DOE/RL-2005-88
DRAFT A

Closure Plan for the 216-A-37-1 Crib

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

United States Department of Energy
P.O. Box 550
Richland, Washington 99352

Approved for Public Release;
Further Dissemination Unlimited

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TERMS

AEA	*Atomic Energy Act of 1954*
bgs	below ground surface
CERCLA	*Comprehensive Environmental Response, Compensation, and Liability Act of 1980*
DOE	U.S. Department of Energy
DST	double-shell tank
Ecology	Washington State Department of Ecology
ETF	Effluent Treatment Facility
GCL	groundwater cleanup level
LERF	Liquid Effluent Treatment Facility
MCL	maximum contaminant level
NA	not applicable
OU	operable unit
PUREX	Plutonium-Uranium Extraction Facility
RCRA	*Comprehensive Environmental Response, Compensation, and Liability Act of 1980*
RI Report	*Remedial Investigation Report for the 200-PW-2 Uranium-Rich Process Waste Group and 200-PW-4 General Process Condensate Group Operable Units*, DOE/RL-2004-25
RI/FS	remedial investigation / feasibility study
RI/FS Work Plan	*Uranium-Rich/General Process Condensate and Process Waste Group Operable Units RI/FS Work Plan and RCRA TSD Unit Sampling Plan; Includes 200-PW-2 and 200-PW-4 Operable Units*, DOE/RL-2000-60
Tri-Party Agreement	*Hanford Federal Facility Agreement and Consent Order*, Ecology et al., 1989
TSD	treatment, storage, and/or disposal (unit)
U	undetected
WAC	*Washington Administrative Code*

METRIC CONVERSION CHART

Into Metric Units			Out of Metric Units		
If You Know	*Multiply By*	*To Get*	*If You Know*	*Multiply By*	*To Get*
Length			**Length**		
inches	25.4	Millimeters	millimeters	0.039	inches
inches	2.54	Centimeters	centimeters	0.394	inches
feet	0.305	Meters	meters	3.281	feet
yards	0.914	Meters	meters	1.094	yards
miles	1.609	Kilometers	kilometers	0.621	miles
Area			**Area**		
sq. inches	6.452	sq. centimeters	sq. centimeters	0.155	sq. inches
sq. feet	0.093	sq. meters	sq. meters	10.76	sq. feet
sq. yards	0.0836	sq. meters	sq. meters	1.196	sq. yards
sq. miles	2.6	sq. kilometers	sq. kilometers	0.4	sq. miles
acres	0.405	Hectares	hectares	2.47	acres
Mass (weight)			**Mass (weight)**		
ounces	28.35	Grams	grams	0.035	ounces
pounds	0.454	Kilograms	kilograms	2.205	pounds
ton	0.907	metric ton	metric ton	1.102	ton
Volume			**Volume**		
teaspoons	5	Milliliters	milliliters	0.033	fluid ounces
tablespoons	15	Milliliters	liters	2.1	pints
fluid ounces	30	Milliliters	liters	1.057	quarts
cups	0.24	Liters	liters	0.264	gallons
pints	0.47	Liters	cubic meters	35.315	cubic feet
quarts	0.95	Liters	cubic meters	1.308	cubic yards
gallons	3.8	Liters			
cubic feet	0.028	cubic meters			
cubic yards	0.765	cubic meters			
Temperature			**Temperature**		
Fahrenheit	subtract 32, then multiply by 5/9	Celsius	Celsius	multiply by 9/5, then add 32	Fahrenheit
Radioactivity			**Radioactivity**		
picocuries	37	Millibecquerel	millibecquerel	0.027	picocuries

1.0 INTRODUCTION

This closure plan is being submitted in accordance with *Hanford Federal Facility Agreement and Consent Order* (Tri-Party Agreement) (Ecology et al. 1989a) interim milestones. Milestone M-020-00B requires submittal of a closure plan for the 216-A-37-1 Crib *Resource Conservation and Recovery Act of 1976* (RCRA) treatment, storage, and/or disposal (TSD) unit to the Washington State Department of Ecology (Ecology) by December 31, 2008. Interim milestone M-020-33 requires submittal of this closure plan to Ecology by April 30, 2006. No other closure plan has been submitted for this TSD unit.

The 216-A-37-1 Crib began operations in March 1977 and was used to dispose of 242-A Evaporator process condensate to the soil column. The 242-A Evaporator process condensate disposed of at this crib was received from the 207-A South Retention Basin, where it was stored while awaiting process parameter sample results before being disposed of. Discharge to the crib was terminated April 12, 1989. At that time, 242-A Evaporator process condensate was determined to be dangerous waste under WAC 173-303, "Dangerous Waste Regulations." A RCRA Part A permit application was submitted to Ecology in 1987 (now located in DOE/RL-88-21, *Hanford Facility Dangerous Waste Part A Permit Application*), designating the 216-A-37-1 Crib as a landfill subject to RCRA regulations governing interim status TSD units. A RCRA interim status indicator parameter evaluation program is in operation at this site.

The 216-A-37-1 Crib was assigned to the process-based 200-PW-4 RCRA Past Practice General Process Condensate Waste Group Operable Unit (OU) for characterization and remedial decision making following the *Comprehensive Environmental Response, Compensation and Liability Act of 1980* (CERCLA) remedial investigation/feasibility study (RI/FS) process. This waste group was low in contaminants and did not qualify for inclusion in other more contaminated waste groups. Because of various similarities of process and waste, this waste group was consolidated with the 200-PW-2 OU for characterization (DOE/RL-98-28, *200 Areas Remedial Investigation/Feasibility Study Implementation Plan – Environmental Restoration Program*). Crib characterization data were collected in accordance with DOE/RL-2000-60, *Uranium-Rich/General Process Condensate and Process Waste Group Operable Units RI/FS Work Plan and RCRA TSD Unit Sampling Plan; Includes 200-PW-2 and 200-PW-4 Operable Units* (RI/FS Work Plan). Characterization data are provided in DOE/RL-2004-25, *Remedial Investigation Report for the 200-PW-2 Uranium-Rich Process Waste Group and 200-PW-4 General Process Condensate Group Operable Units* (RI Report), Appendix B, and are discussed further in Chapter 7.0 of this plan.

The proposed strategy for the 216-A-37-1 Crib TSD unit is clean closure in accordance with WAC 173-303-610, "Closure and Post-Closure." This strategy is based on analytical sample data obtained during the 200-PW-2/-4 OU remedial investigation and on process knowledge and waste characteristics information. The data and information demonstrate that TSD unit vadose zone soil and materials meet the clean-closure performance standards identified in Chapter 6.0 for TSD unit dangerous waste constituents without further physical closure activities. The data also show that TSD unit operations and TSD unit constituents did not impact groundwater, so that groundwater contamination does not preclude TSD unit clean closure. Consequently, after final closure, a RCRA final status groundwater monitoring plan will not be required for

monitoring of TSD unit constituents (Chapter 5.0). Because the clean-closure strategy is based on the results of completed sampling and analysis described in this plan, final approval of this plan will constitute approval of TSD unit clean closure.

The 242-A Evaporator process condensate is a mixed waste (Section 3.1). Source, special nuclear, and by-product materials, as defined in the *Atomic Energy Act of 1954* (AEA), are regulated at U.S. Department of Energy (DOE) facilities exclusively by DOE, acting pursuant to its AEA authority. These materials are not subject to regulation by the State of Washington. All information contained herein and related to, or describing, AEA-regulated materials and processes in any manner, may not be used to create conditions or other restrictions set forth in any permit, license, order, or any other enforceable instrument. DOE asserts that pursuant to the AEA, it has sole and exclusive responsibility and authority to regulate source, special nuclear, and by-product materials at DOE-owned nuclear facilities. Information contained herein on radionuclides is provided for process description purposes only.

Non-TSD unit constituents, including radionuclides, will be dispositioned through past-practice processes for the consolidated 200-PW-2 and 200-PW-4 OUs identified in the Tri-Party Agreement (Ecology et al. 1989a), Chapter 7.0. These activities will satisfy RCRA corrective requirements under the WA7890008967, *Hanford Facility Resource Conservation and Recovery Act Permit, Dangerous Waste Portion, Revision 8, for the Treatment, Storage, and Disposal of Dangerous Waste*, Condition II.Y.

