SGW-58277
Revision 0

Sampling Instructions for Installation of Single-Shell Tank Waste Management Area S-SX Monitoring Wells 299-W22-115, 299-W22-116, and 299-W23-236

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

Contractor for the U.S. Department of Energy
under Contract DE-AC06-08RL14788

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Title *Sampling Instructions for Installation of Single-Shell Tank Waste Management Area S-SX Monitoring Wells 299-W22-115, 299-W22-116, and 299-W23-236*

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Federal Project Director
U.S. Department of Energy, Richland Operations Office

Signature

12-3-14
Date

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Terms

bgs	below ground surface
CERCLA	*Comprehensive Environmental Response, Compensation, and Liability Act of 1980*
DOE	U.S. Department of Energy
DOT	U.S. Department of Transportation
EPA	U.S. Environmental Protection Agency
HASQARD	*Hanford Analytical Services Quality Assurance Requirements Documents*
IATA	International Air Transportation Association
N/A	not applicable
OU	operable unit
QC	quality control
RCRA	*Resource Conservation and Recovery Act of 1976*
SI	sampling instruction
SMR	Sample Management and Reporting
SS	stainless steel
WMA	Waste Management Area

1 Introduction

This sampling instruction (SI) provides the details for sampling activities associated with the installation of three Tri-Party Agreement (Ecology et al., 1989, *Hanford Federal Facility Agreement and Consent Order*) M-24 monitoring wells for Waste Management Area (WMA) S-SX in the 200 West Area of the Hanford Site. The installation of these wells supports the Tri-Party Agreement (Ecology et al., 1989), and will comply with the requirements of WAC 173-160, "Minimum Standards for Construction and Maintenance of Wells." All three wells are replacements for wells that are dry or nearly dry.
The following wells are to be drilled:

- Well 299-W22-115 (C9430) is located east of the 241-SX Tank Farm and is a replacement for existing Well 299-W22-45.
- Well 299-W22-116 (C9431) is located outside the southeast corner of the 241-SX Tank Farm and is a replacement for existing Well 299-W22-50.
- Well 299-W23-236 (C9432) is located south of the 241-SX Tank Farm and is a replacement for existing Well 299-W23-15.

The new wells will be drilled to depths of approximately 12 m (40 ft) below the water table.
Wells 299-W22-45, 299-W22-50, and 299-W23-15 are sampled for dangerous waste constituents under a *Resource Conservation and Recovery Act of 1976* (RCRA) groundwater quality assessment program and for radionuclides under the *Atomic Energy Act of 1954*. Wells 299-W22-45 and 299-W23-15 are 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-W22-115, 299-W22-116, and 299-W23-236 will be sampled under the same programs as the wells they are replacing. 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*.

1.1 Scope and Purpose

The scope of the sampling activities is to collect sediment samples for sieve analysis to determine filter pack requirements and well screen slot size for all three wells, and to collect water samples during drilling from Well 299-W23-236. It is suspected that Well 299-W23-15 may not be yielding samples representative of aquifer conditions due to ambient flow in the well bore (PNNL-15070, *Hanford Site Groundwater Monitoring for Fiscal Year 2004*). To assess sample representativeness for the replacement well (299-W23-236), water samples will be collected during drilling to provide a basis for comparison to samples from the completed well. The following summarizes sampling during drilling of all three wells:

- 299-W22-115 (C9430): Collect grab samples from the drill cuttings at 1.5 m (5 ft) intervals from 0 to 10.7 m (0 to 35 ft) below the water table and composite the samples into a single sample for sieve analysis.
- 299-W22-116 (C9431): Collect grab samples from the drill cuttings at 1.5 m (5 ft) intervals from 0 to 10.7 m (0 to 35 ft) below the water table and composite the samples into a single sample for sieve analysis.
- 299-W23-236 (C9432): Collect grab samples from the drill cuttings at 1.5 m (5 ft) intervals from 0 to 10.7 m (0 to 35 ft) below the water table and composite the samples into a single sample for sieve

analysis. Collect two sets of depth-discrete groundwater samples, the first at 3.0 m (10 ft) below the water table and the second at 12.2 m (40 ft) below the water table. The samples will be analyzed for nitrate, technetium-99, and tritium.

