DOE/RL-2006-34
Revision 0

Sampling and Analysis Plan for the 241-U-361 Settling Tank within the 200-UW-1 Operable Unit

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

United States
Department of Energy
P.O. Box 550
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Date Published
January 2007

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J. D. Aardal 01/25/2007
Release Approval Date

APPROVALS

DOE/RL-2006-34, *Sampling and Analysis Plan for the 241-U-361 Settling Tank within the 200-UW-1 Operable Unit, Rev. 0*

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SAMPLING AND ANALYSIS PLAN FOR THE 241-U-361 SETTLING TANK WITHIN THE 200-UW-1 OPERABLE UNIT

EXECUTIVE SUMMARY

This sampling and analysis plan (SAP) defines the approach to conducting waste designation sampling at the 241-U-361 Settling Tank, located in the 200 West Area in the 200-UW-1 Operable Unit (OU). This activity supports the overall goal of remediating the 241-U-361 Settling Tank, the 216-U-1 Crib, and the 216-U-2 Crib by placing an engineered barrier over these waste sites.

The U.S. Department of Energy prepared a focused feasibility study (DOE/RL-2003-23, *Focused Feasibility Study for the 200-UW-1 Operable Unit*[1]) and the associated proposed plan (DOE/RL-2003-24 Reissued, *Proposed Plan for the 200-UW-1 Operable Unit*[2]), which defined the preferred remedial actions for the waste sites in the 200-UW-1 OU. The focused feasibility study recommends placement of an engineered barrier over the 241-U-361 Settling Tank, after the contents have been removed. A record of decision currently is being prepared to document the final remedial alternative for the 241-U-361 Settling Tank and the associated cribs. Because the record of decision has not yet been approved, this sampling and analysis plan may be implemented independently of the record of decision, as an investigation sampling and analysis plan. Air emissions and waste generation associated with field activities during the sampling event will be addressed in an approved waste control plan.

This SAP defines the approach to conducting waste designation sampling at the 241-U-361 Settling Tank in the 200-UW-1 OU. The sampling strategy for this project is presented in Chapter 3.0 of this SAP.

The overall goal of the sampling identified in this SAP is to provide the data needed for waste designation of the 241-U-361 Settling Tank contents. The tank currently holds approximately 105,992 L (28,000 gal) of sludge and 379 L (100 gal) of supernate. The U.S. Environmental Protection Agency's (EPA) data quality objectives (DQO) process[3] was used to identify project data quality needs, evaluate sampling and analysis options, and document project data quality decisions. The documented DQO process for this SAP can be found in D&D-28702, *Data Quality Objectives Summary Report for the 241-U-361 Settling Tank*.

The sampling strategy described in this SAP for waste designation sampling at the 241-U-361 Settling Tank is based on current site knowledge and site disposition options and includes sampling tank contents through an existing tank vent riser. The selected laboratory(s) that would perform the analyses will receive a separate Letter of Instruction (LOI). The selected laboratory(s) per the LOI will analyze samples and in accordance with established procedures and provide necessary sample reports and explanation of results in support of data validation. The LOI, detailed work procedures or procedural information would be available to the Washington State Department of Ecology (Ecology) and the U.S. Environmental Protection Agency (EPA) upon request.

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[1] DOE/RL-2003-23, 2005, *Focused Feasibility Study for the 200-UW-1 Operable Unit*, Rev. 0, U.S. Department of Energy, Richland Operations Office, Richland, Washington.

[2] DOE/RL-2003-24, 2005 Reissued, *Proposed Plan for the 200-UW-1 Operable Unit*, Rev. 0, U.S. Department of Energy, Richland Operations Office, Richland, Washington.

[3] EPA/600/R-96/055, 2000, *Guidance for the Data Quality Objectives Process*, EPA QA/G-4, U.S. Environmental Protection Agency, Washington, D.C.

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TERMS

AEA	alpha energy analysis
aG	amber glass
ALARA	as low as reasonably achievable
ASAP	as soon as possible
CFR	*Code of Federal Regulations*
COC	contaminant of concern
COPC	contaminant of potential concern
CVAA	cold vapor atomic absorption
DOE	U.S. Department of Energy
DOE-RL	U.S. Department of Energy, Richland Operations Office
DQA	data quality assessment
DQO	data quality objective
DR	decision rule
Ecology	Washington State Department of Ecology
ECO	Environmental Compliance Officer
EPA	U.S. Environmental Protection Agency
G	glass
GEA	gamma energy analysis
HASQARD	*Hanford Analytical Services Quality Assurance Requirements Documents*
HEIS	*Hanford Environmental Information System* database
IC	ion chromatography
ICP	inductively coupled plasma
ISMS	Integrated Safety Management System
LOI	Letter of Instruction
MS	mass spectrometry
N/A	not applicable
OU	operable unit
P	plastic
PCB	polychlorinated biphenyl
PLM	polarized light microscopy
QA	quality assurance
QC	quality control
QAPjP	quality assurance project plan
QC	quality control
RCT	radiological control technician
ROD	record of decision
SAF	Sampling Authorization Form
SAP	sampling and analysis plan
TPH	total petroleum hydrocarbons
TPH-D/K	total petroleum hydrocarbon – diesel/kerosene
Tri-Party Agreement	*Hanford Federal Facility Agreement and Consent Order*
TRU	transuranic (waste materials contaminated with more than 100 nCi/g of transuranic materials having half-lives longer than 20 years)
WAC	Washington Administrative Code

METRIC CONVERSION CHART

Into metric units / Out of metric units

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

06/2001

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

SAMPLING AND ANALYSIS PLAN FOR THE 241-U-361 SETTLING TANK WITHIN THE 200-UW-1 OPERABLE UNIT

1.0 INTRODUCTION

In 1999, the U.S. Department of Energy, Richland Operations Office (DOE-RL) developed the 200 Areas strategy. This strategy grouped non-tank-farm waste sites into process-based operable units (OU) to streamline characterization and remedial-action decisions. Consistent with the 200 Areas strategy and the ongoing effort to accelerate cleanup at the Hanford Site, the DOE partnered with the Washington State Department of Ecology (Ecology) and the U.S. Environmental Protection Agency (EPA) to identify new approaches for the 200 Areas cleanup process. One of these approaches is the geographic-area closure concept (DOE/RL-2002-68, *Hanford's Groundwater Management Plan: Accelerated Cleanup and Protection*). The geographic-based cleanup goals are (1) to reduce environmental risks and protect underlying groundwater by closing high-risk waste sites and (2) to accelerate remediation of the Hanford Site. In addition, economies of scale could be realized by performing remediation of all sites within a given geographic area as an integrated activity. The overall objective of the 200-UW-1 OU initiative is to accelerate all actions necessary to achieve protectiveness for human health and the environment, prevent contaminant migration to groundwater, and provide conditions suitable for future industrial land use.

The overall goals of the sampling identified in this sampling and analysis plan (SAP) are to provide the data needed to support waste designation of the tank contents. A summary of the data needs for this project is presented in Table 1-1.

This SAP defines the approach to conducting waste designation sampling at the 241-U-361 Settling Tank (Figure 1-3) waste site in the 200-UW-1 OU. The sampling strategy for the 241-U-361 Settling Tank project is presented in Chapter 3.0 of this SAP. The selected laboratory(s) that would perform the analyses will receive a separate Letter of Instruction (LOI). The selected laboratory(s) per the LOI will analyze samples and in accordance with established procedures and provide necessary sample reports and explanation of results in support of data validation. The LOI, detailed work procedures or procedural information would be available to Ecology and/or EPA upon request.

The map of the Hanford Site provided in Figure 1-1 depicts the 200 West Area. Figure 1-2 identifies the specific waste sites within the 200-UW-1 OU in the 200 West Area.

As stated in the Executive Summary, the sampling activities presented in this SAP may be performed prior to receiving an approved record of decision (ROD). Air emissions and waste generation associated with field activities during the sampling event will be addressed in an approved waste control plan. Section 5.0 of this SAP describes the waste control plan in further detail.

Table 1-1. Summary of Data Needs Generated from the DQO Process.

Waste Stream	Contaminants of Concern [a]	Data Needs	Recommended Approach
None	None	Visual inspection of tank interior and contents	Videotape interior of tank. See project-specific work package for details.
None	Hydrogen, light gases, total volatile organic compounds, lower explosive limit. Radiological dose rates.	Health and safety	Collect tank headspace vapor samples and dose rates from riser when first opened. See project-specific health and safety plan for details.
Tank Liquid	1,4-Dichlorobenzene, 2-Butanone, 2-Chlorophenol, Acenaphthene, Acetone, Arsenic, Asbestos, Barium, Benzoic acid, Bis (2-ethylhexyl) phthalate, Bromomethane, Cadmium, Carbon disulfide, Chloride, Chloromethane, Copper, Di-n-butylphthalate, Fluoride, Hexane, Hexavalent chromium, Lead, Mercury, Methylene chloride, Nickel, Nitrate (as nitrogen), Nitrite, Normal paraffin hydrocarbon, Pentachlorophenol, Pyrene, Selenium, Silver, Strontium (metal), Sulfate, Tetrachloroethene, Total petroleum hydrocarbons, Toluene, Tributyl phosphate, Uranium (metal), PCBs, Am-241, Cs-137, Co-60, Eu-154, Eu-155, Np-237, Pu-238, Pu-239/240, Sr-90, Tc-99, U-233/234, U-235, U-238.	Waste designation	Grab sample of liquid on sludge surface and/or collection of liquid, if present, during core extrusion. See Table 3-1 for additional detail.
Tank Sludge	1,4-Dichlorobenzene, 2-Butanone, 2-Chlorophenol, Acenaphthene, Acetone, Arsenic, Asbestos, Barium, Benzoic acid, Bis (2-ethylhexyl) phthalate, Bromomethane, Cadmium, Carbon disulfide, Chloride, Chloromethane, Copper, Di-n-butylphthalate, Fluoride, Hexane, Hexavalent chromium, Lead, Mercury, Methylene chloride, Nickel, Nitrate (as nitrogen), Nitrite, Normal paraffin hydrocarbon, Pentachlorophenol, Pyrene, Selenium, Silver, Strontium (metal), Sulfate, Tetrachloroethene, Total petroleum hydrocarbons, Toluene, Tributyl phosphate, Uranium (metal), PCBs, Am-241, Cs-137, Co-60, Eu-154, Eu-155, Np-237, Pu-238, Pu-239/240, Sr-90, Tc-99, U-233/234, U-235, U-238.	Waste designation	Full depth core sample from an existing tank riser. See Table 3-1 for additional detail.

[a] Contaminants of concern for representative sites were identified in the DOE/RL-2003-23, *Focused Feasibility Study for the 200-UW-1 Operable Unit*, risk assessment process for the U Plant Region.

DQO = data quality objective

N/A = not applicable.

PCB = polychlorinated biphenyl.