2.0 FACILITY DESCRIPTION

This chapter describes the 216-A-37-1 Crib site and provides security information.

2.1 FACILITY DESCRIPTION AND OPERATIONS

The 216-A-37-1 Crib is an engineered, subsurface liquid-effluent disposal facility (landfill) that was constructed to dispose of 242-A Evaporator process condensate. The 216-A-37-1 Crib is located outside the 200 East Area perimeter fence about 610 m (2,000 ft) east of the 202-A Plant Canyon Building (Figure 1). Figure 2 is a construction diagram of the 216-A-37-1 Crib. The gravel-filled crib is 213 m (700 ft) long and 3 m (10 ft) wide at the bottom. When actively receiving effluent, the crib was about 2.4 to 4.3 m (8 to 14 ft) deep. A 25.4 cm (10-in.) diameter perforated, galvanized steel distribution pipe was placed 2 m (7 ft) belowgrade near the top of the coarse gravel fill and along the centerline of the crib. The pipe was covered with finer gravel, membrane barrier (generally thin-gauge plastic sheeting), and sand before being backfilled with clean material to the surface elevation. A valve station is located outside the crib perimeter fence at the south end of the crib, and a vent is located at the north end. The crib is surrounded by a light chain barricade. The crib surface is not radiologically contaminated (DOE/RL-2000-60).

The unit-specific Part A (DOE/RL-88-21) identifies the TSD unit boundary as beginning inside the security fence surrounding the crib. Under WAC 173-303-040, "Definitions," for 'landfill,' this unit has no ancillary piping. The waste-feed piping from the 242-A Evaporator, including the valve station and the basin discharge piping to the 216-A-37-1 Crib are outside the TSD unit boundary and the scope of TSD unit closure. This piping is anticipated to be addressed in conjunction with the 200-IS-1 OU (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 216-A-37-1 Crib began operations in March 1977 for percolation of 242-A Evaporator process condensate to the soil column. Discharge of the evaporator process condensate to the crib was terminated on April 12, 1989, when evaporator process condensate was determined to contain potentially dangerous waste regulated under WAC 173-303. The crib has been out of service since April 1989.

2.2 SECURITY INFORMATION

Security information for the Hanford Facility is discussed in DOE/RL-91-28, *Hanford Facility Dangerous Waste Permit Application*, Section 6.1. Because the 216-A-37-1 Crib is located in the 200 East Area, the security information pertaining to the 200 Areas applies to this TSD unit.

A chain barrier surrounds the 216-A-37-1 Crib. Changes to security are expected to occur during the course of 200 East Area deactivation and decommissioning activities. Security measures will remain in place that limit unit entry to authorized personnel and that preclude unknowing access by unauthorized individuals until closure of the TSD unit.

Figure 1. 216-A-37-1 Crib Site Plan (DOE/RL-88-21).

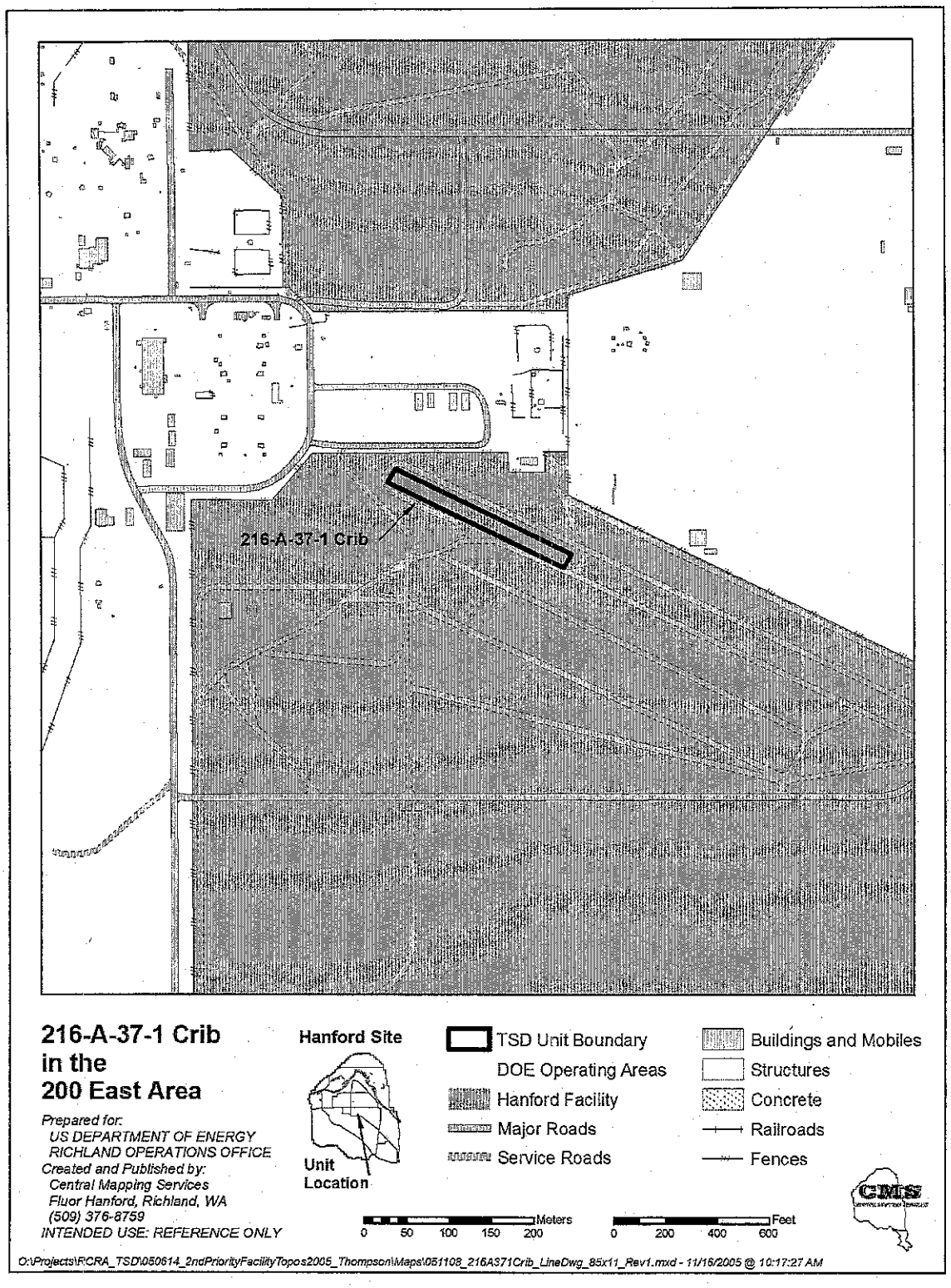
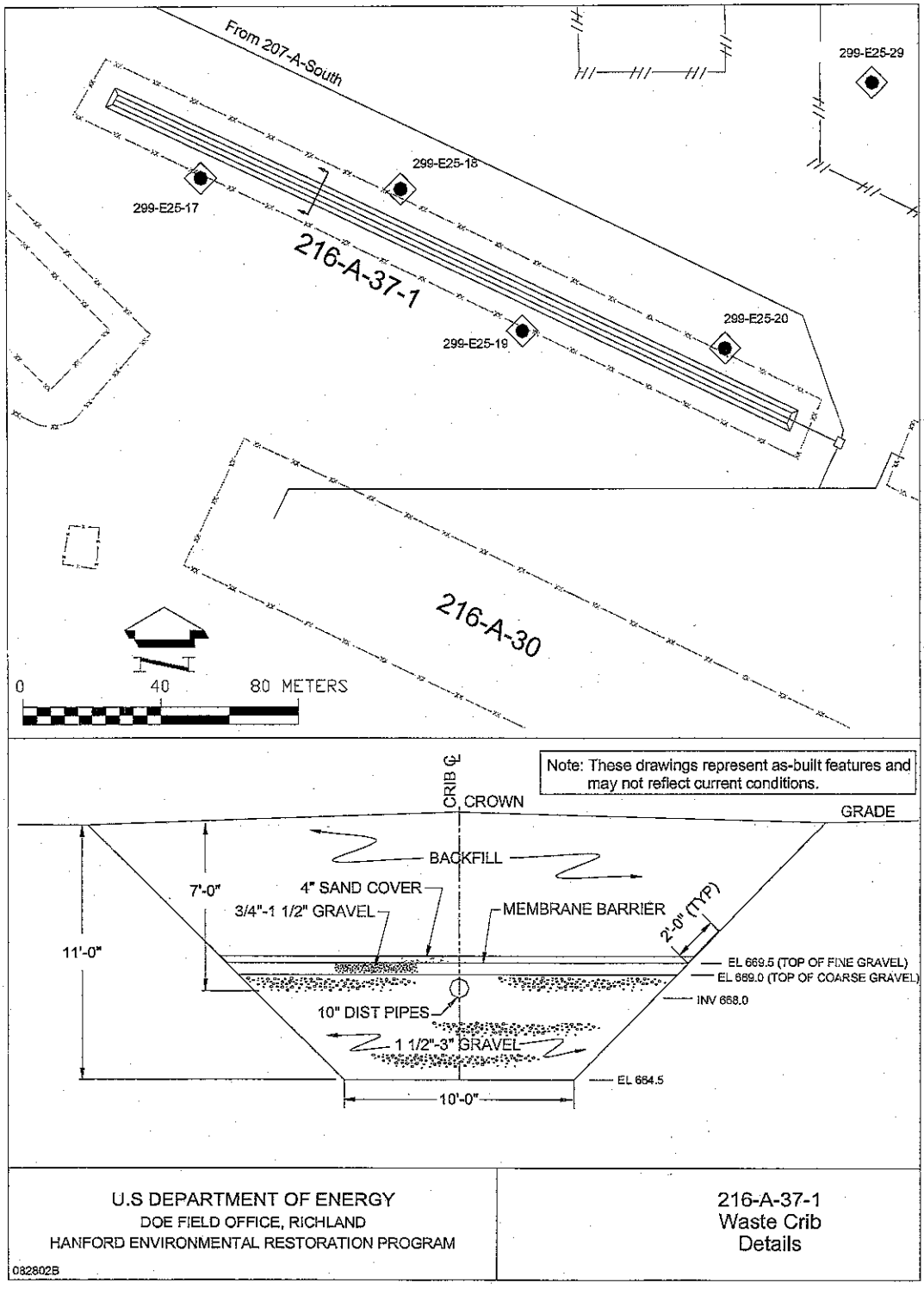


