0083145

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

09-AMCP-0205

AUG 27 2009

Ms. J. A. Hedges, Program Manager
Nuclear Waste Program
State of Washington
Department of Ecology
3100 Port of Benton
Richland, Washington 99354

Dear Ms. Hedges:

SAMPLING AND ANALYSIS PLAN FOR SELECTED 200-MG-1 OPERABLE UNIT WASTE SITES, DOE/RL-2009-60, REVISION 0

This letter transmits the Sampling and Analysis Plan for Selected 200-MG-1 Operable Unit Waste Sites, DOE/RL-2009-60, Revision 0 to the State of Washington Department of Ecology (Ecology) for approval.

This Sampling and Analysis Plan was prepared in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act. Responses to Ecology and the U.S. Environmental Protection Agency comments on the previous draft version have been incorporated per collaborative meetings with L. A. Fort and N. N. Smith-Jackson of Ecology.

Ecology is requested to approve the attached document within 30 days of receipt.

If you have any questions, please contact me, or your staff may contact Briant Charboneau, of my staff, on (509) 373-6137.

Sincerely,

Matthew S. McCormick, Assistant Manager
for the Central Plateau

AMCP:FMR

Attachment

cc: See Page 2

cc w/attach:
G. Bohnee, NPT
L. Buck, Wanapum
D. A. Faulk, EPA
L. A. Fort, Ecology
S. Harris, CTUIR
N. N. Smith-Jackson, Ecology
R. Jim, YN
S. L. Leckband, HAB
K. Niles, ODOE
Administrative Record
Environmental Portal

cc w/o attach:
C. B. Walker, CHPRC
R. E. Piippo, CHPRC
J. G. Vance, FFS

DOE/RL-2009-60
Revision 0

Sampling and Analysis Plan for Selected 200-MG-1 Operable Unit Waste Sites

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

U.S. DEPARTMENT OF ENERGY Richland Operations Office

P.O. Box 550
Richland, Washington 99352

Approved for Public Release;
Further Dissemination Unlimited

DOE/RL-2009-60
Revision 0

Sampling and Analysis Plan for Selected 200-MG-1 Operable Unit Waste Sites

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

U.S. DEPARTMENT OF ENERGY

Richland Operations Office

P.O. Box 550
Richland, Washington 99352

J. D. Aardal 08/20/2009
Release Approval Date

Approval Page

Title: *Sampling and Analysis Plan for Selected 200-MG-1 Operable Unit Waste Sites*

Concurrence

U.S. Department of Energy, Richland Operations Office

Signature ____________________ Date 8/27/09

Washington State Department of Ecology

Signature ____________________ Date

U.S. Environmental Protection Agency, Region 10

Signature ____________________ Date

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Executive Summary

This sampling and analysis plan defines the approach to conduct removal action waste site investigation and sampling at eleven 200-MG-1 Operable Unit waste sites in support of the final remedial action for these sites. These 200-MG-1 Operable Unit waste sites include locations identified as dumping areas, burn pits, one test crib, foundations, and unplanned releases that were not process areas. These waste sites are located within the Central Plateau, as defined in DOE/EIS-0222-F, *Final Hanford Comprehensive Land Use Plan Environmental Impact Statement*,[1] and DOE/EIS-0222-SA-01, *Supplement Analysis Hanford Comprehensive Land-Use Plan Environmental Impact Statement*,[2] and are outside the Core Zone as defined in DOE/RL-2005-57, *Hanford Site End State Vision.*[3] DOE/EIS-0222-F defines the land use for the Central Plateau outside the Industrial-Exclusive Zone as conservation/mining.

The U.S. Department of Energy prepared DOE/RL-2008-44, *Engineering Evaluation/ Cost Analysis for the 200-MG-1 Operable Unit Waste Sites*,[4] to address the potential for release of *Comprehensive Environmental Response, Compensation, and Liability Act of 1980*[5] (CERCLA) hazardous substances from the 194 waste sites of the 200-MG-1 Operable Unit. DOE/RL-2008-44 identified, evaluated, and proposed remedial alternatives for these waste sites in accordance with CERCLA. The selected alternatives for the sites addressed under this plan are removal, treatment, and disposal (RTD) and confirmatory sampling/no further action (CS/NFA). The CS/NFA alternative recognizes that site contaminant concentrations are uncertain but a strong possibility exists that contaminant levels do not exceed removal action levels. Additional data are required to confirm that this alternative is appropriate. If confirmatory data identify contamination that exceeds removal action levels and CS/NFA is inappropriate, the RTD

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[1] DOE/EIS-0222-F, 1999, *Final Hanford Comprehensive Land-Use Plan Environmental Impact Statement*, U.S. Department of Energy, Washington, D.C.

[2] DOE/EIS-0222-SA-01, 2008, *Supplement Analysis Hanford Comprehensive Land-Use Plan Environmental Impact Statement*, Draft, U.S. Department of Energy, Richland Operations Office, Richland, Washington. Available at: http://www5.hanford.gov/arpir/?content=findpage&AKey=DA06917281.

[3] DOE/RL-2005-57, 2005, *Hanford Site End State Vision,* Rev. 0, U.S. Department of Energy, Richland Operations Office, Richland, Washington. Available at: http://www.hanford.gov/docs/rbes/final.cfm.

[4] DOE/RL-2008-44, 2009, *Engineering Evaluation/Cost Analysis for the 200-MG-1 Operable Unit Waste Sites*, Rev. 0, U.S. Department of Energy, Richland Operations Office, Richland, Washington. Available at: http://www2.hanford.gov/arpir/?content=findpage&AKey=0906220322.

[5] *Comprehensive Environmental Response, Compensation, and Liability Act of 1980*, 42 USC 9601, et seq. Available at: http://www.epa.gov/oecaagct/lcla.html#Hazardous%20Substance%20Responses.

action will be implemented or the waste site will be removed from action memorandum authority and will be evaluated as part of the final remedy for the 200-MG-1 Operable Unit. The RTD alternative is selected where soil contaminated above removal action levels is expected and will require removal. The selected alternatives will be implemented under DOE/RL-2009-48, *Action Memorandum for Non-Time-Critical Removal Action for 11 Waste Sites in the 200-MG-1 Operable Unit*[6] and DOE/RL-2009-53, *Removal Action Work Plan for the 200-MG-1 Operable Unit Waste Sites*.[7] This sampling and analysis plan has been prepared to support implementation of DOE/RL-2009-53.

The objectives of data collection under this sampling and analysis plan are to provide the data needed to support disposal of removal action waste and debris; to confirm the absence of contamination above removal action levels that would require further action at CS/NFA sites; and/or to verify the absence of contamination above removal action levels at RTD sites to a nominal depth of 4.6 m (15 ft) below ground surface. Demonstration that removal action levels have been met will support achievement of 200-MG-1 Operable Unit removal action objectives presented in DOE/RL-2009-48. To develop this sampling and analysis plan, a systematic planning process was used to identify removal action data quality needs, evaluate data collection and sampling and analysis options, and document project data quality decisions. This sampling and analysis plan presents a general approach to removal action implementation using the observational approach, which streamlines the site investigation process and employs visual inspections, field measurements, focused sampling and laboratory analysis, where necessary, and targeted removals to support site closure in a defensible and cost-effective manner. This approach accommodates in-process development by the field team lead, in consultation with the U.S. Department of Energy on-scene coordinator and the Washington State Department of Ecology, of the sampling detail necessary to demonstrate achievement of removal action levels. Sampling details will be based on the results of initial site visual inspections, radiological screening, and other pertinent site information. The final sampling design will be approved by the U.S. Department of Energy and the Washington State Department of Ecology. Regulator acceptance of

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[6] DOE/RL-2009-48, pending, *Action Memorandum for Non-Time-Critical Removal Action for 11 Waste Sites in the 200-MG-1 Operable Unit,* Decisional Draft, U.S. Department of Energy, Richland Operations Office, Richland, Washington.

[7] DOE/RL-2009-53, pending, *Removal Action Work Plan for the 200-MG-1 Operable Unit Waste Sites,* Rev. 0, U.S. Department of Energy, Richland Operations Office, Richland, Washington.

sample results by the Washington State Department of Ecology will be documented by waste site and included in a removal action completion report.

The data-collection strategy is based on use of the observational approach, current site knowledge, and the selected removal action alternative. The general site investigation and disposition process, from observational approach activities, to any necessary sampling, and finally site closeout activities, is as follows:

- Removal of debris or stabilization cover, if existing, as necessary to gain access to soils for visual inspection to help document site conditions and locate contamination requiring further evaluation or removal
- Radiological and/or chemical field screening to further define contamination areas for focused sampling
- Confirmatory sampling at CS/NFA sites to show that potential contamination identified by visual inspections and field screening does not exceed removal action levels and that no further action is necessary, and verification sampling at RTD sites to show that contamination removal has been effective and excavation area soils do not exceed removal action levels
- Where contamination is not identified using the observational approach, the absence of contamination at remaining site locations to be demonstrated by site surface area sampling, such as composited grid sampling, or by field-screening methodology
- Data collection for waste designation and disposal to ensure compliance with the Environmental Restoration Disposal Facility waste acceptance criteria (WCH-191, *Environmental Restoration Disposal Facility Waste Acceptance Criteria*[8])
- Assessment of data to determine if the data demonstrate completion of the preferred removal action alternative and support the final remedial action for these 200-MG-1 Operable Unit waste sites
- Documentation of site investigation activities in site-specific removal action completion report(s).

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[8] WCH-191, 2008, *Environmental Restoration Disposal Facility Waste Acceptance Criteria*, Washington Closure Hanford, LLC, Richland, Washington. Available at: http://www.wch-rcc.com/pgs/readroom/WCH/wch191.pdf.

Chapter 1 of this sampling and analysis plan provides an introduction that identifies project scope, goals, and contaminants of potential concern, and summarizes the systematic planning process used to determine project data-collection requirements and approaches. Chapter 2 provides the activity-specific quality assurance project plan. The sampling strategy and data-collection activities for the project are presented in Chapter 3.

Contents

Figures

Tables

Terms

ALARA	as low as reasonably achievable
BTR	buyer's technical representative
CERCLA	*Comprehensive Environmental Response, Compensation, and Liability Act of 1980*
CFR	*Code of Federal Regulations*
COPC	contaminant of potential concern
CS/NFA	confirmatory sampling/no further action
DOE	U.S. Department of Energy
DQA	data quality assessment
DQO	data quality objective
Ecology	Washington State Department of Ecology
EPA	U.S. Environmental Protection Agency
ERDF	Environmental Restoration Disposal Facility
HEIS	Hanford Environmental Information System
MARSSIM	DOE/EH-0624, *Multi-Agency Radiation Survey and Site Investigation Manual*
OU	operable unit
QA	quality assurance
QAPjP	quality assurance project plan
QC	quality control
RAL	removal action level
RL	U.S. Department of Energy, Richland Operations Office
RTD	removal, treatment, and disposal
SAP	sampling and analysis plan
Tri-Party Agreement	Ecology et al., 1989a, *Hanford Federal Facility Agreement and Consent Order*
WAC	*Washington Administrative Code*
WIDS	Waste Information Data System
ZPC	zone of potential contamination

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1 Introduction

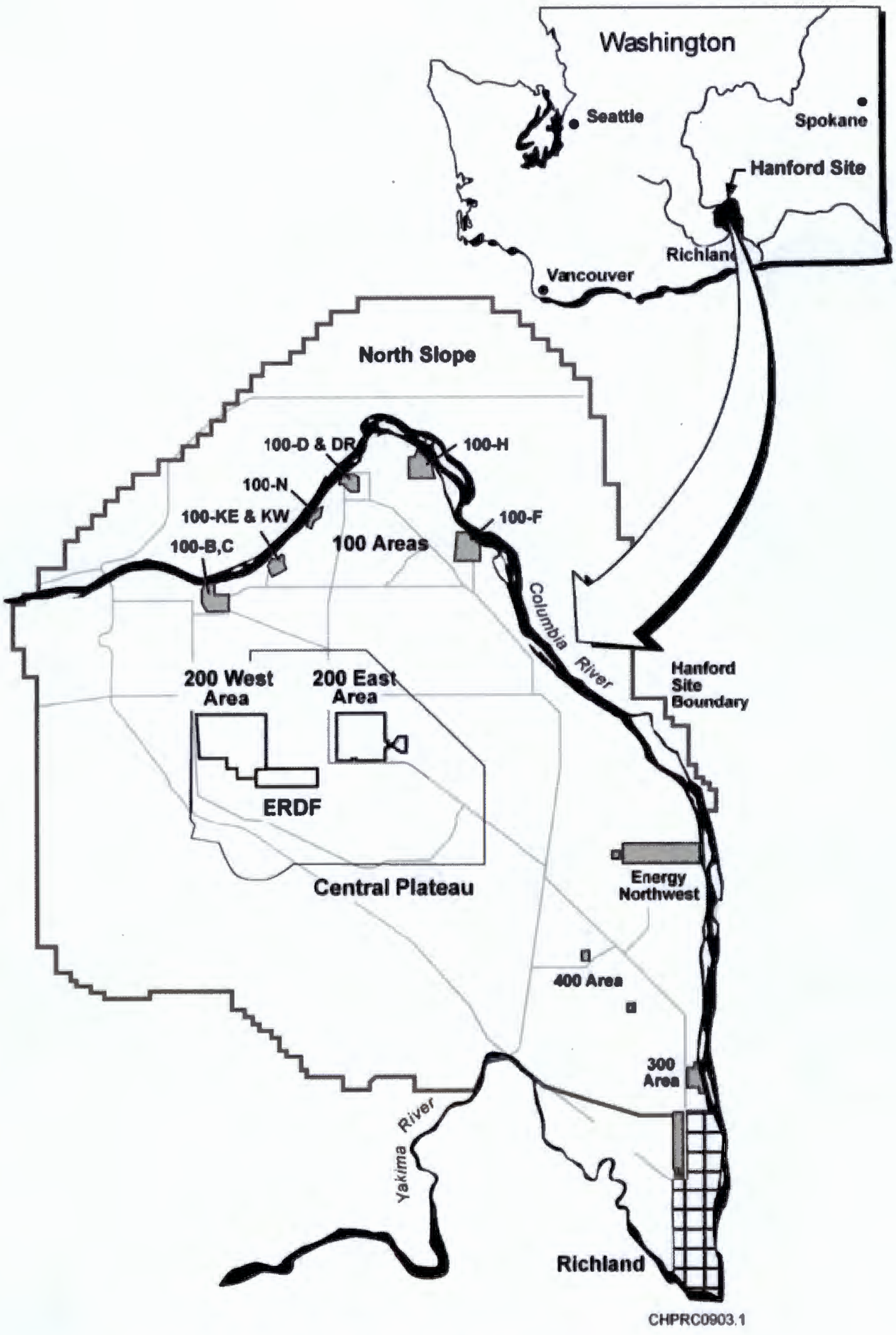
The Hanford Site (Figure 1-1) is a 1,517 km^2 (586 mi^2) federal facility located in southeastern Washington State along the Columbia River. All of the waste sites contained in the 200-MG-1 Operable Unit (OU) are located within the Central Plateau, as defined in DOE/EIS-0222-F, *Final Hanford Comprehensive Land Use Plan Environmental Impact Statement*, and are outside the Core Zone as defined in DOE/RL-2005-57, *Hanford Site End State Vision.*

The 200-MG-1 OU waste group consists of 194 sites that are primarily surface contamination areas that will undergo removal action sampling as necessary to remove site risk and support the final remedial action for these sites. This sampling and analysis plan (SAP) addresses the investigation of eleven 200-MG-1 OU waste sites located near the 200 East and 200 West Areas within the Central Plateau of the Hanford Site (Figure 1-2). The U.S. Department of Energy (DOE) has determined that the 200-MG-1 OU waste sites have the potential for release of *Comprehensive Environmental Response, Compensation, and Liability Act of 1980* (CERCLA) hazardous substances, and that a non-time-critical removal action, pursuant to authority delegated under Executive Order 12580, *Superfund Implementation*, and Section 7.2.4 of Ecology et al., 1989b, *Hanford Federal Facility Agreement and Consent Order Action Plan*, is warranted to mitigate the threat of release. In response, DOE prepared DOE/RL-2008-44, *Engineering Evaluation/Cost Analysis for the 200-MG-1 Operable Unit Waste Sites*, to address the potential for releases from 200-MG-1 OU waste sites. DOE/RL-2008-44 identifies preferred alternatives for the 200-MG-1 OU waste sites addressed under this SAP as removal, treatment and disposal (RTD) sites if contaminated soil removal is expected or as confirmatory sampling/no further action (CS/NFA) sites where contamination is not anticipated but data are required to confirm that no further action under CERCLA is required. DOE/RL-2009-48, *Action Memorandum for Non-Time-Critical Removal Action for 11 Waste Sites in the 200-MG-1 Operable Unit*, selects the removal action alternative for these sites and provides regulatory approval to proceed with implementing the selected alternative. This SAP is intended to provide data that confirms the CS/NFA removal action alternative, verifies removal actions at RTD sites, and provides characterization data for waste disposal.

