DOE/RL-2014-30
Draft A

Sampling and Analysis Plan for Installation of Single-Shell Tank Waste Management Area S-SX RCRA Monitoring Well 299-W22-113 and Single-Shell Tank Waste Management Area U RCRA Monitoring Well 299-W18-260

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

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WMA S/SX

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By Julia Raymer at 10:41 am, Jul 16, 2014

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Terms

AEA	*Atomic Energy Act of 1954*
ALARA	as low as reasonably achievable
bgs	below ground surface
CERCLA	*Comprehensive Environmental Response, Compensation, and Liability Act of 1980*
CHPRC	CH2M HILL Plateau Remediation Company
COC	contaminant of concern
DOE	U.S. Department of Energy
DOE-RL	DOE Richland Operations Office (also known as RL)
DQI	data quality indicator
DQO	data quality objective
Ecology	Washington State Department of Ecology
EPA	U.S. Environmental Protection Agency
GM	Geiger-Müller
HASQARD	*Hanford Analytical Services Quality Assurance Requirements Documents* (DOE/RL-96-68)
HEIS	Hanford Environmental Information System
NAVD88	North American Vertical Datum of 1988
OU	operable unit
PAM	portable alpha meter
QA	quality assurance
QAPjP	quality assurance project plan
QC	quality control
RCRA	*Resource Conservation and Recovery Act of 1976*
RCT	radiological control technician
S&GRP	Soil and Groundwater Remediation Project
SAP	sampling and analysis plan
SMR	Sample Management and Reporting

TPA	Tri-Party Agreement
Tri-Party Agreement	*Hanford Federal Facility Agreement and Consent Order*
VOC	volatile organic compound
WMA	waste management area

1 Introduction

The purpose of this sampling and analysis plan (SAP) is to conduct sampling and measurement activities required to support the drilling and installation of new groundwater monitoring wells, 299-W18-260 (C8925) for Waste Management Area (WMA) U and 299-W22-113 (C8943) for WMA S-SX in the Hanford Site's 200 West Area. Both WMAs are dangerous waste management units regulated under the *Resource Conservation and Recovery Act of 1976* (RCRA); RCW 70.105, "Hazardous Waste Management;" and requirements are implemented by WAC 173-303, "Dangerous Waste Regulations." Soil samples for sieve analyses will be taken from both wells, while water sampling will be collected from the aquifer while drilling well 299-W18-260. Both of these wells are being drilled to replace existing monitoring wells that have gone dry or are nearly dry due to the declining water table. Well 299-W18-260 will replace 299-W18-30 (A4942), and well 299-W22-113 will replace 299-W22-49 (B8813).

Wells 299-W18-30 and 299-W22-49 are sampled for dangerous waste constituents under RCRA groundwater quality assessment programs and for radionuclides under the *Atomic Energy Act of 1954* (AEA). Well 299-W22-49 is sampled under the *Comprehensive Environmental Response, Compensation, and Liability Act of 1980* (CERCLA) for the 200-UP-1 Groundwater Operable Unit (OU). New wells 299-W18-260 and 299-W22-113 will be sampled under the same programs as the wells they are replacing. RCRA groundwater monitoring for WMA U is documented in DOE/RL-2009-74, *Interim Status Groundwater Quality Assessment Plan for the Single-Shell Tank Waste Management Area U*, and RCRA groundwater monitoring for WMA S-SX is documented in DOE/RL-2009-73, *Interim Status Groundwater Quality Assessment Plan for the Single-Shell Tank Waste Management Area S-SX*. CERCLA monitoring for the 200-UP-1 OU is documented in Appendix B of DOE/RL-2013-07, *200-UP-1 Groundwater Operable Unit Remedial Design/Remedial Action Work Plan*. Although only one of the replacement wells will be sampled under a CERCLA program, information from both wells will assist CERCLA OU monitoring, including performance of the 200 West pump-and-treat system.

Recent groundwater plume maps are provided in DOE/RL-2013-22, *Hanford Site Groundwater Monitoring Report for 2012*.

1.1 Data Quality Objectives

This section describes the rationale used to determine the samples to be obtained and the associated level of quality control (QC). The methodology provided in EPA/240/B-06/001, *Guidance on Systematic Planning Using the Data Quality Objectives Process* (EPA QA/G-4) was used to review objectives and to identify adequate quality assurance (QA) and QC provisions to support defensibility of the data to be acquired. The data quality indicators (DQIs) and quality parameters for laboratory analytes are discussed in Sections 2.1.4 and 2.2.6, respectively.

1.1.1 Step 1—State the Problem

The RCRA regulations require that sites under a groundwater quality assessment program determine the extent of contamination in the aquifer. This is interpreted to mean not only the lateral extent of contamination but the vertical extent, as well. The vertical profile of contamination at WMA S-SX has been well characterized by collection of groundwater samples during drilling. However, no information exists for WMA U regarding the vertical extent of groundwater contamination. Thus, one of the primary problems is to gather vertical profile information in the groundwater at WMA U.

Another issue is the selection of well screen slot size for the replacement wells. Hanford Site wells are typically constructed with 20-slot screens, but another size may be more appropriate in specific instances.

1.1.2 Step 2—Identify the Decision

The vertical profile of groundwater contamination at WMA U is a characterization issue; no specific decision is related to this problem. Data will also be gathered under this data quality objective (DQO) process to determine if a 20-slot screen will be acceptable for the replacement wells or if a different screen slot size is more appropriate.

1.1.3 Step 3—Identify Inputs to the Decision

The project will require one sieve analysis of sediments in the saturated zone in each of the two wells to determine the well screen slot size. The sample to be sieved will be a composite of grab samples collected every 1.5 m (5 ft) below the water table for the upper 9.1 m (30 ft) of the aquifer. A geologist will use these data to verify the selection of a 20-slot screen or to select a different screen size, as appropriate. The sieve analysis needs to be completed rapidly to support well completion.

The vertical profile of contamination in the aquifer at WMA U can be determined by collection of depth-discrete groundwater samples during drilling of 299-W18-260. The primary contaminant for this profiling is technetium-99 because most of the technetium-99 in groundwater beneath and downgradient from WMA U originates from the WMA. The other contaminants in groundwater in the WMA vicinity are nitrate and carbon tetrachloride (DOE/RL-2013-22). While WMA U is a source of nitrate to the groundwater, some of the nitrate originates from upgradient (DOE/RL-2013-22). Carbon tetrachloride also originates from an upgradient source. Depth-discrete sampling for all three of these constituents was performed during drilling of the nearby 200-ZP-1 OU extraction well, 299-W17-3, located 150 m (490 ft) to the north-northeast of the WMA. The results are shown in Figures 1-1 through 1-3. While carbon tetrachloride occurs to a depth of about 65 m (215 ft) below the water table, elevated concentrations of nitrate and technetium-99 only extend to about 20 m (65 ft) below the water table (although the concentrations are below the 200-UP-1 cleanup levels of 900 pCi/L for technetium-99 and 45 mg/L for nitrate [DOE/RL-2013-07]). For comparison, the nitrate and technetium-99 plumes at WMA S-SX also extend to approximately 20 m (65 ft) below the water table in the near source environment (DOE/RL-2011-01, *Hanford Site Groundwater Monitoring Report for 2010*). A similar depth is expected for the technetium-99 plume at WMA U, so depth-discrete samples will be collected from 3 to 27.4 m (10 to 90 ft) below the water table at 6.1 m (20 ft) intervals.