Figure 2. Construction Diagram for the 216-A-37-1 Crib.



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3.0 PROCESS INFORMATION

This chapter identifies the process that was the source of the waste disposed of at the 216-A-37-1 Crib and the crib disposal process.

3.1 WASTE SOURCES AND DESCRIPTION

All waste contributions to the 216-A-37-1 Crib originated from the 242-A Evaporator via the 207-A South Retention Basin. Waste processed by the 242-A Evaporator is a mixed waste as defined in WAC 173-303-040 that was received from the Double-Shell Tank (DST) System. DST mixed waste is an aqueous solution containing dissolved cations and anions, sodium, potassium, aluminum, hydroxides, nitrates, and nitrites. Slurry and process condensate are the two mixed-waste streams generated at the 242-A Evaporator. The slurry is returned to the DST System. The process condensate is condensed vapor from the evaporation process. During crib operations, this condensate was transferred to the 207-A South Retention Basin for interim storage before it was disposed of at the 216-A-37-1 Crib.

The process condensate was mostly water containing small quantities of ammonia and inorganic constituents and trace quantities of volatile organics and radionuclides (WHC-EP-0342, Addendum 15, *242-A Evaporator Process Condensate Stream-Specific Report*). The RCRA permitting documents for all three associated units (i.e., DST System Part A [DOE/RL-88-21], 242-A Evaporator unit-specific permit conditions [WA7890008967, *Hanford Facility Resource Conservation and Recovery Act Permit, Dangerous Waste Portion, Revision 8, for the Treatment, Storage, and Disposal of Dangerous Waste*], and 207-A South Retention Basin Part A [DOE/RL-88-21]) identify the potential for all of these units to have managed the same waste and carry the same dangerous waste numbers.

3.2 TREATMENT, STORAGE, AND DISPOSAL UNIT DISPOSAL PROCESS

The 216-A-37-1 Crib operated as a landfill for the disposal of 242-A Evaporator process condensate to the soil column that had been received from the 207-A South Retention Basin. Waste was pumped from 207-A South Retention Basin through waste-transfer piping to the valve station located outside of the south end of the crib and from there to the crib for deposal. At the crib, the transfer piping connected to the perforated waste-distribution piping that evenly distributed effluent waste over the length of the crib. No waste treatment occurred at this site.

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4.0 WASTE CHARACTERISTICS

This chapter identifies the inventory and the characteristics of the waste treated and stored at the 216-A-37-1 Crib.

4.1 WASTE INVENTORY

The 216-A-37-1 Crib operated from 1977 to 1989. The total quantity of waste that was discharged to the crib was limited to the quantity of process-condensate effluent waste generated at the 242-A Evaporator that was discharged to the 207-A South Retention Basins and subsequently to the crib. The process design capacity of 327,000 L (86,400 gal) per day was based on the potential daily output of the 242-A Evaporator process condensate discharged to the crib via the 207-A South Retention Basin. Approximately 377,011 m^3 of 242-A Evaporator process condensate containing trace quantities of chemicals and radionuclides are estimated to have been discharged to this crib (DOE/RL 98-28).

4.2 WASTE CHARACTERISTICS

The 242-A Evaporator process condensate disposed of at this crib was designated a mixed waste. This waste was derived from a waste containing spent halogenated and nonhalogenated solvents identified in WAC 173-303-9904, "Dangerous Sources List," (dangerous waste numbers F001, F002, F003, F004, and F005), and because of the toxicity of ammonia (WT02, state-only, toxic, dangerous waste). The 216-A-37-1 Crib Part A (DOE/RL-88-21) identifies the dangerous waste numbers potentially managed at this unit. The constituents associated with these dangerous waste numbers are identified in Table 1 and represent the potential TSD unit constituents in waste remaining at the unit. Because the 242-A Evaporator treatment was limited to evaporation processes that did not remove dangerous waste numbers, all of the listed DST System dangerous waste numbers potentially apply to the waste stream disposed of at the crib.

Table 1. Comparison of 216-A-37-1 Crib Treatment, Storage, and Disposal Unit Constituent Soil Concentrations to Clean-Closure Levels.

Treatment, Storage, and Disposal Unit Constituents	Maximum Concentration			Hanford Site Soil Background (mg/kg) [a] 90%	Cleanup Levels				Dangerous Waste Level [f] (mg/kg)	Clean-Closure Requirement [e]	Meet Clean-Closure Standard?
	All Soils		Shallow <15 ft bgs		Soil Cleanup Level for Human Health Direct Contact [b]		Groundwater Protection [c] (mg/kg)	Ecological [d]			
	mg/kg	ft bgs			Carcinogen	Non-carcinogen					
Ammonia [f]	266	12.5	266	9.23	NA	NA	NA	--	10,000	NA	Yes
Acetone [g]	0.014	97.5	0.013	NA	NA	72,000	28.9	--	NA	Groundwater protection	Yes
Cresol-m [g, h]	U	NA	U								Yes
Cresol-o [g, h]	U	NA	U								Yes
Cresol-p [g, h]	U	NA	U								Yes
Methylene Chloride [g]	U	NA	U								Yes
Methyl Ethyl Ketone [g, h]	U	NA	U								Yes
Methyl Isobutyl Ketone [g, h]	U	NA	U								Yes
Trichloroethane [g]	U	NA	U								Yes

Shaded areas represent information not required for undetected treatment, storage, and disposal unit constituents.

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

[b] WAC 173-340-740(3)(b)(iii)(B), "Unrestricted Land Use Soil Cleanup Standards," "Method B Soil Cleanup Levels for Unrestricted Land Use," "Standard Method B Soil Cleanup Levels," "Human Health Protection," "Soil Direct Contact," equations found in Tables 740-1 (noncarcinogens) and 740-2 (carcinogens) for human health direct contact. Point of compliance is surface to 4.6 m (15 ft) (WAC 173-340-740(6), "Unrestricted Land Use Soil Cleanup Standards," "Point of Compliance").

