective of groundwater and the Columbia River.

4.4.7.4 Statement of Protectiveness

The remaining soils at the 118-H-3 waste site have been sampled, analyzed, and RESRAD modeled. The results of this effort indicate that the materials from the 118-H-3 waste site containing COCs/COPCs at concentrations exceeding RAGs have been excavated and disposed at ERDF. These results also indicate that residual concentrations will support future land uses that can be represented (or bounded) by a rural-residential scenario and that residual concentrations throughout the site are predicted to pose no threat to groundwater or the Columbia River. The 118-H-3 site has been reclassified as “Interim Closed Out.”

4.4.8 118-H-4, Ball 3X Burial Ground

4.4.8.1 Site Description

The 118-H-4, Ball 3X Burial Ground, was located directly west of the 105H Reactor, within the 105H exclusion area fence. The 118-H-4 Burial Ground was a solid waste site that operated in 1953 to receive thimbles, guides, and radioactive materials removed from the 105H Reactor during installation of the 105-H Ball 3X System. The Ball 3X project replaced the original liquid boron system for emergency reactor shutdown with a system using solid, nickel plated, boron steel, and carbon steel balls.

4.4.8.2 Excavation Operations

Remedial action at the 118-H-4 Burial Ground began on November 4, 2008 and was completed on April 14, 2009 to an approximate depth of 4.5 m (14.8 ft). A total of 1,600 BCM (2,100 BCY) of soil and debris were removed for disposal at ERDF. All contaminated soil and debris were direct loaded for disposal except for the two lead anomalies and the radiologically contaminated soil that were staged to the west and east of the waste site excavation. Additional material was removed from the 118-H-4 excavation on May 4, 2010, because verification sample results indicated residual contamination exceeding direct exposure RAGs was present at two statistical sample locations. An additional 48 BCM (63 BCY) were removed from the excavation and disposed at ERDF.

4.4.8.3 Verification Sampling

Verification sampling for the 118-H-4 Burial Ground was performed on March 18, 2010. The 118-H-4 Burial Ground was divided into two decision units for verification sampling: the burial ground excavation and the waste staging area footprints. Two methods for selecting the sampling locations were utilized: statistical and focused sampling. A total of 12 soil samples were collected from each of the two decision units. Two focused soil samples were collected on the west end of the excavation: one each at the locations where the carbon steel cylinders were found within the burial ground excavation.

The initial verification sample collected from one statistical sample location in the excavation decision unit exceeded direct exposure cleanup levels for Cs-137 and Sr-90. Additional material was removed from the sample location and replacement samples were collected. Evaluation of the verification sampling results shows that no contaminants exceed direct exposure RAGs. Lead and zinc exceed groundwater and Columbia River soil RAGs. RESRAD modeling predicted that residual concentrations of lead and zinc will be protective of groundwater and the Columbia River.

4.4.8.4 Statement of Protectiveness

The results of verification sampling indicate that the materials from the 118-H-4 waste site containing COCs at concentrations exceeding RAGs have been excavated and disposed at ERDF. These results also indicate that residual concentrations will support future land uses that can be represented (or bounded) by a rural-residential scenario and that residual concentrations throughout the site pose no threat to groundwater or the Columbia River. The 118-H-4 excavation area has a maximum depth of approximately 4.5 m (14.8 ft). Contamination did not extend into the deep zone above direct exposure limits; therefore, institutional controls to prevent uncontrolled drilling or excavation into the deep zone are not required. The 118-H-4 site has been reclassified as “Interim Closed Out.”

4.4.9 118-H-5, 105-H Thimble Pit

4.4.9.1 Site Description

The 118-H-5, 105-H Thimble Pit site was located approximately 61 m (200 ft) south of the 105H Reactor. It was a mixed solid waste burial ground that operated in 1953 to receive a single experimental thimble assembly and was reopened in 1960 to receive contaminated soil from the original 105-H Pluto Crib Site (116-H-4 waste site). The 105-H Pluto Crib received contaminated cooling water from reactor process tubes containing ruptured fuel elements.

4.4.9.2 Excavation Operations

Remedial action at the 118-H-5, 105-H Thimble Pit waste site began on September 11, 2008, to excavate and expose the single thimble and any other waste buried at the site. After the thimble was located, all materials were returned to the excavation until loadout began on November 10, 2008. The excavation of the waste site continued through November 12, 2008, to a depth of approximately 3.5 m (11.5 ft). A total of 400 BCM (523 BCY) of contaminated soil and debris was removed for disposal at ERDF.

4.4.9.3 Verification Sampling

Verification sampling for the 118-H-5 Burial Ground was performed on June 10, 2009. The excavation footprint was the only decision unit identified for the 118-H-5 waste site for verification sampling. Two methods were used for selecting the sampling locations: statistical and focused sampling. Twelve statistical soil samples were collected. Two discrete focused soil samples were collected within the excavation footprint on the north end of the excavation at the location where a geophysical survey identified a disturbed anomalous zone.

Evaluation of the verification sampling results at the 118-H-5 waste site indicates that all COCs/COPCs were undetected and/or quantified below RAGs and lookup values except for lead and uranium-233/234 concentrations that exceeded soil RAGs. RESRAD modeling predicted that residual concentrations of lead will be protective of groundwater and the Columbia River. Site-specific RESRAD modeling also determined that residual concentrations of uranium-233/234 are protective of human health.

4.4.9.4 Statement of Protectiveness

The remaining soils at the 118-H-5 site have been sampled, analyzed, and RESRAD modeled. The results of this effort indicate that the materials from the 118-H-5 site containing COCs/COPCs at concentrations

exceeding RAGs have been excavated and disposed at ERDF. These results also indicate that residual concentrations will support future land uses that can be represented (or bounded) by a rural-residential scenario and that residual concentrations throughout the site pose no threat to groundwater or the Columbia River and allow for unrestricted use of shallow zone soil (i.e., surface to 4.6 m [15 ft] deep). The 118-H-5 waste site does not have a deep zone or other conditions that would warrant institutional controls. A reclassification to "Interim Closed Out" is supported for 118-H-5.

4.4.10 128-H-1, 100-H Burning Pit, 100-H Burning Pit No. 1

4.4.10.1 Site Description

The 128-H-1, 100-H Burning Pit was an inactive, nonradioactive hazardous solid waste site that operated from 1949 through 1965. The 128-H-1 waste site is in a large natural depression approximately 15 m (50 ft) east of the west perimeter road and north of the 126-H-1 ash pit. The waste site measures approximately 170 by 160 m (565 by 535 ft). The site was reportedly used for the disposal of nonradioactive combustible materials such as paint waste, office waste, and chemical solvents. Waste oil containing PCBs may have been disposed here.

Documentation indicates the site was first used as a burn pit for disposal of buildings, homes, and sheds removed or demolished as part of clearing the site for eventual construction of the 100H Reactor facilities. The burn pit was subsequently used for disposing of trash, rubbish, and other construction-related waste. Documentation also suggests water seepage into the pit at periods of high flood stages of the Columbia River.

Before remediation began the site was partially divided by a north-south earthen berm, and dense tumbleweeds bordered the western edge of the depression along the west perimeter road. Within the depression, there was scattered surface debris that included wood, glass, metal, wire, cable, spray paint cans, transite, and clay pipe. During a December 2005 site visit, burnt material, fly ash, and cinder was observed to cover the depression floor, and there was tar-stained soil at the southern end of the pit. A majority of the surface debris was located between the earthen berm and the eastern edge of the site. At the southern end of the site, there was a man-made pit filled with tumbleweeds. Debris was visible through the tumbleweeds and included cans, pails or small drums, and concrete.

Historic orchards were present in this area prior to the construction of the 105H Reactor and its ancillary facilities. The distribution of concentrations of lead and arsenic within the waste staging area footprint and soil stockpile areas in the northern portion of the 128-H-1 waste site indicate that the surface soil in this area was contaminated with lead arsenate pesticides.

Two geophysical surveys were performed for the 128-H-1 burn pit. The first geophysical survey was performed in August 2004, to locate and map any significant accumulations of buried debris that might occur within the depression. Much of the surficial debris was found to be concentrated in two locations. One was a 40 m (131 ft) diameter area and the other was located along a north-south linear. These two areas were also noted to have a significant amount of fly ash on the surface. Ferrous debris was scattered across much of the site, with higher concentrations in the northern half of the site.

Two anomalies, determined to be pipelines, were found during the geophysical investigations. The north-south pipeline has been identified as 100-H-51:5 (Section 4.3.47) and the east-west pipeline is part of the 100-H-35 pipelines (Section 4.3.29). A third pipeline trending north-south along the southwest side of the site was not discussed in the geophysics report, but was encountered during site remediation and has been identified as a discovery site, 100-H-56 (Section 4.3.52).

The second geophysical survey was performed in February 2006 as an extension of the original geophysical investigation to locate and map any significant accumulations of buried debris in the area north of the 128-H-1 burn pit. No significant buried anomalies were identified within the extension. Some widely scattered, small magnetic surface anomalies were detected, but they did not appear to be related to the burn pit.

4.4.10.2 Excavation Operations

Remediation of the 128-H-1 waste site was performed from June 23, 2009, through May 25, 2011. Approximately 16,310 BCM (21,333 BCY) of debris (e.g., wood, concrete, glass, ash, and batteries) and contaminated soil was removed, stockpiled onsite, and later disposed at ERDF.

One foot of soil was scraped from the surface of the waste site and disposed at ERDF. This action was performed to encompass removal of all surface debris, including the tar-stained surface soil that was observed during the December 2005 site visit. On May 12, 2010, a walkdown of the site was performed to verify that tar-stained soil was not present. Additionally, the "man-made pit" at the southern end of the site that was identified during the geophysical survey and noted in the December 2005 site visit as having visible debris obscured by tumbleweeds was further evaluated. The tumbleweeds were pushed aside and a steel pipeline was found running north-south through the pit. No other debris was found in the pit. The pipeline running through this pit was identified as the 100-H-51:5 pipeline and will be sampled as part of the 100-H-51:5 confirmatory sampling activity.

Excavation of the burn pit area began in early July 2009 and proceeded to a maximum depth of approximately 7 m (23 ft). Prior to remediation, a test pit was excavated in the burn pit area to a depth of 2.5 m (8 ft) with a soil sample containing ash collected to support determination of the waste characterization profile. Batteries, glass, concrete, wood, ash associated with burning, and a blue-green material were found in the burn area. The blue-green material was cake-like, localized, and contained high concentrations of metals. During remediation, standing water was encountered on July 30, 2009. On September 8, 2009, in-process soil samples were collected that indicated the presence of residual contamination exceeding remedial goals; some debris was also present. These samples were noted to contain ash associated with burning.

From October 28 through November 2, 2009, additional excavation was performed with removal of debris and approximately 0.3 m (1 ft) of additional soil at the base of the excavation.

Following verification sample analysis, it was determined that additional remediation was needed because some sample locations exceeded cleanup criteria. A new remediation design was implemented and the entire burn pit area was additionally excavated as per the new design. A new stockpile waste staging area that consisted of two locations was needed for the additional remediation of the burn pit. Additionally, because of an elevated dieldrin verification sample result, one sample location in the soil stockpile area was also remediated to 1.0 m (3.3 ft) and resampled, using the original sample design and COPC list. This extra remediation began March 29, 2011 and continued to May 10, 2011. Approximately 5,867 BCM (7,674 BCY) of debris and contaminated soil was removed, stockpiled onsite, and later disposed at ERDF.

Following the additional excavation of the burn pit area, XRF was utilized to determine the areas containing the highest contamination within the re-excavated area. Based on sample results, further remediation of the burn pit area occurred on May 25, 2011. Approximately 450 BCM (589 BCY) of debris and contaminated soil was removed and disposed at EDRF.

Another XRF survey was conducted after the excavation of these three additional areas was complete. XRF results were determined to be adequate and soil samples were not taken after this additional

remediation. The project then proceeded with verification sampling. A new sample design for the burn pit area was developed because the boundary for the excavation was expanded during excavation activities. All samples were evaluated using the original COPC list. GPERS surveys were conducted on February 10, 16, and 18, 2010.

4.4.10.3 Verification Sampling

Initial verification sampling for the 128-H-1 site began on June 16, 2010, and was completed on July 1, 2010. The 128-H-1 site consisted of five decision units for verification sampling. Twelve statistical soil samples were collected for each decision unit on a triangular grid within the remediation footprint at the site. After the initial verification samples were analyzed, it was determined that six sample locations within the burn pit excavation decision unit and one sample location within the surface soil stockpile decision unit exceeded the site cleanup criteria.

Following the additional excavation of the burn pit area, XRF was utilized to determine the areas containing the highest contamination within the reexcavated area. Nine areas were chosen to be sampled for ICP metals analysis on May 9, 2011. The results show three sample locations that exceeded RAGs for lead, including one location that also exceeded for copper and zinc.

Additional verification sampling was conducted at the 128-H-1 site on May 26, 2011, for the burn pit and the newly constructed stockpile decision units and June 16, 2011 for the surface soil stockpile decision unit (locations that exceeded RAGs). Due to the large amount of soil that was removed, resampling was conducted using a new sample design with the original COPC list. Two new SPAs were constructed for the additional remediation of the burn pit decision unit. These areas were placed over the existing scraped area south of the burn pit and formed a new decision unit. All areas that required additional remediation were resampled using the original COPC list.

The analytical results (including consideration of modeling) indicate that the residual concentrations of COPCs at this site meet the RAOs for direct exposure, groundwater protection, and river protection, except for copper, lead, and zinc in the west excavation deep zone that exceed groundwater and river protection RAGs. Further supplemental evaluation demonstrates protectiveness for copper, lead, and zinc in the west excavation deep zone. Groundwater and/or the Columbia River protection soil RAGs were exceeded within the surface soil staging area, original waste staging area, excavation scraped soil area, and east excavation area for one or more of the following constituents: lead, benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene, or Aroclor-1260. RESRAD modeling predicted that residual concentrations of these constituents will be protective of groundwater and the Columbia River.

4.4.10.4 Statement of Protectiveness

The results of sampling and modeling show that residual contaminant concentrations do not preclude any future uses (as bounded by the rural-residential scenario) and allow for unrestricted use of shallow zone soils (i.e., surface to 4.6 m [15 ft] deep). The results (including modeling) also demonstrate that residual contaminant concentrations are protective of groundwater and the Columbia River, except for copper, lead, and zinc in the west excavation deep zone. Supplemental evaluation demonstrates protectiveness for copper, lead, and zinc in the west excavation deep zone. The site extended into the deep zone (greater than 4.6 m [15 ft] deep); however, the site was closed out using the shallow zone direct exposure, groundwater, and river protection cleanup criteria. Institutional controls to prevent uncontrolled drilling or excavation into the deep zone of the site are not required. The 128-H-1 site has been reclassified as “Interim Closed Out.”

4.4.11 128-H-2, 100-H Burning Ground #2

4.4.11.1 Site Description

The 128-H-2 site is described as a suspected burn pit in a rocky depression with minimal soil. The site is described as measuring approximately 37 by 24 m (120 by 80 ft). However, field observations found the actual surface depression (i.e., gravel pit) to be closer to 90 by 60 m (295 by 197 ft). Reports mentions the presence of scattered debris (e.g., wood, metal cables, a battery, and concrete) on the site. None of the surface debris described was found within the site boundaries during the geophysical investigation, site walkdowns, or confirmatory sampling excavations. However, some concrete debris and individual items of scattered debris (e.g., a small battery and wire fragments) were found nearby. To the southeast of the site boundaries is an area with scattered fly ash that may have resulted in the speculation that there was a burn pit nearby. The It was also reported that there is little surface evidence of a burn pit, except for the previously mentioned dark-colored rocks. The small amount and nature of the debris found is inconsistent with the use of the area as a burning ground.

A report prepared in 1989 investigated aerial photographs of the 100-H Area to identify visible disposal activities. The report clearly identifies the 128-H-2 site as a soil borrow area in 1948 (the year of 100H Reactor construction). The ground scarring visible in the 1948 photograph appears extensive and recent (no vegetation coverage). In later photographs (from 1964 to 1982) the soil borrow area shows some recovery due to natural vegetation regrowth. None of the photographs show any evidence that the borrow area was used as a burn pit or for the disposal of hazardous or dangerous materials.

A geophysical investigation was conducted in August 2004 to locate and map any buried debris/material at the 128-H-2 site that may be indicative of a burn pit or a waste disposal site. The complete absence of subsurface geophysical anomalies supports the conclusion that this site was not used as a burn pit or disposal area.

4.4.11.2 Confirmatory Sampling

No subsurface anomalies were found during the geophysical investigation at the 128-H-2 site to bias the selection of sampling locations. Therefore, one test trench was excavated within the site boundaries and four test pits were excavated outside of the boundaries encompassing the entire footprint of the surface depression. An observational approach was used during excavation activities to bias sample collection toward any apparent contamination. However, no debris, evidence of burning, or stained soils were observed during excavation. Therefore, grab samples were collected of what appeared to be native soils within each test pit and the test trench.

An evaluation of the soil data for the 128-H-2 site found that all of the COPCs detected at the 128-H-2 site were below the RAGs, except for selenium. A careful examination concluded that the selenium concentration reported is due to the natural mineralogy found in the sample matrix and not to any type of waste disposal, burning, or man-made contamination. Therefore, it is concluded the selenium concentrations at the 128-H-2 site meet the RAOs.

4.4.11.3 Statement of Protectiveness

The evaluations show that the 128-H-2 site was not used as burning grounds, but instead was used as soil borrow pits to provide fill material during construction at the 100-H Area. Confirmatory sampling and visual observation shows there are no hazardous/dangerous materials present at the site and, accordingly, no residual contamination above the RAOs in the soil. The 128-H-2 site does not pose a risk to human health and the environment and will support future unrestricted land uses that can be represented (or bounded) by a rural-residential scenario, and no institutional controls are required. The 128-H-2 site has been reclassified as “Interim No Action.”

4.4.12 128-H-3, 100-H Burning Ground #3

4.4.12.1 Site Description

The 128-H-3 site location has been reported as being at a cobble field (borrow area) north of the 128-H-2 site (Section 4.4.11) and at a trench located on a rise above that cobble field. The trench is oriented in a northwest-southeast direction. The trench is approximately 30 m (98 ft) long by 7 m (23 ft) wide. A site visit in March 1999 concluded that the 128-H-3 site may have been the linear trench located adjacent to the cobble field (borrow area).

A cultural resource inspection, performed in 2007, concluded that the trench associated with the 128-H-3 waste site was part of a pre-Hanford Site farm irrigation system and not a burn pit. As such, confirmatory sampling for the 128-H-3 waste site was performed within the original boundaries surrounding the cobble field and not within the trench. The site has limited access, deterring its selection as a burn pit site. No debris or waste consistent with burning pits has been found at the site.

GPR data were collected along two profiles that crossed the scraped portion of the site. These data show subsurface reflections that are characteristic of natural geologic horizons. Overall, the interpretation of the geophysical data indicates that the site appears to have a small amount of scattered agricultural debris that is on, and just below, the surface. There is no indication of concentrated buried debris evident in the geophysical survey data.

4.4.12.2 Confirmatory Sampling

Assessment of the 128-H-3 site subsurface was performed using test pits excavated within the borrow area associated with the site. Samples were not collected from the trench adjacent to the borrow area as it has been determined to be part of a pre-Hanford Site irrigation system. No subsurface anomalies were found during the geophysical investigation to bias influence the selection of sampling locations at the 128-H-3 site. Five exploratory test pits distributed across the area were excavated to native soil. An observational approach was used during excavation activities to bias sample collection toward any apparent contamination. However, no debris, evidence of burning, or stained soils were observed during excavation. Therefore, grab samples were collected of what appeared to be native soils within each test pit.

Residual concentrations of lead exceeded the soil RAGs for the protection of groundwater and/or the Columbia River. However, it is predicted that this constituent will not migrate to groundwater (and thus the Columbia River) at concentrations exceeding groundwater or river protection criteria within 1,000 years. Therefore, residual concentrations achieve the RAOs for groundwater and river protection.

4.4.12.3 Statement of Protectiveness

The evaluations show that the 128-H-3 site was not used as burning grounds, but instead were used as soil borrow pits to provide fill material during construction at the 100-H Area. A trench-like pit adjacent to the 128-H-3 site was part of a pre-Hanford Site farm irrigation system. Confirmatory sampling and visual observation shows there are no hazardous/dangerous materials present at the site and, accordingly, no residual contamination above the RAOs in the soil. The 128-H-3 site does not pose a risk to human health and the environment and will support future unrestricted land uses that can be represented (or bounded) by a rural-residential scenario, and no institutional controls are required. The 128-H-3 site has been reclassified as “Interim No Action.”

4.4.13 132-H-2, 117-H Filter Building Site

4.4.13.1 Site Description

The 117-H Filter Building was built in 1960, approximately 12 years after the startup of the 105H Reactor, to filter the exhaust air from the reactor building before it was routed to the 116-H Reactor Exhaust Stack. The air was filtered through particulate and halogen (activated charcoal) filters and then routed to the stack via an underground concrete exhaust duct. In 1965, the reactor and associated facilities, including the 117-H Filter Building, were shut down. The 117-H Filter Building, including belowgrade ductwork, was decommissioned and demolished in 1984. Dust was vacuumed from the walls and floors to prevent spread of loose contamination. Filter equipment was removed with the contaminated filters packaged and shipped to the Hanford Site 200 West Area burial grounds for disposal.

4.4.13.2 Decommissioning Activities

As part of decommissioning activities, extensive radiological surveying and sampling activities were performed to characterize residual radiological contamination on the accessible internal surface areas of the 117-H Filter Building. Characterization results indicated that residual contamination was confined to the 1 mm (0.04 in.) vinyl paint layer. An evaluation of the concrete beneath the paint showed that the contamination did not penetrate the paint or absorb into the concrete.

Using the maximum radiological activities from the pre-demolition characterization data to represent residual contamination levels over 100% of the paint and concrete surface of the former building, RESRAD modeling was performed in 2006 to support the previous decision to demolish and bury the building in place. The RESRAD modeling accounts for radioactive decay from 1984 (year of sampling) to 2006 and predicts that the site achieves the dose limits and risk objectives for rural-residential land use with institutional controls, groundwater protection, and river protection.

4.4.13.3 Statement of Protectiveness

Residual concentrations support future land uses that can be represented (or bounded) by a rural-residential scenario and pose no threat to groundwater or the Columbia River based on RESRAD modeling. However, the acceptability of unrestricted direct exposure to belowgrade structure surfaces in the deep zone has not been demonstrated; therefore, institutional controls to prevent uncontrolled drilling or excavation into the deep zone are required. The 132-H-2 site has been reclassified as “Interim Closed Out.”

4.4.14 1607-H1, 1607-H1 Septic Tank and Associated Drain Field, 124-H-1, 1607-H1 Sanitary Sewer System, 1607-H1 Septic Tank

4.4.14.1 Site Description

The 1607-H1 site is located southwest of the 105H Reactor and the 151-H Primary Substation, near the 118-H-2 Burial Ground. The 1607-H1 site includes a septic tank and associated drain field and manhole and interconnecting piping. The 1607-H1 septic tank system was a nonhazardous, nonradioactive liquid waste site that began operation in 1948, and received sanitary sewage from the 105H Reactor and the 151-H Primary Substation. The sanitary wastes from these buildings were conveyed to the 1607-H1 septic tank system via buried VCPs. These pipes are the 100-H-28:4, 1607-H1 Sanitary Sewers waste site (Section 4.3.20). The 1607-H1 drain field measured 17.1 by 15.2 m (56 by 50 ft) and was oriented on a northeast-southwest line from the tank. The at-grade portion of the septic tank was a concrete pad with two manhole covers and a third manhole cover located adjacent to the tank.

In 1985, the 1607-H1 septic system was reactivated to be used by service trailers supporting D&D project personnel. At that time, the tank was discovered to have been backfilled with fly ash. The ash was

vacuumed out of the septic tank and disposed to the ground surface prior to the successful reactivation of the septic system.

During an interview with a former employee it was stated that it was common practice for showers and sinks in the 100-H Area change rooms to be used for personnel decontamination, and these drains lead to the sanitary sewers not the process sewers.

4.4.14.2 Excavation Operations

Remedial action at the 1607-H1 site was performed between September 24 and November 2, 2009, and included the removal of the belowgrade septic tank and the manhole cover surface features. Excavation continued until all debris and contamination associated with the septic tank, drain field pipes, and connecting pipeline structure had been removed. The site was excavated to a depth of approximately 3.2 m (10.5 ft), removing the drain and tile field pipes at approximately 2.5 m (8.2 ft) bgs, and to a depth of approximately 4 m (13 ft) at the septic tank and adjacent manhole structure. A total of approximately 1,166 BCM (1,525 BCY) of soil and debris were removed and directly loaded for disposal at ERDF, including all soils excavated from below the drain field piping. This included carbon steel pipes and drainage tiles/pipe from the area of the septic tank inlet, from the drain field, and concrete/brick from the septic tank and adjacent manhole structure. The septic tank had been previously filled with fly ash, which was removed in 1985 so the septic tank could be reused. A small amount of fly ash was observed to be mixed with soil, which was disposed at ERDF. Otherwise, no fly ash was encountered during remediation activities at this waste site. An additional 528 BCM (691 BCY) of soil from outside of the septic tank and overlying the drain field was removed, forming the overburden pile for the 1607-H1 waste site.

The 1607-H1 remedial design indicated that overburden soil removed to a depth of approximately 1.5 m (5.0 ft) was to be stockpiled separately from overburden soil excavated between 1.5 to 3.0 m (5.0 to 6.6 ft) belowgrade. Material excavated near the septic tank, below 3.0 m (6.6 ft), and within the drain field was to be considered contaminated and direct loaded for disposal at ERDF. This design assumed that soil closer to the drain field VCPs and near the septic tank had a higher potential for contamination. During remediation, no staining or other visual indications were observed and one overburden pile was constructed.

The debris removed from the 1607-H1 site was consistent with that of a sewage system and consistent with the pre-excavation geophysical survey findings. The geophysical survey was performed at the 1607-H1 waste site in September 2004, to locate and map the underground features of the septic system.

Following sample analysis of the initial remediation, it was determined that additional remediation was needed because some sample locations exceeded cleanup criteria. Therefore, an additional 1.0 m (3.3 ft) of soil was removed from the focused sample location and all soil from the overburden stockpile area was removed to 0.3 m (1.0 ft) bgs. This additional remediation began March 8, 2011 and continued to March 17, 2011, and included the removal and disposal of 1,556 BCM (2,035 BCY) of soil material. The removal of extra material from these decision units did not change the original boundary for the areas and only sample locations that previously exceeded cleanup criteria were resampled after additional remediation.

GPERS surveys were conducted within the 1607-H1 site excavation upon completion of remedial action activities. The surveys were performed to determine if residual radiological contamination was present. The GPERS surveys of the site excavation and overburden pile identified no radiological contamination above twice background.

4.4.14.3 Verification Sampling

Statistical verification sampling was conducted at the 1607-H1 site on July 7 through 12, 2010. The 1607-H1 site was divided into two decision units for verification sampling; the excavation and the overburden soil stockpile. A global positioning survey was used to determine the boundaries of the excavation area and the overburden soil stockpile. Twelve statistical verification soil samples were collected from the excavation. Twelve statistical verification soil samples were collected from the overburden soil stockpile. One focused sample was taken within the septic tank footprint.

After the initial verification samples were analyzed, it was determined that the reported arsenic concentrations in four overburden stockpile samples as well as the excavation focused sample exceeded site cleanup criteria for arsenic. Therefore, additional soil at the focused sample location and the entire overburden stockpile was removed and disposed at ERDF. All sample locations that exceeded cleanup criteria were resampled. The additional verification sampling was conducted at the 1607-H1 site on March 23, 2011.

Evaluation of the results from the verification sampling at the 1607-H1 site indicated that no contaminants exceeded direct exposure RAGs. Groundwater and/or the Columbia River protection soil RAGs were exceeded by lead, selenium, Aroclor-1254, DDE, dieldrin, benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, and benzo(k)fluoranthene. RESRAD modeling predicted that residual concentrations of these constituents will be protective of groundwater and the Columbia River.

4.4.14.4 Statement of Protectiveness

The verification sample results show that residual contaminant concentrations do not preclude any future uses (as bounded by the rural-residential scenario) and allow for unrestricted use of shallow zone soils (i.e., surface to 4.6 m [15 ft] deep). Based on modeling, it is believed that contamination did not extend into the deep zone soils; therefore, institutional controls to prevent uncontrolled drilling or excavation into the deep zone are not required. The 1607-H1 site has been reclassified as “Interim Closed Out.”