The 200-MG-1 OU waste sites addressed under this plan are listed in Table 1-1. The locations of sites addressed under this plan are shown in Figure 1-2. The waste sites addressed under this SAP are non-process sites that include dumping areas, a crib, burn pit, non-process facility (e.g., shop) demolition areas, and areas of unplanned releases. The activities that generated the waste found at these sites included construction activities, debris burning, shop activities, storage activities, and potentially decontamination activities. These sites are generally areas of shallow, surface contamination that typically did not release process effluent that could have impacted groundwater or that would have created areas of homogeneous contamination. Although expected to be minimal, radioactive releases could have occurred through airborne dissemination of radioactive particles (windblown dispersal) of radiologically contaminated tumbleweeds or spreading of animal fecal material. The terms "contamination" or "contaminant," as used in this document, refer to the presence of contaminants of potential concern (COPCs) that exist above removal action levels (RALs).

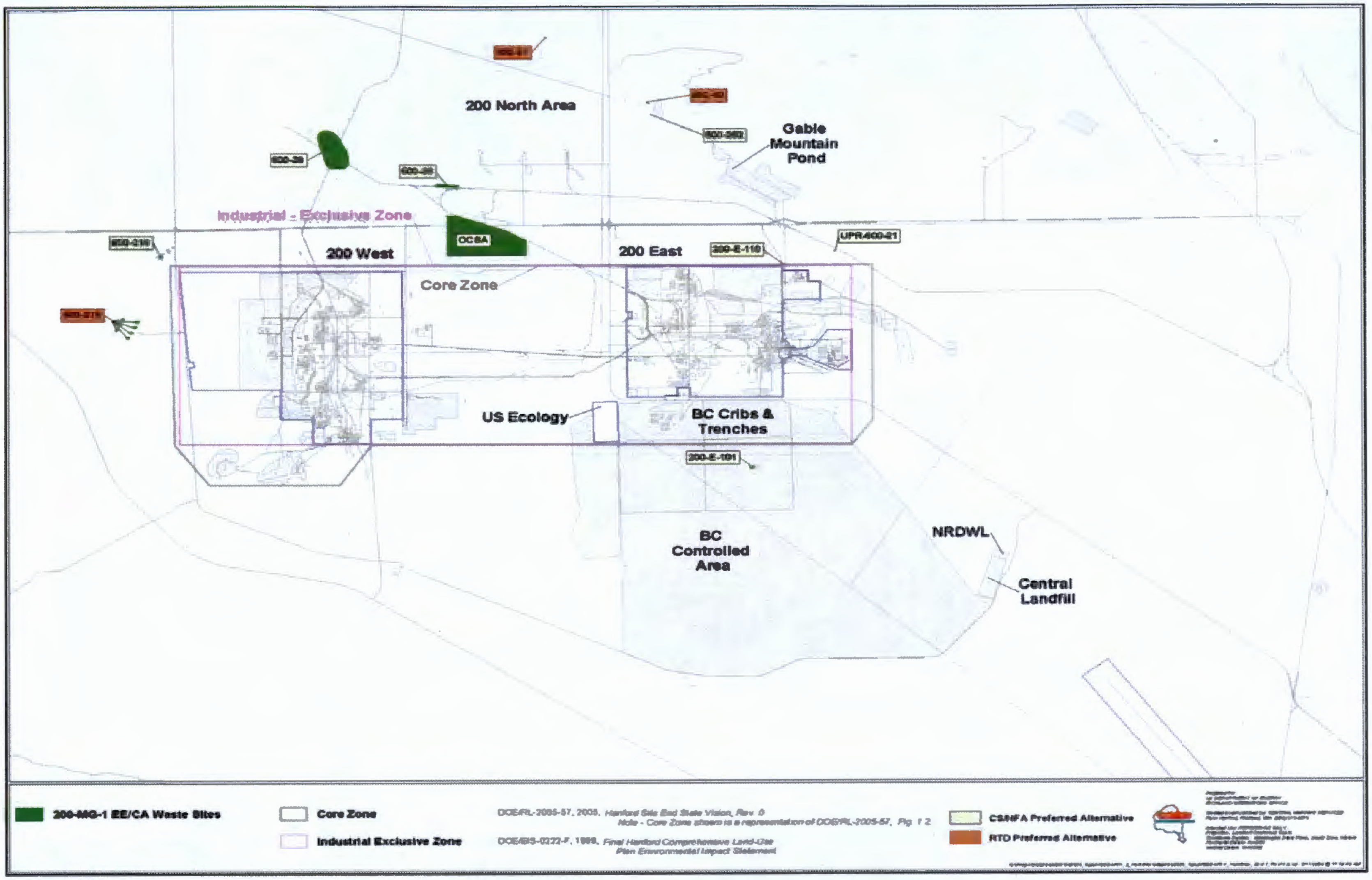
1.1 Project Goals and Scope

The goal of this project is to remove the potential risk presented by these sites by implementing selected removal action alternatives that will meet removal action objectives identified in DOE/RL-2009-48. This goal will be achieved by identifying and removing contamination above RALs at the eleven 200-MG-1 OU waste sites (Table 1-1) identified for expedited action in DOE/RL-2009-48.



ERDF = Environmental Restoration Disposal Facility

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



EE/CA = DOE/RL-2008-44, *Engineering Evaluation/ Cost Analysis for the 200-MG-1 Operable Unit Waste Sites*

NRDWL = nonradioactive dangerous waste landfill

OCSA = Old Central Shop Area

Figure 1-2. Location of 200-MG-1 OU Waste Sites

Table 1-1. Expedited 200-MG-1 OU Waste Sites

Waste Site Code	Waste Site Type	Selected Removal Action Alternative
600-275	Foundation	RTD
200-E-110	Dumping area	CS/NFA
600-36	Burn pit	CS/NFA
600-38	Dumping area	CS/NFA
200-E-101	Experiment/test site	CS/NFA
600-40	Dumping area	RTD
600-51	Dumping area	RTD
600-218	Dumping area	CS/NFA
600-262	Crib	CS/NFA
Old Central Shop Area	Foundations	CS/NFA
UPR-600-21	Unplanned release	CS/NFA

This SAP will support this goal by generating data of sufficient quality and quantity to demonstrate completion of the selected removal action alternative. The scope of the sample planning process included systematic planning to develop sampling data quality objectives (DQOs) for collection of data that (1) support confirmation of the preferred CS/NFA and RTD removal action alternative for these waste sites, and (2) provide characterization data for waste disposal.

Overall data-collection efforts for the 200-MG-1 OU waste sites include:

- Visual inspections to help document site conditions and locate contamination requiring further evaluation or removal
- Radiological and/or chemical field screening to further define potential contamination areas for focused sampling
- Confirmatory sampling to show that contaminant concentrations do not exceed RALs and that no further action is necessary
- Verification sampling at RTD sites to verify that contamination removal has been effective and excavation area soils do not exceed RALs
- Data collection for waste designation and disposal to ensure compliance with the Environmental Restoration Disposal Facility (ERDF) waste acceptance criteria (WCH-191, *Environmental Restoration Disposal Facility Waste Acceptance Criteria*).

1.2 Waste Site Contaminants

Table 1-2 shows COPCs as target analytes for soil sampling. Polynuclear aromatic hydrocarbons, aroclors, and metals also have been added to the list of COPCs because they may be present as a result of Hanford Site operations based on current information from other waste sites. Process knowledge, where available, will be used to guide sampling and analysis. The RALs for these COPCs were derived from

DOE/RL-2009-53, *Removal Action Work Plan for the 200-MG-1 Operable Unit Waste Sites.* The associated analytical performance requirements for these analytes, including the analytical method and required detection limits, are provided in Chapter 2 of this SAP. As outlined in DOE/RL-2008-44, the 200-MG-1 OU waste sites may be contaminated with any or none of the COPCs listed in Table 1-2.

Based on systematic planning process involving U.S. Department of Energy (DOE) and Washington State Department of Ecology (Ecology), where the presence of chemical or radioactive contamination is indicated by visual inspection and field screening, sampling activities may include analysis for all of the Table 1-2 contaminants, and contaminants identified through process knowledge.

Table 1-2. 200-MG-1 OU COPCs

Metals		
Antimony* Arsenic* Barium* Beryllium Chromium* Cobalt	Copper* Lead* Manganese Mercury* Nickel* Selenium*	Silver Thallium Uranium* Vanadium* Zinc*
Radionuclides*		
Americium-241 Cesium-137 Europium-152 Europium-154	Europium-155 Plutonium-238 Plutonium-239/240 Strontium-90	Uranium-233/234 Uranium-235 Uranium-238
Polynuclear Aromatic Hydrocarbons		
Acenaphthene Acenaphthylene Anthracene Benzo(a)anthracene Benzo(a)pyrene	Benzo(b)fluoranthene Benzo(ghi)perylene Chrysene Dibenz(a,h)anthracene Fluoranthene	Fluorene Naphthalene Phenanthrene Pyrene
Polychlorinated Biphenyls		
Aroclor-1016 Aroclor-1221 Aroclor-1232	Aroclor-1242 Aroclor-1248 Aroclor-1254*	Aroclor-1260*
Total Petroleum Hydrocarbons		
Total petroleum hydrocarbons (diesel range)*	Total petroleum hydrocarbons (kerosene range)*	

* Constituents identified were determined using the screening process defined in DOE/RL-2008-44, *Engineering Evaluation/Cost Analysis for the 200-MG-1 Operable Unit Waste Sites.*

1.3 Removal Action Data Needs and DQOs

A systematic planning process was used to support the development of this SAP and to identify data and data quality needs for the 200-MG-1 OU waste site data collection. This is a strategic planning approach that provides a systematic process for defining the criteria that a data collection design should satisfy. Using this process ensures that the type, quantity, and quality of environmental data used in decision making will be appropriate for the intended application. This section summarizes the systematic planning process activities and key outputs. The planning process identified the type, quantity, and quality of data that will be appropriate for the intended use and to support the sample design presented in this SAP.

This SAP supports the collection of data that support site closure by serving three purposes: waste designation of excavated soil and debris for disposal, verification of RTD removal actions, and confirmation of the CS/NFA alternative.

For purposes of waste designation and acceptance by the disposal facility, a waste profile is necessary that requires process knowledge and/or analytical data to complete.

Verification sampling is necessary to confirm the appropriateness of the no-action alternative for the CS/NFA alternative sites identified in Figure 1-2 and to verify that contamination has been removed to below RALs at RTD sites. This will require sampling that provides the type, quantity, and quality of data required to demonstrate closure of these sites.

1.3.1 Systematic Planning Process

The following sections describe the systematic planning process for this SAP and key outputs.

1.3.1.1 Initial Systematic Planning Meeting

CHPRC contractor personnel and the DOE representative attended planning meetings on June 5, 2009, to identify the scope of the investigation, the purpose of this SAP, project data needs, proposed sampling approach(es), and source documents that identify OU COPCs, project scope, and site RALs. Site walkdowns occurred June 9 and June 10, 2009, to confirm site locations and current conditions because much information regarding site conditions is recognized as out of date. The planning process was used to establish the following SAP content and site information:

- **Scope**: This SAP will collect data and support implementation of removal action alternatives for eleven 200-MG-1 OU waste sites identified in Table 1-1 that were identified in DOE/RL-2008-44 as requiring CERCLA action to mitigate site risk.
- **Purpose:** The purpose of the SAP is to obtain sufficient data to demonstrate completion of the selected RTD or CS/NFA removal action alternative. Data will be collected for (1) completion of waste profiles and waste designation for disposal of excavated soil and debris, (2) verification of removals at RTD sites, and (3) confirmation that no action is required at the CS/NFA sites.
- **Source documents:** DOE/RL-2008-44, DOE/RL-2009-53, and DOE/RL-2009-48 provide project information and approval to proceed. DOE/RL-2009-48 is the decision document for this removal action and provides regulatory authorization to proceed with the selected alternatives for these 11 sites and a site description that will assist in formulating data-collection strategy. DOE/RL-2009-48 also provides the removal action objectives that the removal action alternative must meet for selection. DOE/RL-2008-44 provided the initial list of COPCs as SAP target analytes, with additional site specific COPCs added by DOE/RL-2009-53. Except as noted, the SAP will use the entire DOE/RL-2008-44 list of COPCs based on DOE/RL-2008-44 direction to use the entire list where process knowledge is limited. DOE/RL-2009-53 also provided risk-based RALs as the basis for establishing analytical detection limits that this SAP must meet.
- **Assumptions/site conditions:** The following project assumptions and site information formed a basis for team planning discussions and conclusions:
  - Little historical characterization information exists for these sites. It cannot be assumed that the absence of radionuclides implies the absence of chemical contamination.

- DOE/RL-2008-44 describes the 200-MG-1 OU waste sites as shallow, surface contamination sites that provide non-imminent but potential risk of small releases, but are unlikely to present a groundwater threat.
  - These sites include debris accumulation areas and the source of the waste was construction, maintenance, and demolition activities of generally non-contaminated facilities.
  - These sites have not been shown to contain free liquids but may have stains or other surface anomalies that could indicate potential contamination. The underlying soils also are expected to be contaminated to only a nominal depth.
  - There is no waste-generating process associated with these sites that provides for sustained releases and homogeneous contamination. Consequently, contamination is expected to be limited to discreet contamination areas (hot spots) where minor releases could have occurred or where contaminated debris could have contacted soil. An observational investigation approach will help identify hot spots and judgmental sampling locations based on site visual inspections and radiological and/or chemical screening.
  - As areas of shallow surface contamination, it can reasonably be assumed that contamination decreases with depth from the ground surface. Where stabilizing cover is present, contamination will decrease with depth from below the original release surface.
- The 200 Area radiological waste streams contained mixed fission products, including the readily detectable beta/gamma emitter cesium-137 (Cs-137). The absence of Cs-137 at these waste sites will be used to demonstrate the absence of all radionuclides above RALs.
- The sites or portions of sites that do not exhibit hot spot contamination will require data to demonstrate that RALs have been met.
- Contaminated soil or debris removed from these sites is not anticipated to require ex situ treatment to meet ERDF waste acceptance criteria (WCH-191) or to reduce waste volumes. However, before the material is transported to the ERDF, waste profiles will be developed to ensure meeting ERDF waste acceptance criteria for disposal as low-level radioactive waste and/or hazardous waste.

1.3.1.2 Second Systematic Planning Meeting

The second planning meeting occurred June 25, 2009. The focus of this meeting was to develop and refine characterization activities and a confirmatory and verification sampling approach and to develop a schedule for Ecology involvement to facilitate regulator approval. A draft conceptual approach for implementing the observational approach at each site was defined that includes an initial survey, focused material removal, sampling to verify complete removal, and site statistical grid sampling that could be used to generally demonstrate no remaining contamination above RALs.

The planning process developed a general approach to removal action implementation that accommodates in-process development of sampling detail necessary to demonstrate that RALs have been met. The general site approach is presented in the following section.

1.3.1.3 General Site Investigation Approach

Each of the eleven 200-MG-1 OU waste sites will be investigated using the observational approach as follows.