[c] WAC 173-340-740(3)(b)(iii)(A) directs establishment of soil cleanup levels protective of groundwater. Point of compliance is soils throughout the site [WAC 173-340-740(6)].

[d] Not applicable to treatment, storage, and disposal unit closure (Section 6.2.2).

[e] Listed values represent the most restrictive closure requirement after evaluation to ensure that it is not less than natural background and for analytical considerations as indicated in WAC 173-340-700(6)(d), "Overview of Cleanup Standards," "Requirements for Setting Cleanup Levels," "Natural Background and Analytical Considerations."

[f] Ammonia not regulated under WAC 173-340, "Model Toxics Control Act -- Cleanup," and no identified cleanup level exists.

[g] F001-F005 listed waste constituents of 242-A Evaporator waste as the sole source of 216-A-37-1 Crib waste.

[h] Constituent reported under the following synonyms: Cresol-m reported as 3-methylphenol; Cresol-o reported as 2 methylphenol; Cresol-p reported as 4 methylphenol; Methyl ethyl ketone reported as 2-butanone; Methyl isobutyl ketone reported as 4 methyl-2 pentanone (hexone).

[i] Clean-closure level for ammonia only is the WAC 173-303-100, "Dangerous Waste Criteria," dangerous waste designation level as a state-only toxicity criteria (WT02) waste.

bgs = below ground surface.
NA = not applicable.
U = undetected.

5.0 216-A-37-1 CRIB RCRA SITE GROUNDWATER MONITORING

This chapter describes the 216-A-37-1 Crib groundwater monitoring history and provides aquifer information, groundwater well information, and well sampling and analysis information. This chapter updates information provided in the RI/FS Work Plan (DOE/RL-2000-60) and the RI Report (DOE/RL-2004-25) with the latest (fiscal year 2004) groundwater monitoring results.

After clean closure, no RCRA final status groundwater monitoring program will be required for this TSD unit. Groundwater remediation, if required, will remain outside the scope of TSD unit closure. However, regional monitoring will continue for the Plutonium-Uranium Extraction (PUREX) Plant cribs by the 200-PO-1 Groundwater OU for all contaminants of concern to groundwater.

5.1 HISTORY OF RCRA GROUNDWATER MONITORING AT THE 216-A-37-1 CRIB

As a "regulated unit" (i.e., landfill) under the definitions of WAC 173-303-040, this unit must meet interim status groundwater requirements contained in WAC 173-303-400(3)(a) through (3)(c), "Interim Status Facility Standards," "Standards," incorporating by reference 40 CFR 265, "Interim Status Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities," Subpart F, "Ground-Water Monitoring," (as implemented by Ecology). The objective of RCRA monitoring for this crib is to assess the nature and extent of groundwater contamination with hazardous contaminants and determine their rate of movement in the aquifer (40 CFR 265.93(d), "Preparation, Evaluation, and Response," as referenced by WAC 173-303-400, "Interim Status Facility Standards").

The 216-A-37-1 Crib is one of the three RCRA PUREX cribs that also include the 216-A-10 and 216-A-36B Cribs. These cribs are located in the southeast part of the 200 East Area and are within the 200-PO-1 Groundwater OU. The groundwater in the vicinity of the PUREX cribs is monitored on a regional basis. Monitoring requirements and results for these cribs are reported together because these cribs received similar constituents, and determining the contributions of the individual cribs to the groundwater plumes is difficult (PNNL-15070, *Hanford Site Groundwater Monitoring for Fiscal Year 2004*). This region has significant tritium, nitrate, and I-129 groundwater contamination plumes that exceed drinking water standards, the largest of which is the tritium plume. The 200-PO-1 Groundwater OU boundary generally is defined as the extent of the region's tritium plume. A groundwater monitoring program has been in operation for the 216-A-37-1 Crib since May 1988, in accordance with ongoing RCRA monitoring requirements.

5.2 AQUIFER IDENTIFICATION

The uppermost or unconfined aquifer near the PUREX cribs occurs within Ringold Formation unit A. Depth to water is approximately 100 m (328 ft), and the aquifer is approximately 22 m (72 ft) thick. Flow direction of the unconfined aquifer near the 216-A-37-1 Crib occurs primarily toward the southwest. However, to the west and northwest, the water table is

essentially flat. Groundwater flow velocities beneath the cribs range between 0.003 and 0.48 m/day (PNNL-13788, *Hanford Site Groundwater Monitoring for Fiscal Year 2001*).

5.3 WELL LOCATION AND DESIGN

The sites in the 200-PO-1 Groundwater OU are monitored as one waste management unit, because they have similar hydrology and waste constituents. The current interim status groundwater monitoring is identified in PNNL-11523, *Combination RCRA Groundwater Monitoring Plan for the 216-A-10, 216-A-36B, and 216-A-37-1 PUREX Cribs*, which contains details regarding the geology, hydrology, and current groundwater monitoring program for the 216-A-37-1 Crib.

PNNL-11523 organized the downgradient wells into two groups, near-field wells and far-field wells, most of which are located between the 200 East Area and the Columbia River. Eleven near-field wells and 79 far-field wells coincide with the same wells used for monitoring major tritium, nitrate, and I-129 plumes that extend southeastward of the PUREX cribs area to the Columbia River.

Groundwater monitoring wells and boreholes near the 216-A-37-1 Crib are shown in Figure 3. Wells 299-E25-9, 299-E25-17, and 699-37-47A are the near-field downgradient monitoring wells for the 216-A-37-1 Crib. Wells 299-E25-17 and 299-E37-47A are sampled semiannually. Since fiscal year 2000, well 299-E25-17 located near the 216-A-37-1 Crib has been going dry, making sampling difficult, and in the near future this well may be replaced by well 299-E25-18. Well 299-E25-31 serves as the upgradient monitoring well for the 216-A-37-1 Crib and is sampled semiannually. PNNL-11523 contains as-built drawings of the 11 near-field wells and schematic diagrams of the far-field wells. Groundwater monitoring wells and boreholes near the 216-A-37-1 Crib are shown in Figure 1.

5.4 WELL SAMPLING AND ANALYSIS

The PUREX cribs have been sampled for contaminant indicator parameters, groundwater quality parameters, drinking water parameters, and site-specific parameters to satisfy RCRA groundwater monitoring program requirements. The near-field well parameters include anions (nitrate, sulfate, chloride, ammonia); filtered, inductively coupled plasma metals; and the field-collected parameters of pH, specific conductance, temperature, turbidity, and water level. The far-field well parameters include anions and the same field-collected parameters as the near-field wells.

Table 2 identifies the concentration in groundwater of TSD unit constituents measured in crib groundwater monitoring wells. Non-RCRA, AEA parameters include gross alpha, gross beta, tritium, Sr-90, and I-129. The most extensive and significant contaminants are tritium, I-129, and nitrate, none of which are considered TSD unit constituents for the 216-A-37-1 Crib.

Figure 3. Borehole C4106 and Groundwater Monitoring Well Locations for the 216-A-37-1 Crib.