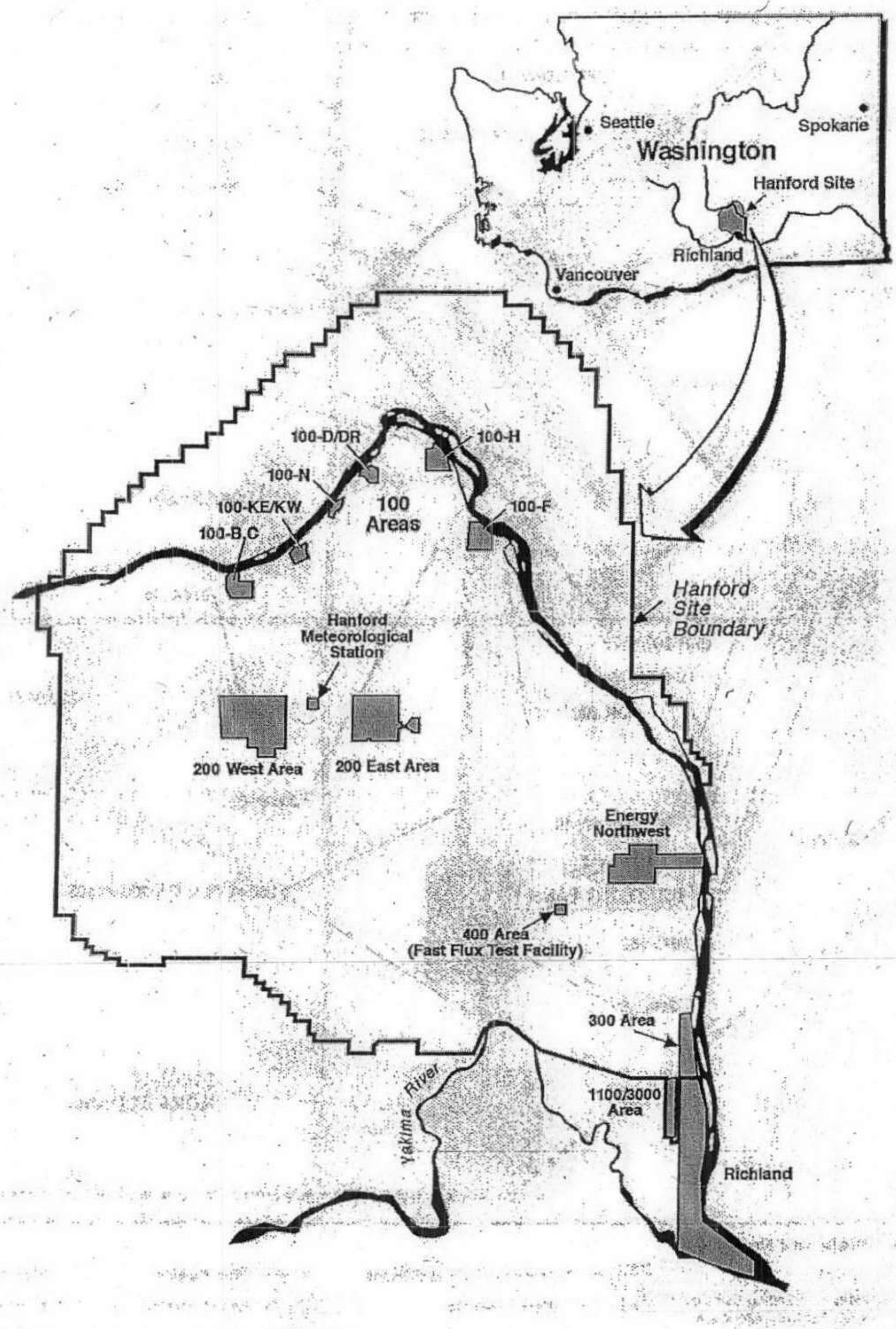

Figure 1-1. Hanford Site and Washington State.

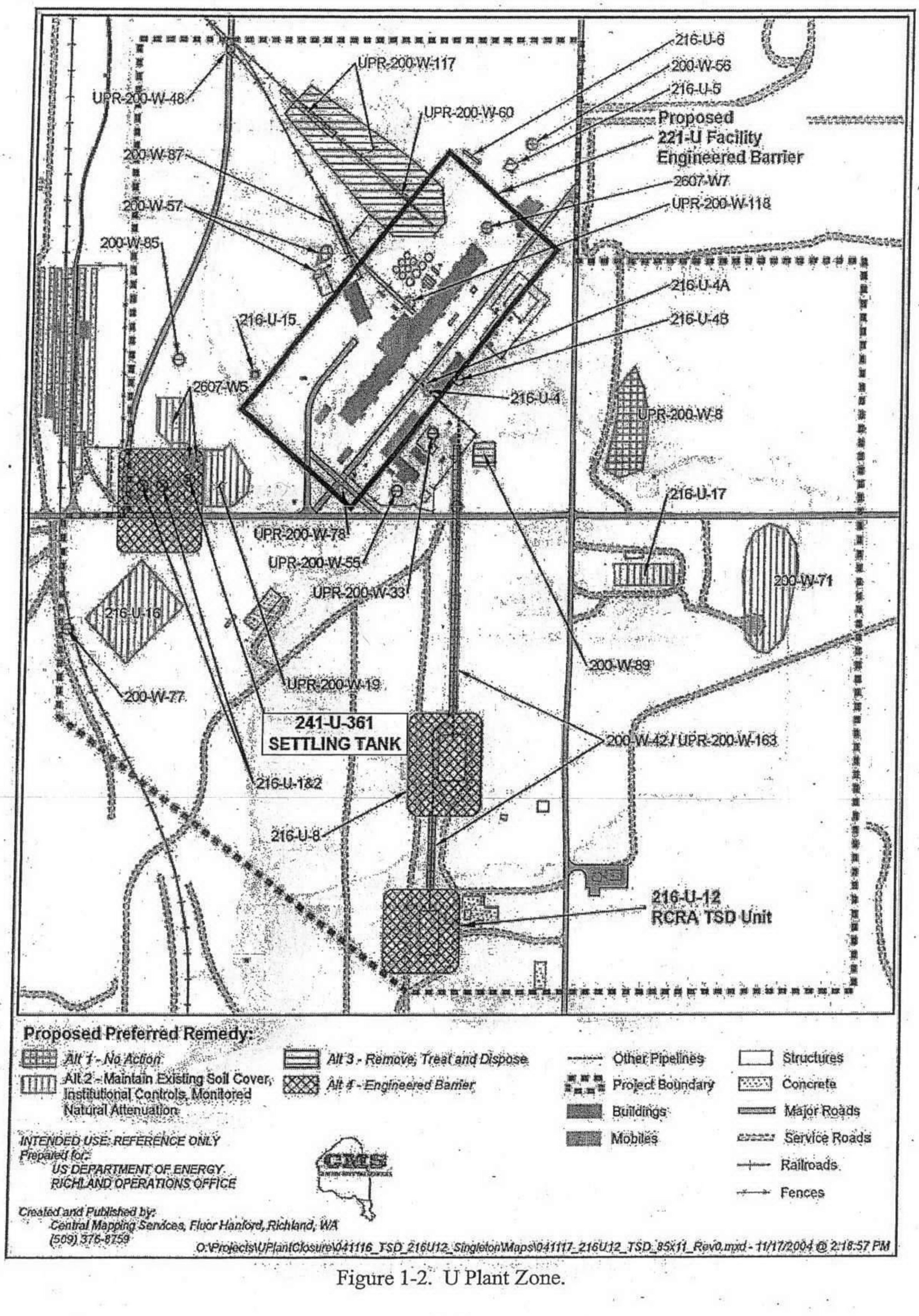

Figure 1-2. U Plant Zone.

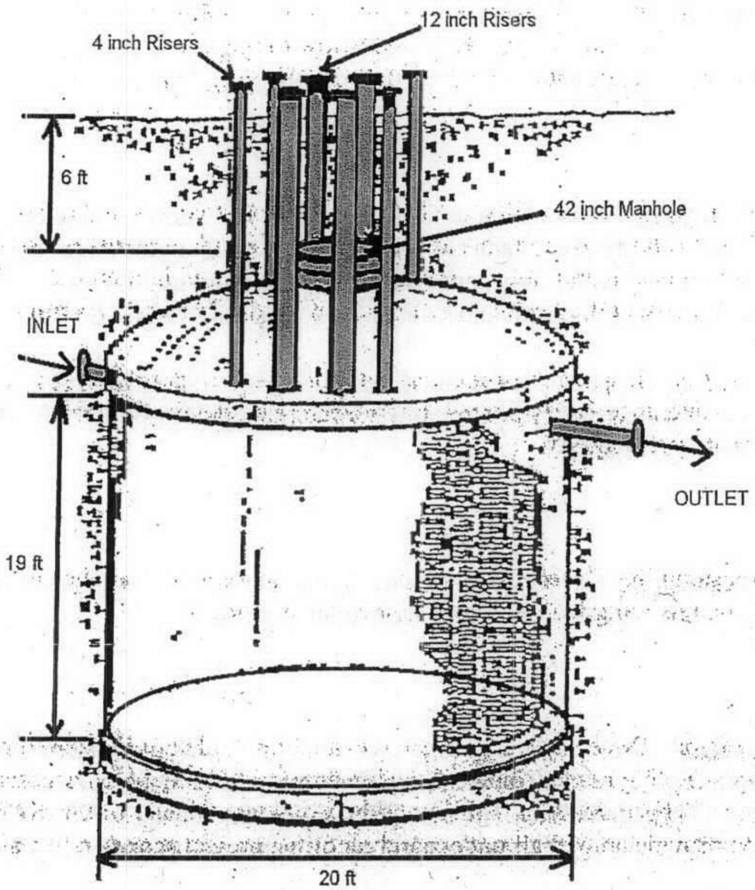

Figure 1-3. 241-U-361 Settling Tank.

The 241-U-361 Settling Tank project is divided into three phases. Only Phase II activities are the subject of this SAP. The other phases of the project are listed below to provide an overall understanding of the planned activities. The planned activities for the 241-U-361 Settling Tank project include the following.

Phase I:

- Health and safety sampling. Data collection for tank headspace vapors and radiological dose rates to ensure that health and safety requirements are met before the tank contents are sampled. Specifics regarding collection of health and safety sampling are not included in this SAP. These details will be documented in a project-specific health and safety plan for the 241-U-361 Settling Tank project

- Tank interior inspection. Inspection of the tank interior (to aid in determining integrity); and inspection of tank contents to verify process knowledge [e.g., depth to sludge, sludge thickness, and presence of supernate (i.e., liquid)].

Phase II:

- Waste designation sampling. Data collection for waste materials (i.e., sludge and liquid) to ensure compliance with the receiving facilities' waste acceptance criteria.

Phase III:

- Engineering evaluation. Develop an engineering evaluation to determine, based on the results of the waste designation sampling results, the preferred method for treatment (as necessary) and disposition of the tank contents. This evaluation will be conducted independently of this SAP; however, it is mentioned here to provide an overall understanding of the project scope and its associated objectives.