The groundwater samples collected during drilling of 299-W18-260 will be analyzed for technetium-99, nitrate, and carbon tetrachloride. Specific conductance also will be measured because it can be used to verify the nitrate results. The samples should be collected by pumping. If pumping is not possible, another method can be used based on conditions observed in the field. Because the sample results will be used for plume delineation, which is also an objective of routine groundwater sampling activities, the normal QA parameters associated with routine groundwater sampling at Hanford (DOE/RL-96-68, *Hanford Analytical Services Quality Assurance Requirements Documents* [HASQARD]) will be sufficient for this purpose.

Although chromium is present in the groundwater beneath WMA U at low concentrations (i.e., ≤15 µg/L during 2013), samples collected during drilling will not be analyzed for this constituent. The drilling process typically causes localized reducing conditions that affect chromium concentrations (Section 3.3.6 of DOE/RL-2011-118, *Hanford Site Groundwater Monitoring for 2011*). To obtain representative chromium water samples during drilling, extended purging is needed and monitoring of dissolved oxygen during the purge is required to indicate when the water is representative of aquifer conditions (Section 3.3.3 of SGW-54551, *Description of Work for the Installation of Eleven Wells at 100-BC-5, FY 2013*). This is a time-consuming and expensive process, and because chromium concentrations beneath WMA U are low, the extra time and expense of collecting representative water samples for chromium is not justified.

1.1.4 Step 4—Define Boundaries of the Study

Because both wells are replacement wells for existing WMA U and WMA S-SX network monitoring wells, their locations are adjacent to the wells being replaced (Figure 1-4).

The soil samples for sieve analysis will be composited from grab samples collected over the planned screen depths (0 to 9.1 m [0 to 30 ft] below the water table.

