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DOE/RL-2007-55
Revision 0

Remedial Design/Remedial Action Work Plan for 200 North Area Waste Sites Located in the 200-CW-3 Operable Unit

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

United States
Department of Energy
P.O. Box 550
Richland, Washington 99352

Approved for Public Release
Further Dissemination Unlimited

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J. D. Aardal 10/14/2008
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APPROVAL

DOE/RL-2007-55, *Remedial Design/Remedial Action Work Plan for 200 North Area Waste Sites Located in the 200-CW-3 Operable Unit*, Rev. 0

D. A. Faulk, Project Manager
Hanford Site Project
U.S. Environmental Protection Agency

10/14/08
Date

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DOE/RL-2007-55, *Remedial Design/Remedial Action Work Plan for 200 North Area Waste Sites Located in the 200-CW-3 Operable Unit*, Rev. 0

M. S. McCormick, Assistant Manager
U.S. Department of Energy
Richland Operations Office

10/14/08
Date

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ACRONYMS

ALARA	as low as reasonably achievable
ARAR	applicable or relevant and appropriate requirements
ASIL	acceptable source impact level
AWQC	ambient water quality criteria
CERCLA	*Comprehensive Environmental Response, Compensation, and Liability Act of 1980*
CFR	Code of Federal Regulations
CWC	Central Waste Complex
DOE	U.S. Department of Energy
DOE-RL	U.S. Department of Energy, Richland Operations Office
DOT	U.S. Department of Transportation
DQO	data quality objectives
Ecology	Washington State Department of Ecology
EPA	U.S. Environmental Protection Agency
ERDF	Environmental Restoration Disposal Facility
ESD	Explanation of Significant Difference
ETF	200 Areas Effluent Treatment Facility
FS	feasibility study
HASP	health and safety plan
HCP EIS	*Hanford Comprehensive Land-Use Plan Environmental Impact Statement*
HEIS	Hanford Environmental Information System
Interim Action ROD	*Interim Action Record of Decision for the 100-BC-1, 100-DR-1, and the 100-HR-1 Operable Units, Hanford Site, Benton County, Washington*
LDR	land disposal restriction
LIGO	Laser Interferometer Gravitational Wave Observatory
MAP	mitigation action plan
MCL	maximum contaminant level
MCLG	maximum contaminant level goal
MEI	maximally exposed individual
MSW	miscellaneous solid waste
MTCA	*Model Toxics Control Act*
NCP	National Contingency Plan
NPL	National Priorities List
OU	operable unit
PPE	personal protective equipment
PQL	practical quantitation limit
PTE	potential-to-emit
QA	quality assurance

QAPjP	quality assurance project plan
RAG	remedial action goal
RAO	remedial action objectives
RC	Remediation Contractor
RCT	radiological control technician
RCRA	*Resource Conservation and Recovery Act of 1976*
RCW	Revised Code of Washington
RD/RAWP	remedial design/remedial action work plan
Remaining Sites ROD	*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*
RESRAD	RESidual RADioactivity
RFP	requests for proposal
ROD	record of decision
RTD	removal, treatment, and disposal
RWP	radiological work permit
SAP	sampling and analysis plan
SDWA	*Safe Drinking Water Act*
SQER	small quantity emission rates
TAP	toxic air pollutant
TBC	To-Be-Considered
TEDE	total effective dose equivalent
Tri-Parties	U.S. Department of Energy, Richland Operations Office; Washington State Department of Ecology; U.S. Environmental Protection Agency
Tri-Party Agreement	*Hanford Federal Facility Agreement and Consent Order*
WAC	Washington Administrative Code
WSCF	Waste Sampling and Characterization Facility

METRIC CONVERSION CHART

Into metric units			Out of metric units		
If you know	Multiply by	To get	If you know	Multiply by	To get
Length			**Length**		
inches	25.40	millimeters	millimeters	0.03937	inches
inches	2.54	centimeters	centimeters	0.393701	inches
feet	0.3048	meters	meters	3.28084	feet
yards	0.9144	meters	meters	1.0936	yards
miles (statute)	1.60934	kilometers	kilometers	0.62137	miles (statute)
Area			**Area**		
square inches	6.4516	square centimeters	square centimeters	0.155	square inches
square feet	0.09290304	square meters	square meters	10.7639	square feet
square yards	0.8361274	square meters	square meters	1.19599	square yards
square miles	2.59	square kilometers	square kilometers	0.386102	square miles
acres	0.404687	hectares	hectares	2.47104	acres
Mass (weight)			**Mass (weight)**		
ounces (avoir)	28.34952	grams	grams	0.035274	ounces (avoir)
pounds	0.45359237	kilograms	kilograms	2.204623	pounds (avoir)
tons (short)	0.9071847	tons (metric)	tons (metric)	1.1023	tons (short)
Volume			**Volume**		
ounces (U.S., liquid)	29.57353	milliliters	milliliters	0.033814	ounces (U.S., liquid)
quarts (U.S., liquid)	0.9463529	liters	liters	1.0567	quarts (U.S., liquid)
gallons (U.S., liquid)	3.7854	liters	liters	0.26417	gallons (U.S., liquid)
cubic feet	0.02831685	cubic meters	cubic meters	35.3147	cubic feet
cubic yards	0.7645549	cubic meters	cubic meters	1.308	cubic yards
Temperature			**Temperature**		
Fahrenheit	subtract 32 then multiply by 5/9ths	Celsius	Celsius	multiply by 9/5ths, then add 32	Fahrenheit
Energy			**Energy**		
kilowatt hour	3,412	British thermal unit	British thermal unit	0.000293	kilowatt hour
kilowatt	0.94782	British thermal unit per second	British thermal unit per second	1.055	kilowatt
Force/Pressure			**Force/Pressure**		
pounds (force) per square inch	6.894757	kilopascals	kilopascals	0.14504	pounds per square inch

06/2001

Source: *Engineering Unit Conversions*, M. R. Lindeburg, PE., Third Ed., 1993, Professional Publications, Inc., Belmont, California.

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REMEDIAL DESIGN/REMEDIAL ACTION WORK PLAN FOR 200 NORTH AREA WASTE SITES LOCATED IN THE 200-CW-3 OPERABLE UNIT

1.0 INTRODUCTION

The Hanford Site (Figure 1-1) is a 1,517 km^2 (586 mi^2) Federal facility located in southeastern Washington State along the Columbia River. From 1943 to 1990, the primary mission of the Hanford Site was the production of nuclear materials for national defense. In July 1989, the 100, 200, 300, and 1100 Areas of the Hanford Site were placed on the National Priorities List (40 *Code of Federal Regulations* [CFR] 300, "National Oil and Hazardous Substances Pollution Contingency Plan," Appendix B, "National Priorities List") pursuant to the *Comprehensive Environmental Response, Compensation, and Liability Act* (CERCLA) *of 1980.*

The process for characterization and remediation of waste sites at the Hanford Site is addressed in the *Hanford Federal Facility Agreement and Consent Order* (Tri-Party Agreement) (Ecology et al. 2003). In 2002, the U.S. Department of Energy, Richland Operations Office (DOE-RL), the U.S. Environmental Protection Agency (EPA), and the Washington State Department of Ecology (Ecology) (the Tri-Parties) renegotiated the 200 Area waste site cleanup milestones under the Tri-Party Agreement. As part of these negotiations, the Tri-Parties agreed to incorporate evaluation of the 200-CW-3 Operable Unit (OU) (i.e., the 200 North Area) and remaining 200 North Area waste sites into the 200-CW-1 OU feasibility study (FS) and remediation processes. The 200-CW-1 OU and the 200-CW-3 OU encompass all waste sites north of the 200 East and West Areas that lie outside the exclusive-use boundary identified in the *Final Hanford Comprehensive Land-Use Plan Environmental Impact Statement* (HCP EIS) (DOE/EIS-0222-F). Combining these waste sites into a single record of decision, specifically the *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* [hereinafter referred to as the Remaining Sites Record of Decision (ROD)] (EPA 1999) was intended to streamline the decision-making process for a significant geographical area of the 200 Area National Priorities List (NPL) site and support U.S. Department of Energy's (DOE) vision of shrinking the area of land occupied by DOE at the Hanford Site. Based on the HCP EIS, the 200 North Area is designated as a conservation (mining) land-use area. In the Remaining Sites ROD, however, the 200-CW-3 OU waste sites are identified for a removal, treatment and disposal remedy under a residential exposure scenario based on the results of the confirmatory sampling and analysis activity, which will be conducted as part of this remedial action.

The 200 North Area located within the 200-CW-3 OU (Figure 1-2) includes 12 remaining waste sites, 9 of which will require confirmation and characterization sampling and analysis before further remediation can be conducted. Four additional waste sites, 216-N-2, 216-N-3, 216-N-5 and 216-N-7, underwent remediation in calendar year 2007. The twelve remaining waste sites are:

- 216-N-1, 216-N-4, and 216-N-6 waste site ponds are each located 274 meters (900 feet) south, southeast of the 212-N, 212-P and 212-R Buildings, respectively and received basin overflow cooling water from the storage of fuel in each building. The ponds range in size from approximately 152 meters (500 feet) in length with a maximum width of 61 meters (200 feet) and depths ranging from 1.83 meters (6 feet) to 2.74 meters (9 feet), including backfill material. Each pond consisted of a natural depression in the natural terrain during operation with the discharged water dispersed by evaporation and percolation into the ground.

- 200-N-3 solid waste site was identified as a series of electrical ballast pits located southwest of the 212-P Building, and northwest of the intersection of two gravel roads, one road leading north toward 212-P Building and the other leading west toward the 212-N Building. The pits were originally used as a source of rock for the railroad track beds, and now contain a large amount of gravel sized rock with some metal pipes, wood, electrical insulators, metal cans and rusted drums.

- UPR-200-N-1 and UPR-200-N-2 are unplanned release sites. The UPR-200-N-1 unplanned release site is a 300-foot (91-meter) leg of the railroad track extending south from the 212-R Building. From 1944 to 1952, irradiated fuel rods were transported to the 212-R Building from the 100 Area reactors by train in water-filled cask cars. The fuel rods were transferred from the railcars to water-filled storage basins inside the building, where the short-lived radionuclides were allowed to decay before transporting the fuel rods to the 200 Areas for processing. From 1982 to 1986, the 212-R Building was used as a maintenance facility for radiologically contaminated railcars in need of brake and wheel maintenance. Over time, movement and repair of the contaminated railcars caused the track and soil to become contaminated. Presently, two locomotives are staged over the top of the waste site. The UPR-200-N-2 unplanned release waste site is an area with approximate dimensions of 20 feet by 20 feet (6.1 meters by 6.1 meters). There are two open wood-lined holes with valves inside the radiologically posted area. The holes measure approximately 1 meter square and are approximately 1 meter in depth. The waste site is adjacent to the northern Well Pump House (referred to as Well House No. 2) foundation located east of the 212-R Building. The Well Pump House was demolished in September of 2004. The two valve boxes are associated with the old well water supply system however there is no information to explain the exact nature or cause of the radiological contamination.

- 600-285-PL, 600-286-PL, and 600-287-PL pipeline waste sites are 18-inch (46-centimeter) diameter vitrified clay pipe. Each underground pipeline serviced one 212 Building and extended to one of the 216-N Ponds for gravity-fed discharge of basin liquids.
  - 212-N Building discharged through 600-285-PL to 216-N-1 Pond
  - 212-P Building discharged through 600-286-PL to 216-N-4 Pond
  - 212-R Building discharged through 600-287-PL to 216-N-6 Pond.

- 2607-N, 2607-P, and 2607-R septic tank waste sites each consist of a rectangular concrete reinforced tank, buried to grade-level, and now filled with soil. The original tank systems consisted of a tank that was 4 feet (1.2 meters) long, 2 feet (0.6 meter wide and 8.25 feet (2.5 meters) deep (inner dimensions) with a capacity of between 210 gallons (795 liters) and 240 gallons (910 liters) based on a user capacity for 6 people. Each tank was connected to a drain field that extends south of the septic tank. Each tank was tied to a Guard House. All three guard houses have been demolished.
  - 2743-N Guard House was serviced by the 2607-N Septic System
  - 2743-P Guard House was serviced by the 2607-P Septic System
  - 2743-R Guard House was serviced by the 2607-R Septic System.

  The Septic Systems were taken out of service in the early 1950s.

  NOTE: No sampling or analysis is necessary for the three septic systems.

The map of the Hanford Site provided in Figure 1-1 depicts the 200 North Area. Figure 1-2 identifies the remaining 12 waste sites within the 200-CW-3 OU.

This remedial action supports minimization of potential releases of hazardous substances from the 200-CW-3 OU waste sites that could adversely impact human health and the environment, is protective of site personnel and the environment, and contributes to the efficient performance of the proposed 200-CW-3 OU remedial actions.

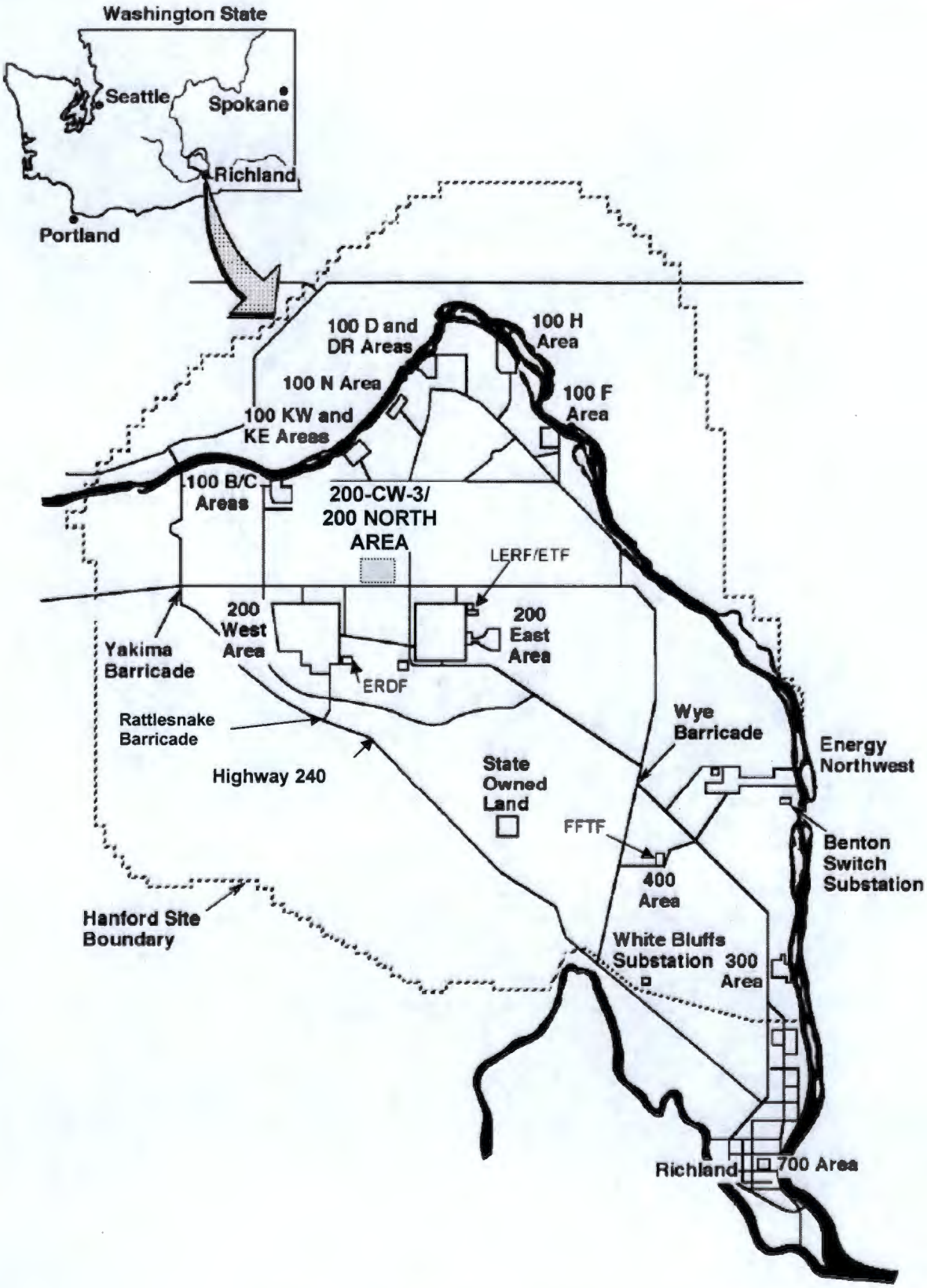

Figure 1-1. Hanford Site and 200 North Area.