1.1 BACKGROUND

The Hanford Site, established in 1943, was originally designed, built, and operated to produce plutonium for nuclear weapons, using production reactors and chemical reprocessing plants. In March 1943, construction began on three reactor facilities (B, D, and F Reactors) in the 100 Areas and three chemical processing facilities (B, T, and U Plants) in the 200 Areas. Operations in the 200 East and 200 West Areas mainly were related to the separation of special nuclear materials from spent nuclear fuel (i.e., fuel that has been withdrawn from a nuclear reactor following irradiation). Operations in the 200 West Area consisted of four main processing areas:

- S Plant and T Plant, where initial processing to separate uranium and plutonium from irradiated fuel rods took place

- U Plant, where uranium recovery operations took place

- Z Plant, where plutonium separation and recovery operations took place.

1.2 SITE DESCRIPTION AND HISTORY

The 241-U-361 Settling Tank is located southwest of the 221-U Canyon Building, north of 16th Street. The 216-U-1 and 216-U-2 Cribs and the 241-U-361 Settling Tank are collocated in a common radiologically controlled area that is posted with Underground Radioactive Material Area signs. The tank is posted with Inactive Miscellaneous Underground Storage Tank signs. The 241-U-361 Settling Tank was constructed in 1944-1945 and had an adjacent reverse well. However, the reverse well was never used and, in December 1949, the inlet lines to the well were cut and plugged. The 241-U-361 Settling Tank waste line then was extended to the 216-U-1 and 216-U-2 Cribs. The 241-U-361 Settling Tank is a circular underground settling tank 6.1 m (20 ft) in diameter by 5.8 m (19 ft) in height, constructed of 15 cm (6 in.) steel reinforced pre-stressed concrete. The top of the tank is approximately 2 m (6 ft) belowgrade, and several vents and risers extend to the ground surface. The bottom of the tank is located approximately 7.6 m (25 ft) belowgrade.

U Plant wastes flowed from the 241-U-361 Settling Tank to the 216-U-1 Crib (which lies 26 m [85 ft] to the west), and then to the 216-U-2 Crib. The surface surrounding the settling tank has been covered with a stabilizer to cover an unplanned release (UPR-200-W-19).

The U Plant wastes included, from 1952 to 1957, cell drainage from the 5-6 tank in the 221-U Canyon Building and waste from the 224-U Concentration Facility until the Uranium Recovery Process operations were shut down and, from July 1957 through May 1967, 224-U Concentration Facility and equipment decontamination waste and reclamation waste from the 221-U Canyon Building.

In the spring of 1953, organic wastes and cell drainage from the tributyl phosphate process in 221-U and waste from 224-U overflowed to the ground by way of the 241-U-361 Settling Tank risers and the 216-U-1 and 216-U-2 Crib vents. Contamination readings of 11.5 rad/h at a distance of 7.6 cm (3 in.) were reported over an area of approximately 4.6 m^2 (50 ft^2).

In 1953, decontamination was attempted. The area was backfilled, delineated by a wooden fence, and posted with Radiation Zone signs. In 1992, the area was surface stabilized by scraping the contaminated surface soil and consolidating it near the 241-U-361 Settling Tank. The contaminated soil was covered with 46 to 61 cm (18 to 24 in.) of clean backfill. The surface surrounding the 241-U-361 Settling Tank was covered with a stabilizer. In 1994, contamination was found on the surface again, presumably caused by insect intrusion.

Approximately 105,992 L (28,000 gal) of waste sludge and 379 L (100 gal) of supernate are believed to remain in the tank.

1.3 CONTAMINANTS

A list of contaminants of potential concern (COPC) was developed for the 200-UW-1 OU waste sites first by identifying all the possible contaminants, based primarily on historical process operation information. This relatively large list of COPCs then was evaluated to exclude contaminants based on sampling data (i.e., remedial investigation data), practical factors (e.g., short radionuclide half-life, process knowledge) and risk information (i.e., toxicological criteria or low/absent risk). Table 1-2 presents the final COPCs list with the excluded contaminants removed from the list. Additional details regarding the COPC list can be found in D&D-28702, *Data Quality Objectives Summary Report for the 241-U-361 Settling Tank*.

Table 1-2. 200-UW-1 OU Contaminants of Potential Concern.

Nonradioactive COPCs	Nonradioactive COPCs	Radioactive COPCs
1,4-Dichlorobenzene	Lead	Americium-241
2-Butanone	Mercury	Cesium-137
2-Chlorophenol	Methylene chloride	Cobalt-60
Acenaphthene	Nickel	Europium-154
Acetone	Nitrogen as Nitrate	Europium-155

Table 1-2. 200-UW-1 OU Contaminants of Potential Concern.

Nonradioactive COPCs	Nonradioactive COPCs	Radioactive COPCs
Arsenic	Nitrogen as Nitrite	Neptunium-237
Barium	Normal paraffin hydrocarbon	Plutonium-238
Benzoic acid	Pentachlorophenol	Plutonium-239/240
Bis (2-ethylhexyl) phthalate	Pyrene	Strontium-90
Bromomethane	Selenium	Technetium-99
Cadmium	Silver	Uranium-233/234
Carbon disulfide	Strontium (metal)	Uranium-235
Chloride	Sulfate	Uranium-238
Chloromethane	Tetrachloroethene	
Copper	TPH - Kerosene	
Di-n-butylphthalate	Toluene	
Fluoride	Tributyl phosphate	
Hexane	Uranium (metal)	
Hexavalent chromium	PCBs	
Asbestos		

COPC = contaminant of potential concern.
PCB = polychlorinated biphenyl.
TPH = total petroleum hydrocarbons.

1.4 DATA QUALITY OBJECTIVES

EPA/600/R-96/055, *Guidance for the Data Quality Objectives Process*, EPA QA/G-4, as amended, was used to support the development of this SAP. The data quality objective (DQO) process is a strategic planning approach that provides a systematic process for defining the criteria that a data collection design should satisfy. Using the DQO 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 key outputs resulting from the implementation of the seven-step DQO process. For additional details, refer to D&D-28702, *Data Quality Objectives Summary Report for the 241-U-361 Settling Tank.*

1.4.1 Statement of the Problem

Data are needed to support waste designation of the contents of the 241-U-361 Settling Tank. Data will be required to ensure compliance with the receiving facilities' waste acceptance criteria.

1.4.2 Decision Rules

Decision rules are developed during the DQO process and generally are structured as "IF...THEN" statements indicating the action that would be taken if a prescribed waste designation condition is met. The decision rules correspond to each of the nine decision statements from the DQO (D&D-28702). Decision rules incorporate the parameters of interest, the scale of the decision, the action level, and the resulting action. The decision rules are summarized in Table 1-3.

Table 1-3. Waste Designation Decision Rules.

DR #	Decision Rule
1	If the true population (as estimated by the maximum radiological sample results)[a] activity of radionuclides in the sludge or liquid samples is greater than or equal to the disposal facility waste acceptance criteria limits or criteria for in situ disposal, evaluate alternative disposition options. Otherwise, dispose of solid waste in an approved disposal facility, or dispose in place.
2 - 8	If the true population (as estimated by process knowledge, or maximum detected sample values)[a] concentrations of chemical constituents in the sludge or liquid samples exceed the dangerous, asbestos, or PCB waste limits[b], then designate as dangerous, asbestos, or PCB waste. Otherwise, disposition wastes as nondangerous, nonasbestos, and/or non-PCB waste.
9	If the true population (as estimated by any detected sample values) concentrations of land-disposal restricted materials or underlying hazardous constituents in the treated waste are equal to or greater than the universal treatment standards and disposal facility waste acceptance criteria or criteria for in situ disposal, provide additional treatment before disposal. Otherwise, dispose of solid waste without additional treatment.

[a] As determined by the waste designation specialist and the project engineer.
[b] Field observations or fiber counts will be used for asbestos designation. PCB waste will use maximum detected sample concentrations.

DR = decision rule.
PCB = polychlorinated biphenyl.

1.5 GENERAL SAMPLE DESIGN CONCEPTS

One of the primary objectives accomplished in the DQO is the selection of a statistical or judgmental sample design and associated error tolerances. The waste designation of solid waste for disposal is based on judgmental sampling because of access limitations and the high cost of sampling and analysis. This is a low-risk alternative that does not require a statistical sampling design.

Based on the DQO process (D&D-28702), core sampling and analysis of the tank contents will be performed. The following sections present basic information regarding the design of the sampling and analysis strategy. Added details of the sampling methods will be presented in Chapter 3.0 of this SAP.

1.5.1 Method-Based Analysis

Method-based analysis avoids identification of individual COPCs and instead specifies the suites of analytical methods that will yield results for the COPCs needed. This method of laboratory analysis tends to provide an umbrella effect in that analyses are provided for the COPCs, as well as for any related constituents. Method-based analysis will be performed for all liquid and sludge samples analyzed for the 241-U-361 Settling Tank.

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2.0 QUALITY ASSURANCE PROJECT PLAN

The quality assurance project plan (QAPjP) establishes the quality requirements for environmental data collection, including sampling, field measurements, and laboratory analysis. This QAPjP complies with the requirements of the following:

- DOE O 414.1C, Quality Assurance
- 10 Code of Federal Regulations (CFR) 830, Subpart A, "Quality Assurance Requirements"
- EPA/240/B-01/003, EPA Requirements for Quality Assurance Project Plans for Environmental Data Operations, EPA QA/R-5, as amended.

The following sections describe the quality requirements and controls applicable to this investigation. Correlation between EPA/240/B-01/003 (QA/R-5) requirements and this chapter is provided in Table 2-1.

Table 2-1. Quality Assurance Crosswalk.

EPA QA/R-5 Criteria	EPA QA/R-5 Title	Reference Section # or Table
Project Management	Project/Task Organization	2.1, 2.1.1
	Problem Definition and Background	1.1, 1.2, 1.3
	Project Task Description	1.0
	Quality Objectives and Criteria	1.4, 2.3
	Training/Qualifications	2.1.2
	Documents and Records	2.6, 2.7
Data Generation and Acquisition	Sample Process Design	1.4, 3.1, 3.2
	Sampling Methods	1.4, 3.1, 3.3, Table 3-1
	Sample Handling and Custody	2.4, Table 2-4, 3.4
	Analytical Methods	2.3, Tables 2-2 and 2-3
	Quality Control	2.2, 2.3, Table 3-1
	Instrument/Equipment Testing, Inspection and Maintenance	2.3.1
	Instrument/Equipment Calibration and Frequency	2.3.1, 2.5, 2.7
	Inspection and Acceptance of supplies and consumables	2.3.1
	Non Direct Measurement	1.4, Tables 2-2 and 2-3
	Data Management	2.6
Assessment and Oversight	Assessment and Response Actions	2.5.2
	Reports to Management	2.5.3
Data Validation and Usability	Data Review, Verification and Validation	2.6
	Verification and Validation Methods	2.7
	Reconciliation with User Requirements	2.8

EPA = U.S. Environmental Protection Agency
QA = quality assurance

Quality requirements for conducting sampling and analysis are described in *Hanford Analytical Services Quality Assurance Requirements Documents* (HASQARD, DOE/RL-96-68). Nonconforming items, activities, or conditions that do not conform to requirements specified in this SAP or reference herein will be controlled to prevent inadvertent use or documented with appropriate cautions. All activities (sampling and analysis) will be performed using approved methods/procedures/work packages that are written in accordance with approved operational and laboratory QA plans, consistent with the requirements of this SAP.