4.4.15 600-151, Dumping Areas 50 Yards and 200 Yards Downstream of River Mile 14, Military Installation NW of 100-H Area

4.4.15.1 Site Description

The 600-151, Dumping Areas 50 Yards and 200 Yards Downstream of River Mile 14 waste site, is located approximately 1.3 km (0.8 mi) north of the 105H Reactor. The 600-151 waste site consisted of scattered debris from U.S. Army Base Camp 130 (BC-130), a military camp covering approximately 162,000 m^2 (40 ac) near the Columbia River, which was occupied from approximately 1950 to 1954. The remains of BC-130 have been identified as an historic-archaeological site. Records and historic maps indicate that BC-130 was a forward position that did not have gun emplacements. Base camps of this nature generally contained water storage, cisterns, fuel and oil tanks, barracks, drain fields, and refuse dumps. The camp was demolished when it was closed in 1954. All that appeared to remain in 2009 were some domestic military debris, several pits (some with wood lining), and shallow trenches where communication lines were thought to be located.

Prior to use by the Hanford Site Manhattan Project, the waste site was part of an agricultural site (orchards) occupying some 202,000 m^2 (50 ac) consisting of five tracts of land used circa 1938 to 1943. During the growing season, the orchards were sprayed with lead arsenate as a pesticide from the times the trees bloomed until they were harvested.

4.4.15.2 Excavation Operations

Remediation of the 600-151 waste site was initiated on April 12, 2010, and consisted of manually removing debris from the ground surface. Areas of stained soil and stressed vegetation were scraped and removed to a minimum depth of 0.31 m (1 ft). In addition, two water valves and a water box associated with the former septic system (the 600-152 waste site) were also removed. Approximately 1,524 BCM (1,993 BCY) of material was removed for disposal at ERDF. A review of the April 2011 verification sampling results indicated that additional soil removal was necessary in some of the areas. On June 22, 2011, an additional 1 m (3 ft) of soil was removed at six locations and 2 m (6 ft) of soil was removed at another location.

4.4.15.3 Verification Sampling

In-process soil samples and XRF measurements detected high concentrations of lead and arsenic. These constituents are associated with historic orchards and the use of lead arsenate as an orchard pesticide; they are eliminated as COPCs for verification sampling.

Cleanup verification sampling was conducted at the 600-151 waste site April 26 through 28, 2011. Only the footprints of the areas where stained soil and concentrated debris were removed were identified for verification soil sampling. Four of the excavated areas did not have a statistical sample fall within the excavation, therefore one focused sample was collected at the approximate center of each of the locations. A total of 43 verification sample locations were identified and discrete soil samples were collected from the areas.

A review of the April 2011 verification sampling results indicated that additional soil removal was necessary due to the residual concentrations of benzo(a)pyrene and petroleum contamination exceeding soil cleanup criteria for direct exposure at seven locations. In June 2011, an additional 1 m (3 ft) of soil was removed at these locations, and on June 7, 2011, eight additional verification samples were collected. The results of this second round of sampling indicated the locations were adequately remediated, except for one sample, which contained benzo(a)pyrene contamination exceeding the cleanup criteria for direct exposure. On June 22, 2011, an additional 1 m (3 ft) of soil was removed at this location and a third verification sample collected.

The results of verification sampling showed that COPCs were quantified below their respective soil RAGs, except for arsenic, copper, lead, benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene, chrysene, and DDE. Of these, arsenic and lead were measured at concentrations exceeding cleanup criteria for direct exposure and protection of groundwater and the Columbia River. However, since arsenic and lead contamination is associated with historic lead arsenate pesticide use at pre-Hanford orchard land, they are excluded as COCs and are not evaluated further. RESRAD modeling predicted that residual concentrations of the remaining constituents will be protective of groundwater and the Columbia River.

4.4.15.4 Statement of Protectiveness

The analytical results indicate (except for arsenic and lead) that the residual concentrations of COPCs at this site meet the RAOs for direct exposure, groundwater protection, and river protection. However, as agreed by the Tri-Parties, lead and arsenic contamination that resulted from pesticide use prior to the Manhattan Project have been excluded as COCs for the 600-151 waste site. Except for lead and arsenic, the results of verification sampling show that residual contaminant concentrations do not preclude any future uses (as bounded by the rural-residential scenario) and allow for unrestricted use of shallow zone soils (i.e., surface to 4.6 m [15 ft] deep). The results also demonstrate that except for lead and arsenic,

residual contaminant concentrations are protective of groundwater and the Columbia River and institutional controls to prevent uncontrolled drilling are not required.

Because arsenic and lead contamination is present in surface soil, an administrative control will be documented in the Hanford Waste Information Data System until a final decision concerning historic orchard pesticide use is made. The 600-151 site has been reclassified as “Interim Closed Out.”

4.4.16 600-152, Military Septic Tanks

4.4.16.1 Site Description

The 600-152 Military Septic Tank waste site is located northwest of the 105H Reactor and consisted of a septic tank and associated structures that were constructed to support military Base Camp 130. This included three in-line concrete covers, two manholes which allowed access to the septic tank, and underground piping connecting the surface features and the septic tank. Identified as part of the 600-152 waste site, a sewer manhole and a pipe running southeast from the sewer manhole were removed during remediation.

In October 2001, liquid in the septic tank was sampled. Results from the sample, described as rainwater, showed elevated gross beta results. No other radionuclides were detected in the analyses. Based on this result, the site was posted with Underground Radioactive Material signs.

4.4.16.2 Excavation Operations

Remedial action at the 600-152 waste site was performed between October 13 and November 10, 2008, and encompassed the removal of the belowgrade septic tank, three concrete covers, two manholes, concrete piping, and associated soils. In addition, a section of cast iron pipe was removed from the waste site that contained seals made of lead. The lead-containing material was containerized after removal from the excavation. The site was excavated up to 5 m (16 ft) belowgrade, resulting in the removal of approximately 287 BCM (375 BCY) of material for disposal at ERDF, including approximately 140 m (460 ft) of pipe.

Results from an in-process sample collected inside the septic tank on October 22, 2009, showed no elevated metals, radionuclides, or SVOCs. GPERS surveys were conducted at the 600-152 waste site upon completion of remedial action activities. The beta survey identified one location near the eastern boundary of the excavation with elevated radiological activity. A focused sample was taken at this location.

4.4.16.3 Verification Sampling

Cleanup verification sampling for the 600-152 waste site was performed on May 13, 2009. The 600-152 site was divided into two decision units for verification sampling. The first decision unit consisted of the excavation footprint and the second decision unit consisted of the overburden soil stockpile. Twelve discrete soil samples were collected within each decision unit. One additional focused sample was collected from an area with an elevated beta reading indicated by the radiological survey.

Cleanup verification sample results for copper, lead, benzo(a)anthracene, benzo(a)pyrene, and benzo(b)fluoranthene exceed soil RAGs for protection of groundwater and/or the Columbia River. RESRAD modeling predicted that residual concentrations of these constituents will be protective of groundwater and the Columbia River.

4.4.16.4 Statement of Protectiveness

The results of verification sampling show that residual soil concentrations support future land uses that can be represented (or bounded) by a rural-residential scenario. The results also demonstrate that residual

contaminant concentrations support unrestricted future use of shallow zone soil (i.e., surface to 4.6 m [15 ft]) and contaminant levels remaining in the soil are protective of groundwater and the Columbia River. Site contamination extended slightly into the deep zone soils, however, the remediation footprint was evaluated against the more restrictive shallow zone criteria. Therefore, institutional controls to prevent uncontrolled drilling or excavation into the deep zone are not required. The 600-152 site has been reclassified as "Interim Closed Out."

4.4.17 600-380, Segment 4 Unknown Cylinder

The 600-380 waste site consisted of an unknown cylinder located 20 m (64 ft) from a maintained gravel road and approximately 1 km (0.6 mi) west of the intersection of H Avenue and the 100H perimeter road. There is no process history associated with the 600-380 waste site. The unknown cylinder was discovered on June 14, 2010. Significant corrosion of the cylinder's exterior indicated that the cylinder had been abandoned for many years. Markings on the cylinder indicated that it formerly contained hydrogen sulfide gas and the cylinder manufacture date was July 1924. The latest legible hydrostatic test date marked on the cylinder was August 1945, but partial markings of a test date in 1950 were also present. Further field investigation on October 10, 2013, determined that the cylinder valve was open and the cylinder was empty. The cylinder was removed for disposal at ERDF on October 24, 2013.

The 600-380 cylinder was a surface feature that did not require subsurface remedial action. Assuming hydrostatic testing occurred in 1950, the cylinder would have been out of service by 1955 as the testing is required every five years. The only COPC for the site would be sulfate. However, given the cylinder would have been out of service by 1955 and was found open and empty during field investigation, it is highly unlikely than any sulfate contamination would be present on the surface soil. The 600-380 site has been reclassified as "Interim Closed Out."

4.4.18 600-381, Segment 4 Underground Structure with Wooden Air Vents Feature

4.4.18.1 Site Description

The 600-381, Segment 4 Underground Structure with Wooden Vents Feature waste site consisted of two wooden air vents covered with screening and protruding from the ground. The site is located 0.8 km (0.5 mi) south of the Columbia River and 1.3 km (0.8 mi) west of Hadley Loop (also known as the 100-H Area perimeter road).

There is no process history associated with the 600-381 waste site. The site was discovered on November 1, 2010. Based on aerial photographs, the waste site is in a general location previously used by the military. Aerial photographs of the area from 1943 and 1948 show the area as being undisturbed. An aerial photograph from 1957 shows surface disturbances consistent with the suspected Army activity. No other records of military activity in this area are available. The 600-381 waste site is located within 100 m (328 ft) of a known historical farm boundary.

A geophysical survey was performed at the 600-381 waste site location in October 2011 for general characterization and delineations of the site. The geophysical investigation results did not indicate that a void space or structure was present beneath the air vents. A near-surface anomaly was detected at approximately 2 m (6.6 ft) south of the air vents at a depth of 0.2 m (0.7 ft) bgs. The results of the investigation suggested that the size of the geophysical anomaly was less than the size of a 208 L (55 gal) drum.

4.4.18.2 Confirmatory Sampling

Confirmatory sampling was performed at the 600-381 waste site on June 28, 2013. The locations of the surface vents and the subsurface geophysical anomaly at 600-381 required investigation. Because the

depth of the features was unknown, a separate test pit was prescribed for each location. Test Pit 1 was excavated at the location of the surface vents. Test Pit 2 was excavated at the location of the subsurface geophysical anomaly.

The excavation of Test Pit 1 continued until a pipeline was encountered. The pipeline end was visible at 0.6 m (2 ft) belowgrade trending south toward the Test Pit 2 location. Due to the proximity of the Test Pit 2 location and the excavation layback of Test Pit 1, the encountered pipeline was deferred for further investigation with Test Pit 2. The excavation of Test Pit 1 continued to the planned depth of 1.2 m (4 ft) bgs. Inert debris, including wood and large cobbles, was observed during the excavation of Test Pit 1. The excavation of Test Pit 1 was expanded to the southwest to follow and observe the nature of debris. An additional 0.6 m (2 ft) of soil and debris was excavated from the bottom of the Test Pit 1 excavation. Two samples were collected from Test Pit 1.

Test Pit 2 was focused to investigate an apparent metallic structure that was noted by the geophysical investigation survey. However, no metallic structure other than a pipeline was found at the Test Pit 2 location. This is the same pipeline that was observed during the excavation of Test Pit 1. The pipeline was approximately 1.5 m (5 ft) in length and was made of thin, aluminum metal. A ferrous-metallic “elbow” was found attached to the end of the aluminum pipe at the location of the indicated geophysical anomaly, at an approximate depth of 0.3 (1 ft) bgs. The pipeline was pulled from the excavation to the surface for observation. This pipeline was free of contents and did not have any sediment for sampling. The Test Pit 2 was excavated to an approximate depth of 0.6 m (2 ft) bgs.

No hazardous or anomalous debris was discovered during excavation of Test Pits 1 and 2. Following the investigation of the 600-381 waste site and the collection of appropriate samples, the two test pits were backfilled with the materials that had been excavated.

4.4.18.3 Statement of Protectiveness

These results show that residual soil concentrations support future land uses that can be represented (or bounded) by a rural-residential scenario. The results also demonstrate that residual contaminant concentrations support unrestricted future use of shallow zone soil (i.e., surface to 4.6 m [15 ft]) and that contaminant levels remaining in the soil are protective of groundwater and the Columbia River. No COPCs were found to exceed direct exposure RAGs in shallow zone soils and contamination is likewise concluded not to exist in deep zone soils; therefore, institutional controls to prevent uncontrolled drilling or excavation into the deep zone are not required. The 600-381 site has been reclassified as “Interim No Action.”

4.4.19 600-382, Segment 4 Oil Stain and Filter Area #3

Due to geographic location and similarity of remediation activities, the 600-382 subsites (600-382:1-5, Sections 4.4.20 through 4.4.24) have been interim closed out as one site. Information regarding these sites and corresponding subsites are described below.

4.4.19.1 Site Description

The 600-382 site is five locations that have discarded oil filters and ground staining devoid of vegetation. The 600-382 site has been divided into five subsites. The descriptions of each subsite are listed below. There is no process history associated with the 600-382 waste site.

- 600-382:1, Segment 4 Oil Stains and Filter Area #3a – Consisted of two oil filters surrounded by soil devoid of vegetation.

- 600-382:2, Segment 4 Oil Stains and Filter Area #3b – Consisted of three oil filters and a small area of soil devoid of vegetation.
- 600-382:3, Segment 4 Oil Stains and Filter Area #3c – Consisted of an oil filter surrounded by soil devoid of vegetation.
- 600-382:4, Segment 4 Oil Stains and Filter Area #3d – Consisted of a 3 m^2 (32 ft^2) area devoid of vegetation containing discarded oil filters.
- 600-382:5, Segment 4 Oil Stains and Filter Area #3e – Consisted of three oil filters surrounded by soil devoid of vegetation.

4.4.19.2 Excavation Operations

The 600-382 waste site was recommended for remediation without confirmatory sampling based on the observed presence of stained soils, stressed vegetation, and barren ground. Remediation of the 600-382 waste site was performed from October 29, 2013, through March 10, 2014. No anomalies were encountered during the remediation. Approximately 85 BCM (111 BCY) of excavated materials from the 600-382 waste site were removed and direct loaded for disposal at ERDF. The approximate depths of the excavations range from 0.3 m (1.0 ft) to 1.0 m (3.3 ft) bgs. No waste SPA or overburden soil stockpiles are associated with the 600-382 waste site. Walkaround boundary surveys were conducted at each of the 600-382 subsites following remediation.

4.4.19.3 Verification Sampling

Cleanup verification sampling was performed at the 600-382 waste site on February 4 and March 12, 2014. The number of discrete samples was determined based on the size of the remediated area of the subsite. One sample was taken from each subsite, except for the 600-382:1 subsite, which is discussed below.

For the 600-382:1 subsite, the initial sample and the initial duplicate sample both failed the 100 Area RAGs for TPH. After further remediation, a second sample and a duplicate sample were collected at the same sample location and analyzed for TPH. Both resample TPH results were less than the RAGs for TPH. All COPCs were quantified below direct exposure RAGs. All COPCs were quantified below groundwater and river protection soil RAGs.

4.4.19.4 Statement of Protectiveness

These results show that residual soil concentrations support future land uses that can be represented (or bounded) by a rural-residential scenario. The results also demonstrate that residual contaminant concentrations support unrestricted future use of shallow zone soil (i.e., surface to 4.6 m [15 ft]) and that contaminant levels remaining in the soil are protective of groundwater and the Columbia River. Contamination above direct exposure levels was not observed in shallow zone soils and is concluded to not exist in deep zone soils; therefore, institutional controls to prevent uncontrolled drilling or excavation into the deep zone of the site are not required. The 600-382 site has been reclassified as “Interim Closed Out.”

4.4.20 600-382:1, Segment 4 Oil Stain and Filter Area #3a

Due to geographic location and similarity of remediation activities, the 600-382:1 site and associated subsites (600-382:1-5, Sections 4.4.20 through 4.4.24) have been interim closed out as one site. For information regarding the 600-382:1 site, refer to the 600-382 site (Section 4.4.19).

The 600-382:1 site has been reclassified as “Interim Closed Out.”

4.4.21 600-382:2, Segment 4 Oil Stain and Filter Area #3b

Due to geographic location and similarity of remediation activities, the 600-382:2 site and associated subsites (600-382:1-5, Sections 4.4.20 through 4.4.24) have been interim closed out as one site. For information regarding the 600-382:2 site, refer to the 600-382 site (Section 4.4.19).

The 600-382:2 site has been reclassified as “Interim Closed Out.”

4.4.22 600-382:3, Segment 4 Oil Stain and Filter Area #3c

Due to geographic location and similarity of remediation activities, the 600-382:3 site and associated subsites (600-382:1-5, Sections 4.4.20 through 4.4.24) have been interim closed out as one site. For information regarding the 600-382:3 site, refer to the 600-382 site (Section 4.4.19).

The 600-382:3 site has been reclassified as “Interim Closed Out.”

4.4.23 600-382:4, Segment 4 Oil Stain and Filter Area #3d

Due to geographic location and similarity of remediation activities, the 600-382:4 site and associated subsites (600-382:1-5, Sections 4.4.20 through 4.4.24) have been interim closed out as one site. For information regarding the 600-382:4 site, refer to the 600-382 site (Section 4.4.19).

The 600-382:4 site has been reclassified as “Interim Closed Out.”

4.4.24 600-382:5, Segment 4 Oil Stain and Filter Area #3e

Due to geographic location and similarity of remediation activities, the 600-382:5 site and associated subsites (600-382:1-5, Sections 4.4.20 through 4.4.24) have been interim closed out as one site. For information regarding the 600-382:5 site, refer to the 600-382 site (Section 4.4.19).

The 600-382:5 site has been reclassified as “Interim Closed Out.”

4.4.25 600-383, Segment 4 Battery Remnant Area #2

Due to geographic location and similarity of remediation activities, the 600-383 site and associated subsites (600-383:1-10, Sections 4.4.26 through 4.4.35) have been interim closed out as one decision unit. Information regarding this site and corresponding subsites is described below.

4.4.25.1 Site Description

The 600-383 waste site is reported as 10 locations that contain remnants of batteries. The 600-383 waste site has been divided into 10 subsites. Subsite 600-383:1 consists of a 4 m (13 ft) diameter area of discarded dry cell battery remnants on bare ground. Subsite 600-383:2 consists of multiple dry cell batteries in an approximate 3 m (10 ft) diameter area of bare ground. Subsite 600-383:3 consists of multiple dry cell batteries in an approximate 1 m (3 ft) diameter area of bare ground. Subsite 600-383:4 consists of a dry cell battery pack in an approximate 1 m (3 ft) diameter area of bare ground. Subsite 600-383:5 consists of two areas approximately 1 m (3 ft) diameter each of discarded dry cell batteries. Subsite 600-383:6 consists of a 1 m (3 ft) diameter area of multiple discarded dry cell batteries on bare ground. Subsite 600-383:7 consists of wet cell car battery remnants located approximately 1 m (3 ft) from a dirt road. Subsite 600-383:8 consists of six dry cell battery remnants in an approximate 6 m (20 ft) diameter area with no visible staining. Subsite 600-383:9 consists of a 5 m (16 ft) diameter area of discarded dry cell batteries on bare ground. Subsite 600-383:10 consists of a 2 m (7 ft) diameter area of debris from multiple dry cell batteries on bare ground.

4.4.25.2 Excavation Operations

The 600-383 waste site was recommended for remediation without confirmatory sampling based on the observed presence of battery debris. Waste characterization samples were collected from each of the 600-383 subsites prior to the start of remediation. Remediation of the 600-383 waste site was performed from September 25 through November 13, 2013. Approximately 55 BCM (72 BCY) of excavated materials from the 600-383 waste site were removed and direct loaded for disposal at ERDF. The approximate depths of the excavations range from less than 0.3 to 0.46 m (1.0 to 1.5 ft) bgs.

4.4.25.3 Verification Sampling

One focused verification soil sample was collected from each of the subsite excavations. No evidence of stained soil was observed to bias the sample location; therefore, all verification samples were grab samples collected from the approximate center of each of the excavations. All COPCs were quantified below direct exposure RAGs. All COPCs were quantified below groundwater and/or river protection soil RAGs except for cadmium, copper, lead, manganese, mercury, nickel, and zinc. RESRAD modeling predicted that residual concentrations of these constituents will be protective of groundwater and the Columbia River.

4.4.25.4 Statement of Protectiveness

The 600-383, Segment 4 Battery Remnant Area #2 waste site verification sampling data demonstrates that this waste site meets RAOs and RAGs. Residual soil concentrations support future land uses that can be represented (or bounded) by a rural-residential scenario. The results also demonstrate that residual contaminant concentrations support unrestricted future use of shallow zone soil (i.e., surface to 4.6 m [15 ft]) and that contaminant levels remaining in the soil are protective of groundwater and the Columbia River. Contamination above direct exposure levels was not observed in shallow zone soils and is concluded to not exist in deep zone soils; therefore, institutional controls to prevent uncontrolled drilling or excavation into the deep zone of the site are not required. The 600-383 site and 600-383:1-10 subsites have been reclassified as “Interim Closed Out.”

4.4.26 600-383:1, Segment 4 Battery Remnant Area #2a

Due to geographic location and similarity of remediation activities, the 600-383:1 site and associated subsites (600-383:1-10, Sections 4.4.26 through 4.4.35) have been interim closed out as one decision unit. For information regarding the 600-383:1 site, refer to the 600-383 site (Section 4.4.25).

The 600-383:1 site has been reclassified as “Interim Closed Out.”

4.4.27 600-383:2, Segment 4 Battery Remnant Area #2b

Due to geographic location and similarity of remediation activities, the 600-383:2 site and associated subsites (600-383:1-10, Sections 4.4.26 through 4.4.35) have been interim closed out as one decision unit. For information regarding the 600-383:2 site, refer to the 600-383 site (Section 4.4.25).

The 600-383:2 site has been reclassified as “Interim Closed Out.”

4.4.28 600-383:3, Segment 4 Battery Remnant Area #2c

Due to geographic location and similarity of remediation activities, the 600-383:3 site and associated subsites (600-383:1-10, Sections 4.4.26 through 4.4.35) have been interim closed out as one decision unit. For information regarding the 600-383:3 site, refer to the 600-383 site (Section 4.4.25).

The 600-383:3 site has been reclassified as “Interim Closed Out.”

4.4.29 600-383:4, Segment 4 Battery Remnant Area #2d

Due to geographic location and similarity of remediation activities, the 600-383:4 site and associated subsites (600-383:1-10, Sections 4.4.26 through 4.4.35) have been interim closed out as one decision unit. For information regarding the 600-383:4 site, refer to the 600-383 site (Section 4.4.25).

The 600-383:4 site has been reclassified as “Interim Closed Out.”

4.4.30 600-383:5, Segment 4 Battery Remnant Area #2e

Due to geographic location and similarity of remediation activities, the 600-383:5 site and associated subsites (600-383:1-10, Sections 4.4.26 through 4.4.35) have been interim closed out as one decision unit. For information regarding the 600-383:5 site, refer to the 600-383 site (Section 4.4.25).

The 600-383:5 site has been reclassified as “Interim Closed Out.”

4.4.31 600-383:6, Segment 4 Battery Remnant Area #2f

Due to geographic location and similarity of remediation activities, the 600-383:6 site and associated subsites (600-383:1-10, Sections 4.4.26 through 4.4.35) have been interim closed out as one decision unit. For information regarding the 600-383:6 site, refer to the 600-383 site (Section 4.4.25).

The 600-383:6 site has been reclassified as “Interim Closed Out.”

4.4.32 600-383:7, Segment 4 Battery Remnant Area #2g

Due to geographic location and similarity of remediation activities, the 600-383:7 site and associated subsites (600-383:1-10, Sections 4.4.26 through 4.4.35) have been interim closed out as one decision unit. For information regarding the 600-383:7 site, refer to the 600-383 site (Section 4.4.25).

The 600-383:7 site has been reclassified as “Interim Closed Out.”

4.4.33 600-383:8, Segment 4 Battery Remnant Area #2h

Due to geographic location and similarity of remediation activities, the 600-383:8 site and associated subsites (600-383:1-10, Sections 4.4.26 through 4.4.35) have been interim closed out as one decision unit. For information regarding the 600-383:8 site, refer to the 600-383 site (Section 4.4.25).

The 600-383:8 site has been reclassified as “Interim Closed Out.”

4.4.34 600-383:9, Segment 4 Battery Remnant Area #2i

Due to geographic location and similarity of remediation activities, the 600-383:9 site and associated subsites (600-383:1-10, Sections 4.4.26 through 4.4.35) have been interim closed out as one decision unit. For information regarding the 600-383:9 site, refer to the 600-383 site (Section 4.4.25).

The 600-383:9 site has been reclassified as “Interim Closed Out.”

4.4.35 600-383:10, Segment 4 Battery Remnant Area #2j

Due to geographic location and similarity of remediation activities, the 600-383:10 site and associated subsites (600-383:1-10, Sections 4.4.26 through 4.4.35) have been interim closed out as one decision unit. For information regarding the 600-383:10 site, refer to the 600-383 site (Section 4.4.25).

The 600-383:10 site has been reclassified as “Interim Closed Out.”

4.4.36 600-384, Segment 4 Stained Soil Area #3

Due to geographic location and similarity of remediation activities, the 600-384 site and associated subsites (600-384:1-5, Sections 4.4.37 through 4.4.41) have been interim closed out as one decision unit. Information regarding these sites and corresponding subsites are described below.

4.4.36.1 Site Description

The 600-384, Segment 4 Stained Soil Area #3 waste site consisted of five locations that had yellow powder, tar, or stained or crusted soils. The 600-384 waste site was divided into five subsites (600-384:1, 600-384:2, 600-384:3, 600-384:4, and 600-384:5). The 600-384 subsites are located north of the railroad tracks and Route 2 North, between the 100-D and 100-H Areas.

4.4.36.2 Excavation Operations

Remediation of the 600-384:1, 600-384:2, and 600-384:5 subsites was performed on November 4 and 5, 2013. Remediation of the 600-384:3 and 600-384:4 subsites was performed on November 25, 2013. Remediation of the 600-384 waste site resulted in approximately 92 BCM (120 BCY) of soil and debris being removed for disposal at ERDF. Additional remediation was performed at the 600-384:3, 600-384:4, and 600-384:5 subsite locations on March 3 through 5, 2014. Additional soil was removed across the entire base of each subsite excavation. Further remediation performed at these three subsites resulted in an additional soil removal of 233 BCM (305 BCY). The final remediation resulted in a total of approximately 325 BCM (425 BCY) of contaminated material being removed and disposed at ERDF.

4.4.36.3 Verification Sampling

Initial verification sampling was performed at the 600-384 waste site on January 29, 2014. Seven focused samples were collected from the five excavations. The analytical data results indicated that additional remediation was required at three sample locations (600-384:3, 600-384:4, and 600-384:5).

Motor oil concentrations at these three locations exceeded the soil cleanup level. Following additional remediation, excavation sample locations 600-384:3, 600-384:4, and 600-384:5 were resampled on March 6, 2014. Additional remediation performed at the 600-384:4 subsite resulted in an excavation area of greater than 100 m^2 (1076 ft^2). Due to the increase of the excavation area, one additional verification sample was collected from the 600-384:4 excavation on March 6, 2014.

All COPCs were quantified below direct exposure RAGs. All COPCs for the 600-384 waste site were qualified below their respective soil RAGs for groundwater and/or river protection except for lead, zinc, benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene, and dibenz(a,h)anthracene. RESRAD modeling predicted that residual concentrations of these constituents will be protective of groundwater and the Columbia River.

4.4.36.4 Statement of Protectiveness

Results of verification sampling show that residual soil concentrations support future land uses that can be represented (or bounded) by a rural-residential scenario. The results also demonstrate that residual contaminant concentrations support unrestricted future use of shallow zone soil (i.e., surface to 4.6 m [15 ft]) and that contaminant levels remaining in the soil are protective of groundwater and the Columbia River. No COPCs were found to exceed direct exposure RAGs in shallow zone soils, and contamination is likewise concluded not to exist in deep zone soils. Therefore, institutional controls to prevent uncontrolled drilling or excavation into the deep zone are not required. The 600-384 site and corresponding 600-384:1-5 subsites have been reclassified as “Interim Closed Out.”

4.4.37 600-384:1, Segment 4 Stained Soil Area #3a

Due to geographic location and similarity of remediation activities, the 600-384 site (Section 4.4.36) and associated subsites (600-384:1-5, Sections 4.4.37 through 4.4.41) have been interim closed out as one decision unit. For information regarding the 600-384:1 site, refer to the 600-384 site (Section 4.4.36).