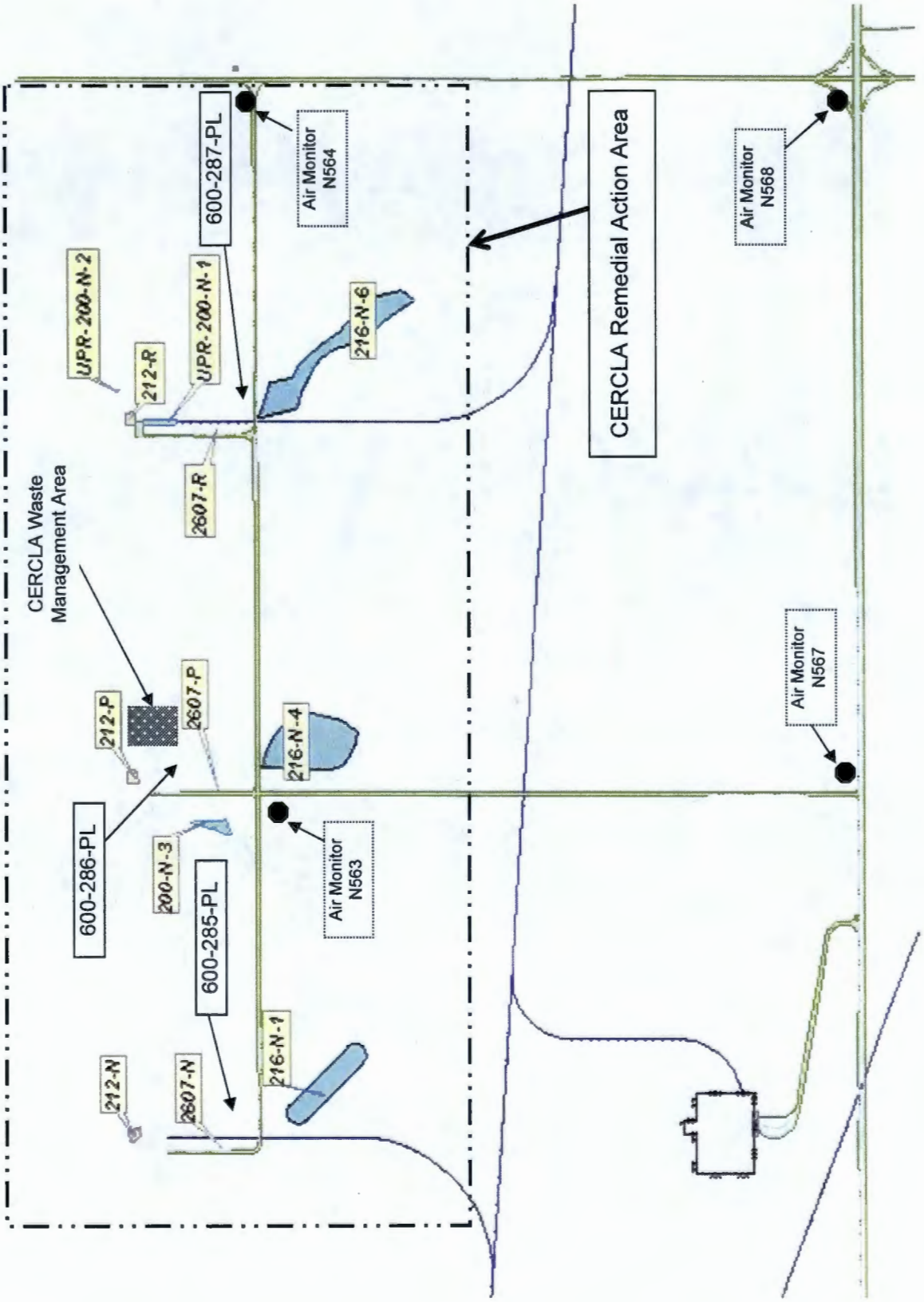

Figure 1-2. 200 North Waste Sites, CERCLA Waste Management Area, CERCLA Remedial Action Area, and Air Monitoring Within the 200-CW-3 Operable Unit.

1.1 PURPOSE

A remedial design/remedial action work plan (RD/RAWP) is used to describe the design and the implementation of the remedial action processes required by the Remaining Sites ROD. The remedial design element of a RD/RAWP discusses the requirements for backfilling or contouring or some combination of backfilling and contouring each waste site after excavation and removal of the contaminated soils, and revegetation of the disturbed areas. The remedial-action element of a RD/RAWP addresses the field-implementation process including: the initial remedy confirmation sampling and analysis; the determination of the correct remedy [e.g., No Action or Removal, Treatment, and Disposal (RTD)]; the execution of the RTD remedy (if chosen); waste sampling, analysis, treatment (as needed), packaging and disposal; waste site closeout sampling and analysis; data quality assessment evaluation to cleanup standards; and backfilling/contouring and revegetation of each remediated waste site.

1.2 SCOPE

The 200-CW-3 OU is made up of the 216-N-2, 216-N-3, 216-N-5 and 216-N-7 waste site trenches that were remediated in calendar year 2007; the 216-N-1, 216-N-4, and 216-N-6 waste site ponds; the 200-N-3 solid waste site; the UPR-200-N-1 and UPR-200-N-2 unplanned release waste sites; the 2607-N, 2607-P and 2607-R septic tanks, and the 600-285-PL. 600-286-PL and 600-287-PL pipeline waste sites The scope of the remediation of the remaining twelve waste sites will be conducted in two phases.

Phase 1 will include sampling and analysis for characterization and confirmation of the RTD remedy, excluding the three septic tanks. The septic tanks will be addressed through the Tri-Party Agreement process, since no sampling and analysis will be required. If the RTD remedy is appropriate for the nine remaining waste sites, then under Phase 2, the RTD action will be implemented as described in this RD/RAWP.

For evaluation of each waste site that does not meet the RTD remedy, a Work Instruction will be developed for each waste site and approved by the DOE-RL, and the EPA. The Work Instruction will include any waste site-specific historical data, geophysical survey information, a summary of field screening information and analytical results from the preliminary investigation sampling and analysis, conducted under the *Sampling and Analysis Plan for Remediation of 200 North Area Waste Sites Located in the 200-CW-3 Operable Unit* (SAP) (DOE/RL-2007-54), which will be used to support the decision of No Action or confirm additional sampling required. The Work Instruction will also include a sampling design and a list of contaminants of concern.

Remediation of the remaining 200-CW-3 OU waste sites is a source control action that addresses contaminated soil associated with discharges either as spills or to ditches or ponds or solid waste placed in a landfill. The scope does not include remediation of groundwater that may be beneath these waste sites

1.3 BRIEF DESCRIPTION OF THE REMAINING SITES ROD

The Remaining Sites ROD (EPA 1999) contains provisions for removal, treatment, and disposal of miscellaneous sites not covered under prior RODs. The Remaining Sites ROD contains provisions for confirmatory sampling at sites identified as candidates for no action. This designation is based on an evaluation of the sites that determined that there is a high level of confidence that these sites comply with remedial action objectives (RAOs) (DOE/RL-94-61). Furthermore, the Remaining Sites ROD provides the guidelines by which newly discovered sites may be designated for RTD or categorized as candidates for no action. This last provision supports the actions, which will be described in this RD/RAWP.

1.4 PLUG -IN APPROACH

The *Interim Action Record of Decision for the 100-BC-1, 100-DR-1, and the 100-HR-1 Operable Units, Hanford Site, Benton County, Washington* (hereinafter referred to as the Interim Action ROD) (EPA 1995), is referenced in the Remaining Sites ROD for use of the plug-in approach. The Interim Action ROD provides a regulatory framework for a "plug-in" approach for input to remediation decisions for analogous sites instead of a rigorous site characterization effort that is often conducted during a remedial investigation. The plug-in approach is proposed for any newly discovered waste site that is similar to the sites addressed in the Remaining Sites ROD. The plug-in approach allows remedial actions to begin much more quickly at a site and without the need for redundant remedy selection processes. The plug-in approach will be utilized as described in the Interim Action and Remaining Sites RODs.

2.0 BASIS FOR REMEDIAL ACTION

2.1 RECORD OF DECISION SUMMARY AND DECISION DEFINITION

2.1.1 Remedial Action Objectives

RAOs are site-specific goals that define the extent of cleanup necessary to achieve the specified level of remediation at a site. Two RAOs are derived from applicable or relevant and appropriate requirements (ARARs), the points of compliance, and the restoration time-frame for the remedial action. RAOs are formulated to meet the overall goal of CERCLA, which is to provide protection to overall human health and the environment. The RAOs have been identified for contaminated near-surface and subsurface soils for the twelve remaining 200-CW-3 OU waste sites in the Remaining Sites ROD. The RAOs and the principal requirements for achievement of the objectives are discussed in the following bullets:

- *Remedial Action Objective 1 –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.*
  - Protection will be achieved by reducing concentrations of, or limiting exposure pathways to, contaminants in the upper 4.6 m (15 ft) of the soil exposure scenario. The levels of reduction will be such that for radionuclides the EPA CERCLA risk range of 10^{-4} to 10^{-6} increased cancer risk will be achieved. To address this objective, the total dose for radionuclides (as determined by RESidual RADioactivity [RESRAD] modeling) shall not exceed 15 mrem/yr above Hanford Site background for 1,000 years following remediation and state of Washington *Model Toxics Control Act* (MTCA) Method B levels for inorganics and organics (see Table 2-1).
- *Remedial Action Objective 2 – 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 will be such that contaminants remaining in the soil after remediation do not result in an adverse impact to groundwater that could exceed maximum contaminant levels (MCL) and non-zero maximum contaminant level goals (MCLG) under the *Safe Drinking Water Act* (SDWA). The SDWA MCL for radionuclides will be attained at a designated point of compliance beneath or adjacent to the waste site in groundwater. The location and measurement of the point of compliance will be defined by EPA. Monitoring for compliance will be performed at the defined point.
  - Protection of the Columbia River from adverse impacts so contaminants remaining in the soil after remediation do not result in an impact to groundwater and, therefore, the Columbia River, that could exceed the ambient water quality criteria (AWQC) under the *Clean Water Act* for protection of fish. Since there are no AWQC for radionculides, MCLs will be used. The protection of receptors (aquatic species, with emphasis on salmon) in surface waters will be achieved by reducing or eliminating further contaminant loadings to groundwater so receptors at the groundwater discharge in the Columbia River are not subject to additional adverse risks. Measurement of compliance will be at a near-shore well, in the down-gradient plume. The location and measurement will be defined by EPA.

Table 2-1. Look-Up Values Summary: Contaminant-Specific Cleanup Levels.

Contaminant	First Remedial Action Objective – Protection from Direct Exposure		Second Remedial Action Objective – Protection of Groundwater/Columbia River		Look-Up Values Summary	
	Remedial Action Goal for Nonradionuclides (mg/kg)	Remedial Action Goal for Radionuclides (pCi/g)	Contaminant-Specific Concentration in Soil Protective of Groundwater (pCi/g or mg/kg)	Contaminant-Specific Concentration in Soil Protective of the Columbia River (pCi/g or mg/kg)	Remedial Action Goal – Shallow Zone [<4.6 m (15 ft)][a]	Remedial Action Goal – Deep Zone [>4.6 m (15 ft)][b,c]
Americium-241	NA	31.1	1,577,000	1,577,000	31.1	1,577,000
Cesium-137	NA	6.2	[d]	[d]	6.2	NA
Cobalt-60	NA	1.4	[d]	[d]	1.4	NA
Europium-152	NA	3.3	[d]	[d]	3.3	NA
Europium-154	NA	3.0	[d]	[d]	3.0	NA
Europium-155	NA	125	[d]	[d]	125	NA
Nickel-63	NA	4,026	[d]	[d]	4,026	NA
Plutonium-238	NA	37.4	1,123	1,123	37.4	1,123
Plutonium-239/240	NA	33.9	718,600	718,600	33.9	718,600
Strontium-90	NA	4.5	[d]	[d]	4.5	NA
Technetium-99	NA	15	15[e]	15[e]	15[e]	15[e]
Thorium-232	NA	1.3	[d]	[d]	1.3	NA
Tritium (H-3)	NA	510	35.5	106.7	35.5	35.5
Uranium-233/234	NA	1.1	1.1[f]	1.1[f]	1.1[f]	1.1[f]
Uranium-235	NA	1.0	1.0[e]	1.0[e]	1.0[e]	1.0[e]
Uranium-238	NA	1.1	1.1[f]	1.1[f]	1.1[f]	1.1[f]
Antimony	32	NA	6.0[e]	6.0[e]	6.0[e]	6.0[e]
Arsenic	6.5[f]	NA	6.5[f]	6.5[f]	6.5[f]	6.5[f]
Barium	5,600	NA	[d]	[d]	5,600	NA
Cadmium	80	NA	[d]	[d]	80	NA
Chromium (III)	80,000	NA	[d]	[d]	80,000	NA
Chromium (VI)	400	NA	8.0	2.2	2.2	2.2
Lead	353	NA	[d]	[d]	353	NA
Manganese	11,200	NA	[d]	[d]	11,200	NA
Mercury	24	NA	[d]	[d]	24	NA
Zinc	24,000	NA	[d]	[d]	24,000	NA

Table 2-1. Look-Up Values Summary: Contaminant-Specific Cleanup Levels.

Contaminant	First Remedial Action Objective – Protection from Direct Exposure		Second Remedial Action Objective – Protection of Groundwater/Columbia River		Look-Up Values Summary	
	Remedial Action Goal for Nonradionuclides (mg/kg)	Remedial Action Goal for Radionuclides (pCi/g)	Contaminant-Specific Concentration in Soil Protective of Groundwater (pCi/g or mg/kg)	Contaminant-Specific Concentration in Soil Protective of the Columbia River (pCi/g or mg/kg)	Remedial Action Goal – Shallow Zone [<4.6 m (15 ft)][a]	Remedial Action Goal – Deep Zone [>4.6 m (15 ft)][b,c]
Polychlorinated Biphenyl	0.5	NA	[d]	[d]	0.5	NA

[a] In the shallow zone, cleanup must achieve the direct exposure remedial action objectives (RAO) and the groundwater/Columbia River RAO; therefore, the lowest value among the "protection from Direct Exposure," "Protective of Groundwater," and "Protective of the Columbia River" values is the applicable look-up value.
[b] In the deep zone, cleanup must achieve the groundwater/Columbia River RAO; therefore, the lowest value between the "Protective of Groundwater" and the "Protective of the Columbia River" values is the applicable look-up value.
[c] Deep zone remedial action goals are not applicable for protection from direct exposure to radionuclides because a potentially exposed individual in a basement is protected from gamma radiation by 0.9 m (3 ft) of soil and a concrete floor.
[d] The RESRAD model predicts the contaminant will not reach groundwater within a 1,000-year time frame.
[e] The remedial action goal is below the practical quantitation limit (PQL). The value presented is the PQL.
[f] The remedial action goal is below background. The value presented is background.
Values in the table are lookup values based on the generic site model. Site-specific remedial action goals will be calculated for site close-out verification using site-specific information.

Once RAOs were identified, it was necessary to develop numerical Remedial Action Goals (RAGs) for use in remedial design and to verify that the remedial action has achieved the RAOs. The RAO framework involved the following:

- Calculating contaminant-specific concentrations in soil that correspond to the RAGs for use in remedial design (Section 2.1.4)

- Developing a verification or waste site closeout methodology documented in an approved sampling and analysis plan for use in a remedial action to determine if residual concentrations in soil achieve the RAGs (Section 3.1.5).

2.1.2 Remedial Action Goals

RAGs are the contaminant-specific numerical cleanup criteria developed to ensure that the remedial actions to be implemented will meet the RAOs set forth in Section 2.1.1 and the Remaining Sites ROD (EPA 1999). The RAGs are based on ARARs, To-Be-Considered (TBC) information, points of compliance, and assumed land use for the remedial action identified in the Remaining Sites ROD (EPA 1999).

