0089509

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

JUL 16 2010

10-AMCP-0178

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

Dear Ms. Hedges:

HEXONE STORAGE AND TREATMENT FACILITY CLOSURE PLAN, DOE/RL-2009-112, REVISION 0 AND SAMPLING AND ANALYSIS PLAN FOR THE HEXONE STORAGE AND TREATMENT FACILITY CLOSURE PLAN, DOE/RL-2009-116, REVISION 0, STATE ENVIRONMENTAL POLICY ACT ENVIRONMENTAL CHECKLIST FOR THE HANFORD FACILITY, HEXONE STORAGE AND TREATMENT FACILITY CLOSURE, REVISION 0, PETITION FOR ONE-TIME LAND DISPOSAL RESTRICTIONS VARIANCE FOR HEXONE TANK BOTTOMS

This letter transmits the Hexone Storage and Treatment Facility Closure Plan, DOE/RL-2009-112, Revision 0 and associated documentation to the State of Washington Department of Ecology for review, comment, and/or approval.

Submittal of the closure plan completes Hanford Federal Facility Agreement and Consent Order Tentative Milestone M-037-01, "Submit Revised Closure Plan to Support Treatment, Storage, and Disposal (TSD) Closure of the Hexone Storage and Treatment Facility (276-S-141/142) TSD Unit," due December 31, 2010. The tentative milestone is included in the "Tentative Agreement on Hanford Federal Facility Agreement and Consent Order Change Forms Implementing Changes to Central Plateau Cleanup," dated March 31, 2010. This revised closure plan supersedes the closure plan submitted in 1992 which met Interim Milestone M-020-27.

Please provide comments on the closure plan and associated documents pursuant to Section 9.2.2 of the Hanford Federal Facility Agreement and Consent Order. Comments are due within 90-days of receipt, unless otherwise agreed to between the project managers.

RECEIVED
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EDMC

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M-020-27
M-037-01

If you have any questions, please contact me, or your staff may contact Matt McCormick, Assistant Manager for the Central Plateau, on (509) 373-9971.

Sincerely,

David A. Brockman
Manager

AMCP:KDL

Attachments

cc w/attachs:
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Environmental Portal

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DOE\RL-2009-112
Revision 0

Hexone Storage and Treatment Facility Closure Plan

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

U.S. DEPARTMENT OF ENERGY Richland Operations Office

P.O. Box 550
Richland, Washington 99352

DOE\RL-2009-112
Revision 0

Hexone Storage and Treatment Facility Closure Plan

Date Published
May 2010

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

U.S. DEPARTMENT OF ENERGY
Richland Operations Office

P.O. Box 550
Richland, Washington 99352

J. D. Aardal 05/27/2010
Release Approval Date

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Printed in the United States of America

Executive Summary

This closure plan presents the process to close the Hexone Storage and Treatment Facility (HSTF), a *Resource Conservation and Recovery Act of 1976,*[1] (RCRA) treatment, storage, and/or disposal (TSD) unit. This unit is located in the southeast corner of the 200 West Area of the Hanford Site. The current HSTF consists of two below-grade carbon-steel tanks (276-S-141 and 276-S-142), and ancillary piping and equipment. A Hanford Facility Dangerous Waste Part A Form[2] exists for this facility, and the facility will close as a TSD unit under closure provisions of WAC 173-303, "Dangerous Waste Regulations."[3] This closure plan provides the TSD unit clean closure performance standards established in accordance with WAC 173-303-610, "Closure and Post-Closure,"[4] and identifies the physical closure activities necessary to achieve clean closure.

The portions of the unit that will be clean closed under this plan include tanks 276-S-141 and 276-S-142, associated pumps, piping, and the soil beneath the removed tanks. The tanks will be clean closed by removal and disposal. If releases to soil occurred, the contaminated soil will be removed and the removal area soil will be sampled in accordance with an approved sampling and analysis plan (DOE/RL-2009-116, *Sampling and Analysis Plan for the Hexone Storage and Treatment Facility Closure Plan)*[5] to verify achievement of clean closure standards.

1 *Resource Conservation and Recovery Act of 1976*, 42 USC 6901, et seq. Available at: http://www.epa.gov/epawaste/inforesources/online/index.htm.

2 WA7 89000 8967b, 2008, *Hanford Facility Resources Conservation and Recovery Act Permit Application, Part A, Closure Unit 19, Hexone Storage Tanks,* Revision 7, September 22, 2008, Washington State Department of Ecology, Richland, Washington.

3 WAC 173-303, "Dangerous Waste Regulations," *Washington Administrative Code*, Olympia, Washington. Available at: http://apps.leg.wa.gov/WAC/default.aspx?cite=173-303.

4 WAC 173-303-610, "Dangerous Waste Regulations," "Closure and Post-Closure," *Washington Administrative Code*, Olympia, Washington. Available at: http://apps.leg.wa.gov/WAC/default.aspx?cite=173-303-610.

5 DOE/RL-2009-116, pending, *Sampling and Analysis Plan for the Hexone Storage and Treatment Facility Closure Plan,* U.S. Department of Energy, Richland Operations Office, Richland, Washington.

Contents

Figures

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Terms

AEA	*Atomic Energy Act of 1954*
CERCLA	*Comprehensive Environmental Response, Compensation, and Liability Act of 1980*
Ecology	Washington State Department of Ecology
HSTF	Hexone Storage and Treatment Facility
NPH	normal paraffin hydrocarbon
OU	operable unit
RCRA	*Resource Conservation and Recovery Act of 1976*
REDOX	Reduction-Oxidation Plant
SAP	sampling and analysis plan
TBP	tributyl phosphate
TSD	treatment, storage, and/or disposal (unit)
WAC	Washington Administrative Code

1 Introduction

The 276-S-141 and 276-S-142 tanks associated pumps, piping, and soil beneath the tanks will be clean closed under this plan with regard to dangerous waste, dangerous waste constituents or residue contamination from tank system operations. Clean closure will be to performance standards established in accordance with WAC 173-303-610, "Dangerous Waste Regulations," "Closure and Post-Closure," and as specified in this closure plan. These tanks are not expected to have affected groundwater and clean closure of soil beneath this unit will demonstrate no impact.

The tank system received waste containing both chemical constituents and *Atomic Energy Act of 1954* (AEA) regulated material. However, treatment, storage, and/or disposal of such waste (i.e., source, special nuclear, and by-product materials as identified in the AEA) are not within the scope of the *Resource Conservation and Recovery Act of 1976* (RCRA) or WAC 173-303 and will be regulated under DOE O 435.1 Chg 1, *Radioactive Waste Management*. Information regarding AEA-regulated material is provided for general knowledge.

This tank system is located within the 200-IS-1 source operable unit (OU). Cleanup of the 200-IS-1 OU will be performed in accordance with the *Comprehensive Environmental Response, Compensation, and Liability Act of 1980* (CERCLA) response action process. Closure activities associated with Hexone Storage and Treatment Facility (HSTF) tank system could be coordinated with the 200-IS-1 source operable unit remedial action.

2 Facility Description

This chapter provides the HSTF operating history, description, and site security information. The HSTF is located in the southeast corner of the 200 West Area of the Hanford Site just north of the 276 building (Figures 2-1 and 2-2). The original HSTF consisted of the following components:

- Two underground storage tanks
- Ancillary equipment
- Piping

The subsequent treatment operation included a temporary distillation system that was removed upon completion of the distillation operation in 1992.

2.1 HSTF Operating History

The HSTF consists of two below-grade single-shell carbon-steel tanks (276-S-141 and 276-S-142 Hexone Storage Tanks). The HSTF received liquid mixed waste from the Reduction-Oxidation (REDOX) Plant and possibly small amounts of hexone waste from the Hot Semiworks Facility (WA7890008967b, *Hanford Facility Resources Conservation and Recovery Act Permit Application, Part A, Closure Unit 19, Hexone Storage Tanks*). The HSTF was used from 1951 through 1967 to store reagent-grade methyl isobutyl ketone (hexone) for makeup as solvent for the REDOX Plant. After 1967, the HSTF contained distilled hexone that had been used in the REDOX Plant. The 276-S-142 Hexone Storage Tank also contained normal paraffin hydrocarbon (NPH) and tributyl phosphate (TBP) from a one-time reactor fuel separation effort in 1966. Between 1966 and 1988, various amounts of water were added to the tanks. In 1990, a distillation system was brought to the HSTF to remove organics from the underground tank waste. Distillation of organics and water pumped from the tanks was completed in 1990 as an interim treatment. The distillate waste was sent to an offsite RCRA-permitted, commercial incinerator, and operations were completed in June 1992. The entire distillation system, including temporary piping connecting the underground tanks to the distillation system, was removed after the completion of distillation operations.

A RCRA Dangerous Waste Permit Application (Form 3) for the hexone tanks was submitted to the Washington State Department of Ecology (Ecology) in December 1987 (WA7890008967b). A RCRA closure plan for the tanks was submitted in November 1992 (DOE/RL-92-40, *Hexone Storage and Treatment Facility Closure Plan*). This closure plan supersedes the 1992 version.

In April 2000, Ecology inspected the treatment, storage, and/or disposal (TSD) unit encompassing the tanks. In May 2000, Ecology issued "Notice of Correction for Stabilization of Hexone Storage and Treatment Facility USDOE DOCKET NUMBER 00NWPKM005" regarding their findings (Wilson, 2000). The letter required that the hexone tanks be stabilized by removing all of the potential safety hazards posed to employees by no later than December 2001. It also required that the stabilization include removal or deactivation of the waste. If the tanks remain in place, provisions must be made for monitoring the tanks for oxygen and organic vapors and for intrusion of liquids.

In May 2001, Ecology issued "Notice of Correction for Stabilization of Hexone Storage and Treatment Facility, BHI DOCKET NUMBER 00NWPKM006" which revised the deadline for stabilizing the hexone tanks to the end of February 2002 (Jamison, 2001). To support the interim stabilization effort, the waste in the tanks was sampled and analyzed. This closure plan is based on the composition of the waste remaining in the tanks as reported for the interim stabilization.

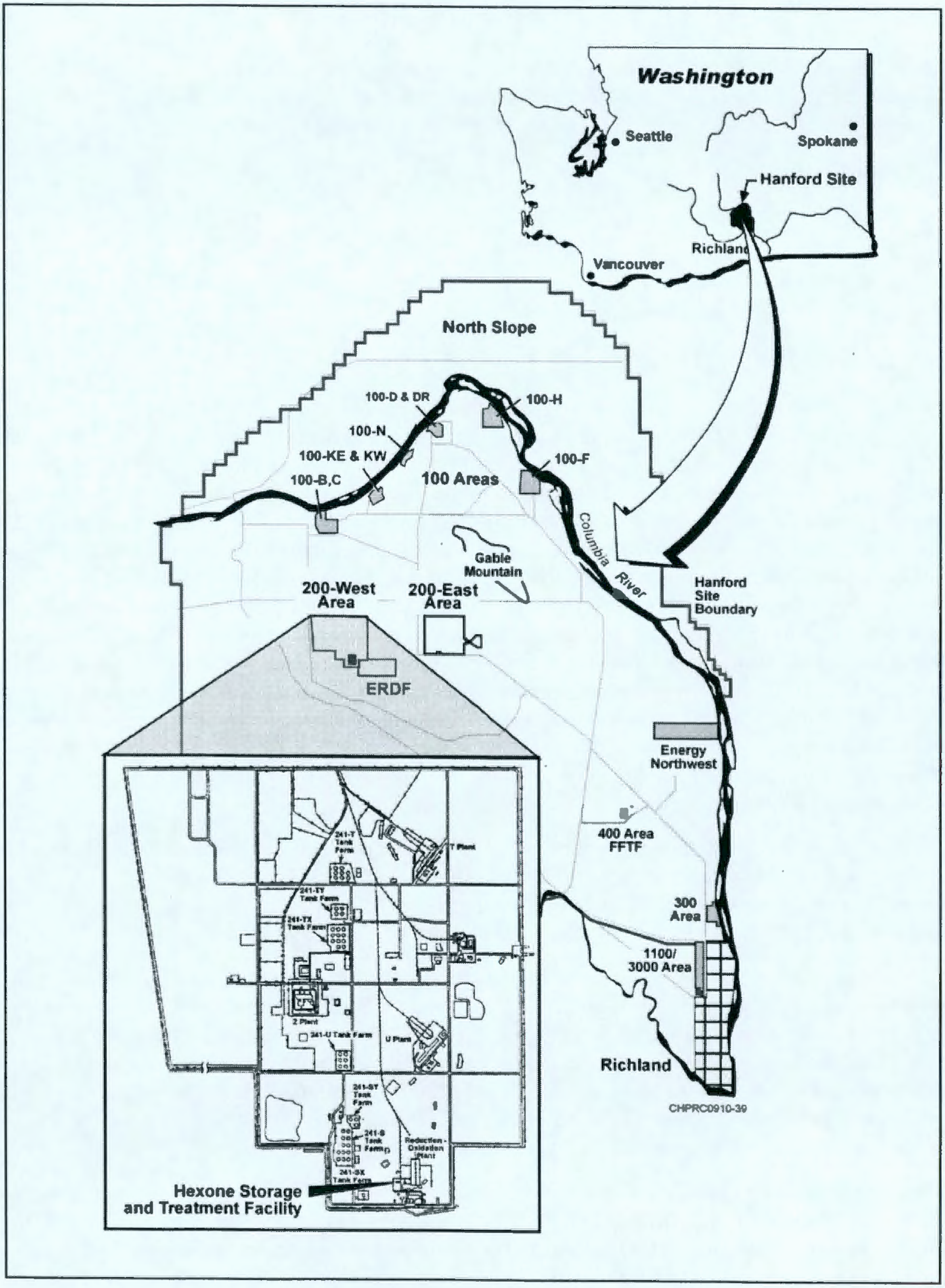

Figure 2-1. HSTF Location and Site Plan

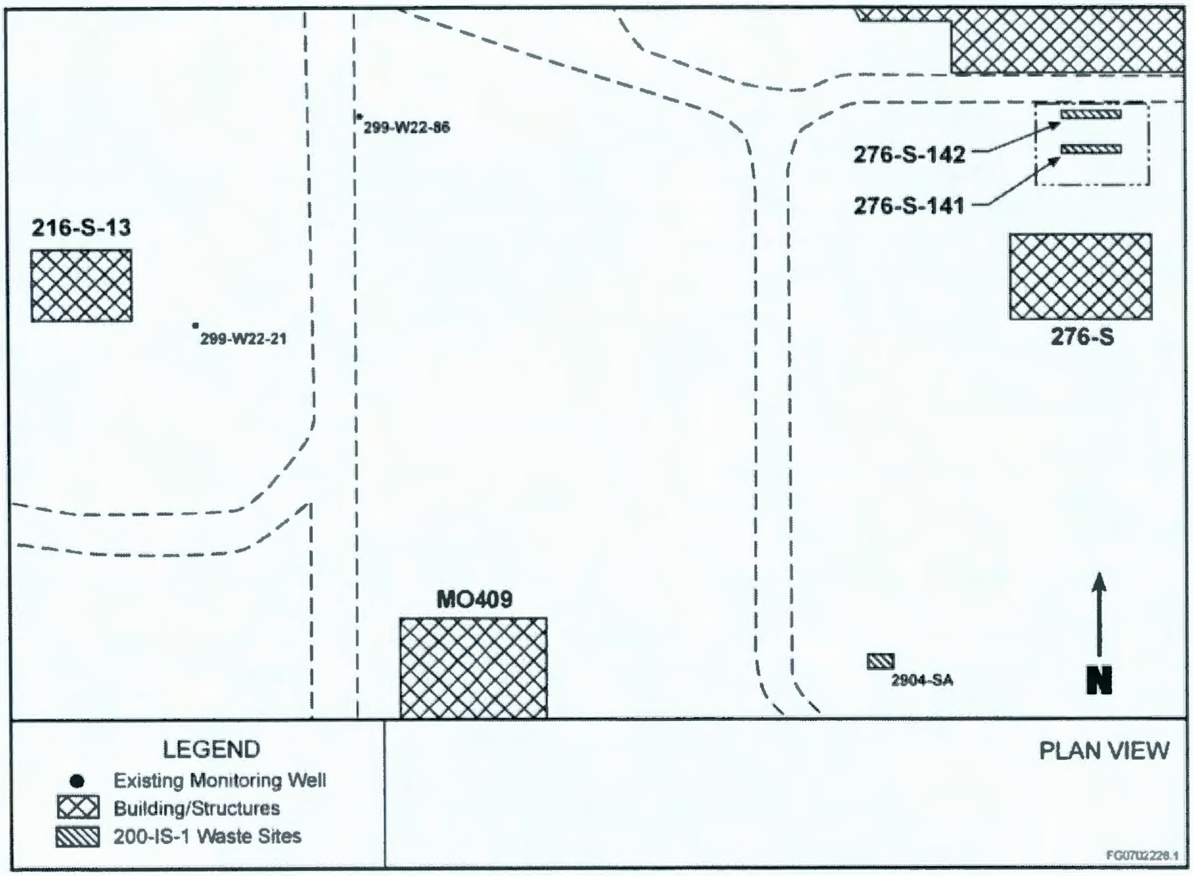

Figure 2-2. Location of HSTF in 200 West Area

On December 13, 2001, Ecology approved grouting as the stabilization method for interim closure of the hexone storage tanks (Wilson, 2001, "Approval for Stabilization of Hexone Storage and Treatment Facility"). Ecology stipulated that each tank be grouted in two pours. In March 2002, the tanks were filled with cement grout using the method authorized by Ecology for stabilization to reduce flammability concerns associated with hexone vapors. The area is currently fenced off as a controlled access zone.

Tanks 276-S-141 and 276-S-142 are 81,400 L (21,500-gal.)[6] working capacity carbon-steel tanks, similar to petroleum storage tanks. The tank shells are 8.5 meters (28 ft) in length with dished heads welded onto the end of the shells, nominally 3.6 meters (12 ft) in diameter, and were constructed with 0.95-centimeter (3/8-inch) thick walls. The tops of the tanks are 0.9 meter (3 ft) underground. Construction specifications and plans for the underground tanks are provided in Figure 2-3. The ancillary equipment associated with the tanks consists of the following:

- Two centrifugal transfer pumps.
- Aboveground and below ground piping for receiving, blending, and transferring hexone solvents (Figure 2-3); part of the original piping was removed in the 1970s (Chapter 3), approximately 13 m (42 ft) of underground piping remains, running from the pump station east to the railroad tracks.
- Aboveground vent piping; tank 276-S-141 vents to tank 276-S-142 through a flame arrestor and 7.6-cm (3-in.) vent pipe.

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[6] The tank working volume is 81,400 L (21, 500 gal.); historical documents reference various volumes.

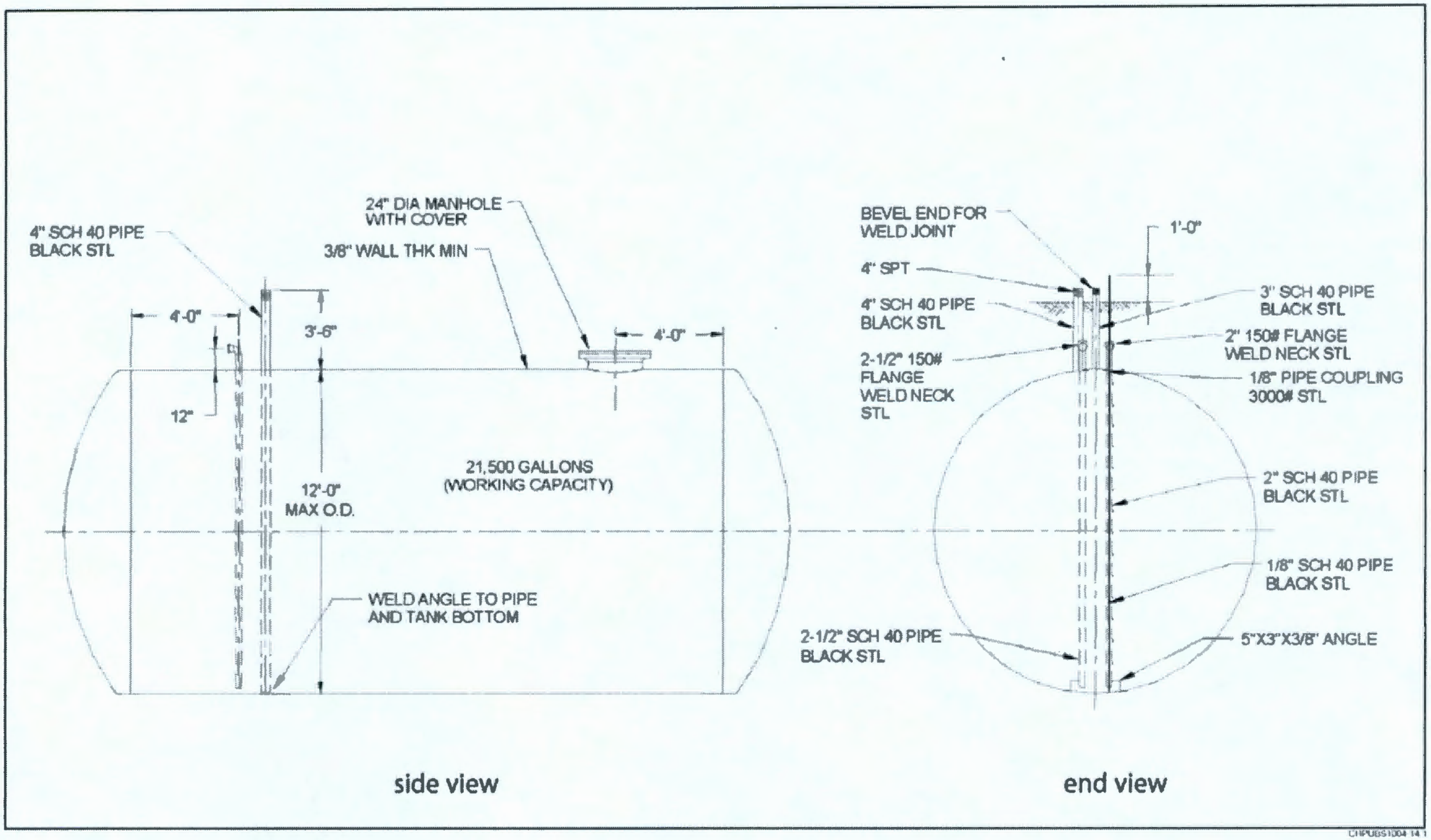
- Obsolete mercury manometer for measuring liquid (out of use since the mid-1970s); the manometer appears to be still intact and not leaking.
- Weight factor liquid level instrumentation.