The 600-384:1 site has been reclassified as "Interim Closed Out."

4.4.38 600-384:2, Segment 4 Stained Soil Area #3b

Due to geographic location and similarity of remediation activities, the 600-384 site (Section 4.4.36) and associated subsites (600-384:1-5, Sections 4.4.37 through 4.4.41) have been interim closed out as one decision unit. For information regarding the 600-384:2 site, refer to the 600-384 site (Section 4.4.36).

The 600-384:2 site has been reclassified as "Interim Closed Out."

4.4.39 600-384:3, Segment 4 Stained Soil Area #3c

Due to geographic location and similarity of remediation activities, the 600-384 site (Section 4.4.36) and associated subsites (600-384:1-5, Sections 4.4.37 through 4.4.41) have been interim closed out as one decision unit. For information regarding the 600-384:2 site, refer to the 600-384 site (Section 4.4.36).

The 600-384:3 site has been reclassified as "Interim Closed Out."

4.4.40 600-384:4, Segment 4 Stained Soil Area #3d

Due to geographic location and similarity of remediation activities, the 600-384 site (Section 4.4.36) and associated subsites (600-384:1-5, Sections 4.4.37 through 4.4.41) have been interim closed out as one decision unit. For information regarding the 600-384:4 site, refer to the 600-384 site (Section 4.4.36).

The 600-384:4 site has been reclassified as "Interim Closed Out."

4.4.41 600-384:5, Segment 4 Stained Soil Area #3e

Due to geographic location and similarity of remediation activities, the 600-384 site (Section 4.4.36) and associated subsites (600-384:1-5, Sections 4.4.37 through 4.4.41) have been interim closed out as one decision unit. For information regarding the 600-384:5 site, refer to the 600-384 site (Section 4.4.36).

The 600-384:5 site has been reclassified as "Interim Closed Out."

4.4.42 600-385, Segment 4 Transite, Concrete, and Metal Debris Area

4.4.42.1 Site Description

The 600-385, Segment 4 Transite, Concrete, and Metal Debris Area waste site is located approximately 1.2 km (0.7 mi) northwest of the northwest comer of the 100H perimeter road along the Columbia River. There is no known specific process history associated with the 600-385 waste site. It was discovered on August 30, 2010. The site consists of an area approximately 5,000 m^2 (1.2 ac) with scattered transite, concrete, and metal debris.

A geophysical investigation was conducted in January 2011, to detect and delineate areas of elevated concentrations of metallic debris. The results indicated that surface and buried metallic material was contained in an area measuring approximately 20 by 190 m (65 by 623 ft) long. An additional geophysical survey was conducted in December 2011 to investigate both metallic and nonmetallic features.
The survey results indicated that most of the debris appeared to be buried in the upper 0.2 m (0.7 ft) of the ground surface.

4.4.42.2 Excavation Operations

Remediation of the 600-385 waste site was performed between March 28 and May 17, 2016. Approximately 5,304 BCM (6,937 BCY) of excavated materials were removed and loaded out for disposal at ERDF. The maximum depth of the excavation extended to approximately 1.5 m (5 ft) deep. The excavated materials consisted of asbestos (transite) and nonhazardous debris (i.e., concrete, wood, metal) as well as the underlying soil. An area of red-stained soil was encountered during remediation. A soil sample was collected of the stained soil on April 7, 2016. Based on the analytical results, the stained soil was determined to be nonhazardous.

4.4.42.3 Statement of Protectiveness

No hazardous materials other than asbestos were identified during remediation; remediation was performed to remove asbestos-containing debris and co-located construction debris. A visual inspection of the 600-385 waste site was conducted by a Washington State certified asbestos supervisor on May 17, 2016; no asbestos was found to be present. Because no other contaminants were identified during the remediation, no verification sampling was performed. This site will support future unrestricted land uses that can be represented (or bounded) by a rural-residential scenario. No institutional controls are required for this site to prevent uncontrolled drilling or excavation into the deep zone (i.e., below 4.6 m [15 ft]). Based on the visual removal of debris material, the 600-385 waste site has been reclassified as “Interim Closed Out.”

4.5 Unassigned Sites

This section presents detailed remedial actions for sites not associated with an OU in the 100-D or 100-H Areas.

4.5.1 100-D-33, Minor Construction Burial Ground #4 East Trench

4.5.1.1 Site Description

The 100-D-33 site is located east/southeast of the 105D Reactor, just south of the rail spur to the fuels transfer bay. The site is a burial ground trench within the Minor Construction Burial Ground #4, approximately 30 m (100 ft) long by 15 m (50 ft) wide. During a March 31, 1999, visit to the site, it appeared as a vegetation-free, cobble-covered field, with no evidence of the trench visible.

The 100-D-33 site was cited as first being used in fall 1954 for disposal of low-level construction wastes from the reactors. This information does not correspond with the evidence provided by photographs, area surface features, geophysical data, and excavation findings for the actual site.

Geophysical investigation used electromagnetic induction, magnetometer, and GPR methods, as well as time domain electromagnetics and found no trench-like features. The photographic review shows the presence of a roadway over the northeast comer of the 100-D-33 waste site during the timeframe the waste disposal was supposed to have been occurring. As such, the site was never used for the disposal of hazardous or dangerous materials and, accordingly, no residual contamination would be present in the soil.

4.5.1.2 Excavation Operations

Exploratory trenching was conducted in April 2007 to confirm the geophysical investigation findings of no reactor hardware debris within the 100-D-33 site. Two trenches were excavated at the site. The excavators were directed to dig to native soil, or to 4.6 m (15 ft), whichever was achieved first. Native soil was reached at between 2 and 3 m (6 and 10 ft) at each of the sites. It was established that the soil at this depth was undisturbed based on observations that correlated with native soil determinations

elsewhere in the 100-D Area. The excavation continued following the confirmation of contact with native soil, to be conservative, and extended to a depth of 4.6 m (15 ft). No debris was encountered within either of the trenches excavated at the 100-D-33 site. The absence of debris within the exploratory trenches supports the conclusion that this site was not used as a burial trench for reactor hardware or disposal of other waste.

4.5.1.3 Statement of Protectiveness

The basis for rejection of 100-D-33 as a waste site is supported by historical review, field inspections, geophysical data, and excavations. It has been determined through the analysis of photographs that the 100-D-33 site was not a burial ground. This is further supported by the geophysical investigation; no subsurface anomalies were identified in the geophysical data, and the subsurface reflections were characteristic of natural geologic horizons. Excavation activities also did not locate any debris.
The 100-D-33 site does not pose a risk to human health and the environment and will support future unrestricted land uses that can be represented (or bounded) by a rural-residential scenario, and no institutional controls are required. The 100-D-33 site has been reclassified as “Rejected.”

4.5.2 100-D-35, Minor Construction Burial Ground #4 West Trench

4.5.2.1 Site Description

The 100-D-35 site is located east/southeast of the 105D Reactor, just south of the rail spur to the fuels transfer bay. The site is a burial ground trench within the Minor Construction Burial Ground #4, approximately 30 m (100 ft) long by 15 m (50 ft) wide. During a March 31, 1999 visit to the site, it appeared as a vegetation-free, cobble-covered field, with no evidence of the trench visible.

The 100-D-35 site was cited as first being used in the fall of 1954 for disposal of low-level construction wastes from the reactors. This information for the 100-D-35 site does not correspond with the evidence provided by photographs, area surface features, geophysical data, and excavation findings for the actual site.

The construction wastes cited to be disposed in 100-D-35 included reactor thimbles, rod guides, and miscellaneous waste during the Ball 3X conversion project. However, it is documented that the waste removed from the Ball 3X outage was sent to 100-D-6, Minor Construction Burial Ground #1 (Section 4.1.6) in 1953.

Geophysical investigation used electromagnetic induction, magnetometer, and GPR methods, as well as time domain electromagnetics and found no trench-like features. In all the photographic reviews, 100-D-35 looks like an undisturbed area. As such, the site was never used for the disposal of hazardous or dangerous materials and, accordingly, no residual contamination would be present in the soil.

4.5.2.2 Excavation Operations

Exploratory trenching was conducted in April 2007 to confirm the geophysical investigation findings of no reactor hardware debris within the 100-D-35 site. Two trenches were excavated at the site.
The excavators were directed to dig to native soil or to 4.6 m (15 ft), whichever was achieved first. Native soil was reached at between 2 and 3 m (6 and 10 ft) at each of the sites. It was established that the soil at this depth was undisturbed based on observations that correlated with native soil determinations elsewhere in the 100-D Area.

The excavation continued following the confirmation of contact with native soil, to be conservative, and extended to a depth of 4.6 m (15 ft). No debris was encountered within either of the trenches excavated at the 100-D-35 site. The absence of debris within the exploratory trenches supports the conclusion that this site was not used as a burial trench for reactor hardware or disposal of other waste.

4.5.2.3 Statement of Protectiveness

The basis for rejection of 100-D-35 as a waste site is supported by historical review, field inspections, geophysical data, and excavations. It has been determined through the analysis of photographs that the 100-D-35 site was not a burial ground, further supported by the geophysical investigation; no subsurface anomalies were identified in the geophysical data, and the subsurface reflections were characteristic of natural geologic horizons. Excavation activities also did not locate any debris. The 100-D-35 site does not pose a risk to human health and the environment and will support future unrestricted land uses that can be represented (or bounded) by a rural-residential scenario, and no institutional controls are required.
The 100-D-35 site has been reclassified as "Rejected."

4.5.3 100-D-40, Minor Construction Burial Ground #5 Hole

4.5.3.1 Site Description

The 100-D-40, Minor Construction Burial Ground #5 Hole is a 12 m (40 ft) diameter hole reported to have been used for the disposal of contaminated material and equipment from the 105D Reactor. The site is located 220 m (720 ft) east of the 105D Reactor and 23 m (75 ft) south of the railroad tracks that serviced the 105D Reactor.

The 100-D-40 site was evaluated, which included research, geophysical investigation, and trench excavation. The conclusion was drawn that this site does not contain waste. As no waste was found within the boundary, it should be assumed that the waste described in association with the 100-D-40 site is at another location within the 100-D Area. The waste was likely disposed in 100-D-47 (Section 4.2.9) and/or 118-D-4 (Section 4.2.32).

4.5.3.2 Excavation Operations

Exploratory trenching was conducted at site 100-D-40 in April 2007 to confirm the findings of the geophysical investigation. The excavation was to proceed to a depth of 4.6 m (15 ft) or to native soil, whichever occurred first. Native soil was encountered at 3 m (10 ft) bgs at 100-D-40. The excavation continued following the confirmation of contact with native soil, and extended to 4.6 m (15 ft). No debris or hazardous materials were observed within the trench. The characteristics typical of native soil and the absence of debris within the exploratory trench supports the conclusion that this site was not used as a burial trench for reactor hardware materials and, accordingly, no residual contamination would be present in the soil.

4.5.3.3 Statement of Protectiveness

The evaluations show that the 100-D-40 site does not contain buried wastes. As such, there are no hazardous or dangerous materials present at the site and, accordingly, no residual contamination in the soil. Therefore, the site is protective of human health, groundwater, and the Columbia River.
The 100-D-40 site will support future unrestricted land uses that can be represented (or bounded) by a rural-residential scenario. No institutional controls are required. The 100-D-40 site has been reclassified as "Rejected."

4.5.4 100-D-41, Minor Construction Burial Ground #5 Trench,

4.5.4.1 Site Description

The 100-D-41, Minor Construction Burial Ground #5 Trench is a 23 m (75 ft) long by 12 m (40 ft) wide rectangular burial ground, trending north to south. The site is reported to have been used for the disposal of irradiated reactor parts, dummies, thimbles, rods, gun barrels, and other contaminated solid waste.
The 100-D-41 site is located 210 m (700 ft) east of the 105D Reactor and 23 m (75 ft) south of the railroad tracks that serviced the 105D Reactor.

The 100-D-41 site was evaluated, which included research, geophysical investigation, and trench excavation. The conclusion was drawn that this site does not contain waste. As no waste was found within the boundary, it should be assumed that the waste described in association with the 100-D-41 site is at another location within the 100-D Area. The waste was likely disposed in 100-D-47 (Section 4.2.9) and/or 118-D-4 (Section 4.2.32).

4.5.4.2 Excavation Operations

Exploratory trenching was conducted at site 100-D-41 in April 2007 to confirm the findings of the geophysical investigation. The excavation was to proceed to a depth of 4.6 m (15 ft) or to native soil, whichever occurred first. Native soil was encountered at 1.8 m (6 ft) bgs at the 100-D-41 site. No debris or hazardous materials were observed at this depth. The characteristics typical of native soil and the absence of debris within the exploratory trench supports the conclusion that this site was not used as a burial trench for reactor hardware and, accordingly, no residual contamination would be present in the soil.

4.5.4.3 Statement of Protectiveness

The evaluations show that the 100-D-41 site does not contain buried wastes. As such, there are no hazardous or dangerous materials present at the site and, accordingly, no residual contamination in the soil. Therefore, the site is protective of human health, groundwater, and the Columbia River.
The 100-D-41 site will support future unrestricted land uses that can be represented (or bounded) by a rural-residential scenario. No institutional controls are required. The 100-D-41 site has been reclassified as “Rejected.”

4.5.5 100-D-58, 100DR Area On-Site Sewage System for MO980 & 4-Closet Restroom Facility

4.5.5.1 Site Description

The 100-D-58, 100-DR Area On-Site Sewage System for MO980 and 4-Closet Restroom Facility waste site is located approximately 183 m (600 ft) northwest of the 105DR Reactor and 76 m (250 ft) southwest of the 105D Reactor. The 100-D-58 waste site was constructed in 1998 to support remedial action in the 100-D Area. The 100-D-58 sewage system received sanitary sewage from MO980 and a restroom trailer. A shower trailer was added by 2008 to support remedial action activity in 100-D Area.

4.5.5.2 Septic Tank Abandonment Activities

The existing septage was pumped from the tank on April 16, 2012. On August 2 and 6, 2012, approximately 1.3 m (4 ft) of soil overlying the septic tank was removed to expose the septic tank. The tank lid was removed and crushed, and the tank void space was filled with sand and gravel. The abandoned tank was then backfilled to grade. The electronic components, pump, and float switches associated with the septic system were removed and either disposed or recycled. The drain field inspection ports, consisting of PVC pipes placed vertically in the drain field, were also removed and disposed. All belowgrade PVC piping associated with the sewage system was abandoned in place.

4.5.5.3 Statement of Protectiveness

The 100-D-58, 100-DR Area On-Site Sewage System for MO980 and 4-Closet Restroom Facility waste site was constructed in 1998 to support remedial action in the 100-D Area. The septic system was not part of a facility that contained CERCLA-related waste materials or hazardous substances. Reclassification of the site to Final Closed Out is supported in accordance with procedure, which specifies that final closeout of septic sites require that the applicable *Washington Administrative Code* (WAC) requirements have been met.

The 100-D-58 septic tank has been abandoned in accordance with the WAC criteria. Instruments and aboveground equipment associated with operation of the system have been removed and disposed or recycled. This site will support future unrestricted land uses that can be represented (or bounded) by a rural-residential scenario. No institutional controls are required for this site to prevent uncontrolled drilling or excavation into the deep zone (i.e., below 4.6 m (15 ft). The 100-D-58 site has been reclassified as "Final Closed Out."

4.5.6 100-D-79, Posted Soil Contamination Areas (SCAs)

The 100-D-79 Posted Soil Contamination Areas site consists of two separate SCAs. Area 1 is approximately 1,790 m^2 (19,260 ft^2) and Area 2 is approximately 4,907 m^2 (52,821 ft^2).

Area 1 is located approximately 50 m (164 ft) directly north of the 116-D-7 Retention Basin (Section 4.1.113) and southeast of the 116-DR-5 outfall (Section 4.3.117). It is not known if the source of the posting is related to historical use as a spoil pile or if it resulted from other remediation activities in the area; however, the area has been downposted, following standard procedures for downposting SCAs, since identification as an orphan site in 2006. A GPERS survey performed on January 27, 2010, indicates no residual radiological contamination in this area.

Area 2, observed north of the 126-D-l site, was previously posted as an SCA. This area was used from 1997 through 1999, to stage overburden soil during the remediation of the 100-D-48:2 (Section 4.1.36), 100-D-49:2 (Section 4.1.40), UPR-100-D-2 (Section 4.1.139), and UPR-100-D-3 (Section 4.1.140) waste sites. Area 2 of the 100-D-79 site is a redundant waste area, because it was previously evaluated (i.e. sampled) and reclassified as Interim Closed Out. It appears that the Radiological Control Organization did not remove the posting. Subsequently, this SCA was identified as an orphan site, without recognizing that the area was previously evaluated, and was given waste site number 100-D-79. A GPERS survey of the area was performed on January 27, 2010. The individual elevated readings shown in the surveys have been evaluated, and it is appropriate to note that these readings are due to the variability in gamma counting methods. Since identification as an orphan site, this area has also been downposted.

The 100-D-79 site has been reclassified as "Rejected."

4.5.7 100-D-92, Potential UST Near Dichromate Station

The 100-D-92 site is 10 m (32 ft) east of the 100-D-12 Sodium Dichromate Transfer Station (Section 4.2.1) and 73 m (239 ft) southeast of the 183D Building. The site was originally identified as a possible UST based on an anomalous area detected in a geophysical survey in June 1993.

A detailed spatial and historical analysis was conducted, and it was determined that the feature is a known piping encasement located below a railroad line, approximately 0.9 m (3 ft) bgs. This encasement was visually observed during remediation of the 100-D-56:2 waste site (Section 4.1.55). No potentially hazardous substances are associated with the encasement beyond the piping it protected. All piping formerly within the encasement is included in either the 100-D-63 (Section 4.1.63) or 100-D-56:2 waste site. All of the 100-D-56:2 sodium dichromate and sodium silicate pipelines in the encasement have been removed as part of remediation of the 100-D-56:2 site. The 100-D-63 pipelines remaining in the encasement will be addressed as a part of the 100-D-63 site. During the remedial action for the 100-D-100 site (Section 4.2.17), the 100-D-92 area was excavated to ground water.

The 100-D-92 site has been reclassified as "Rejected."

4.5.8 100-D-93, Potential UST Near Dichromate Station

The 100-D-93, Potential UST Near Dichromate Station site is described as the location of an underground concrete utility encasement and underlying soil located below a rail line. The site was originally reported as a potential UST after a geophysical survey of the Sodium Dichromate Transfer Station, conducted in June 1993, identified several geophysical anomalies. It was later determined that the geophysical anomaly is a concrete encasement that protected a 30 in. fresh water pipeline that serviced the 183D Water Treatment facility. The site is located 10 m (32 ft) east of the 100D Sodium Dichromate Transfer Station and 73 m (239 ft) southeast of the 183D Building.

The 100-D-93 site has been reclassified as "Rejected."

4.5.9 100-D-95, 100-D/DR Unnumbered Septic Tanks and Tile Field

The 100-D-95, 100-D/DR Unnumbered Septic Tanks and Tile Field site is located approximately 150 m (492 ft) northwest of the 182-D Reservoir. During construction of the Hanford Engineer Works, temporary sewer lines and septic tanks were installed for the disposal of sanitary sewage. Records indicated that a septic tank and tile field was proposed at this location to service several temporary buildings. Based on the review of information, it is reasonable to conclude that the septic system and associated tile field were proposed, but further evaluation of detailed drawings, facility designs, and associated documentation confirm that the septic tank and tile field were never constructed.

In addition to the review of documentation, a geophysical survey was conducted in April 2006, at the location where the septic tank and drain field were said to be located. The survey was performed in support of the Orphan Site Project to determine the existence of the August 1944 plot plan septic system. The geophysical survey report indicated that there were no anomalous features in the geophysical data that have the characteristics typically associated with a septic tank and drain field. The report indicated that most septic tanks are generally detected using the geophysical techniques that were applied during the April 2006 investigation. There were electromagnetic data that indicated metallic surface debris, but the signature of the data does not indicate that the metallic debris is associated with a septic tank or tile field.

Two linear anomalies add to the uncertainty in the interpretation of the geophysical data. There are no known pipelines in that location. These linear anomalies remain unknowns, but professional judgment concludes that they may be associated with the perimeter road.

Based on information gathered during the geophysical investigation, and historical review it was determined that a septic tank and drain field do not exist at the 100-D-95 site.

The 100-D-95 site has been reclassified as "Rejected."

4.5.10 120-D-1, 100-D Ponds

4.5.10.1 Site Description

The 100D ponds were constructed from the former 188-D coal ash disposal basin and consisted of two interconnected surface ponds. The original pond was constructed by excavating an area 9 m (30 ft) deep in the eastern half of the 188-D Ash Disposal Basin. The site was modified in 1979 to form a two-compartment pond, one overflowing to the other. The modification resulted in a combined surface dimension of 50 by 67 m (160 by 220 ft). The south pond has a 1.5 million L (400,000 gal) capacity and functions as a settling pond. The north pond has a 2 million L (570,000 gal) capacity and functions as a percolation pond. Two horizontal effluent transfer pipes are in the dike connecting the two ponds. The ponds are surrounded on the east, north and west sides by 6 to 9 m (20 to 30 ft) high berms.

The ponds were used for the disposal of nonradioactive, nondangerous liquid effluent from the 183-D Water Treatment Facility. The 100D Ponds also received corrosive waste from the regeneration of ion exchange columns located in 185D and 189D. After the construction of the ponds, all process sewer liquid effluents were diverted to the ponds instead of the Columbia River. The ponds also received raw water from the 182D Reservoir in the event of an overflow and filtered and or chlorinated water from the 190D/190DA and 1724DA Buildings.

4.5.10.2 Excavation Operations

The surface sediment in the settling pond was contaminated with various metals and PCBs, up to a depth of 60 cm (24 in.). Remediation of the 100D Ponds began on June 18, 1996, and concluded August 19, 1996. It involved the removal of piping and contaminated sediments associated with past waste disposal practices. A total of 69 truckloads (approximately 7.7 m^3 each load) was hauled to the low-level waste burial ground. Two truckloads of nonradioactive scrap steel piping were hauled to the 183F clear well for disposal.

4.5.10.3 Verification Sampling

Verification samples were collected from 100D Ponds on August 21, 1996. Sampling was conducted by digging approximately 30 cm (12 in.) below the surface with a steel shovel, then scraping away the material which contacted the shovel and collecting the sample with stainless steel and/or plastic tools. A total of 19 samples were collected. The verification sample values were found to be below cleanup limits.

4.5.10.4 Statement of Protectiveness

These data show that the voluntary cleanup in the settling pond was successful in removing the contamination associated with this treatment, storage, and disposal unit. This site will support future unrestricted land uses that can be represented (or bounded) by a rural-residential scenario. No institutional controls are required for this site to prevent uncontrolled drilling or excavation into deep zone (i.e., below 4.6 m [15 ft]). The 120-D-1 site has been reclassified as “Closed Out.”

4.5.11 100-H-39, 100-H Possible Thimble Pit

4.5.11.1 Site Description

The 100-H-39, 100-H Possible Thimble Pit The site was designated to encompass four potential locations where a VSR thimble burial pit may be present after an orphan sites evaluation was performed in response to uncertainty about the existence of the 100-H-2 Buried Thimble Site (Section 4.4.1). The four potential alternative areas were based on aerial photographs and documentation and were consolidated into the 100-H-39 site to facilitate an evaluation and are described below.

- **Potential Area 1.** A notable disturbance was observed on a 1955 aerial photograph during the orphan sites evaluation in an area located east of the convergence of three railroad spur lines, approximately 220 m (722 ft) south of the 105H Reactor perimeter fence.
- **Potential Area 2.** The site is approximately 150 m (492 ft) south of the 105H Reactor perimeter fence, beneath the western railroad spur, just before the convergence of the three railroad spur lines. A field walkdown was conducted on May 7, 2008; no concrete monuments indicating a burial ground were visible in the area.
- **Potential Area 3.** A location west of the convergence of the three railroad spur lines, approximately 230 m (755 ft) south of the 105H Reactor perimeter fence was suggested during the orphan sites evaluation based on inconsistencies in the reported location of the 118-H-3 Burial Ground

(Section 4.4.7). A site investigation was conducted on May 7, 2008, at Potential Area 3. No concrete monuments marking the location of a burial ground were observed.

- **Potential Area 4.** This site was described in 1994 as a thimble burial pit, partially within a barricaded area that surrounds the 100-H-1 Rod Cave (Section 4.3.1). Its location is south of the 105H Reactor with its center approximately 20 m (66 ft) north of the perimeter fence. The location fits the description of the 118-H-5 Burial Ground (Section 4.4.9). A surface feature is visible in a 1955 aerial photograph on the opposite side of the rod cave from the 118-H-5 waste site. The surface feature was used to define the boundary of the site.

4.5.11.2 Excavation Operations

A confirmatory work instruction was issued in November 2009, to establish an approach for determining the nature and extent of contamination at this site. The evidence provided by geophysical data and test pit excavation findings shows that the information that suggests four alternative locations for the burial of VSR thimbles is not credible. Based on a convergence of evidence from test pit excavations and inspections, radiological surveys, site geology, geophysical data, and documentation, it is concluded that the l00-H-39, 100H Possible Thimble Pit Locations, comprised of Potential Area 1, Potential Area 2, Potential Area 3, and Potential Area 4, was never used as a VSR thimble burial ground.

4.5.11.3 Statement of Protectiveness

Site evaluations and supporting documentation for the 100-H-39, 100-H Possible Thimble Pit Locations demonstrate that the RAOs and RAGs are met for this site. The evaluations show that the possible thimble pit locations were not the sites of previous excavations or other activities associated with waste disposal and, therefore, do not contain buried thimbles or hazardous material. No evidence of residual contamination was found to be present in the soil. The 100-H-39 site is determined to be protective of human health, groundwater, and the Columbia River, and will support future unrestricted land uses that can be represented (or bounded) by a rural-residential scenario. No institutional controls are required. The 100-H-39 site has been reclassified as “Rejected.”

4.5.12 100-H-47, 1717-H Geophysical Anomaly, Possible UST

4.5.12.1 Site Description

The 100-H-47 site is an anomaly that was found during a geophysical investigation of site 100-H-45 (Section 4.3.37). 100 H-47 was a potential underground tank associated with the 1717H Building. The site measures approximately 1.2 m (4 ft) in length and 0.9 m (3 ft) in width and is located northeast of the 105H Reactor and approximately 6 m (20 ft) east of the former 1717H Building.

The process history of the 100-H-47 site is unknown. No drawings or documents were located that indicate the presence of a tank. The site is located approximately 10.5 m (34 ft) southwest of the 100-H-45 site. The 100-H-45 site is a suspect propane UST. While doing a geophysical investigation near the 100-H-45 site in 2007, a geophysical anomaly was found and designated as the 100-H-47 site. There is no other known documentation for the 100-H-47 site.

4.5.12.2 Confirmatory Sampling

Excavation for confirmatory sampling was performed on November 12, 2009. Upon excavation, it was apparent that the geophysical anomaly was not a UST but consisted of the lower portion of the metal post of a bollard or overhead pipe support. The concrete was broken off of approximately one-half of the footing during excavation and removal, exposing the metal post. Field screening for radiological contaminants and VOCs did not detect anything anomalous at the site. A confirmatory sample of the 100-H-47 waste site was not collected.

The conclusion, based on observational evidence, is the geophysical anomaly was produced by the metal pipe. It is likely the pipe was cut off during past demolition activities, and, at a later time, the geophysical instrumentation detected the metal in the buried pipe. The metal post may have been an overhead pipe support, although a bollard in that area to protect surrounding equipment is also a possibility. After the confirmatory sampling activities, the metal pipe and concrete footing were returned to the excavated hole, buried, and the site was graded to the match the natural contour of the adjacent land.

4.5.12.3 Statement of Protectiveness

Reclassification of the 100-H-47 site is based on excavation, observation, and field screening.
The 100-H-47 site has been observed to be a concrete footing and metal pipe, and there are no associated CERCLA hazardous substances. The presence of this footing and pipe do not present a risk to human health, groundwater, or the Columbia River. The 100-H-47 site has been reclassified as “Rejected.”

4.5.13 100-H-49:3, 183-H and 1717-H French Drains

4.5.13.1 Site Description

The 100-H-49:3, 183H and 1717-H French Drains subsite includes four french drains (FD 10, 11, 13, and 15) that are associated with the 183H and 1717H Buildings. The 100-H-49 french drain locations were identified using aerials, photographs, drawings, etc. The FD 10 and FD 11 french drains were believed to be located approximately 4.6 m (15 ft) south of the 183H Building and FD 13 and FD 15 approximately 4.6 m (15 ft) east of the 1717H Building.