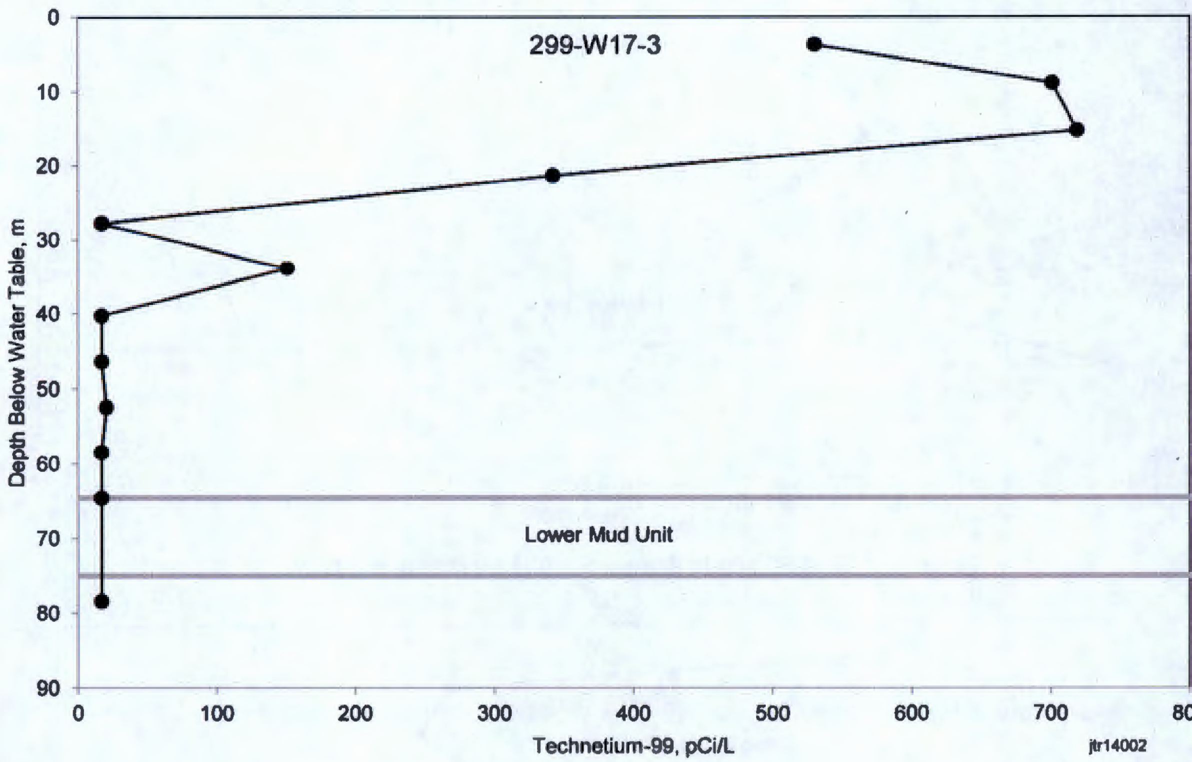

Figure 1-1. Depth-Discrete Sample Results for Technetium-99 at 299-W17-3

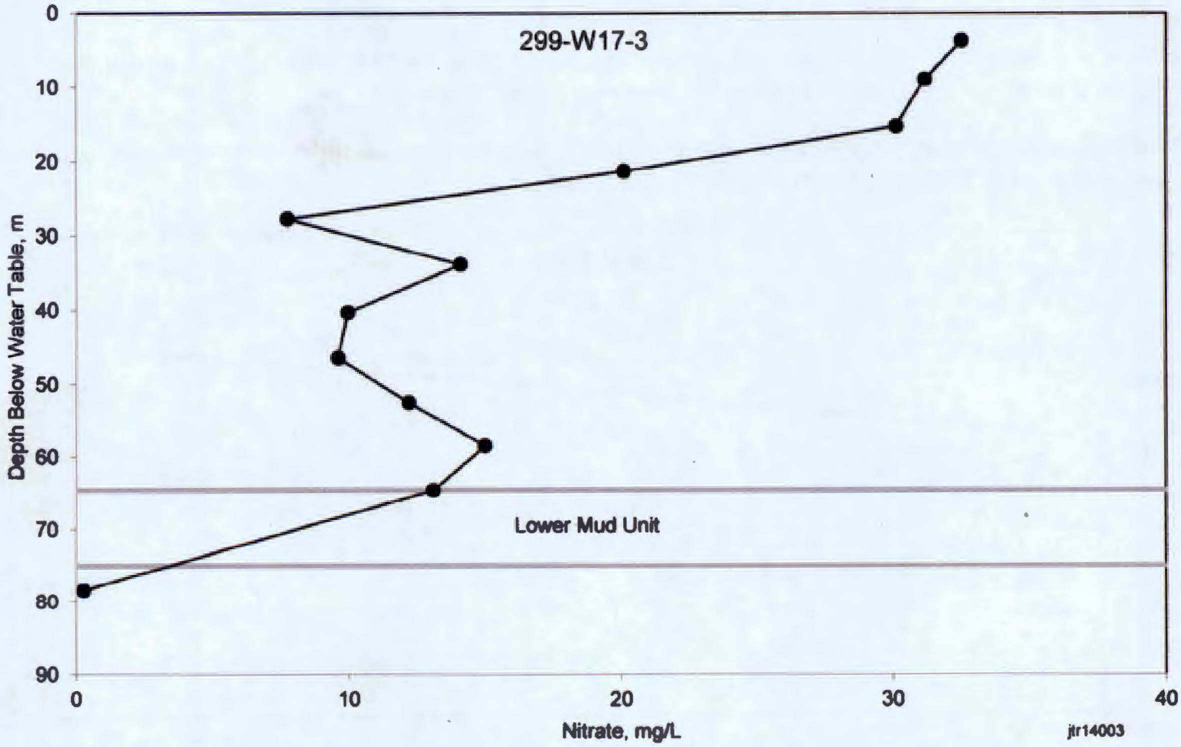

Figure 1-2. Depth-Discrete Sample Results for Nitrate at 299-W17-3

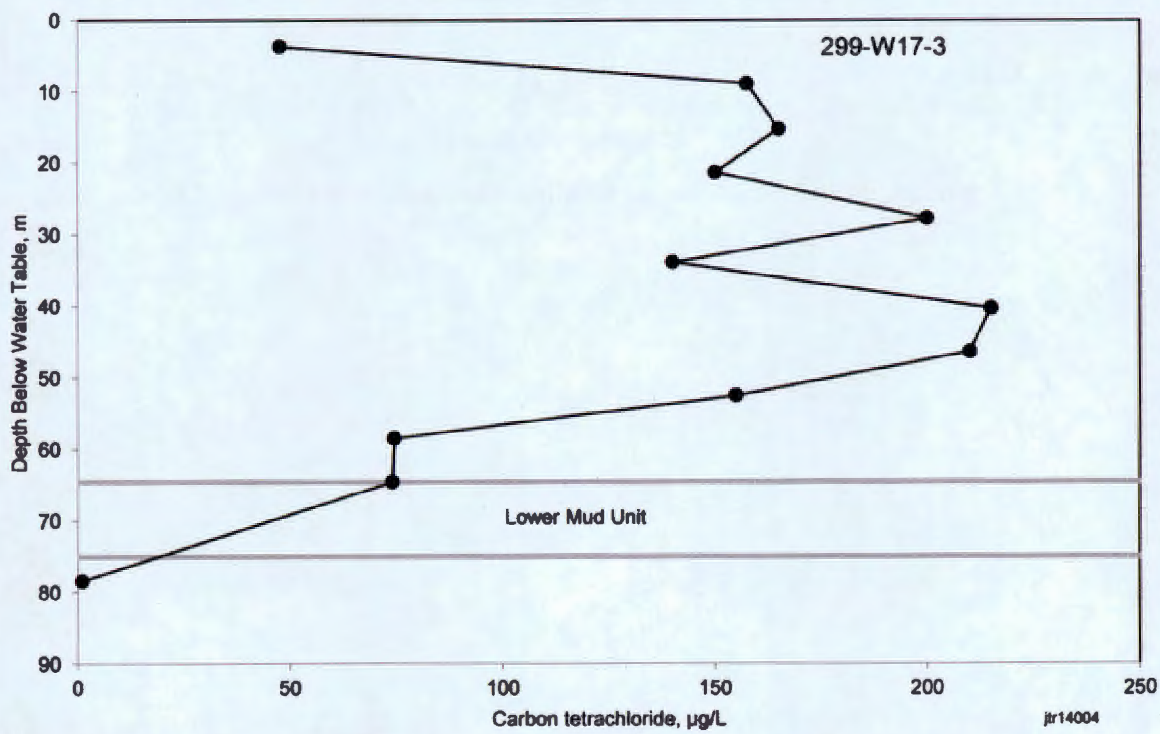

Figure 1-3. Depth-Discrete Sample Results for Carbon Tetrachloride at 299-W17-3

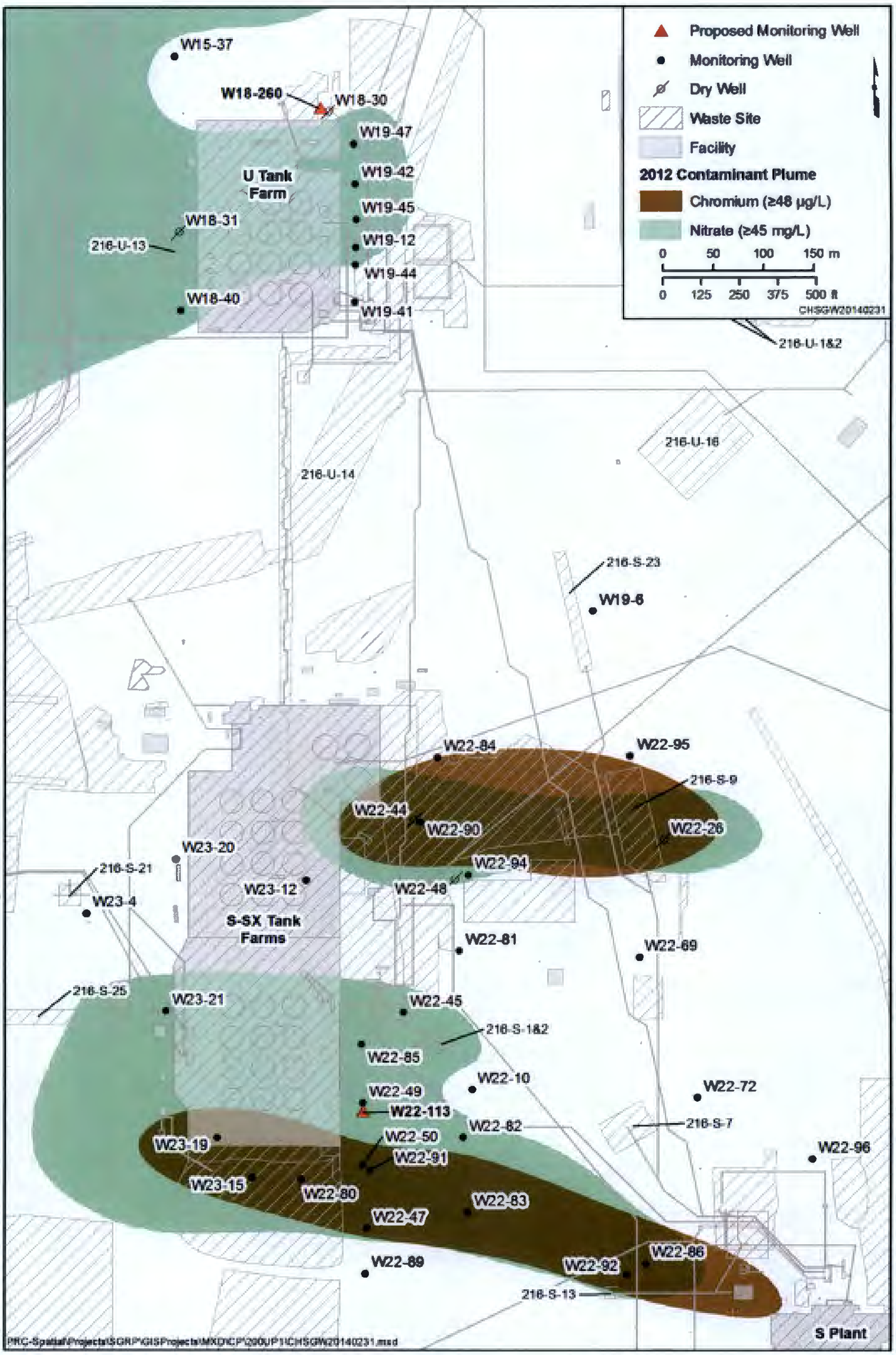

Figure 1-4. Location for New RCRA Wells 299-W19-260 (C8925) and 299-W22-113 (C8943)

Based on experience with depth-discrete sampling during drilling of other wells within the 200-UP-1 and 200-ZP-1 OUs, particularly at WMA S-SX, a vertical profile of 27.4 m (90 ft), with samples collected every 6.1 m (20 ft) beginning at 3.0 m (10 ft) below the water table, should be sufficient to determine the vertical profile of technetium-99 contamination at 299-W18-260. The nitrate contamination may extend deeper because some of the nitrate originates from upgradient of WMA U (DOE/RL-2013-22). The carbon tetrachloride plume may also be deeper because it, too, originates from an upgradient source.