The HSTF underground storage tanks were constructed in 1951. Monitoring of liquid levels in these tanks (before removal of liquid for distillation in 1990), and inspections of tanks of similar age and structure, suggest that the tanks have not leaked. Inspection of the tank interior in 2002 revealed areas of moderate corrosion (rust) BHI-01521, *Evaluation of Alternatives for the Interim Stabilization of the Hexone Tanks*. Past tank integrity testing (1976) has indicated an average wall thickness of 90 percent of the original 0.95-cm (3/8-in.) width (ARH-CD-639, *Integrity of Tanks 276-S-141 and 276-S-142*).

2.2 Security Information

Security information for the Hanford Facility is discussed in Attachment 33, Section 6.1 of the Permit (WA7890008967a, *Hanford Facility Resource Conservation and Recovery Act Permit, Dangerous Waste Portion, Revision 8C, for the Treatment, Storage, and Disposal of Dangerous Waste*). Because the HSTF is located in the 200 West Area, the security information pertaining to the 200 Area applies to this site.

Tanks 276-S-141 and 276-S-142 are below-grade, surrounded with a chain link fence, and appropriately posted with, "Dangerous Unauthorized Personnel Keep Out," or equivalent signs. Security measures that limit unit entry to authorized personnel and that preclude unknowing access by unauthorized individuals will remain in place until the closure certification is submitted.



Source: Drawing H-2-5303, *276-S Organic Solvent Make-up Underground Storage Tanks Vendor Information.*

Figure 2-3. 276-S-141 and 276-S-142 Hexone Storage Tanks Construction Diagram

3 Process Information

This chapter describes how the hexone was processed at the HSTF. The underground storage tanks were installed in 1951 and used to receive commercial-grade hexone from vendors by tank car. A loading platform and hose connection provided access to the railcars. A buried pipe led to two aboveground centrifugal pumps that moved the hexone into either of the two underground tanks. The pumps were equipped with manifold piping that allowed the following transfer operations:

- From the railcars to the underground tanks
- Recirculation of underground tank contents (within each tank)
- Transfer from tank to tank
- Transfer from underground tanks to the adjacent REDOX 276-S organic makeup and treatment facility through overhead piping

These operations were terminated in 1967. In 1967, radioactively contaminated organic liquids associated with the shutdown of the REDOX plant were added to the tanks. It is possible that small amounts of hexone from the Hot Semi-Works, a pilot-scale plant operating in the 1940s and 1950s for developing and refining plutonium extraction methods, also were placed in the tanks. These spent radioactive solvents, such as, hexone, TBP, NPH (a purified derivative of kerosene containing straight-chain hydrocarbons in the range of $C_{10}H_{22}$ through $C_{18}H_{38}$), and solvent-saturated water, were stored in the tanks until 1990. The contents of both tanks were transferred into the distillation system during July through December 1990.

The original pump system remains intact except for the railcar unloading ramp and hose system, and the overhead transfer pipe to the 276-S Building (WHC-EP-0570, *The Distillation and Incineration of 132,000 Liters (35,000 Gallons) of Mixed-Waste Hexone Solvents from Hanford's REDOX Plant*); these components were removed in the early 1970s and 1980s. The temporary piping that connected the underground tanks to the distillation system was dismantled in early 1992. During pumping to the distillation system, water was added to float the remaining hexone, allowing better pump access. The underground storage tanks then were then flushed with NPH after the tanks had been pumped out to dissolve and remove the remaining accessible hexone. The pumpable material was processed through the distillation system.

4 Waste Inventory and Characteristics

The following chapter identifies the inventory and characteristics of the waste received by the HSTF tank system. A detailed discussion of the maximum and annual waste inventory and associated waste codes is included.

4.1 Waste Inventory

The combined storage design capacities of the tanks (276-S-141 and 276-S-142) is 182,000 L (48,000 gal.); the combined working volume of the tanks is 163,000 L (43,000 gal.) (WA7890008967b). The treatment design capacity of the distillation system was 11,400 L (3,000 gal.) of waste per day. The storage design capacity of the railroad tank cars was 152,000 L (40,000 gal.) (DOE/RL-2002-14, *Tanks/Lines/Pits/Boxes/Septic Tank and Drain Fields Waste Group Operable Unit RI/FS/Work Plan and RCRA TSD Unit Sampling Plan Includes 200-IS-1 and 200-ST-1 Operable Units*).

The estimated annual quantity of waste that was treated and stored in the 276-S-141 tank was approximately 76,000 L (20,000 gal.). The estimated annual quantity of waste that was treated and stored in the 276-S-142 tank was approximately 61,000 L (16,000 gal.).

The HSTF was used from 1951 through 1967 to store reagent-grade hexone for makeup as a solvent for the REDOX Plant. After 1967, the HSTF contained distilled hexone, part or all of which had been used in the REDOX Plant.

- The 276-S-142 tank also contained NPH and TBP from a one-time effort in 1966.
- The 276-S-142 tank received approximately 5,000 L (1,300 gal.) of water in 1967, 1,900 L (500 gal.) in the mid-1970s, and 760 L (200 gal.) in the mid-1980s.
- Approximately 760 L (200 gal.) of water were added to the 276-S-141 tank in 1988.

In 1990, as preparation for closure, the mixed waste was pumped from the 276-S-141 and 276-S-142 tanks through a distillation system to decrease the radioactivity of the waste. The distillate was shipped to a commercial incinerator for disposal.

The 276-S-141 and 276-S-142 tanks currently each contain approximately 500 L (130 gal.) of mixed waste (less than 1percent of the tank volume), with the remainder of the tank working volume, approximately 81,000 L (21,370 gal.), filled with cement. In 2002 (prior to grouting), the waste was observed as a uniform tar-like layer across the tank bottom with a dried, cracked crust surface, which extended the length of the tank. No ponding of liquid was observed in either tank.

4.2 Waste Characteristics

The 276-S-141 tank was used to store waste hexone (waste code F003 – spent solvent) that was used as a solvent in the REDOX Plant. The mixed waste was considered ignitable (waste code D001) and a toxic state-only waste (waste code WT02).

The 276-S-142 tank also was used to store hexone waste. In addition, the 276-S-142 tank also stored NPH and TBP waste. This waste resulted from a one-time campaign in 1966.

WA7890008967b also designates the waste as characteristic for toxicity (waste codes D018, D019, D023, D024, D025, D027, D028, D029, D030, D032, D033, D034, D036, D037, D039, D040, D041, D042, and D043).

5 Groundwater Monitoring

The HSTF is not a regulated unit under the definitions of WAC 173-303-040, "Definitions" (i.e., surface impoundment, waste pile, land treatment unit, landfill) that would require groundwater monitoring. Consequently, no RCRA groundwater-monitoring program is required.

6 Closure Approach and Performance Standards

The approach and performance standards to achieving clean closure of the HSTF tank system are described in this chapter. Successful implementation of the closure approach will meet applicable WAC 173-303 requirements for clean closure of portions of the tanks, piping, and soil beneath the tanks and piping. Clean closure of the soil will be used as a basis to demonstrate that the TSD unit did not impact groundwater.

6.1 Closure Approach

The HSTF includes tanks 276-S-141 and 276-S-142. WAC 173-303-640(8)(a), "Tank Systems," "Closure and Post-Closure Care," provides requirements for the closure of a tank system. This subsection states the following, "At the closure of a tank system, the owner or operator must remove or decontaminate all waste residues, contaminated containment systems components (liners, etc.), contaminated soil, and structures and equipment contaminated with waste, and manage them as dangerous waste, unless WAC 173-303-070(2)(a) applies." Figure 6-1 provides a diagram of the closure logic.

Both tanks and all piping and soil will be clean closed under this plan, with regard to dangerous wastes, dangerous waste constituents, or residues from TSD unit operations, after soil has been removed to meet clean closure standards. Clean closure of tanks 276-S-141 and 276-S-142 and their piping will be achieved by removal and disposal, and by removal of any soil contaminated above numerical clean closure standards. Underground piping (200-W-230-PL)[7] from the tanks and above ground piping associated with the pumps constitutes the tank system ancillary piping within the TSD unit boundary and the scope of closure under this plan. Soil beneath the tanks and piping will be clean closed through visual inspections and soil verification sampling that demonstrates there were no releases from the unit and, where releases occurred, that the contaminated soil has been removed to meet clean closure standards, as shown by sampling of the removal area.

[7] The underground piping has been cut off at the point where it came above ground, just east of the hexone storage tanks, the above ground piping to REDOX has been removed (Chapter 3).

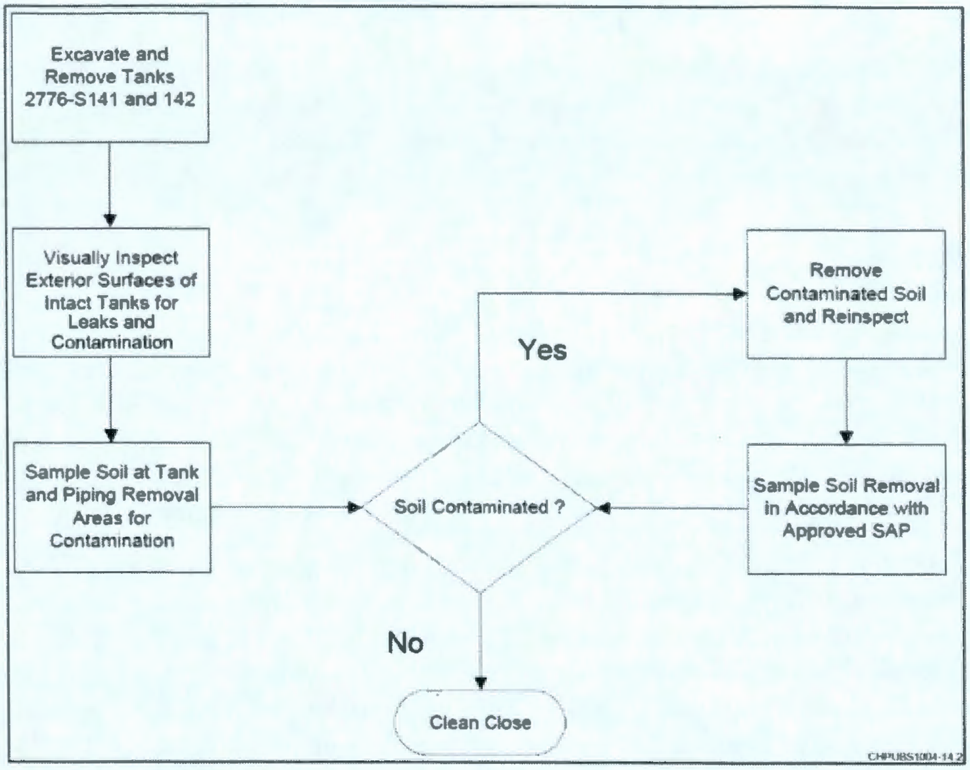


Figure 6-1. Closure Logic Flow Diagram

6.2 Closure Performance Standards

This section presents HSTF closure performance standards. As provided for in this plan, the tanks will be closed in a manner that meets the requirements of WAC 173-303-640(8) for tank systems and the performance standards of WAC 173-303-610(2)(a), "Closure Performance Standard." Closing the unit in accordance with these requirements and standards will accomplish the following:

- Minimize the need for future maintenance.
- Control, minimize, or eliminate to the extent necessary to protect human health and the environment, post-closure escape of dangerous waste, dangerous constituents, leachate, contaminated runoff, or dangerous waste decomposition products to the ground, surface water, groundwater, or the atmosphere.
- Return the land to the appearance and use of surrounding land areas to the degree possible given the nature of the previous dangerous waste activity.

Clean closure will be achieved when the tank system and any soil contaminated with the mixed waste has been removed, and verification sampling demonstrates that TSD unit constituents do not exceed unrestricted numerical clean up levels in accordance with WAC 173-303-610(2)(b)(i). Closure performance standards for tanks 276-S-141 and 276-S-142, their piping, and the soil beneath the tanks and piping are presented in the following sections.

6.2.1 Clean Closure Standards for Tanks and Piping

Under this plan, contaminated tanks 276-S-141 and 276-S-142 and piping will be clean closed by removal and disposal as described in Chapter 7. Further characterization will not be required for removal.

6.2.2 Closure Standards for Soil Beneath Tanks and Piping

Soil within the site excavation will be required to meet numerical cleanup levels calculated using unrestricted use exposure assumptions. Table 6-1 presents the cleanup levels for chemical constituents established in accordance with WAC 173-303-610(2)(b)(i) for unrestricted use. Clean conditions will be documented in the HSTF unit operating record. Sampling and analysis will occur in accordance with an approved SAP (DOE/RL-2009-116, *Sampling and Analysis Plan for the Hexone Storage and Treatment Facility Closure Plan*) for TSD unit dangerous wastes, dangerous waste constituents, and residues (Table 2-1). The TSD unit constituents that will require verification to meet clean closure standards are derived from a comparison of the waste codes contained in WA7890008967b and constituents detected during past sampling of the tank heels during interim stabilization, to the constituents listed in the Universal Treatment Standards table found in 40 CFR 268.48, "Land Disposal Restrictions," "Universal Treatment Standards." This list is a subset of the constituents identified in the data quality objective process for the 200-IS-1 OU characterization sampling.

Table 6-1. Residential Clean Closure Standards for HSTF System Dangerous Constituents

TSD Unit Dangerous Waste, Dangerous Waste Constituents, and Residues[a]	CAS No.	90% Log Normal Percentile[b]	Soil Concentration Protective of Groundwater[c] (mg/kg)	Human Health Protection Soil Direct Contact[d] (mg/kg)		Ecological Protection[e] (mg/kg)	PQLs	Clean Closure Standard [f] (mg/kg)
				Carcinogen	Non-carcinogen			
Hexavalent Chromium	18540-29-9	N/A	18.4	N/A	240	N/A	0.5	18.4
Lead	7439-92-1	10.2	3,000	N/A	250[g]	50	5	50
Nickel	7440-02-0	19.1	130	N/A	1,600	30	4	30
1,1-Dichloroethylene	75-35-4	N/A	0.0501	N/A	4,000	N/A	0.002	0.0501
1,1,2-Trichloroethane	79-00-5	N/A	0.00427	17.5	320	N/A	0.002	0.00427
1,2-Dichloroethane	107-06-2	N/A	0.00232	11	1,600	N/A	0.0015	0.00232
1,4-Dichlorobenzene	106-46-7	N/A	0.134	185	5,600	20	0.004	0.134
2-butanone	78-93-3	N/A	20	N/A	48,000	N/A	0.01	20
2-Methylphenol (o-cresol)	95-48-7	N/A	2.3	N/A	4,000	N/A	0.33	2.3
2,4-Dinitrotoluene	121-14-2	N/A	0.00167	3.23	160	N/A	0.33	0.33
2,4,5-Trichlorophenol	95-95-4	N/A	28.8	N/A	8,000	4	0.33	4
2,4,6-Trichlorophenol	88-06-2	N/A	0.0462	90.9	80	10	0.33	0.33
4-Methylphenol (p-cresol)	106-44-5	N/A	0.40	N/A	400	N/A	0.33	0.40
Acetone	67-64-1	N/A	28.9	N/A	8,000	N/A	0.02	29
Benzene	71-43-2	N/A	0.00448	18.2	320	N/A	0.0015	0.00448
n-Butyl alcohol	71-36-3	N/A	3.5	N/A	8,000	N/A	0.1	3.5
Carbon tetrachloride	56-23-5	N/A	0.0031	7.69	56	N/A	0.005	0.005
3-Methylphenol (m-cresol)	108-39-4	N/A	4.0	N/A	4,000	N/A	0.66	4.0
Di-n-butyl phthalate	84-74-2	N/A	58	N/A	8,000	N/A	0.33	58
Ethylbenzene	100-41-4	N/A	0.0344	90.9	8,000	N/A	0.005	0.0344

Table 6-1. Residential Clean Closure Standards for HSTF System Dangerous Constituents

TSD Unit Dangerous Waste, Dangerous Waste Constituents, and Residues[a]	CAS No.	90% Log Normal Percentile[b]	Soil Concentration Protective of Groundwater[c] (mg/kg)	Human Health Protection Soil Direct Contact[d] (mg/kg)		Ecological Protection[e] (mg/kg)	PQLs	Clean Closure Standard[f] (mg/kg)
				Carcinogen	Non-carcinogen			
Hexachlorobenzene	118-74-1	N/A	0.0877	0.625	64	17	0.33	0.33
Hexachlorobutadiene	87-68-3	N/A	0.605	12.8	80	N/A	0.33	0.605
Hexachloroethane	67-72-1	N/A	0.125	71.4	80	N/A	0.33	0.33
Hexone	108-10-1	N/A	12.8	N/A	6,400	N/A	0.01	12.8
Nitrobenzene	98-95-3	N/A	0.102	N/A	160	40	0.33	0.33
Pentachlorophenol	87-86-5	N/A	0.0116	8.33	2,400	3	0.33	0.33
Tetrachloroethene	127-18-4	N/A	0.000867	1.85	800	N/A	0.005	0.005
Trichloroethylene	79-01-6	N/A	0.003	11	N/A	N/A	0.001	0.003
Vinyl chloride	75-01-4	N/A	0.000383	1.39	240	N/A	0.005	0.005
Xylenes (total)	1330-20-7	N/A	14.6	N/A	16,000	N/A	0.01	14.6
Ignitability	IGNITABLTY	N/A	N/A	N/A	N/A	N/A	1 °C	N/A

Notes:

Clean closure evaluations for TSD units are required to use unrestricted (residential) levels in WAC 173-340-740(3), "Method B Soil Cleanup Levels for Unrestricted Land Use," based on WAC 173-303-610(2)(b)(i), "Closure Performance Standard."

a. HSTF constituents have been identified based on the unit-specific Part A Form and process knowledge of hexone being the only listed waste constituent under F003. In addition, constituents that were above detection limits also appearing within 40 CFR 268.48, "Land Disposal Restrictions," "Universal Treatment Standards," were included after evaluating the analytical results from BHI-01521, *Evaluation of Alternatives for the Interim Stabilization of Hexone Tanks.*

b. DOE/RL-92-24, *Hanford Site Background: Part 1, Soil Background for Nonradioactive Analytes*, Vol. I.

c. WAC 173-340-747(4) "Fixed parameter three-phase partitioning model" as allowed by WAC 173-340-740(3)(b)(iii)(A), "Ground Water Protection."

d. WAC 173-340-740(3)(b)(iii)(B), "Soil Direct Contact," (I), "Noncarcinogens," and (II), "Carcinogens." Equations are found for human health direct contact.

e. WAC 173-340-740(3)(b)(ii), "Environmental Protection." Point of compliance is surface to 4.6 m (15 ft) (WAC 173-340-740(6), "Four-phase partitioning model") Table 749-3 values are screening levels and were not intended to be clean-up levels (WAC 173-340-7493(2)(a)(i), "The Chemicals of Ecological Concern"). If soil sample analytical results exceed these screening level results, DOE may develop another number to be used as the clean-up level in accordance with the provisions of WAC 173-340-740, "Unrestricted Land Use Soil Cleanup Standards."

f. The overall clean closure level is the most restrictive risk based level, provided that it is not below background. PQLs were considered in establishing the clean closure cleanup levels in accordance with WAC 173-340-707(2), "Analytical Considerations."

g. Value from Table 740-1 of WAC173-340-900, "Tables", revised November 2007.

CAS = Chemical Abstracts Service

PQL = practical quantitation limit

N/A = not applicable

7 Closure Activities

This chapter documents the physical activities that will be performed to implement and verify clean closure of tanks 276-S-141 and 276-S-142 and associated piping (200-W-230-PL). These activities include removal of waste inventory, tank, piping, and contaminated soil as well as visual inspections and soil verification sampling. A single closure certification is proposed for both tanks and the associated piping. A schedule for tank system closure activities is presented at the end of this chapter.

7.1 Support Activities

Past activities that have contributed to closure of the HSTF are discussed in Chapter 2. These activities included cessation of waste receipt, removal and distillation of wastes completed in 1992, and stabilization of the tanks with grout and deactivating the purge system in 2002.

7.1.1 Removal of Waste Inventory

As described in Chapter 4, most of the waste had been removed from tanks 276-S-141 and 276-S-142 by 1992. The waste remaining in the tanks was covered with grout in 2002. No further removal of material from the tanks is planned as part of these closure activities.

7.1.2 Field Documentation

Personnel conducting removal and inspection activities will maintain daily activity reports. The reports will be held in a binder system and have consecutively numbered pages. All information pertinent to the activities will be recorded in the daily activity reports in a legible fashion and maintained in the TSD unit operating record. The daily activity reports will be reviewed and signed or initialed by the person in charge on days when work is performed. If review identifies that changes are necessary, the changes will be indicated by a single line drawn through the affected text or text will be modified, as necessary. The individual responsible for the change will initial and date the entry.

Verification checklists (Figure 7-1) will be initiated to verify performance and results of component removal, visual inspections, field screening, and any sampling activities. Copies of all completed checklists will be maintained in the operating record.

7.1.3 Designation and Disposal of Material Removed During Closure

Closure waste and debris removed during closure will be designated to meet the requirements of WAC 173-303-070 through WAC 173-303-100, "Dangerous Waste Criteria." Applicable land disposal restriction notification and certification requirements of WAC 173-303-140, "Land Disposal Restrictions," will be met. Designation of waste generated during closure activities will be based on the Part A Form and available process knowledge and sampling results, as necessary to complete a disposal unit waste profile.

Closure waste and debris will be accumulated, as necessary, in satellite accumulation areas at appropriate locations near HSTF, in accordance with WAC 173-303-200, "Accumulating Dangerous Waste On-Site," while awaiting designation and transfer to an approved storage or disposal unit. Alternatively, closure waste and debris generated as part of a CERCLA remedial action would be managed through the implementation of a waste management plan or a waste control plan. Containers used for transfer of regulated materials will be compatible with the waste and will be labeled. Appropriate waste acceptance documentation will be completed for the receiving unit.

This checklist is to document performance and results of 276-S Tank System closure activities.

HSTF Closure Activity Verification Checklist

1. Identify component/location (e.g., Piping/200-E-246-PL).

2. ☐ Component entirely removed

   Sign: ______________________________ Date: ________________

3. Surface visual inspection of exterior surfaces of tanks removed intact.
   Visual inspection:

   ☐ No visible cracks, openings, or waste staining indicating potential component leak(s).