The purpose of this document is to describe the well specifications, sampling methodology, analyte list, and quality assurance requirements.

1.2 Site Description

The planned drilling locations are near the 241-SX Tank Farm in the 200 West Area. Table 1 lists the wells to be drilled and their specifications. A well location map is shown in Figure 1. The monitoring wells will be installed as RCRA groundwater monitoring wells and will be constructed with 10.2 cm (4 in.) diameter, stainless steel (SS) casings and screens.

WMA S-SX consists of the 241-S and 241-SX Tank Farms. The 241-S Tank Farm contains 12 tanks, each with a capacity of 2.9 million L (770,000 gal). The 241-SX Tank Farm contains 15 tanks, each with a capacity of 3.8 million L (1.0 million gal). Both tank farms received waste generated from the REDOX Plant in the 1950s and 1960s. To minimize the probability and severity of future leaks, all drainable liquid in each tank has been removed and transferred to double shell tanks.

Groundwater beneath WMA S-SX is contaminated primarily with chromium, nitrate, technetium-99, carbon tetrachloride, and tritium. Chromium, nitrate, and technetium-99 originate from the tank farms, although nitrate also originates from an upgradient source. Carbon tetrachloride and tritium are from upgradient sources. Low levels of iodine-129 and selenium-79 also have been found in the groundwater. Recent groundwater plume maps for the WMA S-SX vicinity are provided in DOE/RL-2014-32, *Hanford Site Groundwater Monitoring Report for 2013*.

Table 1. Estimated Depth and Elevation Specifications

Parameter	299-W22-115 (C9430)	299-W22-116 (C9431)	299-W23-236 (C9432)
Surface elevation (m [NAVD88])	203.1[a]	204.1[b]	199.8[c]
Water table elevation (m [NAVD88])	133.1[d]	133.0[e]	133.5[f]
Depth to water (ft bgs)	229	234	218
Planned screen length (ft)	35.0	35.0	35.0
Planned depth to top of 4 in. SS screen (ft bgs)	229	234	218
Planned depth to bottom of 4 in. SS screen (ft bgs)	264	269	253
Planned total depth (ft bgs)	269	274	258
Planned bottom logging depth (ft bgs)[g]	254	259	243

bgs = below ground surface
NAVD88 = North American Vertical Datum of 1988
SS = stainless steel
a. Elevation of brass cap at nearby Well 299-W22-45.
b. Elevation of brass cap at nearby Well 299-W22-50.
c. Elevation of brass cap at nearby Well 299-W23-15.
d. Based on the July 2014 water-level measurement from nearby Well 299-W22-45.
e. Based on the July 2014 water-level measurement from nearby Well 299-W22-50.
f. Based on the August 2014 water-level measurement from nearby Well 299-W23-15.
g. Logging depths are 4.5 m (15 ft) less than planned total depths because the logging tools require a 4.5 m (15 ft) interval at the bottom where space is needed for the logging tool.