1. An initial visual field survey will be performed, formally documenting all visual observations across the site. The visual survey will include documentation of Geographic Information System coordinates, descriptions of observed conditions and delineations of the condition that resulted in the original identification of the site (from Waste Information Data System [WIDS]) and any additional observed conditions. The field survey also will include photo documentation of the site. Radiological surveys will be conducted to identify site health and safety needs. Debris and any stabilization cover will be removed, if existing and as necessary to gain access to soils.
2. Based on the visual survey, the site technical lead may call for focused radiological surveys or subsurface ground-penetrating radar surveys to characterize observed conditions. Characterization sampling of specific areas, using a focused sampling approach with field chemical tests or laboratory samples, may be requested in order to fully understand the nature of any identified condition or material before contamination removal.
3. The field team will agree on an RTD plan that addresses the observed conditions of the site.
4. During soil/material removal, visual (extent of staining, etc.) or radiological indicators will be monitored to guide removal. In the event that no radiological or visual indicator is available, a field chemical test (e.g., X-ray fluorescence, total petroleum hydrocarbon kit) may be employed.
5. After removal, the resulting excavation will be sampled using either a focused design for small areas, graduating to a systematic design with random start for larger excavated areas to verify the absence of contamination above RALs. For sites contaminated with only radionuclides for which isotopic ratios have been established, direct radiological surveys without additional sampling and analysis may be used to verify the absence of radiological contamination above the RALs.
6. At portions of CS/NFA sites where contamination was not identified using the observational approach or at RTD sites after excavations have concluded, sampling could be conducted as required to verify that RALs have been met at these locations. The need for and extent of sampling at such locations will be determined by the field technical lead in consultation with the DOE on-scene coordinator and Ecology and based on the results of initial site visual inspections, radiological screening, and other pertinent site information. Sampling instructions providing the final sampling design will be generated and approved by DOE and submitted to Ecology. Ecology acceptance will be documented in a removal action completion report.
7. Analytical results will be evaluated and re-sampling will be conducted, if necessary.

1.3.1.4 General Data Collection and Sampling Design Concepts

Sampling locations will be selected during site walkdowns by responsible contractor technical staff familiar with the 200-MG-1 OU and the waste sites in question. The primary criteria for selecting sample locations/materials are process knowledge field-screening results (e.g., detectable radioactive and/or chemical contamination as defined with field instruments) or suspicious visual indications.

Visual Inspections. These waste sites have attributes such as visible surface debris and known discharge release points that make visual inspections effective in locating site contamination areas for further evaluation. The site surfaces will be inspected for soil staining or discoloration, absence of vegetation, potentially hazardous debris (e.g., friable asbestos), and any other indications of contamination or visual anomalies.

Radiological Field Screening. The sites could have gamma- and/or beta-emitting constituent(s) that can be identified by surface/near-surface radiological surveys (e.g., radioactive tumbleweeds). For the sampling effort, radiological field screening will be used to establish site radiological contamination levels. In addition, field screening for radiological contamination (Cs-137) may be used as an "indicator" parameter to identify the possible presence of other radionuclide COPCs. If field-screening results indicate the presence of radiological contamination, the areas can be further characterized with laboratory analytical samples. Further details regarding field screening are presented in Chapter 3.

Chemical Field Screening. Chemical field screening will occur at a minimum where visual inspections have identified a potential for chemical contamination requiring further evaluation. If field-screening results indicate the presence of chemical contamination, the areas can be further characterized with laboratory analytical samples. Further details regarding field screening are presented in Chapter 3.

Focused Sampling. The nature of the 200-MG-1 OU waste sites supports the use of judgment/focused sampling for the waste site, as identified in EPA/240/R-02/005, *Guidance on Choosing a Sampling Design for Environmental Data Collection*. This guidance document defines "focused sampling" as selective sampling of areas where potential or suspected soil contamination can reliably be expected to be found if a release of a hazardous substance has occurred. Focused sampling designs are appropriate for waste characterization to ensure compliance with the receiving facilities' waste acceptance criteria, and for confirmation of a conceptual model or remedy, and for evaluation of preliminary data to determine the need for further sampling and analysis. Therefore, sampling in a focused manner will ensure data collection of the area of greatest impact associated with the release for waste characterization purposes.

The number of samples, the depth of sampling, the types of focused samples, and their locations would be developed judgmentally based on the observational approach and site knowledge. Statistical sampling designs will not be implemented for this portion of the sampling effort. Samples will be collected from site locations where existing analytical data, process knowledge, and field radiological surveys indicate maximum contamination, or "worst case" concentrations. Grab samples for shallow surface contamination are the preferred method at most sites. Details of the focused sampling design are presented in Chapter 3.

Site Verification Sampling. Where contamination was not identified at CS/NFA sites using the observational approach and/or at RTD sites after excavation sampling has concluded, sampling could be conducted to confirm that remaining site locations do not exceed RALs and no further action is required to support the final 200-MG-1 OU remedial action. The need for, and extent of such sampling will be determined by the field technical lead in consultation with the DOE on-scene coordinator and Ecology. Details of the design will be based on the overall size of the site, observations, and process knowledge, and developed by the field technical lead in consultation with the DOE on-scene coordinator and Ecology. Sampling instructions providing site-specific sampling design will be generated and submitted to Ecology.

1.3.1.5 Third Systematic Planning Meeting

The third systematic planning meeting occurred July 9, 2009, when DOE and team members met with Ecology. The meeting was held to identify the Ecology participants; discuss an advance copy of the SAP provided to Ecology in preparation for this meeting; and clearly present the investigation approach in order to quickly bring all participants to a baseline understanding of the project scope, approach, and expedited schedule for this project. The discussion was focused on first reaching agreement on the sampling and characterization approach, and then to provide comments on the DQO/SAP document. Any unresolved issues would be addressed as appropriate in follow-up small meetings or workshop sessions.

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2 Quality Assurance Project Plan

The quality assurance project plan (QAPjP) complies with the following requirements:

- 10 CFR 830, Subpart A, "Quality Assurance Requirements"
- DOE O 414.1C, Quality Assurance
- EPA/240/B-01/003, EPA Requirements for Quality Assurance Project Plans, EPA QA/R-5
- Performing contractor's applicable quality assurance (QA) program.

Sample process design is not addressed in the QAPjP but is instead addressed in Section 3.2 of this SAP.

This section describes the applicable quality requirements and controls. Sections 6.5 and 7.8 of Ecology et al., 1989a, *Hanford Federal Facility Agreement and Consent Order* (Tri-Party Agreement) require that DOE conduct QA/quality control (QC) and sampling and analysis activities in accordance with EPA/240/B-01/003; therefore, the QAPjP is organized based on the QA elements specified in EPA/240/B-01/003. The QAPjP is divided into four sections that correspond to U.S. Environmental Protection Agency (EPA) checklist sections and describe the quality requirements and controls applicable to this investigation.

2.1 Project Management and Organization

The following subsections address project management to ensure that the project has a defined goal, the participants understand the goal and the approach to be used, and the planned outputs are appropriately documented. The project organization is shown in Figure 2-1. The managing contractor will be responsible for collecting, packaging, and shipping samples to the appropriate laboratory.

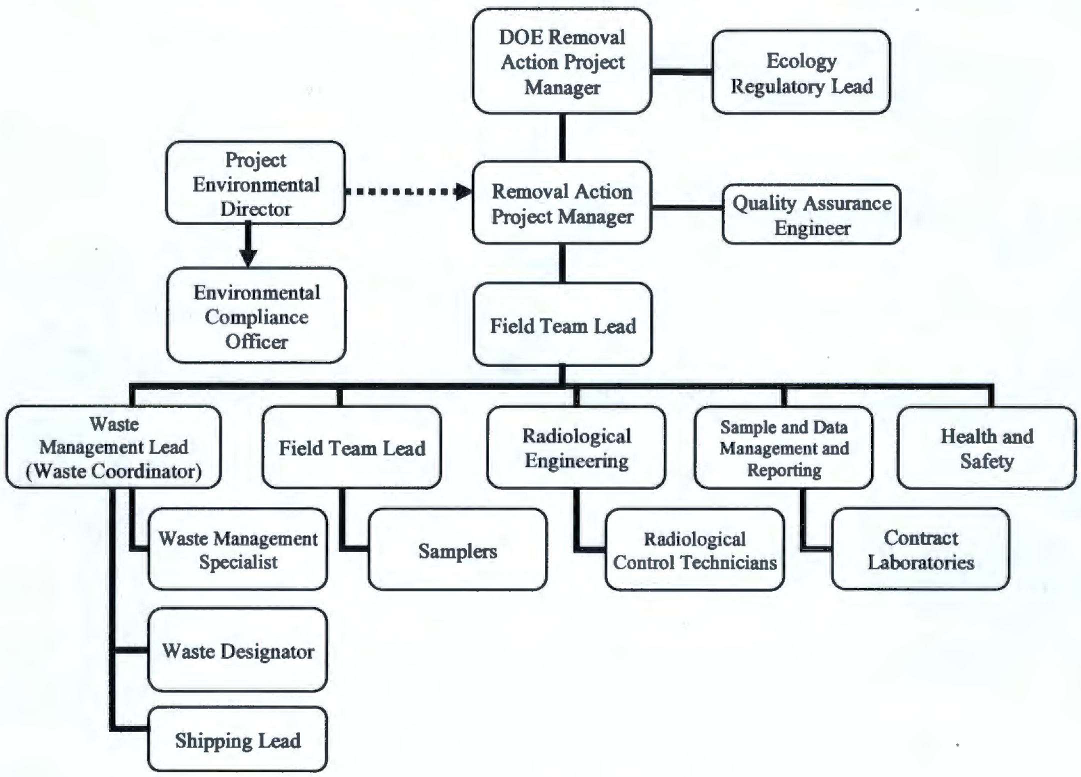


Figure 2-1. Project Organization

The primary contractor, or its approved subcontractor, is responsible for planning, coordinating, sampling, preparation, packaging, and shipping samples to the laboratory. The project organization, in regard to sampling and characterization, is described in the subsections that follow and is shown graphically in Figure 2-1. The Removal Action Project manager maintains a list of individuals or organizations that are the points of contact for each functional element in the figure. For each functional primary contractor role, there is a corresponding oversight role within the DOE.

2.1.1 Management Responsibilities

Management responsibilities and inter-relationships are described in the following subsections.

2.1.1.1 Environmental Compliance

The environmental compliance officers work under the Project Environmental director. The environmental compliance officers provide oversight in dealing with environmental management assessments and compliance assessments, define potential environmental impacts, and identify corrective actions (if needed) for Hanford Site activities.

The Project Environmental director provides environmental oversight for activities and coordinates with the DOE, Richland Operations Office (RL), EPA, and contractor management.

2.1.1.2 Regulatory Project Manager

The Ecology project manager is responsible for regulatory oversight of cleanup project and activities. Ecology, as lead regulatory agency for this project, has approval authority as for the work being performed under this SAP. Ecology will work with RL to resolve concerns regarding the work as described in this SAP in accordance with the Tri-Party Agreement.

2.1.1.3 Tri-Party Agreement Project Manager and RL Technical Lead

The RL is responsible for Hanford Site cleanup. The RL project manager is responsible for authorizing the contractor to perform Hanford Site activities in accordance with CERCLA; the *Resource Conservation and Recovery Act of 1976*; the *Atomic Energy Act of 1954*; and the Tri-Party Agreement. The RL is also responsible for obtaining lead regulatory agency approval of the SAP, which authorizes the field-sampling activities. The RL technical lead is responsible for providing day-to-day oversight of the contractor's work scope performance, for working with the contractor and the regulatory agencies to identify and work through issues, and for providing technical input to the RL federal project director.

2.1.1.4 Removal Action Project Manager

The Removal Action Project manager provides oversight for all activities and coordinates with the DOE, regulators, and primary contractor management in support of sampling activities. The Removal Action Project manager is responsible for direct management of sampling documents and requirements, field activities, and subcontracted tasks and for ensuring that the project file is properly maintained.

The Removal Action Project manager ensures that the sampling design requirements are converted into field instructions (e.g., work packages) that provide specific direction for field activities. The Removal Action Project manager works closely with the Project Environmental director, QA, Health and Safety, the field work supervisor, and the Construction Management lead to integrate these and the other lead disciplines in planning and implementing the work scope. The Removal Action Project manager maintains a list of individuals or organizations filling each of the functional elements of the project organization (Figure 2-1). In addition, the Removal Action Project manager is responsible for version control of the SAP to ensure that personnel are working to the most current job requirements.

The Removal Action Project manager also coordinates with DOE and the Project Environmental director on all sampling activities. The Removal Action Project manager supports DOE in coordinating sampling activities with the regulators.

2.1.1.5 QA Engineer

The QA engineer is matrixed to the project manager and is responsible for QA on the project. Responsibilities include overseeing implementation of project QA requirements, closing corrective actions, reviewing project documents (including SAPs and the QAPjP), and participating in QA assessments. The QA point of contact must be independent of the unit generating the data.

2.1.1.6 Waste Management Lead (Waste Coordinator)

The Waste Management lead reports to the Project Environmental director and communicates policies and procedures for storage, transportation, disposal, and waste tracking in a safe and cost-effective manner to ensure project compliance to the Removal Action Project manager. Other responsibilities include receiving data from the field team lead to initiate waste designations and meet the requirements of other documents (e.g., the waste management plan) to ensure project compliance with waste acceptance criteria and disposal practices. The waste management lead interfaces with the waste management specialist and waste designator.

2.1.1.7 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 and regulatory issues or concerns raised by DOE and/or regulatory agency staff. The Environmental Compliance Officer also may oversee project implementation for compliance with applicable internal and external environmental requirements.

2.1.1.8 Field Team Lead

The field team lead has overall responsibility for planning, coordinating, and executing field activities. Specific responsibilities include converting the sampling design requirements into field task instructions to provide specific direction for field activities, as well as directing training, mock-ups, and practice sessions with field personnel to ensure that the sampling design is understood and can be performed as specified. The field team lead also communicates with the project manager to identify field constraints or emergent conditions affecting sampling design/execution, to direct the procurement and installation of materials and equipment to support field work, and to prepare data packages based on instructions from the Project Environmental director (or designee) and information contained in this SAP. The Shipping lead reports to the Waste Management lead for shipment authorization. No sample material will be transported on or off the Hanford Site without permission from the project-authorized shipper (or designee).

The field work supervisor directs the samplers who, depending on the project, collect groundwater, soil, vapor, and multimedia samples, including replicates/duplicates and prepares all sample blanks according to the SAP and corresponding standard procedures and work packages. The samplers also complete the field logbook and chain-of-custody forms, as well as any shipping paperwork, and ensure delivery of the samples to the analytical laboratory.

A **field technical representative** acts as a technical interface between the Removal Action Project manager and the field crew supervisors (the field work supervisor lead and the field work supervisor - buyer's technical representative [BTR]) and ensures that technical aspects of the field work will be met. The field work supervisor – BTRs oversee the daily operations at the job site. The field technical representative reviews the SAP for field collective concerns, analytical requirements, and special sampling requirements and generates appropriate field-sampling paperwork. The field technical representative, in consultation with the project manager, resolves issues arising from translation of technical requirements to field operations and coordinates resolution of off-normal sampling situations.

2.1.1.9 Radiological Engineering

Radiological Engineering is responsible for the radiological engineering and health physics support for the project. Specific responsibilities include conducting as-low-as-reasonably-achievable (ALARA) reviews, exposure and release modeling, and radiological controls optimization for work planning. In addition, radiological hazards are identified and appropriate controls are implemented to maintain worker exposures to hazards at ALARA levels. Radiological Engineering interfaces with the project Health and Safety representative and other appropriate personnel, as needed, to plan and direct radiological control technician support for activities.

2.1.1.10 Sample Management and Reporting

The Sample and Data Management Reporting organization is responsible for managing the analyses and resulting analytical data for samples collected for this SAP. Sample and Data Management selects laboratories to perform the required analyses and ensures that the laboratories conform to Hanford Site internal laboratory QA requirements (or equivalent), as approved by RL, EPA, and Ecology. After the selected laboratories complete the analyses, Sample and Data Management receives the analytical data from the selected laboratories, performs data entry into the Hanford Environmental Information System (HEIS) database, and arranges for data interpretation. After analytical data interpretation is completed, Sample and Data Management provides the analytical data to the waste management lead (i.e., waste coordinator). Sample and Data Management also interfaces with the field team lead (i.e., sample coordinator) regarding sampling information (e.g., sampling activities, sample and associated data tracking, and distributing analytical data).

The Sample and Data Management and Reporting organization also is responsible for the establishment of DQOs for development of the SAP. Responsibilities include documentation as well as development of the DQOs and the SAP, including sampling design, associated presentations, resolution of technical issues, and any revisions to the SAP.