   ☐ Cracks, openings, and/or waste staining are visible indicating potential leak(s).

   Sign: ______________________________ Date: ________________

4. Visual inspection of soil at component removal area.

   ☐ No soil contamination identified (to Step 5).

   ☐ Contamination identified in soil and the location mapped (to Step 4a).

   Sign: ______________________________ Date: ________________

   a. ☐ Soil contamination removed. Location requires closure verification sampling (to Step 4b).

   Sign: ______________________________ Date: ________________

   b. ☐ Sampling of removal area soil complete in accordance with the approved sampling and analysis plan (Appendix A).

   Sign: ______________________________ Date: ________________

5. Steps 1 through 4 for the listed component and associated soil are complete.

   ☐ Component removed (Step 2) and soil contamination not found (Step 4).

   ☐ Component removed (Step 2) and soil contamination found, removed, and verified as removed by sampling (Steps 4a and 4b).

   ☐ Other.

   Explain: ____

   Sign: ______________________________ Date: ________________

Figure 7-1. Example of a HSTF Closure Activity Verification Checklist

All tank system closure waste may contain AEA-related material and therefore could be designated as low-level waste or mixed waste. All HSTF closure waste will be disposed at an approved onsite or offsite disposal facility.

7.1.4 Visual Inspections

For this closure plan, visual inspection is being used to identify if additional soil verification sampling to determine whether performance standards have been met, is required. Soil excavated from around the tanks during removal, soil beneath the tanks, and soil around the piping runs will be inspected during excavation for staining or other indication of contamination. All stained soil will be removed from the excavation.

Tank and piping exterior surfaces with be visually inspected for contamination. This will be conducted to locate potential component leaks and tank integrity concerns that might require specific sampling. When a tank is removed intact, the tank exterior surfaces will be visually inspected for holes or cracks and other evidence of contamination, such as staining or discoloration from waste.

7.1.5 Closure Verification Sampling

Clean closure of potentially contaminated soil at tank and piping component removal areas would be verified by sampling and analysis. The sampling will be used to verify that concentrations of dangerous wastes, dangerous wastes constituents, or residues in soil are below analytical clean closure levels. Sampling will be performed in accordance with the approved SAP (DOE/RL-2009-116). The SAP identifies the target analytes and documents the number of samples, type and quality of data, sampling and analytical procedures, and the appropriate field and laboratory quality control.

7.2 HSTF Closure Activities

This section identifies the physical activities for clean closure of tanks 276-S-141 and 276-S-142, associated piping, and soil beneath the removed tanks and piping. Access to locations undergoing closure will be controlled during the closure period. Closure activities will be performed to keep personnel exposure as low as reasonably achievable. Upon completion of physical closure activities, the site will be restored consistent with land use for the surrounding area.

7.2.1 Tank Closure Activities

Tanks 276-S-141 and 276-S-142 and associated tank system piping are proposed to be clean closed by removal for disposal, as described in Section 7.1.3. Tanks 276-S-141 and 276-S-142 are planned to be removed without further characterization. The vent piping and risers, pumps and associated above ground piping will be removed along with the tanks. The tanks will either be demolished onsite and removed as debris or removed intact.

Tanks or tank debris removed for disposal will be cleaned and containerized only to the extent necessary to facilitate waste handling and meet disposal unit waste acceptance criteria.

7.2.2 Piping Closure Activities

HSTF transfer piping (above ground and underground, shown in Figure 7-2) will be removed for disposal under this plan. It remains uncertain whether this piping would designate as a dangerous waste upon removal. Without further characterization to make a final designation, the HSTF transfer piping removed during closure activities will be managed as dangerous waste.

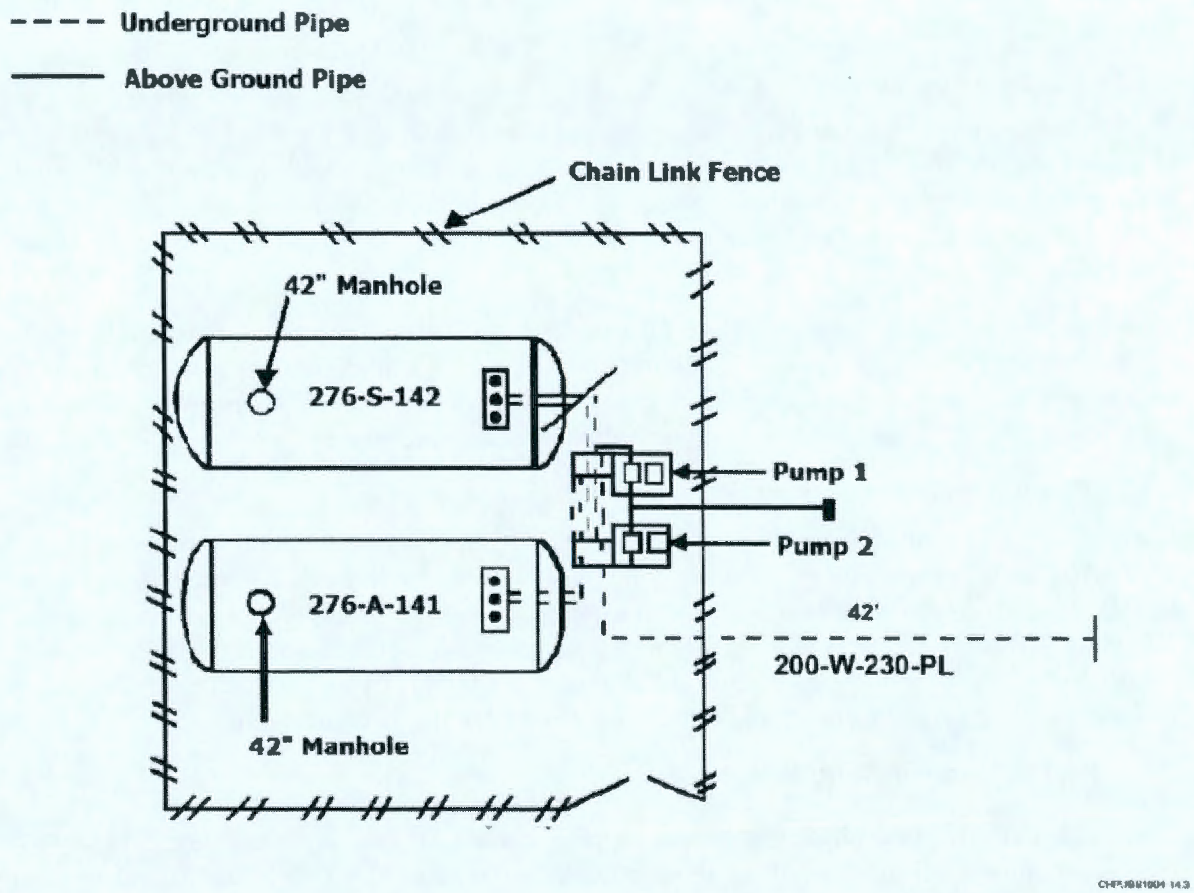


Figure 7-2. 276-S-142 and 176-S-141 Tanks and Piping Within the Scope of TSD Unit Closure

The HSTF tanks have been isolated by dismantling the waste pipelines as described in Chapter 2. The above ground piping, pumps and associated equipment remaining will be removed during closure of the tanks. Figure 7-3 is a photograph of the HSTF area, Figure 7-4 shows the above ground ancillary equipment that will be removed during closure. The underground piping (200-W-230-PL, shown in Figure 7-2) will also be removed.

The piping and associated equipment will be removed and disposed of as debris and will be cleaned and containerized only to the extent necessary to facilitate waste handling and meet disposal unit waste acceptance criteria.

7.2.3 Closure Activities for Soil Beneath Tanks and Piping

In general, the potential for soil contamination because of releases from tanks or piping is limited. Therefore, the general closure approach as identified in Chapter 6 is based on demonstrating through visual inspections and verification sampling that waste releases from the unit did not occur.

After tank removal, the soil at the tank and piping removal areas will be visually inspected and will undergo verification sampling per the approved SAP (DOE/RL-2009-116). Where no soil contamination is identified, indicating that releases have not occurred, the soil at this location will be clean closed. Acceptance will be documented on the inspection checklist (Figure 7-1).

Figure 7-3. Photograph of HSTF Above Ground Piping and Pumps

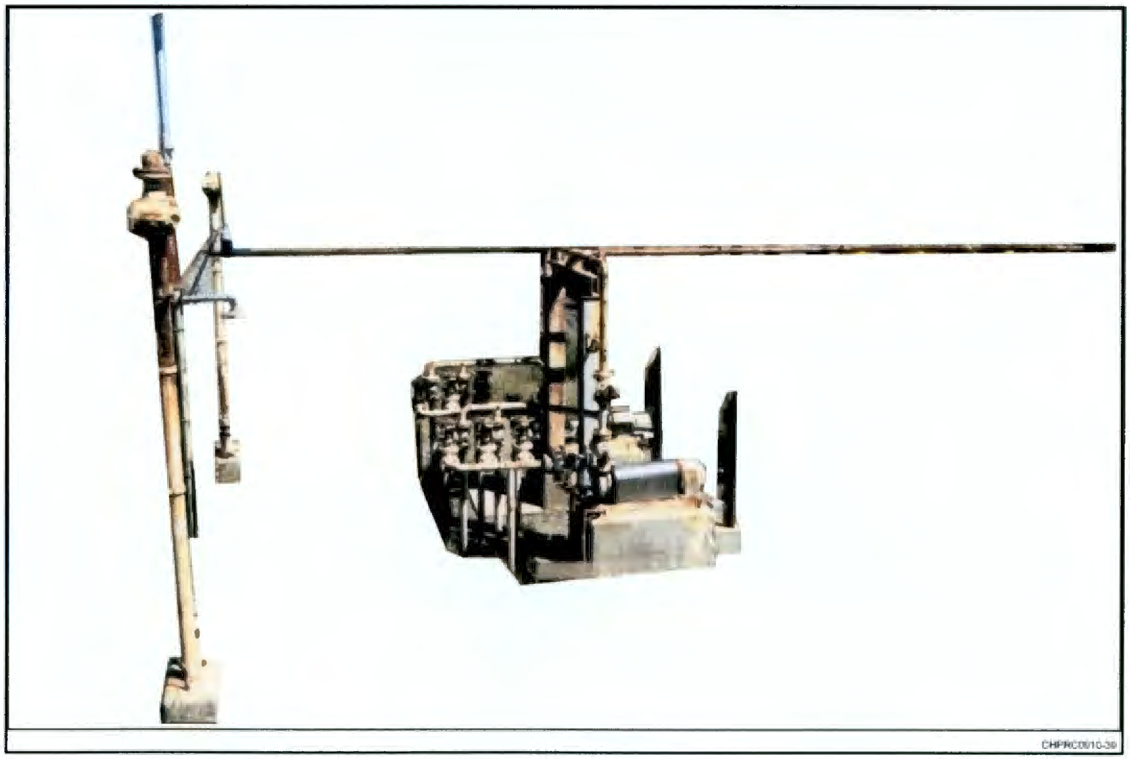


Figure 7-4. Above Ground Equipment to be Removed During Closure

If the soil is found to be contaminated, the condition will be noted on the checklist. Contaminated soil will be removed, containerized, designated, and disposed. The removal area would be documented and sampled in accordance with the approved SAP (DOE/RL-2009-116). The soil would be clean closed when sample results verify achievement of clean closure standards for TSD unit dangerous wastes, dangerous constituents, and residues (Table 6-1). The contamination removal and soil sampling process (Figure 6-1) can be repeated as appropriate until clean closure levels are achieved. Once clean closure levels are confirmed the excavation will be filled and the area will be graveled for dust control, consistent with the appearance and use of surrounding land areas. Alternatively, if sampling shows contamination above clean closure values that will not be removed under this plan, the closure plan would be revised as necessary to identify different clean closure activities or to identify another closure approach (e.g. post closure).

The HSTF TSD unit closure action will comply with all applicable air permitting requirements or with any activity-specific air monitoring plan requirements for radiological or nonradiological air emissions implemented by a coordinated CERCLA remedial action.

Equipment used during closure activities will be decontaminated, reused, or disposed of as waste.

7.3 Inspections

The HSTF TSD unit has been inspected to meet interim status requirements. Annual inspections are performed based on Ecology approval in 2003 (Price, 2003, "Modification of Inspection Frequency of Certain Hanford Facility Treatment Storage, and/or Disposal (TSD) Units"). Until final closure certification (Section 7.6), annual inspections for the unclosed portions of the HSTF will continue.

7.4 Training

A dangerous waste training plan has been maintained for the TSD unit to meet interim status requirements. The duties associated with dangerous waste management activities include performing inspections, and notifying Ecology of any potential threats to human health and the environment. Until final closure certification (Section 7.6), the dangerous waste training plan addressing the HSTF waste management duties for the unclosed portion of the HSTF will be continued.

Training is provided to personnel who perform the annual inspection of the TSD unit and to emergency coordinators for emergency response. Training also will be provided to personnel who perform closure verification sampling activities to ensure that sample data are obtained properly. Following certification of TSD unit closure, training requirements will be discontinued.

7.5 Schedule of Closure

Figure 7-5 provides a schedule for the HSTF closure activities under this plan. The schedule includes the time required to prepare design documents (including permits), remove tanks and piping, perform closure verification sampling at any contaminated soil removal areas (if necessary), and submit a closure certification plan.

Given the duration of closure activities identified in Figure 7-5, tank system closure would require more than 180 days after closure plan approval to complete. Approval of this closure plan represents approval of an extended closure period. If final closure activities cannot be completed in accordance with the approved schedule, an extension of closure in accordance with the requirements of WAC 173-303-610(4)(b), "Closure; Time Allowed for Closure," would be requested.

7.6 Certification of Closure

The HSTF in its entirety will be closed under this plan. This TSD unit is planned to be clean closed in accordance with the specifications in this closure plan. Upon completion of site restoration activities, certification of final closure will be submitted within 60 days to Ecology, in accordance with WAC 173-303-610(6), "Certification of Closure." At the time of final closure certification, the RCRA corrective action status of the HSTF will be determined, in accordance with Hanford Facility RCRA Permit Condition II.Y.2.c.

Figure 7-5. 276-S Tank System Closure Schedule

8 Post-Closure Plan

Tanks 276-S-141 and 276-S-142 and associated piping are proposed to be clean closed under this plan. Subsequently, no constituent subject to the requirements of WAC 173-303-610(2) requiring disposition under a post-closure plan will remain at these tank system locations after closure.

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DOE\RL-2009-116
Revision 0

Sampling and Analysis Plan for the Hexone Storage and Treatment Facility Closure Plan

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

U.S. DEPARTMENT OF ENERGY Richland Operations Office

P.O. Box 550
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DOE\RL-2009-116
Revision 0

Sampling and Analysis Plan for the Hexone Storage and Treatment Facility Closure Plan

Date Published
May 2010

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

U.S. DEPARTMENT OF ENERGY Richland Operations Office

P.O. Box 550
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Release Approval 05/27/2010
Date

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Terms

ALARA	as low as reasonably achievable
ANSI	American National Standards Institute
ASQC	American Society for Quality Control
BTR	buyer's technical representative
CERCLA	*Comprehensive Environmental Response, Compensation, and Liability Act of 1980*
CFR	*Code of Federal Regulations*
COPC	contaminant of potential concern
DOE	U.S. Department of Energy
DQA	data quality assessment
DQI	data quality indicator
DQO	data quality objective
Ecology	Washington State Department of Ecology
EPA	U.S. Environmental Protection Agency
GPS	global positioning system
HASQARD	Hanford Analytical Services Quality Assurance Requirements Document
HEIS	*Hanford Environmental Information System* database
HSTF	Hexone Storage and Treatment Facility
OU	operable unit
PPE	personal protective equipment
QA	quality assurance
QAPjP	quality assurance project plan
QC	quality control
REDOX	Reduction-Oxidation Plant
RPD	relative percent difference
RCRA	*Resource Conservation and Recovery Act of 1976*
RDL	required detection limit
RL	U.S. Department of Energy, Richland Operations Office
SAP	sampling and analysis plan
TSD	treatment, storage, and/or disposal
VOA	volatile organic analyte
WAC	Washington Administrative Code

1 Introduction

The Hexone[1] Storage and Treatment Facility (HSTF) is a *Resource Conservation and Recovery Act of 1976* (RCRA) treatment, storage, and/or disposal (TSD) unit containing two tanks (276-S-141 and 276-S-142) and associated ancillary equipment (e.g., piping). This sampling and analysis plan (SAP) describes the sampling and data gathering methods to be used to perform verification soil sampling after removal of the HSTF system hexone tanks and ancillary equipment. This sampling will provide objective data to confirm the absence of TSD unit constituents[2] at concentrations above clean closure standards. As identified in DOE/RL-2009-112, *276S-Hexone Storage and Treatment Facility Closure Plan*, this sampling addresses Washington Administrative Code(WAC) 173-303-640(8), "Closure and Post-Closure Care," requirement for tank system soil removal areas to meet WAC 173-303-610, "Closure and Post-Closure," decontamination and removal standards. Groundwater is not addressed in this SAP because, based on the depth of the tanks and the depth of groundwater in the 200 West Area, no groundwater is expected to be encountered during closure.

1.1 Site Description and History

The HSTF is located in the southeast corner of the Hanford Site 200 West Area as shown in Figure 1-1. Figure 1-1 also shows the orientation of HSTF in 200 West Area. Figure 1-2 shows the specific locations relative to the local facilities. The HSTF currently consists of two below grade carbon-steel tanks, pumps, and aboveground and underground piping. The HSTF was used from 1951 through 1967 to store reagent-grade hexone for makeup as solvent for the Reduction-Oxidation (REDOX) Plant. After 1967, the HSTF contained distilled hexone, part or all of which had been used in the REDOX Plant. The volume of mixed waste in each tank is approximately 500 L (130 gal.) (less than 1 percent of the tank volume), with the remainder of the tank volume filled with cement. The area is fenced off as a controlled access zone.

1.2 Data Quality Objectives

A systematic planning process patterned after EPA/240/B-06/001, *Guidance on Systematic Planning Using the Data Quality Objectives Process (EPA QA/G-4)*, was used to support the development of this SAP. The data quality objectives (DQO) process is a strategic planning approach for defining the criteria that a data collection design should satisfy. The DQO process is used to ensure that the type, quantity, and quality of environmental data used in decision-making will be appropriate for the intended application.

1.2.1 Statement of the Problem

The problem is to verify that TSD unit constituents, if released to the soil, do not exceed levels established to meet WAC-173-303-610(2)(b)(i), "Closure Performance Standard," clean closure requirements. Based on the results of sampling under this plan, soil that meets these requirements will be considered to have met the closure performance standards (i.e., clean closed).

[1] Hexone is also known as methyl-isobutyl ketone, MIBK or 4-methyl-2 pentanone.

[2] TSD unit constituents refers to "dangerous waste or dangerous waste constituents or residues," which are subject to the numerical closure performance standards in WAC 173-303-610(2)(b), "Dangerous Waste Regulations," "Closure Performance Standard."