Meeting the 200-CW-3 OU RAGs and the ARARs, and by extension, achieving the RAOs, can be accomplished by reducing concentrations (or activities) of contaminants to RAG levels or by eliminating potential exposure pathways/routes.

2.1.3 Application of Remedial Action Goals

The decision process for determining the extent of remediation of the waste sites will incorporate site-specific factors. The waste sites are represented by the following general categories. The application of RAGs to meet RAOs for each site category is discussed below.

- Shallow zone: For shallow sites, where the soil contamination is present within the top 4.6 m (15 ft), RAOs will be achieved when:

  - Contaminant concentrations are demonstrated to be at or below RAGs based on Washington Administrative Code (WAC) 173-340-740(3) (1996) and the 15 mrem/year standard assuming no land-use restrictions (i.e., residential scenario), and

  - Contaminant concentrations meet RAGs that provide protection of groundwater and the Columbia River.

- Deep zone: For deep sites, where contamination continues at 4.6 m (15 ft) below the surface, RAGs protective of groundwater and the Columbia River must be met. The extent of remediation will be determined by evaluating several "balancing factors". These factors, agreed to by the Tri-Parties in the Remaining Sites and Interim RODs, are used to determine the extent of site-specific remediation. These factors include:

  - Reduction of risk by decay of short-lived (half-life of less than 30.2 years) radionuclides
  - Protection of human health and the environment
  - Remediation costs
  - Sizing of the Environmental Restoration Disposal Facility (ERDF)
  - Worker safety
  - Presence of ecological and cultural resources

- Use of institutional controls
- Long-term monitoring costs.

These balancing factors are discussed further in Section 2.1.5. The contaminant levels remaining at these sites must be protective of groundwater and the Columbia River.

The RAGs for both shallow and deep zones for the 200-CW-3 OU waste sites are listed in Table 2-1.

2.1.4 Contaminant-Specific Concentrations in Soil

As discussed in Section 2.1.1, representative contaminant-specific concentrations in soil have been calculated that correspond to the RAGs described in Section 2.1.2. These contaminant-specific concentrations are used as follows:

- To identify target volumes in soil that require remediation for purposes of remedial design;
- To identify minimum quantitation limits for contaminants in soil that must be achieved by analytical systems used during the remedial action; and
- To provide "lookup" values for use in the field to rapidly evaluate analytical data collected during the remedial action.

These contaminant-specific concentrations correspond to the RAGs, but are not intended for use in verifying that the remedial action is complete at a site. The concentrations represent values that individually equate to WAC 173-340 (1996) values or a 15 mrem/year dose rate. For radionuclides, the expectation is that most sites will have multiple radionuclides driving the cleanup; therefore, a cumulative dose of 15 mrem/year would potentially result in individual radionuclide concentrations that are lower than these "lookup" values. The verification process is further defined in Section 3.6. A summary of all representative lookup values can be found in Table 2-1.

2.1.5 Balancing Factors

Based on existing knowledge, it is possible that residual wastes may remain in place at sites where (1) contamination continues at depths below 4.6 m (15 ft) or (2) marginally-contaminated material is present. The *Interim Action Record of Decision for the 100-BC-1, 100-DR-1, and the 100-HR-1 Operable Units, Hanford Site, Benton County, Washington* (hereinafter referred to as the Interim Action ROD) (EPA 1995), is referenced in the Remaining Sites ROD for the use of balancing factors. The Interim Action ROD provides the decision framework to evaluate leaving some contamination in place:

> "The decision to leave wastes in place at such sites will be a site-specific determination made during remedial design and remedial action activities that will balance the extent of remediation with protection of human health and the environment, disturbance of ecological and cultural resources, worker health and safety, remediation costs, operation and maintenance costs, and radioactive decay of short-lived (half-life less than 30.2 years [e.g., ^{137}Cs] radionuclides). The application of the criteria for the balancing factors, the process for determining the extent of remediation at deep sites, and the public involvement process during such determination shall be specified further in the Remedial Design Report."

In addition to the balancing factors identified above, the section of the Interim Action ROD entitled "Scope and Role of Response Action Within Site Strategy" identifies three additional factors: sizing of the ERDF, the use of institutional controls, and long-term monitoring costs.

The balancing factors can be divided into two categories: (1) factors affecting the size of the excavation and (2) factors associated with cost. Three of the balancing factors – minimizing disturbance of cultural or ecological resources, minimizing the size of ERDF (minimize waste volume), and protecting worker health and safety - weigh in favor of minimizing excavation size. The other balancing factors suggest that the extent of remediation and associated costs be weighed against the reliability and cost of institutional controls. The two categories, when weighed with protection of human health and the environment, lead to the following conclusions:

- Contaminant concentrations below 4.6 m (15 ft) will be required to meet the criteria for protection of the groundwater and the Columbia River, as stated in RAO 2 in Section 2.1.1. For residual contamination below 4.6 m (15 ft) shown to impact groundwater or the Columbia River, the balancing factors may be invoked.

- Radioactive contaminants present below the 4.6-m (15-ft) level will be required to be equal to or below concentrations so that the external radiation to a potential receptor in a basement 3.7 m (12 ft) belowground (in combination with radiation exposure from other contaminant pathways) is below 15 mrem/year.

- In the event that DOE-RL relinquishes full control of the site, deed restrictions will be applied, as necessary, to prohibit excavation and drilling below the 4.6-m (15-ft) level in those cases where contaminants meet the required groundwater/river protection cleanup goals but exceed concentrations that are protective for direct exposure.

- For areas where lateral movement of contaminants, low radionuclide levels, or small quantities of disposed waste would generate marginally-contaminated material to be disposed of at ERDF, or where it can be demonstrated that radionuclide concentrations will result in achieving an acceptable risk range within a reasonable period of time, the balancing factors may be invoked.

In the event that the consideration of balancing factors results in a recommendation to leave contaminated soils or debris in place at a waste site at levels that exceed the RAOs, both the Interim Action and the Remaining Sites RODs state that the Tri-Parties will initiate public involvement prior to making a decision to leave contamination in place. The public involvement process is described for an Explanation of Significant Difference (ESD) in the *Community Relations Plan for the Hanford Federal Facility Agreement and Consent Order* (Ecology et al. 2003).

Deed/lease restrictions or other institutional controls and long-term monitoring may be required to prevent human exposure to groundwater and/or contaminated soils or interference with the integrity of the cleanup action for any site. Potential deed restrictions could prohibit the drilling of any well to groundwater or any activity that would result in soil disturbance greater than 3.7 m (12 ft) below the surface. The requirement for deed/lease restrictions will be documented in the site closeout package (see Section 3.7, "CERCLA Cleanup Documentation"). Public comment would not be sought for deed/lease restrictions deemed necessary to prevent interference with the integrity of the cleanup action.

2.1.6 Applicable or Relevant and Appropriate Requirements

The *National Oil and Hazardous Substances Contingency Plan* (NCP) (40 CFR 300) and the Remaining Sites ROD require that the remedial actions described in this document comply with the ARARs established in the ROD. The purpose of this section is to discuss how each of the ARARs identified in the ROD will be met during the remedial action. Tables 2-2 and 2-3 identify specific regulatory sections in each overarching regulation which is an ARAR, with an explanation as to why it is an ARAR. In addition, TBC information consists of nonpromulgated advisories or guidance issued by federal or state governments that are not binding legally and do not have the status of ARARs. However, as appropriate,

TBCs should be considered in determining the remedial actions necessary for protection of human health and the environment.

All activities associated with the remedial action for the source area sites covered under the Remaining Sites ROD will occur onsite, as defined in the NCP. As a result, the remedial actions described in this document need only meet the substantive requirements of the ARARs established in the ROD.

If any requirement that would be applicable or relevant and appropriate for the selected remedial action is promulgated subsequent to the Remaining Sites ROD (EPA 1999) being signed, EPA will review the requirement and determine whether the selected remedy is still protective in light of the new requirement. This determination will be documented in the Administrative Record.

Table 2-2. Identification of Federal Applicable or Relevant and Appropriate Requirements and To Be Considered for the Remedial Action.

ARAR Citation	ARAR or TBC	Requirement	Rationale for Use
Polychlorinated Biphenyls (PCBs) Manufacturing, Processing, Distribution in Commerce, and Use Prohibitions, 40 CFR 761			
"Applicability," Specific Subsections: 40 CFR 761.50(b)(1) 40 CFR 761.50(b)(2) 40 CFR 761.50(b)(3) 40 CFR 761.50(b)(4) 40 CFR 761.50(b)(7) 40 CFR 761.50(c)	ARAR	These regulations establish standards for the storage and disposal of PCB waste.	The substantive requirements of these regulations are applicable or relevant and appropriate to the storage and disposal of PCB liquids, items, remediation waste, and bulk product waste at ≥ 50 ppm. The specific subsections identified from 40 CFR 761.50(b) reference the specific sections for the management of PCB waste type. The disposal requirements for radioactive PCB waste are addressed in 40 CFR 761.50(b)(7).
National Archaeological and Historic Preservation Act of 1976 16 USC 469aa-mm	ARAR	Requires that remedial actions at 200-CW-3 OU waste sites do not cause the loss of any archaeological or historic data. This act mandates preservation of the data and does not require protection of the actual waste site or facility.	Archeological and historic sites have been identified within the 100 and 200 Areas, therefore the substantive requirements of this act are applicable to actions that might disturb these sites.
National Historic Preservation Act of 1966 16 USC 470, Section 106	ARAR	Requires federal agencies to consider the impacts of their undertaking on cultural properties through identification, evaluation and mitigation processes, and consultation with interested parties.	Cultural and historic sites have been identified within the 100 and 200 Areas, and therefore the substantive requirements of this act are applicable to actions that might disturb these types of sites.
Native American Graves Protection and Repatriation Act, 25 USC 3001, et seq.	ARAR	Establishes federal agency responsibility for discovery of human remains, associated and unassociated funerary objects, sacred objects and items of cultural patrimony.	Substantive requirements of this act are applicable if remains and sacred objects are found during remediation and will require Native American Tribal consultation in the event of discovery.
Endangered Species Act of 1973 16 USC 1531 et seq, subsection 16 USC 1536(c)	ARAR	Prohibits actions by federal agencies that are likely to jeopardize the continued existence of listed species or result in the destruction or adverse modification or critical habitat. If remediation is within critical habitat or buffer zones surrounding threatened or endangered species, mitigation measures must be taken to protect the resource.	Substantive requirements of this act are applicable if threatened or endangered species are identified in areas where remedial actions will occur.

Table 2-2. Identification of Federal Applicable or Relevant and Appropriate Requirements and To Be Considered for the Remedial Action.

ARAR Citation	ARAR or TBC	Requirement	Rationale for Use
National Primary Drinking Water Standards, 40 CFR 141			
"Maximum Contaminant Levels for Organic Contaminants," 40 CFR 141.61	ARAR	Establishes MCLs that are drinking water criteria designed to protect human health from the potential adverse effects of organic contaminants in drinking water.	The groundwater in the 200-CW-3 OU is not currently used for drinking water. However, Central Plateau groundwater may be considered a potential drinking water source and because the groundwater discharges to the Columbia River (which is used for drinking water), the substantive requirements in 40 CFR 141.61 for organic constituents are relevant and appropriate.
"Maximum Contaminant Levels for Inorganic Contaminants," 40 CFR 141.62	ARAR	Establishes MCLs that are drinking water criteria designed to protect human health from the potential adverse effects of inorganic contaminants in drinking water.	The groundwater in the 200-CW-3 OU is not currently used for drinking water. However, Central Plateau groundwater may be considered a potential drinking water source and because the groundwater discharges to the Columbia River (which is used for drinking water), the substantive requirements in 40 CFR 141.62 for inorganic constituents are relevant and appropriate.
"Maximum Contaminant Levels for Radionuclides," 40 CFR 141.66	ARAR	Establishes MCLs that are drinking water criteria designed to protect human health from the potential adverse effects of radionuclides in drinking water.	The groundwater in the 200-CW-3 OU is not currently used for drinking water. However, Central Plateau groundwater may be considered a potential drinking water source and because the groundwater discharges to the Columbia River (which is used for drinking water), the substantive requirements in 40 CFR 141.66 for radionuclides are relevant and appropriate.
Regulations pursuant to the *Resource Conservation and Recovery Act of 1976* and implemented through WAC 173-303, "Dangerous Waste Regulations".			

40 CFR 61, "National Emission Standards for Hazardous Air Pollutants."
40 CFR 141, "National Primary Drinking Water Standards."
40 CFR 761, "Polychlorinated Biphenyls (PCBs) Manufacturing, Processing, Distribution in Commerce, and Use Prohibitions."
WAC 173-303, "Dangerous Waste Regulations."

ARAR = applicable or relevant and appropriate requirement.
CFR = *Code of Federal Regulations.*
MCL = maximum contaminant level.
PCB = polychlorinated biphenyl.
TBC = to be considered.
WAC = Washington Administrative Code.

Table 2-3. Identification of State Applicable and Relevant or Appropriate Requirements and To Be Considered for the Remedial Action.

ARAR Citation	ARAR or TBC	Requirement	Rationale for Use
Dangerous Waste Regulations, WAC 173-303			
"Identifying Solid Waste," WAC 173-303-016	ARAR	Identifies those materials that are and are not solid waste.	Substantive requirements of these regulations are applicable because they define how to determine which materials are subject to the designation regulations. Specifically, materials that are generated for removal from the CERCLA site during the remedial action would be subject to the procedures for identifying solid waste to ensure proper management.
"Recycling Processes Involving Solid Waste," WAC 173-303-017	ARAR	Identifies materials that are and are not solid waste when recycled.	Substantive requirements of these regulations are applicable because they define how to determine which materials are subject to the designation regulations. Specifically, materials that are generated for removal from the CERCLA site during the remedial action would be subject to the procedures for identifying solid waste to ensure proper management.
"Designation of Dangerous Waste," WAC 173-303-070(3)	ARAR	Establishes the method for determining whether a solid waste is or is not a dangerous waste or an extremely hazardous waste.	Substantive requirements of these regulations are applicable to materials encountered during the remedial action. Specifically, solid waste generated for removal from the CERCLA site during this remedial action would be subject to the dangerous waste designation procedures to ensure proper management.
"Excluded Categories of Waste," WAC 173-303-071	ARAR	Describes those waste categories that are excluded from the requirements of WAC 173-303 (excluding WAC 173-303-050).	The conditions of this requirement are applicable to remedial actions in the 200-CW-3 OU should waste identified in WAC 173-303-071 be encountered.
"Conditional Exclusion of Special Wastes," WAC 173-303-073	ARAR	Establishes the conditional exclusion and the management requirements of special waste, as defined in WAC 173-303-040.	Substantive requirements of these regulations are applicable to materials encountered during the remedial action. Specifically, the substantive standards for management of special waste are applicable to the interim management of certain waste that will be generated during the remedial action.
"Requirements for Universal Waste," WAC 173-303-077	ARAR	Identifies waste exempted from regulation under WAC 173-303-140 and WAC 173-303-170 through 173-303-9907 (excluding WAC 173-303-960). This waste is subject to regulation under WAC 173-303-573.	Substantive requirements of these regulations are applicable to materials encountered during the remedial action. Specifically, the substantive standards for management of universal waste are applicable to the interim management of certain waste that will be generated during the remedial action.
"Recycled, Reclaimed, and Recovered Wastes," WAC 173-303-120 Specific Subsections: WAC 173-303-120(3) WAC 173-303-120(5)	ARAR	These regulations define the requirements for the recycling of materials that are solid and dangerous waste. Specifically, WAC 173-303-120(3) provides for the management of certain recyclable materials, including spent refrigerants, antifreeze, and lead-acid batteries. WAC 173-303-120(5) provides for the recycling of used oil.	Substantive requirements of these regulations are applicable to certain materials that might be encountered during the remedial action. Recyclable materials that are exempt from regulation as dangerous waste and that are not otherwise subject to CERCLA as hazardous substances can be recycled and/or conditionally excluded from certain dangerous waste requirements.

Table 2-3. Identification of State Applicable and Relevant or Appropriate Requirements and To Be Considered for the Remedial Action.