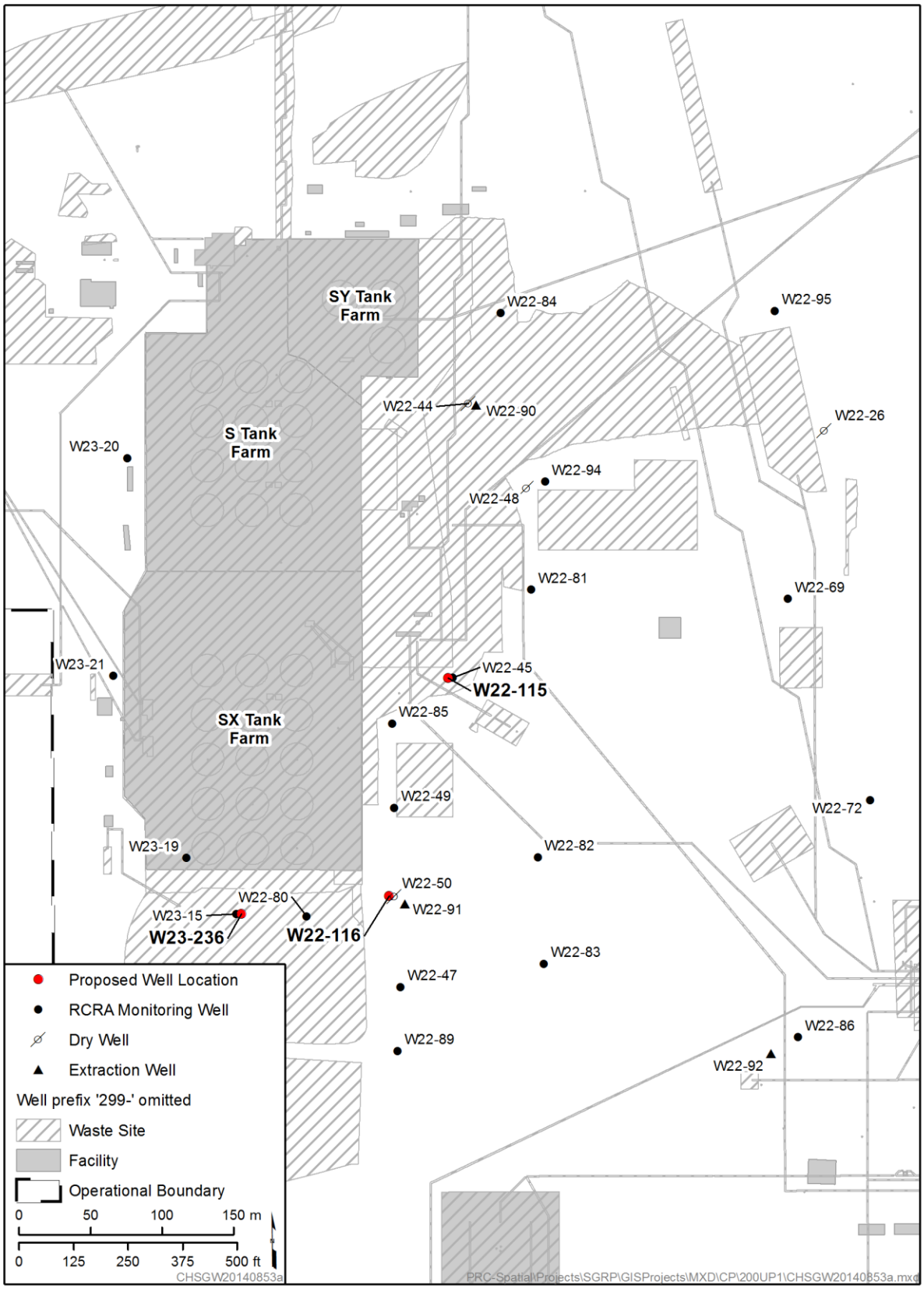

Figure 1. Well Location Map

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2 Field Sampling Instructions

This section describes the site-specific sampling and analysis activities planned in this SI. It also includes requirements for sample handling, custody, preservation, containers, holding times, field quality control (QC), field documentation, precision, and accuracy.

2.1 Basic Design Elements

Sampling requirements for the wells include sediment sampling at all three wells and groundwater sampling at 299-W23-236. Sediment sampling is to include geologic archive samples of drill cuttings collected at 1.5 m (5 ft) intervals throughout the borehole and at changes in lithology, and sieve grab samples collected at 1.5 m (5 ft) intervals below the water table and analyzed to ensure proper well design. Two depth discrete groundwater samples will be collected from Well 299-W23-236. The soil samples for sieve analysis and the water samples are summarized in Table 2.

2.1.1 Soil Samples

The field geologist will collect drill cuttings every 1.5 m (5 ft) and at changes in lithology from surface to total depth for geologic description and archived storage. Archive samples will be collected in pint-sized glass jars and representative interval samples saved in chip trays. If representative samples cannot be collected, notes describing the condition of the samples will be entered into the field geologist's log.