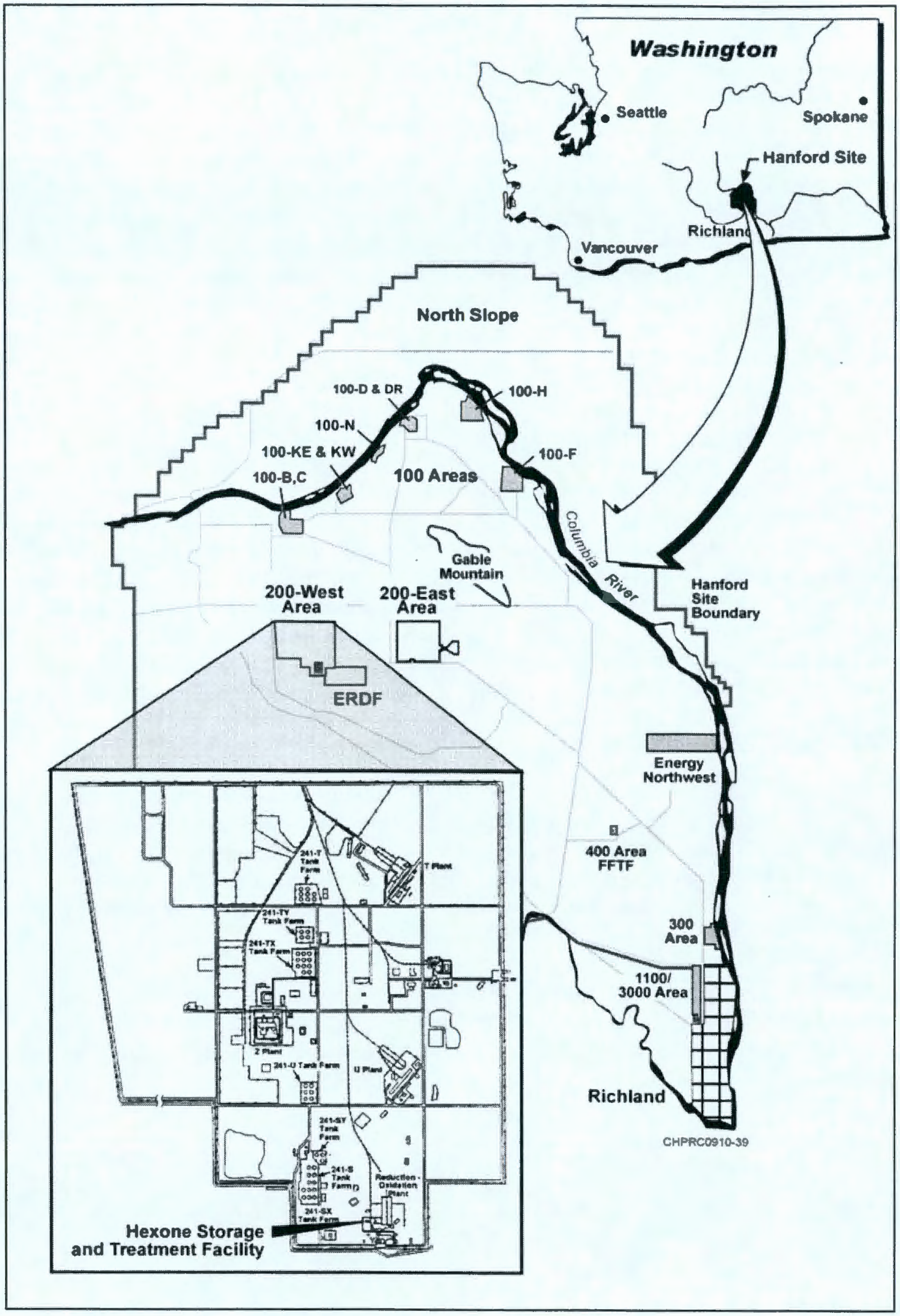

Figure 1-1. HSTF Location and Site Plan

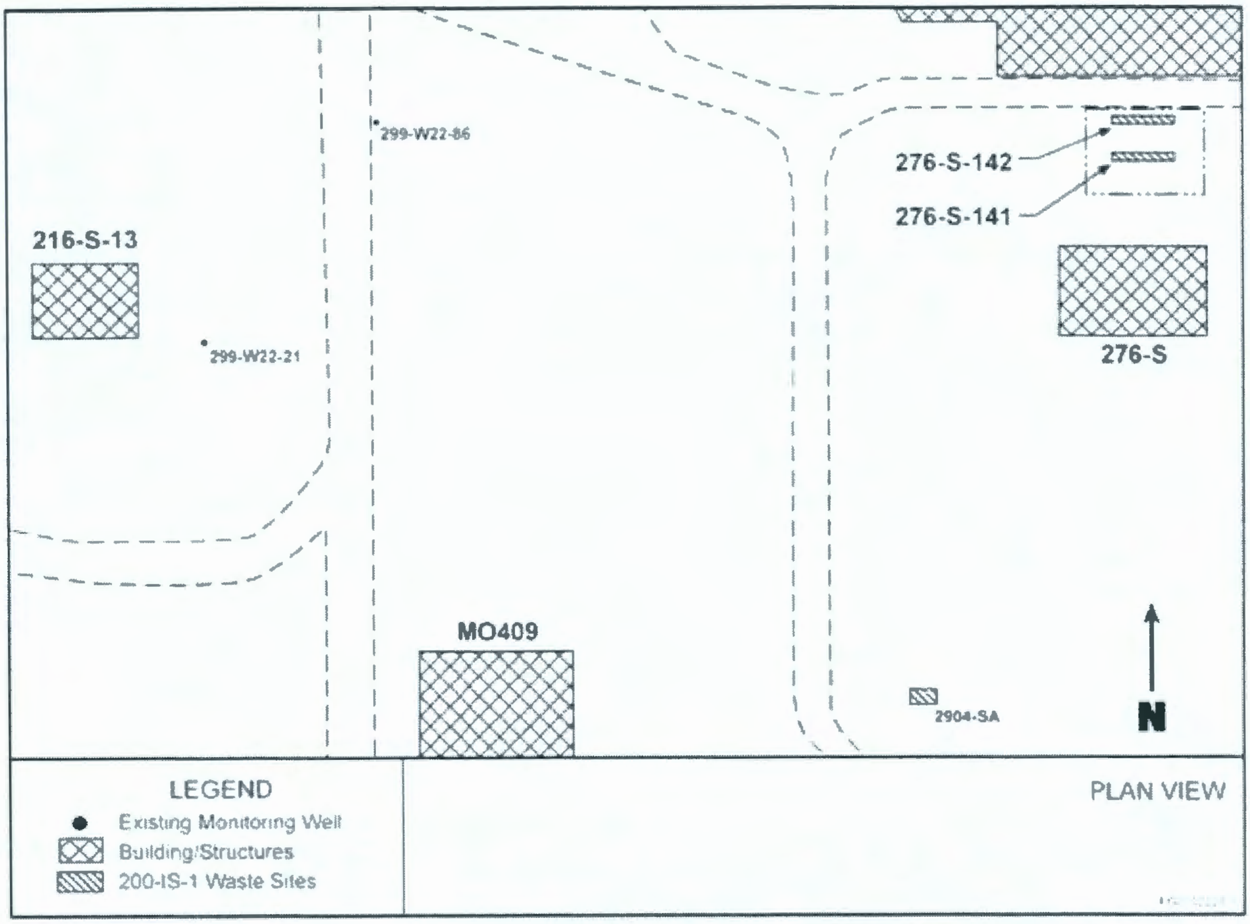

Figure 1-2. 276-S-141 and 276-S-142 Hexone Storage Tanks Location Map

1.2.2 Decision Statements and Decision Rules

The decision statement consolidates potential questions and alternative actions. Decision rule(s) are generated from the decision statement(s). A decision rule is an "IF…THEN…" statement that incorporates the parameter of interest, unit of decision making, action level, and action(s) that would result from resolution of the decision. Table 1-1 presents the decision statement and decision rules for the HSTF soil clean closure activities. Data generated under this SAP will be used, as appropriate, for the decision rules listed in Table 1-1.

Table 1-1. Decision Statements and Decision Rules

Decision Statement	Decision Rules
Decision statement #1 – Determine whether any treatment, storage, and/or disposal unit constituents remain in the soil above WAC 173-303-610 clean closure standards have been released to the soil at tank removal areas.	Decision rule #1a – If sampling does not identify contamination in removal area soil above WAC-173-303-610 clean closure standards, then soil at the location will be clean closed. Decision rule #1b – If sampling identifies contamination above clean closure standards, then additional soil will be removed and the location re-sampled.

Notes:

WAC 173-303-610, "Closure and Post-Closure."

1.3 Constituents Subject to the Numerical Closure Performance Standards

The TSD unit constituents that will require verification to meet clean closure standards are derived from a comparison of the waste codes contained in the HSTF Part A Permit Application and constituents detected during past sampling of the tank heels during interim stabilization to the constituents listed in 40 CFR 268.48, "Land Disposal Restrictions," "Universal Treatment Standards." The HSTF Closure Plan (DOE/RL-2009-112) shows these constituents and the applicable closure performance standards. Table 1-2 identifies the list of TSD unit constituents considered appropriate to verify TSD unit clean closure. However, additional constituents could be added as analytical parameters at the discretion of the Permittee, to address any future RCRA corrective action and/or *Comprehensive Environmental Response, Compensation, and Liability Act of 1980* (CERCLA) decisions.

Table 1-2. HSTF System TSD Unit Constituents

Chemical Abstracts Service Number	Analyte Name
18540-29-9	Hexavalent Chromium
7439-92-1	Lead
7440-02-0	Nickel
75-35-4	1,1-Dichloroethylene
79-00-5	1,1,2-Trichloroethane
107-06-2	1,2-Dichloroethane
106-46-7	1,4-Dichlorobenzene
78-93-3	2-butanone
95-48-7	2-Methylphenol (o-cresol)
121-14-2	2,4-Dinitrotoluene
95-95-4	2,4,5-Trichlorophenol
88-06-2	2,4,6-Trichlorophenol
106-44-5	4-Methylphenol (p-cresol)
67-64-1	Acetone
71-43-2	Benzene
71-36-3	n-Butyl alcohol
56-23-5	Carbon tetrachloride
108-39-4	3-Methylphenol (m-cresol)
84-74-2	Di-n-butyl phthalate
100-41-4	Ethylbenzene
118-74-1	Hexachlorobenzene
87-68-3	Hexachlorobutadiene
67-72-1	Hexachloroethane
108-10-1	Hexone

Table 1-2. HSTF System TSD Unit Constituents

Chemical Abstracts Service Number	Analyte Name
98-95-3	Nitrobenzene
87-86-5	Pentachlorophenol
127-18-4	Tetrachloroethene
79-01-6	Trichloroethylene
75-01-4	Vinyl chloride
1330-20-7	Xylenes (total)
Not applicable	Ignitability

1.4 Summary of Data Quality Objective Process Results (Sampling Design)

Sampling will be required under two scenarios:

- To verify clean closure of the soil after removal of tank and piping
- Where visual inspections identify that releases had occurred and the soil shows signs that contamination was removed

Both scenarios require sampling under this plan to verify that TSD unit constituents do not remain above clean closure standards, established in accordance with WAC 173-303-610(2)(b)(i) requirements, as described in Table 1-3. A focused sampling design will verify that TSD unit constituents are not present in remaining soil above the clean closure standards.

Table 1-3. Required Sample Data

Decision Rule #	Required Data	Samples or Measurements
1a and 1b	Soil Sampling	After equipment or contaminated soil has been removed, soil samples will be taken from the excavation area to verify that no residual soil contamination remains above clean closure standards established in accordance with WAC 173-303-610(2)(b)(i) requirements for unrestricted use. Soil samples will be analyzed for the suite of chemical constituents identified in Table 1-2.

Notes:

WAC 173-303-610(2)(b)(i), "Closure Performance Standard."

2 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. The QAPjP complies with the requirements of the following:

- DOE/RL-96-68, Hanford Analytical Services Quality Assurance Requirements Documents (HASQARD)
- DOE O 414.1C, Quality Assurance
- 10 CFR 830, "Nuclear Safety Management," Subpart A, "Quality Assurance Requirements"
- EPA/240/B-01/003, EPA Requirements for Quality Assurance Project Plans (EPA QA/R-5)

The quality assurance/quality control (QA/QC) and sampling and analysis activities for this SAP specify the QA requirements for TSD units as well as for past practice processes. The organization of this QAPjP is patterned after the QA elements of EPA/240/B-01/003. The QAPjP demonstrates conformance to Part B requirements of ANSI/ASQC E4-2004, *Quality Systems for Environmental Data and Technology Programs: Requirements with Guidance for Use*. The QAPjP is divided into the following four sections (designated in EPA QA/R-5 as A, B, C, and D) which describe the quality requirements and controls applicable to this investigation.

Project Management (Section 2.1) – This section addresses project management, including the project history and objectives, roles and responsibilities of the participants. These elements ensure that the project has a defined goal, that the participants understand the goal and the approach to be used, and that the planning outputs are documented.

Data Generation and Acquisition (Section 2.2) – This section addresses all aspects of project design and implementation. Implementation of these elements ensures that appropriate methods for sampling, measurement and analysis, data collection or generation, data handling, and QC activities are employed and are properly documented.

Assessment and Oversight (Section 2.3) – This section addresses the activities for assessing the effectiveness of the implementation of the project and associated QA and QC activities. The purpose of assessment is to ensure that the QAPjP is implemented as prescribed.

Data Validation and Usability (Section 2.4) – This section addresses the QA activities that occur after the data collection or generation phase of the project is completed. Implementation of these elements ensures that the data conform to the specified criteria, thus achieving the project objectives.

2.1 Project Management

The following subsections address the basic areas of project management, ensuring that the project has a defined goal, that the participants understand the goal and approach to be used, and that the planned outputs have been appropriately documented.

2.1.1 Project and Task Organization

The primary contractor, or its approved subcontractor, will be responsible for collecting, packaging, and shipping soil and other media samples to the laboratory. The project organization, concerning sampling and characterization, is described in the subsections that follow and is shown graphically in Figure 2-1.

With the exception of the U.S. Department of Energy (DOE) Project Manager, all other roles and responsibilities are completed by the primary contractor or its approved subcontractor.

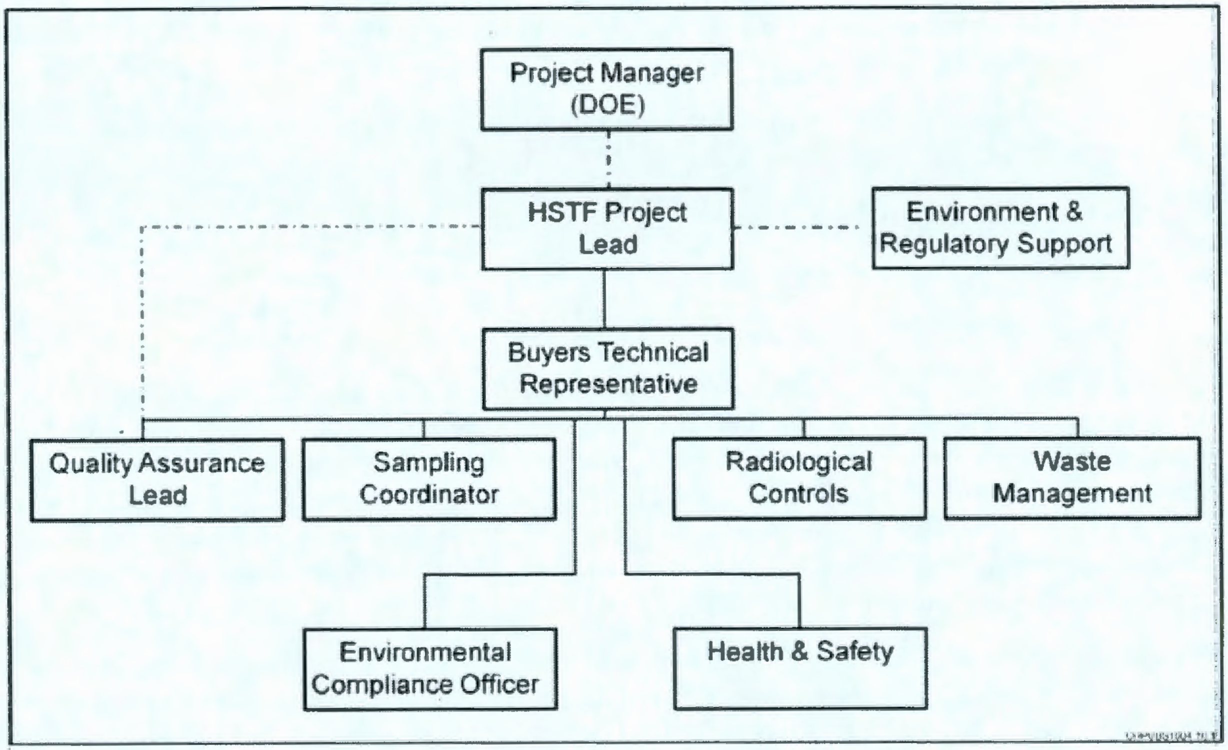

Figure 2-1. Project Organization

2.1.1.1 *DOE Project Manager*

The DOE Project Manager directs closure efforts and coordinates all other efforts for this action.

2.1.1.2 *HSTF Closure Project Lead*

The HSTF closure project lead provides oversight for all activities and coordinates with the U.S. Department of Energy, Richland Operations Office (RL), regulators, and primary contractor management in support of sampling activities. In addition, support is provided to the DOE Project Manager to ensure that the work is performed safely and cost effectively. The project lead is also responsible for direct management of sampling documents and requirements, field activities, and subcontracted tasks. The project lead ensures that the buyer's technical representative (BTR), 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 project lead works closely with the QA and health and safety organizations and the BTR to integrate these and the other lead disciplines in planning and implementing the work scope. The project lead also coordinates with and reports to the regulators and primary contractor management on all sampling activities.

2.1.1.3 *Quality Assurance Lead*

The QA lead is matrixed to the BTR and is responsible for QA issues on the project. Responsibilities include oversight of implementation of the project QA requirements; review of project documents, including SAPs, and the QAPjP; and participation in QA assessments on sample collection and analysis activities, as appropriate.

2.1.1.4 Health and Safety Lead

The health and safety lead's 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, the health and safety lead or their designee assists project personnel to comply with applicable health and safety standards and requirements. Personnel protective equipment (PPE) requirements are coordinated with the radiological controls lead.

2.1.1.5 Buyers Technical Representative

The BTR has the overall responsibility for supporting the HSTF closure project lead in the planning, coordination, and execution of field characterization 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 BTR communicates with the HSTF closure project lead to identify field constraints that could affect the sampling design. In addition, the BTR 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 the U.S. Environmental Protection Agency's (EPA's) 7-step DQO process for this project. Responsibilities include development and documentation of the sampling DQOs and SAP, which includes the sampling design presented in this SAP and the resolution of technical issues. The environmental and regulatory support lead also supports the data quality assessment (DQA) process, as described in Section 2.5.

2.1.1.7 Sampling Coordinator

The sampling coordinator's specific responsibilities include conversion of the sampling design requirements into field task instructions that provide specific direction for field activities. The sampling coordinator also provides oversight of the Sample and Data Management organization and the field samplers, develops and oversees the implementation of the letter of instruction to the sample analysis contractor, and oversees data validation.

The Sample and Data Management organization selects the laboratories that perform the analyses. This organization also ensures that the laboratories conform to HASQARD requirements, or their equivalent, and the QA requirements in the HSTF Closure Plan (DOE/RL-2009-112) and SAP. The Sample and Data Management organization receives the analytical data from the laboratories, performs the data entry into the Hanford Environmental Information System (HEIS), and arranges for data validation.

The samplers collect all samples, including QC samples, and prepare all sample blanks according to the SAP and corresponding field procedures and work packages. The samplers complete the field logbook and chain-of-custody forms, as well as any shipping paperwork. The samplers also deliver the samples to the analytical laboratory.

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

2.1.1.8 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., PPE). Radiological controls interfaces with the project health and safety representative, and plans and directs radiological control technician support for all activities.

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

2.1.2 Problem Definition and Background

The HSTF is a RCRA TSD unit being coordinated with the 200-IS-1 Operable Unit (OU) Tanks/Lines/Pits/ Boxes Waste Group. Prior to sampling under this SAP, closure activities will have been completed for the TSD unit, including excavation and removal of tank system components under the approved HSTF Closure Plan (DOE/RL-2009-112). The general removal area will be sampled to verify that TSD unit constituents do not remain in soil above clean closure standards. Focused sampling will be performed in areas of highest likelihood of leakage. If visual inspection indicates that tank or piping contents were released to the soil, then contaminated soil will be removed and the remaining soil in the affected area will be sampled.

2.1.3 Project and Task Description

This SAP addresses the sampling and analysis activities associated with the closure of the HSTF, which will be closed in accordance with requirements of DOE/RL-2009-112 developed to ensure compliance with the requirements of WAC 173-303-610(2)(b)(i). The remaining soil surface will be verified as meeting closure standards documented in the HSTF Closure Plan (DOE/RL-2009-112) through soil sampling and analysis according to this SAP.

Details of the closure background, approach, site plan, and cleanup criteria are contained in the body of the HSTF Closure Plan (DOE/RL-2009-112).

The field activities described in the SAP include surface soil sampling at the top 0 to 15.24 cm (0 to 6 in.) and analysis for evaluation of the soil removal areas beneath removed tank system components. The Field Sampling Plan (Chapter 3.0) includes site-specific sampling details. Samples will be analyzed for TSD unit constituents to verify achievement of clean closure standards. Chemical and *Atomic Energy Act of 1954* regulated contaminants of potential concern (COPCs) for the 200-IS-1 OU also could be analyzed to assist with OU remedial decision making.

At the completion of sampling, a verification report will be prepared to summarize the sample locations, the number and types of samples collected, and associated HEIS numbers.

2.1.3.1 Constituents of Concern

The TSD unit constituents requiring verification of removal to meet clean closure standards are identified in Section 1.3. Table 2-1 provides the potential cleanup levels (including the laboratory practical quantitation limits), that were considered in determining analytical detection requirements and clean closure levels for the TSD unit constituents, leading to the selection of the clean closure cleanup levels. The constituent of concern list was developed from the unit-specific Part A Form and process knowledge of hexone being the only listed waste constituent under F003. In addition, constituents that were above detection limits also appearing on the universal treatment standard table within 40 CFR 268.48 were included after evaluating the analytical results from BHI-01521, *Evaluation of Alternatives for the Interim Stabilization of Hexone Tanks.*

If additional analytes not identified as TSD unit constituents (or CERCLA COPCs) are detected by the analytical methods used for laboratory analysis, the additional detected analytes and their concentrations will be evaluated against regulatory standards and existing process knowledge. All analytes detected above the required detection limit (RDL) will be reported.

2.1.4 Quality Objectives and Criteria

The QA objective of this plan is to develop implementation guidance that will provide data of known and appropriate quality. Data quality indicators (DQI) assess data quality, by evaluation against identified DQOs, and by evaluation against the work activities identified in this SAP. 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. The principal DQI are precision, bias or accuracy, representativeness, comparability, completeness, and sensitivity. These DQIs are defined for the purposes of this document in Table 2-2. The DQIs will be evaluated during the DQA process (Section 2.5).

Quality objectives and project-specific measurements requirements are presented in Table 2-3 for TSD unit constituents that must meet clean closure standards. Tables 2-4 and 2-5 identify the requirements for non-TSD unit constituents; including *Atomic Energy Act of 1954* regulated material and chemical analytes that would be used to meet corrective action and CERCLA remedial investigation requirements. In consultation with the laboratory, the HSTF closure project lead, and/or others as appropriate, the Sample Management and Reporting organization identify appropriate analytical methods.

In the event of a laboratory analytical failure, the laboratory is required to initiate corrective actions with the Sample and Data Management team of the Environmental Information Systems group. As part of the data package transmittal procedure, a sample disposition record is generated to define the problem and to indicate the agreed upon solution reached with discussions by the HSTF closure project lead or BTR. As part of the sample disposition process, quarterly trend reports containing quality statistics are compiled based on the sample disposition records. This provides an insight into emerging problems and the effectiveness of past responses to problems.