The process description for each french drain was inferred from the construction drawings and the function of the building that they were associated with. Therefore, french drains FD 10 and FD 11 were suggested to receive drainage from the battery, electrical, pump house, and chlorine room. The FD 13 and FD 15 french drains were associated with the 1717-H Machine/Welding Shop processes. The FD 13 is a pipeline that received waste liquids from 1717-H building heater and was remediated and Interim Closed Out as part of the 100-H-4 waste site (Section 4.3.3). The FD 15 reportedly received electrical shop and mechanical equipment room heaters drainage. The french drains are all included in this subsite because there were no documents or records found during research to indicate the end state of the french drains or the underlying soil. The french drains were identified during the orphan sites evaluation conducted on March 12 and 17, 2008.

4.5.13.2 Confirmatory Sampling

Prior to confirmatory sampling activities, the surface observations at FD 10 and FD 11 locations showed no evidence that any french drains existed within a 6.1 m (20 ft) diameter area around the suspected locations. Geophysical surveys were performed for each french drain location. Unfortunately, geophysical surveys were not useful in identifying french drains or refining the excavation locations.

Confirmatory sampling activities for the 100-H-49:3 subsite was initiated on October 5, 2010, to evaluate FD 10, FD 11, FD 13 and FD 15, and was completed on October 6, 2010. French drain FD 10 and FD 15 test pit locations were excavated up to 0.6 m (2 ft) bgs. At the FD 15 excavation, a utility encased in concrete was observed approximately 2 ft bgs under asphalt, trending west-east direction. No french drains were observed; therefore, additional scraping was performed to widen the bottom of the 0.6 m (2 ft) test pit to a 6.1 m (20 ft) test pit diameter. No french drains or any of their components were found at these locations. Based on the test pit observations and the nature of the soils (i.e., lack of rubble/debris, original asphalted location), it was determined that french drains were not constructed at these locations. Due to lack of drain rubble and debris present, and the original layering of asphalt observed at french drain locations FD 10 and 15, a decision was made not to sample at the bottom of these test pit

excavations. Based on the location of the asphalted areas with respect to their associated buildings, the asphalted areas were likely used as access roads and sidewalks.

The test pit excavation at FD 11 was not performed due to safety concerns of aboveground interferences. A pump and treat water and power line is located next to this test pit location, making it impossible to safely excavate without impacting the power line and the associated water lines. Because both the FD 10 and FD 11 french drain locations were inferred from the construction drawing therefore estimating coordinates and the FD 10 was not found during the test pit excavation, it was determined that FD 11 is also unlikely to be present at its suggested location

4.5.13.3 Statement of Protectiveness

Site evaluations and supporting documentation for the 100-H-49:3, 183H and 1717-H French Drains demonstrate that the RAOs and RAGs are met for this site. The evaluations show that the french drains were previously remediated, removed, or not built according to the construction drawings and are therefore not present at their specified locations. No evidence of french drain debris or soil staining was found during test pit excavations at the four suspected french drain locations. The 100-H-49:3 subsite evaluation demonstrates that the site does not contain waste materials or associated CERCLA hazardous substances, and is determined to be protective of human health, groundwater, and the Columbia River. The 100-H-49:3 subsite does not pose a risk to human health and the environment and will support future unrestricted land uses that can be represented (or bounded) by a rural-residential scenario. Therefore, no institutional controls are required for 100-H-49:3. The 100-H-49:3 site has been reclassified as "Rejected."

4.5.14 100-H-55, 100-H Cast Iron Pipe (H-038)

The 100-H-55 Cast Iron Pipe is an 8 in. cast iron pipe protruding 30 cm (12 in.) above the ground surface. Geophysical analysis determined that a linear metallic anomaly extended from the location of the cast iron pipe approximately 11 m (36 ft) to the east.

This anomaly was assumed to be an extension of the cast iron pipe. The purpose of the cast iron pipe was not clear. Excavation for confirmatory sampling was performed on October 26, 2009. Upon excavation, it was apparent that the description of the waste site was incorrect. The 100-H-55 Cast Iron Pipe was actually a valve access can and not part of a pipeline as previously assumed. This section of cast iron pipe provided access to a valve incorporated into what appears to be a 1 in. water service line. The water service line was included in the 100-H-56, 100-H Miscellaneous Pipelines waste site (Section 4.3.52), and addressed separately from the 100-H-55 Cast Iron Pipe. A confirmatory sample of the 100-H-55 Cast Iron Pipe was not collected because there is no mechanism for a valve access can to be a source of hazardous materials.

The presence of this piece of cast iron does not present a risk to human health, groundwater, or the Columbia River. The 100-H-55 site has been reclassified as "Rejected."

4.5.15 116-H-6, 183-H Solar Evaporation Basins

4.5.15.1 Site Description

The 183-H Solar Evaporation Basins are in the northern part of the Hanford Site along the Columbia River. Following shutdown of reactor operations in the mid-1960s, most of the facility was demolished. Four basins were retained for use as solar evaporation basins for chemical wastes from the 300 Area. The newly established unit was named the 183-H Solar Evaporation Basins.

Waste deposited in the basins underwent volume reduction through evaporation. A total of 9,462 kL (2.5 million gal) of caustic solution was discharged to the basins during the period of waste operations.

The solution consisted primarily of sodium nitrate, which was neutralized with sodium hydroxide, and contained trace amounts of uranium, technetium-99, and miscellaneous chemicals. The last shipment of waste to the basins occurred in November 1985.

4.5.15.2 Closure Activities

The basins were cleaned up in late 1995 with all detectable contamination removed, packed, and disposed. Demolition wastes were disposed in the adjacent 183H Clearwells. By the fall of 1996, the basins had been demolished. Chemical contaminants were identified and removed to a maximum depth of 6.1 m (20 ft). The site was backfilled and revegetated in the spring of 1997. The remedial measures included the placing of a vapor barrier at the bottom of the excavation and replacing the excavated soils with clean, compact backfill.

Soil removal began in February 1996. Initially, 0.6 m (2 ft) was taken off the entire footprint of the basins. An overlying grid was constructed and 11 sample locations were chosen at random, with 1 focused sample beneath Basin 1 where high arsenic concentrations had been found through previous sampling. Of the 11 samples collected for field screening analysis, two of the samples were split for confirmation analysis. The results of this sampling effort concluded that copper and nickel were removed from shallow soils to concentrations below action levels. Arsenic and the mobile constituents (hexavalent chromium, nitrate and fluoride) remained below 0.6 m (2 ft).

Deep vadose zone soils were sampled similar to the shallow soils, with the majority of the sampling and analysis being achieved through field screening techniques. Five confirmation samples were sent for offsite independent validation. Hexavalent chromium was not identified in deep soils. Arsenic met cleanup standards at 2.7 m (9 ft). Nitrate and fluoride contamination was found much deeper than earlier characterization information indicated. Soil lifts continued under Basin 1 to 4.6 m (15 ft) below the engineered structure. A test pit was dug to 7.6 m (25 ft). Both nitrate and fluoride contamination above industrial standards were detected at this depth. Removed soil was disposed at ERDF.

4.5.15.3 Statement of Protectiveness

No direct exposure contamination remains at 183H. The extent of contamination remaining at the time of closure of this unit extended from deep vadose zone soils (4.6 m [15 ft] below the bottom of the basin structure) to and including saturated soils and groundwater. Therefore, no measures are required to limit or prohibit activities at the surface. Institutional controls are required to be maintained to ensure that groundwater is not used as a drinking water or irrigation source. Deep vadose zone nitrate and fluoride contamination could not meet groundwater protection standards for modified closure without excavation to groundwater. To achieve a modified closure, it was demonstrated through groundwater-movement modeling that levels remaining in the soil were protective of groundwater. Clean closure of the unit was not achieved due to levels of fluoride and nitrate, remaining in the soil below the excavated 15-foot depth, that are above the Method B Cleanup levels of MTCA. Therefore, the unit was closed under the partial closure option with specified remedial measures provided under postclosure care. The 116-H-6 site has been reclassified as “Closed Out.”

5 Performance Standards and Construction Quality Control

This chapter summarizes the process for demonstrating achievement of performance standards including attainment of RAOs and RAGs and maintaining the required quality controls during remedial activities.

5.1 Attainment of Performance Standards

The remedial actions described in Chapter 4 of this report were performed to identify and reduce potential threats to human health and the environment from waste site contamination. Following interim remedial actions at a waste site, an evaluation against identified performance standards (the RAOs in the interim action RODs) is conducted to verify that the residual contamination does not pose an unacceptable health risk to future users of the site.

5.1.1 Performance Standard Documentation

Attainment of the specific RAO performance standards as stated in the interim action RODs and interim closure of individual 100-DR-1, 100-DR-2, 100-HR-1, 100-HR-2, and unassigned waste sites is documented in the cleanup verification packages (CVPs), remaining sites verification packages (RSVPs), or similar supporting documentation. These documents provide remediation information as described in Section 2.3 to support the formal reclassification in the Waste Site Reclassification Forms. Table 5-1 identifies the “Interim No Action” waste sites in the 100-D/H Area where remedial action was not required based on evaluation of process history and/or confirmatory sampling data. Table 5-2 through Table 5-6 provide information by OU to support the “Interim Closed Out” reclassification for sites where contamination was present above RAGs and remediation consisting of RTD was required.

Table 5-1. No Action and Interim No Action Waste Sites in 100-D/H Areas

Operable Unit	WIDS Site		Closure Document*	Reclassification	
	Code	Name		Date	Status
100-DR-1	100-D-3	Solid Waste Burial Ground, Silica Gel	WSRF 2008-017 attachment, "Description of the 100-D-3 Waste Site"	03/12/2009	Interim No Action
100-DR-1	100-D-24	119-D Sample Building Drywell	WSRF 2006-004 attachment, "Remaining Sites Verification Package for the 100-D-24, 119-D Sample Building Drywell"	09/19/2006	Interim No Action
100-DR-1	100-D-50:5	183-DR Sedimentation Basin Drain Pipelines	WSRF 2006-025 attachment, "Remaining Sites Verification Package for the 100-D-50:5 Process Sewers (183-DR Sedimentation Basin Drains)"	11/06/2007	Interim No Action
100-DR-1	100-D-50:10	Construction Camp Potable Water Supply Pipelines	WSRF 2005-016 attachment, "Remaining Sites Verification Package for the 100-D-50:10 Potable Water Supply Lines"	06/29/2005	Interim No Action
100-DR-1	100-D-63	100-D/DR Service Water Pipelines, 100-D/DR Clean Water Pipelines	WSRF 2008-001 attachment, "Remaining Sites Verification Package for the 100-D-63, 100-D/DR Service Water Pipelines"	04/10/2013	Interim No Action
100-DR-1	100-D-67	D Island Contamination, D Island	WSRF 2011-062 attachment, "100-D-67, D Island Waste Site"	04/01/2014	Interim No Action
100-DR-1	100-D-70	184-DA Steam Generating Plant Dry Well	WSRF 2010-081 attachment, "Remaining Sites Verification Package for the 100-D-70, 184-DA Steam Generating Plant Dry Well"	07/07/2011	Interim No Action
100-DR-1	100-D-74	105-DR Dry Well	WSRF 2010-083 attachment, "Remaining Sites Verification Package for the 100-D-74, 105-DR Dry Well"	06/15/2011	Interim No Action
100-DR-1	100-D-75:2	152-E1-D Secondary Electrical Substation, Substation C4-S1	WSRF 2014-092 attachment, "Remaining Sites Verification Package for the 100-D-75:2 152-E1-D Secondary Electrical Substation, Substation C4-S1 Subsite"	09/30/2014	Interim No Action
100-DR-1	100-D-75:3	152-C1-D Secondary Electrical Substation	WSRF 2011-036 attachment, "Remaining Sites Verification Package for the 100-D-75:3, 152-C1-D Secondary Electrical Substation"	08/08/2011	Interim No Action
100-DR-1	100-D-80:1	Tar Stained Soil & Miscellaneous Debris (Areas 1, 2 and 3)	WSRF 2010-079 attachment, "Remaining Sites Verification Package for the 100-D-80:1, 100-D Tar Stained Soil and Miscellaneous Debris"	03/30/2011	Interim No Action
100-DR-1	100-D-82	100-D Garnet Sand Sites	WSRF 2010-076 attachment, "Remaining Sites Verification Package for the 100-D-82, 100-D Garnet Sand Sites"	01/06/2011	Interim No Action
100-DR-1	100-D-83:4	Additional Treated Water Pipelines	WSRF 2010-093 attachment, "Remaining Sites Verification Package for the 100-D-83:4, Additional Treated Water Pipelines"	07/05/2011	Interim No Action

Table 5-1. No Action and Interim No Action Waste Sites in 100-D/H Areas

Operable Unit	WIDS Site		Closure Document*	Reclassification	
	Code	Name		Date	Status
100-DR-1	100-D-84:1	Sanitary Sewer Pipelines - Areas 1 and 2	WSRF 2010-102 attachment, "Remaining Sites Verification Package for the 100-D-84:1, Sanitary Sewer Pipelines - Areas 1 and 2"	07/07/2011	Interim No Action
100-DR-1	100-D-85:1	Additional 107-DR Effluent Pipeline	WSRF 2010-080 attachment, "Remaining Sites Verification Package for the 100-D-85:1, Additional 107-DR Effluent Pipeline"	01/27/2010	Interim No Action
100-DR-1	100-D-86:2	Additional Process Sewer Pipelines	WSRF 2010-104 attachment, "Remaining Sites Verification Package for the 100-D-86:2, Additional Process Sewer Pipelines"	05/11/2011	Interim No Action
100-DR-1	100-D-87	Spill Near Railroad Car Spot	WSRF 2010-078 attachment, "Remaining Sites Verification Package for the 100-D-87, Spill Near Railroad Car Spot"	01/06/2011	Interim No Action
100-DR-1	100-D-88	Miscellaneous Pipelines	WSRF 2010-097 attachment, "Remaining Sites Verification Package for the 100-D-88, 100-D Miscellaneous Pipelines"	05/16/2011	Interim No Action
100-DR-1	100-D-90	Two Transformers	WSRF 2009-050 attachment, "Remaining Sites Verification Package for the 100-D-90, 100-D/DR Out-of-Service Transformers"	01/06/2011	Interim No Action
100-DR-1	100-D-96:1	100-D/DR Additional French Drains Group 1	WSRF 2009-005 attachment, "Remaining Sites Verification Package for the 100-D-96:1, 100-D/DR Additional French Drains Group 1 Subsite"	01/17/2013	Interim No Action
100-DR-1	100-D-98:2	152-D and 153-D Substations - Inactive	WSRF 2012-082 attachment, "Remaining Sites Verification Package for the 100-D-98:2, 152D Substations Subsite"	01/17/2013	Interim No Action
100-DR-1	100-D-101	108-D Acid Pit and Sump, 108-D Car Spot, 108-D Sodium Silicate Sump, 108-D Storage Tanks, Miscellaneous Structures	WSRF 2012-062 attachment, "Remaining Sites Verification Package for the 100-D-101, 108-D Acid Pit and Sump, 108-D Car Spot, 108-D Sodium Silicate Sump, 108-D Storage Tanks, Miscellaneous Structures Waste Site"	06/11/2013	Interim No Action
100-DR-1	100-D-102	Suspect Effluent Leak Adjacent to 107-DR Basin	WSRF 2012-057 attachment, "Remaining Sites Verification Package for the 100-D-102, Suspect Effluent Leak Adjacent to 107-DR Basin Waste Site"	09/26/2012	Interim No Action
100-DR-1	100-D-105	D/DR-Area Pipelines Discovered During Remediation	WSRF 2013-122 attachment, "Remaining Sites Verification Package for the 100-D-105, D/DR-Area Pipelines Discovered During Remediation Waste Site"	01/21/2014	Interim No Action
100-DR-1	100-D-107	Soil Beneath the 1713-DA Essential Materials Warehouse	WSRF 2013-113 attachment, "Remaining Sites Verification Package for the 100-D-107, Soil Beneath the 1713-DA Essential Materials Warehouse Waste Site"	04/16/2014	Interim No Action
100-DR-1	116-D-3	116-D-3, 108-D Crib #1	WSRF 2002-060, *Waste Site Reclassification Form*	01/30/2003	Interim No Action

Table 5-1. No Action and Interim No Action Waste Sites in 100-D/H Areas

Operable Unit	WIDS Site		Closure Document*	Reclassification	
	Code	Name		Date	Status
100-DR-1	UPR-100-D-1	Oil Soaked Soil	WSRF 2005-020, *Waste Site Reclassification Form*	04/13/2005	Interim No Action
100-DR-1	UPR-100-D-5	Effluent Line Leak #4	WSRF 2009-035 attachment, "Remaining Sites Verification Package for the UPR-100-D-5 Effluent Line Leak #4"	10/14/2010	Interim No Action
100-DR-2	100-D-68	190-DR Process Water Pump House	BHI-01771, *190-DR Process Water Pump House Below-Grade Concrete Structure Sampling and Analysis Plan*; WSRF 2005-034, *Waste Site Reclassification Form*	07/25/2005	No Action
100-DR-2	100-D-94	Dichromate Contaminated Pit Associated with 187-DR	WSRF 2010-084 attachment, "Remaining Sites Verification Package for the 100-D-94, Dichromate Contaminated Pit Associated with 187-DR"	03/31/2011	Interim No Action
100-DR-2	100-D-103	Suspected Trench and French Drain from 116-D-8 Cask Pad	WSRF 2013-045 attachment, "Remaining Sites Verification Package for the 100-D-103, Suspected Trench and French Drain from 116-D-8 Cask Pad Waste Site"	07/18/2013	Interim No Action
100-DR-2	116-DR-3	105-DR Storage Basin Trench	WSRF 2012-036 attachment, "Remaining Sites Verification Package for the 116-DR-3, 105-DR Storage Basin Trench"	09/26/2012	Interim No Action
100-DR-2	128-D-1	100-D/DR Burning Pit	0100D-CA-V0126, *Waste Site Evaluation for 128-D-1 Burn Pit Calculations*; WSRF 2003-009, *Waste Site Reclassification Form*	04/12/2004	Interim No Action
100-HR-1	100-H-7	French Drain A	WSRF 2008-056 attachment, "Remaining Sites Verification Package for the 100-H-7 French Drain A"	07/28/2009	Interim No Action
100-HR-1	100-H-8	French Drain B	WSRF 2006-031 attachment, "Remaining Sites Verification Package for the 100-H-8 French Drain B"	12/03/2009	Interim No Action
100-HR-1	100-H-28:1	184-H Power House Ash Sluicing Line	WSRF 2006-020 attachment, "Remaining Sites Verification Package for the 100-H-28:1, 184-H Power House Ash Sluicing Line"	07/28/2009	Interim No Action
100-HR-1	100-H-28:6	182-H Reservoir Sump Drains	WSRF 2006-026 attachment, "Remaining Sites Verification Package for the 100-H-28:6, 182-H Reservoir Sump Drains"	10/29/2009	Interim No Action
100-HR-1	100-H-28:7	Process Water Pipelines	WSRF 2009-030 attachment, "Remaining Sites Verification Package for the 100-H-28:7, 183-H Process Water Lines"	02/20/2013	Interim No Action
100-HR-1	100-H-28:8	190-H Process Water Pipelines	WSRF 2006-024 attachment, "Remaining Sites Verification Package for the 100-H-28:8, 190-H Process Water Lines"	04/19/2007	Interim No Action

Table 5-1. No Action and Interim No Action Waste Sites in 100-D/H Areas

Operable Unit	WIDS Site		Closure Document*	Reclassification	
	Code	Name		Date	Status
100-HR-1	100-H-33	183-H Solar Evaporation Basins Radionuclide Components	WSRF 2011-099 attachment, "100-H-33, 183-H Solar Evaporation Basins Radionuclide Components Waste Site"	04/12/2012	Interim No Action
100-HR-1	100-H-35	100-H Service Water Pipelines, 100H Clean Water Pipelines	WSRF 2011-003 attachment, "Remaining Sites Verification Package for the 100-H-35, 100-H Service Water Pipelines"	02/28/2012	Interim No Action
100-HR-1	100-H-38	Trenches and Pit Southwest of 105-H	WSRF 2013-095 attachment, "Remaining Sites Verification Package for the 100-H-38, Possible Trenches and Pit Southwest of 105-H Waste Site"	11/05/2013	Interim No Action
100-HR-1	100-H-40	100-H Disposal Pit	WSRF 2009-065 attachment, "Remaining Sites Verification Package for the 100-H-40, 100-H Disposal Pit"	05/20/2010	Interim No Action
100-HR-1	100-H-45	1717-H UST, Underground Propane Tank	WSRF 2009-064 attachment, "Remaining Sites Verification Package for the 100-H-45, 1717-H Underground Propane Tank"	07/08/2010	Interim No Action
100-HR-1	100-H-49:2	119-H, 181-H, and 183-H French Drains	WSRF 2010-096 attachment, "Remaining Sites Verification Package for the 100-H-49:2, 119-H, 181-H, 184-H, and 183-H French Drains"	10/26/2011	Interim No Action
100-HR-1	100-H-50	Steam Condensate French Drains	WSRF 2009-009 attachment, "Remaining Sites Verification Package for the 100-H-50, 100-H Steam Condensate French Drains"	06/16/2011	Interim No Action
100-HR-1	100-H-51:4	100-H Main Gate Storm Drain	WSRF 2009-026 attachment, "Remaining Sites Verification Package for the 100-H-51:4, 100-H Main Gate Storm Drain"	05/26/2011	Interim No Action
100-HR-1	100-H-51:5	Discovery Pipeline at 128-H-1	WSRF 2011-090 attachment, "Remaining Sites Verification Package for the 100-H-53 Carbon Steel Pipe and the 100-H-51:5 Discovery Pipeline"	04/26/2012	Interim No Action
100-HR-1	100-H-53	Carbon Steel Pipe	WSRF 2009-010 attachment, "Remaining Sites Verification Package for the 100-H-53 Carbon Steel Pipe and the 100-H-51:5 Discovery Pipeline"	04/12/2012	Interim No Action
100-HR-1	100-H-54	GPERS 100-H Shoreline Survey UPR	WSRF 2013-131 attachment, "Remaining Sites Verification Package for the 100-H-54, GPERS 100-H Shoreline Survey UPR Waste Site"	03/03/2014	Interim No Action
100-HR-1	100-H-56	H-Area Miscellaneous Pipelines	WSRF 2014-063 attachment, "Remaining Sites Verification Package for the 100-H-56; H-Area Miscellaneous Pipelines Waste Site"	08/20/2014	Interim No Action
100-HR-1	100-H-57	Water Tower Foundations at 100-H	WSRF 2013-115 attachment, "Remaining Sites Verification Package for the 100-H-57, Water Tower Foundations at 100-H Waste Site"	10/21/2013	Interim No Action
100-HR-1	116-H-4	105-H Pluto Crib	WSRF 2016-014, *Waste Site Reclassification Form*	02/14/2017	Interim No Action

Table 5-1. No Action and Interim No Action Waste Sites in 100-D/H Areas

Operable Unit	WIDS Site		Closure Document*	Reclassification	
	Code	Name		Date	Status
100-HR-2	128-H-2	100-H Burning Ground #2	WSRF 2007-008 attachment, "Remaining Sites Verification Package for the 128-H-2, 100-H Burning Ground #2, and 128-H-3, 100-H Burning Ground #3"	01/25/2010	Interim No Action
100-HR-2	128-H-3	100-H Burning Ground #3	WSRF 2007-009 attachment, "Remaining Sites Verification Package for the 128-H-2, 100-H Burning Ground #2, and 128-H-3, 100-H Burning Ground #3"	01/25/2010	Interim No Action
100-HR-2	600-381	Segment 4 Underground Structure with Wooden Air Vents Feature	WSRF 2013-116 attachment, "Remaining Sites Verification Package for the 600-381, Segment 4 Underground Structure with Wooden Air Vents Feature Waste Site"	12/03/2013	Interim No Action

*The full citations for the references included in this column are provided in Chapter 8 of this report.

--- = not applicable
GPERS = global positioning environmental radiological survey
UPR = unplanned release
UST = underground storage tank
WIDS = Waste Information Data System
WSRF = waste site reclassification form

Table 5-2. Summary of 100-DR-1 Operable Unit Waste Site Closure Documentation

WIDS Site		Closure Document*	Reclassification	
Code	Name		Date	Status
100-D-1	Contaminated Drain, Contaminated Storm Drain	WSRF 2010-054 attachment, "Remaining Sites Verification Package for the 100-D-1, Contaminated Storm Drain"	01/27/2011	Interim Closed Out
100-D-2	Solid Waste Site, Lead Sheeting	WSRF 2007-030, "Remaining Sites Verification Package for the 100-D-2 Lead Sheeting Waste Site"	03/19/2008	Interim Closed Out
100-D-4	Sludge Trench #5, 107-DR Sludge Trench #5, 107-D-5, 107-D5	CVP-98-00004, *Cleanup Verification Package for the 100-D-4 Sludge Pit* (WSRF 98-034 as attachment)	03/25/1999	Interim Closed Out
100-D-5	Waste Site Near 103-D, Undocumented Solid Waste Site, Undocumented Solid Waste Site Near 103-D	CVP-2000-00034, *Cleanup Verification Package for the 100-D and 100-DR Group 3 Pipelines (100-D-48:3 and 100-D-49:3) and 100-D-5 and 100-D-6 Burial Grounds* (WSRF 2001-022 as attachment)	04/23/2001	Interim Closed Out
100-D-6	Buried VSR Thimble, Minor Construction Burial Ground #1, Burial Ground 4D, 118-D-4D	WSRF 2001-005, *Waste Site Reclassification Form*	04/23/2001	Interim Closed Out
100-D-7	Undocumented Solid Waste Site	WSRF 2011-005 attachment, "Remaining Sites Verification Package for the 100-D-7 Undocumented Solid Waste Site"	10/10/2011	Interim Closed Out
100-D-8	105-DR Process Sewer Outfall Site, Undocumented Liquid Waste Site, 1907-DR	WSRF 2012-016 attachment, "Remaining Sites Verification Package for the 100-D-8, 105-DR Process Sewer Outfall Waste Site"	08/02/2012	Interim Closed Out
100-D-9	184-DA Boiler Oil Tank	WSRF 2006-030 attachment, "Remaining Sites Verification Package for the 100-D-9 Boiler Fuel Oil Tank Site"	08/10/2006	Interim Closed Out
100-D-18	Sludge Trench #4, 107-D Sludge Trench #4, 107-D-4, 107-D4	CVP-2000-00001, *Cleanup Verification Package for the 100-D-18 Sludge Trench* (WSRF 2000-040 as attachment)	09/26/2000	Interim Closed Out
100-D-19	Sludge Trench #6, 107-D Sludge Trench #6	CVP-2000-00003, *Cleanup Verification Package for the D and DR Group 2 North Pipelines (100-D-48:1/49:1), 100-D-19 Sludge Trench, and UPR-100-D-4 Unplanned Release Site* (WSRF 2000-128 as attachment)	03/26/2001	Interim Closed Out
100-D-20	Sludge Trench #3, 107-D Sludge Trench #3, 107-D-3, 107-D3	CVP-98-00003, *Cleanup Verification Package for the 100-D-20 Sludge Pit* (WSRF 98-067 as attachment)	03/25/1999	Interim Closed Out
100-D-21	Sludge Trench #2, 107-DR Sludge Trench #2, 107-D-2, 107-D2	CVP-98-00002, *Cleanup Verification Package for the 100-D-21 Sludge Pit* (WSRF 98-066 as attachment)	03/25/1999	Interim Closed Out
100-D-22	Sludge Trench #1, 107-DR Sludge Trench #1, 107-D-1, 107-D1	CVP-98-00001, *Cleanup Verification Package for the 100-D-22 Sludge Pit* (WSRF 98-033 as attachment)	03/25/1999	Interim Closed Out