Sediment samples for sieve analyses will be collected during drilling at 1.5 m (5 ft) intervals below the water table to a total depth of 10.7 m (35 ft) and composited into a single sample for each well for analysis. Sieve analyses will be performed to support the selection of the correct filter-pack mesh size and corresponding screen slot size. Sieve analyses will be conducted by the site geologist or other qualified person. The borehole log also will be examined to determine if any fine-grained layers are present that would affect the selection of the filter pack and screen slot size.

2.1.2 Groundwater Samples

Depth discrete water samples will be collected during drilling of Well 299-W23-236. Samples will be collected at 3.0 m (10 ft) below the water table and 12.2 m (40 ft) below the water table. Prior to collecting the samples, groundwater will be pumped to purge a minimum of one borehole/casing volume and until field readings of pH, temperature, and specific conductance have stabilized. It is expected that the turbidity will remain elevated, so the samples should be filtered in the field. The samples will be analyzed for nitrate, technetium-99, and tritium. Analytical methods and performance requirements are listed in Table 3.

2.1.3 Additional Data Collection Activities

The wells will be geophysically logged with the high-resolution, spectral gamma-ray logging system to determine the vertical distribution and concentration of gamma-emitting radionuclides and borehole lithologic changes. Soil moisture data will be obtained using a neutron moisture-logging tool.
The boreholes will be logged before downsizing the temporary drilling casing and/or at total drill depth and prior to well construction. The driller will assist the logging engineer by providing borehole access and hoisting support, as appropriate to access the borehole when the logging crew is onsite.

2.1.4 Groundwater Well Drilling and Completion Procedures

Well drilling and construction will be performed in accordance with WAC 173-160. All three wells will be constructed as 10.2 cm (4 in.) diameter monitoring wells with SS casing and screens.

Preliminary well specifications are given in Table 1. Final well design, including screen placement and length, will be determined by concurrence of the drilling lead and technical lead, based upon field conditions and sieve analyses. Expected total depths for the wells are 82.0 m (269 ft) below ground surface (bgs) for 299-W22-115; 83.5 m (274 ft) bgs for 299-W22-116; and 78.6 m (258 ft) bgs for 299-W23-236.

2.1.5 Radiological Field Data

Radiological screening will be performed by the radiological control technician or other qualified personnel in accordance with approved methods and DOE/RL-96-68 *Hanford Analytical Services Quality Assurance Requirements Documents* (HASQARD), as applicable. The radiological control technician will record field measurements, noting the depth of the sample and the instrument reading on a radiological survey report. Measurements will be communicated to the site geologist for inclusion in the field logbook or operational records daily, or as applicable.

2.1.6 Corrective Actions and Deviations for Sampling Activities

The project manager, field team lead, or designee must document deviations from procedures or other issues related to sample collection, chain-of-custody, analytes, sample transport, or noncompliant monitoring. Examples of deviations include samples not collected because of field conditions, changes in sample locations due to physical obstructions, or additional samples taken.

As appropriate, such deviations or issues will be documented in the field logbook in accordance with internal procedures. The project manager, field team lead, or designee will be responsible for communicating field corrective action requirements and for ensuring that immediate corrective actions are applied to field activities.

2.2 Field Quality Control Sampling

No specific field QC samples are required for this work beyond what is normally collected for the Soil and Groundwater Remediation Project under HASQARD (DOE/RL-96-68), except that equipment blanks may be collected. 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 be collected using high-purity water and will be analyzed for all target analytes listed in Table 3. If disposable (i.e., single-use) equipment is used, equipment blanks are not required.

2.3 Laboratory Quality Control Samples

Laboratory QC samples (e.g., method blanks, laboratory control samples/blank spikes, and matrix spikes) are defined for the U.S. Environmental Protection Agency (EPA) four-digit methods (SW-846, *Test Methods for Evaluating Solid Waste: Physical/Chemical Methods, Third Edition; Final Update IV-B*) and also defined in HASQARD (DOE/RL-96-68). QC samples will be run at the frequency specified in the respective reference unless superseded by agreement between the primary contractor and the laboratory.