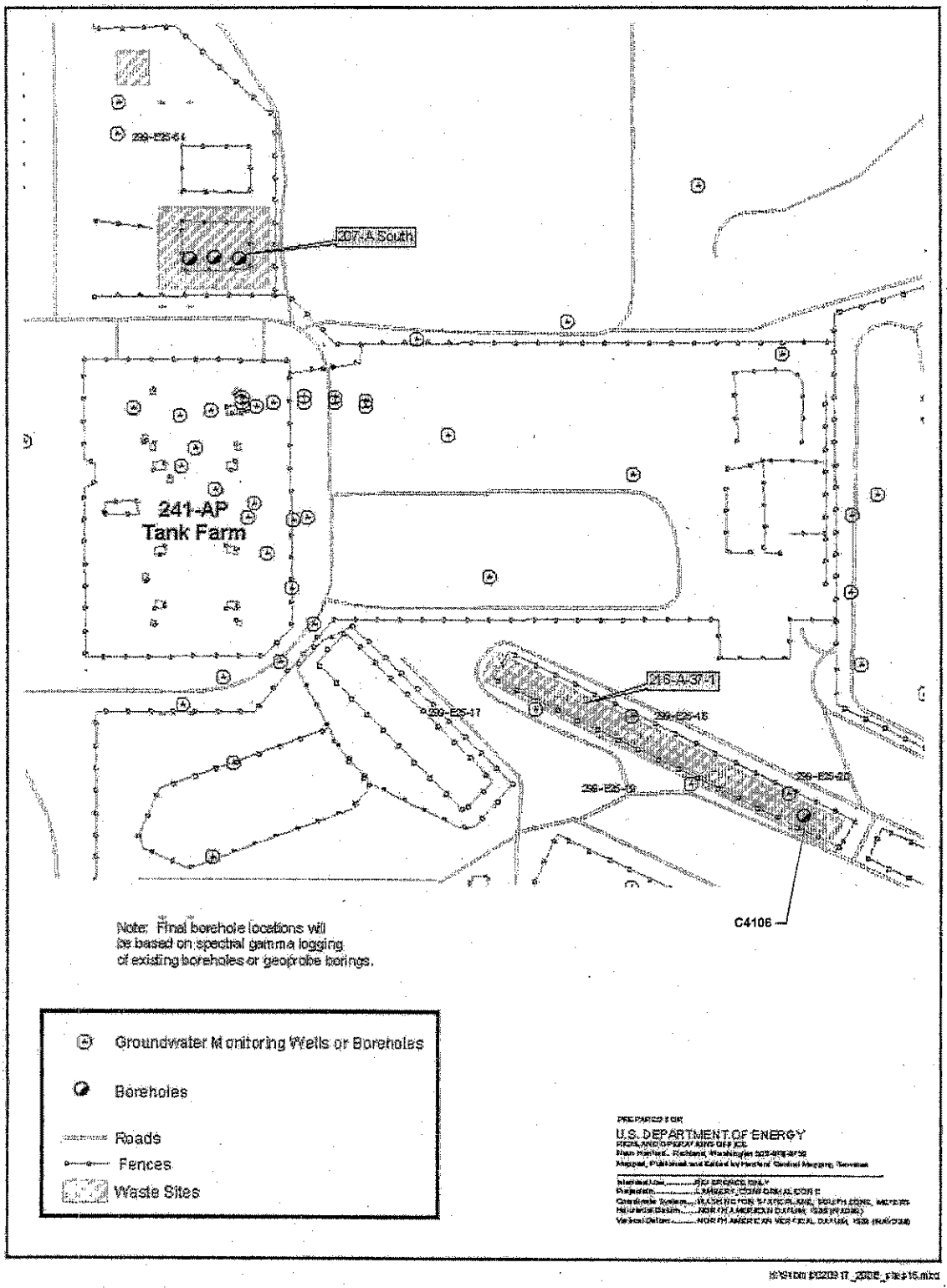

Table 2. Comparison of 216-A-37-1 Crib Groundwater Data to Clean-Closure Levels.

Treatment, Storage, and Disposal Unit Constituents	Maximum Concentration in Groundwater (µg/L)	Hanford Site Groundwater Background (µg/L) [a] (90% Log Normal Distribution)	Groundwater Cleanup Level (GCL) [g] (µg/L)	Clean-Closure Driver [b]	Meet Clean-Closure Standard?
Ammonia	126	113	NA	Not regulated	Yes
Acetone	30	-	7,200	GCL	Yes
Cresol – m	1.44U [c]	-	800	GCL	Yes
Cresol – o	7.5	-	800	GCL	Yes
Cresol – p	1.3U [d]	-	80	GCL	Yes
Methylene chloride	0.077U [e]	-	5	MCL	Yes
Methyl ethyl ketone	29	-	4,800	GCL	Yes
Methyl isobutyl ketone	0.85	-	640	GCL	Yes
Trichloroethane, 1,1,1	0.58U [f]	-	200	MCL	Yes

[a] DOE/RL-96-61, *Hanford Site Background: Part 3, Groundwater Background.* There are no background concentrations for the organic compounds.
[b] Listed values represent the most restrictive level of the groundwater pathways after evaluation of this value, to ensure that it is not less than natural background and for analytical considerations as indicated in WAC 173-340-700(6)(d), "Overview of Cleanup Standards," "Requirements for Setting Cleanup Levels," "Natural Background and Analytical Considerations."
[c] All values reported as undetected with variable detection limits ranging from 10 to 1.44 µg/L.
[d] All values reported as undetected with variable detection limits ranging from 10 to 1.3 µg/L.
[e] All values reported as undetected with variable detection limits ranging from 10 to 0.077 µg/L.
[f] All values reported as undetected with variable detection limits ranging from 10 to 0.58 µg/L.
[g] Groundwater cleanup level, in accordance with WAC 173-340-720(4), "Ground Water Cleanup Standards," "Method B Cleanup Levels for Potable Ground Water."

GCL = groundwater cleanup level.
MCL = maximum contaminant level.
NA = not applicable.
U = undetected.

5.5 RESULTS OF INTERIM STATUS GROUNDWATER ASSESSMENT

The most current (fiscal year 2004) groundwater monitoring results are presented in PNNL-15070. Although monitoring results (including process knowledge and discharge records) indicate that the impact to groundwater also originates from other facilities as well as from the PUREX cribs, individual constituents known to have been received by the PUREX cribs have been detected in groundwater above the maximum contaminant level (MCL) or drinking water standards. However, with regard to TSD unit constituents, ammonia (ammonium ion) was detected in groundwater only in micrograms per liter (parts per billion) (Table 2) and has no Federal drinking water standard (MCL). All other TSD unit constituents either were not detected or also were reported only in low micrograms per liter (Table 2).

PUREX crib regional monitoring reported in PNNL-15070 identified non-TSD unit constituents tritium, nitrate (as N), I-129, Sr-90, and gross beta as exceeding the groundwater protection standards in wells in the vicinity of the 216-A-10 Crib and the 216-A-36B Crib. However, PNNL-15070 does not report exceedances of any groundwater parameters in wells associated with the 216-A-37-1 Crib. Semiannual statistical evaluations have not directly shown that groundwater quality has been impacted from waste discharged into the 216-A-37-1 Crib.

PNNL-15070 indicates that the tritium, I-129, and nitrate contamination plumes in this region generally are attenuating throughout the majority of their extent, except for nitrate in the area of the 216-A-10 and 216-A-36B PUREX Cribs. This could relate to changes in groundwater flow paths caused by the decreased amount of groundwater flow from B Pond and a greater contribution of groundwater flow from the northwest, or it could be from continued migration of vadose zone inventory to the saturated zone from RCRA and non-RCRA cribs. The maximum nitrate concentration in groundwater in 2004 was 132 mg/L at near-field monitoring well 299-E17-14 for the 216-A-36B Crib. Although the extent of the nitrate plume emanating from the 200 East Area is nearly identical to that of the tritium plume, the area of the nitrate greater than the MCL (45 mg/L) is considerably smaller than the portion of the tritium plume above the tritium drinking water standard (20,000 pCi/L). The nitrate reported in groundwater in this region likely is from past-practice routine and/or occasional direct discharges of nitrate-bearing waste to other RCRA cribs and to non-RCRA cribs in this region. These discharges include ammonium nitrate in cladding removal waste discharged to the 216-A-36A Crib (non-RCRA) and to the 216-A-36B Crib, and nitric acid waste routinely discharged to the 216-A-10 Crib (DOE/RL-2005-90, *Closure Plan for the 216-A-36B Crib*).

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6.0 CLOSURE STRATEGY AND PERFORMANCE STANDARDS

This chapter identifies the 216-A-37-1 Crib closure strategy and closure performance standards for soils and materials.

6.1 CLOSURE STRATEGY

The 216-A-37-1 Crib TSD unit, which includes soils and crib piping and materials, will be clean closed without further physical closure actions. Because the clean-closure approach is based on the results of completed sampling and analysis and the clean-closure justification discussion presented in this plan, approval of the plan will constitute approval of clean closure.