Contract Laboratories. The Sample and Data Management and Reporting organization interfaces with the contract laboratories. The laboratories analyze samples in accordance with established procedures and provide necessary sample reports and explanation of results in support of data validation. The laboratories must meet site-specified QA requirements and must have an approved QA plan in place.

2.1.1.11 Health and Safety

The Health and Safety organization's responsibilities include coordinating 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 regulations or by internal contractor work requirements. In addition, the organization assists project personnel in complying with applicable health and safety standards and requirements. Personal protective equipment requirements are coordinated with Radiological Engineering.

2.1.2 Problem Definition/Background

The problem definition and background for the SAP activities are presented in Section 1.3 of this SAP addressing project data needs and DQOs.

2.1.3 Project/Task Description

This SAP governs confirmation and verification data collection and sampling at eleven 200-MG-1 OU waste sites during implementation of CERCLA removal actions. The sites listed in Table 1-1 will have surface soil data collected for confirmation of the selected alternative and to demonstrate that RALs have been met.

Data-collection activities will include visual inspections, radiological and chemical field surveys and screening, and sampling and analysis. An observational approach using visual inspection and field screening will be used to identify areas of potential contamination for removal or further characterization sampling. The final site-specific sampling design will be developed by the field team lead based on initial site evaluation results and in consultation with the DOE on-scene coordinator and Ecology.

The observational approach will be used to guide excavations and the removal area will be evaluated at 0.3 m (1-ft) increments in depth. At removal areas, at least one verification sample will be taken to verify contamination removal to below RALs. At the portions of RTD sites and CS/NFA sites where contamination hot spots were not identified using the observational approach, sample(s) will be taken to verify the absence of contamination above RALs. Under the observational approach, additional sampling may occur based on the observations of the field team lead (or designee) during field activities.

2.1.4 Quality Objectives and Criteria for Measurement Data

The QA objective of this plan is to develop implementation guidance that will provide data of known and appropriate quality. The applicable QC guidelines, quantitative target limits, and levels of effort for assessing data quality are dictated by the intended use of the data and the nature of the analytical method. Data quality for this SAP may be assessed by six data quality indicators: representativeness, accuracy, comparability, completeness, precision, and sensitivity. The quality indicators will be evaluated during the systematic planning process.

The analytical methods, detection limits, and the precision and accuracy requirements for each measurement and sample analysis to be performed are summarized in Table 2-2 (provided later in this section). Procedures from the contractor (or its approved subcontractor) will be used for sampling. In consultation with the laboratory, the Removal Action project manager, and/or others as appropriate, including the Sample Management and Reporting organization, identifies appropriate analytical methods.

2.1.4.1 Representativeness

Representativeness is a measure of how closely analytical results reflect the actual concentration and distribution of the constituents in the matrix sampled. Sampling plan design, sampling techniques, and sample-handling protocols (e.g., storage, preservation, and transportation) are discussed in subsequent sections of this SAP. The required documentation will establish the protocols to be followed and will ensure appropriate sample identification and integrity.

2.1.4.2 Accuracy

Accuracy is an assessment of the closeness of the measured value to the true value. Radionuclide measurements requiring chemical separations use this technique to measure method performance. For radionuclide measurements analyzed by gamma spectroscopy, laboratories typically compare results of blind-audit samples against known standards to establish accuracy. The validity of calibrations is evaluated by comparing results from the measurement of a standard to known values and/or by generation of in-house statistical limits based on three standard deviations (±3 standard deviations). Table 2-2 (provided later in this section) lists the laboratory accuracy parameters for this SAP.

2.1.4.3 Comparability

Comparability expresses the confidence with which one data set can be compared to another. Data comparability will be maintained by using standard procedures, uniform methods, and consistent units.

2.1.4.4 Completeness

The project analytes and parameters are shown in Table 2-2, which also identify laboratory performance parameters. If one or more of the other analytical parameters listed in Table 2-2 are not reported, the Project Environmental director (or designee) will determine whether the data set is complete for this SAP.

The determination of analytes for waste characterization will be performed outside the scope of this SAP and could be made in accordance with a separate waste management DQO. In this case, completeness of the analytical data set for waste management would not be a consideration for this SAP.

2.1.4.5 Precision

Precision is a measure of the data spread when more than one measurement exists of the same sample. Precision can be expressed as the relative percent difference for duplicate measurements, or relative standard deviation for triplicates. Analytical precision for laboratory analyses is included in Table 2-2.

2.1.4.6 Sensitivity

Sensitivity is the capability of a method or instrument to discriminate between measurement responses representing different levels of the variable of interest.

2.1.5 Special Training Requirements and Certification

The Environmental Safety and Health training program provides workers with the knowledge and skills necessary to safely execute assigned duties. Field personnel typically will have completed the following training before starting work:

- Occupational Safety and Health Administration 40-hour hazardous waste worker training and supervised 24-hour hazardous waste site experience
- 8-hour hazardous waste worker refresher training (as required)
- Hanford Site general employee radiation training
- Radiological worker training.

A graded approach is used to ensure that workers receive a level of training commensurate with their responsibilities in compliance with applicable DOE orders and government regulations. Specialized employee training includes pre-job briefings, on-the-job training, emergency preparedness, plan-of-the-day instructions, and facility/work site orientations.

Training records are maintained for each individual in an electronic training record database. The contractor training organization maintains the training records system. Line management will be used to confirm that employee's training is appropriate and up-to-date before performing any field work.

2.1.6 Documentation and Records

Field sampling and laboratory analytical documentation will be in accordance with contractor procedures and standard industry practices. Work products resulting from sampling and analysis may be included as documents and records, including the following:

- Forms required by WAC 173-160, "Minimum Standards for Construction and Maintenance of Wells," and the master drilling contract
- Laboratory data packages
- Verification and validation report.

Both hard copy and electronic versions of the record deliverables will be provided. Data files shall be in an ASCII-compatible format. The Removal Action project manager is responsible for ensuring that project personnel are working to the current version of this SAP.

The field work supervisor or BTR is responsible for ensuring that the field instructions are maintained up to date and aligned with any revisions to the SAP. The field work supervisor or BTR will ensure that all deviations from the SAP or problems encountered in the field are documented appropriately (e.g., in the field logbook or on nonconformance report forms) in accordance with internal corrective-action procedures. The Removal Action project manager, field work supervisor, or designee will be responsible for communicating field corrective-action requirements and for ensuring that immediate corrective actions are applied to field activities.

2.1.6.1 Field Logbooks

Logbooks are required for field activities. The logbook must be identified with a unique project name and number. Individuals responsible for logbooks will be identified in the front of the notebook and only authorized persons may make entries in logbooks. Logbooks will be signed by the field manager, supervisor, cognizant scientist/engineer, or other responsible individual.

Logbooks shall be:

- Waterproof
- Ruled with sequentially numbered pages. (Pages will not be removed from logbooks for any reason.)

Entries will be made in indelible ink. Corrections will be made by marking through the erroneous data with a single line, entering the correct data, and initialing and dating the changes.

The information to be recorded in logbooks is as follows:

- Purpose of activity
- Day, date, time, weather conditions
- Names, titles, organizations of personnel present
- Deviations from the QAPjP or procedures
- All site activities, including field tests
- Materials quality documentation (e.g., certifications)
- Details of samples collected (preparation, splits, duplicates, matrix spikes, blanks)

- Location and types of samples
- Chain-of-custody details and variances relating to chain-of-custody
- Field measurements
- Field calibrations and surveys and equipment identification numbers as applicable
- Equipment decontaminated, number of decontaminations, and variations to any decontamination procedures
- Equipment failures or breakdowns and descriptions of any corrective actions
- Telephone calls relating to field activities.

2.1.6.2 Project File

The Removal Action project manager is responsible for ensuring that a project file is properly maintained. The project file will contain the records or references to their storage locations. The project file will include, as appropriate:

- Field logbooks or operational records
- Data forms
- Global Positioning System data
- Chain-of-custody forms
- Sample receipt records
- Inspection or assessment reports and corrective action reports
- Interim progress reports
- Final reports.

The laboratory is responsible for maintaining and having available upon request:

- Analytical logbooks
- Raw data and QC sample records
- Standard reference material and/or proficiency test sample data
- Instrument calibration information.

Records may be stored in either electronic or hard copy format. Documentation and records, regardless of medium or format, are controlled in accordance with internal work requirements and processes that ensure accuracy and irretrievability of stored records. Records required by the Tri-Party Agreement will be managed in accordance with the requirements of the Agreement.

2.2 Data Generation and Acquisition

The following subsections present the requirements for sampling methods, sample handling and custody, analytical methods, and field and laboratory QC. The requirements for instrument calibration and maintenance, supply inspections, and data management also are addressed. The sampling design is presented in Chapter 3 of this SAP.

The field team lead is responsible for ensuring that all field procedures are followed completely and that field-sampling personnel are adequately trained to perform sampling activities under this SAP. The field team lead must document all deviations from procedures or other problems pertaining to sample collection, chain of custody, sample analytes, sample transport, or noncompliant monitoring. As appropriate, such deviations or problems will be documented in the file logbook or in nonconformance report forms in accordance with internal corrective action procedures. The field team lead is responsible for communicating field corrective-action requirements and for ensuring that immediate corrective actions are applied to field activities.

2.2.1 Sampling Design

The design for data collection and sampling uses an observational approach with visual inspections, radiological and chemical field screening, focused judgmental sampling, and sampling, where appropriate. Implementation of the observational approach described in the prior section will require use of the several data-collection methods developed during the systematic planning process described in Section 1.3.3. The data-collection methods include visual inspections, radiological and chemical surveys, radiological field screening, and analytical sampling as described in Chapter 1.

In addition, information regarding the types, number, and location of samples and discussion of possible variations on these requirements is provided in Chapter 3.

2.2.2 Sampling Methods

The following activities are described in Chapter 3:

- Field sampling methods
- Sample preservation, containers, and holding times
- Corrective actions for sampling activities
- Decontamination of sampling equipment.

The procedures to be implemented in the field are in accordance with those presented in Section 3.2 of this SAP.

2.2.3 Sample Handling, Shipping, and Custody Requirements

The processes followed for sample handling, shipping, and custody requirements should be in accordance with those presented in Section 3.6 of this SAP. A sample and data-tracking database will be used to track the samples from the point of collection through the laboratory analysis process. The HEIS database is the repository for laboratory analytical results. The HEIS sample numbers will be issued to the sampling organization for this project, and the numbers are to be carried through the laboratory data-tracking system.

The following sample handling information is provided in Chapter 3:

- Container requirements
- Container labeling and tracking process
- Sample custody requirements
- Shipping and transportation.

2.2.3.1 Laboratory Sample Custody

Sample custody during laboratory analysis will be addressed in the applicable laboratory's standard operating procedures. Laboratory custody procedures will ensure that sample integrity and identification are maintained throughout the analytical process.

2.2.3.2 *Sample Preservation, Containers, and Holding Times*

Suggested sample container, preservation, and holding-time requirements are specified in Table 2-1 for soil samples. These requirements are in accordance with the requirements of the specific analytical method prepared for specific sample events. The final container type and volumes will be provided on the sampling authorization form and the chain-of-custody form. This SAP defines a "sample" as a filled sample bottle for starting the clock for holding-time restrictions.

Table 2-1. Soil Sample Preservation, Containers, and Holding Time Requirements

Method Name	Number of Bottles	Bottle Type	Volume/Mass	Preservation Required	Holding Time
TPHs	1	G/P	250 mL	Cool ~4°C	14 days
PCBs – EPA 8082	1	G	250 mL	None	1 year
PAHs – GC-MS 8270	1	G	250 mL	Cool ~4°C	14 days
EPA 6010 (ICP metal)	1	G/P	15 g	Cool ~4°C	6 months
Mercury – EPA 7471	1	G	120 mL	None	28 days
Chromium (VI) EPA 7196	1	G/P	50 g	Cool ~4°C	24 hrs
VOA – EPA 8260	1	G	250 mL	Cool ~4°C	14 days
GEA (radionuclides)	1	G/P	750 g	None	None
AEA	1	G/P	750 g	None	None
GFPC	1	G/P	750 g	None	None
Anions - IC EPA 300.0	1	G/P	50 g	Cool ~4° C	48 hours

For the four-digit EPA method, see SW-846, *Test Methods for Evaluating Solid Waste: Physical/Chemical Methods, Third Edition; Final Update IV-B*. For EPA Method 200.8, see EPA/600/R-94/111, *Methods for the Determination of Metals in Environmental Samples, Supplement 1*. For EPA Method 300.0, see EPA/600/4-79/020, *Methods of Chemical Analysis of Water and Wastes.*

AEA = alpha energy analysis
G = glass
GEA = gamma energy analysis
GFPC = gas flow proportional counting
IC = ion chromotography
ICP = inductively coupled plasma
P = plastic
PAH = polycyclic aromatic hydrocarbon
PCB = polychlorinated biphenyl
TPH = total petroleum hydrocarbon
VOA = volatile organic analyte

2.2.4 Analytical Methods Requirements

Analytical parameters and methods are presented in Table 2-2 for soil samples. Tables 2-2 also provides the site-specific RALs (based on COPCs and process knowledge identified in DOE/RL-2008-44) to support removal action at the 11 waste sites. Laboratory analysis should be conducted within allowable sample holding times for each analyte tested.

These analytical methods are controlled in accordance with the laboratory's QA plan and the requirements of the QAPjP. The primary contractor participates in oversight of offsite analytical laboratories to qualify them for performing Hanford Site analytical work.

If the laboratory uses a nonstandard or unapproved method, then the laboratory must provide method validation data to confirm that the method is adequate for the intended use of the data. This includes information such as determination of detection limits, quantitation limits, typical recoveries, and analytical precision and bias. Deviations from the analytical methods noted in Table 2-2 must be approved by the Sample and Data Management organization in consultation with the Project Environmental director.