ARAR Citation	ARAR or TBC	Requirement	Rationale for Use
"Land Disposal Restrictions," WAC 173-303-140(4)	ARAR	This regulation establishes state standards for land disposal of dangerous waste and incorporates by reference the Federal land disposal restrictions of 40 CFR 268 that are applicable to solid waste designated as dangerous or mixed waste in accordance with WAC 173-303-070(3).	The substantive requirements of this regulation are applicable to materials encountered during the remedial action. Specifically, dangerous and/or mixed waste generated and removed from the CERCLA site during the remedial action for offsite (as defined by CERCLA) land disposal would be subject to the identification of applicable land-disposal restrictions at the point of waste generation. The actual offsite treatment of such waste would not be ARAR to this remedial action, but would be subject to all applicable laws and regulations.
"Requirements for Generators of Dangerous Waste," WAC 173-303-170	ARAR	Establishes the requirements for dangerous waste generators.	Substantive requirements of these regulations are applicable to materials encountered during the remedial action. Specifically, the substantive standards for management of dangerous and/or mixed waste are applicable to the interim management of certain waste that will be generated during the remedial action. For purposes of this remedial action, WAC 173-303-170(3) includes the substantive provisions of WAC 173-303-200 by reference. WAC 173-303-200 further includes certain substantive standards from WAC 173-303-630 and -640 by reference.
Model Toxics Control Act -- Cleanup, WAC 173-340			
"Soil Cleanup Standards for Unrestricted Land Use," WAC 173-304-740(3)	ARAR	Identifies the methods used to identify risk-based concentrations and their use in the selection of a cleanup action. Cleanup and remediation levels are based on protection of human health and the environment, the location of the site, and other regulations that apply to the site. The standard specifies cleanup goals that implement the strictest Federal or state cleanup criteria.	The State-established risk-based concentrations for soils and protection of groundwater are relevant and appropriate to the 200-CW-3 OU waste site remedial action because no Federal standard exists.
Minimum Functional Standards for Solid Waste Handling, WAC 173-304			
"On-Site Containerized Storage, Collection and Transportation Standards for Solid Waste," WAC 173-304-200(2)	ARAR	Establishes the requirements for the onsite storage of solid waste that is not radioactive or dangerous waste.	Substantive requirements of these regulations are applicable to materials encountered during the remedial action. Specifically, nondangerous, nonradioactive solid waste (i.e., hazardous substances that are only regulated as solid waste) that will be containerized for remedial from the CERCLA site would be managed on site according to the substantive requirements of this standard.
Solid Waste Handling Standards, WAC 173-350			
"On-Site Storage, Collection and Transportation Standards," WAC 173-350-300	ARAR	Establishes the requirements for the temporary storage of solid waste in a container on site and the collecting and transporting of the solid waste.	The substantive requirements of this newly promulgated rule are relevant and appropriate to the onsite collection and temporary storage of solid waste at the 200-CW-3 OU waste sites. Compliance with this regulation is being implemented in phases for existing areas.

Table 2-3. Identification of State Applicable and Relevant or Appropriate Requirements and To Be Considered for the Remedial Action.

ARAR Citation	ARAR or TBC	Requirement	Rationale for Use
General Regulations for Air Pollution Sources, WAC 173-400			
Washington Clean Air Act of 1967, Ch. 70.94 and Ch. 43.21A RCW General Regulations for Air Pollution, WAC 173-400 Specific subsection: WAC 173-400-040	ARAR	The regulation requires that all sources of air contaminants meet emission standards for visible, particulate, fugitive, odors, and hazardous air emissions. This section requires that all emission units use reasonably available control technology, which may be determined for some source categories to be more stringent than the emission limitations listed in this chapter.	Substantive requirements of the general standards for control of fugitive emissions are applicable to remedial actions at the site due to the generation of fugitive dust that occurs during excavation or other types of construction activities.
Specific subsection: WAC 173-400-113	ARAR	This regulation requires that methods of controls be employed to minimize the release of air contaminants resulting from new or modified sources of regulated emissions. Emissions are to be minimized through application of best available control technology.	Substantive requirements of this regulation would be applicable to remedial actions performed at the site if a treatment technology that emits regulated air emissions were necessary during the implementation of the remedial action.
Controls for New Sources of Toxic Air Pollutants, WAC 173-460 Specific subsections: WAC 173-460-030 WAC 173-460-060 WAC 173-460-070	ARAR	This regulation requires that emissions of toxic air contaminants listed in the regulation be quantified, and ambient impacts evaluated. Best available control technology for toxics shall be used as determined by the lead agency to protect human health and the environment.	Substantive requirements of these regulations would be applicable to remedial actions performed at the site, if a treatment technology that emits toxic air emissions were necessary during the implementation of the remedial action.
Radiation Protection -- Air Emissions, WAC 246-247			
WAC 246-247-035(1)(a)(ii)	ARAR	This regulation establishes requirements of 40 CFR 61, Subpart H, by reference. Radionuclide airborne emissions from the facility shall be controlled so as not to exceed amounts that would cause an exposure to any member of the public of greater than 10 millirem per year effective dose equivalent.	Substantive requirements of this standard are applicable because this remedial action may include activities such as excavation, decontamination and stabilization of contaminated areas and equipment, and operation of exhausters and vacuums, each of which may provide airborne emissions of radioactive particulates to unrestricted areas. As a result, requirements limiting emissions apply. This is a risk-based standard for the purposes of protecting human health and the environment.
"Standards," WAC 246-247-040(3) WAC 246-247-040(4)	ARAR	Emissions shall be controlled to ensure that emission standards are not exceeded.	Substantive requirements of this standard are applicable because fugitive, diffuse and point source emissions of radionuclides to the ambient air may result from activities, such as excavation of contaminated soils and operation of exhauster and vacuums, performed during the remedial action. This standard exists to ensure compliance with emission standards.

Table 2-3. Identification of State Applicable and Relevant or Appropriate Requirements and To Be Considered for the Remedial Action.

ARAR Citation	ARAR or TBC	Requirement	Rationale for Use
"Monitoring, testing, and quality assurance, "WAC 246-247-075(1) and –(2) and –(4)	ARAR	Establishes the monitoring, testing, and quality assurance requirements for radioactive air emissions from major sources. Effluent flow rate measurements shall be made and the effluent stream shall be directly monitored continuously with an in-line detector or representative samples of the effluent stream shall be withdrawn continuously from the sampling site following the specified guidance. The requirements for continuous sampling are applicable to batch processes when the unit is in operation. Periodic sampling (grab samples) may be used only with lead agency prior approval. Such approval may be granted in cases where continuous sampling is not practical and radionuclide emission rates are relatively constant. In such cases, grab samples shall be collected with sufficient frequency so as to provide a representative sample of the emissions. When it is impractical to measure the effluent flow rate at a source in accordance with the requirements or to monitor or sample an effluent stream at a source in accordance with the site selection and sample extraction requirements, the facility owner or operator may use alternative effluent flow rate measurement procedures or site selection and sample extraction procedures as approved by the lead agency. Emissions from nonpoint and fugitive sources of airborne radioactive material shall be measured. Measurement techniques may include, but are not limited to sampling, calculation, smears, or other reasonable method for identifying emissions as determined by the lead agency.	Substantive requirements of this standard are applicable because fugitive and nonpoint source emissions of radionuclides to the ambient air may result from activities, such as excavation of contaminated soils and operation of exhauster and vacuums, performed during the remedial action. This standard exists to ensure compliance with emission standards.
"Monitoring, testing, and quality assurance," WAC 246-247-075(3)	ARAR	Methods to implement periodic confirmatory monitoring for minor sources may include estimating the emissions or other methods as approved by the lead agency.	Fugitive and diffuse emissions from the excavation and related activities will require periodic confirmatory measurements to verify low emissions.

Table 2-3. Identification of State Applicable and Relevant or Appropriate Requirements and To Be Considered for the Remedial Action.

ARAR Citation	ARAR or TBC	Requirement	Rationale for Use
"Monitoring, testing, and quality assurance," WAC 246-247-075(8)	ARAR	Facility (site) emissions resulting from non-point and fugitive sources of airborne radioactive material shall be measured. Measurement techniques may include ambient air measurements, or in-line radiation detector or withdrawal of representative samples from the effluent stream, or other methods as determined by the lead agency.	Fugitive and diffuse emissions of airborne radioactive material due to excavation and related activities will require measurement.
"General Standards," WAC 246-247-040(4) and "General Standards for Maximum Permissible Emissions," WAC 173-480-050(1)	ARAR	At a minimum all emission units shall make every reasonable effort to maintain radioactive materials in effluents to unrestricted areas, as low as reasonably achievable (ALARA). Control equipment of facilities operating under ALARA shall be defined as reasonably available control technology (RACT) and ALARACT.	The potential for fugitive and diffuse emissions due to excavation and related activities will require efforts to minimize those emissions.
"Emission Monitoring and Compliance Procedures," WAC 173-480-070-(2)	ARAR	Determine compliance with the public dose standard by calculating exposure at the point of maximum annual air concentration in an unrestricted area where any member of the public may be.	Fugitive and diffuse emissions resulting from excavation and related activities will require assessment and reporting.
To-Be-Considered pursuant to relevant waste site acceptance criteria			
Environmental Restoration Disposal Facility Waste Acceptance Criteria (WCH-191)	TBC	This document establishes waste acceptance criteria for ERDF.	Waste destined for management at ERDF must meet acceptance criteria to ensure proper disposal.

40 CFR 61, Subpart H, "National Emission Standards for Emissions of Radionuclides Other than Radon from Department of Energy Facilities."
Comprehensive Environmental Response, Compensation, and Liability Act of 1980, 42 USC 9601, et seq.
Resource Conservation and Recovery Act of 1976, 42 USC 6901, et seq.
WAC 173-303, "Dangerous Waste Regulations."
WAC 173-304, "Minimum Functional Standards for Solid Waste Handling."
WAC 173-340, "Model Toxics Control Act -- Cleanup."
WAC 173-350, "Solid Waste Handling Standards."
WAC 173-400, "General Regulations for Air Pollution Sources."
WAC 173-460, "Controls for New Sources of Toxic Air Pollutants."
WAC 173-480, "Ambient Air Quality Standards and Emission Limits for Radionuclides."
WAC 246-247, "Radiation Protection -- Air Emissions."

ARAR = applicable or relevant and appropriate requirement.
CERCLA = *Comprehensive Environmental Response, Compensation, and Liability Act of 1980.*
CFR = *Code of Federal Regulations.*
OU = operable unit.
RCRA = *Resource Conservation and Recovery Act of 1976.*
TBC = to be considered.
WAC = Washington Administrative Code.

2.1.7 Remedy Description

If the RTD remedy specified in the Remaining Sites ROD is selected for the 216-N-1, 216-N-4, and 216-N-6 waste site ponds; the 200-N-3 solid waste site; the UPR-200-N-1 and UPR-200-N-2 unplanned release waste sites; and the 600-285-PL, 600-286-PL, and 600-287-PL pipeline waste sites within the 200-CW-3 OU; then the contaminated soils will be removed and dispose at ERDF, with treatment, as required.

Treatment will be required for land disposal restriction (LDR) material unless a treatability variance or ARAR waiver is requested by DOE-RL and approved by the regulatory agencies. The expected condition is that toxicity characteristic suspect waste may exist. If LDR wastes are encountered, the requirements of 40 CFR 268 will be applied. Should LDR material be encountered, it will be temporarily stored within the CERCLA Remedial Action Area and disposed of in accordance with applicable regulations (Section 2.1.6). A contingency plan will be implemented if and when LDR wastes are detected. If treatment is required to address LDR wastes, DOE-RL will obtain regulatory agency approval.

The Remaining Sites ROD (EPA 1999) was issued to address the selected remedy of RTD for waste sites in the 100 Area and in the 200-CW-3 OU located in the 200 North Area. These additional sites were identified for use of the plug-in approach for remedy selection. These sites were identified as candidate sites needing further evaluation to support a no-action or a RTD action decision. Since these sites need further evaluation, the "observational approach" will be used to allow for remediation of waste sites with limited information using a "test as you go" approach to determine the nature and extent of contamination until cleanup goals have been met.

2.2 REMEDIAL DESIGN

The remaining sites remedial design for the 200-CW-3 OU waste sites requires remediation after an onsite specific evaluation which will be addressed through implementation of the SAP (DOE/RL-2007-54). The onsite evaluation will provide information on the type, spread, and level of contamination.

For the RTD remedy waste sites, a detailed design will be developed for each waste site and provided to DOE-RL and the EPA upon request.

3.0 REMEDIAL ACTION APPROACH AND MANAGEMENT

Initiation of full-scale remedial action to accomplish the goals set forth in the Remaining Sites ROD (EPA 1999) requires completion of numerous interdependent tasks. Key tasks are documented in the following sections, and include both Phase 1 and Phase 2 activities with implementation of the RTD remedy under Phase 2 for field remediation activities.

3.1 REMEDIAL ACTION WORK ACTIVITIES

RTD remedy includes soil excavation, material characterization, treatment (as needed), storage, transportation and disposal, backfilling and revegetation. When the RTD action is selected, soil with constituent concentrations above the RAGs is excavated to a depth of up to 4.6 m (15 ft) below ground surface, using observational approaches and conventional excavation techniques. Excavated material exhibiting concentrations above the RAGs will be disposed at ERDF, in accordance with the *Environmental Restoration Disposal Facility Waste Acceptance Criteria* [Washington Closure Hanford (WCH)-191].

Clean overburden can be segregated and stockpiled onsite for backfilling purposes. For segregation of the clean versus contaminated soil above the RAGs, while the contaminated material is being excavated, it will be radiologically screened and segregated. Soil above the RAGs will be transported to ERDF for disposal. Excavation will continue until all contaminated material exceeding the RAGs is removed to the agreed upon depth, and the site will then be backfilled/or contoured with clean material once the laboratory analyses are completed and the RAOs have been met.

3.1.1 Mobilization and Site Preparation

Mobilization and site preparation include the following activities, which are necessary to prepare the site for excavation:

- Establishing site utility services as required.
- Constructing roads, field support facilities, container survey stations, and decontamination stations. Hanford Site roadways are constructed of existing site materials, except the surface course, which is imported. Field support facilities provide a changing area, lunchroom, and construction offices at individual sites. The changing area includes lockers, benches, and storage for both clean and contaminated personal protection equipment.
- Stripping the existing vegetation and debris. Stripping removes surface and near-surface materials (including vegetation and roots, cobbles, and boulders) that will be stockpiled and used later as a top dressing and planting medium for revegetation.
- Removing overburden material. Clean overburden may be segregated and stockpiled onsite for later use as backfill material.

3.1.2 Waste Site Excavation and Backfill

Excavation and backfill require equipment operations in uncontaminated and contaminated soil and debris of varying physical properties (for example, fine sand to boulders of varying sizes). While the 200-CW-3 OU waste sites excavations are in progress, the actual side slope required to prevent cave-ins and/or sloughing will vary with differences in such factors as materials that have been previously disturbed, excavation depth, soil type, environmental conditions of exposure, and location of personnel

near the excavation. Guidance for the excavation shall be determined in accordance with the requirements of 29 CFR 1910, "Occupational Safety and Health Administration, Department of Labor" and 29 CFR 1926, Subpart P, "Excavations". Excavations will be completed using standard construction equipment and techniques.

Precipitation run-on/run-off-potential and appropriate measures to control this condition (e.g., installation of earthen berms) will be monitored during excavation activities. Excessive run on from surrounding areas could affect slope stability and has the potential to spread contamination. If water does accumulate in soil removal traffic areas or excavations, operations will be suspended until the affected area dries or standing water is removed. Civil land survey shall be accomplished using coordinate datum NAD 83/91, Washington coordinate system (south zone), and elevation datum NAVD88.

Visible dust emissions from active excavations and soil removal will be limited using standard emission control techniques (Section 4.2.4). Active excavations shall use water or crusting agents (e.g., Soil Sement®) as approved for dust control, in accordance with agreements between the DOE-RL and the EPA. Water usage for dust control shall be minimized to protect against contaminant migration. Crusting agents or fixatives shall be applied to any disturbed portion of the contamination area that will be inactive for more than 24 hours. Material to be disposed at ERDF shall also comply with the moisture content and other applicable requirements of WCH-191. Dust fixative is applied to open excavation sites when potential concerns arise about health issues or the spread of contamination.