In 2004, TSD unit characterization sampling was completed as a portion of the 200-PW-2/-4 OU CERCLA RI/FS process. The results of the 200-PW-2/-4 remedial investigation sampling and analysis, as identified in the following sections, indicate that no dangerous waste constituents disposed of during the period of TSD unit operations (TSD unit constituents) exist in crib soils or crib materials above analytical clean-closure standard(s) established in accordance with WAC 173-303-610(2)(b)(i) and (ii), "Closure and Post-Closure," "Closure Performance Standard." Any further physical activities necessary to complete waste-site disposition of non-TSD unit constituents (e.g., radionuclides, past-practice chemical constituents) will occur in conjunction with 200-PW-2/-4 CERLCA OU activities under Tri-Party Agreement (Ecology et al. 1989a), Chapter 7.0, past-practice processes that are outside the scope of TSD unit closure and that satisfy RCRA corrective action requirements under the WA7890008967, *Hanford Facility Resource Conservation and Recovery Act Permit, Dangerous Waste Portion, Revision 8, for the Treatment, Storage, and Disposal of Dangerous Waste*, Condition II.Y.

Because the 216-A-37-1 Crib RCRA TSD unit is not responsible for contaminants in groundwater (Section 5.4), their presence in groundwater above drinking water standards does not preclude TSD unit clean closure before completion of groundwater cleanup. After clean closure, this crib will continue to be monitored by the 200-PW-1 Groundwater OU under a RCRA groundwater assessment program for past-practice (corrective action) constituents (DOE/RL-2000-60, Rev. 1).

6.2 CLOSURE PERFORMANCE STANDARDS

This section identifies TSD unit clean-closure performance standards and unit soil and material clean-closure requirements.

6.2.1 Treatment, Storage, and Disposal Unit Closure Performance Standards

The standards for closure of this TSD unit are in accordance with the requirements of *Hanford Federal Facility Agreement and Consent Order Action Plan* (Ecology et al. 1989b), Section 5.3,

directing that Hanford Site interim status TSD unit closures meet the requirements of WAC 173-303-610. As required by Tri-Party Agreement, Section 6.3.1, clean closure for disposal units also must demonstrate that TSD unit operations did not adversely impact soil or groundwater. The closure performance standards of WAC 173-303-610(2)(a), require the owner or operator of a TSD facility to close the facility in a manner that (1) minimizes the need for further maintenance; (2) controls, minimizes, or eliminates, postclosure escape of dangerous waste, dangerous waste constituents, leachate, contaminated runoff, or dangerous waste decomposition products to the ground, surface water, groundwater, or the atmosphere to the extent necessary to protect human health and the environment; and, (3) returns the land to the appearance and use of surrounding land areas.

Clean closure, meaning the status of a Hanford Site TSD unit closed to levels prescribed in WAC 173-303-610(2)(b), will meet these performance standards. Clean closure will eliminate the need for future inspections, monitoring, and maintenance resulting from contamination from TSD unit constituents. Clean closure based on completed sampling and analysis demonstrates the absence of chemical contamination at the 216-A-37-1 Crib that could escape during a postclosure period. After clean closure, the appearance of the land will be consistent with future land-use determinations for adjacent portions of the 200 Areas as an industrial-exclusive portion of the Hanford Site.

6.2.2 Soil Clean-Closure Requirements

The clean-closure standards for soil are action levels established to meet the closure performance standards of WAC 173-303-610(2)(a) and the clean-closure requirements of WAC 173-303-610(2)(b)(i) and WAC 173-303-650(6)(a), "Surface Impoundments," "Closure and Post-Closure Care." Soil clean-closure levels for TSD unit constituents are numeric cleanup levels prescribed by WAC 173-303-610(2)(b)(i) to be calculated using the formulas of WAC 173-340-740(3), "Unrestricted Land Use Soil Cleanup Standards," "Method B Soil Cleanup Levels for Unrestricted Land Use," or are Hanford Site background (DOE/RL-92-24, *Hanford Site Background: Part 1, Soil Background for Nonradioactive Analytes*) concentrations, whichever is least restrictive. No TSD unit constituent in soil has been shown by remedial investigation sampling to exceed these action levels. Therefore, TSD unit soil meets clean-closure requirements without further remediation for TSD unit constituents (Table 1).

Ammonia is a 216-A-37-1 Crib TSD unit constituent but only because of its designation as a state-only (WT02) waste. Ammonia is not regulated under WAC 173-340-740(3). Consequently, no WAC 173-340-740(3) human health direct contact soil or groundwater protection cleanup level exists for ammonia. In addition, no treatment standard exists for state-only (WT02) ammonia wastes. Given the absence of an established regulatory cleanup level for ammonia in soil, the clean-closure requirement will be the dangerous-waste designation level for ammonia as a state-only toxicity criteria (WT02) waste, calculated in accordance with WAC 173-303-100, "Dangerous Waste Criteria" (i.e., greater than 1 wt% of the waste stream). Because this concentration is greater than Hanford Site background values for ammonia of 9.23 mg/kg (DOE/RL-92-24), its use will not direct cleanup to below background. For ammonia, the maximum concentration in soil of 266 mg/kg (3.8 m or 12.5 ft) below ground surface (bgs) is not sufficient to designate soil as a state-only WT02 dangerous waste

(if removed), and therefore TSD unit soil meets clean-closure requirements without further remediation for ammonia.

Nitrate exists in soils above groundwater protection standards (Section 7.2.3) but is not a 216-A-37-1 Crib TSD unit constituent and so will be addressed outside the scope of TSD unit closure. Although not a TSD unit dangerous waste constituent, nitrate meets the definition of a hazardous substance under the cleanup provisions of the Tri-Party Agreement (Ecology et al. 1989a) (CERCLA or RCRA corrective-action provisions) and, currently, nitrate exceedances would be dispositioned under the 200-PW-4 OU CERCLA RI/FS process that is outside the scope of TSD unit closure and that will satisfy RCRA corrective action requirements. Ecology will oversee nitrates as past practice constituents at the clean-closed TSD unit under RCRA corrective-action authority, under the WA7890008967, *Hanford Facility Resource Conservation and Recovery Act Permit, Dangerous Waste Portion, Revision 8, for the Treatment, Storage, and Disposal of Dangerous Waste*, Condition II.Y.

Along with human-health protection requirements with regard to TSD unit constituents, cleanup to WAC 173-340-740(3) incorporates requirements for consideration of ecological protection [WAC 173-340-740(3)(b)(ii)], soil vapor ambient-air contamination control [WAC 173-340-740(3)(b)(iii)(C)], and groundwater protection requirements [WAC 173-340-740(3)(b)(iii)(A)]. However, these requirements are not applicable to this TSD unit closure. Soil vapor ambient air protection requirements for protection from exposure to volatile organic constituent vapors do not apply, because volatile organic constituents were not detected in site soils. Ecological protection requirements do not apply based on WAC 173-340-7493(2)(a)(i), "Site-Specific Terrestrial Ecological Evaluation Procedures," "Problem Formulation Step," "The Chemicals of Ecological Concern," and beyond that, no ecological indicator soil concentration (WAC 173-340-900, "Tables," Table 749-3) exists for any detected TSD unit constituent. Groundwater protection requires no further consideration, because TSD unit constituents either are not in groundwater above MCLs or, as in the case of ammonia, are monitored but have no MCL (Table 2).

6.2.3 Clean-Closure Standard for Piping and Materials

The clean-closure standard for crib piping and materials is established in accordance with WAC 173-303-610(2)(b)(ii). Materials in this TSD unit include waste distribution piping within the TSD unit boundary and the membrane overlaying the distribution piping as a moisture barrier. For the listed waste constituents regulated under WAC 173-340-740(3) (Table 1), this standard would be the same concentration as for soils. However, for ammonia this standard is the dangerous-waste designation level for ammonia as a state-only WT02 waste, calculated in accordance with WAC 173-303-100 (i.e., greater than 1 wt% of the waste stream). Achievement of this standard for these materials will be demonstrated through use of process knowledge (Chapter 3.0) and knowledge of waste characteristics (Chapter 4.0).