Table 2-2. Analytical Performance Requirements for Soil Samples

Parameter/ Analyte[a]	Analytical Method[b]	Overall Removal Action Levels[c]	Required Detection Limit	Precision Requirement (%)	Accuracy Requirement (%)
		Metals			
Antimony	EPA 6010/200.8	5.4 mg/kg	0.6 mg/kg[d]	±30[e]	70-130[e]
Arsenic	EPA 6010/200.8	6.5 mg/kg	1.0 mg/kg	±30[e]	70-130[e]
Barium	EPA 6010/200.8	1,650 mg/kg	2.0 mg/kg	±30[e]	70-130[e]
Beryllium	EPA 6010/200.8	63.2 mg/kg	0.5 mg/kg	±30[e]	70-130[e]
Boron	EPA 6010/200.8	210 mg/kg	2.0 mg/kg	±30[e]	70-130[e]
Cadmium	EPA 6010/200.8	0.81 mg/kg	0.5 mg/kg	±30[e]	70-130[e]
Chromium (total)	EPA 6010/200.8	2,000 mg/kg	1.0 mg/kg	±30[e]	70-130[e]
Chromium (VI)	EPA 7196	2.1 mg/kg	0.5 mg/kg	±30[e]	70-130[e]
Cobalt	EPA 6010/200.8	15.7 mg/kg	2.0 mg/kg	±30[e]	70-130[e]
Copper	EPA 6010/200.8	284 mg/kg	1.0 mg/kg	±30[e]	70-130[e]
Lead	EPA 6010/200.8	250 mg/kg	5.0 mg/kg	±30[e]	70-130[e]
Lithium	EPA 6010/200.8	160 mg/kg	2.5 mg/kg	±30[e]	70-130[e]
Manganese	EPA 6010/200.8	512 mg/kg	5.0 mg/kg	±30[e]	70-130[e]
Mercury	EPA 7471	2.09 mg/kg	0.2 mg/kg[d]	±30[e]	70-130[e]
Nickel	EPA 6010/200.8	130 mg/kg	4.0 mg/kg	±30[e]	70-130[e]
Selenium	EPA 6010/200.8	5.2 mg/kg	1.0 mg/kg[d]	±30[e]	70-130[e]
Silver	EPA 6010/200.8	13.6 mg/kg	0.2 mg/kg[d]	±30[e]	70-130[e]
Strontium	EPA 6010/200.8	2,920,mg/kg	1.0 mg/kg	±30[e]	70-130[e]
Thallium	EPA 6010/200.8	1.59 mg/kg	1.0 mg/kg	±30[e]	70-130[e]
Tin	EPA 6010/200.8	48,000 mg/kg	10 mg/kg	±30[e]	70-130[e]
Uranium	EPA 6010/200.8	3.21 mg/kg	1.0 mg/kg	±30[e]	70-130[e]
Vanadium	EPA 6010/200.8	560 mg/kg	2.5 mg/kg[d]	±30[e]	70-130[e]
Zinc	EPA 6010/200.8	5,970 mg/kg	1.0 mg/kg[d]	±30[e]	70-130[e]

Table 2-2. Analytical Performance Requirements for Soil Samples

Parameter/ Analyte[a]	Analytical Method[b]	Overall Removal Action Levels[c]	Required Detection Limit	Precision Requirement (%)	Accuracy Requirement (%)
PCBs					
Aroclor-1016	PCB 8082	0.094 mg/kg	0.017 mg/kg	±50[e]	50-150[e]
Aroclor-1221	PCB 8082	0.017 mg/kg	0.017 mg/kg	±50[e]	50-150[e]
Aroclor-1232	PCB 8082	0.017 mg/kg	0.017 mg/kg	±50[e]	50-150[e]
Aroclor-1242	PCB 8082	0.039 mg/kg	0.017 mg/kg	±50[e]	50-150[e]
Aroclor-1248	PCB 8082	0.039 mg/kg	0.017 mg/kg	±50[e]	50-150[e]
Aroclor-1254	PCB 8082	0.066 mg/kg	0.017 mg/kg	±50[e]	50-150[e]
Aroclor-1260	PCB 8082	0.5 mg/kg	0.017 mg/kg	±50[e]	50-150[e]
PAHs					
Acenapthene	GC-MS 8270	98 mg/kg	0.33 mg/kg	±30[e]	70-130[e]
Acenaphthylene	GC-MS 8270	98 mg/kg	0.33 mg/kg	±30[e]	70-130[e]
Anthracene	GC-MS 8270	2,270 mg/kg	0.33 mg/kg	±30[e]	70-130[e]
Benzo(a)anthracene	GC-MS 8270	0.86 mg/kg	0.33 mg/kg	±30[e]	70-130[e]
Benzo(a)pyrene	GC-MS 8270	0.33 mg/kg	0.33 mg/kg	±30[e]	70-130[e]
Benzo(b)fluoranthene	GC-MS 8270	1.37 mg/kg	0.33 mg/kg	±30[e]	70-130[e]
Benzo(k)fluoranthene	GC-MS 8270	1.37 mg/kg	0.33 mg/kg	±30[e]	70-130[e]
Benzo(g,h,i)perylene	GC-MS 8270	2,400 mg/kg	0.33 mg/kg	±30[e]	70-130[e]
Chrysene	GC-MS 8270	9.56 mg/kg	0.33 mg/kg	±30[e]	70-130[e]
Dibenz(a,h)anthracene	GC-MS 8270	1.37 mg/kg	0.33 mg/kg	±30[e]	70-130[e]
Fluoranthene	GC-MS 8270	631 mg/kg	0.33 mg/kg	±30[e]	70-130[e]
Fluorene	GC-MS 8270	101 mg/kg	0.03 mg/kg	±30[e]	70-130[e]
Indeno(1,2,3-cd)pyrene	GC-MS 8270	1.37 mg/kg	0.33 mg/kg	±30[e]	70-130[e]
Napthalene	GC-MS 8270	4.46 mg/kg	0.33 mg/kg	±30[e]	70-130[e]
Phenanthrene	GC-MS 8270	1,140 mg/kg	0.33 mg/kg	±30[e]	70-130[e]
Pyrene	GC-MS 8270	655 mg/kg	0.5 mg/kg	±30[e]	70-130[e]
Anion					
Nitrate (as N)	Anions-IC 300.0	40 mg/kg	0.75 mg/kg	±30[e]	70-130[e]
TPHs					
Diesel Range	TPH-diesel	2,000 mg/kg	5.0 mg/kg	±30[e]	70-130[e]
Kerosene Range	TPH-kerosene	2,000 mg/kg	5.0 mg/kg	±30[e]	70-130[e]

Table 2-2. Analytical Performance Requirements for Soil Samples

Parameter/ Analyte[a]	Analytical Method[b]	Overall Removal Action Levels[c]	Required Detection Limit	Precision Requirement (%)	Accuracy Requirement (%)
		VOA			
Carbon tetrachloride	VOA 8260	0.005 mg/kg	0.005 mg/kg	±30[e]	70-130[e]
		Radiological			
Americium-241	GEA	31.1 pCi/g	1.0 pCi/g	±30[f]	70-130[f]
Cesium-137	GEA	6.2 pCi/g	0.1 pCi/g	±30[f]	70-130[f]
Europium-152	GEA	3.3 pCi/g	0.1 pCi/g	±30[f]	70-130[f]
Europium-154	GEA	3.0 pCi/g	0.1 pCi/g	±30[f]	70-130[f]
Europium-155	GEA	125 pCi/g	0.1 pCi/g	±30[f]	70-130[f]
Plutonium-238	PU AEA	38.8 pCi/g	1.0 pCi/g	±30[f]	70-130[f]
Plutonium-239/240	PU AEA	33.9 pCi/g	1.0 pCi/g	±30[f]	70-130[f]
Strontium-90	GFPC	4.5 pCi/g	1.0 pCi/g	±30[f]	70-130[f]
Uranium-233/234	U AEA	1.1 pCi/g	1.0 pCi/g	±30[f]	70-130[f]
Uranium-235	U AEA	0.5 pCi/g	0.5 pCi/g	±30[f]	70-130[f]
Uranium-238	U AEA	1.1 pCi/g	1.0 pCi/g	±30[f]	70-130[f]

a. The soil analyte list from Table 1-2.

b. The analytical method selection is based on available methods for laboratories currently contracted to the Hanford Site. Equivalent methods may be substituted in future sampling and analysis instructions or other documents. For the four-digit EPA method, see SW-846, *Test Methods for Evaluating Solid Waste: Physical/Chemical Methods, Third Edition; Final Update IV-B*. For EPA Method 200.8, see EPA/600/R-94/111, *Methods for the Determination of Metals in Environmental Samples, Supplement 1*. For EPA Method 300.0, see EPA/600/4-79/020, *Methods of Chemical Analysis of Water and Wastes*.

c. The overall removal action levels are from DOE/RL-2009-53, *Removal Action Work Plan for the 200-MG-1 Operable Unit Waste Sites*.

d. To meet or approach calculated cleanup goals, laboratories must use axial-based ("trace") ICP analytical methods. The laboratory also may substitute graphite furnace or ICP mass spectrometry methods if required detection limits are met.

e. The accuracy criteria specified are for calculated percent recoveries for associated analytical batch matrix spike samples. Additional accuracy evaluation based on statistical control limits for analytical batch laboratory control samples also is performed. The precision criteria shown are for batch laboratory replicate matrix spike or replicate sample relative percent differences.

f. The accuracy criteria shown are for associated batch laboratory control sample percent recoveries. Except for GEA, additional accuracy criteria include analysis-specific evaluations preformed for matrix spike, tracer, and/or carrier recoveries as appropriate to the method. The precision criteria shown are for batch laboratory replicate sample relative percent differences.

AEA = alpha energy analysis
GEA = gamma energy analysis
GFPC = gas flow proportional counting
IC = inductively coupled
ICP = inductively coupled plasma
PAH = polynuclear aromatic hydrocarbon
PCB = polychlorinated biphenyl
TPH = total petroleum hydrocarbon
VOA = volatile organic analyte

Laboratories providing analytical services in support of this SAP will have in place a corrective-action program that addresses analytical system failures and documents the effectiveness of any corrective actions. Issues that may affect analytical results are to be resolved by the Sample and Data Management organization in coordination with the Removal Action project manager and Project Environmental director.

2.2.5 QC Requirements

This section specifies the field and laboratory QC samples and required frequency.

2.2.5.1 Field QC Requirements

Field QC samples will be collected in the field during soil sampling to evaluate the potential for cross contamination and during laboratory analysis to ensure that reliable data are obtained. Field QC for sampling of soil will require the collection of field replicates (duplicates), trip or field blanks, and equipment blanks. Laboratory QC samples estimate the precision and bias of the analytical data. For this sampling, at least one field duplicate will be collected from each waste site requiring laboratory sample(s) to assist with estimating precision. Laboratory QC sample requirements will be specified in the applicable laboratory's statement of work.

Particular care will be exercised to avoid the following common ways in which cross contamination or background contamination may compromise samples:

- Improperly storing or transporting sampling equipment and sample containers
- Contaminating the equipment or sample bottles by setting the equipment/sample bottle on or near potential contamination sources (e.g., uncovered ground)
- Handling bottles or equipment with dirty hands or gloves
- Improperly decontaminating equipment before sampling or between sampling events.

2.2.5.2 Field Replicates

Field replicates will be collected at a frequency of one in 20 samples. Field replicates are used to evaluate laboratory consistency and the precision of field sampling methods. Field duplicates, also known as replicates, are two samples that are collected as close as possible to the same time and same location and are intended to be identical. Field duplicates for soil are collected and homogenized before dividing into two separate samples in the field. Volatile organic analysis soil duplicates are sampled as collocated samples, as described below. Field duplicates are stored and transported together and are analyzed for the same constituents. The field duplicates are used to determine precision for both sampling and laboratory measurements.

Results of field duplicates must have precision within 20 percent, as measured by the relative percent difference. Only field duplicates with at least one result greater than five times the method detection limit or minimum detectable activity are evaluated.

2.2.5.3 Equipment Rinsates or Blanks

Equipment blanks are collected from reusable sampling devices on a 1-in-20 basis. The field team leader may request that additional equipment blanks be taken. Equipment blanks will consist of silica sand or analyte-free water poured over the decontaminated sampling equipment and placed in containers, as identified on the project sampling authorization form. Equipment blanks are not needed for disposable sampling equipment.

Equipment blanks, also known as equipment rinsates, are samples in which high-purity reagent water is passed through the pump or put in contact with the sampling surfaces of the equipment to collect blank samples identical to the sample set that will be collected. The equipment blanks bottles are placed in the same storage containers with the samples from the associated sampling event. Equipment blanks samples are analyzed for the same constituents as the samples from the associated sampling event. Equipment blanks are used to evaluate the effectiveness of the cleaning process to ensure samples are not cross contaminated from previous sampling events.

For the field blanks (i.e., full trip blanks, field transfer blanks, and equipment rinsate), results above two times the method detection limit are identified as suspected contamination. However, for common laboratory contaminants such as acetone, methylene chloride, 2-butanone, toluene, and phthalate esters, the limit is five times the method detection limit. For radiological analytical data, blank results are flagged if they are greater than two times the total minimum detectable activity.

Full Trip Blank. Full trip blanks, also known as trip blanks or daily's, are prepared by the sampling team before traveling to the sampling site. The preserved bottle set is either for volatile organic analysis only or identical to the set that will be collected in the field. It is filled with high-purity reagent water. The bottles are sealed and transported, unopened, to the field in the same storage containers used for samples collected that day. Collected full trip blanks are analyzed for the same constituents as the samples. Full trip blanks are used to evaluate potential contamination of the samples due to the sample bottles, preservative, handling, storage, and transportation.

Field Transfer Blanks. Field transfer blanks, also known as field blanks, are preserved volatile organic analysis sample bottles that are filled at the sample collection site with high-purity reagent water that has been transported to the field. After collection, field transfer blank bottles are sealed and placed in the same storage containers with the samples from the associated sampling event. Field transfer blank samples are analyzed for volatile organic compounds only. Field transfer blanks are used to evaluate potential contamination caused by conditions in the field.

Field Split Samples. Field split samples are two samples that are collected as close as possible to the same time and same location and are intended to be identical. Volatile organic analysis soil splits are sampled as collocated samples, as described above. Field split samples are stored in separate containers and analyzed by different laboratories for similar analytes. Split samples are inter-laboratory comparison samples that are used to evaluate comparability between laboratories. Large relative percent differences can be an indication of laboratory performance problems and should be investigated.

2.2.5.4 Laboratory QC Samples

The laboratory QC samples (e.g., method blanks, laboratory control sample/blank spike, and matrix spike) are defined in Chapter 1 of SW-846, *Test Methods for Evaluating Solid Waste: Physical/Chemical Methods, Third Edition; Final Update IV-B*, and will be run at the frequency specified in that reference unless superseded by agreement.

Quality control checks outside of control limits will be identified in the data validation process and during the data quality assessment (DQA), if performed, described in Section 2.4.

Additional QC measures include laboratory audits and participation in nationally based performance evaluation studies. The contract laboratories participate in national studies such as the EPA-sanctioned Water Pollution and Water Supply Performance Evaluation studies.

Laboratory duplicates will be analyzed for the waste designation samples. Laboratory method blanks and laboratory control samples/blank spikes are defined in Chapter 1 of SW-846 and will be run as specified in Chapter 1 of SW-846.

Failure of QC will be determined and evaluated during data validation and DQA process. Data will be qualified as appropriate.

2.2.6 Measurement Equipment

Each user of the measuring equipment is responsible to ensure that the equipment is functioning as expected, properly handled, and is calibrated before expiration in accordance with procedures governing control of the measuring equipment. Onsite environmental instrument testing, inspection, calibration, and maintenance shall be recorded in a bound logbook (Section 3.4.3). Field-screening instruments will be used, maintained, and calibrated in accordance with the manufacturer's specifications and other approved procedures.

2.2.6.1 Instrument/Equipment Testing, Inspection, and Maintenance Requirements

Onsite environmental instruments shall be tested, inspected, and maintained. Measurement equipment must be inspected before use. Tags will be attached to field-screening and onsite analytical instruments, noting the date when the instrument was last calibrated and the calibration expiration date. Maintenance requirements (e.g., parts lists and documentation of routine maintenance) will be included in the individual laboratory's and onsite organization's QA plan and/or operating procedures. Measurement and testing equipment used in the field or in the laboratory directly affecting the quality of analytical data will be subject to preventive maintenance measures to ensure that measurement system downtime is minimized.

Measurement and testing equipment used in the field or in the laboratory that directly affects the quality of analytical data will be subject to preventive maintenance measures to ensure minimization of measurement system downtime. Laboratories and onsite measurement organizations must maintain and calibrate their equipment. Maintenance requirements (such as documentation of routine maintenance) will be included in the individual laboratory's and the onsite organization's QA plan or operating procedures (as appropriate). Maintenance of laboratory instruments will be performed in a manner consistent with SW-846 or with auditable DOE Hanford Site and contractual requirements. Consumables, supplies, and reagents will be reviewed in accordance with SW-846 requirements and will be appropriate for their use.

2.2.6.2 Instrument Calibration

Laboratories and onsite measurement organizations must maintain and calibrate equipment. Calibration of laboratory instruments will be performed in a manner consistent with SW-846 or with auditable DOE Hanford Site and contractual requirements. Analytical laboratory instruments and measuring equipment are calibrated in accordance with the laboratory's QA plan. Calibration of radiological field instruments will be performed by radiological control technicians. The data will be reported as accepted, rejected, or qualified.

Calibration is conducted with certified equipment and/or standards with a known valid relationship to nationally recognized performance standards. If no such standards exist, the basis for calibration shall be documented.

2.2.7 Inspection of Consumable Supplies

Consumables, supplies, and reagents will be reviewed in accordance with the current requirements of SW-846 and will be appropriate for use. Potential contamination is monitored by QC samples and laboratory blanks. The lot number from the manufacturer-certified, pre-cleaned sample containers shall be recorded in the sampler's logbook.

Supplies and consumables that are used in support of sampling and analysis activities are procured in accordance with internal work requirements and processes that describe the contractor acquisition system and the responsibilities and interfaces necessary to ensure that items procured/acquired for contractor meet the specific technical and quality requirements. The procurement system ensures that purchased items comply with applicable procurement specifications. Supplies and consumables are checked and accepted by users before use.

Supplies and consumables procured by the analytical laboratories are procured, checked, and used in accordance with the laboratories' QA plans.

2.2.8 Nondirect Measurement

Nondirect measurements include data obtained from sources such as computer databases, programs, literature files, and historical databases. Nondirect measurements will not be evaluated as part of this activity.