All sampling and analysis activities conducted in accordance with this SAP will be performed by qualified personnel that meet site- and job-specific training requirements, using properly maintained and calibrated equipment.

2.1 PROJECT MANAGEMENT

The following subsections address the basic areas of project management and will ensure that the 241-U-361 Settling Tank project has a defined goal, the participants understand the goal and the approach to be used, and the planned outputs have been appropriately documented.

2.1.1 Project/Task Organization

The primary contractor, or its approved subcontractor, will be responsible for collecting, packaging, and shipping sludge and other media samples to the laboratory. The project organization, in regard to sampling and waste designation, is described in the subsections that follow and is shown graphically in Figure 2-1. For each functional primary contractor role, there is a corresponding oversight role within DOE-RL.

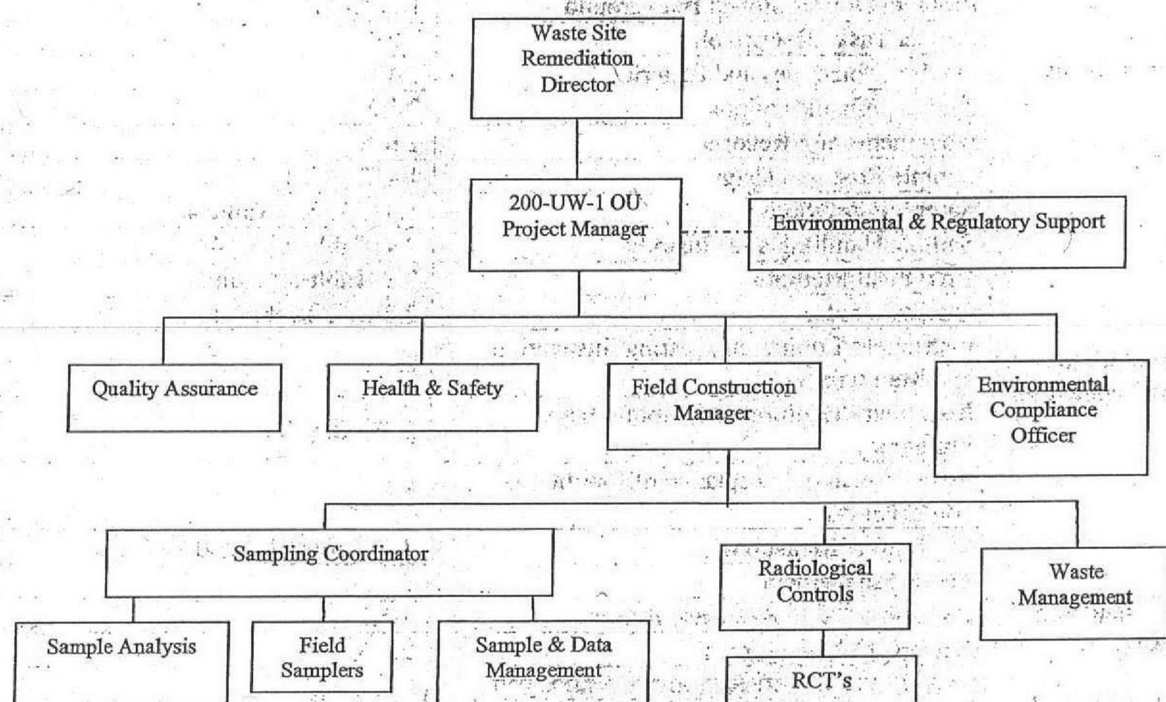

Figure 2-1. Project Organization.

2.1.1.1 Waste Site Remediation Director

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

2.1.1.2 200-UW-1 Operable Unit Project Manager

The 200-UW-1 OU Project Manager is responsible for direct management of sampling documents and requirements, field activities, and subcontracted tasks. The 200-UW-1 OU Project Manager ensures that the Field Construction Manager, Sampling Coordinator, Samplers, and others responsible for implementation of this SAP and QAPjP are provided with current copies of this document and any revisions thereto. The 200-UW-1 OU Project Manager also works closely with the Quality Assurance and Health and Safety organizations and the Field Construction Manager to integrate these and the other lead disciplines in planning and implementing the workscope. The 200-UW-1 OU Project Manager also coordinates with, and reports to DOE-RL, the regulators, and primary contractor management on all sampling activities.

2.1.1.3 Quality Assurance

The Quality Assurance Lead is matrixed to the 200-UW-1 OU Project Manager and is responsible for quality assurance (QA) issues on the project. Responsibilities include oversight of implementation of the project QA requirements; review of project documents, including DQO summary reports, SAPs, and the QAPjP; and participation in QA assessments on sample collection and analysis activities, as appropriate.

2.1.1.4 Health and Safety

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

2.1.1.5 Field Construction Manager

The Field Construction Manager has the overall responsibility for supporting the Sampling Coordinator in the planning, coordination, and execution of field activities. Responsibilities also include 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 Construction Manager communicates with the 200-UW-1 OU Project Manager to identify field constraints that could affect the sampling design. In addition, the Field Construction Manager directs the procurement and installation of materials and equipment needed to support the fieldwork.

2.1.1.6 Environmental and Regulatory Support

The Environmental and Regulatory Support Lead is responsible for the performance of EPA's 7-step DQO process that, for this project, results in the development of the sampling design. Responsibilities include development and documentation of the sampling DQOs and SAP, which includes the sampling design and associated presentations and the resolution of technical issues. The Environmental and Regulatory Support Lead also supports the Data Quality Assessment (DQA) process as described in Section 2.8.

2.1.1.7 Environmental Compliance Officer

The Environmental Compliance Officer (ECO) 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 ECO also reviews plans, procedures and technical documents to ensure that all environmental requirements have been addressed, identifies environmental issues that affect operations and develops cost effective solutions, and responds to environmental/regulatory issues or concerns raised by DOE-RL and/or regulatory agency staff.

2.1.1.8 Sampling Coordinator

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

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

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

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

2.1.1.9 Radiological Controls

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

2.1.1.10 Waste Management

The Waste Management Lead communicates policies and procedures and ensures project compliance for storage, transportation, disposal, and waste tracking in a safe and cost-effective manner. Other responsibilities include identifying waste management sampling/waste designation requirements to ensure regulatory compliance and interpreting the waste designation data to generate waste designations, profiles, and other documents that confirm compliance with waste acceptance criteria.

2.1.2 Training Requirements

Typical training requirements or qualifications have been instituted by the primary contractor management team to meet training requirements imposed by the Project Hanford Management Contract, regulations, DOE orders, DOE contractor requirements documents, American National Standards Institute/American Society of Mechanical Engineers, *Washington Administrative Code*, etc. For example:

- Training requirements or qualifications needed by sampling personnel will be in accordance with quality assurance requirements.
- 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 general employee radiation training
  - Radiological worker training.

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

2.2 FIELD QUALITY CONTROL

Field quality control (QC) samples will be collected to evaluate the potential for cross-contamination and to provide information pertinent to field variability. Field QC for sampling the 241-U-362 Settling Tank will require the collection of field duplicates, trip or field blanks, and equipment blanks. The QC samples and the required frequency for collection are described in this section.

2.2.1 Field Duplicates

Field duplicates provide information regarding the homogeneity of the sample matrix and its associated contaminant, and may provide an evaluation of the precision of the analysis process. Field duplicates will be retrieved from sample intervals using the same equipment and sampling technique. Field duplicates for sample media are collected and homogenized before being divided into two samples in the field. If volatile organic analyte samples are required, they should be collected before homogenization. The duplicate samples will be sent to the primary laboratory in the same manner that the routine site samples are sent. Labeling of the field duplicates will not differentiate between duplicates and routine samples to ensure that the duplicates are analyzed without bias. A minimum of one field duplicate per matrix (sludge and liquid) will be collected each day of sampling.

Field duplicates will be collected with consideration given to the sampling approach and field sample handling restrictions. For example, if the sampled material cannot be accessed in the field, alternative means for measuring field variability will be defined in LOIs to the sampling team and the laboratory.

2.2.2 Field or Trip Blanks

Field or Trip Blanks are collected, containerized and handled in the same manner as the samples. These blanks can be used to indicate sample contamination throughout the entire process (a field blank) or just the shipment process (a trip blank). Field and trip blanks will consist of silica sand, or other appropriate media, placed in containers and analyzed the same as the samples they correspond with. A minimum of one field or trip blank per matrix (sludge and liquid) will be collected each day of sampling.

2.2.3 Equipment Blanks

Equipment blanks are collected for any sampling device that is reused. Equipment blanks will be collected at a frequency of 1 blank per day per matrix (sludge and liquid) or 1 blank per 20 samples per matrix (whichever is more frequent). The field team leader may request that additional equipment blanks be taken. Equipment blanks will consist of silica sand or de-ionized water poured over the decontaminated sampling equipment and placed in containers, as identified on the project Sampling Authorization Form (SAF). A single deionized equipment blank per sampling day could be used as a trip blank if push-mode samplers are used to collect both solid and liquid samples.

Equipment blanks will be analyzed for the COPCs listed in Table 1-2.

If disposable (i.e., single-use) equipment is used, equipment blanks will not be required.

2.2.4 Prevention of Cross-Contamination

Special care should be taken to prevent cross-contamination of samples to avoid the following common ways in which cross-contamination or background contamination may compromise the 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.
- If possible, the sampling sequence will start with the "cleanest" site and gradually work towards the most contaminated site in order to minimize cross-contamination between sampling sites.

2.3 QUALITY OBJECTIVES AND CRITERIA FOR MEASUREMENT DATA

Quality objectives and criteria for measurement data are presented in Tables 2-2 and 2-3 for all analytes. Note that Model Toxics Control Act (WAC 173-340) standards are provided solely for completeness, and are not used as a basis for waste designation. The ability to meet the detection limit requirements is dependent on the amount of sample obtained and matrix interferences.

2.3.1 Measurement and Testing Equipment

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 parts lists and documentation of routine maintenance) will be included in the individual laboratory and the onsite organization QA plan or operating procedures (as appropriate). Calibration of laboratory instruments will be performed in a manner consistent with SW-846, *Test Methods for Evaluating Solid Waste: Physical/Chemical Methods*, as amended, or with auditable DOE Hanford Site and contractual requirements. Calibration of radiological field instruments is discussed in Section 2.7.

Consumables, supplies, and reagents will be reviewed per SW-846 requirements and will be appropriate for their use. Note that contamination is monitored by the QC samples discussed in Section 2.3.3.

Table 2-2. Radiological Analytical Performance Targets.