Table 2-1. Comparison of Background Soil Data to Residential Clean Closure Levels for HSTF System TSD Unit Dangerous Constituents

TSD Unit Dangerous Waste, Dangerous Waste Constituents, and Residues[a]	CAS No.	90% Log Normal Percentile[b]	Soil Concentration Protective of Groundwater[c] (mg/kg)	Human Health Protection Soil Direct Contact[d] (mg/kg)		Ecological Protection[e] (mg/kg)	PQLs	Clean Closure Standard [f] (mg/kg)
				Carcinogen	Non-carcinogen			
Hexavalent Chromium	18540-29-9	N/A	18.4	N/A	240	N/A	0.5	18.4
Lead	7439-92-1	10.2	3,000	N/A	250[g]	50	5	50
Nickel	7440-02-0	19.1	130	N/A	1,600	30	4	30
1,1- Dichloroethylene	75-35-4	N/A	0.0501	N/A	4,000	N/A	0.002	0.0501
1,1,2-Trichloroethane	79-00-5	N/A	0.00427	17.5	320	N/A	0.002	0.00427
1,2-Dichloroethane	107-06-2	N/A	0.00232	11	1,600	N/A	0.0015	0.00232
1,4-Dichlorobenzene	106-46-7	N/A	0.134	185	5,600	20	0.004	0.134
2-butanone	78-93-3	N/A	20	N/A	48,000	N/A	0.01	20
2-Methylphenol (o-cresol)	95-48-7	N/A	2.3	N/A	4,000	N/A	0.33	2.3
2,4-Dinitrotoluene	121-14-2	N/A	0.00167	3.23	160	N/A	0.33	0.33
2,4,5-Trichlorophenol	95-95-4	N/A	28.8	N/A	8,000	4	0.33	4
2,4,6-Trichlorophenol	88-06-2	N/A	0.0462	90.9	80	10	0.33	0.33
4-Methylphenol (p-cresol)	106-44-5	N/A	0.40	N/A	400	N/A	0.33	0.40
Acetone	67-64-1	N/A	28.9	N/A	8,000	N/A	0.02	29
Benzene	71-43-2	N/A	0.00448	18.2	320	N/A	0.0015	0.00448
n-Butyl alcohol	71-36-3	N/A	3.5	N/A	8,000	N/A	0.1	3.5
Carbon tetrachloride	56-23-5	N/A	0.0031	7.69	56	N/A	0.005	0.005
3-Methylphenol (m-cresol)	108-39-4	N/A	4.0	N/A	4,000	N/A	0.66	4.0
Di-n-butyl phthalate	84-74-2	N/A	58	N/A	8,000	N/A	0.33	58
Ethylbenzene	100-41-4	N/A	0.0344	90.9	8,000	N/A	0.005	0.0344
Hexachlorobenzene	118-74-1	N/A	0.0877	0.625	64	17	0.33	0.33

Table 2-1. Comparison of Background Soil Data to Residential Clean Closure Levels for HSTF System TSD Unit Dangerous Constituents

TSD Unit Dangerous Waste, Dangerous Waste Constituents, and Residues[a]	CAS No.	90% Log Normal Percentile[b]	Soil Concentration Protective of Groundwater[c] (mg/kg)	Human Health Protection Soil Direct Contact[d] (mg/kg)		Ecological Protection[e] (mg/kg)	PQLs	Clean Closure Standard[f] (mg/kg)
				Carcinogen	Non-carcinogen			
Hexachlorobutadiene	87-68-3	N/A	0.605	12.8	80	N/A	0.33	0.605
Hexachloroethane	67-72-1	N/A	0.125	71.4	80	N/A	0.33	0.33
Hexone	108-10-1	N/A	12.8	N/A	6,400	N/A	0.01	12.8
Nitrobenzene	98-95-3	N/A	0.102	N/A	160	40	0.33	0.33
Pentachlorophenol	87-86-5	N/A	0.0116	8.33	2,400	3	0.33	0.33
Tetrachloroethene	127-18-4	N/A	0.000867	1.85	800	N/A	0.005	0.005
Trichloroethylene	79-01-6	N/A	0.003	11	N/A	N/A	0.001	0.003
Vinyl chloride	75-01-4	N/A	0.000383	1.39	240	N/A	0.005	0.005
Xylenes (total)	1330-20-7	N/A	14.6	N/A	16,000	N/A	0.01	14.6
Ignitability	IGNITABLTY	N/A	N/A	N/A	N/A	N/A	1° C	N/A

Notes:

Clean closure evaluations for TSD units are required to use unrestricted (residential) levels in WAC 173-340-740(3), "Method B Soil Cleanup Levels for Unrestricted Land Use," based on WAC 173-303-610(2)(b)(i), "Closure Performance Standard."

a. HSTF constituents have been identified based on the unit-specific Part A Form and process knowledge of hexone being the only listed waste constituent under F003. In addition, constituents that were above detection limits also appearing within 40 CFR 268.48, "Land Disposal Restrictions," "Universal Treatment Standards," were included after evaluating the analytical results from BHI-01521, Evaluation of Alternatives for the Interim Stabilization of Hexone Tanks.

b. DOE/RL-92-24, Hanford Site Background: Part 1, Soil Background for Nonradioactive Analytes, Vol. I.

c. WAC 173-340-747(4) "Fixed parameter three-phase partitioning model" as allowed by WAC 173-340-740(3)(b)(iii)(A), "Ground Water Protection."

d. WAC 173-340-740(3)(b)(iii)(B), "Soil Direct Contact," (I), "Noncarcinogens," and (II), "Carcinogens." Equations are found for human health direct contact.

e. WAC 173-340-740(3)(b)(ii), "Environmental Protection." Point of compliance is surface to 4.6 m (15 ft) (WAC 173-340-740(6), "Four-phase partitioning model") Table 749-3 values are screening levels and were not intended to be clean-up levels (WAC 173-340-7493(2)(a)(i), "The Chemicals of Ecological Concern"). If soil sample analytical results exceed these screening level results, DOE may develop another number to be used as the clean-up level in accordance with the provisions of WAC 173-340-740, "Unrestricted Land Use Soil Cleanup Standards.

f. The overall clean closure level is the most restrictive risk based level, provided that it is not below background. PQLs were considered in establishing the clean closure cleanup levels in accordance with WAC 173-340-707(2), "Analytical Considerations."

g. Value from Table 740-1 of WAC173-340-900, "Tables", revised November 2007.

CAS = Chemical Abstracts Service
PQL = practical quantitation limit
N/A = not applicable

Table 2-2. 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 as either the range or 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 samples 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 precision: 276-S-141 Tank was randomly selected for collection of a duplicate sample. Laboratory precision; analysis of laboratory duplicate or matrix spike duplicate.	If duplicate data do not meet objective: • Evaluate apparent cause (e.g., sample heterogeneity). • Request re-analysis or re-measurement. • Qualify the data before use.
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 recovery does not meet objective: • Qualify the data before use. • Request re-analysis or re-measurement.

Table 2-2. Data Quality Indicators

Data Quality Indicator	Definition	Example Determination Methodologies	Project Specific Information*	Corrective Actions
Representa-tiveness	A qualitative term that expresses "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).	Evaluate whether measurements are made and physical samples collected in a manner (through field documentation and approved procedures) that the resulting data appropriately reflect the environment or condition being measured or studied.	Samples will be collected as described in the sampling design. Random sampling is based on ensuring all members of the group are equally likely to be chosen and allows probability statements to be made about the quality of estimates derived from the data.	If results are not representative of the system sampled: • Identify the source of the non-representation. • 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. • Resample and re-analyze.
Comparability	A qualitative term that expresses 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.	All sampling personnel will use the same sampling protocols. Samples will be submitted to the same laboratories when possible (based on laboratory contracts) for analysis by the same methods, thus data results will be comparable.	Data collected through this SAP only needs to be self-consistent.

Table 2-2. 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 defined in this SAP. There is no specific quantitative completeness requirement.	Compare the number of valid measurements completed (samples collected or samples analyzed) with those established by the project's quality criteria (data quality objectives or performance/acceptance criteria).	The percent complete will be determined during data validation.	If data set does not meet completeness objective: • Identify appropriate changes to data collection and/or analysis methods. • Identify quantifiable bias, if applicable. • Qualify the data as appropriate. • Resample and/or re-analyze if needed. • Revise sampling/analysis protocols to ensure future completeness.
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 that can be measured by a method (method detection limit), by an instrument (instrument detection limit), or by a laboratory (quantitation limit). The practical quantitation limit is the lowest level that can be routinely quantified and reported by a laboratory.	Ensure that sensitivity, as measured detection limits, is appropriate for the action levels.	If sensitivity does not meet objective: • Request re-analysis or re-measurement. • Qualify/reject the data before use.

Notes:

* Field sampling requirements are noted. Laboratories will follow contract requirements for use and interpretation of laboratory control samples.

ANSI/ASQC S2-1995, 1995, *Introduction to Attribute Sampling.*

Table 2-3. Analytical Performance Requirements for TSD Unit Dangerous Constituents

TSD Constituent	CAS No.	Analytical Method [a]	RDL (mg/kg)	Precision Requirement (% RPD) [b]	Accuracy Requirement (% Recovery) [c]
Hexavalent Chromium	18540-29-9	EPA 7196 (hexavalent chromium)	0.5	≤30%	70-130%
Lead	7439-92-1	EPA 6010 (ICP metals)	5	≤30%	70-130%
Nickel	7440-02-0	EPA 6010 (ICP metals)	4	≤30%	70-130%
1,1-Dichloroethylene	75-35-4	EPA 8260 (volatile organics)	0.002	≤30%	70-130%
1,1,2-Trichloroethane	79-00-5	EPA 8260 (volatile organics)	0.002	≤30%	70-130%
1,2-Dichloroethane	107-06-2	EPA 8260 (volatile organics)	0.0015	≤30%	70-130%
1,4-Dichlorobenzene	106-46-7	EPA 8260 (volatile organics)	0.004	≤30%	70-130%
2-butanone	78-93-3	EPA 8260 (volatile organics)	0.01	≤30%	70-130%
2-Methylphenol (o-cresol)	95-48-7	EPA 8270 (semivolatiles)	0.33	≤30%	70-130%
2,4- Dinitrotoluene	121-14-2	EPA 8270 (semivolatiles)	0.33	≤30%	70-130%
2,4,5-Trichlorophenol	95-95-4	EPA 8270 (semivolatiles)	0.33	≤30%	70-130%
2,4,6-Trichlorophenol	88-06-2	EPA 8270 (semivolatiles)	0.33	≤30%	70-130%
4-Methylphenol (p-cresol)	106-44-5	EPA 8270 (semivolatiles)	0.33	≤30%	70-130%
Acetone	67-64-1	EPA 8260 (volatile organics)	0.02	≤30%	70-130%
Benzene	71-43-2	EPA 8260 (volatile organics)	0.0015	≤30%	70-130%
n-Butyl alcohol	71-36-3	EPA 8260 (volatile organics)	0.1	≤30%	70-130%
Carbon tetrachloride	56-23-5	EPA 8260 (volatile organics)	0.005	≤30%	70-130%
3-Methylphenol (m-cresol)	108-39-4	EPA 8270 (semivolatiles)	0.66	≤30%	70-130%
Di-n-butyl phthalate	84-74-2	EPA 8270 (semivolatiles)	0.33	≤30%	70-130%
Ethylbenzene	100-41-4	EPA 8260 (volatile organics)	0.005	≤30%	70-130%
Hexachlorobenzene	118-74-1	EPA 8270 (semivolatiles)	0.33	≤30%	70-130%
Hexachlorobutadiene	87-68-3	EPA 8270 (semivolatiles)	0.33	≤30%	70-130%

Table 2-3. Analytical Performance Requirements for TSD Unit Dangerous Constituents

TSD Constituent	CAS No.	Analytical Method [a]	RDL (mg/kg)	Precision Requirement (% RPD) [b]	Accuracy Requirement (% Recovery) [c]
Hexachloroethane	67-72-1	EPA 8270 (semivolatiles)	0.33	≤30%	70-130%
Hexone	108-10-1	EPA 8260 (volatile organics)	0.01	≤30%	70-130%
Nitrobenzene	98-95-3	EPA 8270 (semivolatiles)	0.33	≤30%	70-130%
Pentachlorophenol	87-86-5	EPA 8270 (semivolatiles)	0.33	≤30%	70-130%
Tetrachloroethene	127-18-4	EPA 8260 (volatile organics)	0.005	≤30%	70-130%
Trichloroethylene	79-01-6	EPA 8260 (volatile organics)	0.001	≤30%	70-130%
Vinyl chloride	75-01-4	EPA 8260 (volatile organics)	0.005	≤30%	70-130%
Xylenes (total)	1330-20-7	EPA 8260 (volatile organics)	0.01	≤30%	70-130%
Ignitability	IGNITABLTY	EPA 1010 (ignitability)	1° C	N/A	N/A

Notes:

a. For all four-digit EPA methods, refer to SW-846, *Test Methods for Evaluating Solid Waste: Physical/Chemical Methods, Third Edition; Final Update IV-B.*

b. Precision criteria for batch laboratory replicate sample analyses.

c. Accuracy criteria for associated batch laboratory control sample percent recoveries. Additional analysis-specific evaluations also preformed for matrix spikes, tracers, and carriers as appropriate to the method.

CAS = Chemical Abstracts Service

ICP = inductively coupled plasma

N/A = not applicable

RPD = relative percent difference

RDL = required detection limit

Table 2-4. Analytical Performance Requirements for Opportunistic CERCLA Soil Sampling of Radiological COPCs

COPC	CAS No.	Analytical Method	Preliminary Action Level: Human Health Protection Soil (pCi/g)[a]	Preliminary Action Level: Groundwater Protection (pCi/g)[b]	Preliminary Action Level: Terrestrial Biota Concentration Guide (pCi/g)[c]	RDL (pCi/g)	Precision	Accuracy
Americium-241	14596-10-2	Americium-241/Curium-244	3.66	2.52	3,890	1	≤30%	70-130%
Carbon-14	14762-75-5	Carbon-14 - Low Level	0.128	40	4,760	50	≤30%	70-130%
Cesium-137	10045-97-3	Gamma Spectroscopy	0.0438	40.8	20.8	0.1	≤30%	70-130%
Curium-244	13981-15-2	Americium-241/Curium-244	4.39	25.9	4,060	1	≤30%	70-130%
Europium-154	15585-10-1	Gamma Spectroscopy	0.0191	N/A	1,290	0.1	≤30%	70-130%
Europium-155	14391-16-3	Gamma Spectroscopy	0.9	N/A	15,800	0.1	≤30%	70-130%
Plutonium-238	13981-16-3	Isotopic Plutonium	2.92	1.56	5,270	1	≤30%	70-130%
Plutonium-239/240	Pu-239/240	Isotopic Plutonium	2.88	1.56	6,110	1	≤30%	70-130%
Total Beta Radiostrontium[d]	RAD-SR	Strontium 89/90 - Total Beta Radiostrontium	0.0492	0.192	22.5	1	≤30%	70-130%
Tritium	10028-17-8	Tritium - Low Level Soil	4.51	80	174,000	400	≤30%	70-130%
Uranium-233/234	13966-29-5	Isotopic Uranium	5.81	0.24	4,830	1	≤30%	70-130%
Uranium-238	U-238	Isotopic Uranium	0.979	0.24	1,580	1	≤30%	70-130%

Notes:

a. Action levels are from EPA/540-R-00-006, *Soil Screening Guidance for Radionuclides: Technical Background Document.*

b. Based on DOE/EH-0676, *RESRAD-BIOTA: A Tool for Implementing A Graded Approach to Biota Dose Evaluation, User's Guide*, Version 1.

c. DOE-STD-1153-2002, *A Graded Approach for Evaluating Radiation Doses to Aquatic and Terrestrial Biota.*

d. All values are for strontium-90.

CAS = Chemical Abstracts Service

N/A = not applicable

Table 2-5. Analytical Performance Requirements for Opportunistic CERCLA Soil Sampling of Nonradiological COPCs

COPC	CAS No.	Analytical Method[a]	WAC 173-340-745[b] (mg/kg)	Groundwater Protection[c] (mg/kg)	Terrestrial Biota Protection[d] (mg/kg)	RDL (mg/kg)	Precision Requirement (% RPD)[e]	Accuracy Requirement (% Recovery)[e]
Metals								
Chromium	7440-47-3	EPA 6010 (ICP metals)	5,250,000	2,000	42	1	≤30%	70-130%
Copper	7440-50-8	EPA 6010 (ICP metals)	140,000	284	50	1	≤30%	70-130%
Uranium	7440-61-1	Total Uranium (chemical)	10,500	270	5	1	≤30%	70-130%
Inorganics								
Chloride	16887-00-6	EPA 300.0 (anions by IC)	N/A	1,000	N/A	2	≤30%	70-130%
Fluoride	16984-48-8	EPA 300.0 (anions by IC)	210,000	1,440	N/A	5	≤30%	70-130%
Phosphorous	7440-02-0	EPA 300.0 (phosphate by IC)	N/A	N/A	N/A	5	≤30%	70-130%
Organics								
2-hexanone	591-78-6	EPA 8260 (volatile organics)	17,500	0.341	N/A	0.02	≤30%	70-130%
Aroclor 1254	11097-69-1	EPA 8082A (PCBs by GC)	65.6	0.11	0.65	0.0165	≤50%	50-150%
Tributyl phosphate	126-73-8	EPA 8270 (semivolatiles)	14,270	0.49	N/A	3.3	≤30%	70-130%
TPH-Diesel	68334-30-5	WTPH-D	2,000[f]	2,000[f]	200	5	≤30%	70-130%

Notes:

a. For all four-digit EPA methods, refer to SW-846, *Test Methods for Evaluating Solid Waste: Physical/Chemical Methods, Third Edition; Final Update IV B.* For EPA Method 300.0, see EPA-600/4-79/020, *Methods for Chemical Analysis of Water and Wastes.*

b. WAC 173-340-745 (5)(b)(iii), "Soil Cleanup Standards for Industrial Properties."

c. WAC 173-340-747, "Deriving Soil Concentrations for Ground Water Protection."

d. Values from Table 749-3 of WAC 173-340-900, "Tables," amended November 2007.

e. Accuracy criteria for associated batch laboratory control sample percent recoveries. Except for gamma energy analysis, additional analysis-specific evaluations also preformed for matrix spikes, tracers, and carriers as appropriate to the method. Precision criteria for batch laboratory replicate sample analyses.

f. Based on WAC 173-340-900, Tables 740-1 and 745-1, amended November 2007.

Table 2-5. Analytical Performance Requirements for Opportunistic CERCLA Soil Sampling of Nonradiological COPCs

COPC	CAS No.	Analytical Method[a]	WAC 173-340-745[b] (mg/kg)	Groundwater Protection[c] (mg/kg)	Terrestrial Biota Protection[d] (mg/kg)	RDL (mg/kg)	Precision Requirement (% RPD)[e]	Accuracy Requirement (% Recovery)[e]

CAS = Chemical Abstracts Service
IC = ion chromatography
ICP = inductively coupled plasma
N/A = not applicable
TPH = total petroleum hydrocarbons
TPH-D = Washington State total petroleum hydrocarbons – diesel range

2.1.5 Special Training Requirements and Certification

The training requirements below pertain to the closure activities; however, they do not pertain to the training requirements in WAC 173-303, "Dangerous Waste Regulations." The HSTF Closure Plan (DOE/RL-2009-112) identifies training requirements for TSD unit personnel who perform duties subject to WAC 173-303 requirements.

Training or certification requirements have been instituted by the performing contractor team to meet training requirements imposed by the regulations, DOE orders, contractor requirements documents, and American National Standards Institute (ANSI) and American Society of Mechanical Engineers standards.

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
- Eight-hour hazardous waste worker refresher training (as required)

A graded approach is used to ensure that workers receive a level of training (commensurate with their responsibilities) 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 activities, and facility/worksite orientations.

2.1.6 Documents and Records

The HSTF closure project lead is responsible for ensuring that the current version of the SAP is being used and for providing any updates to field personnel. The administrative document control process maintains version control. Changes to the sampling plan will be made by the HSTF closure project lead including obtaining appropriate regulatory approvals. Table 2-6 defines the types of changes that may be made to the sampling design and the documentation requirements.

Table 2-6. Example Table for Change Control for Sampling Projects

Type of Change	Action	Documentation
Adding constituents, number of samples outside of WAC 173-303 authority (e.g., radionuclides)	Project management approval; notify regulatory agency if appropriate	Project's sample tracking system
Adding or eliminating target constituents, reducing the number of sampling points subject to WAC 173-303 authority	Revise Sampling and Analysis Plan; obtain regulatory approval; distribute plan	Revised plan

Notes:

WAC 173-303, "Dangerous Waste Regulations."

The fieldwork supervisor or BTR is responsible for ensuring that the field instructions are up-to-date and conducted in compliance with any revisions to the SAP. The fieldwork supervisor or BTR will ensure that deviations from the SAP or problems encountered in the field are identified, managed and documented appropriately (e.g., in the field logbook).

The HSTF closure project lead, fieldwork supervisor, or designee will be responsible for communicating field corrective action requirements and for ensuring that immediate corrective actions are applied to field activities and verifying the effectiveness of actions taken.

Logbooks are required for field activities. The logbook must be identified with a unique project name and number. Individuals responsible for recording information in the logbooks will be identified in the front of the logbook. Only authorized persons may make entries. The fieldwork supervisor or other responsible individual will sign logbooks. Logbooks will meet the following requirements:

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

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

The HSTF closure project lead is responsible for ensuring that a project file is properly maintained. The project file will include the following, as appropriate:

- Field logbooks or operational records
- Global positioning system (GPS) data
- Chain-of-custody forms
- Sample receipt records
- Inspection or assessment reports and corrective-action reports
- Interim progress reports
- Final reports

The project file will contain the records or references to their storage locations.

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

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

Records may be stored in either electronic or hard copy format. Documentation and records, regardless of medium or format, are placed in the operating record in accordance with the Condition II.I in WA7890008967, *Hanford Facility Resource Conservation and Recovery Act Permit, Dangerous Waste Portion, Revision 8C, for the Treatment, Storage, and Disposal of Dangerous Waste*, or WAC 173-303-380, "Facility Recordkeeping," and controlled in accordance with internal work requirements and processes that ensure accuracy and retrievability of stored records. Records required to be entered into the Administrative Record will be managed in accordance with Ecology et al., 1989, *Hanford Federal Facility Agreement and Consent Order Action Plan*, (Tri-Party Agreement Action Plan).

2.2 Data Generation and Acquisition

The following subsections address data generation and acquisition to ensure that the project's methods for sampling, measurement and analysis, data collection or generation, data handling, and QC activities are appropriate and documented.

2.2.1 Sample Process Design

Chapter 3.0 presents the field-sampling plan for this effort. This chapter also includes information on sampling objectives and methodologies.

2.2.2 Sampling Methods

The soil surface remaining after the removal of the HSTF tanks and ancillary equipment will be sampled in accordance with field sampling procedures.

If sampling activities are not accomplished in accordance with this SAP, failures observed by the fieldwork supervisor will be documented in the field logbook and may result in changes to the SAP, in accordance with Section 3.5.4. The fieldwork supervisor has responsibility for addressing immediate field issues. Specific sampling information (described in Chapter 3.0) will include the following:

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

2.2.2.1 Sample Location

The preliminary sample location(s) are generally identified in Chapter 3.0 for field implementation. Actual sample locations will be identified in the field before starting the activity. The technical lead or fieldwork supervisor will mark the location. After the location has been marked, minor adjustments to the location may be made to mitigate unsafe conditions and avoid structural interferences. Sample location identification numbers will be defined during or after sampling. Changes in sample locations that do not affect the DQOs will require approval of the HSTF closure project lead. Changes to sample locations that result in impacts to the DQOs will require concurrence by RL and Washington State Department of Ecology (Ecology; the lead regulatory agency).

2.2.3 Sample Handling and Custody

Field sample handling, shipping, and custody requirements will be consistent with established procedures. Sample handling and custody information is provided in the sections that follow.