2.2.9 Data Management

Data resulting from the implementation of the SAP will be stored in the HEIS database. Reports and supporting analytical data packages will be subject to final technical review by qualified reviewers before submittal to the regulatory agencies or inclusion in reports or technical memoranda. Electronic data access, when appropriate, shall be through computerized database (e.g., HEIS). Where electronic data are not available, hard copies will be provided in accordance with Section 9.6 of the Tri-Party Agreement.

The Sample Management and Reporting organization, in coordination with the Removal Action project manager, is responsible for ensuring that analytical data are appropriately reviewed, managed, and stored in accordance with the applicable programmatic requirements governing data management procedures. Electronic data access, when appropriate, will be via a database (e.g., HEIS or a project-specific database). Where electronic data are not available, hard copies will be provided in accordance with Section 9.6 of the Tri-Party Agreement Action Plan.

Planning for sample collection and analysis will be in accordance with the programmatic requirements governing fixed-laboratory sample collection activities, as discussed in the sample team's procedures. In the event that specific procedures do not exist for a particular work evolution, or it is determined that additional guidance to complete certain tasks is needed, a work package will be developed to adequately control the activities, as appropriate. Examples of the sample team's requirements include activities associated with the following:

- Chain-of-custody/sample analysis requests
- Project and sample identification for sampling services
- Control of certificates of analysis
- Logbooks
- Checklists
- Sample packaging and shipping.

Approved work control packages and procedures will be used to document field activities, including radiological measurements when this SAP is implemented. All field activities will be recorded in the field logbook. Examples of the types of documentation for field radiological data include the following.

- Instructions regarding the minimum requirements for documenting radiological controls information as per 10 CFR 835, "Occupational Radiation Protection."
- Instructions for managing the identification, creation, review, approval, storage, transfer, and retrieval of primary contractor radiological records.
- The minimum standards and practices necessary for preparing, performing, and retaining radiological-related records.
- The indoctrination of personnel on the development and implementation of sample plans.
- The requirements associated with preparing and transporting regulated material.
- Daily reports of radiological surveys and measurements collected during conduct of field investigation activities. Data will be cross referenced between laboratory analytical data and radiation measurements to facilitate interpreting the investigation results.
- Daily reports of radiological surveys and measurements collected during conduct of field investigation activities. Data will be cross referenced between laboratory analytical data and radiation measurements to facilitate interpreting the investigation results.

Laboratory errors are reported to the Sample Management and Reporting organization on a routine basis. For reported laboratory errors, a sample disposition record will be initiated in accordance with contractor procedures. This process is used to document analytical errors and to establish their resolution with the Removal Action project manager. The sample disposition records become a permanent part of the analytical data package for future reference and for records management.

2.3 Assessment/Oversight

Routine evaluation of data quality described for this project will be documented and filed with the data in the project file. The Removal Action project manager (or designee) and/or the field team lead will monitor field activities for this SAP. The Removal Action project manager retains overall responsibility for sampling but may delegate specific responsibilities to the field team lead or other appropriate contractor staff.

The Sample and Data Management organization will select a laboratory to perform the soil analyses for this SAP. The Sample and Data Management organization will assess and verify that analytical data are reported by the laboratory and then will enter the verified data into the HEIS database.

2.3.1 Assessments and Response Action

Random surveillance and assessments may be conducted to verify compliance with the requirements outlined in this SAP, project work packages, the QAPjP, procedures, and regulatory requirements. Deficiencies identified by these assessments will be reported. The project's QA organization coordinates corrective actions/deficiencies in accordance with the contractor's QA program. When appropriate, corrective actions will be taken by the Removal Action project manager (or designee).

If circumstances should arise in the field that would dictate the need for additional assessment activities, then they would be performed and recorded. Deficiencies identified by these assessments will be reported in accordance with existing programmatic requirements. The project's line management chain coordinates the corrective actions/deficiencies in accordance with the contractor QA program, the corrective-action management program, and associated procedures that implant these programs.

Oversight activities in the analytical laboratories, including corrective-action management, are conducted in accordance with the laboratories' QA plans. The primary contractor conducts oversight of offsite analytical laboratories to qualify them for performing Hanford Site analytical work.

The Project Environmental director will determine if a DQA will be performed for the activities identified in this SAP; the DQA process, if performed, is discussed in Section 2.4. The results of the DQA will be provided to the Removal Action project manager and Project Environmental director. No other planned assessments have been identified.

2.3.2 Reports to Management

Management will be made aware of deficiencies identified by self-assessments, corrective actions from Environmental Compliance Officers, and findings from QA assessments and surveillances. Issues reported by the laboratories are communicated to the Sample and Data Management organization, which initiates a sample disposition record in accordance with contractor procedures. This process is used to document analytical or sample issues and to establish resolution with the Removal Action project manager and Project Environmental director.

Depending on the type, significance, and visibility of the project, and if required by the Removal Action project manager and Project Environmental director, a DQA report may be prepared to determine if the type, quality, and quantity of the collected data met the quality objectives described in this SAP.

2.4 Data Review, Verification, Validation, and Usability Requirements

Samples taken for standard turnaround time during drilling will be received from the laboratory, loaded into a database (e.g., HEIS), and verified (Section 2.4.1). A total of 5 percent of the data will be validated (Section 2.4.3), and then data assessment will be performed (Section 2.4.4). At the direction of the project manager and Project Environmental director (or designee), analytical data packages will be subject to final technical review by qualified personnel before submittal to the regulatory agencies or inclusion in reports. Electronic data access, when appropriate, will be via a database (e.g., HEIS). Where electronic data are not available, hardcopies will be provided in accordance with Section 9.6 of the Tri-Party Agreement.

2.4.1 Data Review, Verification, and Validation Methods

Data review and verification are performed by the laboratory to confirm that sampling and chain-of-custody documentation are complete. This review shall include linking sample numbers to specific sampling locations, reviewing sample collection dates and sample preparation and analysis dates to assess whether holding times have been met, and reviewing QC data to determine whether analyses have met the data quality requirements specified in this SAP.

The criteria for verification may include review for completeness (all samples were analyzed as requested), use of the correct analytical method/procedure, transcription errors, correct application of dilution factors, appropriate reporting of dry weight versus wet weight, and correct application of conversion factors. Laboratory personnel may perform data verification.

Relative to analytical data in sample media, physical data and/or field-screening results are of lesser importance in making inferences of risk. Field QA/QC will be reviewed to ensure that physical property data and/or field-screening results are usable.

Errors reported by the laboratories are reported to the Sample and Data Management organization's project coordinator, who initiates a sample disposition record in accordance with contractor procedures. This process is used to document analytical errors and to establish resolution with the Removal Action project manager and Project Environmental director. In addition, the contractor QA engineer receives quarterly reports providing summaries and statistics of the analytical errors.

2.4.2 Data Validation

Validation activities will be based on EPA functional guidelines in Bleyler, 1988a, *Laboratory Data Validation Functional Guidelines for Evaluating Inorganics Analyses* and Bleyler, 1988b, *Laboratory Data Validation Functional Guidelines for Evaluating Organics Analyses*. Data validation may be performed by the analytical laboratory, by the Sample and Data Management organization, and/or by a party independent of both the data collector and the data user. At least total of 5 percent of the results will undergo Level C validation, as defined by the validation guidelines. Level C validation is a review of the QC data and specifically requires verification of deliverables and requested versus reported analyses and qualification of the results based on analytical holding times, method blank results, matrix spike/matrix spike duplicate, surrogate recoveries, duplicates, and analytical method blanks.

When outliers or questionable results are identified, additional data validation will be performed. The additional validation will be performed for up to 5 percent of the statistical outliers and/or questionable data. The additional validation will begin with Level C and may increase to Levels D and E as needed to ensure that the data are usable. Note that Level C validation is a review of the QC data, while Levels D and E include review of calibration data and calculations of representative samples from the data set. All data validation will be documented in data validation reports. An example of questionable data is the positive detections greater than the practical quantitation limit or reporting limit in soil from a site that should not have exhibited contamination. Similarly, results below background would not be expected and could trigger a validation inquiry. The determination of data usability will be conducted and documented in a DQA report.

All data validation will be documented in data validation reports, which will be included in the project file.

2.4.3 Reconciliation with User Requirements

The DQA process (if requested as discussed in Section 2.3.2) compares completed field activities to those in corresponding documents and provides an evaluation of the resulting data. The purpose of the data assessment is to determine if quantitative data are of the correct type and are of adequate quality and quantity to meet the project DQOs. The assessment will be consistent with the DQA process in EPA/240/B-06/002, *Data Quality Assessment: A Reviewer's Guide*, and EPA/240/B-06/003, *Data Quality Assessment: Statistical Tools for Practitioners*.

3 Field Sampling Plan

3.1 Sampling Objectives

The objective of the field sampling plan is to identify and describe the sampling and analysis activities to support collection of confirmation and RTD verification data for 200-MG-1 OU waste sites that demonstrate RALs have been met at these sites. This SAP presents a general process that identifies activities for obtaining data necessary to meet site data needs. The process and associated activities are described in the following sections. This process is based on use of the observational approach that is appropriate for sites with limited process knowledge. This approach begins investigating the site with visual inspections and field screening to identify initial site conditions and then performs sampling and analysis (where applicable) to confirm the locations that require removal actions and/or to confirm or verify final site conditions.

Following this general approach and based on initial visual inspections and field-screening results, the field team lead will develop a site-specific sampling instructions that provides the site-specific sampling design in-consultation with the DOE on-scene coordinator and Ecology. The sampling design will be submitted to Ecology. The overall sampling strategy is outlined in Table 3-1. Changes to the field sampling plan may be made in the field by the field team lead with approval from the Removal Action project manager and Project Environmental director.

Table 3-1. Key Features of 200-MG-1 OU Sampling Design

Analytical Methodology	Key Features of Design	Sampling Design Rationale
	Field Screening and Visual Inspections	
Visual inspections	Specific location/area of concern: Surface soils and structures/debris. Investigation method: Direct visual inspection using available site information (e.g., WIDS report, aerial photos, drawings, light detection and ranging maps). Criteria: Visually inspect for staining, discoloration, absence of vegetation, or any other anomalies.	Guide selection of locations for field screening and sampling
Radiological field screening	Specific location/area of concern: Surface soils and debris. Investigation method: Radiological field screening methods are identified in Section 3.3. Analytes: Soils will be screened for Cs-137 as an indicator parameter for other OU radionuclides identified in Table 2-2.	Guide selection of sample locations
Chemical field screening	Specific location/area of concern: Surface soils and debris. Investigation method: Chemical field-screening methods are identified in Section 3.3. Analytes: Soils could be screened to identify the potential presence of chemical COPCs identified in Table 2-2.	Guide selection of sample locations

Table 3-1. Key Features of 200-MG-1 OU Sampling Design

Analytical Methodology	Key Features of Design	Sampling Design Rationale
Surface Grab Samples		
Grab sampling	Specific location/area of concern: Limited area sampling; surface soils (generally 0.3 m [1 ft] bgs) where visual inspections and field screening show contamination present and at excavated areas where contamination has been removed as shown by visual inspections and field screening. Investigation method: Collect at least one judgmental grab sample of surface soils [0.3 m (1 ft)] and the bottom of a contaminated soil removal excavation. Analytes: Soil samples will undergo laboratory analysis for the analytes listed in Table 2-2.	When required, confirms/verifies site contamination does not exceed RALs at hot spots or excavations
Systematic Discrete or Composite Sampling		
Systematic grab sampling	Specific location/area of concern: Larger area sampling; surface soils 0.3 m (1 ft) bgs where visual inspections and field screening show no contamination present. Investigation method: Grid the area and collect discrete or composite samples of surface soils. Compositing may be used. For verification of RTD, grid design will be statistically based. Analytes: Soil samples will undergo laboratory analysis for the analytes listed in Table 2-2.	When required, confirms/ verifies that contamination does not exceed RALs at these portions of the site

bgs = below ground surface

3.2 Sampling Design

To meet project sampling objectives, the sampling design identified in site-specific sampling instructions provides an approach for defining the sample locations, sample intervals, sample processes, target analytes, and analytical methods. The following sections identify the site specific approach for site investigations.

3.2.1 Observational Approach for Site Investigation

Under the observational approach, the site investigation is streamlined such that site characterization and cleanup verification and/or removal action alternative confirmation of each of the eleven 200-MG-1 OU waste sites will occur as described below.

1. An initial visual field survey will be performed to formally document visual observations across the entire site. The visual survey will include documentation of Geographic Information System coordinates, descriptions of observed conditions and delineations of the condition that resulted in the original identification of the site (from WIDS), and any additional observed conditions and/or confirmation of historical conditions. The field survey also will include photo documentation of the site. Radiological surveys will be conducted to identify site health and safety needs and to determine where previous observations have identified potential radioactive contamination. Debris and any stabilization cover, if existing, will be removed as necessary to gain access to soils.

2. Based on the visual survey, the site technical lead may call for focused radiological and/or chemical field surveys or subsurface ground-penetrating radar surveys to characterize observed conditions. Characterization sampling of specific areas, using a focused sampling approach, may be requested in

order to fully understand the nature of any identified condition or material before contamination removal. Sampling will be required at CS/NFA sites to confirm that contamination is below RALs and that no further action is necessary. Documentation will be required at sites where contamination is removed to verify that that contamination in removal area soils does not exceed RALs.

3. The field team will agree on an RTD plan that addresses the observed conditions of the site to a nominal depth of up to 4.6 m (15 ft) below ground surface. However, where deeper excavation is required to attain RALs, soil samples may be taken at depths greater than 4.6 m (15 ft) to characterize deeper groundwater risk drivers.

4. During soil/material removal, visual (extent of staining, etc.) or radiological indicators will be monitored to guide removal. In the event that no radiological or visual indicator is available, a field chemical test (e.g., X-ray fluorescence, total petroleum hydrocarbon kit) may be employed.

5. The design for excavation verification sampling will be developed by the field team lead in consultation with the DOE on-scene coordinator and an Ecology project representative. To verify the absence of contamination above RALs, sampling at smaller excavations could use a focused design graduating to a systematic design with random start for larger excavations. These samples will be analyzed for the entire COPC list as identified in DOE/RL-2009-53, except where radionuclides were not identified by field screening and only the potential for chemical contamination was identified in the WIDS report.

6. Where contamination is not identified using the observational approach and/or after all site physical activities such as RTD site excavations have concluded, the absence of contamination at remaining site locations will be demonstrated by surface area sampling, such as composited grid sampling. Details of the design will be developed based on site evaluation results to date, the overall size of the site, and any other pertinent site-specific information. The site sample design will be provided in a site-specific sampling instruction developed in conjunction with the DOE on-scene coordinator and Ecology. The sampling design will be submitted to Ecology. Ecology's acceptance of the sampling design and results will be documented in a removal action completion report.

7. Data will be collected as necessary for waste designation and disposal to ensure compliance with ERDF waste acceptance criteria (WCH-191).

8. Analytical results will be assessed to determine if they demonstrate completion of the selected removal action alternative and support the final 200-MG-1 OU remedial action for these sites or if re-sampling will be conducted.

The key features of 200-MG-1 OU soil sampling design and the sampling rationale are summarized in Table 3-1. The appropriate site closure and site reclassification documentation will be generated outside the scope of this SAP.

3.2.2 Visual Inspections

Visual inspections will be performed to help guide the locating of site contamination areas for further evaluation. The site surfaces will be inspected for soil staining or discoloration, absence of vegetation, potentially contaminated debris, and any other indications of contamination or visual anomalies. The results of the visual inspection and survey will be documented in field notes onto a site base map. Observations will be clearly noted and described.

3.2.3 Radiological Field-Screening Methods

The following sections describe the radiological field screen methods.

3.2.3.1 Surface Radiological Survey

A surface radiation survey may be performed on the soil at a waste site to document existing surface contamination and to support preparation of supporting health and safety documentation. Gamma radiation instrument measurements (i.e., count rates) will be taken systematically at specified locations using portable radiological equipment. The minimum detectable activity capability of the radiological survey instrumentation will be established. Surface radiation surveys will be conducted by qualified radiological control technicians. A survey report will be prepared documenting the results of each survey. Post-sampling surveys also will be performed at each sampling site where radionuclide contamination is found or anticipated to ensure that sampling activities have not contributed to surface contamination.