2.4 Sample Handling

Sample handling and transfer shall be in accordance with established methods to preclude loss of identity, damage, deterioration, and loss of sample. Custody seals or custody tape shall be used to verify that sample integrity has been maintained during sample transport. The custody seal will be inscribed with the sampler's initials and date.

A sampling and data tracking database is used to track the samples from the point of collection through the laboratory analysis process.

Table 2. Sample Locations and Depths

Well Name	Sample Matrix	Depth, ft below water table (ft bgs)	Allowable Variation on Depth	Analytes	Quality Control Samples	Comment
299-W22-115 (C9430)	Saturated Soil	0 to 35 (229 to 264)	±1 ft	N/A	N/A	Grab samples from the drill cuttings at 1.5 m (5 ft) intervals from 0 to 10.7 m (0 to 35 ft) below the water table, composited into a single sample for sieve analysis. Results will be used to select the filter pack and well screen slot size.
299-W22-116 (C9431)	Saturated Soil	0 to 35 (234 to 269)	±1 ft	N/A	N/A	Grab samples from the drill cuttings at 1.5 m (5 ft) intervals from 0 to 10.7 m (0 to 35 ft) below the water table, composited into a single sample for sieve analysis. Results will be used to select the filter pack and well screen slot size.
299-W23-236 (C9432)	Saturated Soil	0 to 35 (218 to 253)	±1 ft	N/A	N/A	Grab samples from the drill cuttings at 1.5 m (5 ft) intervals from 0 to 10.7 m (0 to 35 ft) below the water table, composited into a single sample for sieve analysis. Results will be used to select the filter pack and well screen slot size.
	Water	10 (228) 40 (258)	±5 ft	Nitrate Tc-99 Tritium	None	Water samples to be collected at 3.0 m (10 ft) below the water table and at the bottom of the borehole. Purge and pump samples are preferred. Bailed samples can be collected if purging is not practicable, as determined by the technical lead. High turbidity is expected, so the samples should be filtered in the field.

bgs = below ground surface
N/A = not applicable

Table 3. Groundwater Sample Analytical Methods

Chemical Abstracts Service Number	Analyte	Survey/Analytical Method	Contract Required Detection Limit[a]	Precision Requirement (Percent)	Accuracy Requirement (Percent)
NO3-N	Nitrate as Nitrogen	EPA Method 300.0 or equivalent	100 µg/L	≤20	80 to 120
14133-76-7	Technetium-99	Liquid scintillation	15 pCi/L[b]	≤30	70 to 130
10028-17-8	Tritium	Liquid scintillation	400 pCi/L[b]	≤30	70 to 130

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

a. These contract required detection limits have been reviewed and will satisfy the quantitation limit requirements for sampling under this SI.

b. minimum detectable concentration

2.4.1 Containers

Pre-cleaned sample containers with certificates of analysis denoting compliance with EPA specifications (EPA 540/R-93/051, *Specifications and Guidance for Contaminant-Free Sample Containers*) for the intended analyses will be used for samples collected for chemical analysis. Container sizes may vary depending on laboratory-specific volumes/requirements for meeting analytical detection limits.
The Radiological Engineering organization will measure both the contamination levels and dose rates associated with the filled sample containers. This information, along with other data, will be used to select proper packaging, marking, labeling, and shipping paperwork and to verify that the sample can be received by the analytical laboratory in accordance with the laboratory's radioactivity acceptance criteria. If the dose rate on the outside of a sample container or the curie content exceeds levels acceptable by an offsite laboratory, the field work supervisor (in consultation with the Sample Management and Reporting [SMR] organization), can send smaller volumes to the laboratory. Container types and sample amounts/volumes are identified in Table 4.