Both new wells are expected to have similar geology and water level horizons at approximately the same elevations and depths as identified in the wells being replaced. Estimated depth and elevation information is provided in Table 1-1.

Table 1-1. Estimated Depth and Elevation Specifications for Wells 299-W18-260 (C8925) and 299-W22-113 (C8943)

Parameter	299-W18-260 (C8925)	299-W22-113 (C8943)
Surface elevation (m/ft [NAVD88])	204.8/672.0	203.9/669.0
Depth to water (m/ft bgs)	71.6/235	70.6/232
Water table elevation (m/ft [NAVD88])	133.2/437[a]	133.3/437[b]
Planned screen length (ft)	30.0	30.0
Planned depth to top of screen (ft bgs)	235	232
Planned depth to bottom of screen (ft bgs)	265	262
Planned total depth (ft bgs)	325	267
Planned bottom logging depth (ft bgs)	310[c]	252[c]

bgs = below ground surface NAVD88 = *North American Vertical Datum of 1988*

a. Based on the January 2014 water-level measurement from nearby well 299-W19-47.

b. Based on the January 2014 water-level measurement from nearby well 299-W22-49.

c. Depth is 4.5 m (15 ft) less than planned total depth because the logging tools require a 4.5 m (15 ft) interval in the bottom of the hole where space is needed for the logging tool.

1.1.5 Step 5—Develop Decision Rules

Data generated by this activity for well 299-W18-260 will be used to verify the vertical extent of the contaminant plumes. No major or regulatory decisions are dependent upon this sampling and analysis activity. Consequently, the sampling design uses a minimum number of environmental samples and QC samples for vertical profiling.

The soil samples will be evaluated using ASTM D422-63(2007), *Standard Test Method for Particle-Size Analysis of Soils*. The samples will require rapid turnaround analysis and will be tested by a contracted geologist in a dedicated field trailer. The hydrologist's interpretation of the screening results from both wells will be used to confirm the planned use of a number 20-slot screen or selection of an alternative size.

1.1.6 Step 6—Specify Tolerable Limits on Decision Errors

No major decisions or compliance aspects need to be addressed for this activity.

1.1.7 Step 7—Optimize the Design

Soil samples composited for sieve analysis will be collected from both wells, and water samples will be collected during drilling of 299-W18-260. The sampling design is optimized based on experience from collecting and interpreting similar soil and groundwater samples in the 200-UP-1 and 200-ZP-1 OUs.

1.1.7 Step 7—Optimize the Design

Soil samples composited for sieve analysis will be collected from both wells, and water samples will be collected during drilling of 299-W18-260. The sampling design is optimized based on experience from collecting and interpreting similar soil and groundwater samples in the 200-UP-1 and 200-ZP-1 OUs.

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2 Quality Assurance Project Plan

The quality assurance project plan (QAPjP) identifies the individuals or organizations that are participating in the project, discusses specific roles and responsibilities, and establishes the quality requirements for environmental data collection, including sampling, field measurements, and laboratory analysis. The quality objectives for measurement data and the special training requirements for staff performing the work are also documented. This QAPjP complies with the following requirements:

- 10 CFR 830, "Nuclear Safety Management," Subpart A, "Quality Assurance Requirements"
- DOE O 414.1D, *Quality Assurance*
- DOE/RL-96-68, *Hanford Analytical Services Quality Assurance Requirements Documents* (HASQARD)
- EPA/240/B-01/003, *EPA Requirements for Quality Assurance Project Plans*

This chapter describes the applicable quality requirements and controls for the sampling performed during installation of wells 299-W18-260 (WMA U) and 299-W22-113 (WMA S-SX).

2.1 Project Management

The following subsections address the basic areas of 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 have been appropriately documented.

2.1.1 Project/Task Organization

The project organization is shown in Figure 2-1. CH2M HILL Plateau Remediation Company (CHPRC), or its approved subcontractor, will be responsible for sample planning, coordination, preparation, sampling, packaging, and shipping of samples to the appropriate laboratory. The subsections that follow describe the project organization, in regard to sampling and characterization.

2.1.1.1 DOE-RL Project Organization

The project has several key positions within the U.S. Department of Energy Richland Operations (DOE-RL) organization, including the following:

- **DOE-RL Project Manager.** The DOE-RL Project Manager is responsible for authorizing the contractor to perform activities under CERCLA, RCRA, AEA, and the *Hanford Federal Facility Agreement and Consent Order* (Ecology et al., 1989) also known as the Tri-Party Agreement (TPA). The DOE-RL Project Manager is also responsible for obtaining lead regulatory agency approval of the SAP authorizing the field sampling activities.
- **DOE-RL Subject Matter Expert.** The DOE-RL Subject Matter Expert is responsible for overseeing day-to-day activities of the contractor performing the work, working with the contractor and the regulatory agencies to identify and resolve technical issues, and providing technical input to the DOE-RL Project Manager.

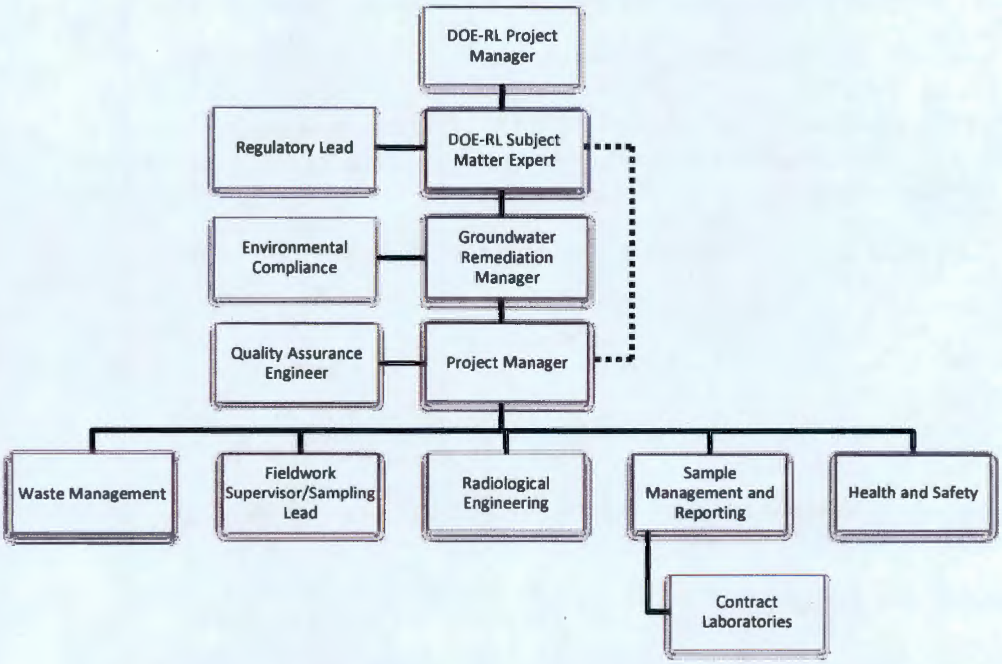

Figure 2-1. Organizational Interfaces for Sampling and Analyses

2.1.1.2 Regulatory Agency

- **Regulatory Lead.** The Washington State Department of Ecology (Ecology) is the lead regulatory agency for RCRA monitoring, and the U.S. Environmental Protection Agency (EPA) is the lead regulatory agency for the 200-UP-1 OU. Both agencies have assigned project management responsible for their respective oversight activities. Both agencies have approval authority for the work being performed under this SAP and will work with DOE-RL to resolve potential concerns over the work in accordance with the TPA (Ecology et al., 1989).