Table 5-2. Summary of 100-DR-1 Operable Unit Waste Site Closure Documentation

WIDS Site		Closure Document*	Reclassification	
Code	**Name**		**Date**	**Status**
100-D-25	Unplanned Release: 107-DR Basin Leaks	CVP-99-00006, *Cleanup Verification Package for the 116-DR-9 Retention Basin* (WSRF 99-106 as attachment)	01/06/2000	Interim Closed Out
100-D-29	Effluent Line Leak #2	WSRF 2009-038 attachment, "Remaining Sites Verification Package for the 100-D-29 Effluent Line Leak #2"	03/25/2010	Interim Closed Out
100-D-30	185-D Sodium Dichromate Trench, 190-D Complex, Unplanned Release	WSRF 2009-049 attachment, "Remaining Sites Verification Package for the 100-D-30, Sodium Dichromate Soil Contamination Waste Site and the 100-D-104, Unplanned Release Near 185-D Sodium Dichromate Storage Tank and Acid Neutralization French Drain Waste Site"	06/03/2015	Interim Closed Out
100-D-31:1	1607-D2 Septic Sewer Pipelines	WSRF 2010-005 attachment, "Remaining Sites Verification Package for the 100-D-31:1, 1607-D2 Septic Sewer Pipeline and the 100-D-31:2, 1700-D Series Buildings Septic Sewer Pipelines"	10/07/2010	Interim Closed Out
100-D-31:2	1700-D Series Buildings Septic Sewer Pipelines	WSRF 2010-006, *Waste Site Reclassification Form*	10/07/2010	Interim Closed Out
100-D-31:3	105-D Sewer Pipelines	WSRF 2010-049 attachment, "Remaining Sites Verification Package for the 100-D-31:3, 105-D Sewer Pipelines and the 100-D-31:4, 190-D Sewer Pipelines"	08/10/2011	Interim Closed Out
100-D-31:4	190-D Sewer Pipelines	WSRF 2010-050, *Waste Site Reclassification Form*	08/15/2011	Interim Closed Out
100-D-31:5	188-D Ash Disposal Pipeline	WSRF 2008-058 attachment, "Remaining Sites Verification Package for the 100-D-31:5, 188-D Ash Disposal Pipeline"	10/22/2009	Interim Closed Out
100-D-31:6	184-D Powerhouse Sewer Pipelines	WSRF 2008-054 attachment, "Remaining Sites Verification Package for the 100-D-31:6, 184-D Powerhouse Sewer Pipelines"	08/24/2009	Interim Closed Out
100-D-31:7	116-D-5 and D-Pond Sewer Pipeline	WSRF 2010-046 attachment, "Remaining Sites Verification Package for the 100-D-31:7, 116-DR-5 and D-Pond Sewer Pipeline"	10/14/2010	Interim Closed Out
100-D-31:8	183-D and 186-D Northern Sewer Pipelines	WSRF 2011-032 attachment, "Remaining Sites Verification Package for the 100-D-31:8, 183-D and 186-D Northern Sewer Pipelines; 100-D-31:9, 183-D and 186-D Process Sewer Pipelines; and 100-D-31:10, 182-D North Septic Sewer Pipeline"	10/18/2011	Interim Closed Out
100-D-31:9	183-D and 186-D Process Sewer Pipelines		10/18/2011	Interim Closed Out
100-D-31:10	182-D North Septic Sewer Pipeline		10/18/2011	Interim Closed Out

Table 5-2. Summary of 100-DR-1 Operable Unit Waste Site Closure Documentation

WIDS Site		Closure Document*	Reclassification	
Code	Name		Date	Status
100-D-31:11	182-D and 183-D Sewer Pipelines	WSRF 2015-003, WSRF 2015-004, and WSRF 2015-005 attachment, "Remaining Sites Verification Package for the 100-D-72, 183-D Acid Facility; 100-D-31:11, 182-D and 183-D Sewer Pipelines; 100-D-31:12, 183-D West Process Sewer Pipelines Waste Sites"	05/28/2015	Interim Closed Out
100-D-31:12	183-D West Process Sewer Pipelines		05/28/2015	Interim Closed Out
100-D-32	Minor Construction Burial Ground #6	CVP-2009-00003, *Cleanup Verification Package for the 100-D-32 Minor Construction Burial Ground #6* (WSRF 2009-008 as attachment)	12/10/2009	Interim Closed Out
100-D-42	Buried VSR Thimble Site	CVP-2009-00004, *Cleanup Verification Package for the 100-D-42, 100-D-43, and 100-D-45 Buried VSR Thimble Sites* (WSRF 2009-012 and WSRF 2009-014 as attachment)	05/13/2010	Interim Closed Out
100-D-45	Buried VSR Thimble Site, Burial Ground 4B, 118-D-4B		05/13/2010	Interim Closed Out
100-D-48:1	North Pipelines from 116-D-7 to the Outfalls	CVP-2000-00003 (WSRF 2000-126 as attachment)	03/19/2001	Interim Closed Out
100-D-48:2	West Pipelines from D Avenue to 116-D-7	CVP-2000-00005, *Cleanup Verification Package for the D and DR Group 2 Pipelines (100-D-48:2/49:2) and Unplanned Release Sites (UPR-100-D-2 and UPR-100-D-3)* (WSRF 2000-064 as attachment)	09/26/2000	Interim Closed Out
100-D-48:3	Effluent Pipelines from D Avenue to 105-D Reactor	CVP-2000-00034 (WSRF 2001-004 as attachment)	04/23/2001	Interim Closed Out
100-D-48:4	Small Cooling Water Effluent Pipelines at 105D Reactor	CVP-2000-00033, *Cleanup Verification Package for the 100-D-48:4 Small Cooling Water Effluent Pipelines* (WSRF 2000-133 as attachment)	04/23/2001	Interim Closed Out
100-D-49:1	North Pipelines from 116-DR-9 to the Outfalls	CVP-2000-00003 (WSRF 2000-127 as attachment)	03/26/2001	Interim Closed Out
100-D-49:2	East Pipelines from D Avenue to 116-DR-9	CVP-2000-00005 (WSRF 2000-065 as attachment)	09/26/2000	Interim Closed Out
100-D-49:3	Effluent Pipelines from D Avenue to ~60 Meters from the 105-DR Reactor	CVP-2000-00034 (WSRF 2000-004 as attachment)	04/23/2001	Interim Closed Out
100-D-49:4	100-DR Effluent Pipelines Within About 60 Meters of the Reactor	CVP-2003-00016, *Cleanup Verification Package for the 118-DR-2:2, 105-DR Reactor Below-Grade Structures and Underlying Soils, and the 100-D-49:4 Reactor Cooling Water Effluent Underground Pipeline* (WSRF 2003-049 as attachment)	01/15/2004	Interim Closed Out
100-D-50:1	Emergency Discharge Pipeline	WSRF 2012-101 attachment, "Remaining Sites Verification Package for the 100-D-50:1 Emergency Discharge Pipeline"	03/22/2013	Interim Closed Out

Table 5-2. Summary of 100-DR-1 Operable Unit Waste Site Closure Documentation

WIDS Site		Closure Document*	Reclassification	
Code	Name		Date	Status
100-D-50:4	Gas Recirculation Pipelines	WSRF 2012-026 attachment, "Remaining Sites Verification Package for the 100-D-50:4 Gas Recirculation Pipelines"	08/02/2012	Interim Closed Out
100-D-50:6	183-DR Clearwell Drain Pipelines	WSRF 2013-011 attachment, "Remaining Sites Verification Package for the 100-D-50:6, 183-DR Clearwell Pipelines"	06/11/2013	Interim Closed Out
100-D-50:7	183-DR Head House Floor Drain and Catch Basins Pipelines	WSRF 2014-007 attachment, "Remaining Sites Verification Package for the 100-D-50:7 Headhouse Floor Drain and Catch Basins Pipelines"	05/08/2014	Interim Closed Out
100-D-50:8	117-DR Condensate Drain Pipelines	WSRF 2012-074 attachment, "Remaining Sites Verification Package for the 100-D-50:8, 117-DR Condensate Drain Pipelines"	01/02/2013	Interim Closed Out
100-D-50:9	1607-DR3 Sanitary Sewer Pipelines	WSRF 2012-094 attachment, "Remaining Sites Verification Package for the 100-D-50:9, 1607-DR3 Sanitary Sewer Pipelines"	01/17/2013	Interim Closed Out
100-D-52	105-D Downcomer Insulation Space Dry Well	CVP-2000-00018, *Cleanup Verification Package for the 100-D-52 Drywell* (WSRF 2000-17 as attachment)	11/08/2000	Interim Closed Out
100-D-56:1	North Portion of 100-D-56	WSRF 2008-044 attachment," Remaining Sites Verification Package for the 100-D-56:1, North Portion of the 100-D-56 Sodium Dichromate Underground Supply Lines Waste Site"	04/05/2012	Interim Closed Out
100-D-56:2	South Portion of 100-D-56	WSRF 2009-016 attachment, "Remaining Sites Verification Package for the 100-D-56:2, South Portion of the 100-D-56 Sodium Dichromate Underground Supply Lines Waste Site"	01/23/2012	Interim Closed Out
100-D-61	Utility Pole and Fixture Debris Piles	WSRF 2008-047 attachment, "Remaining Sites Verification Package for the 100-D-61 Utility Pole and Fixture Debris Piles"	10/22/2009	Interim Closed Out
100-D-65	1904-D Spillway, 116-D-5 Outfall Spillway, 100-D-60:1 Flumes	WSRF 2012-072 attachment, "Remaining Sites Verification Package for the 100-D-65, 116-D-5 Outfall Spillway Waste Site"	01/09/2013	Interim Closed Out
100-D-66	1904-DR Spillway, 116-DR-5 Outfall, 100-D-60:1 Flume	WSRF 2012-087 attachment, "Remaining Sites Verification Package for the 100-D-66, 116-DR-5 Outfall Spillway Waste Site"	01/17/2013	Interim Closed Out
100-D-69	Sodium Dichromate Found Near Pacific Avenue and Paddock Street	WSRF 2014-117 attachment, "Remaining Sites Verification Package for the 100-D-69, Sodium Dichromate Found Near Pacific Avenue and Paddock Street Waste Site"	04/02/2015	Interim Closed Out
100-D-71	Vertical Safety Rod Tower Components	WSRF 2013-080 attachment, "100-D-71, Vertical Safety Rod Tower Components"	09/03/2013	Interim Closed Out
100-D-72	183-D Acid Facility	WSRF 2015-003 attachment	05/28/2015	Interim Closed Out

Table 5-2. Summary of 100-DR-1 Operable Unit Waste Site Closure Documentation

WIDS Site		Closure Document*	Reclassification	
Code	Name		Date	Status
100-D-73	108-D Chemical Pump House Sodium Dichromate System	WSRF 2012-076 attachment, "Remaining Sites Verification Package for the 100-D-73, 108-D Chemical Pump House and 100-D-76, Potential Crib Next to 108D; Former 116-D-3 Crib Waste Sites"	01/28/2013	Interim Closed Out
100-D-75:1	151-D Primary Electrical Substation	WSRF 2015-023 attachment, "Remaining Sites Verification Package for the 100-D-75:1, 151-D Primary Electrical Substation Subsite"	06/17/2015	Interim Closed Out
100-D-76	Former 116-D-3	WSRF 2012-076 attachment	01/28/2013	Interim Closed Out
100-D-78	100-D Yellow Stained Soils	WSRF 2013-052 attachment, "Remaining Sites Verification Package for the 100-D-78, 100-D Yellow Stained Soils Waste Site"	08/21/2013	Interim Closed Out
100-D-80:2	Valve Box with Possible Asbestos Insulation (Area 4)	WSRF 2013-010 attachment, "100-D-80:2, Valve Box with Possible Asbestos Insulation (Area 4)"	03/22/2013	Interim Closed Out
100-D-81	100-D Burn Areas and Other Stained Areas	WSRF 2015-002 attachment, "Remaining Sites Verification Package for the 100-D-81; 100D Burn Areas and Other Stained Areas Waste Site"	03/16/2015	Interim Closed Out
100-D-83:1	183-DR Acid Addition Pipelines	WSRF 2013-077 attachment, "Remaining Sites Verification Package for the 100-D-62, 183-DR Head House Septic Tank; 100-D-77, 183-DR Water Treatment Facility; and 100-D-83:1, 183-DR Acid Addition Pipeline Waste Sites"	10/16/2013	Interim Closed Out
100-D-83:2	183-DR Filter Backwash Connection	WSRF 2013-119 attachment, "100-D-83:2, 183-DR Filter Backwash Connection"	01/29/2014	Interim Closed Out
100-D-83:3	108-D Acid Addition Facility Pipelines	WSRF 2014-101 attachment, "Remaining Sites Verification Package for the 100-D-83:3, 108-D Acid Addition Facility Pipelines Subsite"	01/07/2015	Interim Closed Out
100-D-83:5	186-D Acid Neutralizing System Pipelines and Reactor Cooling Water Pipelines to 105-D	WSRF 2014-021 attachment, "Remaining Sites Verification Package for the 100-D-83:5, 186-D Acid Neutralizing System Pipelines and Reactor Cooling Water Pipelines to 105-D Waste Site"	06/23/2014	Interim Closed Out
100-D-84:2	Sanitary Sewer Pipelines - Areas 3 and 4	WSRF 2014-096 attachment, "Remaining Sites Verification Package for the 100-D-84:2, Sanitary Sewer Pipelines – Areas 3 and 4 Subsite"	12/16/2014	Interim Closed Out
100-D-85:2	Additional 105-DR Reactor Effluent Pipelines	WSRF 2015-020 attachment, "Remaining Sites Verification Package for the 100-D-85:2, Additional 105-DR Reactor Effluent Pipelines Subsite"	06/09/2015	Interim Closed Out
100-D-86:1	105-D Gas Recirculation Pipelines	WSRF 2015-019 attachment, "Remaining Sites Verification Package for the 100-D-86:1, 105-D Gas Recirculation Pipelines Subsite"	06/04/2015	Interim Closed Out

Table 5-2. Summary of 100-DR-1 Operable Unit Waste Site Closure Documentation

WIDS Site		Closure Document*	Reclassification	
Code	**Name**		**Date**	**Status**
100-D-86:3	105-DR Fan Room Sewer Pipelines	WSRF 2015-016 attachment, "Remaining Sites Verification Package for the 100-D-86:3, 105-DR Fan Room Sewer Pipelines Waste Site"	06/16/2015	Interim Closed Out
100-D-96:2	100-D/DR Additional French Drains Group 2	WSRF 2014-102 attachment, "Remaining Sites Verification Package for the 100-D-96:2, 100-D/DR Additional French Drains Group 2 Subsite"	02/18/2015	Interim Closed Out
100-D-97	184-DA Fuel Tank	WSRF 2014-116 attachment, "Remaining Sites Verification Package for the 100-D-97, 184-DA 500-Gallon Fuel Tank Waste Site"	04/02/2015	Interim Closed Out
100-D-98:3	153-D-5 Distribution Substation	WSRF 2014-001 attachment, "100-D-98:3, 153-D-5 Electrical Distribution Substation"	04/16/2014	Interim Closed Out
100-D-99	Two Suspect Features Identified by Ground Penetrating Radar	WSRF 2015-001 attachment, "Remaining Sites Verification Package for the 100-D-99; Two Suspect Features Identified by Ground Penetrating Radar Waste Site"	04/02/2015	Interim Closed Out
100-D-104	Unplanned Release near 185-D Sodium Dichromate Storage Tank and Acid Neutralization French Drain	WSRF 2009-049 attachment	06/03/2015	Interim Closed Out
116-D-1A	105-D Storage Basin Trench #1	CVP-2000-00010, *Cleanup Verification Package for the 116-D-1A/116-D-1B Storage Basin Trenches and 100-D-46 Burial Ground* (WSRF 2000-115 as attachment)	03/01/2001	Interim Closed Out
116-D-1B	116-D-1B, 105-D Storage Basin Trench #2		03/01/2001	Interim Closed Out
116-D-2	105-D Pluto Crib, 116-D-2A	CVP-2000-00013, *Cleanup Verification Package for the 116-D-2 Pluto Crib* (WSRF 2000-098 as attachment)	10/23/2000	Interim Closed Out
116-D-4	108-D Crib #2	CVP-2000-00008, *Cleanup Verification Package for the 116-D-4 Crib* (WSRF 2000-067 as attachment)	10/23/2000	Interim Closed Out
116-D-5	1904-D Outfall Structure	WSRF 2010-012 attachment, "Remaining Sites Verification Package for the 116-D-5, 1904-D Outfall Structure"	08/10/2011	Interim Closed Out
116-D-6	116-D-6, 105-D Cushion Corridor French Drain	CVP-2000-00009, *Cleanup Verification Package for the 116-D-6 French Drain* (WSRF 2000-106 as attachment)	11/08/2000	Interim Closed Out
116-D-7	107-D Retention Basin, 107D	CVP-99-00007, *Cleanup Verification Package for the 116-D-7 Retention Basin* (WSRF 2000-007 as attachment)	08/15/2000	Interim Closed Out
116-D-9	116-D-9, 117-D Crib, 117-D Seal Pit Crib	CVP-2000-00012, *Cleanup Verification Package for the 116-D-9 Crib and Pipeline* (WSRF 2000-132 as attachment)	03/19/2001	Interim Closed Out

Table 5-2. Summary of 100-DR-1 Operable Unit Waste Site Closure Documentation

WIDS Site		Closure Document*	Reclassification	
Code	Name		Date	Status
116-D-10	105-D Fuel Storage Basin Cleanout Percolation Pit, 105-D Fuel Storage Discharge Ponds, 105-D Ponds	WSRF 2009-042 attachment, "Remaining Sites Verification Package for the 116-D-10 Fuel Storage Basin Cleanout Percolation Pit"	12/02/2010	Interim Closed Out
116-DR-1&2	107-DR Liquid Waste Disposal Trench #1, 107-DR Liquid Waste Disposal Trench #2, 116-DR-1, 116-DR-2	CVP-2000-00002, *Cleanup Verification Package for the 116-DR-1&2 Process Effluent Trenches* (WSRF 2000-068 as attachment)	09/26/2000	Interim Closed Out
116-DR-5	1904-DR Outfall Structure, 1904-DR	WSRF 2010-051 attachment, "Remaining Sites Verification Package for the 116-DR-5, 1904-DR Outfall Structure"	01/06/2011	Interim Closed Out
116-DR-9	107-DR Retention Basin, 107-DR	CVP-99-00006, *Cleanup Verification Package for the 116-DR-9 Retention Basin* (WSRF 99-046 as attachment)	01/06/2000	Interim Closed Out
118-D-6:2	105-D Reactor Ancillary Support Areas, Below-Grade Structures and Underlying Soils	CVP-2005-00003, *Cleanup Verification Package for the 118-D-6:2, 105-D Reactor Ancillary Support Areas, Below Grade Structures, and Underlying Soils; the 118-D-6:3, 105-D Reactor Fuel Storage Basin and Underlying Soils; and the 132-D-4, 105-D Reactor Exhaust Stack Foundation* (WSRF 2005-021 as attachment)	07/27/2005	Interim Closed Out
118-D-6:3	105-D Reactor Fuel Storage Basin and Underlying Soils		07/27/2005	Interim Closed Out
118-D-6:4	105-D Fuel Storage Basin Side Slope Soils	WSRF 2010-071 attachment, "Remaining Sites Verification Package for the 118-D-6:4, Northern Decontamination Pad and 105-D Fuel Storage Basin Side Slope Soils"	12/21/2011	Interim Closed Out
120-D-2	186-D Waste Acid Reservoir	WSRF 2008-053 attachment, "Remaining Sites Verification Package for the 120-D-2, 186-D Waste Acid Reservoir"	07/28/2009	Interim Closed Out
126-D-2	126-D-2, 184-D Coal Pit	CVP-2009-00007, *Cleanup Verification Package for the 126-D-2, 184-D Coal Pit, Inert Landfill* (WSRF 2009-017 as attachment)	10/14/2010	Interim Closed Out
128-D-2	128-D-2 Burn Pit	WSRF 2011-035 attachment, "Remaining Sites Verification Package for the 128-D-2 Burn Pit"	09/08/2011	Interim Closed Out
130-D-1	130-D-1, 1716-D Gasoline and Oil Storage Tanks, 1706-D Gasoline Storage Tank	WSRF 2011-045 attachment, "Remaining Sites Verification Package for the 130-D-1, 1716-D Gasoline and Oil Storage Tanks"	08/15/2011	Interim Closed Out
132-D-1	115-D/DR Gas Recirculating Facility	WSRF 2005-037 attachment, "Remaining Sites Verification Package for the 132-D-1, 115-D/DR Gas Recirculating Facility"	12/05/2011	Interim Closed Out
132-D-2	117-D Filter Building	WSRF 2005-024 attachment, "Remaining Sites Verification Package for the 132-D-2; 117-D Filter Building"	05/09/2006	Interim Closed Out

Table 5-2. Summary of 100-DR-1 Operable Unit Waste Site Closure Documentation

WIDS Site		Closure Document*	Reclassification	
Code	Name		Date	Status
132-D-3	132-D-3, 1608-D Waste Water Pumping Station, 1608-D Effluent Pumping Station	WSRF 2005-033 attachment, "Remaining Sites Verification Package for the 132-D-3, 1608-D Effluent Pumping Station"	05/09/2006	Interim Closed Out
132-D-4	132-D-4, 105-D Reactor Exhaust Stack, 116-D Reactor Exhaust Stack	CVP-2005-00003 (WSRF 2005-022 as attachment)	07/27/2005	Interim Closed Out
1607-D2:1	Original 1607-D2 Tile Field, Eastern 1607-D2 Tile Field	CVP-98-00005, *Cleanup Verification Package for the 1607-D2:1 Abandoned Tile Field* (WSRF 98-035 as attachment)	03/25/1999	Interim Closed Out
1607-D2:2	Replacement 1607-D2 Tile Field, Northern Tile Field	CVP-2009-00006, *Cleanup Verification Package for the 1607-D2:2 Replacement Drain Field* (WSRF 2009-036 as attachment)	09/16/2010	Interim Closed Out
1607-D2:3	Septic Pipelines	CVP-2000-00004, *Cleanup Verification Package for the 1607-D2 Septic Pipelines* (WSRF 2000-069 as attachment)	09/26/2000	Interim Closed Out
1607-D2:4	1607-D2 Septic Tank	CVP-99-00005, *Cleanup Verification Package for the 1607-D2 Septic Tank* (WSRF 99-043 as attachment)	11/23/1999	Interim Closed Out
1607-D2:5	Inlet Pipe to Replacement System Tile Field	WSRF 2014-103 attachment, "Remaining Sites Verification Package for the 1607-D2:5, Inlet Pipe to Replacement System Tile Field Subsite"	01/13/2015	Interim Closed Out
1607-D4	1607-D4 Septic Tank and Drain Field, 124-D-4, 1607-D4 Sanitary Sewer System, 1607-D4 Septic Tank	WSRF 2005-036 attachment, "Remaining Sites Verification Package for the 1607-D4 Septic System"	02/23/2006	Interim Closed Out
1607-D5	1607-D5 Septic Tank and Associated Drain Field, 124-D-5, 1607-D5 Sanitary Sewer System, 1607-D5 Septic Tank	WSRF 2011-070 attachment, "Remaining Sites Verification Package for the 1607-D5, Septic Tank and Associated Drain Field"	10/10/2011	Interim Closed Out
628-3	628-3 Burn Pit	WSRF 2010-043 attachment, "Remaining Sites Verification Package for the 628-3 Burn Pit"	05/11/2011	Interim Closed Out
UPR-100-D-2	Effluent Line Leak #1	CVP-2000-00005 (WSRF 2000-062 as attachment)	09/26/2000	Interim Closed Out
UPR-100-D-3	Effluent Line Leak #3	CVP-2000-00005 (WSRF 2000-063 as attachment)	09/26/2000	Interim Closed Out

Table 5-2. Summary of 100-DR-1 Operable Unit Waste Site Closure Documentation

WIDS Site		Closure Document*	Reclassification	
Code	Name		Date	Status
UPR-100-D-4	Unplanned Release: 107-D Basin Leaks	CVP-2000-00003 (WSRF 2000-034 as attachment)	03/26/2001	Interim Closed Out

*The full citations for the references included in this column are provided in Chapter 8 of this report.

VSR = vertical safety rod
WSRF = waste site reclassification form
WIDS = Waste Information Data System

Table 5-3. Summary of 100-DR-2 Operable Unit Waste Site Closure Documentation

WIDS Site			Reclassification	
Code	Name	Closure Document*	Date	Status
100-D-12	Sodium Dichromate/Acid Railcar and Truck Unloading Station and Associated French Drain, Undocumented Liquid Waste Site	CVP-2000-00016, *Cleanup Verification Package for the 100-D-12 Sodium Dichromate Pump Station* (WSRF 2000-105 as attachment)	10/23/2000	Interim Closed Out
100-D-13	Unnumbered Septic System A, Septic Tank D-13, 100-DR Area Sewage Disposal Unit, 124-DR3, 1607-DR3	WSRF 2010-101 attachment, "Remaining Sites Verification Package for the 100-D-13, Unnumbered Septic System A"	09/13/2012	Interim Closed Out
100-D-14	Unnumbered Septic Tank #2, Unnumbered Septic System	WSRF 2006-032 attachment, "Remaining Sites Verification Package for the 100-D-14, Unnumbered Septic System (B); Unnumbered Septic Tank #2 Waste Site"	10/17/2012	Interim Closed Out
100-D-15	Debris North of 100-D Area Perimeter Road and Debris South of 100-D Perimeter Road - within 100-D-55, Gravel Pit #2, Pit 21	WSRF 2009-066 attachment, "Remaining Sites Verification Package for the 100-D-15, Debris North and South of the 100-D Area Perimeter Road Within 100-D-55 (Gravel Pit #2, Pit 21)"	09/16/2010	Interim Closed Out
100-D-23	119-DR Sample Building Drywell	CVP-2003-00018, *Cleanup Verification Package for the 105-DR Large Sodium Fire Facility (122-DR-1:2, 100-D-53/122-DR-1:4, 132-DR-2/122-DR-1:5), the 119-DR Exhaust Stack Sampling Building (100-D-64), and the 100-D-23 and 100-D-54 Dry Wells* (WSRF 2003-053 as attachment)	03/04/2004	Interim Closed Out
100-D-28:1	Replacement Septic System	WSRF 2011-047 attachment, "Remaining Sites Verification Package for the 100-D-28:1, 190-DR Replacement Septic System"	10/10/2011	Interim Closed Out
100-D-43	Buried VSR Thimble Site, Burial Ground 4C, 118-D-4C	CVP-2009-00004, *Cleanup Verification Package for the 100-D-42, 100-D-43, and 100-D-45 Buried VSR Thimble Sites* (WSRF 2009-013 as attachment)	05/13/2010	Interim Closed Out
100-D-46	Burial Ground 4A, 118-D-4A	CVP-2000-00010, *Cleanup Verification Package for the 116-D-1A/116-D-1B Storage Basin Trenches and 100-D-46 Burial Ground* (WSRF 2000-115 as attachment)	03/01/2001	Interim Closed Out
100-D-47	Construction C.G. 558-Rod Burial, Burial Ground 4E, 118-D-4E	CVP-2009-00002, *Cleanup Verification Package for the 100-D-47, Burial Ground 4E* (WSRF 2009-002 as attachment)	01/15/2010	Interim Closed Out
100-D-53	117-DRFilter Building, 117-DR HEPA Filter Building	CVP-2003-00018 (WSRF 2003-053 as attachment)	03/04/2004	Interim Closed Out
100-D-54	Drywell Near Fire Facility Gravel Scrubber			
100-D-62	183-DR Head House Septic Tank	WSRF 2013-077 attachment, "Remaining Sites Verification Package for the 100-D-62, 183-DR Head House Septic Tank; 100-D-77, 187-DR Water Treatment Facility; and 100-D-83:1, 183-DR Acid Addition Pipeline Waste Sites"	10/16/2013	Interim Closed Out
100-D-64	119-DR Sample Building, 105-DR Reactor Exhaust Stack Sampling Building	CVP-2003-00018 (WSRF 2003-053 as attachment)	03/04/2004	Interim Closed Out