2.2.3.1 Sample Identification

The Sample Data Tracking database will be used to track the samples from the point of collection through the collection and 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 in accordance with onsite organizational procedures. Each radiological/nonradiological and physical properties 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:

- Sampling Authorization Form
- HEIS number
- Sample collection date and time
- Name or initials of person collecting the sample
- Analysis required
- Preservation method (if applicable)

2.2.3.2 *Field Sampling Logbook*

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. The individual who made the entry will date and sign entries made in the logbook. Program requirements for managing the generation, identification, transfer, protection, storage, retention, retrieval, and disposition of records within the performing contractor will be followed.

2.2.3.3 *Sample Custody*

Sample custody will be maintained in accordance with existing Hanford Site protocols. The custody of samples will be maintained from the time the samples are collected until the ultimate disposal of the samples, as appropriate. A chain-of-custody record initiated in the field at the time of sampling will accompany each set of samples shipped to any laboratory. Samples will be sent to the laboratory in accordance with applicable shipping procedures. The analyses requested for each sample will be indicated on the accompanying chain-of-custody form. Custody tape will be used to provide indication of tampering with the samples. The custody tape will be inscribed with the sampler's initials and the date.

Chain-of-custody procedures will be followed throughout sample collection, transfer, analysis, and disposal to ensure that sample integrity is maintained. 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 shipper will make a copy of the signed record before sample shipment and will transmit the copy to Sample and Data Management 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 collection
- Matrix
- Preservatives
- Signatures of individual involved in sample transfer
- Requested analyses or reference thereto

2.2.3.4 *Laboratory Sample Custody*

Sample custody during laboratory analysis is addressed in the applicable laboratory standard operating procedures. Laboratory custody procedures will ensure that sample integrity and identification are maintained throughout the analytical process. Storage of samples at the laboratory will be consistent with laboratory instructions prepared by the Data and Sample Management organization.

2.2.4 Analytical Methods

Tables 2-3, 2-4, and 2-5 list the applicable fixed-laboratory methods for analytes and target detection limits. These analytical methods are controlled in accordance with the laboratory's QA Plan and the requirements of this QAPjP. The primary contractor participates in oversight of offsite analytical laboratories to qualify them for performing Hanford Site analytical work.

If the laboratory uses a nonstandard or unapproved method, then the laboratory must provide method validation data to confirm that the method is adequate for the intended use of the data. This includes information such as determination of detection limits, quantitation limits, typical recoveries, and analytical precision and bias. Deviations from the analytical methods noted in Tables 2-3, 2-4, and 2-5 must be approved by the Sample and Data Management organization.

Laboratories providing analytical services in support of this SAP will have in place a corrective action program that addresses analytical system failures and documents on the effectiveness of any corrective actions. Issues that may affect analytical results are to be resolved by the Sample and Data Management organization in coordination with the HSTF closure project lead.

2.2.5 Quality Control

The QC procedures must be followed in the field and laboratory to ensure that reliable data are obtained. Field QC samples will be collected to evaluate the potential for cross-contamination and provide information pertinent to field sampling variability. Field QC sampling will include the collection of field transfer blank, equipment rinsate blank, and field duplicate samples. Laboratory QC samples estimate the precision and bias of the analytical data. Field QC samples are summarized in Section 3.3.5.

Field QC samples will be collected to evaluate the potential for cross-contamination and to provide information pertinent to field variability. Field QC for sampling for this 200-IS-1 OU dangerous waste TSD unit will require the collection of field duplicate, equipment rinsate blank, and field blank samples. The QC samples and the required frequency for collection are described in this section and in Section 3.3.5.

2.2.5.1 *Field Duplicates*

Each field duplicate will be retrieved from the sample interval using the same equipment and sampling technique as the original sample. Field duplicates are collected and homogenized before being divided into two samples in the field. If required, volatile organic analyte (VOA) samples should be collected before homogenization. The duplicate samples will be sent to the primary laboratory in the same manner as the routine site samples. Field duplicates, which provide information regarding the homogeneity of the sample matrix, can be used to evaluate the precision of the analysis process.

At least 5 percent of the total collected samples will be duplicated. At least one field duplicate will be collected from the waste site. The duplicate sample(s) will be suitable for analysis by an offsite laboratory and will be analyzed for all of the constituents listed in Tables 2-3, 2-4, and 2-5.

2.2.5.2 Equipment Rinsate Blanks

Equipment rinsate blanks are used to verify the adequacy of sampling equipment decontamination procedures and will be collected for each sampling method or from each type of non-disposable equipment used. Rinsate blanks need only be collected from equipment that undergoes decontamination and is used for repeated sample collection. An equipment rinsate blank will be taken from each type of decontaminated sampling equipment used for the collection of samples.

The field team lead can request that additional equipment blanks be taken. Equipment blanks will consist of deionized water washed through decontaminated sampling equipment and placed in containers identified on the Sampling Authorization forms. Note that the bottle and preservation requirements for water may differ from the requirements for soil. Equipment rinsate blanks will be analyzed for the following:

- Gross alpha
- Gross beta
- Cyanide
- Metals (excluding hexavalent chromium and mercury)
- Anions (except cyanide)
- VOAs of interest
- Semivolatile organic analytes of interest

2.2.5.3 Field Transfer Blanks

The volatile organic field transfer blanks will constitute approximately 5 percent of all VOA samples. If applicable, at least one field transfer blank will be collected. Field transfer blanks will consist of laboratory grade deionized water added to a clean sample container in the field when characterization samples are being collected. The field transfer blanks will be returned to the laboratory with the samples. Field blanks are prepared as a check for possible contamination originating from ambient conditions at the site during sample collection. The field transfer blank will be analyzed for VOAs only.

2.2.5.4 Prevention of Cross Contamination

Special care should be taken to prevent cross contamination of soil 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 placing them on or near potential contamination sources, such as uncovered ground
- Handling bottles or equipment with dirty hands
- Improperly decontaminating equipment before sampling or between sampling events

2.2.5.5 Laboratory Quality Control

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

Tables 2-3, 2-4, and 2-5 present quality objectives and criteria for soil measurement data for all analytes. The ability to meet the detection limit requirements is dependent on the amount of sample obtained and matrix interferences. Quality Control checks outside of control limits will be identified in the data validation process and during the DQA, if performed, described in Section 2.5.

2.2.5.6 QC Requirements

If only disposable equipment is used or equipment is dedicated to a particular sample location, an equipment rinsate blank is not required. If no volatile organic compound samples are collected, a field transfer blank is not required.

Field duplicates must agree within 20 percent, as measured by the relative percent difference (RPD), to be acceptable. Only those field duplicates with at least one result greater than five times the appropriate detection limit are evaluated. Unacceptable field duplicate results are flagged with a "Q" in the database.

For chemical analyses, the acceptance criteria for laboratory duplicates, matrix spikes, matrix spike duplicates, surrogates, and laboratory control samples are generally derived from historical data at the laboratories in accordance with SW-846. Typical acceptance limits are within 25 percent of the expected values, although the limits may vary considerably with the method and analyte. For radiological analyses, the acceptance limits for laboratory QC samples are specified in the laboratory contract.

Holding time is the elapsed time period between sample collection and analysis. Exceeding required holding times could result in changes in constituent concentrations due to volatilization, decomposition, or other chemical alterations. Recommended holding times depend on the analytical method and chemical constituents, as specified in SW-846 or EPA/600/4-79/020, *Methods of Chemical Analysis of Water and Wastes*. Data associated with exceeded holding times are flagged with an "H" in HEIS.

Additional QC measures include laboratory audits and participation in nationally based performance evaluation studies. The contract laboratories participate in national studies such as the EPA-sanctioned water pollution and water supply performance evaluation studies and DOE's Mixed Analyte Performance Evaluation Program to independently test lab performance on solid samples. The project periodically audits the analytical laboratories to identify and solve quality problems or to prevent such problems. Audit results are used to improve performance. Summaries of audit results and performance evaluation studies are presented in the annual groundwater monitoring report. Failure of QC will be determined and evaluated during data validation and DQA process. Data will be qualified as appropriate.

2.2.5.7 Instrument and Equipment Testing, Inspection, and Maintenance

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 or verify calibration of their equipment in accordance with manufacturer or other applicable guidelines. Calibration of laboratory instruments will be performed in a manner consistent with SW-846, or with auditable HASQARD and contractual requirements. 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).

2.2.6 Instrument and Equipment Calibration and Frequency

Calibration of laboratory instruments will be performed in a manner consistent with SW-846 or with auditable HASQARD and contractual requirements using nationally recognized, traceable standards. Calibration of radiological field instruments will be performed as indicated in the discussion regarding radiological field instrumentation data (Section 3.4).

2.2.6.1 *Inspection and Acceptance of Supplies and Consumables*

Supplies and consumables used in support of sampling and analysis activities are procured in accordance with internal work requirements and processes that describe the acquisition system and the responsibilities and interfaces necessary to ensure that structures, systems, and components, or other items and services procured/acquired, meet the specific technical and quality requirements. The procurement process ensures that purchased items and services comply with applicable procurement specifications. Users check and accept supplies and consumables before use. Supplies and consumables obtained by the analytical laboratories are procured, checked, and used in accordance with the laboratories' QA plans.

2.2.7 Non-Direct Measurements

Non-direct measurements include data obtained from sources such as computer databases, programs, literature files, and historical databases. Data from historical sampling and analysis of HSTF sludge have been collected. This information was used to reduce the list of constituents associated with opportunistic sampling activities. Non-direct measurements will not be evaluated as part of this activity, but as part of an associated waste DQO process.

2.2.8 Data Management

Analytical data resulting from the implementation of the QAPjP will be managed and stored in accordance with the applicable programmatic requirements governing data management procedures. At the direction and discretion of the HSTF closure project lead, all analytical data packages will be subject to final technical review by qualified personnel before submittal to the regulatory agencies or included in reports. Electronic data access, when appropriate, will be by a database. Where electronic data are not available, hard copies will be provided in accordance with the Tri-Party Agreement Action Plan (Ecology, et al., 1989).

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 additional guidance to complete certain tasks is needed, a work package will be developed to control the activities adequately, 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 and checklists
- Sample packaging and shipping

2.2.8.1 *Resolution of Analytical System Errors*

Errors reported by the laboratories are reported to the sampling coordinator, who initiates a sample disposition record. This process is used to document analytical errors and to establish resolution with the HSTF closure project lead.

2.3 Assessment and Oversight

The elements in this group address the activities for assessing the effectiveness of project implementation and associated QA and QC activities. The purpose of assessment is to ensure that the QAPjP is implemented as prescribed.

2.3.1 Assessments and Response Action

Contractor management, regulatory compliance, quality and/or health and safety organizations may conduct random surveillances and assessments to verify compliance with the requirements outlined in this SAP, project work packages, the project quality management plan, procedures, and regulatory requirements.

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

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

2.3.2 Reports to Management

Reports to management on data quality issues will be made at the time these issues are identified. Issues reported by the laboratories are communicated to the Sample and Data Management organization, which initiates a sample disposition record in accordance with contractor procedures. This process is used to document analytical or sample issues and to establish resolution with the HSTF closure project lead.

The DQA report (described in Section 2.5) may be prepared to determine if the type, quality, and quantity of the collected data met the quality objectives.

2.3.3 Changes in Work Scope

Changes to the work scope detailed in this SAP may be required because of unexpected field conditions, new information, health and safety concerns, or other anomalies. Minor changes that have no adverse effect on the DQOs or project schedule can be made in the field with the approval of the project lead or assigned task lead and then documented in the daily field logbook and/or field summary reports. Changes that affect the DQOs will require concurrence by RL and Ecology, and can be documented through unit managers' meetings or other methods that will result in changes being admitted into the administrative record. Alternatively, if substantial changes are required, this SAP can be revised and reissued, requiring RL and regulatory approval.

2.4 Data Validation and Usability

Completed data packages will be validated by qualified primary contractor Sample and Data Management personnel or by a qualified independent contractor. Validation will consist of verifying required deliverables, requested versus reported analyses, chain-of-custody documentation, and transcription errors. Validation also will include evaluating and qualifying the results based on holding times, method blanks, laboratory control samples, laboratory duplicates, and chemical and tracer recoveries, as appropriate. No other validation or calculation checks will be performed.

Level C data validation as defined in the contractor's validation procedures, which are based on EPA functional guidelines (for example, Bleyler, 1988a, *Laboratory Data Validation Functional Guidelines for Evaluating Inorganics Analyses*; Bleyler, 1988b, *Laboratory Data Validation Functional Guidelines for Evaluating Organics Analyses*), will be performed for up to 5 percent of the data by matrix and analyte group (for example, semivolatiles, metals, anions). The goal is to cover the various analyte groups and matrices during the validation.

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

At least one data validation package will be generated. Validation requirements identified in this section are consistent with Level C validation, as defined in data validation procedures.

2.5 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 DQA will be performed in accordance with the EPA DQA process, EPA/240/B-06/002, *Data Quality Assessment: A Reviewer's Guide, EPA QA/G-9R*, and EPA/240/B-06/003, *Data Quality Assessment: Statistical Methods for Practitioners,* EPA QA/G-9S.

3 Field Sampling Plan

3.1 Sampling Objectives

The primary objective of the field sampling plan is to identify and describe activities for sampling of contaminated soil removal areas identified during HSTF TSD unit closure activities under the approved HSTF Closure Plan (DOE/RL-2009-112). The field sampling plan describes pertinent elements of the sampling program. Sample methods, procedures, locations, and frequencies are identified in this section.

Issues with sample collection, sample custody, or data acquisition that affect the quality of data or impair the ability to acquire data because of failure to meet contract requirements or failure to follow procedures will be documented. When a problem is encountered with performing or conducting sampling, cognizant field personnel will communicate the problem to the BTR for evaluation and resolution.

3.2 Documentation of Field Activities

Logbooks or data forms are required for field activities. Requirements for the logbook are provided in Section 2.1.6. Data forms may be used to collect field information; however, the data forms must follow the same requirements as those for logbooks presented below and the data forms must be referenced in the logbooks. The following is a summary of information to be recorded in logbooks:

- Purpose of activity
- Day, date, time, and weather conditions
- Names, titles, and organizations of personnel present
- Deviations from the QAPjP or procedures
- All site activities, including field tests
- Materials quality documentation (e.g., certifications)
- Details of samples collected (preparation, splits, duplicates, matrix spikes, and blanks)
- Location and types of samples
- Chain-of-custody details and variances relating to chain-of-custody
- Field measurements
- Field calibrations and surveys and equipment identification numbers as applicable
- Equipment decontaminated, number of decontaminations, and variations to any decontamination procedures
- Equipment failures or breakdowns and descriptions of any corrective actions
- Telephone calls relating to field activities

3.3 Sampling Design

The three elements associated with the HSTF clean closure verification sampling after removal of the hexone tanks and associated piping and equipment are as follows:

- Sampling of residual soil after removal of stained or contaminated soil and materials
- General removal area sampling to verify that TSD unit constituents do not remain in soil above clean closure standards
- Focused sampling in areas of highest likelihood of leakage

The features of the sampling design are described in Table 3-1.

Table 3-1. HSTF Contaminated Soil Removal Area Sampling Design

Sampling Methodology	Key Features of Design	Basis for Sample Design
Sampling of residual soil after removal of stained/contaminated soil (Section 3.3.1).	Focused sampling in areas affected by spills/leaks after removal of contaminated soil or media.	Focused (discrete sampling) after removal of contaminated soil in conjunction with the random/ systematic grid design enhances defensibility of the closure decision.
General removal area sampling to verify that TSD unit constituents do not remain in soil above clean closure standards (Section 3.3.2.1).	Random/systematic grid sampling of the general removal area after removal of hexone tanks. Establish a quadrilateral that covers each of the general tank removal areas. Each quadrilateral will consist of four cells of equivalent surface area that are then divided into numbered grids. A sample will be taken from one randomly selected grid within each cell.	Random/systematic sampling of the general removal area is a practical and consistent method of providing full coverage of a target area. This approach ensures uniform coverage of the decision unit.
Focused sampling in areas of highest likelihood of leakage (Section 3.3.2.2).	Focused sampling beneath piping and valves, which could have leaked during operation.	Focused (discrete sampling) of potential leakage areas used in conjunction with the random/ systematic grid design enhances defensibility of the closure decision.

3.3.1 Sampling of Residual Soil after Removal of Stained or Contaminated Soil

Stained soil and anomalous materials observed after removal of the hexone tanks and associated piping and equipment will be removed for disposal in Environmental Restoration and Disposal Facility. The residual soil will be sampled to verify compliance with the clean closure standards. Samples will be collected per Table 3-1.

3.3.2 General Removal Area Sampling

The following subsections describe the procedures necessary to define the grid and focus sampling in areas of highest likelihood of leakage. These procedures are followed prior to sampling in the general areas of the HSTF.

3.3.2.1 *Defining the Verification Sampling Grid*

After contaminated soil within the excavation has been removed and is considered ready for verification sampling, the remediated area will be staked for verification sampling. Stakes will be placed at the four corners of a quadrilateral, which encompasses the contaminated soil removal area. Care will be taken to size the boundary such that it contains the footprint of the original contamination but includes a minimum of clean perimeter area. If a number of small, contaminated areas were detected, they may be combined for this verification sampling.

This quadrilateral will be divided into four cells of equivalent area, each with an area no more than 2.3 square meters (m^2) (25 square feet [ft^2]). Depending on the overall size and configuration of the sampling area, the following may apply:

- A second quadrilateral will be established if a contiguous removal area is larger than 9.3 m^2 (100 ft^2). The cells of the quadrilateral need not be the same shape, but must be equivalent in area. Each cell of a quadrilateral will be divided into appropriately sized (for example, 0.09 m^2 [1 ft^2]) numbered grids, to a maximum of 25 grids for each cell.
- Alternatively, for removal areas of 0.09 m^2 (1 ft^2) or smaller, one sample will be taken.

A soil sample will be collected from one randomly selected grid within each cell. The grid location will be determined using a two-digit random number generator. The two digits will represent the x-y coordinates of the location within the grid cell.

3.3.2.2 *Focused Sampling in Areas of Highest Likelihood of Leakage*

Pipe and valve arrays are potential leakage areas during operation. Therefore, the soil beneath these areas in the HSTF will be sampled after removal of the hexone tanks and associated piping and equipment. The residual soil will be sampled to verify compliance with the clean closure standards. Figure 3-1 shows the sampling design for the likely leakage areas.

3.3.3 Sampling Procedures

Samples will be collected from the top 0 to 15.24 cm (0 to 6 in.) at the identified location using hand tools. Large particles (greater than 0.2 cm [0.0004 in.] diameter) will be removed prior to placing the collected soil into sample bottles. Sufficient samples will be taken for the laboratory analysis of TSD unit closure parameters (Table 2-3), as well as opportunistic target analytes (Tables 2-4 and 2-5). These tables list the methods and QC performance requirements for the total possible suite of project analytes. Section 3.5 presents sample bottle size, preservative, packing requirements, and holding times for TSD unit target analytes.

3.3.4 Location Surveying

The location of the surface soil samples will be surveyed after the sampling but before abandonment activities are completed. Data will be recorded in the NAVD88, 1988, *North American Vertical Datum of 1988*, and the Washington State Plane (South Zone) NAD83, 1991, *North American Datum of 1983*, with the 1991 adjustment for horizontal coordinates. All survey data will be recorded in meters and feet. GPS survey instrumentation will be used.

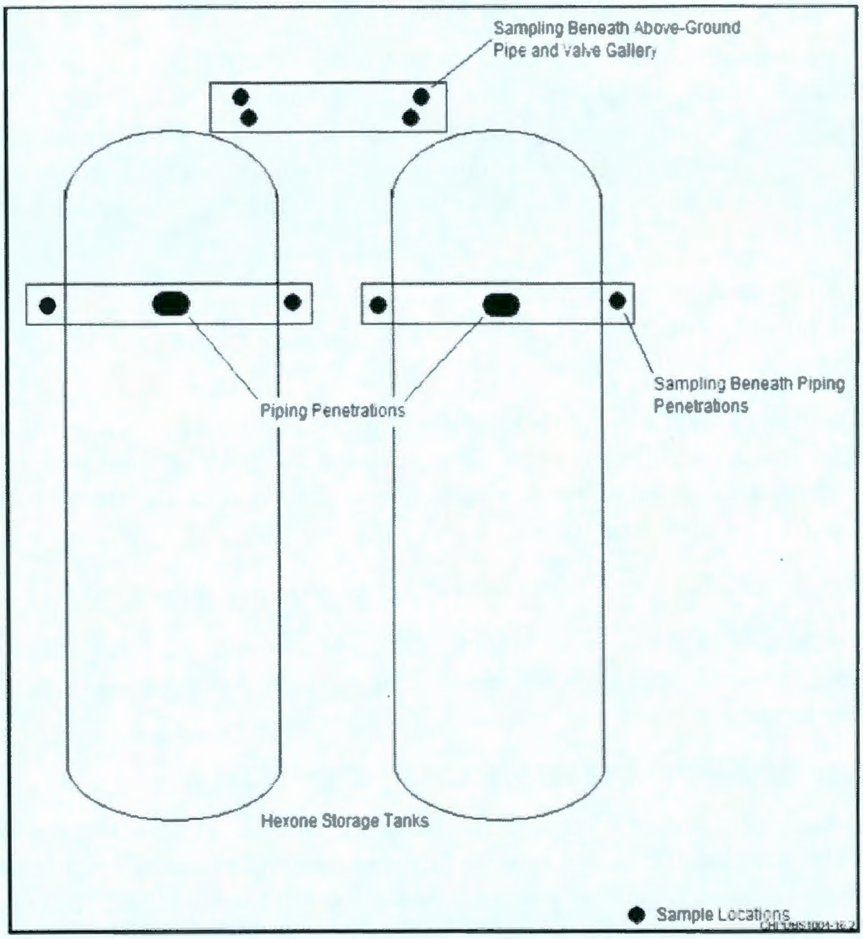

Figure 3-1. Focused Sampling in Areas of Highest Likelihood of Leakage

3.3.5 Field Quality Control Samples

Table 3-2 summarizes the number and types of characterization and field QC samples to be collected at the HSTF system contaminated soil removal area(s). One set of three QC samples will be required to be collected during sampling of contaminated soil removals for tanks 276-S-141 and 276-S-142, and associated piping.