Contaminants of Concern	Chemical Abstracts Service #	Action Level (pCi/g)[a]	Name/Analytical Technology	Detection Limit Targets - Liquid (pCi/L)[a, e]	Detection Limit Targets - Sludge (pCi/g)[a, e]	Precision Req't (% Relative Percent Difference)[b]	Accuracy Req't (% Recovery)[c]
Americium-241	14596-10-2	335	Americium isotopic – AEA	1	1	±30%	70-130%
Cesium-137	10045-97-3	23.4	GEA	15	0.1	±30%	70-130%
Cobalt-60	10198-40-0	4.9	GEA	25	0.05	±30%	70-130%
Europium-154	15585-10-1	10.3	GEA	50	0.1	±30%	70-130%
Europium-155	14391-16-3	426	GEA	50	0.1	±30%	70-130%
Neptunium-237	13994-20-2	59.2	Neptunium-237 – AEA	1	1	±30%	70-130%
Plutonium-238	13981-16-3	470	Plutonium isotopic – AEA	1	1	±30%	70-130%
Plutonium-239/240	PU-239/240	425	Plutonium isotopic – AEA	1	1	±30%	70-130%
Strontium-90	10098-97-2	22.5	Beta counting	2	1	±30%	70-130%
Technetium-99	14133-76-7	1	Technetium-99 – liquid scintillation	15 [d]	15 [d]	±30%	70-130%
Uranium-233/234	13966-29-5	1.76	Uranium isotopic – ICP/MS	1	1	±30%	70-130%
Uranium-235	15117-96-1	1	Uranium isotopic – ICP/MS	1	1	±30%	70-130%
Uranium-238	U-238	1.69	Uranium isotopic – ICP/MS	1	1	±30%	70-130%

[a] The preliminary action level is the lowest regulatory / risk-based value used to determine appropriate analytical requirements (e.g., detection limits), which are consistent with those presented in DOE/RL-2003-23, *Focused Feasibility Study for the 200-UW-1 Operable Unit.*

[b] Precision criteria for batch laboratory replicate sample analyses. Precision criteria for batch laboratory sample replicate and matrix spike replicate determinations are only applicable when results are greater than 5 to 10 times the method detection limit.

[c] Accuracy criteria for associated batch laboratory control sample percent recoveries. With the exception of GEA, additional analysis-specific evaluations also are performed for matrix spikes, tracers, and carriers as appropriate to the method.

[d] Because the Tc-99 action level (1 pCi/g) is lower than the standard laboratory detection limit (15 pCi/g), the laboratory will work to reduce the detection limit to better support design decisions, by increasing the sample size for extraction and/or maintaining a longer scintillation counting time.

[e] The requested detection limits may not be achievable, based on sample sizes or dilutions required, because of sample activity or concentration of constituents in the samples.

AEA = alpha energy analysis.
GEA = gamma energy analysis.
ICP = inductively coupled plasma.
MS = mass spectrometry.

Table 2-3. Nonradiological Analytical Performance Targets.

Contaminants of Concern	Chemical Abstracts Service #	Action Level (mg/kg)[a, b]	Name/Analytical Technology[c]	Detection Limit Targets - Sludge[d, h]	Detection Limit Targets - Liquid[d, h]	Precision Req't (% Relative Percent Difference)[e]	Accuracy Req't (% Recovery)[f]
Metals							
Arsenic	7440-38-2	6.47	Metals – 6010 – ICP or 6020 ICP/MS	1 mg/kg	0.5 mg/L	±30%	70-130%
Asbestos	N/A	N/A	PLM	1 %	N/A	N/A	N/A
Barium	7440-39-3	132	Metals – 6010 – ICP or 6020 ICP/MS	2 mg/kg	10 mg/L	±30%	70-130%
Cadmium	7440-43-9	0.81	Metals – 6010 – ICP or 6020 ICP/MS	0.5 mg/kg	0.005 mg/L	±30%	70-130%
Chromium (total)	7440-47-3	N/A	Metals – 6010 – ICP or 6020 ICP/MS	1 mg/kg	0.01 mg/L	±30%	70-130%
Copper	7440-50-8	217	Metals – 6010 – ICP	1 mg/kg	0.25 mg/L	±30%	70-130%
Lead	7439-92-1	118	Metals – 6010-ICP or 6020 ICP/MS	5 mg/kg	0.1 mg/L	±30%	70-130%
Mercury	7439-97-6	2.09	Mercury – 7470 – CVAA	N/A	0.0005 mg/L	±30%	70-130%
			Mercury – 7471 – CVAA	0.2 mg/kg	N/A	±30%	70-130%
Nickel	7440-02-0	130	Metals – 6010 – ICP or 6020 ICP/MS	4 mg/kg	0.1 mg/L	±30%	70-130%
Selenium	7782-49-2	10	Metals – 1311/6010 – ICP or 1311/6020 ICP/MS	2 mg/kg	2 mg/L	±30%	70-130%
Silver	7440-22-4	13.6	Metals – 1311/6010 – ICP or 1311/6020 ICP/MS	0.2 mg/kg	0.02 mg/L	±30%	70-130%
Strontium	7440-24-6	2,920	Metals – 6010	1 mg/kg	0.1 mg/L	±30%	70-130%
Uranium (metal)	7440-61-1	3.2	Uranium total – 6020 ICP/MS	1 mg/kg	0.0001 mg/L	±30%	70-130%
Other Inorganics							
Chloride	N/A	1,000	Anions – 300.0 – IC	2 mg/kg	2 mg/L	±30%	70-130%
Fluoride	N/A	5.78	Anions – 300.0 – IC	0.5 mg/kg	0.5 mg/L	±30%	70-130%
Nitrogen as nitrate	N/A	40	Anions – 300.0 – IC	0.75 mg/kg	0.75 mg/L	±30%	70-130%
Nitrogen as nitrite	N/A	40	Anions – 300.0 – IC	0.75 mg/kg	0.75 mg/L	±30%	70-130%
Sulfate	N/A	1,000	Anions – 300.0 – IC	2 mg/kg	2 mg/L	±30%	70-130%
Organics							
1,4-Dichlorobenzene	106-46-7	0.03	8270	0.005 mg/kg	0.005 mg/L	±30%	70-130%
2-Butanone	78-93-3	19.6	8260	19.6 mg/kg	19.6 mg/L	±30%	70-130%
2-Chlorophenol	95-57-8	0.943	8270	0.943 mg/kg	0.943 mg/L	±30%	70-130%

Table 2-3. Nonradiological Analytical Performance Targets.

Contaminants of Concern	Chemical Abstracts Service #	Action Level (mg/kg)[a, b]	Name/Analytical Technology[c]	Detection Limit Targets - Sludge[d, h]	Detection Limit Targets - Liquid[d, h]	Precision Req't (% Relative Percent Difference)[e]	Accuracy Req't (% Recovery)[f]
Acenaphthene	83-32-9	133	8270	0.33 mg/kg	0.33 mg/L	±30%	70-130%
Acetone	67-64-1	28.9	8260	0.02 mg/kg	0.02 mg/L	±30%	70-130%
Benzoic acid	65-85-0	257	8270	16.5 mg/kg	16.5 mg/L	±30%	70-130%
Bis (2-ethylhexyl) phthalate	117-81-7	13.9	8270[g]	0.33 mg/kg	0.33 mg/L	±30%	70-130%
Bromomethane	74-83-9	0.01	8260	0.01 mg/kg	0.01 mg/L	±30%	70-130%
Carbon disulfide	75-15-0	5.65	8260	0.005 mg/kg	0.005 mg/L	±30%	70-130%
Chloromethane	74-87-3	0.0165	8260	0.01 mg/kg	0.01 mg/L	±30%	70-130%
Di-n-butylphthalate	84-74-2	56.5	8270[g]	3.3 mg/kg	3.3 mg/L	±30%	70-130%
Hexane	110-54-3	96.2	8260	1.0 mg/kg	1.0 mg/L	±30%	70-130%
Methylene chloride	75-09-2	0.33	8270	3.3 mg/kg	3.3 mg/L	±30%	70-130%
Normal paraffin hydrocarbons	TPH-KEROSENE TPH-DIESEL	2,000	8015D	5 mg/kg	2 mg/L	±30%	70-130%
Total petroleum hydrocarbons	TPH-KEROSENE	2,000	8015D	8 mg/kg	8 mg/L	±30%	70-130%
Polychlorinated biphenyls	N/A	N/A	8082	0.02 mg/kg	0.02 mg/L	±30%	70-130%
Pentachlorophenol	87-86-5	0.33	8270	3.3 mg/kg	3.3 mg/L	±30%	70-130%
Pyrene	129-00-0	655	8270	0.33 mg/kg	0.33 mg/L	±30%	70-130%
Tetrachloroethene	127-18-4	0.0091	8260	0.005 mg/kg	0.005 mg/L	±30%	70-130%
Toluene	108-88-3	7.27	8260[i]	0.005 mg/kg	0.005 mg/L	±30%	70-130%
Tributyl phosphate	126-73-8	6.18	8260	3.3 mg/kg	3.3 mg/L	±30%	70-130%
Physical Properties							
pH	N/A	N/A	9045	0.1	0.1	±30%	70-130%
Bulk density	N/A	N/A	ASTM D2937[j]	wt %	N/A	N/A	N/A
Moisture content	N/A	N/A	ASTM D2216[j]	wt %	N/A	N/A	N/A
Particle size distribution	N/A	N/A	ASTM D422[j]	wt %	N/A	N/A	N/A

Table 2-3. Nonradiological Analytical Performance Targets.

Contaminants of Concern	Chemical Abstracts Service #	Action Level (mg/kg)[a, b]	Name/Analytical Technology[c]	Detection Limit Targets - Sludge[d, h]	Detection Limit Targets - Liquid[d, h]	Precision Req't (% Relative Percent Difference)[e]	Accuracy Req't (% Recovery)[f]

[a] For waste disposal purposes, the action levels that apply to each of the contaminants of potential concern and contaminants of concern are the *Resource Conservation and Recovery Act of 1976* waste designation levels (WAC 173-303, "Dangerous Waste Regulations") and BHI-000139, *Environmental Restoration Disposal Facility Waste Acceptance Criteria*. Analytical data for the contaminants of concern will be used to designate the waste streams and develop waste profiles.

[b] The "Action Level" for the metals is based on total acid soluble metals, not toxicity characteristic leaching procedure by EPA Method 1311.

[c] Four-digit EPA methods are found in SW-846, *Test Methods for Evaluating Solid Waste: Physical/Chemical Methods, Third Edition; Final Update III-A*, as amended. For EPA Method 300.0, see EPA/600/4-79/020, *Methods of Chemical Analysis of Water and Wastes*. For American Society for Testing and Materials standards: ASTM D422, *Standard Test Method for Particle-Size Analysis of Soils*; ASTM D2216, *Standard Test Method for Laboratory Determination of Water (Moisture) Content of Soil and Rock by Mass*; ASTM 2937, *Standard Test Method for Density of Soil in Place by the Drive-Cylinder Method*.

[d] Detection limit requirements are taken from DOE/RL-2003-23, *Focused Feasibility Study for the 200-UW-1 Operable Unit*.

[e] Precision criteria for batch laboratory replicate matrix spike analyses or replicate sample analyses. Compounds spiked in the laboratory control sample or matrix spike are those specified in SW-846. Criteria based on laboratory statistical control limits are acceptable. Precision criteria for batch laboratory sample replicate and matrix spike replicate determinations are applicable only when results are greater than the estimated quantitation limit.