2.1.1.3 Contractor Organization

- **Groundwater Remediation Manager.** The groundwater remediation manager provides oversight for all activities and coordinates with DOE-RL, the regulators, and primary contractor management in support of sampling activities. The contractor department manager also provides support to the project manager to ensure that work is performed safely and cost effectively.

- **Project Manager.** The project manager is responsible for direct management of sampling documents and requirements, field activities, and subcontracted tasks. The project manager ensures that the field team lead and others responsible for implementation of this SAP and QAPjP are provided with current copies of this document and revisions thereto. For each sampling event, the project manager establishes the contaminants of concern (COCs), directs the field team lead (i.e., sample coordinator), and works closely with the QA and the Health and Safety organizations to integrate these and other lead disciplines in planning and implementing the workscope. The project manager coordinates with and reports to RL and CHPRC management on sampling activities.

- **Quality Assurance Engineer.** The QA engineer is matrixed to the 200-UP-1 OU project manager and is responsible for 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.

- **Environmental Compliance.** The environmental compliance officers provide oversight in dealing with environmental management assessments and compliance assessments, defining any potential environmental impacts, and identifying corrective actions (if needed) for each of the Hanford Site activities.

- **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 CHPRC work requirements. In addition, assistance is provided to project personnel in complying with applicable health and safety standards and requirements. Personal protective equipment requirements are coordinated with Radiological Engineering.

- **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 (RCT) support for activities.

- **Sample Management and Reporting.** The Sample Management and Reporting (SMR) organization is responsible for conversion of the sampling design requirements into field instructions, and for managing the analyses and resulting analytical data for samples collected for this SAP. The SMR organization selects laboratories to perform the required analyses and ensures that the laboratories conform to HASQARD (DOE/RL-96-68) QA requirements (or their equivalent), as approved by RL, EPA, and Ecology. After the selected laboratories have completed the analyses, SMR 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, SMR provides the analytical data to the waste management lead (i.e., waste coordinator). The SMR organization also interfaces with the field team lead (i.e., sample coordinator) regarding sampling information (e.g., sampling activities, sample and associated data tracking, and distribution of analytical data).

- **Contract Laboratories.** The contract 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.

- **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 receiving data from the field team lead to initiate waste designations, profiles, and other documents to confirm compliance with waste acceptance criteria.

- **Fieldwork Supervisor/Sampling Lead.** The fieldwork supervisor/sampling lead is responsible for planning and coordinating field sampling resources. The fieldwork supervisor ensures that samplers are appropriately trained and available. Additional responsibilities include ensuring that the sampling design is understood and can be performed as specified. The fieldwork supervisor/sampling lead directs the samplers. The samplers collect groundwater, soil, vapor, and multimedia samples (including replicates/duplicates) and prepare sample blanks in accordance with the SAP, corresponding standard procedures, and work packages. The samplers complete field logbook entries, chain-of-custody forms, and shipping paperwork, as well as ensuring delivery of samples to the analytical laboratory.

2.1.2 Problem Definition/Background

The problem definition and background information is provided in Chapter 1. Two replacement groundwater monitoring wells will be installed (299-W18-260 at WMA U and 299-W22-113 at WMA S-SX) to replace existing wells that are dry (299-W18-30 and 299-W22-49, respectively). This SAP addresses soil sampling within the aquifer to verify screen slot size in both wells, as well as profile groundwater sampling in well 299-W18-260 to determine the vertical distribution of contamination.

2.1.3 Project/Task Description

Two wells are included under this SAP: 299-W18-260 and 299-W22-113. The drilling schedule will be determined as the TPA Milestone M-24-00 (Ecology et al., 1989) drilling schedule is coordinated and prioritized. The two sets of sampling activities are as follows:

- Depth-discrete filtered water samples will be taken in the saturated zone of well 299-W18-260 at 6.1 m (20 ft) intervals
- One composite soil sample from each well will be sieved for particle size analysis

2.1.4 Quality Objectives and Criteria

Table 2-1 describes how data quality indicators relate to sampling activities. Table 2-2 summarizes the analytical methods, the detection limits, and the precision and accuracy requirements for laboratory analyses supporting the WMA U well installation. Procedures from Soil and Groundwater Remediation Project (S&GRP) will be used for sampling at the wells and performing particle size distribution, as required. Analytical methods and associated detection limits, as well as precision and accuracy criteria, are provided in Table 2-2.

The QA objective of this SAP is to develop implementation guidance for providing data of known and appropriate quality. Data quality for this SAP may be assessed by six criteria: precision, accuracy, representativeness, comparability, completeness, and sensitivity. 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 methods.

2.1.4.1 Precision

Precision is a measure of the data spread when there is more than one measurement 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 supporting sampling during drilling of 299-W18-260 is included in Table 2-2.

Table 2-1. Data Quality Indicators

Data Quality Indicator	Definition	Example Determination Methodologies	Project Specific Information*	Corrective Actions
Precision	The measure of agreement among repeated measurements of the same property under identical or substantially similar conditions; calculated either as the range or as the standard deviation. May also be expressed as a percentage of the mean of the measurements, such as relative range, relative percent difference, or relative standard deviation (coefficient of variation).	Use the same analytical instrument to make repeated analyses on the same sample. Use the same method to make repeated measurements of the same sample within a single laboratory or have two or more laboratories analyze identical samples with the same method. Split a sample in the field and submit both for sample handling, preservation and storage, and analytical measurements. Collect, process, and analyze collocated samples for information on sample acquisition, handling, shipping, storage, preparation, and analytical processes and measurements.	Field duplicate samples are not planned for this work, unless otherwise indicated in the Field Sampling Plan, Section 3. Laboratory precision evaluated by analysis of laboratory duplicate and laboratory control standards.	If duplicate data do not meet objective: • Evaluate apparent cause • Request reanalysis or remeasurement • Qualify the data before use • There will be no opportunity for resampling
Accuracy	A measure of the overall agreement of a measurement to a known value; includes a combination of random error (precision) and systematic error (bias) components of both sampling and analytical operations.	Analyze a reference material or reanalyze a sample to which a material of known concentration or amount of pollutant has been added (a spiked sample); usually expressed either as percent recovery or as a percent bias.	Laboratory accuracy determination based on matrix spikes and matrix spike duplicates.	If laboratory recovery does not meet objective: • Qualify the data before use • Request reanalysis or remeasurement • There will be no opportunity for resampling

Table 2-1. Data Quality Indicators

Data Quality Indicator	Definition	Example Determination Methodologies	Project Specific Information*	Corrective Actions
Representativeness	A qualitative term to express "the degree to which data accurately and precisely represent a characteristic of a population, parameter variations at a sampling point, a process condition, or an environmental condition." (ANSI/ASQC S2-1995, *Introduction to Attribute Sampling*)	Evaluate whether measurements are made and physical samples collected in such a manner that the resulting data appropriately reflect the environment or condition being measured or studied.	Samples will be collected as described in the sampling design.	If results are not representative of the system sampled: • Identify the reason for the results not being representative • Reject the data, or, if data are otherwise usable, qualify the data for limited use and define the portion of the system that the data represent • Redefine sampling and measurement requirements and protocols • There will be no opportunity for resampling
Comparability	A qualitative term expressing the measure of confidence that one data set can be compared to another and can be combined for the decision(s) to be made.	Compare sample collection and handling methods, sample preparation and analytical procedures, holding times, stability issues, and QA protocols.	Sampling personnel will use the same sampling protocols. Samples will be submitted to the same laboratory when possible for analysis by the same methods, thus data results will be comparable.	If data are not comparable to other data sets: • Identify appropriate changes to data collection and/or analysis methods • Identify quantifiable bias, if applicable • Qualify the data as appropriate • There will be no opportunity for resampling • Revise sampling/analysis protocols to ensure future comparability