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

Analyte	Bottle		Amount	Preservation	Packing Requirements	Holding Time
	Number	Type				
Technetium-99	1	Glass	1 L	HCl to pH <2	None	6 months
Tritium	1	Glass	250 mL	None	None	6 months
Inorganic anions	1	Glass/ Plastic	60 mL	None	Cool <=6°C	28 days/48 hours for nitrate and nitrite

HCL = hydrochloric acid

2.4.2 Container Labeling

Each sample container will be labeled with the following information on firmly affixed, water resistant labels:

- Sampling Authorization Form number
- Hanford Environmental Information System sample number
- Sample collection date and time
- Analysis required
- Preservation method (if applicable)
- Chain-of-custody number
- Bottle type and size
- Laboratory performing the analyses
- Sample location
- Sample date and time
- Sampler's name

In addition, sample records must include the following information:

- Source of sample
- Matrix (e.g., water and soil)

- Field data (pH and radiological readings)

2.4.3 Sample Custody

Sample custody will be maintained in accordance with existing protocols to ensure the maintenance of sample integrity throughout the analytical process. Chain-of-custody protocols will be followed throughout sample collection, transfer, analysis, and disposal to ensure sample integrity is maintained. 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.

Shipping requirements will determine how sample shipping containers are prepared for shipment. The analyses requested for each sample will be indicated on the accompanying chain-of-custody form. Each time the responsibility changes for the custody of the sample, 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 sample shipment and will transmit the copy to the SMR organization within 48 hours of shipping.

The following information is required on a completed chain-of-custody form:

- Project name
- Signature of sampler
- Unique sample number
- Date and time of sample collection
- Matrix
- Preservatives
- Signatures of individual involved in sample transfer
- Requested analyses (or reference thereto)

2.4.4 Sample Transportation

All packaging and transportation instructions shall comply with applicable transportation regulations and U.S. Department of Energy (DOE) requirements. Regulations for classifying, describing, packaging, marking, labeling, and transporting hazardous materials, hazardous substances, and hazardous wastes are enforced by the U.S. Department of Transportation (DOT) as described in 49 CFR 171, "General Information, Regulations, and Definitions," through 178, "Specifications for Packagings." Carrier specific requirements defined in the International Air Transportation Association (IATA) *Dangerous Goods Regulations* also shall be complied with when preparing sample shipments conveyed by air freight providers.

Samples containing hazardous constituents shall be considered hazardous material in transportation and transported according to DOT 49 CFR, "Transportation," requirements. If the sample material is known or can be identified, it shall be classified, described, packaged, marked, labeled, and shipped according to the specific instructions for that material.

Materials are classified by DOT as radioactive when the isotope specific activity concentration and the exempt consignment limits described in 49 CFR 173, "Transportation," "Shippers—General Requirements for Shipments and Packagings," are exceeded. Samples shall be screened, or relevant historical data shall be used to determine if these values are exceeded. When screening or historical data indicate that samples are radioactive, they shall be properly classified, described, packaged, marked, labeled, and transported according to DOT/IATA requirements.

3 Management of Waste

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*. This waste management plan establishes the requirements for the management and disposal of waste associated with groundwater wells used to monitor the 200-UP-1 OU. Investigation-derived waste from these sampling activities will be handled in accordance with CERCLA. Uncontaminated materials will be segregated to minimize radiological waste. 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*.

4 Health and Safety

The hazardous waste operations safety and health program is implemented for employees involved in hazardous waste site activities. The program was developed to comply with the requirements of 29 CFR 1910.120, "Occupational Safety and Health Standards," "Hazardous Waste Operations and Emergency Response," and 10 CFR 835, "Occupational Radiation Protection," to ensure the safety and health of workers during hazardous waste operations.

The health and safety program was developed to define the chemical, radiological, and physical hazards, and to specify the controls and requirements for day-to-day work activities on the overall Hanford Site. The program incorporates applicable core functions and guiding principles outlined in the Integrated Safety Management System and governs minimal personal training; control of industrial safety and radiological hazards; personal protective equipment; site control; and general emergency response to spills, fire, accidents, injury, and incident reporting.

Project field staff will be required to comply with the health and safety program at all times. Unescorted site visitors must have completed the required health and safety training before entering the work area. Escorted visitors are briefed on health and safety concerns and must be escorted by the site superintendent (or designee) at all times when they are in the work area.

During operations, emergency response will be covered by the health and safety program. The health and safety program specifies primary emergency response actions for site personnel, area alarms, implementation of the emergency action plan and emergency equipment at the task site, emergency coordinators, emergency response, and spill containment.

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