[f] Accuracy criteria for associated batch matrix spike percent recoveries. Evaluation based on statistical control of laboratory control samples also is performed.

[g] The list of compounds analyzed for quality control purposes are those recommended in EPA SW-846.

[h] The requested detection limits may not be achievable, based on sample sizes or dilutions required, because of sample activity or concentration of constituents in the samples.

[i] The list of compounds analyzed for quality control purposes are those recommended in EPA SW-846.

[j] Listed method may be substituted with an equivalent laboratory-specific procedure.

CVAA = cold vapor atomic absorption.
EPA = U.S. Environmental Protection Agency.
IC = ion chromatography.
ICP = inductively coupled plasma.
N/A = not applicable.
MS = mass spectrometry.
PLM = polarized light microscopy.
WAC = *Washington Administrative Code*.

2.3.2 Laboratory Sample Custody

Sample custody during laboratory analysis will be addressed in the applicable laboratory standard operating procedures. Laboratory custody procedures will ensure the maintenance of sample integrity and identification throughout the analytical process.

2.3.3 Quality Assurance Objective

The QA objective of this plan is to develop implementation guidance that will provide data of known and appropriate quality. Data quality is assessed by representativeness, comparability, accuracy, precision, and completeness. 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. Each of these is addressed in the following sections.

2.3.3.1 Representativeness

Representativeness is a measure of how closely the results reflect the actual concentration and distribution of the radiological constituents in the matrix sampled. Sampling plan design, sampling techniques, and sample handling protocols (e.g., storage, preservation, transportation) have been developed and are discussed in subsequent sections of this document. The documentation will establish that protocols have been followed and will ensure sample identification and integrity.

2.3.3.2 Comparability

Comparability expresses the confidence with which one data set can be compared to another. Data comparability will be maintained using standard procedures, consistent methods, and consistent units. Tables 2-2 and 2-3 list applicable fixed laboratory methods for analytes and target detection limits. Actual detection limits will depend on the sample matrix and the sample quantity available. Data will be reported as defined for specific samples.

2.3.3.3 Accuracy

Accuracy is an assessment of the closeness of the measured value to the true value. Radionuclide measurements that require chemical separations use this technique to measure method performance. For radionuclide measurements that are analyzed by gamma spectroscopy, laboratories typically compare results of blind audit samples against known standards to establish accuracy. Validity of calibrations are 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 (+/- 3s). Tables 2-2 and 2-3 list the accuracy provided for fixed laboratory analyses for the project.

2.3.3.4 Precision

Precision is a measure of the data spread when more than one measurement has been taken on the same sample. Precision can be expressed as the relative percent difference for duplicate measurements. Analytical precision for fixed laboratory analyses are listed in Tables 2-2 and 2-3.

2.3.3.5 Completeness

Completeness is a measure of the amount of valid data obtained from the analytical measurement process and the complete implementation of defined field procedures.

2.3.3.6 Detection Limits

Detection limits are functions of the analytical method used to provide the data and the quantity of the sample available for analyses.

2.3.4 Laboratory Quality Control

The laboratory method blanks and laboratory control sample/blank spike are defined in Chapter 1 of SW-846 and will be run at the frequency specified in Chapter 1 of SW-846.

2.4 SAMPLE PRESERVATION, CONTAINERS, AND HOLDING TIMES

Sample preservation, container, and holding time guidance is summarized in Table 2-4. Extra precautions normally are taken for sampling tanks on the Hanford Site. The extra precautions either lengthen the time required for each sampling, shipping, and analysis step, or they create additional steps. For example, personnel may need to wear protective clothing and shielded gloves when collecting samples; samples may require storage and transportation in shielded casks; samples may need to be removed from the casks and transferred to shielded hot cells at the laboratory; and samples may need to be extruded and composited remotely.

Because of the sample handling methods listed above, the sample preservation, containers, and holding time guidance listed below may not be applicable to this sampling activity. However, efforts will be made to minimize the duration between sampling and analysis of samples. Any deviations from SW-846 requirements will be noted on the SAF.

Final sample collection requirements will be identified on the SAF. Should there be conflicting guidance between this SAP and the SAF regarding preservation, containers, or holding times, the SAF will take precedence. The respective laboratory receiving and analyzing the samples will be contacted at a minimum of one week in advance to provide them with a reminder of the forthcoming samples and specific samples that may require a short turnaround time (e.g., 48 hours or less).

Table 2-4. Sample Preservation, Container, and Holding Time Guidelines.

Analytes	Bottle Number	Bottle Type	Amount [a,b]	Preservation	Packing Requirements	Holding Time[c]
Radionuclides						
Americium-241	1	G/P	10-1000 g	None	None	None
Cesium-137	1	G/P	100-1500 g	None	None	None
Cobalt-60	1	G/P	100-1500 g	None	None	None
Europium-152	1	G/P	100-1500 g	None	None	None
Europium-154	1	G/P	100-1500 g	None	None	None
Europium-155	1	G/P	100-1500 g	None	None	None
Neptunium-237	1	G/P	10-1000 g	None	None	None
Plutonium-238	1	G/P	10-1000 g	None	None	None
Plutonium-239/240	1	G/P	10-1000 g	None	None	None
Strontium-90	1	G/P	10-1000 g	None	None	None
Technetium-99	1	G/P	10-1000 g	None	None	None
Uranium-233/234	1	G/P	10-1000 g	None	None	None
Uranium-235	1	G/P	10-1000 g	None	None	None
Uranium-238	1	G/P	10-1000 g	None	None	None
Nonradionuclides						
Asbestos	1	G	40 g	None	Cool 4 °C	14 days
Polychlorinated biphenyls	1	aG	120 g	None	Cool 4 °C	14/40 days
Volatile organic analytes – EPA Method 8260	1	G	125	None	Cool 4 °C	14 days
Semivolatile organic analytes – EPA Method 8270A	1	G	125-1000 g	None	Cool 4 °C	14/40 days
pH – EPA Method 9045	1	G/P	10-250 g	None	None	ASAP; based on when water is added to the sample at the laboratory.
Tributyl phosphate	1	aG	250 g	None	Cool 4 °C	14/40 days
Inductively coupled plasma metals	1	G/P	10-500 g	None	None	6 months
Mercury	1	G	5-125 g	None	None	28 days
TPH-D/K[d]	1	G	125-250 g	None	Cool 4 °C	14 days
300.0[e] – nitrate	1	G/P	50-100 g	None	Cool 4 °C	None established for analysis
353.N[e] – nitrate + nitrite	1	G/P	50-100 g	None	Cool 4 °C	28 days/48 hours after extraction
Physical Properties [f]						
Bulk density – ASTM D2937 [g]	1	Liner	1000 g	None	None	None established for analysis
Moisture content – ASTM D2216 [g]	1	Moisture tin [e]	250 g	None	None	None established for analysis

Table 2-4. Sample Preservation, Container, and Holding Time Guidelines.

Analytes	Bottle		Amount[a,b]	Preservation	Packing Requirements	Holding Time[c]
	Number	Type				
Particle size distribution – ASTM D422 [h]	1	G/P	250 g	None	None	None established for analysis

[a] Optimal volumes, which may be adjusted downward to accommodate the possibility of retrieval of small amount of sample. Minimum sample size will be defined in the Sampling Authorization Form.

[b] Mixed samples may be obtained and submitted to the analytical laboratory for analyses for specific analytes including: Radionuclides – 100 g of sample material for all radionuclides (except Tc-99, which requires approximately 10 g each sample); Chemicals – a 10 g sample is required for all inductively coupled plasma analyses, a 10 g sample is required for TPH-D analysis, and 125 g samples are required for EPA Method 8270 analyses (SW-846, *Test Methods for Evaluating Solid Waste, Physical/Chemical Methods, Third Edition; Final Update III-A*, as amended).

[c] Where two numbers are indicated with a "/" in between, the first number is the time from sample collection to extraction, and the second number is after extraction through analysis.

[d] The analyte is considered only due to the potential presence of process chemical(s); the presence of motor fuel is not expected.

[e] For Test Method 300.0, see EPA/600/4-79/020, *Methods of Chemical Analysis of Water and Wastes*; for Test Methods 353.N, see EPA/600/4-79/020 and EPA/600/R-93/100, *Methods for the Determination of Inorganic Substances in Environmental Samples*.

[f] For American Society for Testing and Materials standards: ASTM D422, *Standard Test Method for Particle-Size Analysis of Soils*; ASTM D2216, *Standard Test Method for Laboratory Determination of Water (Moisture) Content of Soil and Rock by Mass*; ASTM 2937, *Standard Test Method for Density of Soil in Place by the Drive-Cylinder Method*.

[g] Vessel must be sealed.

[h] Method may be substituted with an equivalent laboratory procedure.

aG = amber glass.
ASAP = as soon as possible.
G = glass.
P = plastic.
TPH-D/K = total petroleum hydrocarbons-diesel/kerosene.

2.5 ONSITE MEASUREMENTS QUALITY CONTROL

The collection of QC samples for onsite measurement QC is not applicable to the field-screening techniques described in this SAP. Field-screening instrumentation will be calibrated and controlled according to Sections 2.7, as applicable.

2.5.1 Assessment/Oversight

Routine evaluation of data quality described for this project will be documented and filed along with the data in the project file.

2.5.2 Assessments and Response Action

The primary contractor Regulatory Compliance group may conduct random surveillance and assessments to verify compliance with the requirements outlined in this SAP, project work packages, procedures, and regulatory requirements.

Deficiencies identified by these assessments will be reported in accordance with existing programmatic requirements. Central Plateau Projects Quality Assurance coordinates the corrective actions/deficiencies in accordance with the primary contractor QA program. When appropriate, corrective actions will be taken by the 200-UW-1 OU Project Manager.

2.5.3 Reports to Management

Management will be made aware of all deficiencies identified by self-assessments. Identified deficiencies will be reported to the primary contractor Director, Waste Site Remediation, as appropriate.

2.6 DATA MANAGEMENT

Analytical data resulting from the implementation of this QAPjP will be managed and stored in accordance with the applicable programmatic requirements governing data management procedures. At the direction of the Project Manager, all analytical data packages will be subject to final technical review by qualified personnel before they are submitted to the regulatory agencies or included in reports. 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 *Hanford Federal Facility Agreement and Consent Order* (Tri-Party Agreement) (Ecology et al. 2003).

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 radiological measurements when this SAP is implemented. 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.

2.6.1 Resolution of Analytical System Errors

Errors reported by the laboratories are reported to the Sampling Coordinator, who initiates a Sample Disposition Record in accordance with primary contractor procedures. This process is used to document analytical errors and to establish resolution with the Project Manager. In addition, the primary contractor QA receives quarterly reports that provide summaries and summary statistics of the analytical errors.

2.7 VALIDATION AND VERIFICATION REQUIREMENT

No third party validation is required for analyses in support of waste designation. Validation will consist of verifying instructions in the LOI are met, including required deliverables, requested versus reported analyses, "outlier" data, and transcription errors. Validation also will include evaluating and qualifying the results based on holding times, method blanks, laboratory control samples, laboratory duplicates, "outlier" data and the potential for sample re-analysis (provided sufficient sample exists to run the sample again), and chemical and tracer recoveries, as appropriate. No other validation or calculation checks will be performed.