3.2.3.2 Radiological Screening

Field screening for Cs-137 as a radiological indicator parameter may be used to identify the presence of radiological COPCs to help identify excavation locations for RTD sites and areas of CS/NFA sites requiring further evaluation. Radiological survey information will be used to make decisions concerning no action and/or completeness of soil removal actions. Gridded surveys will provide spatial variability estimates of the radiological contamination.

The surveys will be a combination of static counting, sequential static counting, and scanning counts, depending on the identity and level of contamination to be detected. Because of the unique size and contamination distributions, each site could require a slightly different design. In addition to identifying any areas of elevated residual radiological activity that can aid in the selection of focused samples, the data can be used to evaluate spatial variability for representative statistical sampling designs. Survey scan rates, site-specific background, and associated minimum detectable activities will be established.

Field screening will be used to identify detectable radiological contamination, adjust sampling points if needed, assist in determining sample shipping requirements, determine equipment/personnel decontamination needs, and support worker health and safety monitoring. Field-screening instruments could be used, maintained, and calibrated in accordance with the instrument program, manufacturers' specifications, and other approved procedures. Field-screening instruments include the Geiger-Müller meter, portable alpha meter, and portable sodium iodide detector or other comparable equipment to screen for radionuclide COPCs.

If field screening results indicate the presence of Cs-137, the areas with the highest field screening results could be further characterized with in process analytical samples. The in-process sample results will be used to correlate activity measurements to concentration (i.e., comparison of count per minutes to picocuries per gram) to verify RALs have been met and to identify the ratios of other radionuclides to the detectable screening levels, thereby verifying the acceptability of Cs-137 as an indicator parameter. Discrete samples could be collected from the hot spots for high-purity germanium analysis. Field screening for the beta/gamma emitter Cs-137 will indicate the potential presence of other radionuclide COPCs in soil. The screening results will be documented in a radiological survey report.

Excavations for sites with radionuclide contaminants will be guided by onsite measurements. Sodium iodide detectors with the ability to discriminate the specific energy of the limiting action levels will be used to provide isotope-specific count rate information and to verify that contamination levels are within allowable limits. Other detectors may be used on a case-by-case or site-specific basis. At each foot in depth, starting at the surface and descending down to a nominal 4.6 m (15 ft) depth, for each excavation location, the soil in each excavator bucket will be radiologically screened using field survey instruments.

If surface radiation surveys indicate that an area exceeds RALs, samples will not be collected, because additional excavation is required. If surface radiation surveys indicate that an area is less than RALs, additional sampling is not required. A copy of the radiological survey report will be maintained.

3.2.3.3 Hand-Held Instrument Static Survey Approach

A hand-held 5 by 5 cm (2- by 2-in). sodium iodide detector could be used when collecting static radiological measurements for identifying areas of radiological contamination and the size by identification of Cs-137 contamination boundaries. The hand-held instrument surveys will consist of surface radiological measurements using systematic grids at specified locations. Survey readings will be recorded via an integrated system consisting of a portable radiological survey meter, a Global Positioning System, and a data logger that records instrument response and location coordinates.

To accommodate effective and early review of instrument readings, the survey area will be subdivided into appropriate sized survey blocks, with measurements tracked using a combination of associated survey block numbers, survey line numbers, and survey point numbers. If prescribed survey points cannot be accessed because of obstructions or hazards, nearby locations will be selected and recorded along the survey lines.

Radiological control technicians will perform the surface radiation surveys in accordance with applicable health and safety procedures. Instrument measurements and data-recording operations will be performed according to radiological survey task instructions generated by the Radiological Control organization. A survey report will be prepared that documents the procedures, deviations, instrument raw count rate values, and survey location coordinates.

3.2.3.4 Vehicle-Mounted Moving Survey Approach

For larger waste sites, vehicle-mounted radiological survey equipment may be used for moving radiological surveys in all or selected portions subject to site accessibility and existence of unacceptable vegetation or terrain. Project-specific survey procedures for the mobile surveys and the equipment-specific minimum detectable activity study will be established before field implementation. This roving radiological survey will be used to obtain scoping data on the density and magnitude of hot spots in areas that generally are not contaminated. The survey area will be selected after evaluation of walking radiological survey data.

The survey will consist of establishing transects that cross the area. The survey will be designed to provide 20 percent coverage, using randomly spaced survey transects. The survey equipment will be configured with a Global Positioning System and data logger to record radiological measurements.

3.2.4 Chemical Screening Measurements

The potential for chemical contamination of soil at the 200-MG-1 OU exists due to possible releases of discarded liquids or contact with contaminated debris (e.g., containers). For the sampling effort at the 200-MG-1 OU, chemical field screening could be used to identify possible chemical contaminants that could require excavation or further evaluation. At CS/NFA sites, the absence of chemical contamination determined through field screening will help confirm that no further action under CERCLA is necessary due to CERCLA hazardous substances. Chemical field screening also could be used to guide soil excavations at RTD sites.

Table 3-2 lists chemical field-screening methods that are suitable for detection of 200-MG-1 OU COPCs and could be used where applicable and if available. The potential nonradiological contaminants will be evaluated against potential screening technologies to determine if field screening offers an advantage. Censored data (nondetect results) likely are not usable when the practical quantitation limit of the field-screening method is above the action level. Where performed, chemical field screening would be completed using the most practical techniques appropriate under expected sampling constraints. Contaminant fate and transport, constituent location, and environmental impacts (such as degradation) must be considered in determining target compounds for field screening.

Table 3-2. Potential Chemical Field-Screening Measurement Methods

Variable	Potentially Appropriate Measurement Method	Possible Limitations
Metals	X-ray fluorescence	Detection limit 100 to 400 mg/kg depending on constituent
Mercury	Mercury vapor monitor	Associated with soil concentrations well above RALs
Polyaromatic hydrocarbons	Immunoassay	Detection limits 1 to 5 mg/kg
PCBs	Immunoassay	Detection limits 0.1 to 0.3 mg/kg
TPHs	Immunoassay	Detection limits 5 to 10 mg/kg
Volatile organic analyte	Infrared analyzer	Effectiveness dependent upon required detection limits for volatile organic analyte of interest

Nondetect results may not be usable when the practical quantitation limit of the field-screening method is above the action level.

PCB = polychlorinated biphenyl

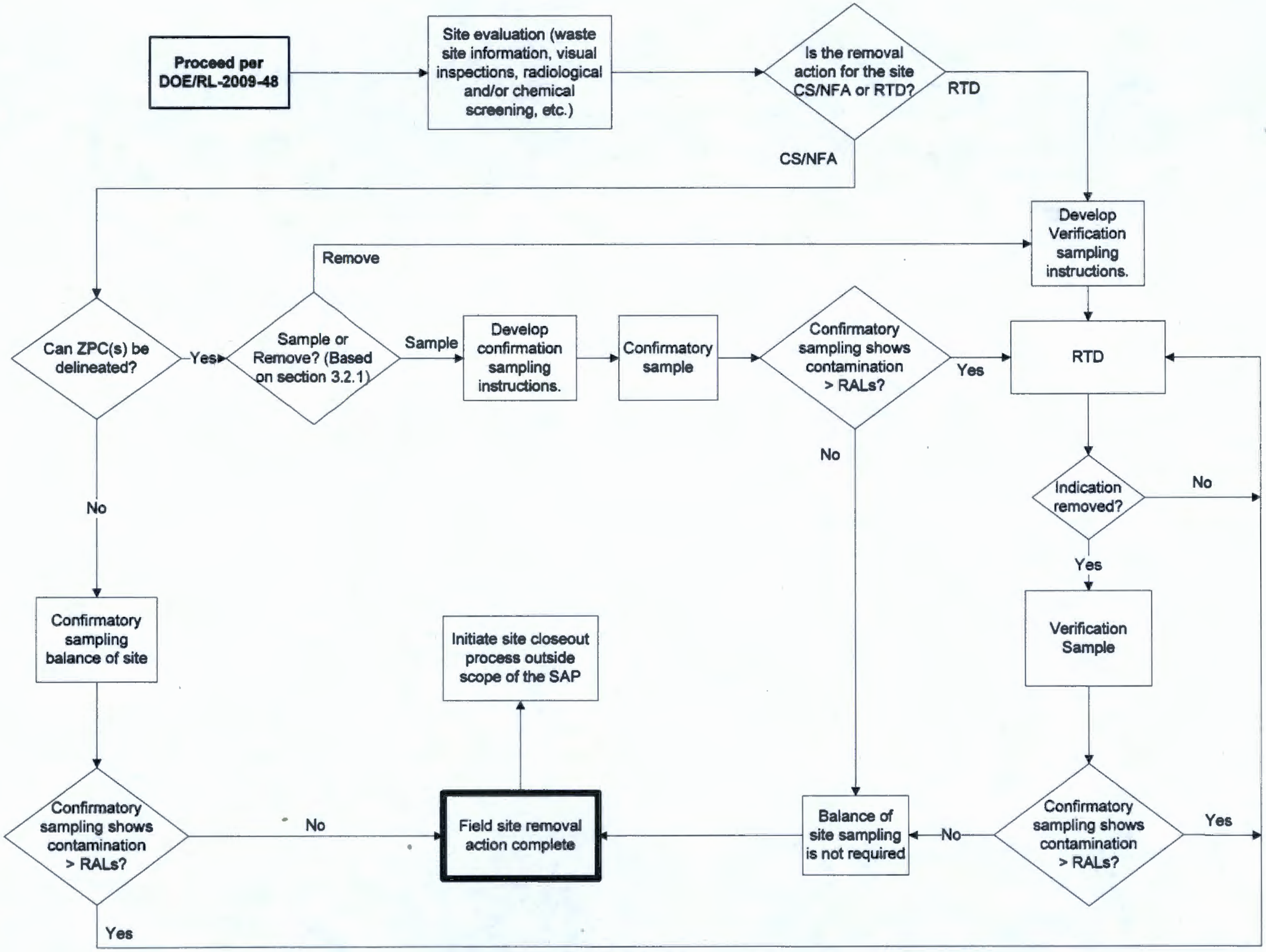
TPH = total petroleum hydrocarbon

Field-screening instruments will be used, maintained, and calibrated in accordance with the manufacturer's specifications and other approved procedures. The field team lead will record field-screening results in the field log.

3.2.5 Soil Sampling

This section describes the general approach for determining the number and type of samples required for verification sampling of contamination removal areas, and for confirmation sampling of the balance of site locations, where required. The decision logic for making these determinations is provided in Figure 3-1. For sites where no indication of radiological or chemical contamination was identified during the initial site evaluation, the field team lead in consultation with the DOE on-scene coordinator and Ecology, will determine the need for, and extent of, sampling necessary to verify the absence of contamination at the site. The final and site-specific sampling details for confirmatory and/or verification sampling will be provided in a site-specific sampling instruction developed by the field team leader with documented concurrence from the DOE on-scene coordinator. The sampling instruction will be submitted to Ecology. To the extent practicable, the sampling instruction will use focused sampling.

For each site, one or more distinct areas will be identified as zones of potential contamination (ZPCs). A ZPC is an area, within an individual 200-MG-1 OU waste site, that has been specifically delineated through background documentation and/or the initial field survey as potentially contaminated. For RTD sites, the ZPC is the area to be excavated. For CS/NFA sites, there may be no pre-identified ZPC. On any site, the initial surveys may identify additional ZPCs. The ZPCs can be a single contamination area or can consist of multiple, discontiguous but proximal and analogous contamination areas.



ZPC = zone of potential contamination

Figure 3-1. Decision Logic Diagram

3.2.5.1 General Soil Sampling Design

A statistical approach will be used for the sites where focused sampling is not appropriate, (e.g., when it is not possible to identify worst case sampling locations balance of site confirmatory sampling is deemed necessary). The number and location of analytical samples will be determined by the sample design team using visual sample plan (http://dqo.pnl.gov) or other suitable planning tools. Visual sample plan is a site map-based user interface program used to calculate the number of samples given a selected sampling approach and inputs to the associated equation. Statistical designs will be random, based on suspected contaminant variability, or based on a grid system to provide sufficient area coverage based on suspected contaminant distribution. The sampling plan components presented here include how many sampling locations to choose and where within each location to collect samples.

The purpose of the sampling is to compare a site mean value with a fixed threshold. The true mean value is the 95 percent upper confidence limit of the observed population mean and is the statistical parameter of interest. The fixed threshold for these waste sites is represented by the constituent specific RALs. Therefore, comparison of the true mean with RALs will demonstrate compliance with cleanup criteria. Either a parametric or non-parametric sampling approach could be used, both of which rely on assumptions about the population. Typically, nonparametric equations require fewer assumptions and allow for more uncertainty about the statistical distribution of values at the site. However, fewer samples are required for a parametric approach if the parametric assumptions are valid.

Ecology Publication 94-49, *Guidance on Sampling and Data Analysis Methods*, recommends use of systematic sampling with sample locations distributed over the entire study area. Locating sample points over a systematic grid with a random start ensures spatial coverage of the site with a random start for use in visual sample plan. Statistical analyses of systematically collected data generally are valid if a random start to the grid is used.

Table 3-3 summarizes a default statistical sampling design for 200-MG-1 OU waste sites. The presumed default statistical bias will be the MARSSIM (DOE/EH-0624, *Multi-Agency Radiation Survey and Site Investigation Manual*) sign test, a non-parametric test that determines the minimum number of samples required to compare a population mean to a threshold (e.g., RAL).

Table 3-3. Summary of Sampling Design

Primary Objective of Design	Compare a Site Mean to a Fixed Threshold
Type of sampling design	Nonparametric
Sample placement (location) in the field	Systematic with a random start location
Working (null) hypothesis	The mean value at the site exceeds the threshold
Formula for calculating number of sampling locations	Sign test – MARSSIM version

MARSSIM = DOE/EH-0624, *Multi-Agency Radiation Survey and Site Investigation Manual*

The values of the inputs that result in the calculated number of sampling locations are summarized in Table 3-4.

Table 3-4. Visual Sample Plan User Inputs

Parameter	Value	Basis
S	0.45	Assumed standard deviation value relative to a unit action level
Δ	0.4	User defined conservative value relative to a unit action level
α	5%	False rejection rate
β	20%	False acceptance rate
MARSSIM overage	20%	User-defined sample increase factor

MARSSIM = DOE/EH-0624, *Multi-Agency Radiation Survey and Site Investigation Manual*

3.2.5.2 Focused Judgmental Soil Sampling

Because these 200-MG-1 OU sites are not process sites and do not represent areas of homogenous contamination, the ZPCs represent worst-case location(s) or potential hot spots. Zone of potential contamination sampling areas will be investigated using either focused (judgmental) sampling or using a systematic (gridded) sampling approach as shown in Figure 3-1. Sampling of these zones will occur after removal of contaminated or likely contaminated soil, or when further characterization is required before soil removal.

Focused judgmental sampling is collecting a single sample or a very limited number of samples at a worst-case location within the ZPC. Focused sampling will be limited to smaller areas of contamination or smaller contamination removal areas. For focused sampling, a default of one sample per 47 m^2 (500 ft^2) will be used. Test pits may be dug for access to subsurface soils where there is evidence of contamination at depth.

A systematic sampling approach using a grid system may be used for confirmatory or verification sampling of larger ZPCs. This approach divides the ZPC into grids and randomly or systematically samples the soil at each grid node or at a selected number of grid nodes. The specific location of the first grid node will be assigned randomly (i.e., using a random number generator).

The use of either focused or gridded sampling will be determined on a case-by-case basis and based on the following considerations:

- Site size
- Likelihood of contamination based on known site information
- Significance of not detecting residual contamination.

3.2.5.3 Statistical Grid Sampling

As indicated in Figure 3-1, sampling may not be required outside of the ZPC where the ZPC boundaries are clearly and specifically identified, and where no likely mechanism exists for distribution of the contamination beyond the ZPC itself. The determination of the extent of sampling, or if any is required, will be based on the following considerations:

- The reason for site WIDS listing
- Clear understanding of the contamination event(s)
- Contamination distribution mechanism

- Potential for analogous, non-reported contamination events
- Justification for sampling only a portion of the remaining area (e.g., within some distance of identified ZPCs).