Table 2-1. Data Quality Indicators

Data Quality Indicator	Definition	Example Determination Methodologies	Project Specific Information*	Corrective Actions
Completeness	A measure of the amount of valid data needed to be obtained from a measurement system.	Compare the number of valid measurements completed (samples collected or samples analyzed) with those established by the project's quality criteria (DQOs or performance/acceptance criteria).	This is characterization data collected while drilling. Completeness will be assessed by the OU project manager.	If data set does not meet completeness objective: • The OU project manager will determine if there were sufficient data collected to achieve the intended purpose • Identify appropriate changes to data collection and/or analysis methods to improve completeness in the future • There will be no opportunity for resampling
Sensitivity	The capability of a method or instrument to discriminate between measurement responses representing different levels of the variable of interest.	Determine the minimum concentration or attribute to be measured by a method (method detection limit), by an instrument (instrument detection limit), or by a laboratory (quantization limit). The practical quantitation limit is the lowest level that can be routinely quantified and reported by a laboratory.	Ensure sensitivity, as measured detection limits, is appropriate.	If sensitivity does not meet objective: • Request reanalysis or remeasurement • Qualify/reject the data before use • There will be no opportunity for resampling

Table 2-2. Groundwater Sample Analytical Methods for Sampling During Drilling of 299-W18-260

Chemical Abstracts Service Number	Parameter	Survey/Analytical Method	Practical Quantitation Limit	Precision Requirement	Accuracy Requirement
Laboratory Analysis					
56-23-5	Carbon Tetrachloride	SW-846, EPA Method 8260B	3.4 µg/L	≤20%	Statistically derived
NO3-N	Nitrate as Nitrogen	EPA Method 300.0	100 µg/L	≤20%	80 to 120%
14133-76-7	Technetium-99	Liquid scintillation	15 pCi/L*	≤20%	70 to 130%
Field Screening					
NA	Specific Conductance	Hach HQ40d or equivalent	N/A	N/A	±0.5% of reading

Source: SW-846, *Test Methods for Evaluating Solid Waste: Physical/Chemical Methods, Third Edition; Final Update IV-B.*

* minimum detectable concentration

N/A = not appplicable

2.1.4.2 Accuracy

Accuracy is an assessment of the closeness of the measured value to the true value. For radionuclide measurements analyzed by gamma spectroscopy, laboratories typically compare the 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 lists the data quality indicators (laboratory accuracy parameters) for analyses supporting the sampling during drilling of 299-W18-260.

2.1.4.3 Representativeness

Representativeness is a measure of how closely analytical results reflect the actual concentration and distribution of the constituents in the matrix sampled. Representativeness is an objective of sampling plan design, sampling techniques, and sample-handling protocols (e.g., storage, preservation, and transportation), which 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.

2.1.4.4 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.

2.1.4.5 Completeness

The analytical data set for this SAP will be considered complete if the analytes listed in Table 2-2 are sampled successfully.

2.1.4.6 Sensitivity

Sensitivity is the measure of the minimum concentration of a constituent that an analytical method can detect or accurately report. A detection limit relates to the smallest analyte concentration that can be statistically differentiated from zero. Most analytical methods have a higher concentration (sometimes called a quantitation limit) that is clearly above zero, but below which reliable results cannot be obtained with acceptable accuracy and precision. Reporting limits are administrative values that a laboratory is confident that is consistently above detection and quantitation levels for a particular analyte and matrix. Acceptable sensitivity is when analytical method reporting limits are below applicable regulatory action limits. Table 2-2 includes project-required detection limits that the laboratory should meet.

2.1.5 Special Training/Certification

The Environmental Safety and Health Training Program provides workers with the knowledge and skills necessary to execute assigned duties safely. 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 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/work site orientation.

2.1.6 Documents and Records

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

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

Field documentation will be kept in the form of chain-of-custody/sample analysis request forms, data forms, and logbook entries. The laboratory is responsible for maintaining, and having available upon request, the following documentation:

- 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 to ensure the accuracy and retrievability of stored records. Records required by the TPA (Ecology et al., 1989) will be managed in accordance with the requirements therein.

2.2 Data, Measurement, and Acquisition

The following subsections present the requirements for sampling methods, sample handling/sample custody, analytical methods, and field and laboratory QC. The requirements for instrument calibration and maintenance, and data management also are addressed.

2.2.1 Sampling Methods Requirements

The procedures to be implemented in the field will be in accordance with those presented in Section 3 of this SAP. In the event of failure to accomplish sampling activities in accordance with this SAP, those failures (observed by the fieldwork supervisor) will be documented in the field logbook and may result in changes to the SAP or resampling. The fieldwork supervisor is responsible for immediately addressing any issue of nonconformity related to the fieldwork.

2.2.2 Sample Identification

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 will be carried through the laboratory data-tracking system.

2.2.3 Sample Preservation, Containers, and Holding Times

Sample preservation, containers, and holding-time requirements will be prepared for each specific sample event, as specified on the sampling authorization and chain-of-custody forms in accordance with the requirements specified for the applicable analytical method.

2.2.4 Laboratory Sample Custody

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

2.2.5 Analytical Methods Requirements

Analytical parameters and methods are presented in Table 2-2. Laboratories providing analytical services in support of this SAP have corrective action programs in place that address analytical system failures and related documentation that defines the effectiveness of any corrective actions. Issues that may affect analytical results are to be resolved by the SMR organization in coordination with the project leadership.

Analytical errors reported by the laboratories are conveyed to the SMR organization's project coordinator, who initiates a sample disposition record in accordance with CHPRC procedures. This process is used to document analytical errors and to establish resolution with project leadership. The QA engineer receives quarterly reports providing summaries and summary statistics of the analytical errors.

2.2.6 Quality Control Requirements

The only field QC samples required to support the sampling effort for installation of 299-W18-260 is the collection of a field transfer blank when volatile organic compound (VOC) samples are being collected. Laboratory QC for groundwater samples are outlined in Table 2-3. 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 event

Laboratory QC sample requirements in Table 2-3 will be specified in the applicable laboratory's statement of work.

2.2.6.1 Field and Laboratory Quality Control

Laboratory duplicates will be analyzed. Laboratory method blanks and laboratory control samples/blank spikes 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 as specified.

Table 2-3. Laboratory Quality Control Summary

QC Sample Type	Purpose	Frequency
Method Blank	Assess response of an entire laboratory analytical system.	One per batch*, 20 samples maximum or as identified by the method guidance per media sampled.
Matrix Spike	Identify analytical (preparation + analysis) bias; possible matrix effect on the analytical method used.	When required by the method guidance, one per batch*, 20 samples maximum or as identified by the method guidance per media sampled.
Matrix Duplicate or Matrix Spike Duplicate	Estimate analytical bias and precision.	When required by the method guidance, one per batch*, 20 samples maximum or as identified by the method guidance per media sampled.
Laboratory Control Samples	Assess method accuracy.	One per batch*, 20 samples maximum or as identified by the method guidance per media sampled.
Surrogates	Estimate recovery/yield.	When required by the method guidance, as identified by the method guidance.

* Batching across projects is allowed for similar matrices (e.g., Hanford Site groundwater).

2.2.6.2 Field Duplicates

No field duplicates are required for this effort. Field replicates are used to evaluate the precision of field sampling methods.