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 their program documentation, and/or per manufacturer specifications.
- 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. Some instruments require calibration twice daily, once in the morning prior to field screening, and once at the conclusion of the day to evaluate for potential instrument "drift".

2.8 DATA QUALITY ASSESSMENT

The DQA process compares completed field sampling activities to those proposed in corresponding sampling documents and provides an evaluation of the resulting data. The purpose of the data evaluation is to determine if quantitative data are of the correct type and are of adequate quality and quantity to meet the project DQOs. The EPA DQA process, EPA/600/R-96/084, *Guidance for Data Quality Assessment*, identifies five steps for evaluating data generated from this project, as summarized in the following:

Step 1. Review Data Quality Objectives and Sampling Design. This step requires a comprehensive review of the sampling and analytical requirements outlined in the project-specific DQO summary report and SAP.

Step 2. Conduct a Preliminary Data Review. In this step, a comparison is made between the actual QA/QC achieved (e.g., detection limits, precision, accuracy, completeness) and the requirements determined during the DQO. Any significant deviations will be documented. Basic statistics will be calculated from the analytical data at this point, including an evaluation of the distribution of the data.

Step 3. Select the Statistical Tests. Using the data evaluated in Step 2, select appropriate statistical hypothesis tests or graphical data analyses and justify this selection.

Step 4. Verify the Assumptions. Assess the validity of the data analyses by determining if the data support the underlying assumptions necessary for the analyses or if the data set must be modified (e.g., transposed, augmented with additional data) before further analysis. If one or more assumptions is questioned, return to Step 3.

Step 5. Draw Conclusions from the Data. The analyses are applied in this step, and the results will be used to select among four possible outcomes for each COC.

2.9 TECHNICAL PROCESSES AND SPECIFICATIONS

Sampling and field measurements will be conducted according to the following approved work processes.

Sample Location. Sample locations are limited to available tank risers that are of sufficient diameter to allow passage of the sampling equipment. It is anticipated that one riser on either side of the tank will be the chosen location for core sampling. This will ensure that the sampling vehicle will not have to rest on top of the tank. Changes in sample location that do not affect the DQOs will require approval by the 200-UW-1 OU Project Manager.

Sample Identification. The *Sample Data Tracking System* database will be used to track the samples through the collection and laboratory analysis process. The HEIS database is the repository for the laboratory analytical results. HEIS sample numbers will be issued to the sampling organization. Each sample will be identified and labeled with a unique HEIS sample number. The sample location, depth, and corresponding HEIS numbers will be documented in the sampler's field logbook.

Each sample container will be labeled with the following information, using a waterproof marker on firmly affixed, water-resistant labels:

- HEIS number
- Sample collection date/time
- Name/initials of person collecting the sample
- Analysis required
- Preservation method, if applicable.

2.9.1 Field Sample Log

All information pertinent to field sampling and analysis will be recorded in field checklists and bound logbooks in accordance with existing sample collection protocols. The sampling team will be responsible for recording all relevant sampling information. Entries made in the logbook will be dated and signed by the individual who made the entry. Prime contractor program requirements for managing the generation, identification, transfer, protection, storage, retention, retrieval, and disposition of records also will be followed.

2.9.2 Sample Custody

The custody of samples will be maintained from the time that the samples are collected until the 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 any laboratory (in a cooler or shielded sampling cask, depending on dose rate). Wire or laminated waterproof tape will be used to seal the coolers or other shipment containers. 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, transfer, analysis, and disposal to ensure that sample integrity is maintained. Each time that the responsibility for the custody of the sample changes, the new and previous custodians will sign the record and note the date and time. The sampler will make a copy of the signed record before shipping the sample and will transmit the copy to Sample and Data Management within 48 hours of shipping.
A custody seal (i.e., evidence tape) will be affixed to the lid of each sample container. The container seal will be inscribed with the sampler's initials and the date.

2.9.3 Sample Containers and Preservatives

Level I EPA precleaned sample containers normally are used for samples collected for radiological analysis. Container sizes may vary, depending on the laboratory-specific volumes needed to meet analytical detection limits. If, however, the dose rate on the outside of a sample container or the curie content within the sample exceeds levels acceptable to the laboratory, the sampling lead can send smaller volumes to the laboratory after consultation with Sample and Data Management to determine acceptable volumes. Preliminary container types and volumes are identified in Table 2-4. The final container type and volumes will be provided on the SAF. Because the sludge will be sampled using a core sampler, the core segments likely will be shipped to the laboratory in the sampler itself. This will preclude the use of the sample containers listed in Table 2-4. Sample containers and preservatives will be used at the laboratory following extrusion of the core segments from the samplers.

2.9.4 Sample Shipping

The radiological control technician will measure both the contamination levels on the outside of each sample container and the dose rates on each sample container before it is shipped to the 222-S Laboratory, or approved alternate laboratory[4]. The radiological control technician also will measure the radiological activity on the outside of the sample container (through the container) and will document the highest contact radiological reading in millirem per hour. This information, along with other data, will be used to select proper packaging, marking, labeling, and shipping paperwork in accordance with U.S. Department of Transportation regulations (49 CFR, "Transportation") and to verify that the sample can be received by the analytical laboratory in accordance with the laboratory's acceptance criteria. The sampler will send copies of the shipping documentation to Sample and Data Management within 48 hours of shipping.

[4] The samples taken from the 241-U-361 Settling Tank are expected to be highly radioactive; the samples are expected to be analyzed at the 222-S Laboratory. The 222-S Laboratory is a high-radiation capability laboratory with its own procedures. This laboratory operates in accordance with HASQARD, and performs its own performance evaluation testing. If the radiation levels are lower than expected, an environmental laboratory may be selected for some analyses. If an environmental laboratory is chosen it will require compliance with HASQARD, and based on data usage may require state accreditation.

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3.0 FIELD SAMPLING PLAN

3.1 SAMPLING OBJECTIVES

The field sampling plan identifies and describes the sampling and analysis activities being conducted to support waste designation of the 241-U-361 Settling Tank contents. The field sampling plan uses the sampling approaches developed in the DQO process (D&D-28702) as the basis for the site-specific sampling plan presented in the following sections. The overall sampling strategy is outlined in Table 3-1 and graphically depicted in Figure 3-1. Minor changes to the field sampling plan may be made in the field by the 200-UW-1 OU Project Manager. Changes to the field sampling plan that affect the DQOs will be reviewed and approved by DOE-RL, EPA, and Ecology prior to implementation.

3.1.1 Waste Designation Sampling

Waste designation sampling is performed to provide data to support the waste designation process. The generator, with coordination from the waste management representative, is ultimately responsible for proper waste designation. The waste designation sampling objectives for material in the 241-U-361 Settling Tank are to determine the following attributes:

- If sludge meets the ERDF waste acceptance criteria (BHI-00139)
- If characteristic waste codes apply (WAC 173-303-090)
- If the waste meets the definition of a toxic dangerous waste (WAC 173-303-100)
- If the waste meets the definition of a dangerous persistent waste (WAC 173-303-100)
- If the waste is regulated due to concentrations of PCBs (40 CFR 761)
- If the waste is regulated due to asbestos content (40 CFR 61 Subpart M).

3.1.2 Potentially Applicable Nondestructive Analyses

Several nondestructive analysis techniques have been identified that are available at the Hanford Site and potentially are applicable to examination of the 241-U-361 Settling Tank. These techniques, any of which could be used, include the following:

- Passive Gamma Logging. This down-hole analytical technique can detect low concentrations of Pu-239 and Am-241
- Neutron Moisture Logging. This down-hole analytical technique can quantify the moisture content of the sludge
- Passive Neutron Monitoring. This down-hole analytical technique provides quantitative determinations of transuranic element concentrations. The technique can measure concentrations of transuranic elements to approximately 100 nCi/g
- Xenon Daughter Products Monitoring. This analytical technique provides an indication of the presence of transuranic elements.

By collecting logging data in a series of small depth increments, a relatively high-resolution profile of sludge characteristics may be generated using a combination of the down-hole techniques. The ability to apply these tools to the 241-U-361 Settling Tank requires that a clean and dry pipe be inserted vertically into the sludge.

The xenon monitoring technique involves collection of a relatively large amount of headspace vapor for analysis. This technique could be performed during the health and safety sampling phase of this project.

Table 3-1. 241-U-361 Settling Tank Sampling Design.

Waste Stream	Data Needs	Recommended Sampling Approach	Location and Number of Samples	Contaminants of Concern
None	Visual inspection of tank contents and interior structure.	Place lighting and video camera into tank head space through an existing tank riser or manhole. Record estimated depth of sludge, state of the tank interior (integrity), and presence or absence of supernate layer.	None; video recording of tank interior and contents will be performed per an approved work package.	None
None	Radiological and chemical data from tank headspace vapors for health and safety purposes.	Collect vapor samples from tank headspace through an existing tank riser or manhole. Collect dose rate readings from interior of tank when opened.	Tank headspace vapor samples will be collected per an approved health and safety plan. Tank dose rate readings will be collected using a project-specific radiological work plan and standard site field radiation detection equipment.	Hydrogen, light gases, total volatile organic compounds, lower explosive limit, etc. Specific constituents to be monitored will be outlined in the health and safety plan.
Sludge	Radiological and chemical data for waste designation for waste disposal.	Passive gamma logging, neutron moisture logging, passive neutron monitoring, and/or xenon daughter products monitoring may be used in conjunction with laboratory analysis to characterize tank contents. Remove core sample segments from tank. Extrude core sample segments at 222-S Laboratory, or approved alternate laboratory. Composite sample material from each visible stratum (if they exist). Perform method-based analyses for radiological and chemical analytical methods listed in Tables 2-2 and 2-3. Photographic documentation of the sampling activities may be used for documentation purposes.	Collect one full-depth core sample of the tank sludge from an accessible tank riser. Full depth core sample should equal approximately 8 sample segments. Additional full-depth core sample(s) may be collected at the discretion of the 200-UW-1 OU project manager. Collect QC samples per Section 2.2 of this plan.	All radiological and chemical constituents listed in Table 1-2.

Table 3-1. 241-U-361 Settling Tank Sampling Design.

Waste Stream	Data Needs	Recommended Sampling Approach	Location and Number of Samples	Contaminants of Concern
Liquid	Radiological and chemical data for waste designation for waste disposal.	Passive gamma logging, neutron moisture logging, passive neutron monitoring, and/or xenon daughter products monitoring may be used in conjunction with laboratory analysis to characterize tank contents. Collect liquid samples (if present) from the supernate layer over the sludge. Remove core sample segments from tank. Extrude core sample segments at 222-S Laboratory, or approved alternate laboratory. Collect liquid (if present) from each of the core sample segments during extrusion. Perform method based analyses for radiological and chemical analytical methods listed in Tables 2-2 and 2-3. Photographic documentation of the sampling activities may be used for documentation purposes.	Collect a minimum of 1 bottle per sample segment during core segment extrusion. Collect a minimum of 2 bottles from the supernate layer over the sludge. Collect QC samples per Section 2.2 of this plan.	All radiological and chemical constituents listed in Table 1-2.