Table 3-2. Summary of Projected Sample Collection Requirements for Tanks 276-S-141 and 276-S-142 and Associated Piping

Sampling Method	Quality Control Samples
Duplicates	1
Equipment blanks	1
Field transfer blank	1
Total number of quality control samples per tank	**3**

3.3.6 Field Screening

Radiological field screening data, organic vapor monitor data, visual observation of the soil matrix, and visual observation of contamination will be used to support sampling and analysis efforts, to assist in determining sample shipping requirements and support worker health and safety monitoring. Screening will be conducted visually and with field instruments. Radiological screening will be performed by the radiological control technician or other qualified personnel. The radiological control technician will record field measurements, noting the depth of the sample and the instrument reading. Measurements will be relayed to the field geologist for inclusion into the field logbook or operational records daily, as applicable.

The following information will be disseminated to personnel performing work in support of this SAP:

- Instructions will be provided to radiological control technicians on the methods required to measure sample activity and media for gamma, alpha, and/or beta emissions, as appropriate.
- Information regarding the Geiger-Müller, portable alpha meter, dual phosphors beta/gamma, and sodium iodide portable instruments will include a physical description of the instruments, radiation and energy response characteristics, calibration and maintenance, performance testing descriptions, and the application and operation of the instrument. These instruments are commonly used on the Hanford Site for obtaining removable surface contamination measurements and direct measurements of the total surface contamination.
- Information on the characteristics associated with the hand-held probes to be used in the performance of direct radiological measurements will include a physical description of the probe, the radiation and energy response characteristics, calibration/maintenance and performance-testing descriptions, and the application/operation of the instrument. The hand-held probe is an alpha instrument commonly used on the Hanford Site for obtaining removable surface contamination measurements and direct measurements of the total surface contamination.

3.3.7 Pre-Shipment Sample Screening

A representative portion of each sample will be shipped to an offsite laboratory, or will be submitted to the Radiological Counting Facility, 222-S Laboratory, or other suitable onsite laboratory for total activity analysis before shipment. Total radiological activities will be used for sample pre-shipment characterization. All samples will be taken from contamination soil removal areas surveyed and verified not to contain measurable radiological contamination above background; therefore, the chance that laboratory acceptance criteria will be exceeded is minimal. However, samples that slightly exceed the offsite laboratory criterion may be reduced in volume, which reduces total activity and allows offsite shipment. Onsite and offsite laboratories will be identified before initiating field activities and will be mutually acceptable to the performing contractor, Sample and Data Management group, and the task lead.

3.4 Calibration of Field Equipment

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

Calibrations must be performed as follows:

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

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

- Pacific Northwest National Laboratory calibrates radiological field instruments on the Hanford Site, as specified in its program documentation.
- Daily calibration checks will be performed and documented for each instrument used to characterize areas under investigation. These checks will be made on standard materials sufficiently like the matrix under consideration for direct comparison of data. Analysis times will be sufficient to establish detection efficiency and resolution.

3.5 Sample Handling

The following sections discuss the various activities required for sampling handling. These activities include packaging, container labeling, sample transportation, corrective actions, and equipment decontamination.

3.5.1 Packaging

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

Table 3-3 presents soil sample preservation, containers, and holding times for the nonradiological analytes. Final sample collection requirements will be identified on a chain-of-custody/sampling analysis form.

Table 3-3. Sample Preservation, Container, and Holding Time Guidelines

		Bottle				
Analytes	**Matrix**	**Number**	**Type**	**Preservation**	**Packing Requirements**	**Holding Time**
Hexavalent Chromium	Soil	1	aG	None	Cool ≤6 °C	30/7 Days
Metals (Except Cr(VI))	Soil	1	G/P	None	None	6 months
Semi-Volatile Organics	Soil	1	aG	None	Cool ≤6 °C	14/40 Days
Volatile Organics	Soil	1	aG	None	Cool ≤6 °C*	14 Days

Table 3-3. Sample Preservation, Container, and Holding Time Guidelines

Notes:

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.

* Additional packing requirements allowed by SW-846 Method 5035A, such as freezing, cooling, or methanol addition, may be used.

aG	= amber glass	G	= glass
Cr(VI)	= hexavalent chromium	P	= plastic

3.5.2 Container Labeling

The sample location, depth, and corresponding HEIS numbers are documented in the sampler's field logbook. A custody seal (e.g., evidence tape) is affixed to each sample container and/or the sample collection package in such a way as to indicate potential container tampering.

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

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

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

- Analysis required
- Source of sample
- Matrix
- Field data (pH, radiological readings)

Except for VOA samples, a custody seal will be affixed to the lid of each sample container. The custody seal will be inscribed with the sampler's initials and the date. Custody seals are not applied directly to VOA bottles collected because of a potential for affecting analytical results and/or fouling of laboratory equipment. Custody seals and any other required labels or documentation can be fixed to the exterior of a container holding vials in such a manner to detect potential tampering.

3.5.3 Sample Transportation

Sample transportation will be in compliance with the applicable regulations for packaging, marking, labeling, and shipping hazardous materials, hazardous substances, and hazardous waste mandated by the U.S. Department of Transportation (49 CFR 171-177, "General Information, Regulations, and Definitions," through Part 177, "Carriage By Public Highway") in association with the International Air Transportation Authority, DOE requirements, and applicable program specific implementation procedures.

3.5.4 Corrective Actions and Deviations for Sampling Activities

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

As appropriate, such deviations or problems will be documented in the field logbook or on nonconformance report forms in accordance with internal corrective action procedures. The HSTF closure project lead and BTR (or designee) will be responsible for communicating field corrective action requirements and for ensuring that immediate corrective actions are applied to field activities and that these corrective actions are effective.

More significant changes in sample locations that do not affect DQOs will require notification and approval of the HSTF closure project lead. Changes to sample locations that could result in impacts to meeting the DQOs will require concurrence with RL and regulatory project managers. Changes to the SAP will be documented as described in Section 2.1.6.

3.5.5 Decontamination of Sampling Equipment

Sampling equipment will be decontaminated in accordance with the sampling equipment decontamination procedure. To prevent potential contamination of the samples, care should be taken to use decontaminated equipment for each sampling activity.

Special care should be taken 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

Single use, disposable sampling equipment will not require decontamination.

4 Health and Safety

All field operations will be performed in accordance with CH2M HILL Plateau Remediation Company health and safety requirements, outlined in an approved project-specific health and safety plan. In addition, a work control package will be prepared to further control site operations. This work package will include an activity hazard analysis and will reference applicable radiological control requirements, if required. Radiological contamination is expected to be encountered during the HSTF project closure activities.

The sampling processes and associated activities will take into consideration exposure reduction and contamination control techniques (e.g., ALARA and Integrated Safety Management System) that will minimize chemical exposure to the sampling team.

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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STATE ENVIRONMENTAL POLICY ACT
ENVIRONMENTAL CHECKLIST

FOR THE

HANFORD FACILITY,
HEXONE STORAGE AND TREATMENT FACILITY CLOSURE

REVISION 0

MAY 2010

WASHINGTON ADMINISTRATIVE CODE
ENVIRONMENTAL CHECKLIST
[WAC 197-11-960]

2010-06-14

A. BACKGROUND

1. Name of proposed project, if applicable:

This State Environmental Policy Act (SEPA) of 1971 Environmental Checklist is being submitted for closure of the Hanford Facility, Hexone Storage and Treatment System.

2. Name of applicants:

U.S. Department of Energy, Richland Operations Office (RL).

3. Address and phone number of applicants and contact persons:

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

Contact:

David A. Brockman, Manager
Richland Operations Office
(509) 376-7395

4. Date checklist prepared:

May 2010.

5. Agency requesting the checklist:

State of Washington Department of Ecology
Nuclear Waste Program
3100 Port of Benton Blvd.
Richland, Washington 99354

6. Proposed timing or schedule: (including phasing, if applicable):

This SEPA Environmental Checklist is being submitted concurrently with a closure plan [DOE/RL-2009-112, Hexone Storage and Treatment Facility Closure Plan (Revision 0)] prepared for submittal to the Washington State Department of Ecology (Ecology) by May 28, 2010.

7. Do you have any plans for future additions, expansion, or further activity related to or connected with this proposal? If yes, explain.

No.

8. List any environmental information you know about that has been prepared, or will be prepared, directly related to this proposal.

This SEPA Environmental Checklist is being submitted to Ecology to address the Hexone treatment and Storage Facility closure activities. Environmental information that has been prepared directly related to this proposal is contained in DOE/RL-2009-112, Hexone Storage and Treatment Facility Closure Plan (Revision 0).

General information concerning the Hanford Site environment can be found in the Hanford Site National Environmental Policy Act (NEPA) Characterization, PNNL-6415, Revision 18, September 2007. This document is updated periodically by Pacific Northwest National Laboratory (PNNL), and provides current information concerning climate and meteorology, ecology, history and archeology, socioeconomic, land use and noise levels, and geology and hydrology. These baseline data for the Hanford Site and past activities are useful for evaluating proposed activities and their potential environmental impacts.

9. Do you know whether applications are pending for government approvals of other proposals directly affecting the property covered by your proposal? If yes, explain.

No other applications are pending at this time.

10. List any government approvals or permits that will be needed for your proposal, if known.

RL forwards the aforementioned DOE/RL-2009-112, Hexone Storage and Treatment Facility Closure Plan to Ecology for approval.

11. Give brief, complete description of your proposal, including the proposed uses and the size of the project and site. There are several questions later in this checklist that ask you to describe certain aspects of your proposal. You do not need to repeat those answers on this page.

RL proposes clean closure for tanks 276-S-141 and 276-S-142 and ancillary equipment. Clean closure of tanks 276-S-141 and 276-S-142 and tank ancillary equipment will be achieved by removal and disposal and by removal of any soil potentially contaminated above numerical clean closure standards. Tanks 276-S-141 and 276-S-142 are planned to be removed intact or demolished in place and removed as contaminated debris.

The ancillary equipment that will be removed and disposed of within the tank closure scope consists of the following:

- Two centrifugal transfer pumps.
- Aboveground and below ground piping for receiving, blending, and transferring hexone solvents, approximately 13m (42 feet) of underground piping, running from the pump station east to the railroad tracks will be excavated.

- Aboveground vent piping; tank 276-S-141 vents to tank 276-S-142 through a flame arrestor and 7.6-cm (3-in.) vent pipe.
- Obsolete mercury manometer for measuring liquid
- Weight factor liquid level instrumentation.

Soil beneath the tanks and piping will be clean closed through visual inspections and soil verification sampling that demonstrates there were no releases from the unit and, where releases occurred, that the contaminated soil has been removed to meet clean closure standards, as shown by sampling of the removal area. After removal of tanks 276-S-141 and 276-S-142 and the ancillary equipment, the soil at the tank and piping removal areas will be visually inspected and sampling to identify if releases from the unit occurred. Where releases occurred, the contaminated soil will be removed, containerized, designated, and disposed. The contaminated soil removal areas will undergo closure verification sampling in accordance with an approved sampling and analysis plan (DOE/RL-2009-116, Sampling and Analysis Plan for the Hexone Treatment and Storage Facility Closure Plan).

The final closure of the Hexone Treatment and Storage Facility may be coordinated with the remedial activities associated with implementation of the 200-IS-1 Operable Unit final remedy.

Additional details associated with the proposed closure of the Hexone Storage and Treatment Facility are found in DOE/RL-2009-112, Hexone Storage and Treatment Facility Closure Plan (Revision 0).

12. Location of the proposal. Give sufficient information for a person to understand the precise location of your proposed project, including a street address, if any, and section, township, and range, if known. If a proposal would occur over a range of area, provide the range or boundaries of the site(s). Provide a legal description, site plan, vicinity map, and topographic map, if reasonably available. While you should submit any plans required by the agency, you are not required to duplicate maps or detailed plans submitted with any permit applications related to this checklist.

The Hexone Storage and Treatment Facility is located in the southeast corner of the 200 West Area of the Hanford Site just north of the 276 Building in the REDOX Area. Tanks 276-S-141 and 276-S-142 are 81,400 L (21,500-gal.)[1] working capacity carbon-steel tanks, similar to petroleum storage tanks. The tank shells are 8.5 meters (28 feet) in length with dished heads welded onto the end of the shells, nominally 3.6 meters (12 feet) in diameter, and were constructed with 0.95-centimeter (3/8-inch) thick walls. The tops of the tanks are 0.9 meter (3 feet) underground.

Tanks 276-S-141 and 276-S-142 of the Hexone Storage and Treatment Facility were used from 1951 through 1967 to store reagent-grade methyl isobutyl ketone (hexone) for makeup as a solvent for the Reduction-Oxidation Plant. After 1967, the HSTF contained distilled hexone, part or all of which had been used in the Reduction-Oxidation Plant.

[1] The tank working volume is 81,400 L (21, 500 gal.); historical documents reference various volumes.

- The 276-S-142 tank also contained normal paraffin hydrocarbon and tributyl phosphate from a one-time campaign in 1966.
- The 276-S-142 tank received approximately 5,000 L (1,300 gal.) of water in 1967, 1,900 L (500 gal.) in the mid-1970s, and 760 L (200 gal.) in the mid-1980s.
- Approximately 760 L (200 gal.) of water were added to the 276-S-141 tank in 1988.

In 1990, as preparation for closure, the mixed waste was pumped from the 276-S-141 and 276-S-142 tanks through a distillation system to decrease the radioactivity of the waste. The distillate was shipped to a commercial incinerator for disposal. In 2002, the tanks were filled with grout, in two pours with a cold seam, to mitigate flammability concerns.

The final closure of the Hexone Storage and Treatment Facility may be coordinated with the remedial activities associated with implementation of the 200-IS-1 Operable Unit final remedy.

TO BE COMPLETED BY APPLICANT **EVALUATIONS FOR AGENCY USE ONLY**

B. ENVIRONMENTAL ELEMENTS

1. Earth

a. General description of the site (circle one): Flat, rolling, hilly, steep slopes, mountainous, other___________.

Portions of the site have an approximately 10 foot thick layer of clean soil and ash added to stabilize the site, however; the locale is generally flat.

b. What is the steepest slope on the site (approximate percent slope)?

The approximate slope of the land is less than 2 percent.

c. What general types of soils are found on the site? (for example, clay, sandy gravel, peat, muck)? If you know the classification of agricultural soils, specify them and note any prime farmland.

Soil types beneath the soil/ash stabilization covering portions of the site consist mainly of eolian and fluvial sands and gravel interbedded with layers of silt loam. More detailed information concerning specific soil classifications can be found in the Hanford Site National Environmental Policy Act (NEPA) Characterization, PNL-6415, Revision 18, September 2007. Farming is not permitted on the Hanford Facility.

d. Are there surface indications or history of unstable soils in the immediate vicinity? If so, describe.

No.

e. Describe the purpose, type, and approximate quantities of any filling or grading proposed. Indicate source of fill.

Clean backfill would be used to level terrain after removal of tanks, piping, and contaminated soil. It is expected that less than 250 cubic meters of clean backfill, from existing Hanford Site borrow area(s) would be used to level the area.

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f. Could erosion occur as a result of clearing, construction, or use? If so, generally describe.

No.

g. About what percent of the site will be covered with impervious surfaces after project construction (for example, asphalt or buildings)?

No impervious surfaces are expected to be constructed for the Hexone Storage and Treatment Facility.

h. Proposed measures to reduce or control erosion, or other impacts to the earth, if any:

None.

2. Air

a. What types of emissions to the air would result from the proposal (i.e., dust, automobile, odors, industrial wood smoke) during construction and when the project is completed? If any, generally describe and give approximate quantities, if known.

Minimal amounts of dust would be expected due to excavation/backfill activities during closure.

b. Are there any off-site sources of emissions or odors that may affect your proposal? If so, generally describe.

No.

c. Proposed measures to reduce or control emissions or other impacts to the air, if any?

None.

3. Water

a. Surface

1) Is there any surface water body on or in the immediate vicinity of the site (including year-round and seasonal streams, saltwater, lakes, ponds, wetlands)? If yes,

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describe type and provide names. If appropriate, state what stream or river it flows into.

No. The Hexone Storage and Treatment Facility is over 11 kilometers from the Columbia River.

2) **Will the project require any work over, in, or adjacent to (within 200 feet) the described waters? If yes, please describe and attach available plans.**

No.

3) **Estimate the amount of fill and dredge material that would be placed in or removed from surface water or wetlands and indicate the area of the site that would be affected. Indicate the source of fill material.**

None.

4) **Will the proposal require surface water withdrawals or diversions? Give general description, purpose, and approximate quantities if known.**

No surface water withdrawal or diversion would be required.

5) **Does the proposal lie within a 100-year floodplain? If so, note location on the site plan.**

The Hexone Storage and Treatment Facility is not within the 100-year or 500-year floodplain [Hanford Site National Environmental Policy Act (NEPA) Characterization, PNL-6415, Revision 18, September 2007].

6) **Does the proposal involve any discharges of waste materials to surface waters? If so, describe the type of waste and anticipated volume of discharge.**

No.

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b. Ground

1) Will ground water be withdrawn, or will water be discharged to ground water? Give general description, purpose, and approximate quantities if known.

No.

2) Describe waste material that will be discharged into the ground from septic tanks or other sources, if any (for example: Domestic sewage; industrial, containing the following chemicals...; agricultural; etc.). Describe the general size of the system, the number of such systems, the number of houses to be served (if applicable), or the number of animals or humans the system(s) are expected to serve.

None.

c. Water Run-off (including storm water)

1) Describe the source of run-off (including storm water) and method of collection and disposal, if any (include quantities, if known). Where will this water flow? Will this water flow into other waters? If so, describe.

None.

2) Could waste materials enter ground or surface waters? If so, generally describe.

No waste materials can enter ground or surface waters as a result of closure.

d. Proposed measures to reduce or control surface, ground, and run-off water impacts, if any:

No measures are proposed to reduce or control surface, ground, and run-off impacts.

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4. Plants

a. Check or circle the types of vegetation found on the site.

- ☐ deciduous tree: alder, maple, aspen, other
- ☐ evergreen tree: fir, cedar, pine, other
- ☐ shrubs
- ☐ grass
- ☐ pasture
- ☐ crop or grain
- ☐ wet soil plants: cattail, buttercup, bulrush, skunk cabbage, other
- ☐ water plants: water lily, eelgrass, milfoil, other
- ☐ other types of vegetation

No native vegetation resided in the immediate vicinity of the Hexone Storage and Treatment Facility within the 200 West Area. The site is currently covered with gravel and concrete.

b. What kind and amount of vegetation will be removed or altered?

No vegetation would be removed or altered during Hexone Storage and Treatment Facility closure activities.

c. List threatened or endangered species known to be on or near the site.

No known threatened or endangered species are known to be on or near the Hexone Storage and Treatment Facility. Additional information on species can be found in Hanford Site National Environmental Policy Act (NEPA) Characterization, PNL-6415 (Revision 18, September 2007).

d. Proposed landscaping, use of native plants, or other measures to preserve or enhance vegetation on the site, if any:

None.

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5. Animals

a. Indicate (by underlining) any birds and animals which have been observed on or near the site or are known to be on or near the site:

birds: Raptors (burrowing owls, ferruginous, redtail, and Swainson's hawks) eagles, songbirds,
animals: deer, elk, coyotes, rabbits, rodents.

Additional information on animals can be found in Hanford Site National Environmental Policy Act (NEPA) Characterization, PNL-6415 (Revision 18, September 2007).

b. List any threatened or endangered species known to be on or near the site.

One federal and state listed threatened or endangered species has been identified on the 1,517 square kilometer Hanford Site along the Columbia River (the bald eagle) and three in the Columbia River (steelhead, spring-run Chinook salmon, and bull trout). In addition, the state listed white pelican, sandhill crane, and ferruginous hawk also occur on or migrate through the Hanford Site.

c. Is the site part of a migration route? If so, explain.

The Hanford Site is a part of the broad Pacific Flyway. However, the Hexone Storage and Treatment Facility location is not known as a haven for migratory birds.

d. Proposed measures to preserve or enhance wildlife, if any:

This project contains no specific measures to preserve or enhance wildlife.

6. Energy and Natural Resources

a. What kinds of energy (electric, natural gas, oil, wood stove, solar) will be used to meet the completed project's energy needs? Describe whether it will be used for heating, manufacturing, etc.

None.

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b. **Would your project affect the potential use of solar energy by adjacent properties? If so, generally describe.**

No.

c. **What kinds of energy conservation features are included in the plans of this proposal? List other proposed measures to reduce or control energy impacts, if any:**

None.

7. **Environmental Health**

a. **Are there any environmental health hazards, including exposure to toxic chemicals, risk of fire and explosion, spill, or hazardous waste that could occur as a result of this proposal? If so, describe.**

Environmental health hazards could come from exposure to chemicals and Atomic Energy Act regulated materials. Stringent administrative controls and engineered barriers will be used to minimize the probability of even a minor incident and/or accident. A chemical spill, release, fire, or explosion could occur only as a result of a simultaneous breakdown in multiple barriers or a catastrophic natural forces event.

1) **Describe special emergency services that might be required.**

No special emergency services are known to be required.

2) **Proposed measures to reduce or control environmental health hazards, if any:**

None.

b. **Noise**

1) **What type of noise exists in the area which may affect your project (for example: traffic, equipment, operation, other)?**

None is anticipated.

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2) **What types and levels of noise would be created by or associated with the project on a short-term or a long-term basis (for example: traffic, construction, operation, other)? Indicate what hours noise would come from the site.**

None is anticipated.

3) **Proposed measures to reduce or control noise impacts, if any:**

None.

8. Land and Shoreline Use

a. What is the current use of the site and adjacent properties?

The Hexone Storage and Treatment Facility site is a portion of the larger REDOX Area and is not in use. Adjacent properties are industrial/research.

b. Has the site been used for agriculture? If so, describe.

No portion of the 200 West Area has been used for agricultural purposes since 1943.

c. Describe any structures on the site.

None.

d. Will any structures be demolished? If so, what?

No.

e. What is the current zoning classification of the site?

Does not apply. The site is located on Federal lands and as such is not subject to the Growth Management Act (State of Washington land use authority). However, for completeness, the Hanford Site is currently included in the Benton County Comprehensive Plan (June 22, 1998) as the undesignated "Hanford Sub-Area".

TO BE COMPLETED BY APPLICANT | **EVALUATIONS FOR AGENCY USE ONLY**

f. What is the current comprehensive plan designation of the site?

The Federal land management decision process has determined through NEPA [Hanford Comprehensive Land-Use Plan Environmental Impact Statement Record of Decision (64 FR 61615, November 12, 1999)] that the 200 West Area geographic area, which includes the Hexone Storage and Treatment Facility, is designated Industrial-Exclusive.

g. If applicable, what is the current shoreline master program designation of the site?