In this remedial action, soils will be removed to a maximum depth of 4.6 m (15 ft). If the RAGs are not met at 4.6 m (15 ft), then the trench will remain opened with fixative applied until future actions are determined pending evaluation of the data. If the RAGs are met at less than 4.6 m (15 ft), then no further excavation will be conducted for the specific waste site. All data collected during the remedial action will be provided to the 200-CW-3 OU and the groundwater projects.

Waste volume reduction practices, such as minimizing cross-contamination during the remedial action or segregation of clean overburden from contaminated materials, will be implemented where feasible. Exposed dig faces and excavated material will be surveyed and characterized for appropriate disposition. When RAOs have been met and verified, site backfilling will be authorized. Clean backfill material is obtained from clean material storage areas and local borrow sites such as ERDF.

3.1.3 Material Handling and Transportation

All contaminated materials (including excavated soils, debris, disposable protective clothing, air filters, and trash) require proper packaging, handling, and transportation in accordance with this RD/RAWP's Waste Management Section 4.1. Contaminated bulk materials will be hauled in the standard ERDF open-top, hinged-gate roll-off boxes that are designed for a maximum payload of approximately 18.1 metric tons (20 tons) or an approved alternative. The bulk containers will be transported on roll-on/roll-off trailers with hydraulic dumping capabilities that are towed by conventional tractor units or shuttle trucks. The trailers and tractors will be suitable for operating on sloped excavation access ramps and other off-road ramps, and meet applicable U.S. Department of Transportation (DOT) requirements. The wheel wells of the tractor will be constructed to prevent soil from being thrown onto the trailer and its containers during transport.

Containers will be transported from the 200-CW-3 OU to the ERDF over existing Hanford Site roadways. Each shipment of soil/debris transported to the ERDF will be referenced to a waste profile that is intended to bound the levels of hazardous constituents in the material found at the site. The waste profile is in

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Soil Sement® is a registered tradename of Midwest Industrial Supply, Inc., Canton, Ohio.

effect until the characteristics of the excavation site have changed significantly. Empty containers returning from the ERDF will be removed from the ERDF tractor trailers in the CERCLA Waste Management Area and rolled on to project haul trucks for refilling. The CERCLA Waste Management Area supports a continuous flow of materials through the transportation system by allowing excavation to continue for a limited time if the trucks running to the ERDF are not operating, or by allowing ERDF trucks to continue to run for a limited time if the excavators are not operating.

Transportation and handling for offsite treatment and/or disposal of contaminated material will be coordinated on a case-by-case basis. All offsite shipments will be conducted using equipment and methods that are compliant with applicable DOT regulations.

3.1.4 Data Quality Objectives Process and Characterization

The EPA-developed data quality objectives (DQO) process has been used to develop the Phase 1 data collection, sampling, analysis rationale, strategy, and requirements for these characterization efforts. The results of the DQO process are documented in the EPA approved SAP (DOE/RL-2007-54).

3.1.5 Sampling and Analysis

Phase 1 sampling and analysis will be used for confirmation of the remedy conceptual model of RTD and for waste designation to support disposal. If the analytical results identify that all contaminants are below the RAGs and meet the RAOs, without any excavation necessary, then the Remediation Contractor will develop a Work Instruction to confirm a No Action remedy or to conduct further sampling and analysis in support of remedy selection.

Soil sampling and analysis will be based on the observational approach and performed in accordance with the SAP (DOE/RL-2007-54). The initial sampling and analysis methodology consists of site excavation such as test pits and monitoring at sites where the remedy must be selected i.e., No Action or RTD, and where cleanup goals for each remedy have been selected. Sampling at each waste site will continue to a depth of 4.6 m (15 ft).

The DQO process has been used to develop which waste streams are expected to be generated, the initial characterization data needs, rationale, strategy, and requirements for the data collection and analysis. Data collection will include survey and sample data. The initial sampling and analysis data will be used as follows:

- Confirmation of the RTD remedy or to develop a Work Instruction to either confirm the No Acton remedy or to conduct further sampling and analysis
- The area and depth of the contamination spread
- Characterize waste for designation, treatment and/or disposal
- Identify radiological and hazardous conditions which may be encountered during soil removal
- Specify health and safety requirements.

Documentation on the results of the DQO process is included in the SAP (DOE/RL-2007-54).

For evaluation of each waste site that does not meet the RTD remedy, a Work Instruction will be developed for each waste site and approved by the DOE-RL, and the EPA. The Work Instruction will include any waste site-specific historical data, geophysical survey information, a summary of field

screening information and analytical results from the preliminary investigation sampling and analysis, conducted under the SAP (DOE/RL-2007-54), which will be used to support the decision of No Action or confirm additional sampling required. The Work Instruction will also include a sampling design and a list of contaminants of concern.

As part of the Phase 2 RTD remedy implementation, a verification sampling and analysis plan will be developed and approved by the EPA for use in closeout of each waste site. If the analytical results identify that all contaminants are below the RAGs and meet the RAOs, then the site has been cleaned and may be backfilled or contoured according to the remedial design, once authorization is received from DOE-RL and the EPA.

3.1.6 Decontamination

Decontamination at the completion of a given excavation will generally be performed using dry methods (such as wiping) to the extent possible. When the use of wet methods (for example, pressure washers and steam cleaners) is required to achieve decontamination objectives, the associated water will be collected, and work will be conducted by trained site workers in accordance with the following best management practices:

- Decontamination activities will be performed within the CERCLA Remedial Action Area
- The amount of water used to clean equipment will be minimized
- Only raw or potable water will be used
- Regulated soaps, detergents, or other cleaning agents will not be added to wash water
- Pressure washing will normally use cold water.

When excavation operations are completed at a given site, equipment will generally be relocated to a nearby site that will undergo remedial action, and decontamination will be performed at the new site in accordance with the best management practices. If it is not practical or efficient to relocate the equipment to a new site, equipment decontamination may be performed within the initial CERCLA Remedial Action Area. In such cases, a pre- and post-survey will be performed on the washing/decontamination area to determine whether any supplemental remediation of the area is needed as a result of the process. The project may also opt to perform other methods of equipment washing and/or decontamination for a completed site (e.g., wrap the equipment for transfer to a decontamination pad, provide for a temporary facility at the site to collect wash water, or fix the contamination to the equipment). Decontamination fluid/wash water that is collected will be managed in accordance with Section 4.1, "Waste Management".

3.1.7 Waste Disposal

All waste management activities will be performed in accordance with waste management ARARs identified in the Remaining Sites ROD and as discussed in Section 2.1.6 of this RD/RAWP. Certain materials are eligible for salvage and recycling, which is encouraged if the appropriate regulatory and project requirements are met and it is economically feasible for the project to do so. The radiologically contaminated CERCLA waste from the remedial action will either be disposed of at ERDF, or temporarily stored offsite at the Central Waste Complex (CWC) prior to treatment and disposal, or disposed of offsite at the 200 Areas Effluent Treatment Facility (ETF), if liquid. The movement and treatment, storage, and/or disposal of waste at the CWC or the ETF (both considered 'offsite' under CERCLA), or another offsite facility requires an offsite determination approval in accordance with 40 CFR 300.400.

Treatment of waste could be necessary before disposal at ERDF, and containerized waste could be stored at ERDF with the appropriate concurrence(s) while the waste is awaiting treatment. Liquid waste sent to the ETF will be treated separately from other non-CERCLA sources, and any treatment residues that meet

ERDF waste acceptance criteria (WCH-191) could be disposed of at ERDF. Section 4.1 discusses waste management in further detail.

3.1.8 Site Verification and Closeout

Site verification and closeout includes sample collection, demonstration of attainment of RAOs, cleanup documentation, site closure, and site release, as summarized in Sections 3.6 and 3.7. These actions will be conducted under Phase 1 for the No Action remedy and under Phase 2 for the RTD remedy.

3.2 PROJECT SCHEDULE AND COST ESTIMATE

The 200-CW-3 OU has been scheduled and estimated and final remediation is scheduled to be complete by 2024.

Phase 1 of the remedial action for the remaining 12 waste sites in the 200-CW-3 OU is anticipated to begin in fiscal year 2009. Detailed planning of individual activities including resource loading for personnel, equipment costs, analytical costs, material costs, and waste disposal costs and schedules for performance tracking will be developed before work is initiated and will be provided to the DOE-RL and the EPA.

Project Cost and Schedule Tracking

Performance measurement and analysis is performed by the Remediation Contractor. Project cost and schedule will be controlled and updated using the Remediation Contractor's project management system.

An earned-value system will track the cost, schedule, and performance as the project progresses towards completion. Cost/schedule performance reports will provide budgeted cost of work-scheduled comparisons and budgeted costs of work performed against the actual cost of work performed. These reports will provide variances to the baseline schedule and cost as budgeted. Variances above threshold values will be documented, as well as the rationale for the variance(s) and any recovery plan required.

Trends and baseline change proposals readily will be identified through the Remediation Contractor's formal trend and change control program. All changes that affect the baseline will be documented. The Remediation Contractor's trend register, which will be reviewed monthly by Remediation Contractor senior management, categorizes trends from conception to final resolution. Trends will be identified as either performance trends or scope trends and will be defined further as resolved or unresolved.

Fiscal year project staffing, as budgeted, will be reconciled monthly during project review meetings to the actual number of full-time-equivalent personnel used during the month. Likewise, the corresponding number of hours actually worked will be presented and compared to the budgeted current work plan. Actual overtime will be monitored monthly (by department) and will be reconciled to the current budgeted overtime.

Cost and schedule variances to the current budget will be tracked monthly and on a to-date basis and will be reconciled back to the cause of the variance. Project impacts because of the cost and/or schedule variance will be described and corrective actions identified and tracked to the point of final resolution.

3.3 CHANGE MANAGEMENT/CONFIGURATION CONTROL

There are three types of changes in the 200-CW-3 OU remedial action that could affect compliance with the requirements in the Remaining Sites ROD (EPA 1999): (1) a nonsignificant or minor change, (2) a significant change to a component of the remedy, and (3) a fundamental change to the overall remedy.

A nonsignificant or minor change falls within the normal scope of changes occurring during the remedial design and remedial action processes. These minor changes should be documented in the appropriate post-decision project file (for example, through inter-office memoranda or log-books). Nonsignificant changes shall not impact the requirements of the Remaining Sites ROD (EPA 1999) nor will they impact the functional requirements. Examples of nonsignificant changes may include, but are not limited to, the following:

- The addition of waste sites that are adjacent to and within the area required for remediation of sites addressed in the Remaining Sites ROD (EPA 1999)
- Modifications to the remedial action schedule that do not impact agreed-upon milestones.

It may be determined that a significant change to the selected remedy as described in the Remaining Sites ROD (EPA 1999) is necessary after the ROD has been signed. Significant changes are defined as changes that significantly modify the scope, performance, or component cost for the remedy as presented in the ROD. All significant changes will be addressed in an explanation of significant difference (ESD). Examples of significant changes may include, but are not limited to, the following:

- A significant increase or decrease in the total cost of site remediation (greater than +50 percent or more than –30 percent) addressed in the Remaining Sites ROD (EPA 1999). A significant delay in the point in time when the remedial action or objectives are met
- The addition of waste sites for remediation in a manner that is consistent with the scope and role of action as described in the Remaining Sites ROD (EPA 1999).

A fundamental change is a change that does not meet the requirements set forth in the Remaining Sites ROD (EPA 1999) or that incorporates remedial activities not defined in the scope of the ROD. In few cases are there fundamental changes to a ROD. Should the situation arise, the ROD must be amended. Significant changes that fundamentally alter the remedy occur when the following situation arises:

- A final land use is defined that is not compatible with the Remaining Sites ROD (EPA 1999).

Determining the significance of the change is the lead regulatory agency's responsibility. The project manager is responsible for tracking all changes and obtaining appropriate reviews by staff. The project manager will discuss the change with DOE-RL, and DOE-RL will then discuss the type of change that is necessary with the EPA and Ecology. Appropriate documentation will follow, in accordance with the requirements for that type of change.

3.4 PROJECT TEAM

The term "project team," in the strictest sense, means all individuals working to accomplish a particular project. According to this definition, there are numerous members of the project team. For the purpose of this discussion, the project team will be limited to the regulatory agencies, DOE-RL, and the Remediation Contractor.

3.4.1 Regulatory Agencies

The regulatory agencies for the CERCLA remediation activities in the 200-CW-3 OU of the Hanford Site are Ecology and EPA. EPA is the lead regulatory agency for the 200-CW-3 OU and may request support from the non-lead agency, if necessary. As the lead regulatory agency, EPA is responsible for overseeing the activities to verify that all applicable regulatory requirements are met.

3.4.2 Remedial Project Manager (U.S. Department of Energy)

DOE is the government agency responsible for the remedial actions throughout the 200-CW-3 OU and the remaining Hanford Site, and as such, has assigned remedial project managers to each main area and task involved with remediation activities. A Remedial Project Manager is responsible for the management of the assigned activities, including scope, budget, schedule, quality, personnel, communication, risk/safety, contracts, and regulatory interface.

The Remedial Project Manager also directs response efforts and coordinates all other efforts for this remedial action per 40 CFR 300.120.

3.4.3 Remediation Contractor

The Remediation Contractor (RC) team is currently responsible for implementation of remedial actions in the 200-CW-3 OU. The RC is responsible for implementing the remedial action. The project organization, in regard to the remedial action, is described in the subsections that follow and is shown graphically in Figure 3-1. With the exception of the DOE-RL Remedial Project Manager, all other roles and responsibilities are completed by the RC. Note: For each functional RC role, there is a corresponding oversight role within DOE-RL.

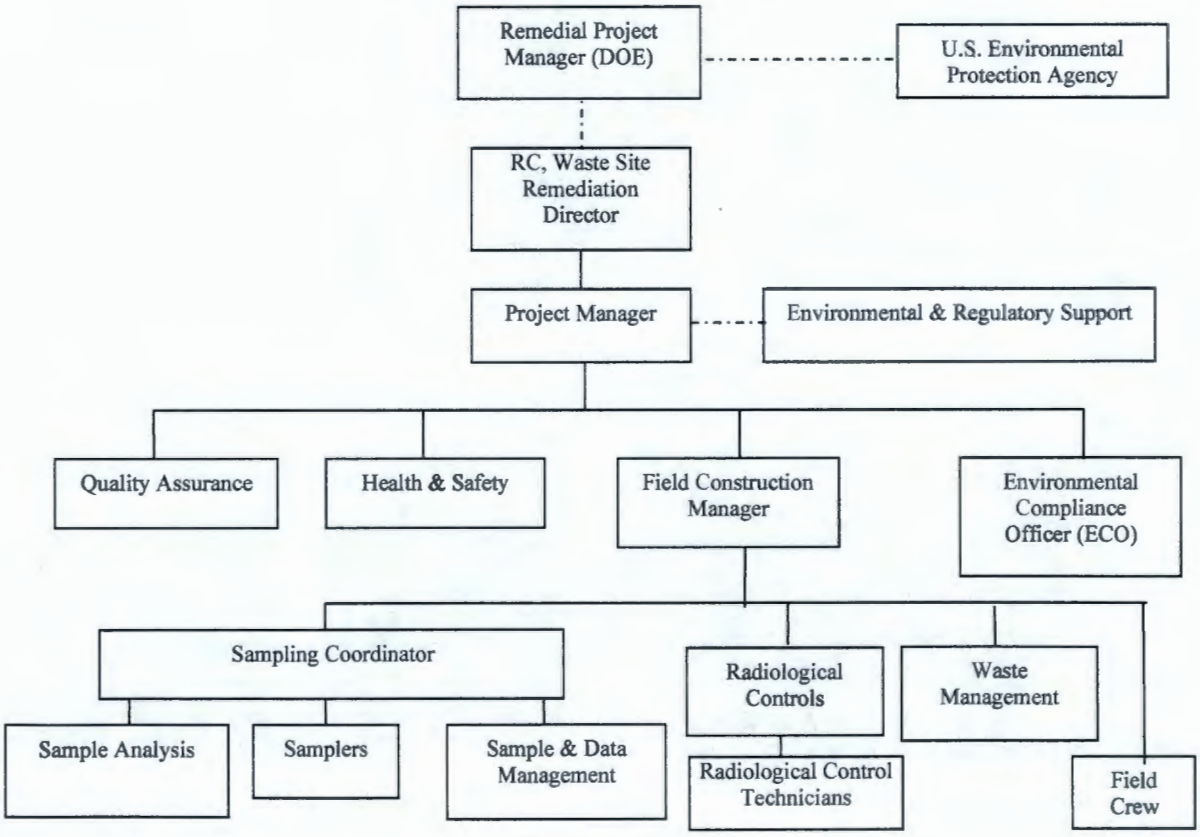

Figure 3-1. Project Organization.