Belowgrade piping and membrane material were not sampled as a portion of the remedial investigation activities. However, these materials meet clean-closure requirements without further investigation, because they are not reasonably expected to be contaminated with TSD unit

constituents above clean-closure levels. The waste distribution piping is considered to be empty. No liquid has been added since 1989 (approximately 17 years at this writing) and piping was sloped and perforated to facilitate complete drainage, thereby precluding liquid from remaining in the piping. The membrane was placed above waste distribution piping that was perforated on the bottom and drained downward directly to coarse gravel, making membrane contact with waste unlikely. Dangerous waste residues would not reasonably exist on internal piping surfaces or on the fabric membrane (even if contacted by waste), given that the effluent primarily was water and was very low in solids (Section 4.1) and that waste stream constituents (volatiles and ammonia) are not prone to residue deposition. Thus, no reasonable potential exists for ammonia or the listed, volatile organic constituents (which were not detected in crib soils) to exist in piping as effluent or on piping or membrane surfaces as residues at levels that could reasonably exceed their respective dangerous waste designation or WAC 173-340-740(3) clean-closure requirements.

7.0 CLOSURE ACTIVITIES

This chapter summarizes completed clean-closure activities for the 216-A-37-1 Crib closure activities, including TSD unit physical isolation, borehole drilling, and soil closure verification sampling and analysis.

7.1 TREATMENT, STORAGE, AND DISPOSAL UNIT PHYSICAL ISOLATION

In 1989, to preclude any further discharges to this crib and in support of TSD unit closure, the 207-A South Retention Basin, the sole upstream source of 216-A-37-1 Crib waste, was physically isolated from receipt of 242-A Evaporator process condensate effluent. Operations at the 242-A Evaporator were halted in 1989 to begin facility upgrades that would preclude discharges to the ground, including disposal to the soil column at the 216-A-37-1 Crib. At that time, waste began being transferred to the Liquid Effluent Retention Facility (LERF) basins for storage, awaiting future treatment at the 200 Areas Effluent Treatment Facility (ETF). This action permanently isolated the downstream 216-A-37-1 Crib from any further waste additions.

7.2 TREATMENT, STORAGE, AND DISPOSAL UNIT CLOSURE CHARACTERIZATION

This section summarizes completed TSD unit closure characterization activities, comprising borehole drilling, geophysical logging, field screening, and sampling and analysis of borehole soils. These actions were performed in fiscal years 2003 and 2004 as a portion of the 200-PW-2/-4 OU RI to identify the nature and extent of chemical and radiological contamination within at the TSD unit in support of remedial decision making and RCRA unit closure. Work plan sampling and analysis requirements for TSD unit characterization were arrived at during a data quality objectives process documented in CP-14176, *Remedial Investigation Data Quality Objectives Summary Report for the 200-PW-4 Operable Unit*. The remedial investigation was conducted in accordance with the sampling and analysis plan in Appendix B of the RI/FS Work Plan (DOE/RL-2000-60, Rev 1). Data collected from the crib are presented in the RI Report (DOE/RL-2004-25, Appendix B) and described in Section 7.2.2.3.

7.2.1 Borehole Drilling and Geophysical Logging

This section identifies the 216-A-37-1 Crib borehole drilling and geophysical logging activities.

7.2.1.1 Borehole Drilling

Drilling of Borehole C4106 (Figure 3) began on May 29, 2003, and was completed on June 24, 2003 for characterization of the 216-A-37-1 Crib. The borehole activities for this crib are described in detail in CP-18666, *200-PW-2 and 200-PW-4 Operable Unit Borehole Summary Report*. The borehole was drilled at a worst-case location, to a total depth of 84.8 m (278 ft) bgs, and the water table was found at 84.1 m (277.5 ft) bgs. The borehole was drilled to the top of

groundwater using a cable-tool drill rig and was advanced to total depth using drive barrels and split-spoon samplers. Split-spoon samplers generally were used as the primary sampling device for collecting chemical, radiological, and physical property samples, but occasionally the drive barrel was used to collect moisture samples. After reaching total depth, each borehole was decommissioned by removing the temporary casings and backfilling the borehole with silica sand from the bottom to the water table, with granular bentonite up to 0.3 to 1 m (1 to 3 ft) bgs, and with a concrete surface seal in accordance with WAC 173-160, "Minimum Standards for Construction and Maintenance of Wells."

7.2.1.2 Borehole Geophysical Logging Activities and Results

Geophysical logging of gamma-emitting radionuclides and neutron moisture content was performed for this borehole using the Spectral Gamma-Ray Logging System and the Neutron Moisture-Logging System between April 30, 2003, and May 12, 2003. Data and additional details from the 216-A-37-1 Crib characterization are presented in the borehole summary report (CP-18666, Appendix F) and in the RI Report (DOE/RL-2004-25.

Logging information was used to guide sampling and analysis, for safety considerations, and to help confirm radiological analytical sampling results. The spectral gamma-ray logs supplement the analytical radionuclide data and present a vertical distribution of radionuclides in the vadose zone beneath the waste sites, which aids in the geological interpretation of subsurface stratigraphy. The logging system provided a continuous radiometric signature of the soils through a single thickness of casing to total drilled depth. A neutron moisture-logging tool was employed to provide a direct reading of hydrogen atom distribution and generate a moisture profile of the vadose zone in each borehole, significant because mobile contaminants move toward groundwater with the moisture front.

Logging data compared relatively well with laboratory sample data for radionuclides. Cesium-137 was the only manmade radionuclide detected and was observed between 2.7 and 11.0 m (9 and 36 ft) bgs, at concentrations ranging from 0.2 to 30 pCi/g with the maximum concentration measured at 3 m (10 ft) bgs (CP-18666, Appendix F). Sample data from Borehole C4106 showed low levels for Cs-137 with only two results above the minimum detectable activity (0.012 pCi/g): 0.113 pCi/g at 3.8 m (12.5 ft) bgs and 0.018 pCi/g at 5.3 m (17.5 ft) bgs.

Existing boreholes near this waste site underwent spectral gamma-ray logging in 2003 before the drilling program began: 299-E25-17 (A6301), 299-E25-19 (A4765), and 299-E25-20 (A4767) (Figure 2). Again, Cs-137 was the only manmade radionuclide detected in these locations. Cs-137 was detected sporadically and only at concentrations near the minimum detection level (0.2 pCi/g) suggesting a low potential for lateral spread of contamination. Neutron-moisture logging showed low moisture levels in deeper soils from 21.4 to 32.6 m (70 to 107 ft) bgs, consistent with analytical data reporting concentrations of Cs-137 near minimum detection level at these depths and suggesting limited contaminant mobility in these dryer vadose zone soils.

7.2.2 Soil Sampling and Analysis

This section describes soil sampling and field screening activities and soil sample analytical results.

7.2.2.1 Soil Sampling Activities

Borehole soil samples were taken and underwent field screening and laboratory analysis, as summarized in this section and described in detail in CP-18666. Data collected from the remedial investigation are presented in the RI Report (DOE/RL-2004-25, Appendix B) and discussed in the following section.

Thirty soil samples were collected from Borehole C4106 vadose zone material. A spilt-spoon sampler was the primary sampling device used to collect the samples from the boreholes. Two were quality control samples (equipment blanks) and the remaining 28 were obtained from borehole material from 0.2 to 83.1 m (0.5 to 272.5 ft) bgs for chemical and radiological analysis and determination of physical properties.

Borehole soil samples were analyzed selectively for ammonia, anions, hexavalent chromium, total cyanide, metals, nitrate/nitrite, oil and grease, pesticides and herbicides, pH, polychlorinated biphenyls, semivolatile organics, total petroleum hydrocarbons, radionuclides, volatile organics, moisture content, particle-size distribution, and bulk density (DOE/RL-2004-25, Table 2-2). These parameters included all listed waste TSD unit constituents identified on Table 1. Physical property samples were collected at major lithologic changes and as determined by the site geologist. Sample collection was guided by the sample schedule in the RI/FS Work Plan (DOE/RL-2000-60). The RI Report (DOE/RL-2004-25),Table 2-2, provides sample information (e.g., *Hanford Environmental Information System* sample number, date, depth, analyses performed) for Borehole C4106 soil samples. Analytical results are presented in Appendix B of the RI Report (DOE/RL-2004-25).