2.2.6.3 Equipment Rinsate Blanks

Equipment blanks are collected from reusable sampling devices in a frequency of 1 in 20 samples. The fieldwork supervisor may request that additional equipment blanks be taken if an equipment cleanliness issue is perceived. Equipment blanks will consist of reagent water poured over the decontaminated sampling equipment and placed in containers, as identified on the project sample authorization form. Equipment blanks are not needed for disposable sampling equipment.

2.2.6.4 Full Trip Blanks

Full trip blanks are samples prepared by the sampling team before traveling to the sampling site. The preserved bottle set is filled with reagent water, as appropriate, for the primary sample media. The bottles are sealed and transported, unopened, to the field in the same storage container used for samples collected the same day. No trip blanks are required for this work.

2.2.6.5 Field Transfer Blanks

Field transfer blanks are preserved volatile organic analysis sample containers filled at the sample collection site with reagent water transported to the field. The samples are prepared during the sampling to evaluate potential contamination caused by conditions in the field. After collection, field transfer blank bottles are sealed and placed in the same storage container with the samples from the associated sampling event. Field transfer blank samples are analyzed for VOCs only.

A minimum of one field transfer blank will be collected during each sample event in which the samples will undergo volatile organic analysis. The field transfer blank will consist of reagent water or silica sand (as appropriate to the primary sample media) added to clean sample containers at the location where the

VOC sample was collected. The field transfer blank will be batched with samples for which volatile organic analysis is being requested.

2.2.7 Instrument/Equipment Testing, Inspection, and Maintenance

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 the minimization of measurement system downtime. Laboratories and onsite measurement organizations also must maintain and calibrate their equipment. Onsite environmental instrument testing, inspection, calibration, and maintenance will be recorded in a bound logbook. 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) is included in the individual laboratory's and onsite organization's QA plan and/or operating procedures.

2.2.8 Instrument/Equipment Calibration and Frequency

Calibration will be conducted using certified equipment and/or standards with a known, valid relationship to nationally recognized standards. If no such standard exists, the basis for the calibration will be documented. Calibration of laboratory instruments will be performed in a manner consistent with SW-846 or with auditable DOE Hanford Site and contractual requirements. Pacific Northwest National Laboratory instrument technicians will calibrate radiological field instruments.

2.2.9 Inspection/Acceptance of Supplies and Consumables

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

Supplies and consumables used in support of sampling and analysis activities are procured in accordance with internal work requirements and processes described in the contractor acquisition system. Responsibilities and interfaces necessary to ensure that items procured/acquired for the contractor meet the specific technical and quality requirements must be in place. The procurement system ensures that purchased items comply with applicable procurement specifications. Users check and accept supplies and consumables prior to use.

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

2.2.10 Data Management

Data resulting from the implementation of this 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, will be through computerized database (e.g., HEIS). Where electronic data are not available, hardcopies will be provided in accordance with Section 9.6 of the TPA (Ecology et al., 1989). Samples taken while drilling will be designated as characterization samples in HEIS.

2.3 Assessment and Oversight

Routine evaluation of data quality for this project will be documented and filed with the data in the project file. The project manager and/or the fieldwork supervisor will monitor field activities for this SAP. The project manager retains overall responsibility for sampling events, but specific in-field coordination responsibilities belong to the fieldwork supervisor. The SMR organization will select a laboratory to perform the groundwater analyses for this SAP. The SMR organization also will assess and verify that analytical data are reported by the laboratory and then enter the verified data into the HEIS database.

2.3.1 Assessments and Response Actions

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. The project's QA organization coordinates the corrective actions for deficiencies in accordance with the S&GRP's QA program. When appropriate, corrective actions will be taken by the project manager or a delegate.

2.3.2 Reports to Management

Management will be made aware of deficiencies identified by self-assessments.

2.4 Data Review, Verification, Validation, and Usability Requirements

Samples taken during drilling will be received from the laboratory and loaded into a database (e.g., HEIS) (Section 2.2.10), and data assessment will be performed (Section 2.4.1). At the direction of the project manager, analytical data packages will be subject to final technical review by qualified personnel. 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 TPA (Ecology et al., 1989).

2.4.1 Data Verification and Usability Methods

Data review and verification are performed by the SMR organization to confirm that sampling and chain-of-custody documentation are complete. This review will include associating sample numbers to specific sampling locations and correlating sample collection dates with sample preparation/analysis dates to assess whether holding times have been met.

As the data generated through this SAP are not intended to be used for regulatory purposes, but only to support characterization and well design, no independent third-party validation or data quality assessment activities are required or planned.

3 Field Sampling Plan

3.1 Sampling Objectives

The objective of this activity is to conduct sampling to support the selection of well screen slot size for two replacement RCRA groundwater monitoring wells, one at WMA U (299-W18-260) and one at WMA S-SX (299-W22-113), and to support vertical plume delineation at 299-W18-260. Soil samples for sieve analysis will be collected from both wells, whereas groundwater samples will be collected only from 299-W18-260.

3.2 Sample Location and Depth

Table 3-1 lists the sample types and locations for wells 299-W18-260 and 299-W22-113. Depth below the water table will be the primary reference point for sample collection (the sample depths below ground surface [bgs] listed in Table 3-1 are approximate and depend on an estimate of the water table and land surface elevations).

3.3 Sample Identification

A sample data-tracking database will be used to track the groundwater samples through collection and the laboratory analysis process. The HEIS database is the repository for the laboratory analytical results. The HEIS sample numbers will be issued to the sampling organization for this project. The radiological and physical properties of 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:

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

3.4 Field Sample Logbook

Information pertinent to sampling and analysis will be recorded on field checklists and bound logbooks in accordance with existing sample collection protocols (HASQARD [DOE/RL-96-68]). The sampling team is responsible for recording relevant sampling information. Logbook entries 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.

Table 3-1. Planned Sampling During Drilling of Wells 299-W18-260 and 299-W22-113

Sampling Objectives	Sample Matrix	Depth (ft) Below Water Table (Estimated Borehole Depth [ft bgs])	Allowable Variation on Depth	Analytes at Specified Depth	Number of Samples	Quality Control Samples	Sampling Methods
Vertical contaminant distribution **299-W18-260 (C8925)**	Water	10 (245) 30 265) 50 (285) 70 (305) 90 (325)	±5 ft	Technetium-99 Nitrate Carbon tetrachloride Specific conductance	5 total	Field transfer blank at each depth	Purge and pump samples are preferred. Bailed samples can be collected if the purge-and-pump method is not practicable, as determined by the technical lead.
Sieve analysis on one composite sample to serve as design input to select well screen mesh size **299-W18-260 (C8925)**	Saturated soil	0 (235) 5 (240) 10 (245) 15 (250) 20 (255) 25 (260) 30 (265)	±1 ft	NA	1	NA	Grab samples from the drill cuttings at 5 ft intervals from 0 to 30 ft below the water table, composited into a single sample for sieve analysis.
Sieve analysis on one composite sample to serve as design input to select well screen mesh size **299-W22-113 (C8943)**	Saturated soil	0 (232) 5 (237) 10 (242) 15 (247) 20 (252) 25 (257) 30 (262)	±1 ft	NA	1	NA	Grab samples from the drill cuttings at 5 ft intervals from 0 to 30 ft below the water table, composited into a single sample for sieve analysis.

Note: Field depth measurements are made in feet.