3.4.3.1 RC, Waste Site Remediation Director

The Director of Waste Site Remediation provides oversight for all activities and coordinates with DOE-RL, regulators, and primary contractor management in support of remediation activities. In addition, support is provided to the 200-CW-3 OU Project Manager to ensure that the work is performed safely and cost-effectively.

3.4.3.2 200-CW-3 Operable Unit Project Manager

The 200-CW-3 OU Project Manager is responsible for direct management of sampling documents and requirements, field activities, and subcontracted tasks. The 200-CW-3 OU Project Manager ensures that the Field Construction Manager, Environmental Compliance Officer, Sampling Coordinator, and others responsible for implementation of regulatory documents are provided with current copies of these documents and any revisions thereto. The 200-CW-3 OU Project Manager also works closely with the Quality Assurance and Health and Safety organizations and the Field Construction Manager to integrate these and the other lead disciplines in planning and implementing the workscope. The 200-CW-3 OU Project Manager also coordinates with, and reports to DOE-RL, the regulators, and remediation contractor management on all remediation activities.

3.4.3.3 Quality Assurance

The Quality Assurance Lead is matrixed to the 200-CW-3 OU Project Manager and is responsible for quality assurance (QA) issues on the project. Responsibilities include oversight of implementation of the project QA requirements; review of project documents, including DQO summary reports, SAPs, and the quality assurance project plan (QAPjP); and participation in QA assessments on sample collection and analysis and other remediation activities, as appropriate.

3.4.3.4 Health and Safety

The Health and Safety organization responsibilities include coordination of industrial safety and health support within the project as carried out through health and safety plans, job hazard analyses, and other pertinent safety documents required by Federal regulation or by remediation primary contractor work requirements. In addition, assistance is provided to project personnel in complying with applicable health and safety standards and requirements. Personnel protective clothing requirements are coordinated with Radiological Controls Lead.

3.4.3.5 Field Construction Manager

The Field Construction Manager has the overall responsibility for supporting the safety, environmental, QA, sampling, waste management, and radiological control staff in the planning, coordination, and execution of field remediation activities. Responsibilities also include directing training, mock-ups, and practice sessions with field personnel to ensure that the field actions are understood and can be performed as specified. The Field Construction Manager communicates with the 200-CW-3 OU Project Manager to identify field constraints that could affect the remediation activities. In addition, the Field Construction Manager directs the procurement and installation of materials and equipment needed to support the field work.

3.4.3.6 Environmental and Regulatory Support

The Environmental and Regulatory Support Lead is responsible for the development of required regulatory documents. Responsibilities include development and documentation of the sampling DQOs and sampling and analysis plan, and remedial action work plans. The Environmental and Regulatory

Support Lead also supports the Data Quality Assessment process as described in SAP (DOE/RL-2007-54) and develops the final verification plan or remedial action report at the conclusion of the remediation activity.

3.4.3.7 Environmental Compliance Officer

The Environmental Compliance Officer provides technical oversight, direction and acceptance of project and subcontracted environmental work and develops appropriate mitigation measures with a goal of minimizing adverse environmental impacts. The Environmental Compliance Officer also reviews plans, procedures and technical documents to ensure that all environmental requirements have been addressed, identifies environmental issues that affect operations and develops cost effective solutions, and responds to environmental/regulatory issues or concerns raised by DOE-RL and/or regulatory agency staff.

3.4.3.8 Sampling Coordinator

The Sampling Coordinator's specific responsibilities include conversion of the sampling design requirements into field task instructions that provide specific direction for field activities. The Sampling Coordinator also provides oversight of the Sample and Data Management Organization and the Field Samplers, develops and oversees the implementation of the Letter of Instruction to the Sample Analysis Contractor, and oversees data validation.

The **Sample and Data Management Organization** selects the laboratories that perform the analyses. This organization also ensures that the laboratories conform to Hanford Site internal laboratory quality assurance requirements, or their equivalent, as approved by DOE-RL, the U.S. Environmental Protection Agency, and the Washington State Department of Ecology. Sample and Data Management receives the analytical data from the laboratories, performs the data entry into the *Hanford Environmental Information System* (HEIS), and arranges for data validation.

The **Samplers** collect all samples, including replicates/duplicates and prepare all sample blanks according to the sampling and analysis plan and corresponding field procedures and work packages. The Samplers also complete the field logbook and chain-of-custody forms, as well as any shipping paperwork. The Samplers also deliver the samples to the analytical laboratory.

The **Sample Analysis Organization** analyzes samples in accordance with established procedures and provides necessary sample reports and explanation of results in support of data validation.

3.4.3.9 Radiological Controls

The Radiological Controls Lead is responsible for the radiological/health physics support within the project. Specific responsibilities include conducting as low as reasonably achievable (ALARA) reviews, exposure and release modeling, and radiological controls optimization for all work planning. In addition, radiological hazards are identified and appropriate controls are implemented to maintain worker exposures to hazards at ALARA levels (e.g., personal protective equipment). Radiological Controls interfaces with the project health and safety representative and plans and directs radiological control technician (RCT) support for all activities.

3.4.3.10 Waste Management

The Waste Management Lead communicates policies and procedures and ensures project compliance for storage, transportation, disposal, and waste tracking in a safe and cost-effective manner. Other responsibilities include identifying waste management sampling/characterization requirements to ensure

regulatory compliance and interpreting the characterization data to generate waste designations, profiles, and other documents that confirm compliance with waste acceptance criteria.

3.4.3.11 Field Crew

The field crew consists of laborers, teamsters, and equipment operators who provide hands-on support for implementing the remedial action.

3.5 PLANNING DOCUMENTATION

Planning documentation to implement remedial actions includes the preparation of a set of field documents required to guide work being performed. Examples include analytical system work instructions, site support systems work instructions, radiation permits and excavation permits. Some documentation requires the review and concurrence of DOE-RL and the regulatory agency(s). A SAP and a RD/RAWP require DOE-RL and EPA concurrence for 200-CW-3 OU.

When reviews are required or requested, DOE-RL shall provide the documentation to the lead regulatory agency for review. Summary briefings and discussions may be held at unit managers' meetings or other forums, as agreed. Issues will be identified and resolved in a timely manner to prevent or minimize impacts to schedules, including those for procurement.

3.5.1 Field Procedures

Field procedures (for example, sampling and industrial hygiene) provide guidance to site workers during field work execution. The procedures define the scope, operations, progression of field work, personnel control requirements, radiological posting requirements, and analytical system guidance. The procedures also provide contingency plans should unexpected conditions arise. The field construction manager must execute field operations in compliance with these field procedures.

3.5.2 Sampling and Analysis Plans

The Phase 1 SAP (DOE/RL-2007-54) will provide direction for sampling efforts to support remedy confirmation, extent of contamination, waste characterization, preliminary investigation data for further sampling and analysis, if needed, and worker health and safety. The 200-CW-3 OU SAP includes a quality assurance project plan that defines the strategy to control the quality and reliability of the analytical data and establish associated protocols for data management. The field analytical team must perform all sampling and analysis efforts in strict compliance with the SAP (DOE/RL-2007-54), which is prepared by project staff and provided to the DOE-RL and the EPA for review and approval.

As part of the Phase 2 RTD remedy implementation, a verification sampling and analysis plan will be developed and approved by the EPA for use in closeout of each waste site. If the analytical results identify that all contaminants are below the RAGs and meet the RAOs, then the site has been cleaned and may be backfilled or contoured according to the remedial design, once authorization is received from DOE-RL and the EPA.

3.5.3 Health and Safety Plan

The Remediation Contractor's Hazardous Waste Operations Safety and Health Program was developed for employees involved in hazardous waste site activities. The program was developed to comply with the requirements of 29 CFR 1910.120 and 10 CFR 835 to ensure the safety and health of workers during hazardous waste operations.

A site-specific health and safety plan (HASP) will be developed that defines the chemical, radiological, and physical hazards and specifies the controls and requirements for work activities. Access and work activities are controlled in accordance with approved work packages, as required by established internal work requirements and processes. The HASP addresses the health and safety hazards of each phase of site operation and includes the requirements for hazardous waste operations and/or construction activities, as specified in 29 CFR 1910.120. As part of work package development, a job or activity hazards analysis will be written to identify the hazards associated with specific tasks already not covered under a HASP. The elements included in a HASP are as follows:

- General overview of the hazards associated with the area
- List of employee training assignments
- List of personal protective equipment (PPE) to be used at the work site
- Medical surveillance requirements
- Work site control measures
- Emergency response
- Confined space entry internal work requirements and processes
- Spill containment program.

In addition to the HASP, a radiological work permit (RWP) will be prepared, as needed, for work in areas with potential radiological hazards. The RWP extends the Radiological Protection Program (discussed in Section 4.6) to the specific work site or operation. All personnel assigned to the project and all work site visitors strictly must adhere to the provisions identified in the HASP and RWP.

Before work and before each activity begins, a pre-job briefing will be held with the involved workers. This briefing will include reviews of the hazards that could be encountered and the associated requirements. Throughout an activity, daily briefings also could be held, as well as special briefings before major evolutions.

3.5.4 Mitigation Action Plan

A mitigation action plan (MAP) defines the methods for protection and restoration of cultural and ecologically significant areas, and identifies the species inhabiting the remediation area. A MAP presents a framework for limiting disturbances to natural and cultural resources during remedial action projects and identifies opportunities for site restoration and revegetation, as appropriate.

The CERLCA Remedial Action Area as shown in Figure 1-2 will undergo both a cultural and ecological resources review prior to initiation of field activities. If cultural or ecological resources requiring mitigation or protection are found, then a MAP will be developed with input from the stakeholders and submitted to the DOE-RL and the EPA for review and approval.

3.5.5 Revegetation Plan

As one of the final steps during Phase 2 of the remedial action, site restoration is required. The aim of site restoration is to have the remediated sites and sites disturbed during remedial activities eventually return to a shrub-steppe community with a minimum of non-native species. The revegetation part of each waste site's post-cleanup restoration will need to be delayed to allow for future activities such as cleanup of other nearby waste sites and structures including building demolition. Since the final cleanup stages of restoration within the 200-CW-3 OU should allow for the most efficient future revegetation, a final revegetation plan will be developed upon completion of all remedial activities within the 200-CW-3 OU.

The final revegetation plan will be based on the eventual goal for the 200-CW-3 OU remediation of revegetating the waste sites, support-facility areas, borrow sites, and remediated building and unplanned

release site areas to communities dominated by native plant species. Native species of a Hanford Site genotype will be used for all revegetation efforts. Sandberg's bluegrass and needle-and-thread grass (*Stipa comata*) have been collected on the Hanford Site and grown under controlled agricultural production methods to provide a source of seeds for revegetation. Seeds of other native plants, such as sagebrush, yarrow (*Achillea millefolium*), Carey's balsamroot (*Balsamorhiza careyana*), Indian ricegrass (*Oryzopsis hymenoides*), and snow buckwheat, have also been collected on the Hanford Site and may be added to the planting mixture as available and as appropriate. In addition, the percentages of sand, loam, and organic material, which contribute to the overall soil structure, will play an important part in final revegetation.

During this interim remedial action, water and crusting agents or mulch will be utilized to prevent soil erosion and to limit dust emissions until revegetation. Once each waste site has been backfilled or contoured, as described in the remedial design, native plant species will be seeded in each area as an interim step towards final revegetation.

3.5.6 Safety Analysis/Hazard Classification

Hazards associated with the proposed remedial actions addressed in this document are examined with respect to anticipated inventories of radioactive and/or hazardous materials, and appropriate controls are identified. The hazard classification (initial or final, as appropriate) is documented in a final report.

3.5.7 Procurement

Procurement activities include preparing requests for proposals (RFPs), soliciting qualified remedial action contractors, awarding a subcontract, coordinating submittals, negotiating change orders, and receiving and controlling remedial action contractor requests for payment. The RFP documents are prepared as part of the remedial design. The Procurement staff must assemble the RFP and contract documents.

3.5.8 Best Management Practices / Quality Control

Construction and remedial action quality control shall be performed in accordance with Remediation Contractor's best management practices and established quality control program. Such a program will include the following:

- A summary of responsibilities and authorities of all organizations and key personnel involved in the design and construction of site remediation
- The qualifications of the quality assurance personnel to demonstrate that they possess the training and experience necessary to fulfill their identified responsibilities
- The sampling activities, sample size, sample locations, frequency of testing, acceptance and rejection criteria, and plans for implementing corrective measures as addressed in the plans and specifications
- Descriptions of the reporting requirements for quality assurance activities (including such items as daily summary reports, schedule of data submissions, inspection data sheets, problem identification and corrective measures reports, evaluation reports, acceptance reports, and final documentation) and descriptions of the provisions for the final storage of all records consistent with overall requirements of the Remediation Contractor's records management program.

3.5.9 Long-Term Monitoring and Maintenance

Post-remediation monitoring and maintenance requirements will be documented in an operations and maintenance plan, which will document the long-term maintenance and monitoring requirements associated with each remediated waste site. This document will include the requirements for the maintenance of the vegetation, documentation of the monitoring results, and the maintenance requirements for vegetative cover.

3.5.10 Implementation and Maintenance of Institutional Controls

Institutional controls are designed to prevent exposure to contamination by limiting land or resource uses. Remediation in the 200-CW-3 OU is based on the mandate of restricted land and groundwater use, until such time that contaminant concentrations are conducive to unlimited use. These institutional controls are required during remedial action and through development and implementation of a final ROD.

A plan for implementing current and post-remedial action institutional controls as specified in the Remaining Sites ROD (EPA 1999) is presented in the *Sitewide Institutional Controls Plan for Hanford CERCLA Response Actions* (DOE/RL-2001-41). The institutional controls defined in the plan will be enforced during and after remediation, as appropriate. The Remaining Sites ROD (EPA 1999) describes the institutional controls, such as: warning notices, entry restrictions, land-use management, groundwater-use management, and waste site information management. Implementation of the Remaining Sites ROD (EPA 1999) requirements to post and maintain warning signs along access roads is required.

3.6 ATTAINMENT OF REMEDIAL ACTION OBJECTIVES AND RELEASE OF SITE

3.6.1 No Action

Waste sites selected as No Action shall demonstrate attainment of the RAOs when the combination of initial (Phase 1) sampling results and work instruction sampling results are evaluated and determined to be below RAGs. If sampling results exceed RAGs, the RTD remedy will be implemented.

Once the No Action remedy is verified for a waste site, the site will be reclassified as "no action".

3.6.2 Removal, Treatment, and Disposal

The general approach for verifying attainment of RAOs identified in the Remaining Sites ROD (EPA 1999) for RTD waste sites involves the following steps:

- Evaluating summary analytical data against the appropriate RAGS
- Modeling exposure and risk to future site inhabitants (human and ecological)
- Modeling future impacts to groundwater.

Details regarding verification sampling and analysis will be provided in a future 200-CW-3 OU sampling and analysis plan. Once Phase 2 sampling and analysis is completed and the bulleted steps have been addressed, and the RAOs have been attained, then the site will be reclassified as "interim closed out".

3.7 CERCLA CLEANUP DOCUMENTATION

At the completion of each waste site's remedial action, a remedial action report or verification plan will be prepared for each site. The report or plan will provide the needed documentation for verification of the

remedial action at each site and will be used to support the eventual deletion of the waste site from the NPL. At a minimum, the following documentation is required for each waste site:

- Description of current waste site condition
- Basis for reclassification
- Analytic data or data references (if applicable).

4.0 ENVIRONMENTAL MANAGEMENT AND CONTROLS

The ARARs for this remedial action were identified in the Remaining Sites ROD (EPA 1999) for the 200-CW-3 OU Remediation Activities. A discussion of how the remedial actions for both Phase 1 and Phase 2 will comply with these ARARs is provided in the following sections.

4.1 WASTE MANAGEMENT

Waste management activities performed in this RD/RAWP will be in accordance with the Remaining Sites ROD (EPA 1999).