Table 5-3. Summary of 100-DR-2 Operable Unit Waste Site Closure Documentation

WIDS Site		Closure Document*	Reclassification	
Code	Name		Date	Status
100-D-77	183-DR Acid Facility, 183-DR Head House, 183-DR Flocculation, 183-DR Sedimentation Basins, and 183-DR Filter Plant	WSRF 2013-077 attachment, "Remaining Sites Verification Package for the 100-D-62, 183-DR Head House Septic Tank; 100-D-77, 183-DR Water Treatment Facility; and 100-D-83:1, 183-DR Acid Addition Pipeline Waste Sites," and WSRF 2013-078 attachment, "Remaining Sites Verification Package for the 100-D-62, 183-DR Head House Septic Tank; 100-D-77, 183-DR Water Treatment Facility; and 100-D-83:1, 183-DR Acid Addition Pipeline Waste Sites"	10/16/2013	Interim Closed Out
100-D-100	Stained Soil Near 183-DR Railroad Tracks	WSRF 2014-025 attachment, "Remaining Sites Verification Package for the 100-D-100, Stained Soil Near the 183-DR Railroad Track Waste Site"	08/03/2015	Interim Closed Out
100-D-106	1607-D1 Influent Pipelines	WSRF 2014-104 attachment, "Remaining Sites Verification Package for the 100-D-106; 1607-D1 Influent Pipelines Waste Site"	01/30/2015	Interim Closed Out
116-D-8	100-D Cask Storage Pad	WSRF 2009-015 attachment, "Remaining Sites Verification Package for the 116-D-8, 100-D Cask Storage Pad"	08/10/2011	Interim Closed Out
116-DR-4	105-DR Pluto Crib	CVP-2000-00015, *Cleanup Verification Package for the 116-DR-4 Pluto Crib* (WSRF 2000-103 as attachment)	10/23/2000	Interim Closed Out
116-DR-6	1608-DR Liquid Disposal Trench, Wash Pad Liquid Waste Site 3C	CVP-2000-00014, *Cleanup Verification Package for the 116-DR-6 Liquid Disposal Trench* (WSRF 2000-104 as attachment)	10/23/2000	Interim Closed Out
116-DR-7	105-DR Inkwell Crib, 105-DR DR Ink Facility Tank	CVP-2000-00019, *Cleanup Verification Package for the 116-DR-7 Inkwell Crib* (WSRF 2000-004 as attachment)	09/26/2000	Interim Closed Out
116-DR-8	117-DR Crib, 117-DR Seal Pit Crib (CERCLA)	WSRF 2009-037 attachment, "Remaining Sites Verification Package for the 116-DR-8 Seal Pit Crib"	09/20/2010	Interim Closed Out
116-DR-10	105-DR Fuel Storage Basin Cleanout Percolation Pit, 105-DR Fuel Storage Discharge Pond, 105-DR Pond	WSRF 2010-015 attachment, "Remaining Sites Verification Package for the 116-DR-10, 105-DR Fuel Storage Basin Cleanout Percolation Pit"	12/28/2010	Interim Closed Out
118-D-1	100-D Burial Ground No. 1	CVP-2010-00007, *Cleanup Verification Package for the 118-D-1 Burial Ground* (WSRF 2010-056 as attachment)	10/10/2011	Interim Closed Out
118-D-2:1	100-D Burial Ground No. 2 Trenches and Disposal Pits	CVP-2012-00002, *Cleanup Verification Package for the 118-D-2:1, 100-D Burial Ground No. 2 Trenches and Disposal Pits* (WSRF 2012-015 as attachment)	07/11/2012	Interim Closed Out
118-D-2:2	Anomaly Characterization Area	CVP-2012-00003, *Cleanup Verification Package for the 118-D-2:2, 100-D Burial Ground No. 2 Anomaly Characterization Area* (WSRF 2012-014 as attachment)	09/27/2012	Interim Closed Out
118-D-3:1	100-D Burial Ground No. 3 and Process Cells	CVP-2012-00001, *Cleanup Verification Package for the 118-D-3:1, 100-D Burial Ground No. 3 and Process Cells* (WSRF 2012-002 as attachment)	07/11/2012	Interim Closed Out
118-D-3:2	Fuel and Anomaly Characterization Areas	CVP-2012-00004, *Cleanup Verification Package for the 118-D-3:2, Fuel and Anomaly Characterization Areas* (WSRF 2012-009 as attachment)	08/02/2012	Interim Closed Out

Table 5-3. Summary of 100-DR-2 Operable Unit Waste Site Closure Documentation

WIDS Site		Closure Document*	Reclassification	
Code	**Name**		**Date**	**Status**
118-D-4	118-D-4, Construction Burial Ground, Burial Ground 4F, 118-D-4F	CVP-2009-00001, *Cleanup Verification Package for the 118-D-4 Burial Ground* (WSRF 2008-055 as attachment)	10/14/2010	Interim Closed Out
118-D-5	118-D-5, Ball 3X Burial Ground, Burial Ground 4G, 118-D-4G, Minor Construction Burial Ground Number 3	CVP-2009-00008, *Cleanup Verification Package for the 118-D-5 Burial Ground 4G* (WSRF 2009-020 as attachment)	02/01/2010	Interim Closed Out
118-DR-1	105-DR Gas Loop Burial Ground	CVP-2009-00010, *Cleanup Verification Package for the 118-DR-1, 105-DR Gas Loop Burial Ground* (WSRF 2009-029 as attachment)	06/10/2010	Interim Closed Out
118-DR-2:2	105-DR Reactor Below-Grade Structures and Soil	CVP-2003-00016, *Cleanup Verification Package for the 118-DR-2:2, 105-DR Reactor Below-Grade Structures and Underlying Soils, and the 100-D-49:4 Reactor Cooling Water Effluent Underground Pipeline* (WSRF 2003-049 as attachment)	01/15/2004	Interim Closed Out
126-DR-1	190-DR Clearwell Tank Pit	WSRF 2008-046 attachment, "Remaining Sites Verification Package for the 126-DR-1 Waste Site"	04/23/2009	Interim Closed Out
132-DR-1	132-DR-1, 1608-DR Waste Water Pumping Station, 1608-DR Effluent Pumping Station	WSRF 2005-035 attachment, "Remaining Sites Verification Package for the 132-DR-1, 1608-DR Effluent Pumping Station"	09/22/2005	Interim Closed Out
132-DR-2	132-DR-2, 116-DR Reactor Exhaust Stack	CVP-2003-00018 (WSRF 2003-053 as attachment)	03/04/2004	Interim Closed Out
1607-D1	1607-D1 Septic Tank and Associated Drain Field, 124-D-1, 1607-D1 Sanitary Sewer System, 1607-D1 Septic Tank	WSRF 2011-120 attachment, "Remaining Sites Verification Package for the 1607-D1, Septic Tank and Associated Drain Field"	05/14/2012	Interim Closed Out
600-30	100-DR Construction Laydown Area	WSRF 2011-055 attachment, "Remaining Sites Verification Package for the 600-30, 100-DR Construction Laydown Area"	08/10/2011	Interim Closed Out

*The full citations for the references included in this column are provided in Chapter 8 of this report.

CERCLA = *Comprehensive Environmental Response, Compensation, and Liability Act of 1980*
HEPA = high-efficiency particulate air
VSR = vertical safety rod
WIDS = Waste Information Data System
WSRF = waste site reclassification form

Table 5-4. Summary of 100-HR-1 Operable Unit Waste Site Closure Documentation

WIDS Site			Reclassification	
Code	**Name**	**Closure Document***	**Date**	**Status**
100-H-1	105-H Rod Cave	CVP-2000-00029, *Cleanup Verification Package for the 100-H-21 Reactor Effluent Pipelines, 100-H-22 Effluent Pipeline Leakage, and 100-H-1 Rod Cave* (WSRF 2001-007 as attachment)	03/26/2001	Interim Closed Out
100-H-3	1716-H Garage Fuel Tanks Site	WSRF 2010-103 attachment, "Remaining Sites Verification Package for the 100-H-3, 1716-H Garage Fuel Tank Site"	06/01/2011	Interim Closed Out
100-H-4	1717-H Hot Shop, French Drain, and Contaminated Storage Unit	WSRF 2011-001 attachment, "Remaining Sites Verification Package for the 100-H-4, 1717-H Hot Shop, French Drain, and Contaminated Storage Unit"	06/01/2011	Interim Closed Out
100-H-5	107-H Retention Basin Sludge Burial Site, 107-H Buried Sludge Site, Sludge Disposal Trench, 107-H Grave	CVP-2000-00028, *Cleanup Verification Package for the 100-H-5 Sludge Disposal Trench* (WSRF 2000-117 as attachment)	12/18/2000	Interim Closed Out
100-H-9	French Drain C	CVP-2006-00003, *Cleanup Verification Package for the 118-H-6:2, 105-H Reactor Ancillary Support Areas, Below Grade Structures, and Underlying Soils; the 118-H-6:3, 105-H Reactor Fuel Storage Basin and Underlying Soils; the 118-H-6:6 Fuel Storage Basin Deep Zone Side-Slope Soils; the 100-H-9, 100-H-10, and 100-H-13 French Drains; the 100-H-11 and 100-H-12 Expansion Box French Drains; and the 100-H-14 and 100-H-31 Surface Contamination Zones* (WSRF 2005-053 and WSRF 2006-010, -011, -012, -013, and -014 as attachments)	06/22/2006	Interim Closed Out
100-H-10	French Drain D		06/22/2006	Interim Closed Out
100-H-11	Expansion Box French Drain E		06/22/2006	Interim Closed Out
100-H-12	Expansion Box French Drain F and Shielding Lead		06/22/2006	Interim Closed Out
100-H-13	French Drain G		06/22/2006	Interim Closed Out
100-H-14	Surface Contamination Zone H		06/22/2006	Interim Closed Out
100-H-17	116-H-2 Trench Overflow	CVP-2000-00031, *Cleanup Verification Package for the 100-H-17 Overflow, 116-H-2 Liquid Waste Disposal Trench, 100-H-2 Buried Thimble Site, and the 100-H-30 Sanitary Sewer Trench* (WSRF 2000-119 as attachment)	03/01/2001	Interim Closed Out
100-H-21	100-H Reactor Cooling Water Effluent Underground Pipelines	CVP-2000-00029 (WSRF 2001-006 as attachment)	03/19/2001	Interim Closed Out
100-H-22	Soil Contaminated by Effluent Line Leakage			
100-H-24	151-H Electrical Facilities, 100-H-24 Substation, 151-H Substation	CVP-2000-00030, *Cleanup Verification Package for the 100-H-24 Substation* (WSRF 2001-027 as attachment)	05/09/2001	Interim Closed Out

Table 5-4. Summary of 100-HR-1 Operable Unit Waste Site Closure Documentation

WIDS Site		Closure Document*	Reclassification	
Code	Name		Date	Status
100-H-28:2	South Process Sewers	WSRF 2015-052 attachment, "Remaining Sites Verification Package for the 100-H-28:2 and 100-H-42 Waste Sites"	09/25/2015	Interim Closed Out
100-H-28:3	North Process Sewers	WSRF 2015-027 attachment, "Remaining Sites Verification Package for the 100-H-28:3, 100-H-28:5, and 100-H-44 Waste Sites, and the 100-H-28:2, 100-H-28:3, 100-H-28:4, and 100-H-28:5 Overburden Piles"	07/09/2015	Interim Closed Out
100-H-28:4	1607-H1 Sanitary Sewer Pipelines	WSRF 2014-118 attachment, "Remaining Sites Verification Package for the 100-H-28:4, 1607-H1 Sanitary Sewer Pipelines"	03/05/2015	Interim Closed Out
100-H-28:5	1607-H2 Sanitary Sewer Pipelines	WSRF 2015-027 attachment	07/09/2015	Interim Closed Out
100-H-30	110-H Sanitary Sewer Trench	CVP-2000-00031 (WSRF 2000-119 as attachment)	03/01/2001	Interim Closed Out
100-H-31	Polychlorinated Biphenyl in Soil on North Side of 105-H Reactor Building	CVP-2006-00003 (WSRF 2006-015 as attachment)	06/22/2006	Interim Closed Out
100-H-41	100-H Contaminated Area	WSRF 2010-003 attachment, "Remaining Sites Verification Package for the 100-H-41, 100-H Contaminated Area Waste Site"	03/05/2011	Interim Closed Out
100-H-42	1906-H Drainage Lift Station	WSRF 2015-052 attachment	09/25/2015	Interim Closed Out
100-H-43	1716-H Maintenance Garage, Repair Shop	WSRF 2014-110 attachment, "Remaining Sites Verification Package for the 100-H-43, 1716-H Maintenance Garage, Repair Shop Waste Site"	03/05/2015	Interim Closed Out
100-H-44	183-H Neutralization Pit	WSRF 2015-027 attachment	07/09/2015	Interim Closed Out
100-H-46	190-H Potential Contaminated Soil	WSRF 2014-003 attachment, "Remaining Sites Verification Package for the 100-H-46, 190-H Potential Contaminated Soil Waste Site"	04/29/2014	Interim Closed Out
100-H-48	184-HA Underground Fuel Oil Tanks Associated Piping	WSRF 2013-126 attachment, "Remaining Sites Verification Package for the 100-H-48, 184-HA Underground Fuel Oil Tanks Associated Piping and 100-H-52, 184-HA Septic Drain Field and Associated Piping"	04/02/2014	Interim Closed Out
100-H-49:1	184-H Boiler House and 1717H Hot Shop French Drains	WSRF 2014-111 attachment, "Remaining Sites Verification Sites Package for the 100-H-49:1, 184-H Boiler House and 1717-H Hot Shop French Drains Subsite"	03/18/2015	Interim Closed Out
100-H-51:1	1703-H Sanitary Sewer Segment	WSRF 2014-115 attachment, "Remaining Sites Verification Package for the 100-H-51:1, 1703-H Sanitary Sewer Segment Subsite"	03/27/2015	Interim Closed Out
100-H-51:2	117-H Seal Pit Crib Feedline	WSRF 2015-025 attachment, "Remaining Sites Verification Package for the 100-H-51:2, 117-H Seal Pit Crib Feedline Subsite"	07/09/2015	Interim Closed Out

Table 5-4. Summary of 100-HR-1 Operable Unit Waste Site Closure Documentation

WIDS Site		Closure Document*	Reclassification	
Code	Name		Date	Status
100-H-51:3	184-H Brine Discharge Line	WSRF 2014-097 attachment, "Remaining Sites Verification Package for the 100-H-51:3, 184-H Brine Discharge Line and 100-H-51:6, Carbon Steel Pipe Subsites"	03/27/2015	Interim Closed Out
100-H-51:6	Carbon Steel Pipe			
100-H-52	184-HA Drain Field and Associated Piping	WSRF 2013-126	04/02/2014	Interim Closed Out
100-H-59:1	100-H Area Railroad Track Soil Contamination Area	WSRF 2015-013 attachment, "Remaining Sites Verification Package for the 100-H-59:1, 100-H Area Railroad Track Soil Contamination Area Subsite"	06/04/2015	Interim Closed Out
100-H-59:2	Debris Piles near 100-H Area Railroad Track	WSRF 2015-074 attachment, "Remaining Sites Verification Package for the 100-H-59:2, Debris Piles Near 100-H Area Railroad Track Subsite"	11/09/2015	Interim Closed Out
116-H-1	107-H Liquid Waste Disposal Trench	CVP-2000-00026, *Cleanup Verification Package for the 116-H-1 Process Effluent Trench* (WSRF 2001-013 as attachment)	04/03/2001	Interim Closed Out
116-H-2	1608-H Liquid Waste Disposal Trench, 1608-H Crib & Trench	CVP-2000-00031 (WSRF 2000-119 as attachment)	03/01/2001	Interim Closed Out
116-H-3	105-H Dummy Decontamination French Drain, Perf Decontamination Drain	CVP-2000-00032, *Cleanup Verification Package for the 116-H-3 French Drain* (WSRF 2000-135 as attachment)	04/03/2001	Interim Closed Out
116-H-5	116-H-5 Outfall Structure, 1904-H Outfall Structure	WSRF 2011-012 attachment, "Remaining Sites Verification Package for the 116-H-5, 1904-H Outfall Structure"	05/03/2012	Interim Closed Out
116-H-7	107-H Retention Basin, 107H	CVP-2000-00027, *Cleanup Verification Package for the 116-H-7 Retention Basin* (WSRF 2001-026 as attachment)	07/24/2001	Interim Closed Out
116-H-9	117-H Crib, 117-H Seal Pit Crib	WSRF 2009-047 attachment, "Remaining Sites Verification Package for the 116-H-9, 117-H Seal Pit Crib"	12/22/2010	Interim Closed Out
118-H-6:2	105-H Reactor Ancillary Support Areas, Below-Grade Structures and Underlying Soils	CVP-2006-00003 (WSRF 2006-008 as attachment)	06/22/2006	Interim Closed Out
118-H-6:3	105-H Reactor Fuel Storage Basin and Underlying Soils	CVP-2006-00003 (WSRF 2006-009 as attachment)	06/22/2006	Interim Closed Out
118-H-6:4	105-H Fuel Storage Basin Shallow Zone Side Slope Soils	CVP-2010-00005, *Cleanup Verification Package for the 118-H-6:4, 105-H Fuel Storage Basin Shallow Zone Side Slope Soils* (WSRF 2010-037 as attachment)	11/10/2010	Interim Closed Out
118-H-6:5	105-H Decontamination Pads	CVP-2011-00002, *Cleanup Verification Package for the 118-H-6:5, 105-H Decontamination Pads* (WSRF 2011-060 as attachment)	10/18/2011	Interim Closed Out
118-H-6:6	118-H-6:6 Deep Zone Side Slope Soils	CVP-2006-00003 (WSRF 2006-022 as attachment)	06/22/2006	Interim Closed Out

Table 5-4. Summary of 100-HR-1 Operable Unit Waste Site Closure Documentation

WIDS Site		Closure Document*	Reclassification	
Code	Name		Date	Status
126-H-2	183-H Clearwells/Disposal Pit	WSRF 2006-006 attachment, "Remaining Sites Verification Package for the 126-H-2, 183-H Clearwells/Disposal Pit Waste Site"	10/18/2012	Interim Closed Out
132-H-1	116-H Reactor Exhaust Stack Burial Site	WSRF 2006-053 attachment, "Remaining Sites Verification Package for the 132-H-1, 116-H Reactor Stack Burial Site"	06/26/2007	Interim Closed Out
132-H-3	1608-H Waste Water Pumping Station Site, 116-H-8, 1608-H Effluent Pumping Station Site	WSRF 2006-050 attachment, "Remaining Sites Verification Package for the 132-H-3, 1608-H Effluent Pumping Station Waste Site"	07/12/2012	Interim Closed Out
1607-H2	1607-H2 Septic Tank and Associated Drain Field, Septic System, 1607-H2 Sanitary Sewer System, 124-H-2, 1607-H2 Septic Tank	CVP-2000-00024, *Cleanup Verification Package for the 1607-H2 Septic System* (WSRF 2000-118 as attachment)	02/05/2001	Interim Closed Out
1607-H3	1607-H3 Septic Tank and Associated Drain Field, 124-H-3, 1607-H3 Sanitary Sewer System, 1607-H3 Septic Tank	WSRF 2010-057 attachment, "Remaining Sites Verification Package for the 1607-H3 Septic Tank and Associated Drain Field"	02/01/2011	Interim Closed Out
1607-H4	1607-H4 Septic Tank and Associated Drain Field, 1607-H4 Sanitary Sewer System, 124-H-4, 1607-H4 Septic Tank; Septic System	CVP-2000-00025, *Cleanup Verification Package for the 1607-H4 Septic System* (WSRF 2000-129 as attachment)	02/26/2001	Interim Closed Out

*The full citations for the references included in this column are provided in Chapter 8 of this report.

Table 5-5. Summary of 100-HR-2 Operable Unit Waste Site Closure Documentation

WIDS Site		Closure Document*	Reclassification	
Code	**Name**		**Date**	**Status**
100-H-2	Buried Thimble Site	CVP-2000-00031, *Cleanup Verification Package for the 100-H-17 Overflow, 116-H-2 Liquid Waste Disposal Trench, 100-H-2 Buried Thimble Site, and the 100-H-30 Sanitary Sewer Trench* (WSRF 2000-119 as attachment)	03/01/2001	Interim Closed Out
100-H-37	100-H Mud Dauber Contamination Area	WSRF 2010-007, *Waste Site Reclassification Form*, and attachment, "100-H-37 Mud Daubers Waste Site"	08/05/2010	Interim Closed Out
118-H-1:1	100-H Burial Ground Trenches and Sorting Cells	CVP-2011-00001, *Cleanup Verification Package for the 118-H-1:1, 100-H Burial Ground Trenches and Sorting Cells* (WSRF 2011-034 as attachment)	07/28/2011	Interim Closed Out
118-H-1:2	Anomaly Staging Area and Fuel Bunker	CVP-2011-00003, *Cleanup Verification Package for the 118-H-1:2, Burial Ground Anomaly Staging Area and Suspect Spent Nuclear Fuel Bunker Area* (WSRF 2011-068 as attachment)	10/12/2011	Interim Closed Out
118-H-2	H-1 Loop Burial Ground, 100-H Burial Ground No. 2, P13 Test Loop	CVP-2010-00002, *Cleanup Verification Package for the 118-H-2, H-1 Loop Burial Ground* (WSRF 2010-023 as attachment)	11/15/2010	Interim Closed Out
118-H-3	Construction Burial Ground	CVP-2010-00006, *Cleanup Verification Package for the 118-H-3, Construction Burial Ground* (WSRF 2010-044 as attachment)	06/27/2011	Interim Closed Out
118-H-4	Ball 3X Burial Ground	CVP-2010-00003, *Cleanup Verification Package for the 118-H-4, Ball 3X Burial Ground* (WSRF 2010-036 as attachment)	12/29/2010	Interim Closed Out
118-H-5	105-H Thimble Pit	CVP-2009-00009, *Cleanup Verification Package for the 118-H-5, 105-H Thimble Pit* (WSRF 2009-021 as attachment)	01/05/2010	Interim Closed Out
128-H-1	100-H Burning Pit, 100-H Burning Pit No. 1	WSRF 2010-062 attachment, "Remaining Sites Verification Package for the 128-H-1, 100-H Burning Pit Waste Site"	05/08/2012	Interim Closed Out
132-H-2	117-H Filter Building Site	WSRF 2006-049 attachment, "Remaining Sites Verification Package for the 132-H-2, 117-H Filter Building"	08/01/2006	Interim Closed Out
1607-H1	1607-H1 Septic Tank and Associated Drain Field, 124-H-1, 1607-H1 Sanitary Sewer System, 1607-H1 Septic Tank	WSRF 2010-065 attachment, "Remaining Sites Verification Package for the 1607-H1 Septic Tank and Associated Drain Field"	09/01/2011	Interim Closed Out
600-151	Dumping Areas 50 Yards and 200 Yards Downstream of River Mile 14, Military installation NW of 100-H Area	WSRF 2011-053 attachment, "Remaining Sites Verification Package for the 600-151, Dumping Areas 50 Yards and 200 Yards Downstream of River Mile 14 Waste Site"	10/27/2011	Interim Closed Out
600-152	Military Septic Tanks	WSRF 2009-019 attachment, "Remaining Sites Verification Package for the 600-152 Military Septic Tanks"	04/01/2010	Interim Closed Out

Table 5-5. Summary of 100-HR-2 Operable Unit Waste Site Closure Documentation

WIDS Site		Closure Document*	Reclassification	
Code	Name		Date	Status
600-380	Segment 4 Unknown Cylinder	WSRF 2013-133 attachment, "600-380, Segment 4 Unknown Cylinder Waste Site"	03/25/2014	Interim Closed Out
600-382	Segment 4 Oil Stain and Filter Area #3	WSRF 2014-026 attachment, "Remaining Sites Verification Package for the 600-382, Segment 4 Oil Stains and Filter Area #3 Waste Site"	08/20/2014	Interim Closed Out
600-382:1	Segment 4 Oil Stain and Filter Area #3a			
600-382:2	Segment 4 Oil Stain and Filter Area #3b			
600-382:3	Segment 4 Oil Stain and Filter Area #3c			
600-382:4	Segment 4 Oil Stain and Filter Area #3d			
600-382:5	Segment 4 Oil Stain and Filter Area #3e			
600-383	Segment 4 Battery Remnant Area #2	WSRF 2014-023 attachment, "Remaining Sites Verification Package for the 600-383, Segment 4 Battery Remnant Area #2 Waste Site"	07/08/2014	Interim Closed Out
600-383:1	Segment 4 Battery Remnant Area #2a			
600-383:2	Segment 4 Battery Remnant Area #2b			
600-383:3	Segment 4 Battery Remnant Area #2c			
600-383:4	Segment 4 Battery Remnant Area #2d			
600-383:5	Segment 4 Battery Remnant Area #2e			
600-383:6	Segment 4 Battery Remnant Area #2f			
600-383:7	Segment 4 Battery Remnant Area #2g			
600-383:8	Segment 4 Battery Remnant Area #2h			
600-383:9	Segment 4 Battery Remnant Area #2i			
600-383:10	Segment 4 Battery Remnant Area #2j			

Table 5-5. Summary of 100-HR-2 Operable Unit Waste Site Closure Documentation

WIDS Site		Closure Document*	Reclassification	
Code	**Name**		**Date**	**Status**
600-384	Segment 4 Stained Soil Area #3	WSRF 2014-008 attachment, "Remaining Sites Verification Package for the 600-384, Segment 4 Stained Soil Area #3 Waste Site"	08/13/2014	Interim Closed Out
600-384:1	Segment 4 Stained Soil Area #3a			
600-384:2	Segment 4 Stained Soil Area #3b			
600-384:3	Segment 4 Stained Soil Area #3c			
600-384:4	Segment 4 Stained Soil Area #3d			
600-384:5	Segment 4 Stained Soil Area #3e			
600-385	Segment 4 Transite, Concrete, and Metal Debris Area	WSRF 2016-005 attachment, "600-385, Segment 4 Transite, Concrete, and Metal Debris Area Waste Site"	07/05/2016	Interim Closed Out

*The full citations for the references included in this column are provided in Chapter 8 of this report.

NW = northwest
WIDS = Waste Information Data System
WSRF = waste site reclassification form

Table 5-6. Summary of Unnassigned Waste Site Closure Documentation

WIDS Site			Reclassification	
Code	**Name**	**Closure Document***	**Date**	**Status**
100-D-58	100-DR Area On-Site Sewage System for MO980 & 4-Closet Restroom Facility	WSRF 2012-073 attachment, "100-D-58, 100-DR Area On-Site Sewage System for MO-980 and 4-Closet Restroom Facility"	11/19/2012	Final Closed Out
120-D-1	100-D Ponds	DOE/RL-92-71, *100-D Ponds Closure Plan*	08/27/1999	Closed Out
116-H-6	183-H Solar Evaporation Basins	DOE/RL-97-48, *183-H Solar Evaporation Basins Postclosure Plan*; WSRF 99-124, *Waste Site Reclassification Form*	05/13/1997	Closed Out

*The full citations for the references included in this column are provided in Chapter 8 of this report.

WIDS = Waste Information Data System

WSRF = waste site reclassification form

5.1.2 Remedial Action Objectives and Goals

As applicable, RAO performance standard attainment involves comparisons of soil analytical data to RAGs. RAGs are specific numeric targets identified in the interim action RODs. Comparison of soil analytical data to RAGs is performed following these general steps:

- Identify the units within a site for cleanup verification and conduct sample collection and analysis for COCs and COPCs.
- Calculate the summary statistics or determine maximum values for the residual contaminants in the identified units.
- Identify the appropriate RAGs to be applied to the units.
- Evaluate the summary statistics or maximum values, as appropriate, for the identified units against the decision rules for achieving the appropriate RAGs.

The 100-DH Area waste sites RAGs, as applicable, along with the process for verifying attainment of the RAGs, are described in detail in the 100 Area RDR/RAWP and are summarized in Table 5-7.

Table 5-7. Summary of Achieved Performance Standards for Unrestricted Land Use

Regulatory Requirement	Remedial Action Goals	Evaluation Method
Direct Exposure – Radionuclides	Attained <15 mrem/yr dose rate above background over 1,000 years. Final closeout sampling is to demonstrate attainment of the CERCLA risk range of 10^{4} to 10^{-6}.	Compared dose and risk goals to RESRAD model outputs based on unrestricted land use assumptions and verification data set values.
Direct Exposure – Nonradionuclides	Attained individual COC RAGs (MTCA Method B cleanup levels for unrestricted land use). Passed the WAC 173-340-740(7)(e) three-part test.	Compared goals with verification data set values.
Risk – Radionuclides	Achieved hazard quotient of <1 for noncarcinogens.	Compared goal with individual hazard quotients calculated from verification data set values.
	Achieved cumulative hazard quotient of <1 for noncarcinogens.	Compared goal with cumulative hazard quotients calculated from verification data set values.
	Achieved excess cancer risk of $<1\times10^{-6}$ for individual carcinogens.	Compared goal with individual carcinogen risks calculated from verification data set values.
	Attained a cumulative excess cancer risk of $<1\times10^{-5}$ for carcinogens.	Compared goal with cumulative carcinogen risks calculated from verification data set values.
Groundwater/River Protection – Radionuclides	Attained individual radionuclide groundwater and river cleanup requirements. Attained National Primary Drinking Water Standards <4 mrem/yr (beta/gamma) dose rate.	Compared goals to RESRAD model outputs based on unrestricted land use assumptions and verification data set values.

Table 5-7. Summary of Achieved Performance Standards for Unrestricted Land Use

Regulatory Requirement	Remedial Action Goals	Evaluation Method
Groundwater/River Protection – Nonradionuclides	Attained individual nonradionuclide groundwater and river cleanup requirements.	Compared the RAGs of the *100 Area RDR/RAWP* (DOE/RL-96-17) with verification data set values.

References: DOE/RL-96-17, *Remedial Design Report/Remedial Action Work Plan for the 100 Area*.