3.5 Sample Custody

Sample custody will be maintained in accordance with existing Hanford Site sampling protocol. 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 shipping. Each chain-of-custody form will include the sample identification number, the associated well identification number, and the 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 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 is fixed to each sample container and to the sample collection package in such a way as to indicate potential tampering. Except for volatile organic analysis samples, a custody seal will be fixed to the lid of each sample container, and the custody seal will be inscribed with the sampler's initials and the date. Custody seals are not applied directly to volatile organic analysis sample bottles because of a potential for affecting analytical results. Custody seals and any other required documentation can be fixed to the exterior of a plastic bag holding volatile organic analysis vials in such a manner to detect potential tampering. Sample custody during laboratory analysis is addressed in the applicable laboratory's standard operating procedures.

3.6 Sample Containers, Preservatives, and Holding Times

Appropriate sample containers will be used for soil and groundwater samples collected for analysis. Container sizes may vary, depending on the laboratory-specific volumes needed to meet analytical detection limits. If, however, the radiological dose rate on the outside of a sample jar or the Curie content within the sample exceeds levels acceptable to an offsite laboratory, the sample coordinator may send smaller volumes to the laboratory after consultation with SMR to determine acceptable volumes. Sample volumes, container types, and sample preservation requirements are maintained in the HEIS database and are captured on the sample chain-of-custody via the sample data tracking system.

3.7 Sampling Procedure

Soil samples composited from drill cuttings will be collected within the unconfined aquifer from both wells. For each well, grab samples will be collected from 0 to 9.1 m (30 ft) below the water table at 1.5 m (5 ft) intervals and composited into a single sample for sieve analysis. This will enable verification of both the filter pack and the screen slot size for the wells. The geologist will conduct and document the sieve analyses in accordance with ASTM D422-63(2007).

Most groundwater samples will be pumped from selected intervals, although use of a bailer is acceptable under specific circumstances (e.g., near the water table where insufficient head may preclude use of a sample pump, or where groundwater turbidity is high enough to interfere with pumping). Prior to sample capture, the pump will be operated for a period sufficient to purge and provide stabilized field readings (e.g., temperature, pH, conductivity). The water samples will be filtered to remove drilling solids.

3.8 Sample Shipping

Samples may not be transported without authorization from the S&GRP authorized shipper. If the proposed wells have a medium or high risk of encountering radiological material, RCT surveys will be required. As applicable, the RCT will measure the contamination levels on the outside of each sample jar and the dose rates on each sample jar. As applicable, the RCT will also measure the radiological activity on the outside of the sample container (through the container) and will document the highest contact radiological reading in mrem/hr. 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 SMR within 48 hours of shipping.

As a general guideline, samples with activities less than 5 μSv/hr (0.5 mrem/hr) 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 5 μSv/hr (0.5 mrem/hr) and 100 μSv/hr (10 mrem/hr) may be shipped to an offsite laboratory, although samples with dose rates within this range will be evaluated on a case-by-case basis by SMR. Samples with activities greater than 100 μSv/hr (10 mrem/hr) may be sent to an onsite laboratory, as arranged by SMR.

3.9 Radiological Field Data

The scope of work for this SAP consists of groundwater and soil sampling. Alpha and beta/gamma data collection in the field will be used, as needed, to support sampling and analysis efforts. The following information will be disseminated to personnel performing work in support of this SAP:

- Instructions to RCTs on the methods required to measure sample activity and media for gamma, alpha, and/or beta emissions, as appropriate.
- Information regarding the Geiger-Müller (GM) portable instrument, to include a physical description of the GM, radiation, and energy response characteristics, calibration, maintenance, performance testing descriptions, and the application and operation of the instrument. The GM instrument is a beta/gamma instrument commonly used on the Hanford Site to obtain removable surface contamination measurements and direct measurements of the total surface contamination.
- Information regarding the portable alpha meter (PAM), to include a physical description of the PAM, the radiation and energy response characteristics, calibration, maintenance, performance testing descriptions, and the application and operation of the instrument. The PAM is an alpha instrument commonly used on the Hanford Site to obtain removable surface contamination measurements and direct measurements of total surface contamination.
- Information on the characteristics associated with the hand-held probes to be used in the performance of direct radiological measurements includes a physical description of the probe, the radiation and energy response characteristics, calibration, maintenance, performance testing descriptions, and the application and operation of the instrument. The hand-held probe is an alpha instrument commonly used on the Hanford Site to obtain removable surface contamination measurements and direct measurements of total surface contamination.

4 Management of Waste

Pursuant to TPA (Ecology et al., 1989) Milestone M-024-64, "The management of purgewater and investigation derived wastes from existing wells and wells under the revised M-024 Tri-Party Agreement milestones (including treatment, storage, and disposal unit wells), will be managed as CERCLA wastes in accordance with a CERCLA decision document, sampling and analysis plan, or waste control plan." Accordingly, waste generated from well drilling, well construction, sampling activities, and well development, such as soil, water, and personal protective equipment, will be managed in accordance with DOE/RL-2000-51, *Interim Action Waste Management Plan for the 200-UP-1 Operable Unit*. Purgewater will be managed in accordance with DOE/RL-2009-39, *Investigation-Derived Waste Purgewater Management Action Memorandum*, and DOE/RL-2009-80, *Investigation Derived Waste Purgewater Management Work Plan*.

Because wells 299-W22-113 and 299-W18-260 are outside the boundaries of surface contamination Waste Information Data System sites and more than 50 m (164 ft) from the nearest waste tanks, vadose zone contamination is not expected. Thus, the cuttings above the historical (1984) high water mark of 148 m (486 ft) above mean sea level (NAVD88) at well 299-W19-1 (in between wells 299-W22-113 and 299-W18-260) will be placed on plastic sheeting and returned to the environment near the borehole locations unless field instruments indicate contamination. In that event, vadose zone cuttings will be containerized and sampled for the same constituents provided for saturated zone cuttings.

Cuttings below the historical high water mark of approximately 148 m (486 ft) above mean sea level (i.e., those more than 186 ft (56.7 m) bgs at well 299-W18-260 and below 183 ft (55.8 m) bgs at well 299-W22-113) will be containerized and sampled for disposal. In order to develop a list of analytes, sample results from soils at three nearby wells drilled since 2000 were evaluated. These wells are 299-W19-45 (C3394), 299-W22-85 (C3399), and 299-W22-91 (C8096) (see Figure 1-1 for well locations).

The initial list of soil sample analytes (i.e., those sampled at the nearby wells) was reduced by deleting those constituents that are not regulated for disposal, those constituents that were not detected, and those radioisotopes that were only detected below the Environmental Restoration Disposal Facility contaminant reporting limit of 1 pCi/g. The list was then further reduced by eliminating all but the highest result for each constituent. Based on the remaining analytes, the soil cuttings in the vicinity of the nearby wells are nonregulated except for radioactive constituents and the F001-F005 listed waste codes associated with 200-UP-1 groundwaters. However, this will be confirmed by performing analyses on soil samples for 299-W18-260 and 299-W22-113 for the remaining analytes. Analyses required to detect all remaining constituents are of limited number: metals by 200.8 (lead, antimony, arsenic, and boron), metals by 6010 (26 analytes total covered by the standard analyte list), volatile organics (acetone and methylene chloride), anions (nitrate, nitrite, sulfate, chloride, fluoride, and acetate), gross alpha/beta, strontium-90, and technetium-99. These analyses will be performed on saturated zone cuttings from 299-W18-260 and 299-W22-113 sampled 5 ft below the current water table for waste characterization purposes.

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5 Health and Safety

Field operations will be performed in accordance with 10 CFR 851, "Worker Safety and Health Program," health and safety requirements and appropriate S&GRP 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 and possible release of radiological contamination, consistent with the requirements defined in 10 CFR 835, "Occupational Radiation Protection."

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