The requirements specified by the ARARs and other applicable guidance are addressed in this section, including waste storage, transportation, packaging, handling, and labeling as they specifically apply to waste streams.

Treatment will be required for LDR material unless a treatability variance or ARAR waiver is requested by DOE-RL and approved by the regulatory agencies. If LDR wastes are encountered, the requirements of 40 CFR 268 will be applied. Should LDR material be encountered, it will be temporarily stored within the CERCLA Remedial Action Area and disposed in accordance with applicable regulations. If treatment is required to address LDR wastes, DOE-RL will obtain regulatory agency approval.

4.1.1 Projected Waste Streams

One or all of the following waste streams are anticipated and may fall into any combination of the following categories: radioactive, mixed, hazardous, dangerous, suspect radioactive, suspect dangerous, suspect mixed, and nonregulated:

- Miscellaneous solid waste (e.g., soil, concrete, asphalt, personal protective equipment, cloth, plastic hose, and metal)
- Decontamination fluids
- Equipment and construction materials (such as construction equipment and materials, and sampling equipment)
- Nondangerous/no-radiation-added (nonradioactive) solid waste (for example, paper, wood, construction debris, metal, plastic, and glass).

4.1.2 Waste Categories

Waste materials will be separated into the broad categories as described in the following subsections. Depending on the levels of contamination encountered, some materials classified as contaminated may require special handling.

- **Nonhazardous, nondangerous miscellaneous solid waste**: Filter paper, wipes, personal protective equipment, cloth, plastic, equipment, tools, pumps, wire, metal and plastic piping, concrete, soil, and materials from cleanup of unplanned releases
- **Uncontaminated Material**: Uncontaminated material includes material excavated to gain access to contaminated material and verified as containing no contamination or contaminant levels above

remedial action cleanup levels. Such material does not require packaging. Uncontaminated soil may be stockpiled for future use as backfill.

- **Contaminated Material**: Contaminated material includes soil, hard waste, and soft waste that exhibit contamination levels in excess of the remedial action cleanup levels. Soil consists of silts, sands, and gravels. Hard waste is debris that includes structural materials, pipe, and similar materials. Soft waste includes paper, rags, gloves, and similar materials.

  Contaminated soil shall be segregated from contaminated debris and containerized separately in accordance with the ERDF waste acceptance criteria (WCH-191). Remedial action contractor-generated contaminated, compacted trash consisting of materials such as gloves, disposable suits, cans, empty barrels, and cardboard containers that exhibit properties in excess of the remedial action cleanup levels and below ERDF waste acceptance limits will be disposed in accordance with the ERDF waste acceptance criteria (WCH-191).

- **Contaminated Material Potentially Designated as Dangerous Waste (Anomalous Waste)**: Contaminated material potentially designated as dangerous waste is that portion of contaminated material subject to verification that it meets one or more of the dangerous waste designation criteria (WAC 173-303-070). Anomalous solid and/or liquid waste will be set-aside in the CERCLA Remedial Action Area. Final disposition of the material will depend on the results of the verification/designation process. Dangerous waste placed in a staging pile in the CERCLA Remedial Action Area must meet the substantive requirements invoked by WAC 173-303-646(8). Dangerous waste stored in containers in the CERCLA Remedial Action Area must be managed in accordance with the substantive requirements of WAC 173-303-630. The CERCLA Remedial Action Area is identified in Figure 1-3.

- **Low-Level Radioactive Waste**: Low-level radioactive waste, including soil, concrete, debris, and structures, will be removed during excavation. Plastic, paper, and other compactable waste will also be generated as part of the remediation activities. Debris that has contacted contaminated media may be disposed at the ERDF if the waste acceptance criteria can be met. If the waste acceptance criteria cannot be met, the waste will be shipped to an appropriate offsite facility, depending on the waste designation. Offsite facilities that receive contaminated waste must be deemed acceptable by the EPA in accordance with 40 CFR 300.440.

- **Hazardous and/or Mixed Waste (Both Radioactive and Hazardous)**: Hazardous and/or mixed waste that meets the LDR treatment standards and the most current ERDF waste acceptance criteria may be disposed in the ERDF. Wastes that do not meet the acceptance criteria may be staged until they can be treated to meet the criteria, and will be handled on a case-by-case basis. Depending on the waste designation, the waste may be shipped to an appropriate offsite facility. Offsite facilities that receive contaminated waste must be deemed acceptable by the EPA in accordance with 40 CFR 300.440.

4.1.3 Waste Characterization, Designation, and Disposal

Waste from the excavation sites will be containerized (as appropriate) and transported for storage, treatment (if required), and/or disposal. Certain bulky items that exceed the capacity of standard ERDF containers (for example, piping or concrete sections) may be packaged and shipped with specified criteria and procedures in accordance with ERDF waste acceptance criteria (WCH-191). Shipment of DOT hazardous materials will comply with all applicable DOE and/or DOT requirements.

Miscellaneous solid waste and demolition debris that has contacted contaminated media, and/or is designated as contaminated by process knowledge or other information, may be disposed at the ERDF as

described above. Waste will be characterized and designated in accordance with requirements of the receiving facility and in accordance with the approved SAP (DOE/RL-2007-54). The sorting process is observational and is performed to identify the nonconforming waste forms. Miscellaneous solid waste or demolition debris that is nondangerous, but cannot be practically or cost-effectively radiologically released, and/or that cannot be released because of the unavailability of permitted landfills at the time of removal from the ground, and/or because of the unavailability of a recycling pathway, will be stockpiled onsite near the point of origin. Waste will be designated using process knowledge, historical analytical data, engineering calculations, and/or analyses of samples identified in the SAP, as appropriate. Every effort will be made to minimize waste volume for disposal at ERDF.

The ERDF is the preferred disposal location, provided that the waste acceptance criteria are met. As necessary, waste will be stored within the CERCLA Remedial Action Area, in the CERCLA Waste Management Area or at the ERDF.

Miscellaneous solid waste and demolition debris that has contacted contaminated media may be disposed at the ERDF as described above. Miscellaneous solid waste or demolition debris that is nondangerous and has been radiologically released may be disposed at an offsite permitted disposal facility or a limited purpose inert landfill, or recycled, as appropriate. Uncontaminated soils may be placed on the ground in stock piles near the point of origin.

Small volumes of liquid that have been solidified may also be disposed at the ERDF if the waste meets the ERDF waste acceptance criteria. Liquid waste that does not meet the acceptance criteria will be shipped to an appropriate offsite facility, including any EPA-approved treatment, storage, and disposal facility, depending on the waste designation. Offsite facilities that receive contaminated waste must be deemed acceptable by the EPA in accordance with 40 CFR 300.440. Used oil will be sent offsite for recycling or disposal. Spent or unusable chemicals/reagents may also be generated during field sampling and analysis and would require disposal based on the designation.

Three categories of waste exist from a designation standpoint: (1) wastes that do not require additional characterization or special handling, (2) wastes that do not require additional characterization but do require special handling, and (3) wastes that require additional characterization:

- **Wastes That Do Not Require Additional Characterization or Special Handling**. Wastes that do not require additional characterization or special handling include untreated wastes, and/or process soil, that may be designated without characterization and do not require special handling for human exposure or waste acceptance.

- **Wastes That Do Not Require Additional Characterization, But Do Require Special Handling**. Wastes that do not require additional characterization but do require special handling are untreated wastes, and/or process soil, that may be designated without characterization, but do require special handling for human exposure or waste acceptance. Waste types in this category include, but are not limited to, high-dose, highly contaminated components that do not contain dangerous/hazardous materials.

- **Wastes That Require Additional Characterization**. Wastes that require additional characterization include untreated and/or treated wastes that cannot be designated without characterization and may also require special handling for human exposure protection or waste acceptance. Unknown anomalous materials are included in this category.

4.1.3.1 Returned Sample Waste

Screening and analysis of both solids and liquids may be conducted at the waste sites, offsite or onsite laboratories, and/or a radiological counting facility. Samples from a radiological counting facility and from onsite laboratories may be returned to the CERCLA Remedial Action Area (refer to Figure 1-2). Unused samples and associated laboratory waste from offsite analyses will be managed by the applicable laboratory in accordance with contract specifications. Waste from field screening and onsite laboratories will be managed depending on whether it has been altered. Altered samples will be contained and disposed at ETF, ERDF, or other appropriate facilities as authorized by the lead regulatory agency, depending on waste designation. Unaltered liquid waste generated during sample screening and analysis that does not exceed collection criteria limits may be discharged to the ground near the point of generation; if it exceeds the collection criteria, it may be disposed at the ETF, ERDF, or other appropriate facilities. Some liquids may be neutralized and/or stabilized to meet the disposal facility's waste acceptance criteria. Pursuant to 40 CFR 300.440, EPA approval is required before unused samples or waste can be returned from offsite laboratories.

In conducting the remedial action, various waste steams will be encountered. Each waste stream will require specific processing and disposal. Similar types of waste will be managed uniformly. Assignment of waste to the appropriate waste stream depends on knowing the designation of the waste and appropriate disposal facility.

4.1.3.2 Waste Size Reduction

The most current versions of WCH-191 will be used to assure compliance with ERDF shipping requirements, including waste size reduction requirements.

4.1.3.3 Waste Handling

At each site, containers and ERDF haul trucks being released from radiologically-controlled areas will meet exterior contamination limits for staging and transport. Highly-contaminated material may require dedicated containers for packaging (e.g., shielded).

4.1.3.4 Waste Profile

The Remediation Contractor will provide waste characterization and necessary transport papers. Waste profiling for establishing values for the waste tracking form will take place concurrently with remedial action activities. Field screening measurements will be used to obtain data to adjust the waste tracking form. The waste profile will be adjusted (as necessary) through a combination of in-process field screening methods, analytical laboratory analysis, and notification of the field engineer.

Sampling and laboratory analysis of anomalous waste will be used to characterize soil and debris. The data will be used to prepare or update waste profiles, as necessary.

4.1.4 Waste Generation Management

Marking, labeling, segregation, and staging of waste containers will be performed or directed by the waste specialist.

Wastes will be stored in a CERCLA Waste Management Area located near the 212P Building (refer to Figure 1-2).

The following sections describe types and management of expected wastes.

4.1.4.1 Miscellaneous Solid Waste

Miscellaneous solid waste (MSW) that has contacted suspect dangerous or suspect mixed waste will be treated as such. Field screening will be used to segregate radioactive waste from no-radiation-added (nonradioactive) waste. Container(s) will be properly marked and labeled. The containers will be segregated from other materials in accordance with their field screening results and locations then staged at the designated site-specific waste container storage area. The containers of MSW will be dispositioned on the basis of analytical results obtained from the soil contacted in conjunction with analytical results.

4.1.4.2 Decontamination Fluids

Decontamination fluids (water and/or nondangerous cleaning solutions) generated from cleaning equipment and tools in the remedial action area will be managed in accordance with Section 3.1.6. If necessary, decontamination fluids can be containerized, over-packed, and temporarily stored at the designated site-specific waste container storage area.

Additional chemical decontamination of sample equipment may be conducted at the Waste Sampling and Characterization Facility (WSCF) because decontamination and containment systems already are established at this location. The waste generated at WSCF is not considered CERCLA waste and will be managed in accordance with applicable regulations and requirements.

4.1.4.3 Equipment and Construction Materials

Equipment and construction materials that contact suspect dangerous and/or suspect mixed waste will be decontaminated following guidance provided in Section 3.1.6. Rinsate shall be managed as described in Section 4.1.4.2. All sampling equipment shall be cleaned and decontaminated for chemical contamination after radiological release by a radiological control technician. If contamination is determined to be fixed for any equipment or materials, the radiological control technician and task manager will make the decision to remove the contamination using more aggressive methods or to dispose of the equipment. If equipment is to be dispositioned, a declaration of excess form will be completed and the material will be containerized. If necessary, equipment and construction materials can be containerized and stored at the designated CERCLA Waste Management Area.

4.1.4.4 Nondangerous/No-Radiation-Added Solid Waste

All nondangerous/no-radiation-added (nonradioactive) solid waste will be radiologically released and may be disposed to an offsite solid waste landfill consistent with standard site refuse disposal practices. This waste will not have contacted suspect dangerous or mixed waste and will not contain free liquids. Items in this category include paper, wood, construction debris, metals, plastic, glass, etc. A radiological release certification form should be attached and visible from outside the trash bag. If necessary, nondangerous/no-radiation-added solid waste can be containerized, segregated, and stored at the designated CERCLA Waste Management Area.

4.1.5 Management of Waste Containers

The containers will be stored inside the applicable site-specific waste container storage area. Containers awaiting analytical results will be marked and labeled as appropriate. Weekly inspections will be performed to document the integrity, container marking/labeling, physical container placement, storage area boundaries/identification/warning signs, and spill control. Containers showing signs of deterioration will be identified on the container inspection form and will be overpacked or repackaged. Spills or releases will be reported as stated in Section 4.3. In the event of a spill or release, appropriate and immediate action will be taken to protect human health and the environment.

4.1.6 Final Disposal/Storage

All waste will be stored in the CERCLA Waste Management Area until the proper waste shipping papers are completed. The process for developing proper waste shipping papers includes the following: receipt of analytical results, designation, profiling, and proper disposal paperwork. The designation process ensures the waste will be profiled for the appropriate disposal facility. Waste profiling provides information concerning each waste stream. The designation and profiling are conducted in accordance with the requirements of WAC 173-303-070, "Designation of Dangerous Waste," specifically WAC 173-303-070(3). Dangerous waste will be evaluated for applicable land disposal restrictions in accordance with WAC 173-303-140, "Land Disposal Restrictions."

Any waste that does not meet the ERDF waste acceptance criteria will remain at the designated site-specific waste container storage area pending disposal at an appropriate location. A case-by-case disposal determination will be made in instances where waste exceeds the ERDF waste acceptance criteria. Any waste requiring treatment before disposal requires approval by the lead regulatory agency.

Waste above radiological release levels that meet the ERDF waste acceptance criteria will be transported to the ERDF for disposal. Nonradiologically-contaminated dangerous waste may be shipped to ERDF or to an offsite facility, contingent upon the waste meeting the offsite *Resource Conservation and Recovery Act* (RCRA) *of 1976* disposal facility's waste acceptance criteria and offsite determination of acceptability by the EPA.

Soils associated with analytical results below radiological release criteria specified in contractor specific waste acceptance/radiological release procedures, and below chemical cleanup values specified in WAC 173-340-740, "Unrestricted Land Use Soil Cleanup Standards," may be returned to the environment near the sample location.

The MSW identified as nondangerous/no-radiation-added solid waste that does not require disposal at ERDF and meets the Hanford Site free-release criteria may be disposed in an appropriate solid waste disposal facility (Subtitle "D" landfill).

4.1.7 Waste Disposal Records

Original copies of all sampling records, waste inventory documentation, and waste container certification forms will be forwarded to the assigned waste specialist to be included in the waste file and to initiate waste tracking in the Solid Waste Information Tracking System. The completed waste files will be included in the project file following final waste disposition.

4.1.8 Waste Transportation

Packaging, marking, and labeling for transportation will be in accordance with DOT 49 CFR requirements, as appropriate. With appropriate documentation (such as safety analysis report for packaging or risk-based exemption), packaging exceptions to DOT requirements that provide an equivalent degree of safety during transportation may be used for waste shipments. Coordination and preparation of these documents will be approved by the DOE-RL. ERDF roll-off-type containers will be used for most bulk wastes. Containers will be sealed and shipped to the identified disposal facility as quickly as economically feasible. Waste will be transported in accordance with WAC 173-303 and DOT regulations, as appropriate.

The transport of contaminated material requires reusable containers to be filled at the excavation site, surveyed, and decontaminated, if required; taken to a storage area; and then hauled to ERDF for unloading.

4.1.9 Waste Treatment

When necessary, treatment may be conducted at the site, at the ERDF, or at an EPA-approved offsite facility. If LDR wastes are encountered, the requirements of 40 CFR 268 will be applied, unless the EPA approves a treatability variance. Offsite treatment must be performed at a facility approved by the EPA in accordance with 40 CFR 300.440. Return of treated waste from offsite treatment facilities for disposal at the ERDF will require additional authorization from the EPA.

4.1.10 Waste Minimization and Recycling

By using waste separation and segregation, waste generation will be kept to a minimum. Waste will be segregated within the remedial action area as generated, which will minimize the volume of regulated waste.