WAC 173-340-740, "Model Toxics Control Act—Cleanup," "Unrestricted Land Use Soil Cleanup Standards."

CERCLA = *Comprehensive Environmental Response, Compensation, and Liability Act of 1980*
COC = contaminant of concern
MTCA = *Model Toxic Control Act*
RAG = remedial action goal
RDR/RAWP = Remedial Design Report/Remedial Action Work Plan
RESRAD = RESidual RADioactivity dose model

5.1.3 Contaminant Identification

As applicable, the COPCs and COCs for some waste sites were initially identified in the interim action RODs based on historic and field investigation information and were further refined during development of the 100 Area RDR/RAWP (DOE/RL-96-17), 100 Area SAP (DOE/RL-96-22), and DOE/RL-2001-35, 100 Area Burial Grounds SAP (DOE/RL-2001-35).

Tables 5-8 through 5-11 represent the COCs/COPCs that were used to support a protectiveness determination for each waste site. These COCs/COPCs are documented in the closure document for each waste site and may include additional constituents identified during the remediation and characterization process pursuant to the interim action ROD "observational approach" or other supporting documentation. Following the process described in this section, residual soil concentrations at all the sites addressed in this report, except for the "Accepted" sites, were shown to meet the RAO performance standards and cleanup objectives established for eventual unrestricted surface use. The "Accepted" sites are currently associated with retained active facilities or are undergoing remedial actions. Closeout of individual waste sites was based on the evaluation of analytical laboratory results from verification or confirmatory soil samples that were analyzed by contract laboratories using approved EPA methods. The resulting data for each waste site were subjected to a data quality assessment and determined to be suitable for their intended use to support closure decisions.

Table 5-8. 100-DR-1 Operable Unit Summary of Waste Site Contaminants of Concern and Potential Concern

Site	Americium-241	Barium-133	Carbon-14	Cesium-137	Cobalt-60	Europium-152,-154,-155	Neptunium-237	Nickel-63	Plutonium-238	Plutonium-239/240	Strontium-90	Technetium-99	Thorium-228,-232	Tritium	Uranium-233/234	Uranium-235,-238	Anions	Cyanide	Asbestos	ICP Metals	Hexavalent Chromium	Mercury	Total Uranium	Herbicides	PAH	PCBs	Pesticides	TPH	SVOCs	VOCs
100-D-1	X			X	X	X		X	X	X	X									X	X	X				X		X	X	X
100-D-2																				X	X	X								
100-D-3			X											X		X														
100-D-4	X			X	X	X			X	X	X				X	X					X					X	X			
100-D-5				X	X	X		X		X	X				X	X					X									
100-D-6				X	X	X		X		X	X				X	X					X									
100-D-7																			X	X	X	X				X	X	X	X	X
100-D-8	X		X	X	X	X		X	X	X	X	X		X	X	X	X			X	X	X			X	X	X		X	
100-D-9																				X						X		X	X	X
100-D-18	X			X	X	X			X	X	X										X					X				
100-D-19	X			X	X	X		X		X	X				X	X						X				X				
100-D-20	X			X	X	X			X	X	X										X					X				
100-D-21	X			X	X	X			X	X	X										X					X				
100-D-22	X			X	X	X			X	X	X				X	X					X					X	X			
100-D-24			X	X	X	X					X			X	X	X				X	X	X							X	X
100-D-25				X	X	X		X	X	X	X										X					X				
100-D-29	X			X	X	X		X	X	X	X			X		X					X					X				
100-D-30																				X	X	X								
100-D-31:1				X	X	X			X	X	X				X	X	X			X	X	X			X	X		X		X
100-D-31:2				X	X	X			X	X	X				X	X	X			X	X	X			X	X		X		X

Table 5-8. 100-DR-1 Operable Unit Summary of Waste Site Contaminants of Concern and Potential Concern

Site	Americium-241	Barium-133	Carbon-14	Cesium-137	Cobalt-60	Europium-152,-154,-155	Neptunium-237	Nickel-63	Plutonium-238	Plutonium-239/240	Strontium-90	Technetium-99	Thorium-228,-232	Tritium	Uranium-233/234	Uranium-235,-238	Anions	Cyanide	Asbestos	ICP Metals	Hexavalent Chromium	Mercury	Total Uranium	Herbicides	PAH	PCBs	Pesticides	TPH	SVOCs	VOCs
100-D-31:3				X	X	X					X					X	X			X	X	X			X	X	X	X	X	X
100-D-31:4				X	X	X					X					X	X			X	X	X			X	X	X	X	X	X
100-D-31:5																	X	X		X	X	X								
100-D-31:6																	X			X	X	X			X		X			
100-D-31:7				X	X	X					X				X	X	X			X	X	X			X	X	X	X	X	X
100-D-31:8				X	X	X					X					X	X			X	X	X			X	X	X	X	X	X
100-D-31:9				X	X	X					X					X	X			X	X	X			X	X	X	X	X	X
100-D-31:10				X	X	X					X					X	X			X	X	X			X	X	X	X	X	X
100-D-31:11																	X			X	X	X			X	X	X	X	X	
100-D-31:12																	X			X	X	X			X	X	X	X	X	
100-D-32	X			X	X	X		X	X	X	X					X				X	X	X								
100-D-42					X																									
100-D-45			X		X			X																						
100-D-48:1				X	X	X				X	X				X	X					X									
100-D-48:2				X	X	X				X	X				X	X					X									
100-D-48:3				X	X	X				X	X				X	X					X									
100-D-48:4				X	X	X				X	X					X					X									
100-D-49:1				X	X	X				X	X				X	X					X									
100-D-49:2				X	X	X				X	X				X	X					X									
100-D-49:3				X	X	X				X	X				X	X					X									

Table 5-8. 100-DR-1 Operable Unit Summary of Waste Site Contaminants of Concern and Potential Concern

Site	Americium-241	Barium-133	Carbon-14	Cesium-137	Cobalt-60	Europium-152,-154,-155	Neptunium-237	Nickel-63	Plutonium-238	Plutonium-239/240	Strontium-90	Technetium-99	Thorium-228,-232	Tritium	Uranium-233/234	Uranium-235,-238	Anions	Cyanide	Asbestos	ICP Metals	Hexavalent Chromium	Mercury	Total Uranium	Herbicides	PAH	PCBs	Pesticides	TPH	SVOCs	VOCs
100-D-49:4	X	X	X	X	X	X		X	X	X	X	X		X	X	X				X	X	X	X			X				
100-D-50:1	X		X	X	X	X		X		X	X	X		X	X	X				X	X	X				X			X	
100-D-50:4	X		X	X	X	X				X	X			X						X	X	X			X	X		X	X	
100-D-50:5				X	X	X					X									X	X	X	X			X				
100-D-50:6				X	X	X					X								X	X	X	X	X			X				
100-D-50:7																	X		X	X	X	X				X	X			
100-D-50:8			X	X	X	X					X			X	X	X				X	X	X							X	X
100-D-50:9				X							X									X	X	X			X	X	X			
100-D-50:10[a]																														
100-D-52				X		X									X	X				X										
100-D-56:1																	X			X	X	X								
100-D-56:2																	X			X	X	X								
100-D-61																				X	X	X			X	X	X	X		
100-D-63				X	X	X					X				X	X				X	X	X								
100-D-65	X		X	X	X	X		X	X	X	X				X	X	X			X	X	X			X	X	X		X	
100-D-66	X		X	X	X	X		X	X	X	X				X	X	X			X	X	X			X	X	X		X	
100-D-67					X	X														X										
100-D-69																				X	X	X								
100-D-70																	X			X	X	X			X	X		X		X
100-D-71																			X	X		X			X	X		X		

Table 5-8. 100-DR-1 Operable Unit Summary of Waste Site Contaminants of Concern and Potential Concern

Site	Americium-241	Barium-133	Carbon-14	Cesium-137	Cobalt-60	Europium-152,-154,-155	Neptunium-237	Nickel-63	Plutonium-238	Plutonium-239/240	Strontium-90	Technetium-99	Thorium-228,-232	Tritium	Uranium-233/234	Uranium-235,-238	Anions	Cyanide	Asbestos	ICP Metals	Hexavalent Chromium	Mercury	Total Uranium	Herbicides	PAH	PCBs	Pesticides	TPH	SVOCs	VOCs
100-D-72																	X			X	X	X			X	X	X	X	X	
100-D-73																				X	X	X							X	X
100-D-74																				X	X	X			X	X				
100-D-75:1																			X	X		X				X		X	X	
100-D-75:2																				X		X			X	X		X		
100-D-75:3																				X		X			X	X		X		
100-D-76																				X	X	X							X	X
100-D-78																	X		X	X	X	X								
100-D-80:1																									X	X		X		
100-D-80:2																			X											
100-D-81																				X	X	X			X	X		X		
100-D-82																				X	X	X				X				
100-D-83:1																	X			X	X	X								
100-D-83:2																				X	X	X				X	X			
100-D-83:3																	X			X	X	X							X	
100-D-83:4																	X			X	X	X								
100-D-83:5																	X			X	X	X								
100-D-84:1																	X			X	X	X			X	X	X		X	
100-D-84:2																	X			X	X	X			X	X	X	X	X	
100-D-85:1				X	X	X														X	X	X								

Table 5-8. 100-DR-1 Operable Unit Summary of Waste Site Contaminants of Concern and Potential Concern

Site	Americium-241	Barium-133	Carbon-14	Cesium-137	Cobalt-60	Europium-152,-154,-155	Neptunium-237	Nickel-63	Plutonium-238	Plutonium-239/240	Strontium-90	Technetium-99	Thorium-228,-232	Tritium	Uranium-233/234	Uranium-235,-238	Anions	Cyanide	Asbestos	ICP Metals	Hexavalent Chromium	Mercury	Total Uranium	Herbicides	PAH	PCBs	Pesticides	TPH	SVOCs	VOCs
100-D-85:2	X			X	X	X		X	X	X	X				X	X	X			X	X	X				X				
100-D-86:1	X		X	X	X	X			X	X	X			X	X	X				X	X	X			X	X		X	X	
100-D-86:3																	X			X	X	X			X	X	X		X	
100-D-87																	X			X	X	X							X	
100-D-88																	X			X	X	X			X	X		X		X
100-D-90																										X				
100-D-96:1																	X			X		X								
100-D-96:2																	X			X		X			X					
100-D-97																				X	X	X			X	X		X		X
100-D-98:2																				X		X				X		X		
100-D-98:3																			X	X		X				X		X		X
100-D-99																	X			X	X	X			X	X	X	X		X
100-D-101																	X			X	X	X							X	
100-D-102	X			X	X	X		X	X	X	X			X		X	X			X	X	X				X				
100-D-104																				X	X	X								
100-D-105																	X			X	X	X								
100-D-107																				X	X									
116-D-10	X		X	X	X	X		X	X	X	X			X	X	X				X	X	X				X				
116-D-1A	X			X	X	X				X	X					X					X									
116-D-1B	X			X	X	X				X	X					X					X									

Table 5-8. 100-DR-1 Operable Unit Summary of Waste Site Contaminants of Concern and Potential Concern

Site	Americium-241	Barium-133	Carbon-14	Cesium-137	Cobalt-60	Europium-152,-154,-155	Neptunium-237	Nickel-63	Plutonium-238	Plutonium-239/240	Strontium-90	Technetium-99	Thorium-228,-232	Tritium	Uranium-233/234	Uranium-235,-238	Anions	Cyanide	Asbestos	ICP Metals	Hexavalent Chromium	Mercury	Total Uranium	Herbicides	PAH	PCBs	Pesticides	TPH	SVOCs	VOCs
116-D-2	X			X	X	X			X	X	X				X	X					X									
116-D-4																X					X									
116-D-5	X		X	X	X	X		X	X	X	X				X	X	X			X	X	X			X		X		X	
116-D-6	X			X		X				X					X	X				X		X								
116-D-7	X			X	X	X		X	X	X	X									X	X	X								
116-D-9											X					X					X									
116-DR-1&2	X			X	X	X		X	X	X	X										X									
116-DR-5			X	X	X	X		X	X	X	X					X				X	X	X				X			X	
116-DR-9	X			X	X	X		X	X	X	X										X					X				
118-D-6:2	X		X	X	X	X	X	X	X	X	X		X	X	X	X				X	X	X				X				
118-D-6:3	X		X	X	X	X	X	X	X	X	X		X	X	X	X				X	X	X				X				
118-D-6:4	X		X	X	X	X		X	X	X	X			X	X	X				X	X	X				X				
120-D-1[b]																				X	X	X				X	X			
120-D-2																	X		X	X	X	X								
126-D-2	X			X	X	X													X	X	X	X			X	X	X	X	X	
128-D-2				X							X								X	X	X	X				X	X	X	X	X
130-D-1																				X					X	X		X	X	X
132-D-1	X		X	X	X	X			X	X	X			X	X	X				X	X	X			X	X			X	
132-D-2			X	X	X	X			X	X	X			X		X				X	X	X				X				
132-D-3			X	X	X	X			X	X	X			X		X				X	X	X				X				

Table 5-8. 100-DR-1 Operable Unit Summary of Waste Site Contaminants of Concern and Potential Concern

Site	Americium-241	Barium-133	Carbon-14	Cesium-137	Cobalt-60	Europium-152,-154,-155	Neptunium-237	Nickel-63	Plutonium-238	Plutonium-239/240	Strontium-90	Technetium-99	Thorium-228,-232	Tritium	Uranium-233/234	Uranium-235,-238	Anions	Cyanide	Asbestos	ICP Metals	Hexavalent Chromium	Mercury	Total Uranium	Herbicides	PAH	PCBs	Pesticides	TPH	SVOCs	VOCs
132-D-4[b]	X		X	X	X	X	X	X	X	X	X		X	X	X	X				X	X	X				X				
1607-D2:1						X										X				X	X	X				X			X	
1607-D2:2				X	X	X										X	X			X	X	X				X			X	
1607-D2:3				X	X	X														X	X	X								
1607-D2:4						X														X		X							X	
1607-D2:5																	X			X	X	X			X	X			X	
1607-D4																			X	X						X	X		X	
1607-D5																	X			X	X	X			X	X	X	X	X	
628-3																			X	X	X	X			X	X	X	X		
UPR-100-D-1																				X						X		X	X	X
UPR-100-D-2				X	X	X				X	X				X	X					X									
UPR-100-D-3				X	X	X				X	X				X	X					X									
UPR-100-D-4				X	X	X				X	X				X	X					X									
UPR-100-D-5	X			X	X	X		X	X	X	X			X		X					X					X				

a. The site has no contaminants of concern or contaminants of potential concern.

b. The site is geographically associated with the 100-DR-1 Operable Unit but is not currently classified within a specific operable unit.

ICP = inductively coupled plasma
PAH = polycyclic aromatic hydrocarbon
PCB = polychlorinated biphenyl
TPH = total petroleum hydrocarbon
SVOC = semi-volatile organic compound
VOC = volatile organic compound

Table 5-9. 100-DR-2 Operable Unit Summary of Waste Site Contaminants of Concern and Potential Concern

Site	Americium-241	Barium-133	Carbon-14	Cesium-137	Cobalt-60	Europium-152,-154,-155	Nickel-63	Plutonium-238	Plutonium-239/240	Silver-108m	Strontium-90	Technetium-99	Thorium-228	Tritium	Uranium-233,-234	Uranium-235,-238	Anions	Asbestos	ICP Metals	Hexavalent Chromium	Mercury	Total Uranium	Herbicides	PAH	PCBs	Pesticides	TPH	SVOCs	VOCs
100-D-12																				X									
100-D-13	X			X	X	X					X						X		X	X	X	X			X	X	X	X	
100-D-14																	X		X	X					X	X		X	
100-D-15																		X	X	X	X				X	X	X	X	X
100-D-23	X		X	X	X	X	X	X	X		X				X	X			X	X	X								
100-D-28:1																			X	X	X			X	X	X		X	
100-D-43			X		X		X																						
100-D-46	X			X	X	X			X		X					X				X									
100-D-47			X	X	X	X	X	X	X		X					X		X	X	X	X								
100-D-53	X		X	X	X	X	X	X	X		X				X	X			X	X	X								
100-D-54	X		X	X	X	X	X	X	X		X				X	X			X	X	X								
100-D-62																	X		X	X	X			X	X	X	X	X	
100-D-64	X		X	X	X	X	X	X	X		X				X	X			X	X	X								
100-D-68																			X	X	X				X	X		X	
100-D-77																	X		X	X	X			X	X	X	X	X	
100-D-94																	X		X	X	X								
100-D-100																			X	X									
100-D-103																			X	X	X			X	X		X	X	X
100-D-106																	X		X	X	X			X	X	X		X	
116-D-8				X		X					X		X			X	X		X	X	X				X		X	X	X
116-DR-3	X	X	X	X	X	X	X	X	X		X	X		X	X	X			X	X	X				X				
116-DR-4				X	X	X					X									X									

Table 5-9. 100-DR-2 Operable Unit Summary of Waste Site Contaminants of Concern and Potential Concern

Site	Americium-241	Barium-133	Carbon-14	Cesium-137	Cobalt-60	Europium-152,-154,-155	Nickel-63	Plutonium-238	Plutonium-239/240	Silver-108m	Strontium-90	Technetium-99	Thorium-228	Tritium	Uranium-233,-234	Uranium-235,-238	Anions	Asbestos	ICP Metals	Hexavalent Chromium	Mercury	Total Uranium	Herbicides	PAH	PCBs	Pesticides	TPH	SVOCs	VOCs
116-DR-6				X	X	X					X					X				X									
116-DR-7				X	X	X					X				X	X													
116-DR-8	X		X	X	X	X	X	X	X		X			X	X	X			X	X	X				X			X	X
116-DR-10	X		X	X	X	X	X	X	X		X			X	X	X			X	X	X				X				
118-D-1	X		X	X	X	X	X	X	X	X	X	X		X		X			X	X	X						X	X	
118-D-2:1			X	X	X	X	X	X	X		X			X	X	X			X	X	X		X						
118-D-2:2			X	X	X	X	X	X	X		X			X	X	X			X	X	X			X	X		X		
118-D-3:1	X		X	X	X	X	X	X	X		X			X	X	X	X		X	X	X			X				X	X
118-D-3:2	X		X	X	X	X	X	X	X	X	X			X		X	X		X	X	X							X	X
118-D-4			X	X	X	X	X	X	X		X					X			X	X	X								
118-D-5					X	X	X												X	X	X								
118-DR-1				X		X	X												X	X	X								
118-DR-2:2	X	X	X	X	X	X	X	X	X		X	X		X	X	X			X	X	X	X			X				
122-DR-1:2	X		X	X	X	X	X	X	X		X				X	X			X	X	X								
126-DR-1																		X	X	X	X				X				
132-DR-1			X	X	X	X		X	X		X			X		X			X	X	X				X				
132-DR-2*	X		X	X	X	X	X	X	X		X				X	X			X	X	X								
1607-D1	X			X	X	X											X		X	X	X			X	X	X		X	
600-30																		X	X	X	X				X	X	X	X	X

*The site is geographically associated with the 100-DR-2 Operable Unit but is not currently classified within a specific operable unit.

ICP = inductively coupled plasma
PAH = polycyclic aromatic hydrocarbon
PCB = polychlorinated biphenyl
TPH = total petroleum hydrocarbon
SVOC = semi-volatile organic compound
VOC = volatile organic compound

Table 5-10. 100-HR-1 Operable Unit Summary of Waste Site Contaminants of Concern and Potential Concern

Site	Americium-241	Carbon-14	Cesium-137	Cobalt-60	Europium-152,-154,-155	Neptunium-237	Nickel-63	Plutonium-238	Plutonium-239/240	Radium-226	Strontium-90	Technetium-99	Thorium-228,-232	Tritium	Uranium-233/234	Uranium-235,-238	Anions	Asbestos	ICP Metals	Hexavalent Chromium	Mercury	Total Uranium	Herbicides	Oil and grease	PAH	PCBs	Pesticides	TPH	SVOCs	VOCs
100-H-1			X	X	X		X	X	X		X					X			X	X										
100-H-3																			X		X				X	X	X	X		
100-H-4			X	X	X						X				X	X			X	X	X				X	X	X	X	X	X
100-H-5			X	X	X			X	X		X								X							X				
100-H-7			X	X	X			X	X		X								X	X	X					X			X	
100-H-8																			X	X	X					X				
100-H-9	X	X	X	X	X	X	X	X	X		X		X	X	X	X			X	X	X					X				
100-H-10	X	X	X	X	X	X	X	X	X		X		X	X	X	X			X	X	X					X				
100-H-11	X	X	X	X	X	X	X	X	X		X		X	X	X	X			X	X	X					X				
100-H-12	X	X	X	X	X	X	X	X	X		X		X	X	X	X			X	X	X					X				
100-H-13	X	X	X	X	X	X	X	X	X		X		X	X	X	X			X	X	X					X				
100-H-14	X	X	X	X	X	X	X	X	X		X		X	X	X	X			X	X	X					X				
100-H-17			X	X	X				X		X					X				X										
100-H-21			X	X	X		X	X	X		X					X			X	X										
100-H-22			X	X	X		X	X	X		X					X			X	X										
100-H-24																										X				
100-H-28:1																			X		X				X					
100-H-28:2		X	X	X	X		X										X		X	X	X				X	X	X	X	X	
100-H-28:3																	X		X	X	X					X				
100-H-28:4																			X	X	X					X	X		X	
100-H-28:5																	X		X	X	X				X	X	X		X	
100-H-28:6			X	X	X						X								X	X	X					X				

Table 5-10. 100-HR-1 Operable Unit Summary of Waste Site Contaminants of Concern and Potential Concern

Site	Americium-241	Carbon-14	Cesium-137	Cobalt-60	Europium-152,-154,-155	Neptunium-237	Nickel-63	Plutonium-238	Plutonium-239/240	Radium-226	Strontium-90	Technetium-99	Thorium-228,-232	Tritium	Uranium-233/234	Uranium-235,-238	Anions	Asbestos	ICP Metals	Hexavalent Chromium	Mercury	Total Uranium	Herbicides	Oil and grease	PAH	PCBs	Pesticides	TPH	SVOCs	VOCs
100-H-28:7			X	X	X						X				X	X		X	X	X		X				X				
100-H-28:8															X	X				X										
100-H-30			X	X	X				X		X					X				X										
100-H-31	X	X	X	X	X	X	X	X	X		X		X	X	X	X			X	X	X					X				
100-H-33												X					X		X	X		X								
100-H-35	X		X	X	X		X	X	X		X	X			X	X			X	X	X	X				X				
100-H-38																	X		X	X	X		X		X	X	X	X	X	
100-H-40																			X		X				X	X		X		
100-H-41		X	X	X	X		X				X						X		X	X	X				X	X	X		X	
100-H-42		X	X	X	X		X										X		X	X	X				X	X	X	X	X	
100-H-43																			X	X	X				X	X	X	X	X	
100-H-44																	X		X	X	X									
100-H-45																			X		X				X			X		
100-H-46																		X	X	X	X									
100-H-48																	X		X		X				X	X		X		
100-H-49:1																			X		X				X	X	X	X		
100-H-49:2	X	X	X	X	X						X		X	X		X	X		X	X	X				X	X	X	X		X
100-H-50																			X	X	X									
100-H-51:1																	X		X	X	X				X		X			
100-H-51:2		X	X	X	X			X	X	X	X		X	X		X		X	X	X	X					X				
100-H-51:3																			X	X	X									
100-H-51:4																			X		X				X				X	

Table 5-10. 100-HR-1 Operable Unit Summary of Waste Site Contaminants of Concern and Potential Concern

Site	Americium-241	Carbon-14	Cesium-137	Cobalt-60	Europium-152,-154,-155	Neptunium-237	Nickel-63	Plutonium-238	Plutonium-239/240	Radium-226	Strontium-90	Technetium-99	Thorium-228,-232	Tritium	Uranium-233/234	Uranium-235,-238	Anions	Asbestos	ICP Metals	Hexavalent Chromium	Mercury	Total Uranium	Herbicides	Oil and grease	PAH	PCBs	Pesticides	TPH	SVOCs	VOCs
100-H-51:5	X		X	X	X										X				X	X	X									
100-H-51:6																			X	X	X									
100-H-52																	X		X	X	X				X	X		X		
100-H-53	X		X	X	X										X				X	X	X									
100-H-54			X	X	X		X	X	X		X					X			X	X										
100-H-56																	X		X	X	X									
100-H-57																	X		X	X	X									
100-H-59:1			X	X	X														X		X									
100-H-59:2																			X	X	X				X	X	X	X		
116-H-1			X	X	X				X		X								X	X										
116-H-2			X	X	X				X		X					X			X	X										
116-H-3			X	X	X														X	X										
116-H-4	X		X	X	X			X	X		X				X	X				X										
116-H-5	X	X	X	X	X		X	X	X		X	X		X	X	X	X		X	X	X				X	X	X	X	X	
116-H-6*												X					X		X	X		X								
116-H-7			X	X	X		X	X	X		X	X				X			X	X						X				
116-H-9		X	X	X	X			X	X	X	X		X	X		X			X	X	X					X				
118-H-6:2	X	X	X	X	X	X	X	X	X		X		X	X	X	X			X	X	X					X				
118-H-6:3	X	X	X	X	X	X	X	X	X		X		X	X	X	X			X	X	X					X				
118-H-6:4	X	X	X	X	X	X	X	X	X		X			X	X	X			X	X	X					X				
118-H-6:5	X	X	X	X	X	X	X	X	X		X	X	X	X	X	X			X	X	X				X	X		X		X
118-H-6:6	X	X	X	X	X	X	X	X	X		X		X	X	X	X			X	X	X					X				

Table 5-10. 100-HR-1 Operable Unit Summary of Waste Site Contaminants of Concern and Potential Concern

Site	Americium-241	Carbon-14	Cesium-137	Cobalt-60	Europium-152,-154,-155	Neptunium-237	Nickel-63	Plutonium-238	Plutonium-239/240	Radium-226	Strontium-90	Technetium-99	Thorium-228,-232	Tritium	Uranium-233/234	Uranium-235,-238	Anions	Asbestos	ICP Metals	Hexavalent Chromium	Mercury	Total Uranium	Herbicides	Oil and grease	PAH	PCBs	Pesticides	TPH	SVOCs	VOCs
126-H-2			X	X	X			X	X		X	X		X		X	X		X	X	X			X	X	X		X		X
132-H-1		X	X	X	X			X	X		X			X		X			X	X	X					X				
132-H-3		X	X	X	X		X	X	X		X	X		X		X	X		X	X	X				X	X				
1607-H2			X	X							X				X	X			X	X	X					X			X	
1607-H3																	X		X	X	X				X	X	X		X	X
1607-H4			X	X							X				X	X			X	X	X				X	X			X	

*The site is geographically associated with the 100-HR-1 Operable Unit but is not currently classified within a specific operable unit since it is a TSD unit.