The crib TSD unit sampling approach was consistent with the characterization approach for other OU waste sites. The sampling approach generally required a greater sample frequency near the base of each waste site, which usually is the area of highest contamination. Sample collection was attempted always at depths of 4.6 m (or less) and 7.6 m (15 and 25 ft) bgs to define contamination profiles for remedial designs. Surface soils were tested for pesticides and herbicides used to kill insects and vegetation at 0.15 m (0.5 ft) bgs for investigation-derived waste characterization of near-surface soils. Samples to a depth of 4.6 m (15 ft) are critical for evaluation of human-health direct exposure and terrestrial wildlife scenarios, whereas deeper samples are applicable to groundwater protection considerations. Sample intervals generally increased below depths of about 15.2 to 27.4 m (50 to 90 ft) to intervals of 15.2 to 30 m (50 to 100 ft). Borehole samples were taken at 11 elevations: 3.8 m (12.5 ft), 5.3 m (17.5 ft), 8.4 m (27.5 ft), 11.4 m (37.5 ft), 14.5 m (47.5 ft), 22.1 m (72.5 ft), 29.7 m (97.5 ft), 44.9 m (147.5 ft), 60.2 m (197.5 ft), 72.2 m (237 ft), and 83 m (272 ft) bgs. One liner from selected sample intervals was analyzed for physical properties.

7.2.2.2 Sample Field Screening

Drill cuttings and soil samples collected from the borehole were screened in the field for volatile organic contamination, ammonia, tributyl phosphate, beta-gamma activity, and alpha activity. Screening information was used to assist in determining discrete sample locations or depths, to support worker health and safety, and for shipping information on the samples being placed into containers for shipment.

Samples were screened using hand-held vapor analyzers for volatile organic contamination, ammonia, and tributyl phosphate. Volatile organic compound screening was performed with a photoionization detector using 5 p/M as an indicator of contamination. The pH was determined in the field using pH paper, a pH meter, or both. Field screening results were documented in field logbooks.

7.2.2.3 Soil Sample Results

Table 1 identifies the maximum concentration listed in the RI Report (DOE/RL-2004-25, Appendix B) for TSD unit constituents (Section 4.2) and compares these concentrations to clean-closure levels. Pesticides and herbicides (non-TSD unit constituents) tested for at 0.15 m (0.5 ft) bgs were not detected. As expected at this site, ammonia (as N) was detected and reported at a maximum concentration of 266 mg/kg at 38.1 m (125 ft) bgs, which does not exceed the ammonia clean-closure level (10,000 mg/kg). Of the remaining TSD unit constituents, only acetone was detected and then only at 0.014 mg/kg at 29.7 m (97.5 ft) bgs, which is well below the soil cleanup levels protective of groundwater. No concentration of TSD unit constituents exceeded clean-closure levels in soils. Radionuclides (non-TSD unit constituents) were detected in the vadose zone beneath the 216-A-37-1 Crib in Borehole C4106 to a depth of 83.1 m (272.5 ft) bgs, with the maximum radionuclide concentrations present from 3.8 to 14.4 m (12.5 to 47.5 ft) bgs.

Nitrate was detected in soil at concentrations ranging from 134 to 385 mg/kg between 3.8 and 5.3 m (12.5 and 17.5 ft) bgs. These levels exceed WAC 173-340-747, "Deriving Soil Concentrations for Ground Water Protection," soil concentrations protective of groundwater (40 mg/kg). However, nitrate was not a constituent of process condensate, was not listed on the Part A permit application (DOE/RL-88-21) as having been received at the unit during the period of TSD unit operations, and is not a 216-A-37-1 Crib TSD unit constituent. Although nitrate is not a 216-A-37-1 Crib TSD unit constituent subject to the RCRA TSD unit closure requirements of WAC 173-303-610, nitrate meets the definition of a hazardous substance under the cleanup provisions of the Tri-Party Agreement (Ecology et al. 1989a) (CERCLA or RCRA corrective-action provisions). Currently, past-practice constituents, including nitrates, would be dispositioned under the 200-PW-2/-4 OU CERCLA RI/FS process.

These nitrates could originate as natural background; to a lesser degree from nitrates in process condensate; from conversion of ammonia in soil after disposal; or, could be from a combination of these factors. Only trace quantities of nitrates were know to exist as inorganic anions in the process condensate (WHC-EP-0342, Addendum 15), and soil concentrations likely are not from this source. Natural background levels can range from 52 mg/kg to 232 mg/kg (95 percent upper confidence limit) (DOE/RL-92-24, Table 2), accounting for much of the nitrate. Ammonia (NH_3) is the only nitrogen-based compound listed on the Part A permit application (DOE/RL-88-21) as having been received at this unit. Ammonia was prevalent in the waste stream and, under limited aerobic conditions requiring exposure to air, a fraction of the ammonia could oxidize to nitrate in the environment. However, such oxidation is not anticipated to have occurred to any significant extent in the deep, anaerobic soils of this crib. Even if it had occurred, the relatively short duration of TSD unit operations (less than 2 years) greatly limited the quantity of ammonia discharged as a RCRA constituent that would be available for such conversion to nitrate.

7.2.3 Other Activities During the Closure Period

The duties associated with dangerous waste management activities include performing inspections, notifying Ecology of any potential threats to human health and the environment, and performing groundwater monitoring. Following Ecology approval of clean closure, training for dangerous waste management activities at the 216-A-37-1 Crib will be discontinued.

Until final closure, TSD unit interim status inspections will continue. Following closure plan approval equating to clean-closure approval (Chapter 6.0), inspections for the 216-A-37-1 Crib will be discontinued.

7.3 SCHEDULE FOR CLOSURE

In accordance with Tri-Party Agreement (Ecology et al. 1989a) milestone M-20-033, submittal of a TSD unit closure plan to Ecology is required by April 30, 2006. The closure plan strategy for this TSD unit is clean closure. Closure activities, primarily comprising unit isolation and closure verification sampling and analysis to support this strategy, are complete. No additional closure activities have been scheduled. Acceptance of sample results demonstrating the absence of contamination at the unit above clean-closure levels will constitute approval of clean closure and completion of closure.

7.4 AMENDMENT OF CLOSURE PLAN

As required by WAC 173-303-610(3)(b), "Closure and Post-Closure," "Closure Plan; Amendment of Plan," the closure plan will be amended if changes to closure activities require a modification of the approved closure plan. However, closure activities are complete.

7.5 CERTIFICATION OF CLOSURE

This TSD unit received its final volume of waste in 1989. Closure activities comprising borehole drilling and soil sampling and analysis were completed in 2004 in conjunction with the 200-PW-2/-4 OU CERCLA RI/FS process (DOE/RL-2004-25). This sampling demonstrated the absence of chemical contamination in TSD unit soils above clean-closure levels (Chapter 6.0). Acceptance of sample results demonstrating the absence of contamination at the unit from TSD unit constituents above clean-closure levels will constitute completion of closure and approval of clean closure.

In accordance with WAC 173-303-610(6), "Closure and Post-Closure," "Certification of Closure," within 60 days of completion of TSD unit closure, the DOE will submit to the lead regulatory agency (Ecology) a certification of closure. Both DOE and the Co-Operator identified on the current Part A permit application (DOE/RL-88-21) will sign the certification of closure, and an independent Registered Professional Engineer will state that the unit has been closed in accordance with the approved closure plan. The certification will be submitted by registered mail or an equivalent delivery service. Documentation supporting the independent Registered Professional Engineer's certification will be placed in the Administrative Record.

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8.0 POSTCLOSURE PLAN

The closure strategy for the 216-A-37-1 Crib is clean closure with regard to contamination from RCRA TSD unit constituents. Therefore, no postclosure plan for purposes of addressing RCRA constituents is needed for this site. Although a RCRA final status groundwater monitoring program will not be required, activities associated with the corrective action of these sites will continue under the CERCLA RI/FS processes for the 200-PW-2/-4 (source) OU for the vadose zone soil and the 200-PO-1 Groundwater OU for groundwater beneath this unit.

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9.0 REFERENCES

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40 CFR 265.93, "Interim Status for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities," "Preparation, Evaluation, and Response," Title 40, *Code of Federal Regulations*, Part 265.93, as amended.

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