Waste minimization practices will be followed to the extent technically and economically feasible during all phases of waste management. Waste materials will be recycled, reused, or reclaimed when feasible. Introduction of clean materials into a contamination area and contamination of clean materials will be minimized to the extent practicable. During all phases of waste management, emphasis will be placed on source reduction to eliminate or minimize the volume of waste generated.

All materials released offsite for disposal/recycle must be certified free of contamination in accordance with DOE-RL guidance for nonreal property. Waste materials with no or *de minimis* levels of CERCLA hazardous substances are not considered CERCLA waste and, therefore, are not subject to the 40 CFR 300.440 offsite acceptability determination.

4.2 STANDARDS CONTROLLING RELEASES TO THE ENVIRONMENT

4.2.1 Air Emissions

The Revised Code of Washington (RCW) 70.94, "Washington Clean Air Act," requires regulation of radioactive air pollutants. The state implementing regulation WAC 173-480, "Ambient Air Quality Standards and Emission Limits for Radionuclides," sets standards that are as stringent or more so than the Federal standards under the Federal *Clean Air Act of 1990*, and under the Federal implementing regulation, 40 CFR 61, Subpart H, "National Emission Standards for Emissions of Radionuclides Other than Radon from Department of Energy Facilities." EPA partial delegation of the 40 CFR 61 authority to the State of Washington includes all substantive emissions monitoring, abatement, and reporting aspects of the federal regulation. The state standards protect the public by conservatively establishing exposure standards applicable to even the maximally exposed public individual, be that individual real or hypothetical. To that end, the standards address any member of the public, at the point of maximum annual air concentration in an unrestricted area where any member of the public may be. Radionuclide airborne emissions from the Hanford Site "facility" are not to exceed amounts that would cause an exposure to any said member of the public of greater than 10 mrem/yr effective dose equivalent. The state implementing regulation WAC 246-247, "Radiation Protection – Air Emissions," which adopts the WAC 173-480 standards and the 40 CFR 61, Subpart H standard, and requires verification of compliance with the 10 mrem/yr standard, and would be applicable to the remedial action.

The WAC 246-247 further addresses emission sources emitting radioactive airborne emissions by requiring monitoring of such sources. Such monitoring requires physical measurement of the effluent or ambient air. The substantive provisions of WAC 246-247 that require monitoring of radioactive airborne emissions would be applicable to the remedial action.

The above state implementing regulations further address control of radioactive airborne emissions where economically and technologically feasible (WAC 246-247-040(3) and -040(4), "Radiation Protection - Air Emissions," "General Standards," and associated definitions). To address the substantive aspect of these requirements, best or reasonably achieved control technology will be addressed by ensuring that applicable emission control technologies (those successfully operated in similar applications) will be used when economically and technologically feasible (i.e., based on cost/benefit). If it is determined that there are substantive aspects of the requirement for control of radioactive airborne emissions, then controls will be administered as appropriate using reasonable and effective methods.

4.2.2 Toxic/Criteria Air Pollutant Information

The nonradiological contaminants of Table 2-1 were compared against those listed in WAC 173-460-150 Class A and WAC 173-460-160 Class B toxic air pollutants (TAPs). All of the nonradiological contaminants are identified TAPs. Arsenic, cadmium, chromium (VI), lead and polychlorinated biphenyls are not expected to exceed the acceptable source impact level (ASIL) quantity for Class A or the Small Quantity Emission Rates (SQER) levels. Antimony, barium, chromium (III), manganese, mercury and zinc are not expected to exceed the ASIL quantity for Class B or the SQER levels. In addition, within the 200-CW-3 OU, access will be restricted, not only to the public, but also to workers from other Hanford Site areas. Until the initial sampling and analysis activity is completed, soil contamination levels of the nonradiological contaminants will not be known. Emission controls (Section 4.2.4) will be in place, however, to greatly limit the emission of TAPs below the SQER levels. Based on the potential emission levels, the restricted public access, and the use of emission controls, there is no adverse impact from this activity to the environment from toxic air pollutants.

4.2.3 Airborne Radionuclide Source Information

The total potential fugitive emissions were calculated for the remedial action activities identified Sections 1.2 and 3.1 for Phase 1 remedy confirmation and waste characterization. RTD excavation activities will be addressed in a revision to this RD/RAWP.

There is a potential for particulate radioactive airborne emissions to result from the Phase 1 remedial action activities. The primary radionuclides within the 200-CW-3 OU for the remaining waste sites, include americium-241, cesium-137, cobalt-60, europium-152, europium-154, europium-155, nickel-63, plutonium-238, plutonium-239/240, strontium-90, technitium-99, thorium-232, tritium, uranium-233/234, uranium-235, and uranium 238. Other radionuclides may also be encountered during the remedial action activities, but are not anticipated at this time in other than negligible quantities.

The distance to the Laser Interferometer Gravitational Wave Observatory (LIGO) receptor is 16,630 meters East-Southeast of the 200 East Area. This location represents the nearest unrestricted public access and therefore the maximally exposed individual (MEI) for purposes of assessing potential public exposure due to airborne releases. The total unabated emissions in terms of potential-to-emit (PTE) assumed to represent the total abated emissions to the receptor from the remedial action activities could result in up to 1.3E-03 mrem/year total effective dose equivalent (TEDE) to the MEI (DOE/RL-2006-29).

Table 4-1. 200-CW-3 Operable Unit Waste Sites Remediation Potential to Emit Calculations.

Isotopes	Soil Contaminant Concentration pCi/g	Curies released	Dose Factor mrem/Ci*	Unabated Offsite Dose mrem/year TEDE to MEI
Americium-241	31.1	3.6E-05	1.5E+01	5.4E-04
Cesium-137	6.2	7.1E-06	2.0E-03	1.4E-08
Cobalt-60	1.4	1.6E-06	3.0E-01	4.8E-07

Table 4-1. 200-CW-3 Operable Unit Waste Sites Remediation Potential to Emit Calculations.

Isotopes	Soil Contaminant Concentration pCi/g	Curies released	Dose Factor mrem/Ci*	Unabated Offsite Dose mrem/year TEDE to MEI
Europium-152	3.3	3.8E-06	3.1E-01	1.2E-06
Europium-154	3.0	3.5E-06	2.5E-01	8.8E-07
Europium-155	125	1.4E-04	9.8E-03	1.4E-06
Nickel-63	4,026	4.6E-03	6.9E-05	3.2E-07
Plutonium-238	37.4	4.3E-05	8.9E+00	3.8E-04
Plutonium-239/240	33.9	3.9E-05	9.5E+00	3.7E-04
Strontium-90	4.5	5.2E-06	9.5E-03	4.9E-08
Technitium-99	15	1.7E-02	1.4E-03	2.4E-05
Tritium	510	5.9E-01	7.1E-06	4.2E-06
Uranium-233/234	1.1	1.3E-06	3.7E+00	4.8E-06
Uranium-235	1.0	1.2E-06	3.5E+00	4.2E-06
Uranium 238	1.1	1.3E-06	3.3E+00	4.3E-06
Total TEDE				1.3E-03 mrem/year
Soil Density: 1,570 kg/m^3 (98 lb/ft^3)	Total Soil Volume for 69 pits, nine Waste Sites: 733 m^3 (25,875 ft^3)	Release Fractions: 1.00E-03, except for Tc-99 and H-3 which are 1.0		

* DOE/RL-2006-29, latest revision

NOTE: The RAG values for radionuclides listed in Table 2-1 were used as a bounding factor. The pCi/g values are assumed to be 10% of the inventory available for emission due to the expected use of bulk soil excavation techniques. The values are listed in the Soil Contaminant Concentrations column of this table.

4.2.4 Emission Controls

Based on analysis of the potential emissions and analysis of available control technologies, the following controls have been selected for use during the remedial action.

- Water will be applied, as needed, during any excavation and backfilling activities, for suppression of fugitive emissions and dust.

- Fixatives will be applied to contaminated soil and/or debris and equipment, as needed, to minimize airborne contamination during the remedial action activities for fugitive emissions and dust. Fixative application techniques may include spraying, brushing on, pouring or some other method, as necessary.

- Fixatives or cover material (e.g., soil, gravel, plastic, etc.) will be applied to disturbed contaminated soils, associated with the remedial action, when field activities will be inactive more than 24 hours.

- If the sustained wind speed is predicted overnight to be greater than 32 km/hr (20 mph) based on the Hanford Meteorological Station morning forecast, fixative or cover material will also be applied, as needed. This will allow the project enough time, if necessary, to prepare for the application of dust control measures. If a fixative has already been applied and the contaminated items will remain undisturbed, further use of fixatives will not be needed during the remediation activities. The fixatives or other controls will not be applied when the contaminated items are frozen, or it is raining, snowing, or other freezing precipitation is falling at the end of work operations.

- The waste packages will remain closed, except during packaging and waste inspection activities, once they are staged in the CERCLA Waste Management Area, which is within the CERCLA Remedial Action Area.

- Field activities should be temporarily ceased and the area should be placed in a safe configuration if contamination control measures are not adequate, based on site conditions (e.g., excessive wind).

- Operational limits for removable or transferable contamination levels will be established in the activity work packages and associated radiation work plans. Fixatives or other controls will be employed if removable or transferable contamination levels (other than specks of contamination) above 100,000 disintegrations per minute per 100 square centimeters beta/gamma or exceeding 20,000 disintegrations per minute per 100 square centimeters alpha are measured or expected.

4.2.5 Monitoring

The calculated potential for unabated annual dose combined for all related activities during the remedial action is below 0.1 mrem/year; therefore, this activity is not subject to continuous emissions monitoring as required by WAC 246-247-035. Periodic confirmatory measurement will be provided, however, as required by WAC 246-246-035. Alternative monitoring techniques have been considered and near-facility ambient air monitors are sufficient to meet the periodic confirmatory measurement requirement.

Near-Facility Monitoring Stations N563, N564, N567, and N568 (Figure 1-2) will be utilized for the remedial action activities. The Hanford Site protocol established for near-facility monitors will be followed for data collection, sampling frequencies, sample analysis, and data reporting [*Environmental Monitoring Plan* (DOE/RL-91-50)].

Air monitor downtime will be minimized and the four monitors in our CERCLA Remedial Area (i.e., N563, N564, N567, and N568) shall be operated, as required. However, if a designated air monitor is out of operation for more than 48 hours during normal work operations (excluding weekends and holidays, when work activities are not being conducted), where there is a potential for radiological emissions, the DOE-RL and the EPA will be notified. If two or more designated air monitors are out of operation during normal work operations, activities where there is a potential for radiological emissions shall be temporarily suspended until operation of at least three of the designated air monitors are in operation or equivalent backup equipment is deployed and operational.

Additional monitoring for diffuse and fugitive emissions will be conducted and will consist of radiological surveys using hand-held instruments at the excavation activities. Both alpha and beta/gamma surveys will be performed for all removable contamination surveys and for soil surveys (direct readings).

Excavation activities will be stopped if removable or transferable contamination (other than specks of contamination) with detected readings greater than 500,000 disintegrations per minute per 100 square centimeters beta/gamma or greater than 28,000 disintegrations per minute per 100 square centimeters alpha is encountered on the soil outside of active work areas posted for contamination control. The size of the posted area at any one time will be minimized to facilitate contamination control. Excavation in that area will not continue until an internal review of the work and encountered conditions has been performed and an internal determination has been made that no threat to personnel safety or the environmental exists, or until proper controls (i.e., removal and disposal, water, fixatives, or covers) have been put in place to mitigate any further potential for emissions, and EPA and DOE-RL have been contacted and briefed of the situation.

4.3 REPORTING REQUIREMENTS FOR NONROUTINE RELEASES

The following reporting requirements apply for hazardous substances that could be released during the remedial action activities.

4.3.1 Federal Hazardous Substance

40 CFR 302 requires immediate notification to the National Response Center on discovery of a release of a hazardous substance into the environment in excess of a reportable quantity.

40 CFR 355 requires immediate notification to the community emergency coordinator for the local emergency planning committee and to the State Emergency Response Commission for a release of a reportable quantity of an extremely hazardous substance, a comprehensive release of a reportable quantity of an extremely hazardous substance, or a CERCLA hazardous substance.

4.4 RELEASE OF PROPERTY

All property released for offsite disposal and/or reuse and recycle is nonreal property. The release of nonreal property will follow DOE guidance. If the property meets the surface contamination limits based on radiological surveys and/or characterization information, and the person or entity receiving the property is aware of the measured radioactivity on the property, the property could be dispositioned with low-levels of residual radioactivity. Property released via this process will be viewed as containing no or *de minimis* levels of CERCLA hazardous substances, and therefore will not be subject to CERCLA.

4.5 CULTURAL AND ECOLOGICAL RESOURCE PROTECTION STANDARDS

Cultural and ecological resource reviews will be performed for the remedial action activities within the 200-CW-3 OU for the remaining waste sites prior to any intrusive field activities.

4.6 RADIOLOGICAL CONTROLS AND PROTECTION

The radiological controls and protection program is defined in DOE-approved programs and Remediation Contractor-approved internal work requirements and processes. The radiological controls and protection program implements the Remediation Contractor's policy to reduce risks to safety or health to levels that are ALARA and to ensure the adequate protection of workers. The Remediation Contractor's radiological protection program meets the requirements of 10 CFR 835. Appropriate dosimetry, RWPs, PPE, ALARA planning, periodic surveys, and radiological control technical support also will be provided.

The standard Remediation Contractor's controls for work in radiological areas are assessed as adequate to control project activities. These controls will provide for radiological controls planning to identify the specific conditions, and the controls also will govern the specific requirements for an activity, periodic radiation and contamination surveys of the work area, and periodic or continuous observation of the work by the radiological controls organization. The ALARA planning process will be used to identify shielding requirements, contamination control requirements (including local ventilation controls), radiation monitoring requirements, and other radiation control requirements for the individual tasks conducted during the projects.

Measures also will be taken to minimize the possibility of releases to the environment. Section 4.2 of this RD/RAWP, quantitatively addresses the radionuclide inventory and controls which may be utilized during project activities that could prevent the potential release of the inventory, but not to the exclusion of 10 CFR 835 requirements. Therefore, monitoring will be completed as described in Section 4.2 and

radiological worker exposure must also be monitored using approved occupational radiological protection methods.

4.7 QUALITY ASSURANCE REQUIREMENTS

Overall quality assurance for the RD/RAWP will be planned and implemented in accordance with 10 CFR 830, Subpart A, *Quality Assurance Requirements*; *EPA Requirements for Quality Assurance Project Plans* (EPA QA/R-5); and *Test Methods for Evaluating Solid Waste, Physical/Chemical Methods* (SW-846) (EPA 1986). The quality assurance activities will use a graded approach based on the potential impact on the environment, safety, health, reliability, and continuity of operations. The SAP (DOE/RL-2007-54) also contains a quality assurance project plan, which will be used to support the sampling and characterization activities. Other specific activities will include quality assurance implementation, responsibilities and authority, document control, quality assurance records, and audits. These activities are discussed in the following sections.

4.7.1 Quality Assurance Implementation

All project-related activities will establish and implement appropriate quality assurance requirements. Conditions adverse to quality will be identified in nonconformance reports, audit reports, surveillance reports, and corrective action requests. Investigation and corrective actions in response to these adverse conditions will be completed in a timely manner.

4.7.2 Responsibilities and Authority

The Remediation Contractor must perform quality engineering, design reviews, surveillance, and audits (as necessary) to achieve quality assurance objectives. The Remediation Contractor also must ensure that the various contractors and design agencies establish programs to control design and quality assurance in accordance with applicable requirements.

4.7.3 Document Control

All technical documents (e.g., specifications and drawings) will be controlled in accordance with approved configuration management internal work requirements and processes. The responsible design agency will maintain control of the design documents through acceptance of the documents.

4.7.4 Quality Assurance Records

Each organization that maintains quality assurance records will be required to control the records in accordance with applicable Remediation Contractor quality assurance requirements.

4.7.5 Audits/Assessments

Internal and external audits may be performed by the Remediation Contractor's assessments, regulatory, and quality program organizations to ensure project compliance with the quality assurance program requirements.

4.7.6 Self-Assessments

Self-assessments may be conducted by project personnel to determine compliance in accordance with the requirements of the Remediation Contractor's internal work requirements and processes.

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