ICP = inductively coupled plasma
PAH = polycyclic aromatic hydrocarbon
PCB = polychlorinated biphenyl
TPH = total petroleum hydrocarbon
TSD = treatment, storage, or disposal
SVOC = semi-volatile organic compound
VOC = volatile organic compound

Table 5-11. 100-HR-2 Operable Unit Summary of Waste Site Contaminants of Concern and Potential Concern

Site	Americium-241	Carbon-14	Cesium-137	Cobalt-60	Europium-152,-154,-155	Nickel-63	Plutonium-238	Plutonium-239/240	Silver-108m	Strontium-90	Thorium-228	Tritium	Uranium-233,-234	Uranium-235,-238	Anions	Cyanide	Asbestos	ICP Metals	Hexavalent Chromium	Mercury	Herbicides	PAH	PCBs	Pesticides	TPH	SVOCs	VOCs
100-H-2			X	X	X			X		X				X					X								
100-H-37	X		X	X	X					X		X		X				X	X	X							
118-H-1:1		X	X	X	X	X	X	X		X	X	X			X			X		X		X	X		X		
118-H-1:2		X	X	X	X	X				X		X		X				X	X	X		X			X		
118-H-2		X		X		X		X		X		X	X	X					X								
118-H-3	X	X	X	X	X	X	X	X	X	X		X	X	X				X	X	X			X				
118-H-4		X		X	X	X	X	X				X						X	X								
118-H-5	X	X	X	X	X	X	X	X		X			X	X				X	X	X							
128-H-1																	X	X	X	X		X	X	X	X	X	X
128-H-2																	X	X	X	X			X	X	X	X	X
128-H-3																	X	X	X	X			X	X	X	X	X
132-H-2		X	X	X	X		X	X		X		X		X				X	X	X			X				
1607-H1	X	X	X	X	X	X		X		X		X	X	X	X			X	X	X			X	X		X	
600-151																	X	X	X	X		X	X	X	X		X
600-152										X								X				X		X			
600-380															X												
600-381															X			X	X	X		X	X	X	X	X	
600-382:1																		X		X		X	X	X	X		
600-382:2																		X		X		X	X	X	X		
600-382:3																		X		X		X	X	X	X		
600-382:4																		X		X		X	X	X	X		
600-382:5																		X		X		X	X	X	X		

Table 5-11. 100-HR-2 Operable Unit Summary of Waste Site Contaminants of Concern and Potential Concern

Site	Americium-241	Carbon-14	Cesium-137	Cobalt-60	Europium-152,-154,-155	Nickel-63	Plutonium-238	Plutonium-239/240	Silver-108m	Strontium-90	Thorium-228	Tritium	Uranium-233,-234	Uranium-235,-238	Anions	Cyanide	Asbestos	ICP Metals	Hexavalent Chromium	Mercury	Herbicides	PAH	PCBs	Pesticides	TPH	SVOCs	VOCs
600-383:1																		X		X							
600-383:2																		X		X							
600-383:3																		X		X							
600-383:4																		X		X							
600-383:5																		X		X							
600-383:6																		X		X							
600-383:7																		X		X							
600-383:8																		X		X							
600-383:9																		X		X							
600-383:10																		X		X							
600-384:1															X	X		X		X	X	X	X	X	X		
600-384:2															X	X		X		X	X	X	X	X	X		
600-384:3															X	X		X		X	X	X	X	X	X		
600-384:4															X	X		X		X	X	X	X	X	X		
600-384:5															X	X		X		X	X	X	X	X	X		
600-385																	X										

ICP = inductively coupled plasma
PAH = polycyclic aromatic hydrocarbon
PCB = polychlorinated biphenyl
TPH = total petroleum hydrocarbon
SVOC = semi-volatile organic compound
VOC = volatile organic compound

5.2 Future Attainment of Final Remediation Action Performance Standards

Cleanup of waste sites in accordance with the interim action RODs is expected to continue in the River Corridor until the final RODs are established. Final RODs are required (40 CFR 300, "National Oil and Hazardous Substances Pollution Contingency Plan") for the 100-D/H Area to identify the final remedy decision, including any adjustments to the remedy identified in the interim action RODs, if necessary, to ensure protection of human health and the environment.

In addition to the information and data that originally established the basis for remedial actions under the interim action RODs, final remedial action decisions will incorporate new information acquired through characterization of interim closed waste sites. Development of the final remedy RODs will also incorporate data and information collected during the final source and groundwater remedial investigation/feasibility study. The final ROD development process will also incorporate evaluation of emerging ecological protection requirements, although the interim action RODs include general objectives for protection of ecological receptors based on meeting the unrestricted land use cleanup levels.

The final RODs will integrate historic and current characterization information, as well as current applicable or relevant and appropriate requirements. Waste sites remediated under interim action RODs will ultimately be evaluated by the lead agency and lead regulatory agency against the decisions and requirements documented in the final RODs. Upon satisfactory completion of the final remedial actions for each of the 100-DR-1, 100-DR-2, 100-HR-1, and 100-HR-2 OUs, EPA will issue a certificate of completion to DOE.

5.3 Quality Control

The QA/QC programs used throughout the remediation activities are identified in the 100 Area RDR/RAWP (DOE/RL-96-17), 100 Area SAP (DOE/RL-96-22), and other supporting documentation (e.g., DOE/RL-2001-35; BHI-01249, *Data Quality Objectives Summary Report for 100/300 Area Remaining Sites Analytical Sampling Effort*), as applicable. Samples that were used to demonstrate achieving the cleanup objectives for individual waste sites were collected and analyzed in accordance with these documents, which were approved by the Tri-Party agencies. The sampling and analysis plan contains a QA project plan to establish the objectives, functional activities, methods, and QA/QC measures associated with the sampling and analysis activities. Verification data sets that were used to support waste site closure underwent a data quality assessment to ensure suitability for their intended use. Results of the data quality assessment are documented in the closure documents for individual waste sites.

6 Final Inspection and Certifications

Based on evaluation of the approved closeout documentation referenced in Table 5-2 through Table 5-6 and final inspection of the 100-DR-1, 100-DR-2, 100-HR-1, 100-HR-2, and unassigned waste sites, interim remedial actions have been completed and RAOs have been achieved. Pursuant to the scope of the 100 Area interim action ROD and RAOs, this means that contaminated soil was excavated and disposed at ERDF and waste sites were backfilled and revegetated, as needed.

The results of confirmatory and verification sampling at “Interim Closed Out” and “Interim No Action” 100-DR-1, 100-DR-2, 100-HR-1, and 100-HR-2 OU waste sites show that residual contaminant concentrations do not preclude future uses (as bounded by the rural-residential scenario) and allow for unrestricted surface use (i.e., ground surface to 4.6 m [15 ft] deep). The results also demonstrate that residual contaminant concentrations are protective of groundwater and the Columbia River. If deemed necessary, final inspections of the interim remedial actions will be conducted in the future and include the DOE Richland Operations Office, EPA, and contractor representatives. The inspections would include only the waste sites where remedial actions occurred to verify that the sites had been backfilled with clean materials and revegetated as required by the applicable interim action RODs.

DOE/RL-2001-41, *Sitewide Institutional Controls Plan for Hanford CERCLA Response Actions and RCRA Corrective Actions*, describes institutional controls for the Hanford Site. Based on the completed interim actions, institutional controls are required at 56 of the 235 remediated 100-DR-1, 100-DR-2, 100-HR-1, 100-HR-2, and unassigned waste sites (including subsites). Table 6-1 through Table 6-5 identify (by OU) the institutional controls and rationale for the controls associated with each waste site. The most common institutional control requires preventing uncontrolled drilling or excavation into the deep zone (i.e., below 4.6 m [15 ft]).

The remaining remediated waste sites in the 100-DR-1, 100-DR-2, 100-HR-1, and 100-HR-2 OUs are available for unrestricted land use. Institutional controls, and the specific waste sites requiring them, will be updated in DOE/RL-2001-41 to reflect the final action decisions documented in the *Record of Decision, Hanford 100 Area Superfund Site, 100-DR-1, 100-DR-2, 100-HR-1, 100-HR-2, 100-HR-3 Operable Units*.

Table 6-1. 100-DR-1 Operable Unit Sites with Institutional Controls

WIDS Site Code	WIDS Site Name	Institutional Control	Rationale
100-D-5	Waste Site Near 103-D, Undocumented Solid Waste Site, Undocumented Solid Waste Site Near 103D	Institutional controls are required to prevent uncontrolled drilling or excavation into deep zone (i.e., below 4.6 m [15 ft]).	The verification sampling does not demonstrate the acceptability of unrestricted access to the deep zone.
100-D-6	Buried VSR Thimble, Minor Construction Burial Ground #1, Burial Ground 4D, 118-D4-D	Institutional controls are required to prevent uncontrolled drilling or excavation into deep zone (i.e., below 4.6 m [15 ft]).	The verification sampling does not demonstrate the acceptability of unrestricted access to the deep zone.
100-D-18	Sludge Trench #4, 107-D Sludge Trench #4, 107-D-4, 107-D4	Institutional controls are required to prevent uncontrolled drilling or excavation into deep zone (i.e., below 4.6 m [15 ft]).	The verification sampling does not demonstrate the acceptability of unrestricted access to the deep zone.
100-D-19	Sludge Trench #6, 107-D Sludge Trench #6	Institutional controls are required to prevent uncontrolled drilling or excavation into deep zone (i.e., below 4.6 m [15 ft]).	The verification sampling does not demonstrate the acceptability of unrestricted access to the deep zone.
100-D-25	Unplanned Release: 107-DR Basin Leaks	Institutional controls are required to prevent uncontrolled drilling or excavation into deep zone (i.e., below 4.6 m [15 ft]).	The verification sampling does not demonstrate the acceptability of unrestricted access to the deep zone.
100-D-48:1	North Pipelines from 116-D-7 to the Outfalls	Institutional controls are required to prevent uncontrolled drilling or excavation into deep zone (i.e., below 4.6 m [15 ft]).	The verification sampling does not demonstrate the acceptability of unrestricted access to the deep zone.
100-D-48:2	West Pipelines from D Avenue to 116-D-7	Institutional controls are required to prevent uncontrolled drilling or excavation into deep zone (i.e., below 4.6 m [15 ft]).	The verification sampling does not demonstrate the acceptability of unrestricted access to the deep zone.
100-D-48:3	Effluent Pipelines from D Avenue to 105D Reactor	Institutional controls are required to prevent uncontrolled drilling or excavation into deep zone (i.e., below 4.6 m [15 ft]).	The verification sampling does not demonstrate the acceptability of unrestricted access to the deep zone.
100-D-48:4	Small Cooling Water Effluent Pipelines at 105D Reactor	Institutional controls are required to prevent uncontrolled drilling or excavation into deep zone (i.e., below 4.6 m [15 ft]).	The verification sampling does not demonstrate the acceptability of unrestricted access to the deep zone.
100-D-49:1	North Pipelines from 116-DR-9 to the Outfalls	Institutional controls are required to prevent uncontrolled drilling or excavation into deep zone (i.e., below 4.6 m [15 ft]).	The verification sampling does not demonstrate the acceptability of unrestricted access to the deep zone.
100-D-49:2	East Pipelines from D Avenue to 116-DR-9	Institutional controls are required to prevent uncontrolled drilling or excavation into deep zone (i.e., below 4.6 m [15 ft]).	The verification sampling does not demonstrate the acceptability of unrestricted access to the deep zone.

Table 6-1. 100-DR-1 Operable Unit Sites with Institutional Controls

WIDS Site Code	WIDS Site Name	Institutional Control	Rationale
100-D-49:3	Effluent Pipelines from D Avenue to ~60 Meters from the 105-DR Reactor	Institutional controls are required to prevent uncontrolled drilling or excavation into deep zone (i.e., below 4.6 m [15 ft]).	The verification sampling does not demonstrate the acceptability of unrestricted access to the deep zone.
100-D-50:1	Emergency Discharge Pipeline	Institutional controls are required to prevent uncontrolled drilling or excavation into deep zone (i.e., below 4.6 m [15 ft]).	The verification sampling does not demonstrate the acceptability of unrestricted access to the deep zone.
100-D-50:6	183-DR Clearwell Drain Pipelines	Institutional controls are required to prevent uncontrolled drilling or excavation into deep zone (i.e., below 4.6 m [15 ft]).	The results of verification sampling indicate that deep zone concentrations of residual waste site contamination exceed direct exposure cleanup levels.
100-D-86:3	105-DR Fan Room Sewer Pipelines	Institutional controls are recommended to add perimeter fencing and signage to deter human entry. Institutional controls are required to prevent uncontrolled drilling or excavation into deep zone (i.e., below 4.6 m [15 ft]).	Verification sample results for one contaminant of concern exceed the residential exposure cleanup levels. Contamination above direct exposure levels could not be removed without incurring significant adverse impacts to the bat colonies at the 190DR tunnel subsite. Institutional controls to deter human entry are required in the north area of the subsite, near the 190DR tunnel location.
116-D-1A	105-D Storage Basin Trench #1	Institutional controls are required to prevent uncontrolled drilling or excavation into deep zone (i.e., below 4.6 m [15 ft]).	The verification sampling does not demonstrate the acceptability of unrestricted access to the deep zone.
116-D-1B	116-D1B, 105-D Storage Basin Trench #2	Institutional controls are required to prevent uncontrolled drilling or excavation into deep zone (i.e., below 4.6 m [15 ft]).	The verification sampling does not demonstrate the acceptability of unrestricted access to the deep zone.
116-D-6	116-D6, 105-D Cushion Corridor French Drain	Institutional controls are required to prevent uncontrolled drilling or excavation into deep zone (i.e., below 4.6 m [15 ft]).	The verification sampling does not demonstrate the acceptability of unrestricted access to the deep zone.
116-D-7	107-D Retention Basin, 107D	Institutional controls are required to prevent uncontrolled drilling or excavation into deep zone (i.e., below 4.6 m [15 ft]).	The verification sampling does not demonstrate the acceptability of unrestricted access to the deep zone.
116-DR-1&2	107-DR Liquid Waste Disposal Trench #1, 107-DR Liquid Waste Disposal Trench #2, 116-DR-1, 116-DR-2	Institutional controls are required to prevent uncontrolled drilling or excavation into deep zone (i.e., below 4.6 m [15 ft]).	The verification sampling does not demonstrate the acceptability of unrestricted access to the deep zone.

Table 6-1. 100-DR-1 Operable Unit Sites with Institutional Controls

WIDS Site Code	WIDS Site Name	Institutional Control	Rationale
116-DR-9	107-DR Retention Basin, 107DR	Institutional controls are required to prevent uncontrolled drilling or excavation into deep zone (i.e., below 4.6 m [15 ft]).	The verification sampling does not demonstrate the acceptability of unrestricted access to the deep zone.
118-D-6:2	105-D Reactor Ancillary Support Areas, Below-Grade Structures and Underlying Soils	Institutional controls are required to prevent uncontrolled drilling or excavation into deep zone (i.e., below 4.6 m [15 ft]).	The verification sampling does not demonstrate the acceptability of unrestricted access to the deep zone.
118-D-6:3	105-D Reactor Fuel Storage Basin and Underlying Soils	Institutional controls are required to prevent uncontrolled drilling or excavation into deep zone (i.e., below 4.6 m [15 ft]).	The verification sampling does not demonstrate the acceptability of unrestricted access to the deep zone.
118-D-6:4	105-D Fuel Storage Basin Side Slope Soils	Institutional controls are required to prevent uncontrolled drilling or excavation into deep zone (i.e., below 4.6 m [15 ft]).	The verification sampling does not demonstrate the acceptability of unrestricted access to the deep zone.
132-D-2	117-D Filter Building	Institutional controls are required to prevent uncontrolled drilling or excavation into deep zone (i.e., below 4.6 m [15 ft]).	The verification sampling does not demonstrate the acceptability of unrestricted access to the deep zone.
132-D-3	132-D3, 1608-D Waste Water Pumping Station, 1608D Effluent Pumping Station	Institutional controls are required to prevent uncontrolled drilling or excavation into deep zone (i.e., below 4.6 m [15 ft]).	The verification sampling does not demonstrate the acceptability of unrestricted access to the deep zone.
132-D-4	132-D4, 105-D Reactor Exhaust Stack, 116-D Reactor Exhaust Stack	Institutional controls are required to prevent uncontrolled drilling or excavation into deep zone (i.e., below 4.6 m [15 ft]).	The verification sampling does not demonstrate the acceptability of unrestricted access to the deep zone.
UPR-100-D-2	Effluent Line Leak #1	Institutional controls are required to prevent uncontrolled drilling or excavation into deep zone (i.e., below 4.6 m [15 ft]).	The verification sampling does not demonstrate the acceptability of unrestricted access to the deep zone.
UPR-100-D-3	Effluent Line Leak #3	Institutional controls are required to prevent uncontrolled drilling or excavation into deep zone (i.e., below 4.6 m [15 ft]).	The verification sampling does not demonstrate the acceptability of unrestricted access to the deep zone.
UPR-100-D-4	Unplanned Release: 107-D Basin Leaks	Institutional controls are required to prevent uncontrolled drilling or excavation into deep zone (i.e., below 4.6 m [15 ft]).	The verification sampling does not demonstrate the acceptability of unrestricted access to the deep zone.

VSR = vertical safety rod
WIDS = Waste Information Data System

Table 6-2. 100-DR-2 Operable Unit Sites with Institutional Controls

WIDS Site Code	WIDS Site Name	Institutional Control	Rationale
100-D-23	119-DR Sample Building Drywell	Institutional controls are required to prevent uncontrolled drilling or excavation into deep zone (i.e., below 4.6 m [15 ft]).	The acceptability of unrestricted direct exposure to deep zone soils has not been demonstrated.
100-D-46	Burial Ground 4A, 118-D-4A	Institutional controls are required to prevent uncontrolled drilling or excavation into deep zone (i.e., below 4.6 m [15 ft]).	The verification sampling does not demonstrate the acceptability of unrestricted access to the deep zone.
100-D-53	117-DR Filter Building, 117-DR HEPA Filter Building	Institutional controls are required to prevent uncontrolled drilling or excavation into deep zone (i.e., below 4.6 m [15 ft]).	The acceptability of unrestricted direct exposure to deep zone soils has not been demonstrated.
100-D-54	Drywell Near Fire Facility Gravel Scrubber	Institutional controls are required to prevent uncontrolled drilling or excavation into deep zone (i.e., below 4.6 m [15 ft]).	The acceptability of unrestricted direct exposure to deep zone soils has not been demonstrated.
100-D-64	119-DR Sample Building, 105-DR Reactor Exhaust Stack Sampling Building	Institutional controls are required to prevent uncontrolled drilling or excavation into deep zone (i.e., below 4.6 m [15 ft]).	The acceptability of unrestricted direct exposure to deep zone soils has not been demonstrated.
116-D-8	100D Cask Storage Pad	Institutional controls are required at the location of the cesium-137 contamination south of the 116-D-8 cask storage pad near the 100-D-50:2 subsite tunnel which houses maternal bat colonies. The structure was left intact and perimeter fencing and signage to deter human entry will be added to eliminate or mitigate impacts to the bat colony.	No further remediation can be conducted at the site without incurring significant adverse impacts to the bat colonies at the nearby 100-D-50:2 pipeline subsite.
116-DR-6	1608-DR Liquid Disposal Trench, Wash Pad Liquid Waste Site 3C	Institutional controls are required to prevent uncontrolled drilling or excavation into deep zone (i.e., below 4.6 m [15 ft]).	The verification sampling does not demonstrate the acceptability of unrestricted access to the deep zone.
132-DR-1	132-DR1, 1608-DR Waste Water Pumping Station, 1608DR Effluent Pumping Station	Institutional controls are required to prevent uncontrolled drilling or excavation into deep zone (i.e., below 4.6 m [15 ft]).	The acceptability of unrestricted direct exposure to belowgrade structure surfaces in the deep zone has not been demonstrated.
132-DR-2	132-DR2, 116-DR Reactor Exhaust Stack	Institutional controls are required to prevent uncontrolled drilling or excavation into deep zone (i.e., below 4.6 m [15 ft]).	The acceptability of unrestricted direct exposure to deep zone soils has not been demonstrated.

HEPA = high-efficiency particulate air
WIDS = Waste Information Data System

Table 6-3. 100-HR-1 Operable Unit Sites with Institutional Controls

WIDS Site Code	WIDS Site Name	Institutional Control	Rationale
100-H-1	105-H Rod Cave	Institutional controls are required to prevent uncontrolled drilling or excavation into deep zone (i.e., below 4.6 m [15 ft]).	The verification sampling does not demonstrate the acceptability of unrestricted access to the deep zone.
100-H-5	107-H Retention Basin Sludge Burial Site, 107H Buried Sludge Site, Sludge Disposal Trench, 107-H Grave	Institutional controls are required to prevent uncontrolled drilling or excavation into deep zone (i.e., below 4.6 m [15 ft]).	The verification sampling does not demonstrate the acceptability of unrestricted access to the deep zone.
100-H-17	116-H-2 Trench Overflow	Institutional controls are required to prevent uncontrolled drilling or excavation into deep zone (i.e., below 4.6 m [15 ft]).	The verification sampling does not demonstrate the acceptability of unrestricted access to the deep zone.
100-H-21	100-H Reactor Cooling Water Effluent Underground Pipelines	Institutional controls are required to prevent uncontrolled drilling or excavation into deep zone (i.e., below 4.6 m [15 ft]).	The verification sampling does not demonstrate the acceptability of unrestricted access to the deep zone.
100-H-22	Soil Contaminated by Effluent Line Leakage	Institutional controls are required to prevent uncontrolled drilling or excavation into deep zone (i.e., below 4.6 m [15 ft]).	The verification sampling does not demonstrate the acceptability of unrestricted access to the deep zone.
100-H-33	183-H Solar Evaporation Basins Radionuclide Components	Institutional controls are required to be maintained to ensure that groundwater is not used as a drinking water or irrigation source.	The extent of contamination remaining at the time of closure of this unit extended from deep vadose zone soils (4.6 m [15 ft] below the bottom of the basin structure) to and including saturated soils and groundwater.
116-H-1	107-H Liquid Waste Disposal Trench	Institutional controls are required to prevent uncontrolled drilling or excavation into deep zone (i.e., below 4.6 m [15 ft]).	The verification sampling does not demonstrate the acceptability of unrestricted access to the deep zone.
116-H-3	105-H Dummy Decontamination French Drain, Perf Decontamination Drain	Institutional controls are required to prevent uncontrolled drilling or excavation into deep zone (i.e., below 4.6 m [15 ft]).	The verification sampling does not demonstrate the acceptability of unrestricted access to the deep zone.
116-H-7	107-H Retention Basin, 107H	Institutional controls are required to prevent uncontrolled drilling or excavation into deep zone (i.e., below 4.6 m [15 ft]).	The verification sampling does not demonstrate the acceptability of unrestricted access to the deep zone.
118-H-6:2	105-H Reactor Ancillary Support Areas, Below-Grade Structures and Underlying Soils	Institutional controls are required to prevent uncontrolled drilling or excavation into deep zone (i.e., below 4.6 m [15 ft]).	The verification sampling does not demonstrate the acceptability of unrestricted access to the deep zone.
118-H-6:3	105-H Reactor Fuel Storage Basin and Underlying Soils	Institutional controls are required to prevent uncontrolled drilling or excavation into deep zone (i.e., below 4.6 m [15 ft]).	The verification sampling does not demonstrate the acceptability of unrestricted access to the deep zone.
118-H-6:6	118-H-6:6 Deep Zone Side Slope Soils	Institutional controls are required to prevent uncontrolled drilling or excavation into deep zone (i.e., below 4.6 m [15 ft]).	The verification sampling does not demonstrate the acceptability of unrestricted access to the deep zone.

Table 6-3. 100-HR-1 Operable Unit Sites with Institutional Controls

WIDS Site Code	WIDS Site Name	Institutional Control	Rationale
126-H-2	183-H Clearwells/Disposal Pit	Institutional controls are required to prevent uncontrolled drilling or excavation into deep zone (i.e., below 4.6 m [15 ft]).	Contamination resides within the concrete floor of the clearwell below an approximate depth of 4.9 m (16 ft).
1607-H2	1607-H2 Septic Tank and Associated Drain Field, Septic System, 1607-H2 Sanitary Sewer System, 124-H-2, 1607-H2 Septic Tank	Institutional controls are required to prevent uncontrolled drilling or excavation into deep zone (i.e., below 4.6 m [15 ft]).	The verification sampling does not demonstrate the acceptability of unrestricted access to the deep zone.

WIDS = Waste Information Data System

Table 6-4. 100-HR-2 Operable Unit Sites with Institutional Controls

WIDS Site Code	WIDS Site Name	Institutional Control	Rationale
132-H-2	117-H Filter Building Site	Institutional controls are required to prevent uncontrolled drilling or excavation into deep zone (i.e., below 4.6 m [15 ft]).	The acceptability of unrestricted access to the deep zone has not been demonstrated.
600-151	Dumping Areas 50 yards and 200 yards Downstream of River Mile 14, Military installation NW of 100-H Area	An administrative control will be documented in WIDS until a final decision concerning historic orchard pesticide use is made.	Arsenic and lead contamination is present in surface soil above direct exposure cleanup levels.

NW = northwest
WIDS = Waste Information Data System

Table 6-5. Unassigned Sites with Institutional Controls

WIDS Site Code	WIDS Site Name	Institutional Control	Rationale
116-H-6	183H Solar Evaporation Basins	Institutional controls are required to be maintained to ensure that groundwater is not used as a drinking water or irrigation source.	Clean closure of the unit was not achieved due to levels of fluoride and nitrate remaining in the soil below the excavated 4.6 m (15 ft) depth, that are above the Method B Cleanup levels of the Model Toxics Control Act (WAC 173-340).

Reference: WAC 173-340, “Model Toxics Control Act—Cleanup”
WIDS = Waste Information Data System

7 Operations and Maintenance Activities

DOE will retain the operation, surveillance, maintenance, and stewardship responsibilities for the entire infrastructure of the 100-D/H Area. Monitoring activities will be conducted to verify that the remedies remain effective, resources are protected, and contaminant migration is prevented. Activities such as maintaining signs, fences, and restrictions on excavations or land use are defined in an operations and maintenance plan for a site.

DOE will continue to be responsible for the following general activities:

- Responding to emergency situations or off-normal conditions such as the deterioration of a physical control beyond predicted levels, an error that results in a "near-miss," or the discovery of previously unidentified sources of contamination.
- Notifying the appropriate regulatory agencies of regulatory threshold exceedances, releases of hazardous substances in excess of quantities reportable under CERCLA, and spills or discharges of hazardous substances or dangerous wastes to the environment.
- Requiring long-term monitoring for source sites where residual contaminants preclude unrestricted use.

Resource management plans have been developed at the Hanford Site to protect and provide the policies, goals, and objectives for the management of the site's biological, natural, and cultural resources. These plans address the ongoing surveillance, protection, and controlled use of the resources and guide the management of resources.

CERCLA 5-year reviews will be required to assess the protectiveness of remedial actions where hazardous substances, pollutants, or contaminants are left onsite above levels that allow for unlimited use and unrestricted exposure. In addition to CERCLA, the Tri-Party Agreement (Ecology et al. 1989) allows 5-year reviews to address regulated RCRA units and past-practice units that are regulated under RCRA and/or CERCLA. The fourth CERCLA 5-year review report for the Hanford Site was completed in March 2017.

7.1 Environmental Monitoring

The 100 Area of the Hanford Site has significant natural resources including habitats for numerous endangered, protected, and listed species. In addition to the cleanup conducted under CERCLA, environmental monitoring and reporting on the 100-DR-1, 100-DR-2, 100-HR-1, and 100-HR-2 OUs is conducted annually in accordance with DOE O 231.1B, Admin Chg 1, *Environment, Safety, and Health Reporting*. DOE/RL-2017-24, *Hanford Site Environmental Report for Calendar Year 2016*, includes a summary of cleanup performance and compliance relative to applicable federal, state, and local environmental laws and regulations; DOE orders; Secretary of Energy Notices; and DOE Headquarters and site operations office directives, policies, and guidance. It summarizes specific requirements, actions, plans, and schedules identified in the Tri-Party Agreement (Ecology et al., 1989) and other compliance or consent agreements. Although the report is written each year primarily to meet DOE reporting requirements and guidelines, it is also intended to provide a broad spectrum of environmental information to DOE managers, the public, the Tribes, public officials, regulatory agencies, Hanford Site contractors, and elected representatives.

Each annual report provides an overview of activities at the site; demonstrates the status of the site's compliance with applicable federal, state, and local environmental laws and regulations, executive orders, and DOE policies and directives; and summarizes environmental data that characterize Hanford Site

environmental management performance. The report also highlights significant environmental and public protection programs and efforts.

The monitoring includes many Hanford Site activities including decommissioning, demolition, remediation, restoration, waste management, closure activities, environmental occurrences, pollution prevention, waste minimization, and monitoring activities for environmental resources. Media included in the monitoring activities are air emissions, facility effluents, surface water, river sediment, drinking water, groundwater, food/farm products, vegetation, fish and wildlife (including threatened and endangered species), radiation, and cultural resources.

Future environmental monitoring requirements will be updated in groundwater monitoring plans or remedial design/remedial action work plans to reflect the final action decisions documented in the *Record of Decision, Hanford 100 Area Superfund Site, 100-DR-1, 100-DR-2, 100-HR-1, 100-HR-2, 100-HR-3 Operable Units*.

7.2 Groundwater Monitoring

Groundwater monitoring at the Hanford Site is governed by DOE/RL-2002-59, *Hanford Site Groundwater Strategy: Protection, Monitoring, and Remediation*, and fulfills requirements for monitoring according to the *Atomic Energy Act of 1954*, RCRA, CERCLA, and WAC 173-303, "Dangerous Waste Regulations." The strategy focuses on protecting groundwater, groundwater monitoring, and groundwater remediation. Sampling and analysis in the 100-HR-3 OU, which is the groundwater beneath the 100-DR-1, 100-DR-2, 100-HR-1, and 100-HR-2 OUs, is performed according to DOE/RLO-2013-30, *Sampling and Analysis Plan for 100-HR-3 Groundwater Operable Unit Monitoring*. Monitoring results are presented in annual Hanford Site groundwater monitoring reports. Future groundwater monitoring requirements will be updated in DOE/RL-2013-30 to reflect the final action decisions documented in the *Record of Decision, Hanford 100 Area Superfund Site, 100-DR-1, 100-DR-2, 100-HR-1, 100-HR-2, 100-HR-3 Operable Units*.

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