Does not apply.

h. Has any part of the site been classified as an "environmentally sensitive" area? If so, specify.

No.

i. Approximately how many people would reside or work in the completed project?

Does not apply.

j. Approximately how many people would the completed project displace?

None.

k. Proposed measures to avoid or reduce displacement impacts, if any:

Does not apply.

l. Proposed measures to ensure the proposal is compatible with existing and projected land uses and plans, if any:

Does not apply (refer to Section B.8.f.).

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9. Housing

a. **Approximately how many units would be `provided, if any? Indicate whether high, middle, or low-income housing.**

None.

b. **Approximately how many units, if any, would be eliminated? Indicate whether high, middle, or low-income housing.**

None.

c. **Proposed measures to reduce or control housing impacts, if any:**

Does not apply.

10. Aesthetics

a. **What is the tallest height of any proposed structure(s), not including antennas; what is the principal exterior building material(s) proposed?**

No new structures are being proposed.

b. **What views in the immediate vicinity would be altered or obstructed?**

None.

c. **Proposed measures to reduce or control aesthetic impacts, if any:**

None.

11. Light and Glare

a. **What type of light or glare will the proposal produce? What time of day would it mainly occur?**

None.

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b. **Could light or glare from the finished project be a safety hazard or interfere with views?**

No.

c. **What existing off-site sources of light or glare may affect your proposal?**

None.

d. **Proposed measures to reduce or control light and glare impacts, if any:**

None.

12. **Recreation**

a. **What designated and informal recreational opportunities are in the immediate vicinity?**

None.

b. **Would the proposed project displace any existing recreational uses? If so, describe.**

No.

c. **Proposed measures to reduce or control impacts on recreation, including recreation opportunities to be provided by the project or applicant, if any?**

None.

13. **Historic and Cultural Preservation**

a. **Are there any places or objects listed on, or proposed for, national, state, or local preservation registers known to be on or next to the site? If so, generally describe.**

No places or objects listed on, or proposed for, national, state, or local preservation registers are known to be on or next to the Hexone Storage and Treatment Facility.

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b. Generally describe any landmarks or evidence of historic, archaeological, scientific, or cultural importance known to be on or next to the site.

There are no known archaeological, historical, or Native American religious sites on or near the Hexone Storage and Treatment Facility.

c. Proposed measures to reduce or control impacts, if any:

None.

14. Transportation

a. Identify public streets and highways serving the site, and describe proposed access to the existing street system. Show on site plans, if any.

Does not apply.

b. Is site currently served by public transit? If not, what is the approximate distance to the nearest transit stop?

No. The distance to the nearest public transit stop is approximately 36 kilometers, located at Washington State University Tri-Cities.

c. How many parking spaces would the completed project have? How many would the project eliminate?

Does not apply.

d. Will the proposal require any new roads or streets, or improvements to existing roads or streets, not including driveways? If so, generally describe (indicate whether public or private).

No.

e. Will the project use (or occur in the immediate vicinity of) water, rail, or air transportation? If so, generally describe.

No.

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f. **How many vehicular trips per day would be generated by the completed project? If known, indicate when peak volumes would occur.**

No additional vehicular traffic will be required.

g. **Proposed measures to reduce or control transportation impacts, if any:**

None.

15. **Public Services**

a. **Would the project result in an increased need for public services (for example: fire protection, police protection, health care, schools, other)? If so, generally describe.**

No.

b. **Proposed measures to reduce or control direct impacts on public services, if any:**

Does not apply.

16. **Utilities**

a. **Circle utilities currently available at the site: electricity, natural gas, water, refuse service, telephone, sanitary sewer, septic system, other:**

None.

b. **Describe the utilities that are proposed for the project, the utility providing the service, and the general construction activities on the site or in the immediate vicinity which might be needed.**

No additional utilities are proposed supporting closure of the Hexone Storage and Treatment Facility.

SIGNATURES

The above answers are true and complete to the best of my knowledge. I understand that the lead agency is relying on them to make its decision.

David A. Brockman, Manager
U.S. Department of Energy
Richland Operations Office

7/16/2010
Date

Petition for One-Time Land Disposal Restrictions Variance for Hexone Tank Bottoms

Contents

Figures

Tables

Terms

CFR	Code of Federal Regulations
ERDF	Environmental Restoration Disposal Facility
HSTF	Hexone Storage and Treatment Facility
LDR	land disposal restrictions
TOC	total organic carbon
UHC	underlying hazardous constituent

Petition for One-Time Land Disposal Restrictions Variance for Hexone Tank Bottoms

1 Introduction

The following is a petition for a site-specific variance to a land disposal prohibition submitted pursuant to WAC 173-303-140(2)(a), "Dangerous Waste Regulations," "Land Disposal Restrictions," "Applicability," which incorporates 40 CFR 268.44(h), "Land Disposal Restrictions," "Variance from a Treatment Standard," by reference. This petition proposes a land disposal variance for a F003 mixed waste that also displays more than one characteristic. The following sections address the requirements for petitions stated in WAC 173-303-910, "Petitions."

2 Identification of Petitioner

Petitioner's name and address:

U.S. Department of Energy
Richland Operations Office
P.O. Box 550
Richland, Washington 99352
(509) 376-6536

Facility's EPA/State Identification Number: WA7890008967

Facility name and address: Hexone Storage and Treatment Facility
200 West Area, Hanford Site
Richland, Washington 99352

3 Petitioner's Interest in the Proposed Action

The U.S. Department of Energy, Richland Operations Office is requesting a site-specific variance from the land disposal restrictions (LDR) treatment standards of WAC 173-303-140. This petition concerns two underground storage tanks each containing approximately 500 L (130 gal.) each of mixed waste and 81,400 L (21,500-gal.) of grout (Portland cement) poured on top of the mixed waste.

4 Statement of Need and Justification for the Proposed Action

The U.S. Department of Energy, Richland Operations Office believes that additional treatment of the waste to meet the existing LDR treatment standard is inappropriate, and that a site-specific variance from the treatment standard is justified. This section describes further information on the need for and justification of the site-specific variance request. The origin of this waste is described, followed by a description of the process already used to treat the waste. Finally, alternative approaches for further treatment are evaluated to explain why disposal without further treatment is the most technically appropriate treatment for this waste.

4.1 Description of Original Waste

Tanks 276-S-141 and 276-S-142 of the Hexone Storage and Treatment Facility (HSTF) were used from 1951 through 1967 to store reagent-grade methyl isobutyl ketone (hexone) for makeup as a solvent for the Reduction-Oxidation Plant. After 1967, the HSTF contained distilled hexone, part or all of which had been used in the Reduction-Oxidation Plant.

- The 276-S-142 tank also contained normal paraffin hydrocarbon and tributyl phosphate from a one-time campaign in 1966.

- The 276-S-142 tank received approximately 5,000 L (1,300 gal.) of water in 1967, 1,900 L (500 gal.) in the mid-1970s, and 760 L (200 gal.) in the mid-1980s.
- Approximately 760 L (200 gal.) of water were added to the 276-S-141 tank in 1988.

In 1990, as preparation for closure, the mixed waste was pumped from the 276-S-141 and 276-S-142 tanks through a distillation system to decrease the radioactivity of the waste. The distillate was shipped to a commercial incinerator for disposal. In 2002, the tanks were filled with grout, in two pours with a cold seam, to mitigate flammability concerns.

4.2 Description of Treatment Residual

The waste in tanks 276-S-141 and 276-S-142 has undergone treatment (distillation) and grouting with Portland cement. The distillation reduced the waste volume, reducing the radioactivity of the distillate and allowing its disposal at a commercial incineration facility. The grouting addressed safety concerns of an explosion hazard due to volatile organics in the remaining waste.

The 276-S-141 and S276-142 tanks currently each contain small amounts of mixed waste comingled with the first grout pour, with the remainder of the tank volume filled with the second grout pour. In 2002 (prior to grouting), the waste was observed as a uniform tar-like layer across the tank bottom with a dried, cracked crust surface, which extended the length of the tank (BHI-01521, *Evaluation of Alternatives for the Interim Stabilization of the Hexone Tanks*). Table 1 presents the characteristics and Figure 1 provides the appearance of the sludge in tank 276-S-142 prior to interim stabilization.

Table 1. Characteristics of Hexone Storage Tanks Treatment Residual Prior to Interim Stabilization

Parameter	Characteristic
Quantity	Approximately 1,000 L (260 gal) (total - both tanks)
Physical form	Sludge - dark-colored, mildly acidic, phosphate tar
pH	3.2-4.8
Density	0.91 - 1.21 g/mL
Composition	Principle chemical components Normal petroleum hydrocarbons Tibutyl phosphate Iron oxide Hexone Principle radionuclides*: • americium-241 • plutonium isotopes • curium-244

Notes:

* The analytical results indicate that radionuclide constituents are below the transuranic concentration level of 100 nCi/g (BHI-01521, *Evaluation of Alternatives for the Interim Stabilization of the Hexone Tanks*).

Source: BHI-01521, *Evaluation of Alternatives for the Interim Stabilization of the Hexone Tanks.*

Figure 1. Sludge in Tank 276-S-142 – Surface Condition

4.3 Waste Codes and LDR Treatment Standards

At the point of generation, waste codes D001, F003, and WT02 applied to the waste hexone solvent. WA7890008967, *Hanford Facility Resources Conservation and Recovery Act Permit Application, Part A, Closure Unit 19,* designates the waste as:

- D001 (High total organic carbon [TOC] ignitibility characteristic)
- F003[1] (Listed Waste - Solvent, hexone)
- D018, D019, D023- D025, D027- D030, D032- D034, D036, D037, D039- D043 (toxicity characteristic - organics)
- WT02 (Washington State toxicity) hexone is toxic category D

The analytical results from the samples taken to support the interim stabilization option evaluation are listed in Table 2, along with the 40 CFR 268.48, "Land Disposal Restrictions," "Universal Treatment Standards," concentration based treatment standards, where applicable. Table 2 includes results only for those compounds that were detected during analysis. For some compounds, especially semivolatiles, the detection limits achieved in analysis exceeded regulatory thresholds or no detection limits were reported. This was largely due to the radionuclide concentration of the samples and the number of dilutions required to complete the analysis. Process information indicates that these compounds were not

[1] F003 is considered state-only F003 based on the partial adoption of EPA's mixture rule exclusion from 40 CFR 261.3(g), "Identification and Listing of Hazardous Waste," "Definition of Hazardous Waste," into WAC 173-303-070(2)(c), "Dangerous Waste Regulations," "Designation of Dangerous Waste". EPA has excluded the waste, but Ecology has not.

introduced to the hexone storage tanks in either the solvent or the subsequent waste. Therefore, corresponding "D" codes found in the Part A Application are not applicable to the waste. Based on this information, this document requests a variance from the treatment standards as summarized in Table 3. Table 4 lists the 40 CFR 268.40, "Applicability of Treatment Standards," for high total organic D001 waste.

Table 2. Composition of HSTF Tank Waste Prior to Interim Stabilization

				276-S-142			
CAS	Contaminant	B11D03 - 141 West Tank Comp	276-S-141 B11D04 - 141 West Replicate	B11D05 - 141 East	B11D06 - 142 West Tank Comp	B11D07 - 142 East	UTS
108-10-1	Hexone (MIBK)	8430	9790	13,700	18,200	26,600	33
79-00-5	1,1,2-Trichloroethane	3	80	57	55	83	6
84-74-2	Di-n-butyl phthalate	U	120	260	U	U	28
71-36-3	N-butyl alcohol	1480	1640	1690	1320	1500	2.6
79-34-5	1,1,2,2-Tetrachloroethane	55	U	U	U	U	6
67-64-1	Acetone	47	60	153	52	59	160
71-43-2	Benzene	3	4	U	U	U	10
75-15-0	Carbon Disulfide	1.39	0.61	U	U	U	--[a]
67-66-3	Chloroform	3	U	U	5	U	6
78-93-3	2-Butanone (MEK)	5	4	4	4	10	36
124-48-1	Dibromochloromethane	1.48	0.46	0.38	0.55	0.63	15
127-18-4	Tetrachloroethylene	1	U	U	U	U	6
108-88-3	Toluene	3	4	2	8	2	10
108-90-7	Chlorobenzene	1.2	1	0.07	U	U	6
100-41-4	Ethylbenzene	7	5	4	6	9	10
1330-20-7	Xylenes	4	1	1	0.62	5	30
75-35-4	1,1-Dichloroethene	3	3	U	U	U	6
75-01-4	Vinyl Chloride	3	U	U	U	U	6
74-87-3	Chloromethane	4	U	U	U	U	30
75-34-3	1,1-Dichloroethane	3	U	U	U	U	6
540-59-0	1,2-Dichloroethene	6	U	U	U	U	30
107-06-2	1,2-Dichloroethane	3	U	U	U	U	6
79-01-6	Trichloroethene	3	3	U	U	U	6
100-42-5	Styrene	2	3	U	4	10	N/A[b]

Table 2. Composition of HSTF Tank Waste Prior to Interim Stabilization

			276-S-141		276-S-142		
CAS	Contaminant	B11D03 - 141 West Tank Comp	B11D04 - 141 West Replicate	B11D05 - 141 East	B11D06 - 142 West Tank Comp	B11D07 - 142 East	UTS
591-78-6	2-hexanone	33	34	22	33	26	N/A[b]
126-73-8	Tri-n-butyl phosphate	55,000	41,000	11,000	65,000	44,000	N/A[b]
N/A	NPH	55,600	43,600	60,600	232,000	213,000	N/A[b]

Notes:

All numbers in mg/kg.

These data are from samples collected March 2 through 7, 2001.

Source: FH-0103068, *Final Results from the 276-S Hexone Tank Sludge Samples*.

a. Carbon Disulfide UTS is 4.8 mg/L toxicity characteristic leaching procedure.

b. This compound is not regulated under 40 CFR 268, "Land Disposal Restrictions."

MEK = methyl ethyl ketone
MIBK = methyl isobutyl ketone
N/A = not applicable
NPH = normal paraffin hydrocarbon
U = not identified above detection limits
UTS = universal treatment standard

Table 3. Treatment Standard Variance Requested

Waste Code	276-S-141	276-S-142
D001 - high total organic carbon ignitability[a]	x	x
State only F003 - spent solvent listed waste (hexone)[b]	x	x

Notes:

a. Waste does not display characteristic but is subject to land disposal restrictions in 40 CFR 268.40, "Land Disposal Restrictions," "Applicability of Treatment Standards."

b. State only F003 is still subject to land disposal restrictions in 40 CFR 268.40 based on 40 CFR 261.3(g)(3), "Identification and Listing of Hazardous Waste," "Definition of Hazardous Waste."

Table 4. 40 CFR 268.40 Treatment Standards for High Total Organic Carbon D001 Waste

Treatment Standard	Definition	Technical Feasibility/Appropriateness
RORGS	Recovery of organics utilizing one or more of the following technologies: (1) Distillation (2) Thin film evaporation (3) Steam stripping (4) Carbon adsorption (5) Critical fluid extraction (6) Liquid-liquid extraction (7) Precipitation/crystallization (including freeze crystallization) (8) Chemical phase separation techniques (i.e., addition of acids, bases, demulsifiers, or similar chemicals)	The waste has already been treated through distillation to the extent practical, which removed as much waste from the two tanks as possible. During this operation, water was added to the waste to allow treatment of as much material as was technically possible. The remaining tars cannot be pumped and access is not practical.
CMBST	High temperature organic destruction technologies, such as combustion in incinerators, boilers, or industrial furnaces	See below for a detailed discussion of combustion alternatives.
POLYM	Formation of complex high-molecular weight solids through polymerization of monomers in high-TOC D001 non-wastewaters, which are chemical components in the manufacture of plastics	Not appropriate to this waste stream, since the tar is not amenable to polymerization.

Note:

40 CFR 268.40, "Land Disposal Restrictions", "Applicability of Treatment Standards."

It is probable that during the grouting, the more volatile organic compounds were driven off and the material in the tanks no longer contains certain constituents above the treatment standard. However, during closure, no additional sampling of the waste is planned; therefore, this variance request is based on data from the most recent waste analysis (2001).

5 Proposed Alternative Treatment Method

The proposed treatment process is based on the activities performed to date (distillation and grouting) and disposal onsite at Environmental Restoration Disposal Facility (ERDF). ERDF is constructed to contain both the dangerous waste component and the radioactive component of this waste stream. If during closure of the HSTF area the tanks can be removed intact and transferred to ERDF, then the grout and the tank shell will provide encapsulation. If, due to the weight of the tanks or field conditions, intact disposal is not feasible, the tanks will be demolished on site and the debris will be placed in a double-lined roll-off container and transported to a cell at ERDF for disposal.

6 Rationale for Disposal of Tanks or Tank Debris Without Further Treatment

The U.S. Department of Energy, Richland Operations Office believes that further treatment of this waste is either technically inappropriate or technically infeasible as discussed below and that disposal of the waste in its current form is the best demonstrated available technology for this particular waste given its unique physical, chemical, and radiological properties. The alternatives for treating the material in Table 5 have been evaluated in the process of selecting this disposal option:

1. **Combustion.** Combustion of the waste material could meet the treatment standards for D001, F003, D018, and the UHCs. Combustion of the intact tanks is deemed technically infeasible due the lack of a facility able to treat the intact tanks. Combustion of the tank demolition debris is deemed technically inappropriate due to the debris size required for combustion. Facilities currently approved to take a mixed waste solid require this material to be 1.3 cm (0.5 inch) or less to be fed into the treatment unit. Due to the nature of the waste and its current configuration, (a heavy tarlike substance covered by Portland cement), preparing the waste for combustion would involve dismantling the tank, removing the grout and waste material. This solid material would then have to be crushed into 1.3 cm (0.5 inch) or smaller pieces suitable for feeding into a commercial treatment unit. The radiological risk of the waste is dominated by alpha emitting nuclides, including plutonium-238, plutonium-239/240, americium-241, and curium-244 with concentrations varying from 2,000 to 36,000 pCi/g, the primary exposure route for alpha emitting compounds is inhalation. The additional material handling to prepare the waste for treatment would significantly increase the external dose and inhalation exposure risk.

2. **Macroencapsulation.** Macroencapsulation does not meet the treatment standards for D001, F003, D018, or the UHCs.

3. **Disposal without further treatment.** The waste in its current form presents a low risk when disposed of in the lined disposal unit of ERDF. The amount of waste is small, at approximately 1,000 L (260 gal.) total for both tanks. Of that amount, the regulated constituents are a small fraction. Table 6 provides a conservative estimate of the amount of regulated constituents in both tanks. While it does not meet the treatment standard, there is no free liquid in the waste and the tank and grout severely impede any migration.

Table 5. Treatment Options

Waste Code	Treatment Standard	Technical Feasibility or Appropriateness	
		Intact Tanks	Tank Demolition Debris
D001 (High TOC)	RORGS, CMBST, or POLYM as defined by 40 CFR 268.42	Technically infeasible due to the size of the tanks and lack of facility to perform treatment on the intact tanks.	Technically inappropriate because would result in combustion of large amounts of mildly contaminated media, potential volatilization of contaminants, and creation of additional contaminated equipment during processing of the tanks.
F003 (state only)	Concentration based standard - see Table 2	Technically inappropriate because waste is currently contained and migration is severely impeded by the tank shell and grout layers.	Technically inappropriate because would result in combustion of large amounts of mildly contaminated media, potential volatilization of contaminants, and creation of additional contaminated equipment during crushing.

Notes:

40 CFR 268.42, "Land Disposal Restrictions," "Treatment Standards Expressed as Specified Technologies"

Table 6. Estimated Total Quantities of Predominant Dangerous Waste Constituents

Compound	kg	lbs
Hexone	24	53.06
N-butyl alcohol	2	4.20
Di-n-butyl phthalate	0.16	0.34

Notes:

Calculated based on maximum concentration and density of samples for a given tank.

This treatability variance is based on 40 CFR 268.44(h)(2) which states:

- It is inappropriate to require the wastes to be treated to the level or by the method specified as the treatment standard, even though such treatment is technically possible. To show this is the case, the petitioner must either demonstrate that:
  - Treatment to the specified level or by the specified method is technically inappropriate (for example, resulting in combustion of large amounts of mildly contaminated media where the treatment standard is not based on combustion).
  - For remediation waste only, treatment to the specified level or by the specified method is environmentally inappropriate because it would likely discourage aggressive remediation.

For the reasons described above, the U.S. Department of Energy believes that treatment of the waste by combustion is inappropriate. The potential for release of radioactive material, the potential exposure of workers during the crushing operations, and the additional waste generated as a result of treatment (equipment, etc.) are a sufficient basis for determining that combustion of the material to meet the LDR treatment standards in Tables 2 and 4 is inappropriate and not protective of human health and the environment.

7 Quality Assurance/Quality Control for Waste Analysis

Sampling and analysis of the hexone tank heels was performed prior to interim stabilization in accordance with the quality assurance and quality control measures in BHI-01418, *Data Quality Objective for 276-S-141/142 Hexone Tank Characterization/Stabilization Project*, and DOE/RL-2000-73, *Sampling and Analysis Plan for the 276-S-141/142 Hexone Tank Stabilization/Characterization Project*.

On March 2 through 7, 2001, the tanks were sampled. The sampling event included deploying a video camera into the tanks through the 0.61 m (2-ft) diameter manway to visually survey the tank internals and to guide the survey efforts. Samples were collected through the 0.61 m (2-ft) diameter manway and the 10 cm (4 in.) diameter risers of each tank.

The sludge collected from the hexone storage tanks can be characterized as a dark-colored, mildly acidic, phosphate tar. Sludge collected on the west ends of the tanks was less viscous sludge than the sludge collected from the east ends of the tanks, which was more granular in texture. The pH of the sludge samples ranged from 3.2 to 4.8 standard units. The principle chemical components of the sludge include normal petroleum hydrocarbons, tributyl phosphate, iron oxide, and hexone. The principle radionuclides detected in the sludge samples include americium-241, plutonium isotopes, and curium-244.

8 Certification

The following certification is made in accordance with WAC 173-303-910.

I certify under penalty of law that I have personally examined and am familiar with the information submitted in this petition and all attached documents, and that, based on my inquiry of those individuals immediately responsible for obtaining the information, I believe that the submitted information is true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment.

Signature of petitioner:

David A. Brockman, Manager
U.S. Department of Energy
Richland, Operations Office

9 References

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