Where sampling outside of the ZPC is determined to be required, a statistically defined grid-sampling approach will be used. Measured or assumed contaminant variability across the site will be used to determine the required number of samples, if available. Otherwise, default assumptions will be used as described in Section 3.2.5.1. It is unlikely that most contaminant variability will not be known because of limited or no pre-existing data. Data from the initial survey may be used. Alternatively, a limited field sampling may be performed to determine contaminant distribution variability. A default presumed variability of 45 percent relative standard deviation will be used if no data are available. The validity of the default variability will be evaluated as part of a DQA (Section 2.4.3).

3.2.6 Waste Management Sampling

The following steps are involved in determining an adequate sample mass to collect in the field and the proper particle size for the analytical laboratory to measure for radiological and nonradiological analysis.

The DQO process for waste management included a review of the COPCs identified for the 200-MG-1 OU and an analysis of any additional constituents that should be evaluated to complete the waste designation and profile. Waste will be addressed in accordance with the waste management plan in DOE/RL-2009-53.

Modification of the waste sampling and analysis requirements determined during the DQO process may be required at some sites. Site-specific waste characterization sampling and analytical requirements will be developed as needed for waste acceptance at the ERDF. Additional analytical data may be needed at some sites if no existing waste profiles correspond to the suspected waste streams.

3.2.6.1 Waste Designation Sampling Design

A judgmental sampling approach is used for waste designation determinations. Wastes that require characterization include material/media that cannot be designated without characterization and may require special handling for human-exposure protection or waste acceptance. Uncontainerized, unknown material/media and unknown waste containers have been included in this category because containers will be encountered during cleanup of the 200-MG-1 OU waste sites. The sampling protocols for waste material/media and unknown waste forms will be completed in accordance with site procedures.

3.2.6.2 Optimal Sample Size that Satisfies the DQOs

Sampling for waste profile/designation of the material/media will be focused in two areas. Sampling of material/media also will be performed in the most highly contaminated areas as determined through field-screening techniques. Periodic sampling for quick-turnaround laboratory analyses of nonradiological contaminants may be performed to verify waste profiles as directed by the waste management lead.

3.3 Sampling Locations and Frequencies

The observational approach will be used to investigate these sites. The actual number and location of soil samples will be indeterminate until field walkdowns begin and will be in accordance with site-specific sampling instructions. Shallow, surface contamination sites, deep excavations are not anticipated. If deeper and therefore larger excavations are required, more sampling could be required. Although not expected, multiple non-contiguous contamination areas at a single site could be identified that would require multiple samples for further characterization or for verification of removal if excavated. The need for samples will be based on the results of visual inspections and field screening and will be determined in consultation with the DOE on-scene coordinator as the site investigation proceeds. Table 3-5 summarizes the sampling approach and minimum number of samples.

During site removal actions, soil samples will be collected at a minimum upon completion of the excavation to verify RALS are not exceeded. Upon completion of field activities at RTD sites and after visual inspections and field screening have not identified contamination at CS/NFA sites, sampling will occur of the overall site to confirm the absence of contamination above RALs at these locations.

3.4 Documentation of Field Activities

3.4.1 Logbooks

Logbooks or data forms are required for field activities. Requirements for the logbook are provided in Section 2.1.6. Data forms may be used to collect field information; however, they must follow the same requirements for logbooks and must be referenced in the logbooks. The information that is required to be field logbooks is shown in Section 2.1.6.1.

3.4.2 Corrective Actions and Deviations for Sampling Activities

The Removal Action project manager, field work supervisor, BTR, or designee must document all deviations from procedures or other problems pertaining to sample collection, chain-of-custody, target analytes, sample transport, or noncompliant monitoring. Examples of deviations include samples that cannot be collected because of field conditions, changes in sample locations because of physical obstructions, or additions of sample depth(s).

As appropriate, such deviations or problems will be documented in the field logbook or on nonconformance report forms in accordance with internal corrective-action procedures. The Removal Action project manager, field work supervisor, BTR, or designee, will be responsible for communicating field corrective-action requirements and for ensuring that immediate corrective actions are applied to field activities.

More significant changes in sample locations that do not impact the DQOs will require notification and approval of the Removal Action project manager and Project Environmental director. Changes to sample locations that could result in impacts to meeting the DQOs will require concurrence with DOE and regulator project managers. Changes to the SAP will be documented as noted in Section 2.1.6.

3.5 Calibration of Field Equipment

The Removal Action Project manager or the BTR is responsible to ensure that all field equipment is calibrated appropriately. All onsite environmental instruments are calibrated in accordance with the manufacturer's operating instructions, internal work requirements and processes, and/or work packages that provide direction for equipment calibration or verification of accuracy by analytical methods. The results from all instrument calibration activities are recorded in logbooks and/or work packages; either hard copy or electronic are acceptable.

Calibrations must be performed as follows:

- Before initial use of a field analytical measurement system
- At the frequency recommended by the manufacturer or procedure, or as required by regulations
- Upon failure to meet specified QC criteria.

Table 3-5. Sample Summary Table

Waste Site(s)	Data Needs	General Sampling Approach	Location and Number of Samples	Sample Analytes
All (11) sites*	Radiological and chemical data for waste disposal, verification of contaminant removal at RTD sites to below RALs, and confirmation of the no-action alternative	• Perform initial site evaluation, including site historical document review, visual inspections and initial radiation surveys to guide comprehensive radiological field screening. • Perform field radiological survey(s) and/or chemical field survey(s) and document (photographs, field-screening reports, etc.) to identify contamination locations requiring removal or sampling to confirm contamination is below RALs. • Where zones of contamination (hot spots) are indicated by inspections and field screening that require sampling: – Perform focused, judgmental grab sampling of soil as specified under the Location and Number of Samples column and document sampling activities, including depth of sample collection, and field activities (photographs, field screening reports, etc.). **OR** – Excavate indications in 0.3 m (1 ft) depth increments using visual and field-screening methods to guide the lateral and vertical extent of the excavation. Sample the excavation bottom to verify that contamination is removed to below RALs. As required (Section 3.2.5.3), perform sampling of the balance of the site (non-hot-spot locations) to confirm the absence of contamination above RALs.	Collect one QC duplicate sample and one field blank for each the waste site. At each non-contiguous sample location, collect at least one focused, judgmental soil sample. The sample can be of surface soil where excavation is not indicated or at excavation sites from the bottom of the excavation. For small areas, collect at least one sample from random site grids possibly using the coordinates established for the radiological survey. For larger areas, collect up to four samples using a similar grid system.	Where both chemical and radiological contamination is indicated, analyze samples for all Table 2-2 constituents. Where only chemicals are present and radiological field screening identifies no radionuclide contamination, analyze only for Table 2-2 chemicals. Where only radiological contamination is present, radiological surveys will be used to verify RALs are met (Section 3.2.3.2). Where no indication of radiological or chemical contamination was identified during the initial site evaluation, the field team lead in consultation with the DOE on-scene coordinator and Ecology, will determine the need for, and extent of, sampling necessary to verify the absence of contamination at the site (Section 3.2.5).

*200-E-101 Experiment/Test Site
200-E-110 Dumping Area
600-36 Burn Pit
600-38 Dumping Area
600-40 Dumping Area
600-51 Dumping Area
600-218 Dumping Area
600-262 Crib
600-275 Foundations
Old Central Shop Area (OCSA) Foundations
UPR-600-21 Unplanned Release

Field instrumentation, calibration, and QA checks will be performed in accordance with the following.

- Calibration of radiological field instruments on the Hanford Site is performed under contract by Pacific Northwest National Laboratory, as specified in its program documentation.
- Daily calibration checks will be performed and documented for each instrument used to characterize areas that are under investigation. These checks will be made on standard materials that are sufficiently like the matrix under consideration that direct comparison of data can be made. Analysis times will be sufficient to establish detection efficiency and resolution.
- Standards used for calibration will be traceable to a nationally or internationally recognized standard agency source or measurement system, if available.

3.6 Sample Handling, Packaging, and Container Labeling

Packaging. Level I EPA pre-cleaned sample containers will be used for soil samples collected for chemical analysis. Container sizes may vary depending on laboratory-specific volumes/requirements for meeting analytical detection limits. The radiological engineering organization will measure both the contamination levels and dose rates associated with the sample containers. This information, along with other data, will be used to select proper packaging, marking, labeling, and shipping paperwork and to verify that the sample can be received by the analytical laboratory in accordance with the laboratory's acceptance criteria. If the dose rate on the outside of a sample jar or the curie content exceeds levels acceptable by an offsite laboratory, the field work supervisor, in consultation with the Sample and Data Management organization, can send smaller volumes to the laboratory. Preliminary container types and volumes are identified in Table 2-1.

Container Labeling. The sample location, depth, and corresponding HEIS numbers are documented in the sampler's field logbook. Each sample container will be labeled with the following information on firmly affixed, water-resistant labels:

- Sampling authorization form
- Sampling authorization form number
- HEIS number
- Sample collection date/time
- Analysis required
- Preservation method (if applicable).

In addition to the above information, sample records must include:

- Analysis required
- Source of sample
- Matrix (water, soil, etc.)
- Field data (potential of hydrogen, radiological readings).

Field Sample Logbook. Information pertinent to sampling and analysis will be recorded in field checklists and logbooks in accordance with existing sample collection protocols. The sampling team will be responsible for recording relevant sampling information. Entries made in the logbook will be dated and signed by the individual making the entry. Program requirements for managing the generation, identification, transfer, protection, storage, retention, retrieval, and disposition of records will be followed.

Sample Custody. Sample custody will be maintained in accordance with existing Hanford Site protocols. The custody of samples will be maintained from the time that samples are collected until ultimate disposal of the samples, as appropriate. A chain-of-custody record will be initiated in the field at the time of sampling and will accompany each set of samples shipped to the laboratory. Sample shipping procedures will be followed throughout sample shipment. Each chain-of-custody form will include the sample identification number, associated site identification number, and remediation system designation. The analyses requested for each sample will be indicated on the accompanying chain-of-custody form.

Chain-of-custody procedures will be followed throughout sample collection, storage, transfer, analysis, and disposal to ensure that sample integrity is maintained. Each time the responsibility for the custody of the sample changes, the new and previous custodians will sign the record and note the date and time. A custody seal (i.e., evidence tape) will be affixed to the lid of each sample jar. The container seal will be inscribed with the sampler's initials and the date. Sample custody during laboratory analysis will be addressed in the applicable laboratory's standard operating procedures.

Sample Shipping. Samples will be transported after authorization from the project-authorized shipper. Sample transportation will be in compliance with the applicable regulations for packaging, marking, labeling, and shipping hazardous materials, hazardous substances, and hazardous waste that are mandated by the U.S. Department of Transportation (49 CFR 171-177, Chapter 1, "Research and Special Programs Administration, Department of Transportation," Part 171, "General Information, Regulations, and Definitions," through Part 177, "Carriage By Public Highway") in association with the International Air Transportation Authority, DOE requirements, and applicable program-specific implementing procedures.

As a general guideline, samples with no or very low radioactivity will be shipped for analysis to the Waste Sampling and Characterization Facility. Samples with activities <0.5 mrem/h can be shipped to an appropriate offsite laboratory (e.g., DOE contract laboratory, or a laboratory with a U.S. Nuclear Regulatory Commission or state license for specific radionuclides). Samples with activities between 0.5 and 10 mrem/h can be shipped to an offsite laboratory, although samples with dose rates within this range will be evaluated on a case-by-case basis by Sample and Data Management. Samples with activities >10 mrem/h will be sent to an onsite laboratory, as arranged by the Sample and Data Management organization.

4 Health and Safety

Field operations will be performed in accordance with health and safety requirements and appropriate Soil & Groundwater Remediation Project requirements. Work control documents will be prepared to further control site operations. Safety documentation will include an activity hazard analysis and, as applicable, radiological work permits. The sampling procedures and associated activities will implement ALARA practices to minimize the radiation exposure to the sampling team, consistent with the requirements defined in 10 CFR 835.

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5 Management of Waste

All waste (including unexpected waste) generated by sampling activities will be managed in accordance with the waste management portion of the removal action work plan for the 200-MG-1 (DOE/RL-2009-53).

Unused samples and associated laboratory waste for the analysis will be dispositioned in accordance with the laboratory contract and agreements for return of waste to the project site. Pursuant to 40 CFR 300.440, "National Oil and Hazardous Substances Pollution Contingency Control Plan," "Procedures for Planning and Implementing Off-Site Response Actions," approval of the DOE Removal Action project manager as the lead agency (40 CFR 300.5, "National Oil and Hazardous Substances Pollution Contingency Plan," "Definitions") is required before returning unused samples or waste from offsite laboratories (as applicable). By approving this SAP, RL authorizes return of all samples that are not otherwise dispositioned by contract.

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Task# DOE-AMCP-C-2009-0205

E-STARS[R] Report
Task Detail Report
08/27/2009 1200

TASK INFORMATION

Task#	DOE-AMCP-C-2009-0205		
Subject	SAMPLING AND ANALYSIS PLAN FOR SELECTED 200-MG-1 OPERABLE UNIT WASTE SITES, DOE/RL-2009-60, REVISION 0		
Parent Task#		**Status**	Open
Reference		**Due**	
Originator	Hintzen, Kathryn M	**Priority**	High
Originator Phone	(509) 373-9971	**Category**	None
Origination Date	08/26/2009 1819	**Generic1**	
Remote Task#		**Generic2**	
Deliverable	None	**Generic3**	
Class	None	**View Permissions**	Normal

Instructions

bcc w/attach:
AMCP OFF File
KM Hintzen, AMCP
FM Roddy, AMCP
JG Morse, AMCP
OA Farabee, AMCP
BL Charboneau, AMCP
N Ceto, DEP
SR Weil, EMD
JA Frey, AMMS
RM Carosino, OCC
KE Lutz, ORP
KS Ballinger, OCE

RECEIVED
SEP 14 2009
DOE-RLCC

Record Note: This letter transmits the Sampling and Analysis Plan for Selected 200-MG-1 Operable Unit Waste Sites, DOE/RL-2009-60, Revision 0 to Ecology for approval. This Sampling and Analysis Plan was prepared in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act. Responses to Ecology and EPA comments on the previous draft version have been incorporated per collaborative meetings with L. A. Fort and N. N. Smith-Jackson of Ecology.

This Completes ESTARS Action LMSI-RLCC-I-AMCP-2009-0156

Original Hand Carried to J. A. Hedges, Ecology

ROUTING LISTS

1	Route List	Active

- Roddy, Francis M - Approve - Approved - 08/27/2009 0805
  Instructions:
- Farabee, Al - Approve - Approved - 08/27/2009 0844
  Instructions:
- Charboneau, Briant L - Approve - Approved with comments - 08/27/2009 1108
  Instructions:
- Weil, Stephen R - Approve - Withdrawn - 08/27/2009 1030
  Instructions:

Task# DOE-AMCP-C-2009-0205

	• Frey, Jeffrey A - Approve - Approved - 08/27/2009 0923 *Instructions:*
	• Carosino, Robert M - Approve - Approved with comments - 08/27/2009 1020 *Instructions:*
	• McCormick, Matthew S - Approve - Awaiting Response - Due Date *Instructions:*
ATTACHMENTS	
Attachments	1. 09-AMCP-0205 Attachment (DOE-RL-2009-60, Revision 0).tif.pdf 2. 09-AMCP-0205 Background (CHPRC-0900488).tif.pdf 3. 09-AMCP-0205.doc
COMMENTS	
Poster	Carosino, Robert M (Corbin, Peggy A) - 08/27/2009 1020
	Approve
	Approve. BDW reviewed and concurred. RMC 8/27/09
Poster	Charboneau, Briant L - 08/27/2009 1108
	Approve
	Comments resolution was not coordinated with EPA until my review. I have contacted EPA and Frank is currently coordinating our responses to their comments by providing a redline-strikeout for their review. Frank stated no coordination was performed because the resolution to their comments was very straight forward.
TASK DUE DATE HISTORY	
No Due Date History	
SUB TASK HISTORY	
Subtask#	DOE-AMCP-C-2009-0205.1
Subject	SAMPLING AND ANALYSIS PLAN FOR SELECTED 200-MG-1 OPERABLE UNIT WASTE SITES, DOE/RL-2009-60, REVISION 0
Originator	Carosino, Robert M (Corbin, Peggy A)
	Routing List *No Active Routing List*

-- end of report --