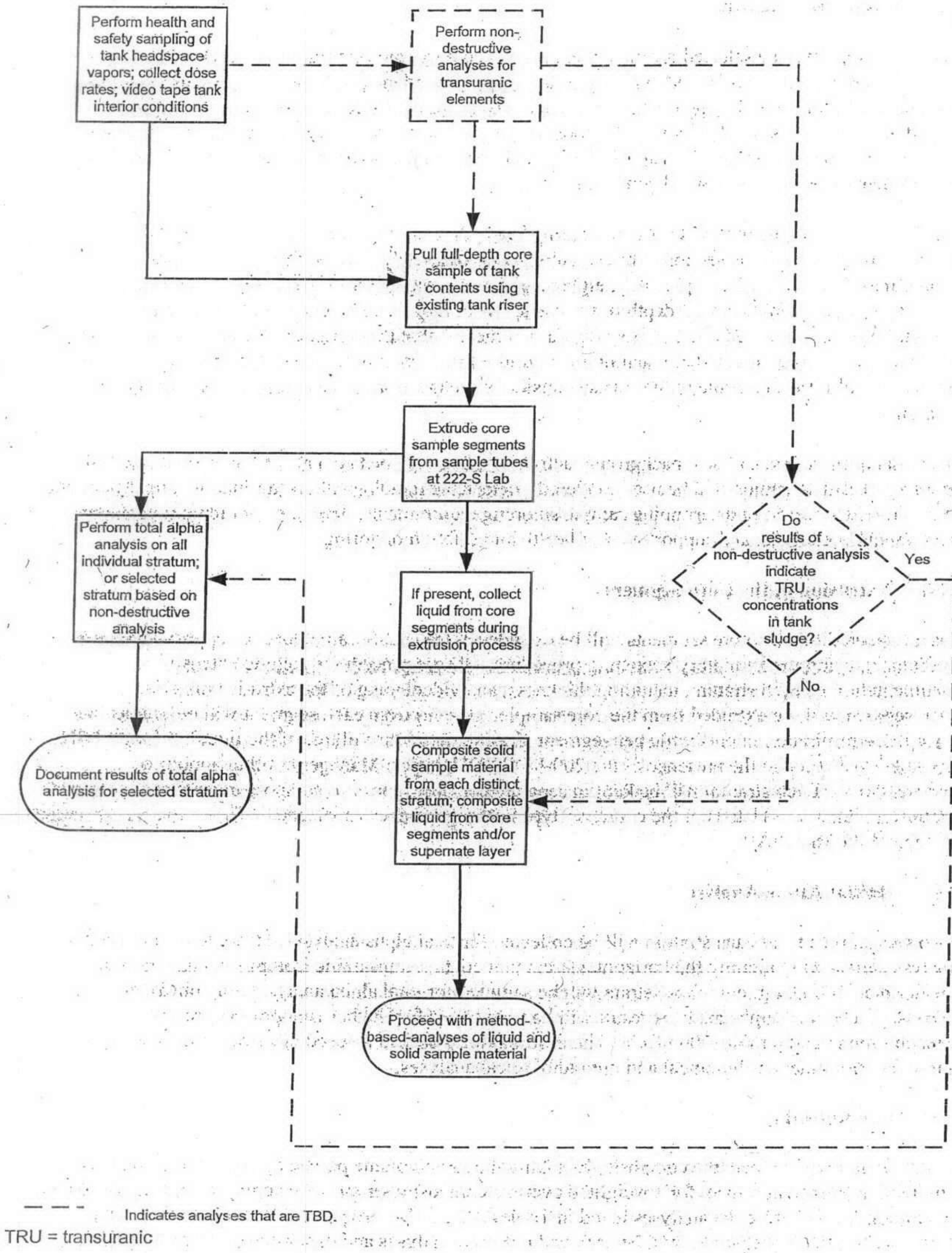

Figure 3-1. 241-U-361 Settling Tank Sampling Strategy.

3.1.3 Push-Core Sampling

A tank vent riser will be selected for the collection of a core sample from the sludge. One full-depth push-core sample will be collected using existing equipment and the procedures used by the Tank Farm Contractor to sample single- and double-shell tanks. Because the sludge is assumed to be uniformly layered across the tank, the location of the core sample (i.e., which vent riser will be utilized for sample access) will be determined by the Tank Farm Contractor sampling organization and the 200-UW-1 OU Project Manager based on physical constraints in access.

Based on core sampling at the 241-Z-361 Settling Tank, the core segments will be 48.3 cm (19 in.) long with a 6.5 cm^2 (1 in^2) cross-section, which results in approximately 320 mL (480 g) of sample volume/mass. For purposes of planning, eight segments are estimated for a full depth core. This will be adjusted depending on the actual depth of the waste. The sludge will be cored to the bottom of the tank. Previous sampling at the 241-U-361 Settling Tank indicated that the sludge had the consistency of soft mud; therefore, it is assumed that reaching the bottom of the tank will not present a problem. However, removing a fully intact sample to the surface outside of the tank may be a challenge due to material sloughing.

Before sampling begins, a local background activity reading will be taken at the location selected for sampling. 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.

3.1.4 Extrusion of the Core Segments

It is anticipated that the core segments will be extruded at the 222-S Laboratory (or approved alternate laboratory), using the laboratory's existing procedures. These procedures include extensive documentation of each stratum, including thickness, and videotaping of the extruded material. Each segment will be extruded from the core sampler. Liquid from each segment will be drained and placed, at a minimum, in one bottle per segment, depending on the volume of the liquid. Sludge will be separated into strata in the presence of the 200-UW-1 OU Project Manager or other appointed representative. Each stratum will be kept in separate containers prior to compositing material from each stratum for analysis. Details of the container types, storage temperatures, and holding times are discussed in Table 2-4 of this SAP.

3.1.5 Initial Alpha Analyses

Two subsamples from each stratum will be collected for total alpha analysis. However, if nondestructive analyses are used to identify the horizontal strata that contain transuranic isotopes in concentrations greater than 100 nCi/g, only those strata will be sampled for total alpha analysis, for confirmation purposes. The total alpha analysis result will be used to verify whether isotopes are present in concentrations greater than 100 nCi/g. This information also will be used to guide compositing of the strata for subsequent radiological and nonradiological analyses.

3.1.6 Compositing

The laboratory will create the composite by taking the same volume percentage of samples from each stratum and combining them for a weighted average composite sample. The composite sample then will be homogenized before the analyses listed in Tables 2-2 and 2-3 are performed on each composite. Subsamples of the composites will be archived until the analyses and data assessment are completed.

Supernates collected from the segments will be composited by taking the same volume percentage of sample from each core and combining them for a weighted average composite sample, assuming that sufficient supernate volume exists. The composite sample then will be homogenized and analyses are performed for the metals and other organics, volatile organic compounds, semivolatile organic compounds, and radionuclides in Tables 2-2 and 2-3. For planning purposes, it is assumed that two composite supernate samples, along with the appropriate QC samples, will be analyzed. If insufficient supernate is collected, the metals and radionuclide analyses will be performed preferentially.

3.1.7 Media Sampling and Analysis

For the 241-U-361 Settling Tank, samples will be collected from the tank to establish the maximum concentrations of the contamination. The number of samples collected for a focused design will be determined judgmentally. Because of the geometry of the tank, the lack of a mixing mechanism within the tank, and the lessons learned from sampling/characterization activities at the 241-Z-361 Settling Tank (Hampton and Miller, 2001), the sludge in the 241-U-361 Settling Tank is assumed to be layered uniformly. Therefore, it is assumed that one full-depth core sample from an existing tank riser will provide representative data that can be used to designate the tank contents for waste disposal.

3.2 SAMPLING LOCATIONS AND FREQUENCY

Table 3-1 lists the sampling techniques and the samples required for the 241-U-361 Settling Tank project. Table 3-1 also summarizes the number of samples required for each location or medium.

3.3 SAMPLING PROCESSES

The sampling processes will be consistent with the requirements outlined in the Tri-Party Agreement Action Plan, Section 7.8, "Quality Assurance" (Ecology et al. 2003), and the QAPjP (Section 2.0 of this SAP). The project will use the Tank Farm Contractor's tank sampling organization or other approved sampling organization to perform the sample collection associated with the 241-U-361 Settling Tank project. The approved sampling organization will perform the sample collection activities in accordance with their existing procedures for sample collection, collection equipment, and sample handling.

3.4 SAMPLE MANAGEMENT

Sample and data management activities will be consistent with the prime contractor QA program and the QAPjP (Section 2.0 of this SAP). Sample preservation, container, and holding-time requirements will be documented on a chain-of-custody form / SAF in accordance with SW-846 and the specific analytical method prepared for specific sample events.

Because the core segments will be shipped to the laboratory within the sampler, sample preservation, container, and holding-time requirements may not be met for all analyses. However, efforts will be made to minimize the duration between sampling and analysis of samples. As stated previously, the receiving laboratory will be given a minimum of a weeks' notice prior to sample shipment to the laboratory.

3.4.1 Sample Custody

All samples obtained during the project will be controlled from the point of origin to the analytical laboratory, as required by SW-846 and the QAPjP (Section 2.0 of this SAP).

3.4.2 Sample Packaging and Shipping

Sample packaging and shipping are addressed as described in Section 2.9.

3.4.3 Field Documentation

Sample preservation and container details will be documented on the Chain-of-Custody Form/SAF in accordance with the requirements specified in SW-846 and the QAPjP (Section 2.0 of this SAP). As noted in Section 3.4, sample preservation, container, and hold-time requirements may not be met for all analyses, based on the manner in which the samples are shipped to the laboratory. Any deviations from SW-846 will be documented on the SAF.

4.0 HEALTH AND SAFETY

All field operations will be performed in accordance with prime contractor health and safety requirements outlined in an approved 241-U-361 Settling Tank health and safety plan. In addition, a work control package will be prepared that will further control site operations. This work package will include an activity hazard analysis, and will reference applicable radiological control requirements.

The sampling processes and associated activities will take into consideration exposure reduction and contamination control techniques [(e.g., ALARA and Integrated Safety Management System (ISMS)] that will minimize radiation exposure to the sampling team, as required by minimum requirements established by 10 CFR 835, and provide the basis for consistent and uniform implementation of radiological control requirements.

Health and safety personnel will use data collected during the activities addressed in this SAP as input to determine exposure levels to workers and to conduct health and safety assessments during all field activities, in accordance with the health and safety plan.

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5.0 MANAGEMENT OF WASTE

All waste generated by sampling activities will be managed in accordance with the waste management portion of an approved waste control plan. Unused samples and associated laboratory waste for the analysis will be dispositioned in accordance with the laboratory contract and agreements for return to the project site. Pursuant to 40 CFR 300.440, "National Oil and Hazardous Substances Pollution Contingency Plan," "Procedures for Planning and Implementing Off-site Response Actions," Ecology Project Manager approval is required before returning unused samples or waste from offsite laboratories (as applicable).

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